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Special Issue: Implication of Public Transport Services to Rural Mobility

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PREFACE

Dear Readers,

Once again, welcome to the third issue of volume 3 of our online-peer-reviewed International Journal of the Society of Transportation and Traffic Studies. Four issues of the journal are published annually.

Also, in this issue, we welcome Professor Lu Huapu of Tsinghua University, China to our International Board of Editors.

This issue contains 5 papers covering various topics of urban transport, public transport, and airport service quality at the Suvarnabhumi International Airport in Bangkok and rural public transport. The impacts of urban and public transport on the environment and their implication on transport sustainability were discussed in terms of noise pollution, congestion, climate change, and safety and security. The quality of services at Bangkok airport was studied using a model to assess passengers' perception and satisfaction. Geographically, the papers cover a number of Asian countries including Korea, Thailand and Indonesia. The implication of public transport services on rural mobility presents an interesting insight into the current situation in Indonesia.

We trust our readers will find these papers interesting, informative and useful.

Pichai Taneerananon Professor Chair of Editorial Board

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ANALYSIS OF URBAN TRAFFIC NOISE FOR ENVIRONMENTAL NOISE ASSESSMENT - FOCUSED ON JINJU CITY, KOREA –

Seul KOO Graduate Student (BK21) Dept. of Urban Engineering Gyeongsang National University 501, Jinju-daero, Jinju-si, Gyeongsangnam-do, South Korea FAX:+82-55-772-1779 E-mail: alice590@naver.com Jae-Hoon EO Ph. D. Candidate Dept. of Urban Engineering Gyeongsang National University 501, Jinju-daero, Jinju-si, Gyeongsangnam-do, South Korea FAX:+82-55-772-1779 E-mail: newogo@korea.kr

Hwan-Hee YOO Professor (BK21) Dept. of Urban Engineering Gyeongsang National University 501, Jinju-daero, Jinju-si, Gyeongsangnam-do, South Korea FAX:+82-55-772-1779 E-mail: hhyoo@gnu.ac.kr

Abstract: The damage of city life is being increased by traffic noise. As a result of analyzing the noise measuring network data from 2002 to 2009 in Jinju city of Korea in order to analyze the characteristics of land use zoning-based noise distribution in urban area with the use of GIS, the following conclusions were obtained. All of the land use zoning except industrial region were exceeding the standard for noise environment. Especially, the night noise in the residential area is sharply rising in these days. To evaluate this urban noise quantitatively, the manufacture of urban traffic noise map with the use of GIS is expected to be likely able to be utilized effectively in establishing a measure of reducing the urban traffic noise.

Key Words: Noise measuring network, Land use zoning-based noise, Geographic information system, Standard for noise environment, Urban traffic noise map

1. INTRODUCTION

Urban area is being continuously increased the traffic volume owing to diverse economic activities. Thus, the traffic noise caused by road traffic tends to be growing. Urban area is being utilized the land with various uses such as commerce, industry, housing, school, and hospital. The traffic noise in these land use zones is having great influence upon the urban living environment.

Especially, the districts of being sensitive to noise such as housing, school, hospital, etc. need to be arranged a plan available for minimizing influence of urban traffic noise. However, cities in Korea were developed by which diverse land use zones are concentrated on the urban space. Thus, there are many difficulties for individually managing urban traffic noise by land use zoning. Accordingly, noise is being eased by installing soundproofed wall or sound- proofed vegetation along the side of a road. However, there is a need of arranging more fundamental solution of a cause. The Korean government is operating the regularly automatic measuring network or manual measuring network by selecting the representative point by land use zoning in order to continuously monitor noise in urban area. The manual measurement network is measuring for more than 5 minutes, respectively, with 4 times in daytime and twice at night, and is grasping cyclic change in urban traffic noise through this. According to a report of the results of operating environmental noise measuring network for 2009, the number of cities, which are operating noise measuring network, are 45 cities. As for a case of having exceeded the standard for noise environment in residential area, 67% in daytime and 82% at night are being analyzed to have exceeded the urban standard. Thus. citizens' living environment can be known to be much damaged by traffic noise(Jae-Hoon et al., 2010). To analyze characteristics of noise distribution in urban area, the characteristic of noise diffusion is analyzed by applying GIS (Geographical Information System) to the noise measuring networks, which are distributed in urban area, or to the point-based noise measuring value. Based on this, a noise map is made. Thus, a research of analyzing noise effect in the urban space is being diversely carried out (Birmingham Environmental & Consumer Services Department / DETR, 2000; Jae-Hoon et al., 2010; Kucas et al., 2007). GIS can predict the characteristic of spatial diffusion with interpolation by integrating the map and the noise observation data, thereby being able to be used effectively in estimating the noise diffusion level at the point of having failed to be measured noise (Kucas et al., 2007).

This study analyzed characteristics of noise environment by analyzing a change in noise by land use zoning through selecting Jinju city in Korea as the target region and through using regular noise observation data, which are distributed in urban space. Through this, it suggested characteristics of noise environment by land use zoning, and predicted the characteristics that traffic noise, which is happened on the side of road, by applying GIS interpolation. Thus, the purpose of this study was to offer data available for being utilized given establishing the noise reduction measure.

2. NOISE MEASURING NETWORK AND TRAFFIC NOISE ENVIRONMENTAL STANDARD

The Ministry of Environment is integrating and operating the noise and vibration measuring networks in 764 places (605 places for environmental noise, 91 places for aircraft noise, 34 places for railroad noise, 34 places for road vibration) nationwide, and is offering the present status and the measuring data of environmental noise, aircraft noise, and railway noise measuring networks in the whole nation through the national noise information system for services to the public. Also, through a system called NOISEINFO, it also offers with real time the measuring data of the nation's Automatic Environmental Noise Measurement System in 62 places nationwide. These noise measuring network materials are being used in establishing diverse policies for improving noise environment by grasping the noise environment hindrance element, which is taken place in the urban area (ME, Korea Ministry of Enviornment; CERTU, 2007; Seungil, 1998).

The standard, which was used when evaluating the noise environment by land use zoning in this study, was based on the standard for noise environment in the framework Act on environmental policy. Table 1 is what indicated the management standard for road traffic noise. The district, which needs to be regulated as a case of exceeding or having concern about exceeding this management standard for traffic noise, can be designated as the traffic noise-vibration management district. This can be seen to be the positive national administrative action, which allows all people to possibly live in calm and peaceful environment, through preventing and dropping noise.

 Table 1 Traffic noise management standard by land

use zoning	unit: Leq dB(A)				
	Standard for environmental noise				
Target region	Daytime	Nighttime			
	(06:00~22:00)	(22:00~06:00)			
Private					
residential area,	50	40			
School, Hospital					
Residential area	55	45			
Commercial area	65	55			
Industrial area	70	65			

3. NOISE ANALYSIS AND NOISE MAP MAKING BY LAND USE ZONING

To analyze the characteristics of noise distribution by land use zoning, Jinju city was selected where is located in the southland of Korea. Jinju city is a small and medium-sized city where about 340,000 people dwell. Its land use zoning is composed of residential area, commercial area, industrial area, and green area. To monitor noise in downtown area, 25 environmental manual noise measuring networks are being operated from 2002. The locations with noise measurement are being operated 5 measuring places, respectively, in hospital area(A), school area(B), residential area(C), commercial area(D), and industrial area(E) (Fig. 1).



Figure 1 Locations of manual environmental noise measuring networks in Jinju

The locations of noise measuring networks are installed by being divided from the road side to the district away from the road. The Points available for representing noise level by land use zoning were selected, thereby being operated regularly (automatic) or quarterly (manual). Especially, in case of manual measuring network, the measurement is being made for more than 5 minutes, respectively, with 4 times in daytime and twice at night. In the definition of measurement time, the daytime level is measured 4 times with interval in over 2 hours from 6am to 10pm. The nighttime level is measured twice with interval in over 2 hours from 10pm to 6am next day. Thus, the measuring noise level is made by calculating an arithmetic mean of the measured value.

This study analyzed the characteristics of noise distribution by land use zoning through using the measured materials in 25 noise measuring networks in area of Jinju city from 2002 to 2009. Fig. 2 is what indicated the noise distribution by time level. Analyzing the characteristics of noise distribution by considering the standard for environmental noise, which was suggested in Table 1, in case of hospital area, the mean noise in daytime level was about 60dB, thereby having exceeded 50dB, which is the measurement. The nighttime level was 52dB, thereby having exceeded 40dB, which is the measurement. In case of school area, the daytime level was 57dB. The nighttime level was 50dB. Thus, it exceeded both of 50, 40dB, which are the standards for noise. Even as for residential area

and commercial area, both the daytime and nighttime levels exceeded the measurement. Just industrial area didn't exceed the measurement in the daytime and nighttime levels. Seeing based on these analytical results, the damage caused by noise pollution in downtown life can be known to be very serious.

Due to urban development in high density, the economic activity comes to be brisk in downtown, resulting in a rise in traffic volume. The expansion in road according to this is becoming a factor of increasing urban traffic noise.



Figure 2 Distribution of the mean noise by time level



Figure 3 The mean noise in daytime and nighttime by year

Fig. 3 is indicated the year-based noise distribution by using the measured materials in noise measuring networks from 2002 to 2009. In urban area, the hospital, school, and residential area are districts, which are very sensitive to noise. In the face of needing to thoroughly manage noise, most of areas are exceeding the noise standard. Out of it, the noise in residential area tends to be continuously increased. Especially, what night noise steeply increases these days violates citizens' sleeping environment. Thus, the arrangement of a countermeasure is judged to be imminent. Also, in case of commercial area,

the night noise is being grown. Thus, the commercial activity in nighttime level can be known to come to be gradually brisk.

To easily grasp a change by time level in this noise and to utilize it as data given establishing several kinds of measures of improving noise environment, it indicated a change in noise by land use zoning and prepared noise map. Fig. 4 was prepared noise map by dividing the locations of noise measuring networks in Jinju city by land use zoning and by indicating the mean noise by time level along with the noise standard.



Figure 4 Noise distribution chart of using noise measuring network data

However, the noise measuring network measures noise by selecting the representative district in urban area, thereby having difficulty in predicting all the noises, which occur in the detailed district of urban space. Accordingly, this study measured noise, which happens on the side of road by using GIS, and predicted characteristics that noise is spread to the district around, with GIS interpolation, thereby having generated data available for being used in analyzing damage and effect of noise. Fig. 5 was indicated with figure by selecting residential area out of districts in Jinju city, by measuring noise on the side of road, and by predicting noise, which is expanded to the surrounding area, by GIS.

Fig. 5-(a) is indicating location that measured noise centering on the side of road in residential area. (b) is showing the process of being expanded to the surrounding district by



(a) Noise measurement value

applying spline interpolation in GIS to the measured noise value. (c) was made in order to possibly compare the present status and the noise value in the corresponding district by indicating the noise distribution chart on the whole of the target districts by overlapping with aerial image. The noise map, which was made in this way, may be used in mediating several kinds of grievances, which occur due to noise, by evaluating noise environment in the residential area on the side of road and by analyzing noise environment by each house.



(b) Noise distribution by Spline interpolation



(c) Noise map connected with aerial image

Figure 5 Noise map of residential area made by GIS

4. CONCLUSION

As a result of analyzing the noise measuring network materials from 2002 to 2009 in Jinju city in order to analyze the noise distribution characteristics by land use zoning in urban area by using GIS, the following conclusions were obtained. As a result of analyzing the noise distribution by land use zoning, which corresponds to hospital, school, housing, commercial, and industrial area by dividing it into daytime and nighttime, all of land use zoning except industrial area were exceeding the noise environment standard. Out of it, the noise in residential area tended to be increased continuously. Especially, what night noise in the residential area is steeply growing these days is judged to be imminent in arranging a

measure in a sense of violating citizens' sleeping environment. Also, in case of commercial area, the night noise is being grown. Thus, the commercial activity in the nighttime level can be known to get brisk gradually.

Also, the manufacture of noise map with the use of GIS can be used in mediating several kinds of grievances, which occur due to noise, by evaluating noise environment in the residential area on the side of road and by analyzing noise environment by each house. The manufacture of noise map over the whole area of city can lead to being utilized in establishing a measure of reducing noise given devising urban management planning.

ACKNOWLEDGEMENT

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DEVELOPMENT OF BEHAVIORAL INTENTION MODEL TO UNDERSTAND THE INFLUENCE OF FACILITATING CONDITIONS ON TRAVELLERS'S INTENTION TO USE THE BUS TRANS JAKARTA

Ignatius DodhyWIBOWO Ph.D Student School of Architecture, Planning and Policy Development Bandung Institute of Technology Ganesha 10, Bandung 40132 Indonesia Email : dowib@yahoo.com

Ofyar Z TAMIN Professor Faculty of Civil and Environmental Engineering Bandung Institute of Technology Ganesha 10, Bandung 40132 Indonesia Fax : +62 22 251 6586 Email : ofyar@trans.si.itb.ac.id

ABSTRACT:

Bus Rapid Transit system is one of the TDM strategies focus on improving the service quality of busbased transit system by providing facilitating infrastructures, facilitating regulations and any other facilitating conditions. This paper will examine the influence of facilitating conditions on the individual's intention to use the bus rapid transit system in capital city of Jakarta Indonesia, which known as busway. The aim of this researh is to develop a behavioral intention model, which takes into account the influence of facilating conditions on individual's intention to use the busway. The result of the analysis indicates that individual's attitude toward facilitating conditions indirectly influence the intention to use the busway by 37% and directly influence the attitude toward behavior of using busway and perceived behavior control respectively by 60,84% and 64%.

KEYWORDS: Transportation Demand Management, Bus Rapid Transit System, Facilitating Conditions, Behavioral Intention Model

1. INTRODUCTION

Many attempts have been made in the policymakers to overcome the problems and negative impacts arising from these urban transportation problems. The conventional approach, which has been used by urban transportation planners and decision makers, is to accommodate any growth in transportation needs in the form of increased capacity and efficiency of the network systems infrastructure. This has been done by building new infrastructures, increasing capacity of existing infrastructure, and increasing the efficiency of infrastructure use with a variety of policy tools of engineering and traffic management. However, this approach is more effective for short time intervals only. In line with the increased need for movement and rapid urbanization, this approach will be felt no longer effective and very difficult to implement from the very large funding requirements. There are many policies aimed at reducing the use of private vehicles which can be categorized as an effort to manage the transportation demand or Transportation Demand Management (TDM). Any policies, which aim at improving or enhancing the service quality of alternative mode of transport, such as public transport, can be categorized as improvements in transport options (Litman, 2003). Bus Rapid Transit (BRT) is one of the strategies included in this category, namely Public Transit Improvements (www.vtpi.org).

In general, Bus Rapid Transit System is a term applied to a variety of public transportation systems using buses to provide faster, more efficient service than an ordinary bus line. Often this is achieved by making improvements to existing infrastructure, vehicles and scheduling. The goal of these systems is to approach the service quality of rail transit while still enjoying the cost savings and flexibility of bus transit (wikipedia). The provision of facilitating conditions in the BRT system is an important factor and has become the main characteristic of this strategy.

The Trans Jakarta, or more popularly known as Busway is one of the BRT system which has been implemented in capital city of Jakarta, Indonesia. The existence of busway in Jakarta is expected to attract travellers to use them as one of alternative modes of transportation, so it can be one of many solutions to overcome the tendency of increasing traffic congestion in Jakarta. The main issue is how can the busway attract travellers to use them, or in other words what factors can affect a travellers's intention to use busway. Do facilitating conditions, such as facilitating infrastructures and/or facilitating regulations, which constitute characteristics of BRT systems can encourage travellers to use busway as an alternative mode of transportation?

In generall, busway has a better service characteristic compared to regular bus service since the availability of facilitating infrastructures such as special bus lane, special bus station etc. However, the availability of these facilitating infrastructures doesn't necessarily attract travelers to use busway. Since busway only serve on some corridors, the accessibility to the bus station will be important. Therefore, the availability of bus feeder, park and ride facilities and any other supporting facilities will have significant effect on traveler's intention to use busway.

To investigate how facilitating conditions influence the traveler's intention to use busway, an understanding of travellers behavior is absolutely necessary. By understanding the determinants of travellers's behavior, particularly in transportation modes choice, can provide useful insights for transportation planners and decision makers in predicting the choice of transport modes and how to influence the choice behavior through appropriate policies. The choice of transportation modes in the planning system plays a very important role. This is due to the mode choice can affect how efficiently a person to travel, how much space the city designated as a function of transport as well as alternatives available to the travellers (Ortuzar and Willumsen, 1999).

In the field of transport, models of psychology to understand the behavior of travellers in choosing modes of transportation have started to be considered. Psychological models which have contributed a lot in understanding the behavior are behavioral intention models, which include the theory of Reasoned Action (Fishbein & Ajzen, 1975) and the theory of planned behavior (Ajzen, 1991). With respect to the determinants of mode choice behavior, behavioral intention models have provided a very good understanding

of the determinants of behavior. These models typically rely on theory of reasoned action (Fishbein & Ajzen, 1975) and the theory of planned behavior (Ajzen, 1991) to explain the fundamental basis of behavior. This model states that the attitudes toward behavior, subjective norm, and perceived behavioral control predict intention and intention predict behavior. Behavioral intention models also hypothesize that belief concepts (i.e. behavioral beliefs, normative beliefs and control beliefs) predict attitudes towards behavior, subjective norms and perceived behavioral control (Ajzen & Fishben, 1980; Fishben & Ajzen, 1975). However, although in some previous studies behavioral intention model can predict behavior, this model does not take into account the influence of facilitating conditions, such as the availability of facilitating infrastructures and/or facilitating regulations in the Bus Rapid Transit System. Therefore, the aim of this study was to develop a behavioral intention model by taking into account the influence of facilitating conditions in the BRT system (in this case is Trans Jakarta bus/busway) to the travellers's intentions to use busway.

2. BEHAVIORAL INTENTION MODEL

There are two recognized models of behavioral intention, i.e theory of reasoned action (TRA), which was proposed by Martin Fishben and Icek Ajzen, and theory of planned behavior, which was proposed by Ajzen. Both models look at behavioral intentions rather than attitudes as the main predictors of behavior. According to theory of reasoned action, attitudes toward a behavior (or more precisely, attitudes toward the expected outcome or result of a behavior) and subjective norms (the influence other people have on a person's attitudes and behavior) are the major predictors of behavioral intention. Whilst theory of planned behavior holds that human action is guided by attitudes toward a behavior, subjective norms and perceived behavioral control (an individual's assessment of his/her own ability to take an action).



Figure 1 Reasoned Action Model



Figure 2 Theory of planned behavior

In relation to the availability of facilitating infrastructures and other supporting facilities on bus rapid transit system, this study tried to examine the influence of facilitating conditions on behavioral intention and its relationship towards behavioral intention and towards determinant factors of behavioral intention as contained in the previous theory. Facilitating conditions can be interpreted as the conditions created due to the efforts made to facilitate a particular behavior. In the context of the BRT system, the availability of facilitating infrastructure and facilitating regulations are examples of efforts to create such conditions.



Figure 3 Theory of facilitated behavior

This study was started with the hypothesis in which attitude toward facilitating conditions will have no direct effect toward behavioral intention, but it will influence behavioral intention through factors as contained in theory of planned behavior. The basic idea is that the facilitating conditions in busway system will increase the service level of busway system, and therefore it will influence traveler's attitude toward the use of busway. Besides, since such conditions facilitate the use of busway, then traveler's assessment of his/her own ability to use busway will be positively increase. The availability of facilitating infrastructures in busway system is also suspected to influence traveler's perception on social support.

3. METHODOLOGY

3.1 Data Collection Methods Data collection methods is done by using both on line well conventional questionnaire as as questionnaire, which are collected directly from respondents. The questionnaire consists of 13 questions of demographic data and 35 questions representing variables being studied. These questions were intended to measure the respondent's belief about the behavior in question, belief about social support she/he will accept, perception of her/his ability to perform a behavior, and belief about the ease which will be

obtain due to the availability of facilitating infrastructures. Operationally, the questions covered in the questionaire can be seen in Table 1. Likert scale was used, where the score 1 representing disagreement against the statements in the questionnaire, and score 7 represents agreement against the statements in the questionnaire.

The study was conducted in the capital city of Jakarta Indonesia, with a target population of this study were all users of the busway who travel to and from work, and the sampling population is busway users who travel to and from work in the area of Jln. Sudirman - Jl. Thamrin. Data collected from 603 respondents, by using stratified purposive random sampling method. According to Loehlin (1998), the minimum sample size required to reduce bias on any kind of SEM (Structural equation model) estimation is 200. Whereas according to Stevens (1996), the sample size for maximum likelihood has to be minimum of 15 times the number of observable variables. By considering those opinions about the minimum sample size, the number of samples can be collected is 603. The number of data is intended to cover a number of categories of busway users to be analyzed, which include sex category and previous mode category. However, this paper will present the analysis for the whole sample only.

3.2 Structural Model



Figure 4 Structural Model

Description:

ATB: Attitude Towards BehaviorSN: Subjective normsPBC: Perceived Behavioral Control

ATFC : Attitude Towards Facilitating Conditions BI : Behavioral Intention

: Behavior

The relationship between variables to be studied is described and explained in Figure 4, and the research hypothesis for the structural model is formulated as follows:

В

H 1: ATFC has positive effect on ATB H 2: ATFC has positive effect on SN H 3: ATFC has positive effect on PBC H 4: ATB has positive effect on BI

3.3 Measurement Model

; H 5: SN has positive effect on BI ; H 6: PBC has positive effect on BI ; H 7: BI has positive effect on B

Latent variables are translated into measurable indicators that can be observed directly, as described in table 1 below:

Table 1 Operationalization of Research Variables

Theoretical Concepts	Operational Definitions (Empirical Concepts)	Measurement Scale
Attitude Towards Behavior	Score scale of behavioral beliefs with indicators :	Likert 7 points: strongly
(ATB)	• Belief about the cheapness or expensiveness (X1)	disagree - strongly agree
	• Belief about the quickness to get to the destination (X2)	
	• Belief about the comfortability (X3)	
	• Belief about the safety (X4)	
	• Belief about timeliness of the schedule (X5)	
Subjective Norms (SN)	Scale scores on normative beliefs with indicators :	Likert 7 points: strongly
	• Belief about family support (X6)	disagree - strongly agree
	• Belief about superior support (X7)	
	• Belief about colleague support (X8)	
	• Belief about best friend support (X9)	
	• Belief about family expectation (X10)	
	• Belief about superior expectation (X11)	
	Belief about colleague expectation (X12)	
	• Belief about best friend expectation (X13)	
Theoretical Concepts	Operational Definitions (Empirical Concepts)	Measurement Scale
Perceived Behavioral Control	Score scale of control beliefs with indicators :	Likert 7 points: strongly
(PBC)	• Belief about her/his knowledge about bus route (X14)	disagree - strongly agree
	• Belief about her/his knowledge about how to get the bus	
	station (X15)	
	• Belief about her/his physical condition (X16)	
	• Belief about her/his ability to pay (X17)	
	• Belief about the ease procedure to use busway (X18)	
	• Belief that she/he won't get any significant difficulties	
	(X19)	
Attitude Towards Facilitating	Scale scores on facilitating behavioral beliefs with indicators :	Likert 7 points: strongly
Conditions (ATFC)	• Belief about the ease because of the availability of sufficient	disagree - strongly agree
	bus fleet (X20)	
	• Belief about the ease because of the availability of access	
	facilities to the bus station (X21)	
	• Belief about the ease because of the availability of special	
	bus lanes (X22)	
	• Belief about the ease because of the availability of bus	
	feeder (X23)	
	• Belief about the ease because of the availability of park &	
	ride facilities (X24) $D_{\rm eff}$ is the following factor of the following fa	
	• Belief about the ease because of the availability of bus	
	departure and arrival time information ($\lambda 25$)	
	• Bener about the ease because of the availability of bus	
Pohevioral Intention (PI)	Fourse on the behavioral intention scale with indicators :	Likert 7 points: strongly
Denavior at Intention (DI)	• Expectation level to use busway (V1)	disagree - strongly agree
	 Expectation level to use busway (11) Desire level to use busway (V2) 	disagree - strongry agree
	 Desire rever to use busway (12) Intention level to use busway (V3) 	
Babayior (B)	• Intention level to use busway (15)	Likert 7 points: strongly
Deliavior (D)	• Number of days in a week to use husway for travelling to	disagree - strongly agree
	workplace (Y4)	ansagree subligity agree
	• Number of days in a week to use busway for travelling from	
	workplace (Y5)	
	• Number of days in a week to use busway for travelling	
	toand from workplace (Y6)	

4. DATA ANALYSIS

Data analysis using Structural Equation Modeling generated parameters estimation as shown in the following tables.

Table 2 Model Parameters Estimation

Path coefficient					Error Variance					Goodness of Fit Test		
γ1	γ2	γ3	γ4	γ5	γ6	β	ζ1	ζ2	ζ3	ζ4	ζ5	P value = 5.059% (>5%)
0.78	0.10	0.80	0.38	0.02	0.39	0.71	0.39	0.99	0.35	0.52	0.49	RMSEA = 0.014 (<0.08) CFI = 1 (>0.90)

Table 3 t-value of Model Parameter

Path							
ATFC-ATB	ATFC-SN	ATFC-PBC	ATB-BI	SN-BI	PBC-BI	BI-B	
17.36	2.19	18.67	7.06	0.50	7.26	16.27	

The results of tests of significance of each structural model parameters shown in table 3 shows one path is not significant, i.e. the path $SN \rightarrow BI$ with the t-value 0.50 <1.96, so the model needs to be improved by Trimming, which release or remove insignificant path coefficients from the model (Heise, 1969; Pedhazur, 1982 in Bachrudin & Tobing, 2003)

Table 4 Model Parameter Estimation After Trimming

Path coefficient					Error Variance					Goodness of Fit Test		
γ1	γ2	γ3	γ4	γ5	γ6	β	ζ1	ζ2	ζ3	ζ4	ζ5	P value = 5.297% (>5%)
0.78	0.10	0.80	0.38	-	0.39	0.71	0.39	0.99	0.35	0.52	0.49	RMSEA = 0.013 (<0.08) CFI = 1 (>0.90)

 Table 5 t-value of Model Parameter After Trimming

Path								
ATFC-ATB	ATFC-SN	ATFC-PBC	ATB-BI	SN-BI	PBC-BI	BI-B		
17.36	2.19	18.67	7.08	-	7.28	16.28		

The results of tests of significance of each structural model parameters are shown in the diagram t-value, showing all significant at the 5% error.

So that the analysis has been performed structural equation obtained as follows:

• ATB = 0.78 * ATFC + 0.39, with a coefficient of determination R² = 0.61

- SN = 0096 * ATFC + 0.99, with a coefficient of determination R ² = 0.0091
- PBC = 0.80 + 0.35 * ATFC, with a coefficient of determination R ² = 0.65
- ATB BI = 0.38 * + 0.39 * PBC + 0.52, with a coefficient of determination R ² = 0.48
- B = 0.71 * BI + 0:49, with a coefficient of determination R ² = 0.51

Structural equation of SN obtained from the analysis show that R2 is very low, i.e. 0.0091. This figure shows that the influence of ATFC towards SN is very low. It means that ATFC is not reliable enough to explain SN.

In line with this, the results of the analysis also shows that the relationship between SN and BI is not significant (t-value <0.05), so that BI is only directly influenced by the ATB and PBC and influenced indirectly by ATFC through ATB and PBC. Therefore the presence of SN in influencing the behavior of using the busway can be ignored. Direct and indirect influences between variables are shown in table 6.

Effect of Inter-Variable	Direct Effect	Indirect Effect	Total Effect
ATFC→ATB	0,78	-	0,78
ATFC→PBC	0,80	-	0,80
ATFC→BI	-	(0,78)(0,38)+(0,8)(0,39)=0,6084	0,6084
ATB→BI	0,38	-	0,38
PBC→BI	0,39	-	0,39

5. CONCLUSION

Attitude toward facilitating conditions (ATFC) or a person's attitude toward conditions that make it easier for someone to use busway indirectly have a positive impact on the travellers's intention to use busway. ATFC affect a travellers's intention to use busway through attitude towards behavior and perceived behavioral control .This means that the high and low of ATB's and PBC's influence on intentions is influenced by the high and low of ATFC. Meanwhile, according to results of the analysis, subjective norms (SN) or the influence of social environment is not significant in influencing a travellers's intention to use busway, although SN is also positively influenced by ATFC. Influence among variables in the model, can be explained as follows:

- High and low of ATB of 0.78 or 60.84% is positively influenced the level of ATFC.
- High and low of PBC of 0.80 or 64% is positively influenced the level of ATFC.
- ATFC indirectly affect BI of 0.6084 or 37% via ATB and PBC.
- While each ATB and PBC directly affect BI of 0.38 and 0.39 or 14.44% and 15.21%.
- ATB and PBC jointly affect BI by 48%, and the remaining 52% is the influence of other variables that are not explained by the model.

In general it can be concluded, that the availability of facilitating conditions in the Trans Jakarta Bus/busway has a positive influence on a travellers's intention to use Trans Jakarta Bus. Whether a travellers's positive attitude towards facilitating conditions in the Trans Jakarta bus is significantly influence travellers's attitude in assessing the service quality of the Trans Jakarta Bus and influence travellers's perception of his ability to use Trans Jakarta Bus, so it will eventually also have a positive influence on a travellers's intention to use Trans Jakarta Bus. In other words, the more positive travellers's attitude towards facilitating conditions in the Trans Jakarta bus, the greater the intention travellers to use Trans Jakarta Bus. Therefore, it is important for authorities to always pay attention to the availability and the functioning of the facilitating infrastructures and or facilitating regulations continuously.

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AWARENESS OF URBAN TRANSPORTATION SUSTAINABILITY: A CASE STUDY IN BANGKOK, THAILAND

Hnin Yu Aung Ph.D. student (RoSCoE) Department of Civil Engineering Prince of Songkla University Hat Yai, Songkhla Thailand Fax: +66-74-212891 E-mail: hninyuaung00@gmail.com Donyarit SETTASUWACHA Ph.D. student (RoSCoE) Department of Civil Engineering Prince of Songkla University Hat Yai, Songkhla Thailand Fax: +66-74-212891 E-mail: choke ce9@hotmail.com

Pichai TANEERANANON Professor Department of Civil Engineering Prince of Songkla University Hat Yai, Songkhla Thailand Fax: +66-74-212891 E-mail: pichai.t@psu.ac.th

Abstract: Urban transportation system contributes not only to a city's economic growth but also to the depletion of resource and air pollution. In the cities of developing countries, the system is still facing many challenges. In this paper, we present the findings of a survey on the awareness of urban transportation sustainability of three groups of participants: government officers, academicians and the general public. The results show on issues relating to the environment, all participants have increased awareness, with more emphasis on air pollution, climate change and land consumption issues. On social criteria, safety and security are getting more attention. As regards economic related issues, all groups have more awareness, with government officers at the top of the list. Increasing urban traffic congestion should be urgently addressed as it has a big impact on the city's efficiency and hence the country's economy. This research presents the status of urban transportation system sustainability to concerned agencies, especially the urban planners to enable them to make better decisions in the future.

Key Words: Awareness, Urban Transportation Sustainability, Environmental, Social and Economy

1. INTRODUCTION

Nowadays, the world is facing many challenges, such as global warming, oil shortage, environmental impact, etc. Transportation sector is one of the most serious sectors related with these challenges in the world. Poor transport facilities may cause many environmental, economic and social issues. Transportation is one of the chief contributors to health and environmental problems in urban regions. The concepts of sustainability are growing interested in sustainable development and sustainable transportation. The sustainability concepts are originally focused on long- term environmental concerns, such as the depletion of natural resource and degradation of ecology. Sustainability has complex implications but it is simple concept, (Litman and Burwell, 2006). It focuses on outcomes of social welfare and a distinction between development and growth is maintained sustainability because protects natural resources and ecological systems. There are three main types of sustainable development issues which are economy, society and environment. CST, 2005; Litman, 2007 is described that some incorporates other issues are such as governance and fiscal sustainability. Mobility has related with increasing of pollution, emissions of green- house gas, traffic congestion, risk of serious injury and death, noise and water pollution, and ecosystem. We have been witnessing these impacts even in the developed countries such as United States of America, Europe, and some Asia countries, etc... Therefore, professionals in developed and developing countries are more awareness in sustainable urban transportation projects in order to be less impact from the development of three issues: Environment, Economy and Society. According to this, private and public sectors make more assessment to sustain the urban transportation in the approach of holistic and systematic as much as they can.

2. OBJECTIVES

The main purpose of this study is to analyze and compare of people understandable in urban transportation sustainability that is the best way to study transportation sustainability. The specific objectives of this study are as follow;

- To investigate the awareness of urban transportation sustainability in three stages statistical from government, academic and general people sectors.
- To identify discrepancy among target groups.

In this study, we have a plan to analyze the outcomes by comparing with two different

groups in which how does the public and private sectors contribute in sustainable urban transportation.

3. METHODOLOGY

The procedures carried on this study are as follows:

- The criteria of environment, society, and economy, and their indicators are prepared from the journals, reference books, rules, organization records, etc.
- Questionnaire type carried out under three issues: economic, social, and environmental, by according to three sectors.
- Collecting 30 samples by each government, academic, and general people in Bangkok, Thailand.
- Receiving questionnaire data forms, information data is converted into digital format in Analytical Hierarchy Process (AHP) program and Microsoft-Excel 2007.
- Compare awareness data results of private and public sector.

Multi-criteria method is used to combine both quantitative and qualitative aspects for problems. In this research, AHP method is applied because it is one of the methods of Multi-Criteria Decision Making (MCDM) method. In AHP method, they can describe corresponding to the maximum eigenvalue of the pair-wise comparison matrix by a set of eigenvectors. Structuring of a hierarchy which consists of levels and its attributes are required by the AHP. As the final objective of the problems situated at the top of the hierarchy, the influence of the potential alternatives evaluations can make on the attributes in each level. Therefore, constructing a hierarchy is very important to obtain a final objective of problems. In a hierarchy, they assume that the criteria to be independent among them.



Figure 1 General For of a Hierarchy Structure

The above Figure 1 shows a general form of the hierarchy structure. The constructing hierarchy of AHP for decision makers are consistently evaluated its various elements by comparing them one to another two at same time. These ratings are changed to numerical values by AHP that can be compared and processed over the total range of the problems. In the final step of the process, numerical priorities are estimated for each of the decision alternatives. The AHP hierarchy consists of an overall goal, a group of options or *alternatives* for achieving the goal, and a group of factors or criteria that relate the alternatives to the goal. The criteria can be broken down into sub criteria, sub-subcriteria, and so on, in as many levels as the problem needs. A decision making framework would be constructed based on the AHP

structure with components of objective, criteria, their sub - criteria, and potential alternatives. alternatives There two which are are government and public, with three criteria such as economic, social and environment to get final objective of our study. Our study focuses on the awareness of sustainable transportation in urban area dwellers and a generalized decision making framework to prioritize potential alternatives of minimize discrepancy strategies based on the AHP method. The following Figure 2 shows the proposed AHP structure. The authors believe that this AHP structure can allow decision-makers to more accurately make decisions based on their own specific situations. In this study, we used a specific case study to demonstrate this structure.



Figure 2 Proposed AHP Structure

4. SCOPE OF THE STUDY

This study is mainly focused on understanding of urban transportation sustainability in an urban city, Bangkok, Thailand. In this survey, the questionnaire was distributed to government officers of transportation field, Thai faculties and students, and Thai general people.

4.1 Information about the survey

Government sectors data could be collected from the office of Transport and Traffic Policy and Planning, and department of highway. However, faculty respondents' data are received from Asian Institute of technology, Kasetsart University, Thammasat University and Suranaree University of Technology. Moreover, students' data got from AIT and general people data could be collected from Thammasat University, Asian Institute of Technology's staffs, and students' family, (Table 1). Faculty and government sector respondents answering questionnaire is the most important part of that survey. In brief, awareness should be educated, lived to all people who take part in transport system.

4.2 Gender, age, education, and vehicle ownership

There are 120 respondents for this questionnaire survey. As far as educational level of the respondents are concerned, from Fig 3, two percent were a Higher secondary level, twenty three percent were Bachelor level, forty nine percent were Master level and the remaining twenty six percent were Doctoral level. Moreover, twenty percent are female and others percentage are male (Figure 4), and age level of respondents are shown in Figure 5. 70% of respondents have both car and motorcycle, 20 % have only car and other 10 % of the respondents are captive public transport user (Figure 6).

Number	Key informants	Name of department / university	Number of distributed	Number of received	Rate (%)
1	Student	Asian Institute of Technology	50	40	80.0
2	General people	Thammasat University, Asian Institute of Technology's staff and students' family	60	40	66.7
3	Government officer	Transport and Traffic Policy and Planning, department of highway, and other government office.	45	35	77.8
4	Faculty	Universities (Asian Institute of Technology, Kasetsart University, Thammasat University, Suranaree University of Technology, Chulalongkorn University)	75	30	40
	ŗ	230	145	63.04	

Table 1 Summarized information of key person in the questionnaire survey



Figure 3 Educational attainment of the questionnaire survey (Source : Author's survey, 2010)





5. DESCRIPTIVE STATISTICAL ANALYSIS

In questionnaire form, it was divided into three portions. The first portion was described respondent's general information including education level age, gender, field of expertise, current position and vehicle ownership (Figure 3,4,5,6). The second portion of questionnaire was to examine the relative weight of each distress through the AHP technique. Relative importance of awareness of each criterion was measured in the scale of pair wise comparisons. Using pair wise comparisons, the relative importance of one criterion over another can be expressed. This standard importance level table is very useful because it has been determined by experienced researchers in AHP to be a reasonable basis comparing for two alternatives. In third part of the questionnaire, the respondents were asked to tell about how much appropriate on awareness of each indicator is appropriate for sustainable transport system to them. Relative appropriate of



Figure 6 Vehicle ownership in questionnaire survey

awareness of each indicators were measured in the scale of five where '1' for very poor appropriate and '5' for very appropriate (Table 2).

5.1 Three sectors awareness of sustainable transport system

This section result was calculated by AHP calculation technique to get ranking of awareness for each sector.

(a) Academic sector: In this research, academic sector was the first ranking more awareness in Environment because vehicles are a major source of air and noise pollution. It showed in Table 3. Moreover, emission of carbon dioxide from vehicles is one of causing of global warming and climate change and also motorways are disturbing wildlife habitats. Therefore, they have a desire to implement good accessibility transit System and they urge transport users to use eco-mobility in urban areas.

Standard Importance Level Table					
Importance Level	Numerical Value				
Equal important	1				
Equally to moderately important	2				
Moderate importance	3				
Moderately to strongly important	4				
Strong importance	5				
Strongly to very strongly important	6				
Very strong importance	7				
Very strongly to extremely important	8				
Extreme importance	9				

Table 2 Standard Im	portance Level Table	(adapted from Saaty)

(b) General people sector: They were also more emphasized in environment (49%) than others (Table 3) because they always face lower quality of air, so they are suffering negative impacts of their health in urban areas. Hence, they would like to improve public transport system for developing countries in future.

(c) Government sector: In government sector, they were more awareness in environment and economy (both are 36%) because transport sector is one of the challenges in environmental impacts and one of the contributors to economic development. If a country has good transport services, a lot of people and goods can move easily and cheaply. As a consequence, national income and productivity of goods will be increased, and also a country's economy will be growth (Table 3).

5.2 Environmental criteria awareness

(a) Academic sector: In awareness of environmental critera, the first rank of faculty awareness in environmental criteria was same as student awareness. According to the faculty's survey result, the last ranking is land consumption 16% but noise and water pollution and air pollution were the last ranking awareness in student (Table 4).

(b) General people: This analysis showed that land consumption was the first ranking awareness in general people. Table 4 is presented that energy consumption 16% was the last ranking of general people awareness in environmental criteria.

(c) Government sector : Government sector has the most awareness in air pollution and climate change condition because the effect of air pollution and climate change are one of the negative impacts of citizen's health. The health of its inhabitants and more of the poor are affected by pollution from vehicle emission. Land consumption (15%) is the last awareness in it (Table 4).

Donking	Sustainable	percentage of awareness				
Kalikilig	transport system	Faculty	Student	General people	Government	
1	Environment	43%	46%	49%	36%	
2	Society	30%	32%	29%	36%	
3	Economy	27%	22%	22%	28%	

Table 3 Ranking of awareness of sustainable transport system

Table 4 Ranking of all sectors awareness in environmental criteria

Donking	Environmental eritoria	Percentage of awareness					
Kalikilig	Environmental criteria	Faculty	Student	General people	Government		
1	climate change	26%	24%	21%	23%		
2	Land consumption	16%	23%	24%	15%		
3	Energy consumption	18%	19%	16%	20%		
4	Noise & water pollution	18%	17%	21%	19%		
5	Air pollution	22%	17%	18%	23%		

5.3 Economic criteria awareness

(a) Academic sector: In this analyzed, academic sector was the most awareness in travel time and congestion of economic criteria (Table 5). The incredible congestion of road traffic is the one of symbolical urban problems in capital cities. In addition, transportation and land use policies can be helped the creating of more multi-modal transportation systems and more accessible lane use development by implementing accessibility for public users and by making transportation low-priced to lower income transport users.

(b) General people: Travel time and congestion was the most awareness (28%) and monetary cost-change was the lowest rank of awareness (15%) in them, (Table 5). Second awareness of general people is different with other sector's second awareness. Improve accessibility was the second awareness in general people survey because they have desire to provide street designs that promote different modes of transportation, avoid congestion and

create livable neighborhoods with sustainable transportation. Therefore, improving accessibility of public transport system is really needed for potential users.

(c) Government sector: Travel time and congestion of government sector awareness was 33% and the lowest awareness in economic criteria was monetary cost-change 12% (Table 5). They seemed that travel time and congestion is more important in economic criteria for sustainable transport system because economic growing of one country is very relation with travel time of people and freight transport. Furthermore, increasing rate of traffic congestion is affected on a growing of national income and quality of life of all countries. Moreover, it can be reduced the pool of resources available to businesses and workers by reducing access to jobs and employees.

5.4 Social criteria awareness

In social criteria, all sectors were more awareness in increased safety and security However, second awareness of student and general people were improve public health, and then government and faculty awareness were the quality of life to sustain for urban transportation system. The author found that general people and student were having same awareness in it.

Donking	Economia critoria	Percentage of awareness					
Kaliking	Economic criteria	Faculty	Student	General people	Government		
1	Travel time/congestion	24%	27%	28%	33%		
2	Economic Development	22%	24%	19%	22%		
3	Improve Accessibility	20%	20%	22%	17%		
4	Monetary cost-change	16%	16%	15%	12%		
5	Land use change	18%	14%	16%	16%		

Table 5 Ranking of all sectors awareness in Economic criteria

(a) Academic sector: They have the most awareness in increased safety and security of social criteria. They considered that road traffic accident rate and accident related cost are increased in developing countries because level of motorization is increasing in it. Furthermore, freight transport safety is one important things of a nation for developing and increasing rate of national income. If all countries emphasize in freight safety, damages and losses of goods could be reduced as well as transferring of goods might be moved very easily between countries. Equity was the lowest awareness in student sector, which was 12% and faculty's lowest awareness was access to public transit (14%), (Table.6).

(b) General people: Increased safety and security was the first ranking of awarenesss in general people and it's percentage is 30% and second awareness is improve public health (22%), (Table 6). They were more emphatatic

in Increased safety and Security because they are facing many transport problems in their daily life to arrive on-time their work. Some people are suffering the impact of transportation as they are working on the road side. Hence, their healthy may be decreased because of vehicle emissions. Furthermore, they are facing more pick up pocketing in rush hours. Therefore, general people was more sensitive in transport security.

(c) Government sector: Increased safety and security, and Equity were the most and lowest awareness of government sector in social criteria. Thus, They have a desire to improve facilities of transportation, transport activities and services. Moreover, for road safety, a road infrastructure must be adapted to the limitations of the road users, and vehicle must be equipped with technology to support the driving task and to protect vulnerable and other users.

Donking	Social critoria	Percentage of awareness					
Ranking	Social criteria	Faculty	Student	General people	Government		
1	Increased safety and security	31%	33%	30%	31%		
2	The quality of life	20%	20%	19%	25%		
3	Improve public health	20%	21%	22%	21%		
4	Equity	15%	12%	14%	11%		
5	Access to public transit	14%	15%	15%	12%		

Table 6 Ranking of all sectors awareness in Social criteria

5.5 Three sectors awareness in each indicator of urban transportation sustainability

In environmental indicator, government sector, general people and faulty were more awareness in pollution because transport sector is one of the challenge sectors of carbon dioxide emission. Therefore, government is encourging to prevent the effect of pollution . However, student was more awareness in Resource consumption indicator, (Table 7) because they would like to implement using of bicycle for short distance travelling and also want to reduce fuel consumption.

Table 7 Ranking of all sectors awareness in environmental indicator

Ranking En	Environmental indicator	percentage of awareness				
	Environmental indicator	Faculty	Student	General people	Government	
1	Pollution	35%	33%	35%	34%	
2	Resource consumption	33%	34%	33%	33%	
3	Natural & Community conservation	32%	33%	32%	33%	

Table 8 Ranking of all sectors awareness in economic indicator

Ranking Economic indicator	Economic indicator	percentage of awareness				
	Economic indicator	Faculty	Student	General people	Government	
1	Travel and system performance	35%	31%	34%	33%	
2	Infrastructure	33%	34%	32%	33%	
3	Public and Private Economy	32%	35%	34%	34%	

Table 9 Ran	king of all	sectors awareness	in	social	indicator
	0				

Donking	Social indicator	percentage of awareness				
Kanking Social indicator		Faculty	Student	General people	Government	
1	Safety	36%	35%	36%	35%	
2	Public Welfare	33%	34%	33%	33%	
3	Social & Economic Development	31%	31%	31%	32%	

In economic indicator, Public and Private Economy was the first ranking of awareness in student, general people and government sector because the severity traffic congestion and freight transport productivity indicator is very useful for economic growth of a country and also urban transportation sustainability. However faculties were the most awraness in travel and system performance (Table 8). They considered that reduction of traffic congestion and energy efficiency is very important for urban transportation sustainability.

In social indicator, safety was the first ranking for all sector awareness (Table 9) because safety was the first priority for transport users in transportation planning. Moreover, they would like to prevent many loosing of social life of people and to do freight transport safety for improving productivity of goods.

6.SUMMARY AND CONCLUSION

In urban transportation sustainability, all sector respondents were more aware of environmental issues, especially air pollution, climate change and land consumption. They are more emphatic congestion problems. in traffic Traffic congestion is caused by the increasing rate of vehicle ownership in developing cities. They believe that improved transportation system would minimize the increasing rate of cars and CO2, so that alternative fuel of transport modes should be substituted for long distance travel. In economic issues, all the respondents, especially government sector were more aware of them. They considered that travel time is more important in economic criteria for sustainable transport system because economic growth of one country is closely related to travel time of people and frieight transport. On issues of Society, increased safety and security are the most sensitive issues in all sectors with the desire to reduce road casualties and physical damage from traffic accidents, improve access for people, and increase traffic flow on main roads. In conclusion, this result this research contributed a view to the urban transport planners about the condition of sustainable transportation system and to minimize the gap between government and public sector issue for urban transportation sustainability. Furthermore, the authors believe that people in Bangkok have sufficient understanding of the issue of transportation sustainability. Thus, decision makers and planners can make better decision for sustainable urban transport system in the future.

7. RECOMMENDATIONS

Firstly, to achieve sustainable transport system, the gap between government and public sectors awareness should be minimized which is the best way for urban transportation sustainability. Secondly, transport users should use the nonmotorized transport for short distance travelling to prevent climate change and air pollution and also government should construct the bicycle lanes in developing countries. Thirdly, to reduce increasing rate of traffic congestion and the emission of carbon dioxide, government should control the vehicle ownership and low occupancy vehicles in developing countries. Finally, the government should ensure that disadvantage groups have good access to all transport modes and implement good transport services for them in urban areas. As for the recommendation for future study, government and employers should put more investment in public transportation to sustain urban transport system as well as to improve public transport system in developing countries. Not only it provides means as a tool for sustainable transportation in this region, it also can be applied for any other countries.

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PASSENGERS' PERSPECTIVE TOWARD AIRPORT SERVICE QUALITY AT SUVARNABHUMI INTERNATIONAL AIRPORT

Arisara Seyanon, PH.D. Lecturer of Hotel And Tourism Management School of Business University of the Thai Chamber of Commerce TEL. 081-345-9304 E-MAIL: arisara@msn.com

ABSTRACT:

The purpose of this study is to contribute to the development of a conceptual model of perceived service quality in airports by adapting the concept of expectations underlies the selection of Fodness and Murray's (2007: 492-506) methodology for measuring service quality with focus on passenger perceived service quality. In this study the researcher used quantitative method to test an objective approach to measuring passengers' perception and satisfaction of airport service quality at Suvarnabhumi International Airport, Thailand. Questionnaire collected from 500 passengers who had travel by departure, arrival, or transit at Suvarnabhumi International Airport. The results of factor analysis identified three factors: 1) Environment Service Provider, 2) Personnel and Passengers' Relationship, and 3) Servicescape. The findings of this study indicated that the passengers' satisfaction. And there were significant differences in airport service quality attributes among Thai and foreigner passengers.

KEYWORDS: Airport Service Quality, Passenger Satisfaction, SuvarnabhumiInternational Airport

1. INTRODUCTION

Today, the airport industry is changing rapidly. Air travelers have various choices among airports and airport marketers have increasing changing among themselves to meet the needs of customers better than in the competition. Airports are one of important elements of the transportation system. They offer all the infrastructure need to allow passengers and freight to transfer from surface to air mode of transport and allow airlines to take off and landing. The basic airport infrastructure and facilities consist of runways, taxiways, apron space, passenger terminals, cargo warehousesand ground transport interchanges. Airport brings together a wide range of facilities and services in order to be able to fulfill their function within the air transportation industry.

The growth of global tourist industry and modern Bangkok has played a crucial role in establishing Thailand both as a favorite vacation destination and emerging place for business opportunity. In order to secure a title of a world class city, Bangkok has strived to become an aviation hub for the Southeast Asian region. Boosted by Thailand's geographical advantage, the new

Bangkok International Airport, which suvarn = golden and bhumi = land (Suvarnabhumi meaning the golden land). Suvarnabhumi International Airport pronounced su-wan-naalso known as (new) Bangkok poom, International Airport, is the international airport serving Bangkok, Thailand. Suvarnabhumi International Airport was opened on September 28, 2006; it has become one of the keys economic strength for country. Suvarnabhumi International Airport has 2 runways ad will be able to handle 61 flights per hour, 45 million passengers and 3 million tons of cargo per year.

One of the biggest challenges of Suvarnabhumi International Airport management is how to provide and maintain passenger satisfaction. Even though airport is usual monopolies, the elements of airport service have become more critically important. Management teams increasingly do research and focus on passenger perspective and the research finding agrees that airport service quality and passenger satisfaction are identified as a key success factor in the battle of air transportation industries.

Suvarnabhumi International Airport has a great opportunity to build a reputation, the highest international standard, and to generate additional substantial revenue from financial and including retail commercial services and entertainment businesses in airport area. For all this reasons, it is necessary to measure passengers' satisfaction level toward airport service quality that use Suvarnabhumi International Airport for developing the high quality of international airport service.

1.1 Problem Statement

The lack of competition among airports, the marketing and services literature has shown little interest in airports and especially on air travelers;

a diverse group who consume while spending much time in the airport's complex servicescape (Fodness & Murray, 2007: 493). To summarize the current situation of service quality theory in the airport industry there are compelling reasons to manage service quality; as a matter of fact service attributes are commonly measured by airports. However, there is a limited amount of conceptual and empirical work on passengers' perceptions of airport service quality and even less studies on passengers' expectations but most importantly no widely accepted and integrated model of the multi-dimensional passenger expectations (Fodness & Murray, 2007: 493-494).

Airport passengers come from different countries and cultures around the world, it is difficult for airport management to recognize what kind ofservice that passengers expect to perceive from airport service provider and what is their perception of their service encounter. To better serve numerous kinds of passengers, it is importantto have a clear understanding of what they want in each service sector and how they perceive the actual service quality. This paper will examine which attributes of airport service quality influence to passengers' satisfaction at Suvarnabhumi International Airport.

1.2 Purpose of the Study

The purpose of this study is to contribute to the development of a conceptual model of perceived service quality in airports by adapting the concept of expectations underlies the selection of Murray's Fodness and (2007: 492-506) methodology for measuring service quality with focus on passenger perceived service quality. Fodness and Murray suggested that for a model to be fully developed as a global measure of airport service quality, it should be tested in locations. Lubbe, Douglas, different and

Zambellis (2010: 1-4) worked on service quality and focused on service performance and importance measure methodologies for analyzing airport service quality by applying model of Fodness and Murray's (2007).

1.3 Research Objectives

The following four objectives are addressed in this study:

- 1. To examine the passengers' perception of airport service quality in different airport service sectors.
- 2. To determine which attributes of airport service quality (function, interaction, and diversion) have influenced and affected passengers' satisfaction at Suvarnabhumi International Airport.
- 3. To determine the level of passengers' satisfaction toward airport service quality.

Hypotheses	Antecedents of Airport Service Quality Factors
H ₁ :	Passengers' satisfaction perceptions factors have positive influence on overall
H ₂ :	satisfaction. There is a significant difference in airport service quality factors between type of passengers (Thei and Famigner)

Table 1 Hypotheses of Airport Service Quality



Figure 1 Conceptual Model of Airport Service Quality

1.4 Significance of the Study

This research contributed both academically and practically. First, this study provided evidence of the airport service quality attributes that influenced passengers' satisfaction. Second, this study provided a practical airport marketing perspective airport manager for measuring airport service quality in order to: 1) assess passenger perceptions of airport service quality at Suvarnabhumi International Airport, 2) identify and prioritize service areas requiring managerial attention and action to ensure and service improve quality and passenger satisfaction,3) provide the airport's managers wit indications of how to establish and sustain competitive advantage based on a service quality strategy.

2. REVIEW OF LITERATURE

2.1 The Development of Airport Service Quality

Fodness and Murray (2007: 492-506) constructed conceptual model outpreliminary of the expectations of the airport experience using data obtained from the passengers in qualitative research and from the proscriptions provided by relevant literatures. In addition to providing the data for development of preliminary conceptual bases for passengers' expectations of airport service quality, the researchers generated an item pool for the construction of a related expectations measurement instrument. The results from the three qualitative studies were compiled to create a master list of airport service quality themes. Multiple mentions of the same theme were eliminated. The final list of 65 airport service quality themes appears. The resulting model of airport service quality expectations is composed of three primary dimensions - servicescape,

interaction and services. And the model suggested that each dimensions has three subdimensions.

Fodness and Murray (2007: 492-506) used 65 airport service quality themes to test preliminary model in figure 2 by testing 12 hypotheses. Each airport service quality theme was paired with a seven-point scale ranging from 1 = stronglydisagree to 7 = strongly agree. To test the hypotheses, data were analyzed using both exploratory and confirmatory factor analysis (CFA). The reduced factor solution for each scale was then subjected to a varimax rotation seeking more easily interpretable results. Churchill (1979: 64-73) selected only items that loaded on a single factor for the final version of the scale, which all items less than 0.6 were removed. Items were reduced and subdimensions were modified for each scale in an iterative process.

2.2 Airport Service Quality

Airport service quality literature and research is distinguished from the mainstream service quality perspective (e.g. the gap theory model) by its focus on quality at the attribute level. Researchers attempting to measure airport service quality typically proceed from a list of objective indicators of service that are developed from discussions with airport stakeholders rather than passengers, including airport and airline operators, consultants, regulators and travel industry managers.

Piyajitmetta (abstract: 2003) studied the factors affecting to Thai passengers' total satisfaction on service of Thai AirwaysInternational inBangkok Metropolitan area: a case study of sector Bangkok – Hong Kong – Bangkok. The researcher collected the data from 385 Thai passengers who have utilized and consumed the services of Thai Airways International of routing Bangkok – Hong Kong – Bangkok. The research found three factors about the factors affecting to Thai passengers' total satisfaction on service of Airways International Thai in Bangkok Metropolitan area for the Sector Bangkok -Hong Kong - Bangkok. First factor was "satisfaction of services of ticketing offices", consisted of four attributes were: satisfaction of kindness of staff, satisfaction ofpoliteness of satisfaction of check-in staff, staff. and of purchasing satisfaction Thai Airways International Public Company limited because of their good service. Second factorwas "service on board", consisted of two attributes were: satisfaction of in-flight convenient equipments and entertainment, and satisfaction of in-flight service of aircrews and foods/beverages. And the last factor was "other services", consisted of passengers' satisfaction of purchasing high price ticket because of good service, satisfaction of purchasing high price ticket because of safety of aircraft, satisfaction of purchasing high price ticket because of new aircraft, Satisfaction of on time flight schedule.

Lubbe et al. (2010: 1-4) applied the concept of expectations underlies the selection of Fodness and Murray's (2007: 492-506) methodology for measuring service quality with its focus on passenger expectations in service quality. This research investigated passengers' perceptions of airport service quality at O.R. Tambo International Airport, South Africa. The study showed that the importance of service quality measurement and management at airports was seen as important but for airport service strategies to yield the desired results; passengers themselves need to be the ones to define and evaluate service. Significant differences also occur in the perceptions of frequent travelers and infrequent travelers.

3. METHODOLOGY

3.1 Population and Sample Size

Population was the total number of passengers both Thai and foreigner who had travel by departure, arrival, or transit at Suvarnabhumi International Airport. The researcher used the convenience sampling method to collect the data. The sample size in the study was 500 passengers (Thai and foreigner) who had travel at Suvarnabhumi International Airport for departure, arrival and transit during the month of January 2011.

3.2 Instruments

А self-administered questionnaire was developed. The data collection instrument consisted of five-point Likert scale. The questions asked reflect Fodness and Murray's multi-dimensional scale to assess passengers' satisfaction of airport service quality at Suvarnabhumi International Airport, Thailand. The questionnaireshad 2 parts: 1) the satisfaction of airport service quality and 2) demographic profile.

The first part of the questionnaire was to assess the respondents' perception of satisfaction of airport service quality attributes, consisted of 22 items of airport service quality. This part also included overall satisfaction. All of the statements were rated on five-point Likert scale, ranging from 1 = very unsatisfied, 2 =unsatisfied, 3 = neutral, 4 = satisfied, and 5 =very satisfied. The second part of the questionnaire was asked about the demographic profile of respondents.

3.3 Reliability and Validity of Airport Service Quality

Fodness and Murray (2007: 492-506) stated the alpha for the global construct was estimated at 0.85 and for the second-order constructsat 0.79 (Function). 0.74 (Interaction). and 0.80 (Diversion). Cronbach's alpha was computed for subdimensions and the values ranged from 0.81 to 0.61. The results also showed all possible pairs of the dimensions and found values ranging from 0.75 to 0.98. All of the items loaded on the factors higher than 0.6 (Churchill, 1979: 64-73) to which they were assigned, however, which can be considered a test of convergent validity of the scale.According to Nunnally (1967: 226), coefficients greater than or equal to 0.50 are generally acceptable and are a good indication of construct reliability.

3.4 Data Collection

For the data collection process, this research used a self-administered questionnaire to ask the passengers who had travel by departure, arrival, or transit at Suvarnabhumi International Airport. The respondents completed the questionnaire in two parts: 1) Passengers' satisfaction perception of airport service quality and 2) Demographic Profile. The respondents were asked to indicate each statement on a five-point Likert scale.

3.5 Data Analysis

In order to achieve the stated objectives and to test the hypotheses, various kinds of statistical techniques were employed. These techniques included basic descriptive, factor analysis, multiple regressions analysis, and one-way analysis of variance (ANOVA). Data were entered into the Statistical Package for Social Sciences Windows Version 11.0 (SPSS) program to analyze the findings.

4. RESULTS

A total of 500 questionnaires were distributed and returned completed and usable. The respondents consisted of: 249 Thai passengers (49.8%) and passengers foreigner (50.2%),251 183 respondents came from Thailand (36.6%), 112 respondents came from Europe (22.4%), 42 respondents came from Japan (8.4%), 34 respondents came from China (6.8%), 30 respondents came from North America (6.0%),28 respondents came from South America (5.6%), 26 respondents came from other Asian countries (5.2%), 25 respondents came from other countries (5.0%), 14 respondents came from Australia/New Zealand (2.8%),and 6 respondents came from Africa (1.2%). The purpose of travel of respondents were 150 respondents (30.0%) for vacation/pleasure, 113 respondents (22.6%) for work, 94 respondents (18.8%) for visit friends/relatives, 58 respondents (11.6%) for education, 56 respondents (11.2%) for business/professional, and 29 respondents (5.8%) for others purposed. The trip orientation of Suvarnabhumi International Airport consisted of 265 respondents (53%) were arrival, 198 respondents (39.6%) were departure and 37 respondents (7.4%) were transit the flight. The respondents used Suvarnbhumi International Airport to travel in the last 12 months were: 2 times with 153 respondents (30.6%), 3 times with 86 respondents (17.2%), more than 5 times with 81 respondents (16.2%), one time with (14.8%), 5 times with 58 respondents (11.6%), and 4 times with 48 respondents (9.6%).

4.1 Factor Analysis

A principal component analysis was conducted on the 22 variables which variables of satisfaction of airport service quality to ensure that the variables were not intercorrelated and that the variables were grouped properly. In this study, the value of Kaiser-Meyer-Olkin

(KMO) of satisfaction of airport service quality was 0.873, and verified that the use of factor analysis was appropriate in the study. Bartlett's test of sphericity value Chi Square (χ^2) was 3444.000, with p = .000, indicating that the data were suitable for factor analysis.

Airport Service Quality

After analyzing the variables of satisfaction of airport service quality, the data with principal component analysis of factor analysis to delete the intercorrelations among the dimensions and results were three factors with 22 variables (Figure 2). The first factor was labeled as "Environment Service Provider," consisted of nine variables and explained 28.723% of the variance in the data, with an eigenvalues of 6.319. The second factor was labeled as "Personnel and Passengers' Relationship," consisted of eight variables and explained 9.086% of the variance in the data, with an eigenvalues of 1.999. The third factor was labeled as "Servicescape", consisted of five variables, and the total variance explained was 7.670% with an eigenvalues of 1.687 (Table 2).



Figure 2 Conceptual Model of Airport Service Quality

Service Quality Attributes	Factor 1 Environment	Factor 2 Personnel and	Factor 3 Servicescape	Communalities
	Provider	Passengers'		
	11011401	Relationship		
Factor 1: Environment Service Provider		·		
National chain restaurants are available at airports.	0.710			0.536
Nationally known retail outlets are available at airports.	0.694			0.532
An airport has current décor.	0.672			0.464
An airport display art.	0.651			0.433
An airport's decor match the local culture of the city at	0.634			0.414
An airport has business centers.	0.545			0.377
A variety of specialty retail stores sell the local culture	0.522			0.395
The local cuisines are available at airport	0.481			0.370
An airport should have quiet areas in which to nap or				
to do business	0.448			0.311
Factor 2: Personnel and Passengers' Relationship				
It upsets you when you have to wait in line more than ten	minutes	0.74		0.581
during check in process.		017 1		0.001
It upsets you when you have to wait more than		0.73		0.556
ten minutes to receive your baggage after flight.		0.75		0.000
Employees at an airport respond do not busy to respond		0.67		0.495
to your request promptly.				
You can wit the similare within ten minutes of londing		0.65		0.478
Your complaints are responded to immediately at		0.05		0.478
airport		0.54		0.388
Conference facilities are available to you at an airport				
so that you can conduct meetings.		0.45		0.369
Employees at an airport available to offer you		0.45		0.351
individualized attention.				
Transferring or connecting flight is easily for you		0.42		0.368
Factor 3: Servicescape				
An airport's external signs clearly direct me to airport			0 800	0.640
services.	a ainmant		0.800	0.649
An airport's physical layout makes it easy to you to	o airport.		0.789	0.659
find what you need			0.692	0.529
A variety of ground transportation options to the			0.072	0.025
nearest city			0.603	0.434
Baggage carts are conveniently located.			0.440	0.317
Eiigenvalue	6.319	1.99	1.687	
Variance Explained (%)	28.273	9.08	7.67	
Cumulative Variance (%)	28.723	37.80	45.478	
Cronbach's alpha	0.817	0.80	0.758	

Table 2 Factor Analysis of Satisfaction of Airport Service Quality

Note: Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA): 0.873 Bartlett's Test of Sphericity: 3444.000, p = 0.000

4.2 Results of Hypotheses Testing

H₁: Passengers' satisfaction perceptions of the airport service quality have positive influence on overall passenger satisfaction.

The regression model considered overall passenger satisfaction to be the dependent variable and the three factors of airport service quality to be independent variables. The result of hypothesis 1 indicated that the airport service quality factors had a positive influence on overall passenger satisfaction. The results of the regression model indicated that the regression model was statistically significant (F (3, 496) =65.624, p = .000).The coefficient of determination (R²) of 0.284 showed that 28% of the overall passenger satisfaction was explained by the three factors of airport service quality. All of the three underlying factors: 1) Environment Service Provider, 2) Personnel and Passengers' Relationship, and 3) Servicescape all appeared to significant independent variables be that influence on overall passenger satisfaction. Therefore, hypothesis 1 "Passengers' satisfaction perceptions of the airport service quality have positive influence on overall passenger satisfaction" was supported.

H₂: There is a significant difference in airport service quality factors between types of passengers (Thai and Foreigner).

One-way ANOVA was used to determine whether there was a statistically significant difference in airport service quality factors (Factor 1 – Environment Service Provider, Factor 2 – Personnel and Passengers' Relationship, and Factor 3 - Servicescape) with the type of passengers (Thai and Foreigner). If the resultsof the ANOVA were statistically significant,

Tukey's HSD test was carried out to assess the significance of pairwisepost hoc differences.

Type of passengers (Thai and Foreigner) was treated as independent variable and airport service quality factors as dependent variable. The result of the ANOVA revealed that there was statistically significant difference in airport service quality factor 2 – Personnel and Passengers' Relationship (F (1, 498) = 12.024, p = .001) factor 2 between Thaiand foreigner. Since there were fewer than three groups, therefore, pairwise comparison using Tukey's HSD was not used to test for means of airport service quality factor 2 – Personnel and Passengers' Relationship between Thai and foreigner.

5. MANAGERIAL IMPLICATION

Understanding the relationship between airport service quality and management is important. However, it is perhaps more useful managerially to identify specific variables of airport service quality that most relate to the passengers as appropriate intervention strategies can be formulated. This study offers direction for managers who seek to use service quality as a critical component of their airport's competitive strategy. Thus, allocating an appropriate amount of resources to the key factors of airport service qualitycan increase the likelihood of being perceived by a passenger as the best choice, relative to the alternatives available.

In this study, to increase airport service quality that influences passengers' satisfaction, managers should focus on these 10 attributes:

- 1. A variety of ground transportation options to the nearest city are available.
- 2. Transferring or connecting flight is easily for you.
- 3. It upsets you when you have to wait more than ten minutes to receive your baggage after flight.

- 4. It upsets you when you have to wait in line more than ten minutes during check in process.
- 5. You can exit the airplane within ten minutes of landing.
- 6. Employees at an airport available to offer you individualized attention.
- 7. Conference facilities are available to you at an airport so that you can conduct meetings.
- 8. Employees at an airport respond do not busy to respond to your request promptly.
- 9. The local cuisines are available at airport.
- 10. A variety of specialty retail stores sell the local culture products at the airport.

5.1 Implication for Future Research

Based on the results of this research, the others researchers should develop a formal survey instrument to be administered to various airport stakeholders at large, medium, and small hub airports. The satisfaction of passengers' perception of airport service quality factors will be used to determine the relative importance of the identified airport quality factors to each group. For further study, there are two criticalinvestigations are needed: first, the relationships between airport service qualityand other important airport performance measures. Second, the relative importance of service quality in the passengers' airport choice decision is currently the subject of speculation requiring empirical inquiry and specification.

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IMPLICATION OF PUBLIC TRANSPORT SERVICES TO RURAL MOBILITY

Dewanti Graduate Student, School of Graduate, Gadjah Mada University Kampus UGM, Bulaksumur, Yogyakarta, Indonesia. Phone: +62-274-524712 or 524713, Fax: + 62-274-524712 or 524713 Email: dewanti@mstt.ugm.ac.id or dewanti_marsoyo@yahoo.com

Danang Parikesit Professor, Department of Civil and Environmental Engineering, Gadjah Mada University Jl. Grafika 2, Kampus UGM, Yogyakarta, Indonesia. Email: dparikesit@ugm.ac.id Achmad Djunaedi, Professor, Department of Architecture Engineering and Planning, Gadjah Mada University Jl. Grafika 2, Kampus UGM, Yogyakarta, Indonesia. Email: achmaddjunaedi@yahoo.com

ABSTRACT:

This research aims to analyze the development of rural public transport (RPT) services, various problems faced by rural community in obtaining these services as well as its effects on mobility. This research was conducted in the Kulonprogo Regency, Indonesia by carrying out observation and data collection of RPT service performance in two routes. Community valuation toward public transport services as well as the characteristics of their travel was obtained by distributing questionnaires to 150 respondents. Descriptive qualitative analysis is applied to find out the description of RPT service evolved and to analyze its effect on rural mobility. A wide range of recommendations related to public transport services, regulation and policy is given to improve rural public transport performance.

KEYWORDS: Indonesia, rural mobility, public transport

1. INTRODUCTION

Attention to the rural transport services in developing countries have not so great compared to that to the transportation infrastructure (Dawson and Barwell 1993 and Starkey, 2002).

Transport services have not reached rural remote areas or rural areas far from the village's main street (Johnston, 2007). Besides that, the ownership of motor vehicle in rural areas is still rare (Dennis, 1998.) that resulted in many rural roads are not used for motor vehicle movement but for more on-foot or non motorized movement. This condition cause the characters of rural travel are dominated by long travel time and require more human energy. Rural community productivity reduced and their health performances also declined as a result of those travel pattern (Doran, 1996). Motor vehicles accessibility in such areas is very demanded for marketing of crops, distributing fertilizer and seeds and delivering social-economic services. It is also necessary to facilitate the use of more centralized services, such as hospital, and long distance travels for social, education, working and economic purposes. In general, motor vehicle ownership in rural area is still low, so it needs some efforts of personal and goods mobility improvement not only by road network development but also by transport services provision (Barwell, 1996).

Owen (1987) explains that the availability of transport services determines the mobility of people, goods and services that are highly influential on the process and outcome of development. Without transportation, the various social-economic needs of society can not be provided or distributed quickly and it will hinder the process of community and regional development, where human needs are evolving. Transport services can be obtained from the individual's ability to provide personal transportation and the availability of public transportation. However, the existing services are often restricted by the less public transport service with unreliable operation pattern. Such condition is probably caused by small demand and the absence of operation regulation on rural public transport like in urban areas (Dewanti, 2009). The role of rural public transport is actually not only for passengers transportation but also for goods one. Crops, small industry and other rural economic products have not been

optimally exploited as a result of insufficiency of public goods transport for distributing them. Thus, goods transport is still utilizing more passenger public transport. That practice certainly violates regulation which determines the use of special vehicles for goods transportation.

There is considerable potential for interventions to promote increased used of rural roads by motor vehicles or by enhancing public transport service. Despite the neglect of rural public transport services in the literature on developing countries, the Indonesian situation as recorded in the national statistic reveals a significance increase in the availability of public transport services over a twenty year period (Johnston, 2007). With the expansion in the road network and the growth in the vehicle fleet over the last three decades, public transport services have increased dramatically in rural Indonesia. By 1993 motorized public transport was available in 80 percent of Indonesia's village territories but this should not be taken to mean that an equivalent proportion of the rural population enjoyed public transport 'to the front door'. Given the distribution of rural population in small hamlets within these village territories, many rural dwellers have to walk substantial distances before they can reach public bus service. This point helps to explain why public transport services (small bus/van, motorcycle taxi) have become a significant feature of the rural transport system in Indonesia and why they seem to have considerable potential for further expansion, particularly in the 'pioneering' sense of providing the first significant improvement in transport conditions for hamlets that had previously depended on walking and the movement of goods by human power. Land public transport services for rural roads in Indonesia are generally supported by two types of transport means, small buses/vans or motorcycle taxis ('ojek'). Based on the 2002 data

indicate that all of Indonesia's 56,749 rural villages had some form of public transport, although 3.87 percent of villages did depend on non-motorized modes (bicycle and tricycle taxis and boats) and nearly 8 percent of villages had unspecified 'other'modes of public transport (Johnston, 2007).

Considering to those problems, this research analyze the performance of rural public transport (RPT) service, and its impacts on rural mobility. Two public transport routes in Kulon Progo regency, DIY province, Indonesia with different topography characters were selected to gather data of public transport operation and performance by field observation. Special questionnaires were also distributed to 150 public transport users to find out their responses on the existing public transport services. In depth interview was carried out to collect various responses from many stake holders in terms of RPT services and its development. Descriptive qualitative analysis was adopted to find out the implication of public transport service to rural mobility which indicates the nature of rural people movement in terms of trip length, duration, frequency, convenience and transport cost.

2. CHARACTERS OF STUDY AREA

2.1 Description of Study Area

Most Indonesia's territory (70%) is rural area and Kulon Progo, as one of regencies in Yogyakarta Province, Indonesia is selected as a study area. This regency was chosen as research location considering to the availability of diverse natures of area and public transport services required by this research's objectives (see Figure 1). This covers high land and flat area so that necessarily observing the possibility of the occurrence of land public transport service differences. The northern part of Kulon Progo regency is high land with altitude between 500 - 1000 m above sea level, the central area is hilly land of 100 -500 m above sea level and the southern part is flat area with altitude until 100 m above sea level. This area is served by formal public transport of small station wagon vehicles, with capacity of 8 passengers or small bus with capacity of 20 passengers and informal ones of motorcycle taxis and hired automobiles. The last data in 2009 specified that there are 33 rural public transport routes with 106 vehicles. This study focuses on observation of small capacity (8 passengers) public transport vehicles in two routes (route 2 and 9) and the availability of motorcycle taxi in research location. Motorcycle taxi, also called as 'ojek', is very common kind of informal public transport in this area that operates in area or in time which is not served by formal public transport.



Figure 1 Kulon Progo Regency

2.2 Public Transport Route

Rural public transport service in Kulon Progo regency is a part of the government services to the public by utilizing small station wagon vehicles, with capacity of 8 passengers or small bus with capacity of 20 passengers. This study observes for only small capacity (8 passengers) vehicles of two routes in research location, those are route 2 and 9 (see Figure 2). Route 2 is taken into account due to its classification as moderate distant route with moderate number of fleets of 8. This route origins from Wates (the capital of Kulon Progo regency) terminal and destinates to Glagah Coast, so the dominant area character is coastal or lowlands with altitude of less than 100 meter above sea level. Route 9 is regarded as moderate distance with the number of fleets of 6 vehicles. It starts from Wates terminal and ends in Kutogiri, a hilly area or highlands with altitude of 100 - 500 meter above sea level. The available public facilities along rural public transport route are significant factor influencing the number of public transport users since they generate people trips. Public facilities in route 2 length comprises of 8 education of 18 km facilities, 1 hospital, 1 public medical centre, 4 banks and 2 markets, whereas route 9 of 12 km consists of 15 education facilities, 1 length hospital, 2 public medical centres, 3 banks and 2 markets. Route 9 indicates the more density of public facilities and it is presumable the more RPT users and the better services required.

As informal public transport, 'ojek' do not have any specific route (Figure 2). It can serve all places demanded by passengers at any time. People are possible to take 'ojek' service easily by calling the operator by cellular phone (the most popular phone in rural area) or come to 'ojek' posts in several locations such as market, bus stop or bus terminal, school, village levelgovernment office, etc. The use of motorcycle for this service is beneficial for its flexibility and capability in passing various natures of topography.



Figure 2 Route 2 (orange line) and Route 9 (yellow line)

3. PUBLIC TRANPORT SERVICE PERFORMANCE

Public transport service pattern is defined by Republic of Indonesia Act no. 38, year 2004, as a system or working method of public transport operator in delivering the service to the public transport users, in this case is rural society. Public transport service pattern in rural area is really different to the urban area which has a guideline of public transport operation and service. Considering to the absence of that guideline, the assessment on rural public transport will refer to the urban service standard.

3.1 General Service performance

Criteria for public transport service generally consists of waiting time, distance to bus stop or to transport service, transfer frequency, travel duration and transport fare. The following table presents dominant aspects of general services on two different routes which were the most frequent occurrence in RPT field survey.

Parameter	Description	Route 2	Route 9	
Route length	Km	18	12	
Number of fleets	vehicles	8	6	
	<5 minutes	0 %	1,3 %	
	5-10 minutes	18,2 %	56,6 %	
waiting time	11 - 20 minutes	56,8 %	31,6 %	
	>20 minutes	25 %	10,5 %	
	0 – 500 meter	43,2 %	43,5 %	
Distance to bus stop	500 meter – 1 km	20,4 %	19,7 %	
-	>1 km	36,4 %	36,8	
	0	86,4 %	86,8 %	
Number of transfer	1	13,6 %	11,9 %	
Number of transfer	2	0 %	1,3 %	
	> 2	0 %	0 %	
	0 - 30 minutes	79,5 %	86,8 %	
Travel duration	31 – 60 minutes	15,9 %	13,2 %	
Traver duration	61 – 90 minutes	2,3 %	0 %	
	> 90 minutes	2,3 %	0%	
Tuonon out four	Rp.2,000 (Students), Rp 3,000 – Rp 5,000			
Transport lare	(public, depends on the distance)			
Departure delay	minutes	90	10-15	
Average load factor	-	28 %	36 %	
Average Headway	minutes	55,2	17,7	

Table 1 Dominant Aspect of General Services of Formal RPT

Regarding to the above table, both routes characters are quite similar; however, there are three significant differences in the magnitude of departure delay, average headway and load factor. Route 2 has longer time headway because RPT delays the departing time for such a long time up to 90 minutes either in departure (origin) terminal or in destination terminal and this route passes longer distance than route 9. The less public facilities density in route 2 gives specific impact on lower load factor. Route 9 has higher load factor due to the availability of more public facilities along the route so that the number of passenger is slightly greater. In general route 9 service is better than that of route 2. Comparing to the standard of urban public transport load

factor of 70%, both routes designate very low performance. reflecting very small number of passenger in RPT service. This situation is reinforced by Dewanti (2011), indicating the existence of competition between this kind of formal RPT service and informal one (especially 'ojek'), also the increasingly use of motorcycle so that reducing the demand of rural public transport service. That evidence of high motorcycle growth is supported by figure 3. The operation of 'ojek' is definitely different, absence of those criteria, easier and quicker to find the service but more expensive. 'Ojek' transport fare ranges between Rp 5,000 - Rp 6,000 for 2-3 km and Rp 5,000-Rp 10,000 for 3-7 km.



Figure 3 Growth of Vehicles in Yogyakarta Province (data for regency level is unavailable)

3.2 Comparison between Rural and Urban Transport Service Characteristics

The absence of standard of rural public transport service causes difficulty in comparing the real performance to the proper standard. However, this section tries to explain the condition of rural public transport service compare to the standard of urban public transport services developed by Directorate General of Land Transportation (2002). Such comparison is presented in the Table 2.

Service aspects	Urban public transport	Rural public transport (route 2 and 9)		Evaluation	
	standard	Variable	% (average)	on RPT	
Waiting time		<5 minutes	0,65 %		
	Average: 5 – 10 minute	5 - 10 minutes	37,4 %	Good	
	Max: $10 - 20$ minutes	11 – 20 minutes	44,2 %		
		>20 minutes	17,75 %		
Distance to bus stop		0 – 500 meter	43,35 %		
	500 – 1000 m	500 meter – 1 km	20,05 %	good	
		>1 km	36,6 %		
	Average : $0 - 1$	0	86,6 %		
Number of transfer		1	12,75 %	good	
	Max: 2	2	0,65 %	good	
		> 2	0 %		
Travel duration		0 - 30 minutes	83,15 %		
	Average: 1 – 1,5 jam	31 – 60 minutes	14,55 %	and	
	Max. 2 – 3 jam	61 – 90 minutes	1,15 %	good	
		> 90 minutes	1,15 %		
Load factor	≥70 %	-	32 %	poor	
Headway	-	-	36,45 minutes	poor	

Table 2 Comparison between Rural and Urban Transport Service

In general, it can be concluded that the overall services of route 2 and 9 are good in some service aspects of waiting time, distance to bus stop, number of transfer and travel duration, because their existing service performances are dominantly close to the average or maximum value of the standard of urban transport service. Two service aspects of load factor and headway are still poor. Furthermore RPT service performance will also be reviewed by Users' valuation.

3.3 Users Valuation to Rural Transport Service

Valuation on rural transport service is important in reviewing rural society's perception on public transport operation and service. It can be analyzed what problems they faced and what aspiration they proposed to improve RPT service. Their valuations are closely related to their social-economic characters and their dominant trips using RPT. The majority of RPT users in both routes is female (60.3% in average). This evident is also reinforced by respondents statement indicating that motorcycle availability in a family does not always give positive impact on women's travel. Most motorcycles are used to support men's activities and women depend on walking, bicycling or travelling by RPT. Great proportion of users (94% in average) use RPT for inter-village trips. Route 2 is dominated by the presence of some schools, then more public transport users are students for going to school, whereas route 9 are dominated by older people (especially women) who will go to the market and to work. More traditional markets are available in route 9, so that more women go to the market by rural public transport. The most frequent travel purposes which are carried out in those routes are consecutively: education, going to the market, working, others, farming and recreation. Considering to the result of questionnaire survey of RPT service, dominant users' valuation to rural transport service is presented in Table 3.

Rural transport services	Characters (%	Valuation (% users)	
	users)		
Waiting time	11-20 minutes	Long waiting time	
	(44.2%)	(40.3%)	
Distance to service	\leq 500 m (43.4%)	Near (49.6%)	
	>1 km (36.6%)		
Transfer Frequency	None (86.6%)	No problem (86.6%)	
Travel duration	\leq 30 minutes (83.1%)	Moderate (41.7%)	

 Table 3 Rural Public Transport Users' Dominant Valuation

Long waiting time is crucial problem faced by rural people, meanwhile distance to service, transfer frequency and travel duration are not considered as serious problems. It indicates that rural people seem to have no big problems on public transport services. They do not really care with the service given by public transport operators and it could be caused by their different perception to such service comparing to urban people's perception whose higher assessment standard.

4. RURAL MOBILITY IMPLICATIONS

4.1 Change of Transport Mode Choice.

Based on in-depth interview survey to the Head of Local Communication Department, RPT operators, 'ojek' operators, local government staffs and household members (husbands or wives) there is significant change of transport modes choice either as personal transport or public transport. High level ownership of motorcycle (see Figure 4) in rural areas has shifted the role of bicycle and walking to motorcycle as personal transport and the role of RPT to motorcycle as personal transport. In addition, some rural people utilize motorcycles as additional income sources by operating them as informal public transport ('ojek'). Motorcycle with its abundant benefits as a mode of transport has currently significant role in personal or goods transportation in rural area. It gives significant impact on reduction of RPT service in terms of number of routes and vehicles (see Figure 5 and 6). These evidents are also supported by statement of public transport and ojek operators who realize that their business in transport service is not prospective anymore due to rapid growth of motorcycle as personal means of transport and the increase of cellular phone ownership which is very helpful in obtaining transport service.



Figure 4 Motorcycle Ownership in Rural Area of Kulon Progo



Figure 5 The Decrease of the Number of RPT Routes in Kulon Progo



Figure 6 The Decrease of the Number of RPT Vehicles in Kulon Progo

Now, motorcycle is dominant means of transport in rural area replacing bicycle and formal public transport. Almost 90% rural households own at least one motorcycle. The nature of such dominance is also represented by travel characters change such as travel distance, frequency, ease and convenience, etc. This kind of vehicle performs higher travel speed, better and larger area coverage and relatively cheaper vehicle operating cost (Adesanya, 1998). All respondents that operation agree good performance of motorcycle and so many advantages in owning motorcycle lead the number of motorcycle increase steeply. Rural people do not have to purchase much money for a new or second hand motorcycle, only Rp 500.000 (around 55 USD) in cash for down payment, people can buy motorcycle in installment scheme. Besides that manv middlemen come to the village offering new or second hand motorcycle in very interesting and affordable scheme of payment, so, rural people do not have to go to city centre distant from their home for buying that vehicle. The minority of rural households which do not have motorcycles are those categorized as very poor households or old people ones.

4.2 Change of Travel Characters

The alteration of transport modes choice gives implication on the change of travel characteristics such as travel distance, frequency and travel convenience indicated by the ease of service, cheap transport cost and better travel speed. Respondents get benefit in using motorcycle for some reasons as follow:

(a) Ease of obtaining service. Waiting time, walking time to obtain the service and transfer time is not necessary in the use of motorcycle for certain purpose of trip. This character will reduce total travel time and simplify the trip. Besides that, the availability of motorcycle service is very good, whenever it is needed, it is available and it is not limited by service schedule. Getting 'ojek' service is assumed to be easier, as long as consumers have cellular phone, they can call 'ojek' drivers (they generally own cellular phones) whenever they need.

(b) Low operating cost. The least motorcycle fuel consumption compare to other motorized vehicles and cheap maintenance/spare parts cost makes its low operating cost. Great different of vehicle operating cost between other motorized vehicles, the ease in buying motorcycle leads motorcycle become as a main vehicle and a cheap means of transport for a household, although less safety consideration.

(c) Higher speed. Motorcycle is able running in higher average speed than RPT and without waiting time, transfer time, no or minimum walking time to obtain the service so that reducing total travel time.

(d) High flexibility. Motorcycle capability in roaming various kinds of topography makes this vehicle can pass easily in flat, hilly or mountainous area and in wide, narrow road or in good or poor paved road. It is definitely reliable and multipurpose vehicle in many conditions of area for transporting passengers or goods with low capacity.

All best features of motorcycle affect people trip characters in terms of travel distance, frequency and the ease of travel which all of those are mobility indicators. Dominant travel purpose of rural people in study area can be classified as working, schooling, health caring, administrative activities (such as: banking, official matters, etc), social activities (such as: visit relatives, friends, etc.), recreation, worship and shopping. Impact of motorcycle usage on travel distance for those various travel purposes is presented in Figure 7. The numbers in that figure demonstrates distance (in meter unit) can be reached for all travel purposes before and after using motorcycle. It does not mean that when they use motorcycle, their travel distance will automatically be longer, but people have greater possibility in obtaining better service which is usually farther from their home. The travel mileage change for each travel purpose differs according to existing public service location.



Figure 7 Travel Distance Change

The use of motorcycles has advantage in getting transport service; so many rural people who own motorcycle tend to make certain travel more frequent. Some travel purposes (i.e.: working, schooling and administrative activities) does not perform significant frequency change since it probably be as a kind of regular activities. The alteration is more often indicated by the increase of respondents' presence for working or schooling which previously rather low as a consequence of poor rural mobility, also indicated by the decrease of occurrence of respondent to come late at school or work place. Figure 8 presents the change of trip frequency qualitatively indicated by the difference of two points distance (of trip frequency before and after using motorcycle) measured from the central point of the axis.



Figure 8 Travel Frequency Change

4.3 Restricted Female Mobility

As the new role of motorcycle as a main means of transport in family, it does not automatically make women become the majority of motorcycle users, this finding is specified by the data of majority of RPT users (60%) is women and it is reinforced by respondents' statement indicating that male (as father, husband or head of household) has highest priority in riding motorcycle. It can be concluded, rural women trip is dominantly on public transport vehicles, by walking or cycling. This situation strengthen Porter's statement (2002) that rural women consume more time and more energy for trips and brings negative impacts on health performance of rural women, that is lower reproduction health quality. By decreasing formal RPT performance may impact negatively to the women as they should move to the slower means of transport and consume much more energy, those are walking or cycling. For women who keep using formal RPT, they will spend more time for movement and reduce their effective time for family taking care and economic activities handling. However, they are willing to utilize various kinds of informal public transport which often less safety and convenience consideration (i.e.: riding on pick up or open small truck). Rural women are more sensitive through long and safe travel.

4.4 Goods Mobility

Other problems also emerge in rural mobility in correlation with goods transport. Transporting the yield, small-scale industries' product and other kind of goods is not easy to find proper and affordable means of transport. People sometime take their goods in the same RPT for passengers to distribute and to market their farm yield or the products of household industry to other villages or cities. It is the only fastest way (and may be the cheapest) to transport such goods. For smaller amount or less volume of goods, motorcycle is the more preference means of goods transport. That practice often creates inconvenience and reduces traffic safety due to the mix used of formal RPT vehicle. Excessive inside vehicle frequently baggage leads passengers have to stand up on the open door and this dangerous behaviour may cause fatal accident to the standing passengers. The use of motorcycle as goods transport also performs poor behavior of overloading baggage or improper packing that finally would impact on motorcycle rider's safety.

The lack of goods public transport in rural area makes rural people face some restrictions in transporting freight. Practices of selling farm or agricultural product to middlemen has been widely expanded, farmers do not have to bring their products out of village, self transporting them to the markets. Buyers (middlemen) will come to the farm and transport the product they bought by their own means of transport. Such practices impact on lower price of agricultural products and farmers do not have better bargaining position in determining that price. On the other side, motorcycle usage also increase rural people's working mobility, especially on the occasion of transporting fertilizer, of moving certain equipment or diesel generator machine for irrigating their land. Rural people basically consider that motorcycle assists them to transport whatever goods on a relatively small amount in a quicker, easier and cheaper way.

5. RPT IMPROVEMENT PROGRAMMES

Performance of RPT tends to decline indicated by decreasing number of vehicles and routes and who do not have motorized personal vehicle or for longer distance trip (such as out of regency or province) and in specific weather condition (rainy season). RPT improvements are essential in providing better transport service and increasing rural passenger and goods mobility. Several schemes of RPT improvement are proposed in the following section.

5.1 RPT Incentive

Most problems of RPT are caused by unreliable service performance of it, in terms of long waiting time, low load factor and poor schedule, that makes rural people face some difficulties and inconvenience in getting RPT service for their movement. Some rural people consider transport fare of RPT is expensive in one side, and the rapid growing of motorcycle with all its advantages let them move to motorcycle service as personal or public transport. Those RPT service problems are due to the low level of demand, so the number of existing passengers is few. Public transport operators need longer time to wait more passengers occupy vehicle and then they finally run it. This condition also lead to income earned is often unable to cover the vehicle operating cost and operators become more difficult to increase their services. One effort that could be applied is sufficient incentive provision for RPT to improve the service. Government as the most responsible stakeholder in providing public services is expected to be able giving such incentive or subsidy for RPT not only for users as students but also for contributing in vehicle operating cost. Incentive will assist both transport operators and users to find better and affordable transport services, furthermore it also benefited to rural women in obtaining faster and safer transport service.

a great number of RPT passengers move to motorcycle as their main means of transport. This situation must be recovered because there is still potential demand of RPT of rural people.

5.2 Service Guideline of Formal RPT

Until now, provision of RPT service has not been firmly regulated by government. There has no specific guideline that control rural public transport operation and service like in urban area. Such condition let RPT operation has no strong foundation. Guideline of vehicle type for RPT, time and area of operation, the magnitude of transport fare also service performance criteria has not been set yet. This creates opportunity for everyone who is interested in a business of transport services provision to participate in that field without clear requirements. Users will also difficult to complain in the matter of poor service, because it really has no regulation. In one hand, operators may determine transport fare as their desire without considering users' ability to pay, on the other hand, good service is usually balanced by relatively expensive cost. In reality, giving maximal service to the consumers will be difficult, due to little demand and low capability of rural people to pay good services. However, it does not mean that rural people will always get poor services. So, it is necessary to develop regulation or guideline which determines minimum requirements of RPT operation and service that enable operators to have strong foundations in handling public transport. For RPT users, their rights and obligations can be regulated. Mistake and deviation in RPT operation will be sought the solutions and reasons. By this certainty, it is expected that operator candidates will not be hesitate in starting their business, while, the users will feel more convenient and safer in traveling and obtaining certainty in transport service. Finally, it could increase rural mobility.

5.3 Better Management of Informal Public Transport 'Ojek'

Although the role of ' ojek ' currently tends to be lower, but its existence in certain places (such as: remote areas, hilly areas and those with no public transport service) is urgently needed bv community in supporting their mobility. Besides that, ' ojek ' is also as a family income source that is easy to start, so it is frequently used as a side job as well as the main job. Due to its informal nature causes this transport is not affected by Government's regulation. Considering to the high potential of ' ojek ' in rural transport service provision, government should be more involved in its management, regulate its fare and safety similar aspects. The scheme has been implemented by Thailand Government in setting motorcycle taxi fare in urban areas and special requirements for operators to improve the safety of motorcycle-taxi (Oshima and Fukuda, 2007). The determination of upper and lower limit of transport fare enable consumers to get the certainty of price, while operators would diminish the occurrence of unfair competition among operators. Providing safety guarantee for 'ojek' users could be very beneficial for the availability of safe public transport services. 'Ojek' drivers should get training on safe driving practices as well as providing safety equipments for 'ojek' users' facilities, such as helmet. Besides, it is also necessary the use of particular attributes for ojek operators to facilitate ojek users in identifying the ojek existence and in ensuring the service given. То facilitate communication coordination and between Governments and ojek drivers or operators, it is recommended to set up formal organization of ojek drivers. Government could also issue some credits or soft loan of motorcycle provision for those who interested in conducting 'ojek' service, open small workshops and fuel stations

and also train the operators for traffic safety and motor cycle maintenance. The basic problem in 'ojek' operation is relatively high vehicle operating cost but low capacity that impact on high transport fare so that only small portion of rural people could afford such fare for their movement. To overcome this problem, ojek operators should have skill in efficient ojek management and government should support some training in enhancing their skill. Better operation of 'ojek' in rural area will create a multi mode transport system and it can operate in different character of area so that rural people can be supplied by sufficient public transport services.

5.4 Modified Design of RPT Vehicles

In rural goods transport, non-mechanized means including head loading are mostly catering to the needs of rural goods transport (Ellis and Hine, 1998). Bicycles and motorcycles are very common to carry water, firewood's, and cattle foods. For heavier load to be transported such as agricultural produces and inputs, small scale industry and fishery product, bigger and motorized vehicles are needed to carry such goods. The problem is the volume of such goods is not so high, like personal transport, that the provision of special freight means of transport will be uneconomically feasible. Therefore, joining both demands of personal and goods transports to be one service may beneficial in terms of vehicle capacity and operating cost. Proper rural vehicle design is important to be developed in order to have specification for certain vehicle types that dominantly used by rural people. Bicycle and motorcycle have a great percentage of rural means of transport. So, the development of both vehicle designs will improve their usage in various travel purposes either for private and public transport service.

Non-motorized transport and some low cost motorized vehicles are important and significant to offer a wide range of options to meet a variety of movement needs under different conditions. They are appropriate to many of the major transport demands of rural people which are often for the movement of relatively small payloads or small numbers of people over

relatively short distances. Some can be used on footpaths or walking trails. Others require engineered tracks but all can operate on routes of a lower standard and hence lower cost than the motorable roads required for conventional motor vehicles. The characteristics of non motorized transport and some low-cost motorized transport are given in table 4.

Vehicle	Max. Load	Max speed	Max. Range	Route requirement
	(kg)	(km/hour)	(km.)	
Standard bicycle	75	20	25	reasonably flat, Narrow path,
Bicycle and trailer	200	10 - 15	15 - 20	Reasonably flat, Wide track,
Bicycle and side car	150	10 - 15	15 - 20	Reasonably flat, Wide track,
Motorcycle	100	40 - 90	100	Motorable path
Motorcycle and side-car	250 - 500	30 - 60	60	Unsuitable for steep hills
Motorcycle and trailer	250	30 - 60	60	Unsuitable for steep hills

Besides the use of those vehicles in rural area, regular public transport should be encouraged to provide both the movement of passenger and freight by dual purpose bus with facilities to carry passengers and goods

6. CONCLUSION AND RECOMMENDATION

RPT service in hilly area is quite different from the flat one, but in general both areas indicate long waiting time and low load factor that impact on decreasing RPT service and the number of routes and fleets. This situation is worsened by increasing motorcycle ownership in rural areas and more rural people movements supported by motorcycles. Motorcycle becomes the main means of transport in rural area either for passengers or goods movement. Extensively use of motorcycle has altered rural mobility in terms of longer travel distance, more frequent travel and cheaper transport cost. However, there is still lack of RPT service standard and less attention for women travel and goods transportation. Poorer performance of RPT must be improved because there is still demand of RPT service, especially for people who do not have personal vehicle or motorcycle or for long travel such as inter village or inter regency travel or travel in a group and in certain circumstance, such as in rainy season, bringing a lot of luggage. Although motorcycle becomes very popular means of transport, RPT should not be neglected due to the demand availability and traffic safety aspect.

Finally, some efforts are recommended to improve the role and performance of RPT as follows:

 Indonesian Government, in this matter is Communication Department, should prepare an operation guideline of rural public transport to conduct better transport services. It will be required by every public transport operator to have specific regulation in delivering the service and by government itself to monitor, to evaluate and to direct transport service system in rural area.

- 2. The provision of rural PT service has to consider mainly on social aspect approach due to low economic condition rural people, unexploited existing natural resources, limited environment condition and other problems faced by rural people. Government's incentive, community empowerment and involvement are possible schemes to be developed in promoting RPT.
- 3. Supporting technical, economical and entrepreneurial innovation to develop lowcost means of transport, and types of serviceare appropriate to local requirements and economically viable. This kind of means of transport will enable increasing rural mobility in various topography areas and road network conditions.

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