Analysis of Car Commuters knowledge, Awareness and Willing to Modal Shift in Klang Valley, Malaysia

SARA KAFFASHI*, MAD NASIR SHAMSUDIN[1], SHAUFIQUE FAHMI SIDIQUE[2], ABDULLATIF BAZRBACHI[1], ALIAS RADAM[2] and KHALID ABDUL RAHIM[2]

[1]Faculty of Environmental Studies, Universiti Putra Malaysia. 43400
UPM Serdang, Selangor.
[2]Faculty of Economics and Management, Universiti Putra Malaysia, 43400
UPM Serdang, Selangor, Malaysia.

ABSTRACT

The main objective of present study is to evaluate private vehicle commuters' knowledge and concern about health and environmental impact of transportation related air pollution in Klang Valley, Malaysia. Data were collected using structured questionnaire and interviewing 450 car commuters in five main areas of Klang Valley. The Results indicated that majority of respondents (58%) have knowledge about deteriorating effect of transport on society's health and welfare. While, only 36% of them were concern about the transport related environmental problems. This study suggest that government intervention through increasing toll, parking fee and introducing congestion fee together with providing more efficient public transport can reduce more than half of travels by car.

Keywords*: transportation, air pollution, knowledge and awareness, modal shift.*

INTRODUCTION

Malaysia is a developing country with rapid rate of urbanization and industrialization. One of the obvious impacts of economic development and rise in standard of living is evidenced by increasing number of private own vehicles. The private vehicle ownership is escalating so as congestion and air pollution. Malaysia has a population of 29 million with 22 million registered vehicles from which 16 millions are active on roads[1]. The current trend of private

vehicle ownership is showing an increasing trend with 25% increment in 2014 compare to 2013. Poor public transport system is the main reason of increasing rate of private own vehicles. Inefficiency of public transportation made it to have only 17% of mode share in passengers' daily commute (fallen from 34% in 1980)[1]. Furthermore people

also are less concerned about harmful effects of motorized transportation and rarely show interests in non-motorized transport such as walking or biking[3]. Due to DOE of Malaysia[4], the number of unhealthy days and also amount of pollutants emission shows an increasing rate in 2014 compared to previous years. The CO emission was increased by 3.5 percent, SO2 (3.5%), followed by NO2 and PM both by 1.5%. Motor vehicles contributed 68.5 per cent of the pollutants emission to the atmosphere in 2012 (Figure 1). Considering 95% of CO emission to the atmosphere in Malaysia is from motor vehicles[4], taking into account the externalities is an important step to increase societal welfare.

The Klang Valley region (Figure.2) with about 2843 km[2] is located in the southwestern part of the Peninsular Malaysia consisting of the following areas: Kuala Lumpur, Klang, Kajang, Subang Jaya,

Petaling Jaya, Selayang, Shah Alam, Ampang Jaya, Putrajaya, and Sepang. In present study, this region is selected as our study area for two main reasons. First, it is one of the most developed areas in the country following rapid urbanization, population growth and industrial activities.

As a result this area is one of the most congested and polluted areas in Malaysia. Klang Valley has a 6 million person population, while the number of cars alone in Klang Valley area is more than 4 million currently, expected to reach to 7 million by the year 2020[2]. Second, Klang Valley compared with other areas in Malaysia has the most extensive public transport network. Considering the fact that Klang Valley is the most congested area in the region where alternative transport mode also is provided (either at the present or in future plan), any policy that can alter the negative impacts of transportation could be set as a successful example for other areas in Malaysia which are prone to face same impacts from high growth rate as Klang Valley does.

Review of literature shows that there is considerable studies on air pollution and its effects in Klang Valley region. Examples are Afroz et al.[5], Ling et al.[6], Azmi et al.[7], Rahman et al.[8], Leh et al.[9], Dominick et al.[10], Zahari et al.[11], Ahamad et al.[12]. There have been also several studies trying to address the social, economic and environmental issues from transportation policies in Malaysia. Examples are Mohamad[13], Hossain[14], AK et al.[15], Nurdden,et al.[16], Almselati et al.[3]; Dissanayake et al.[17], Shariff [18], Khoo et al.[19].

The aim of this study is first to evaluate the private vehicle commuters' knowledge and concern about health and environmental impact of transportation related air pollution in Klang Valley and second to investigate the modal share after government intervention through new policies. The contribution of this paper to existing knowledge is that having perspectives from knowledge, concerns, and characteristics of private vehicle owners in Klang Valley can help the government to find out the most acceptable ways of intervention to change the behaviour, internalize external costs and overall increase societal welfare.

METHODOLOGY

This study utilized questionnaire based method. There are several approaches to conduct a survey such as in-person interview, telephone interview, mail or email. Face-to face in-person interview selected for the purpose of this study view point of capability in providing highly accurate data. Furthermore, for the sake of convenience rather than
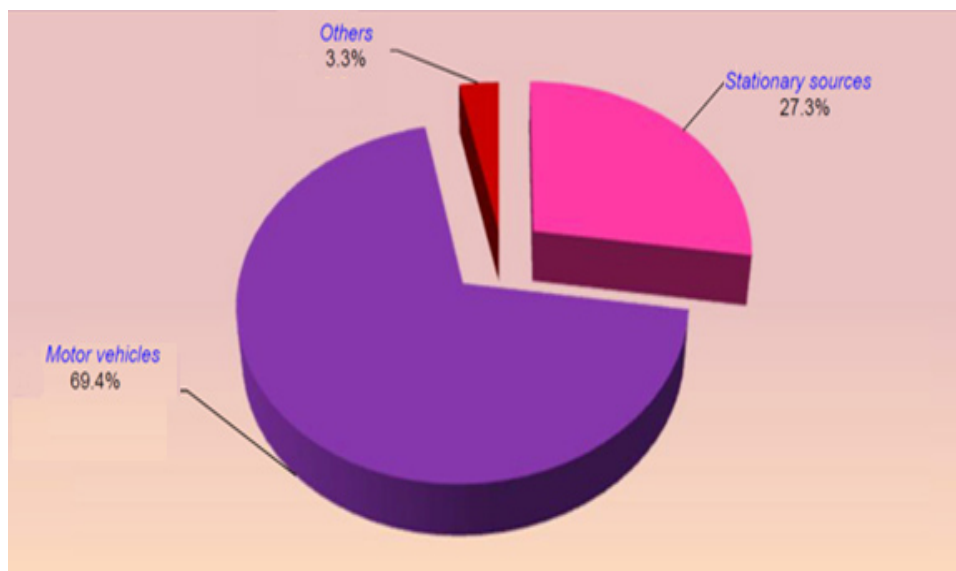

Fig. 1: Source DOE Malaysia, 2014

paper based questionnaires we applied computer aided personal interview (CAPI). The sampling frame was included all Klang Valley citizens who use their own car to commute to work every day. Sample size was selected considering following formula [20].

$$S= z_2 \ (p(1-p))/d_2 \qquad ...(1)$$

Where S is sample size, z is z value, p is the percentage of respondents who selected the choice (usually set as 0.5) and d is the confidence interval. Considering that the number of cars in Klang valley is 4 million at the moment and taking it to the sample size formula, the number of respondents was estimated 384 persons. However, to be on the safe side 450 interview took place.
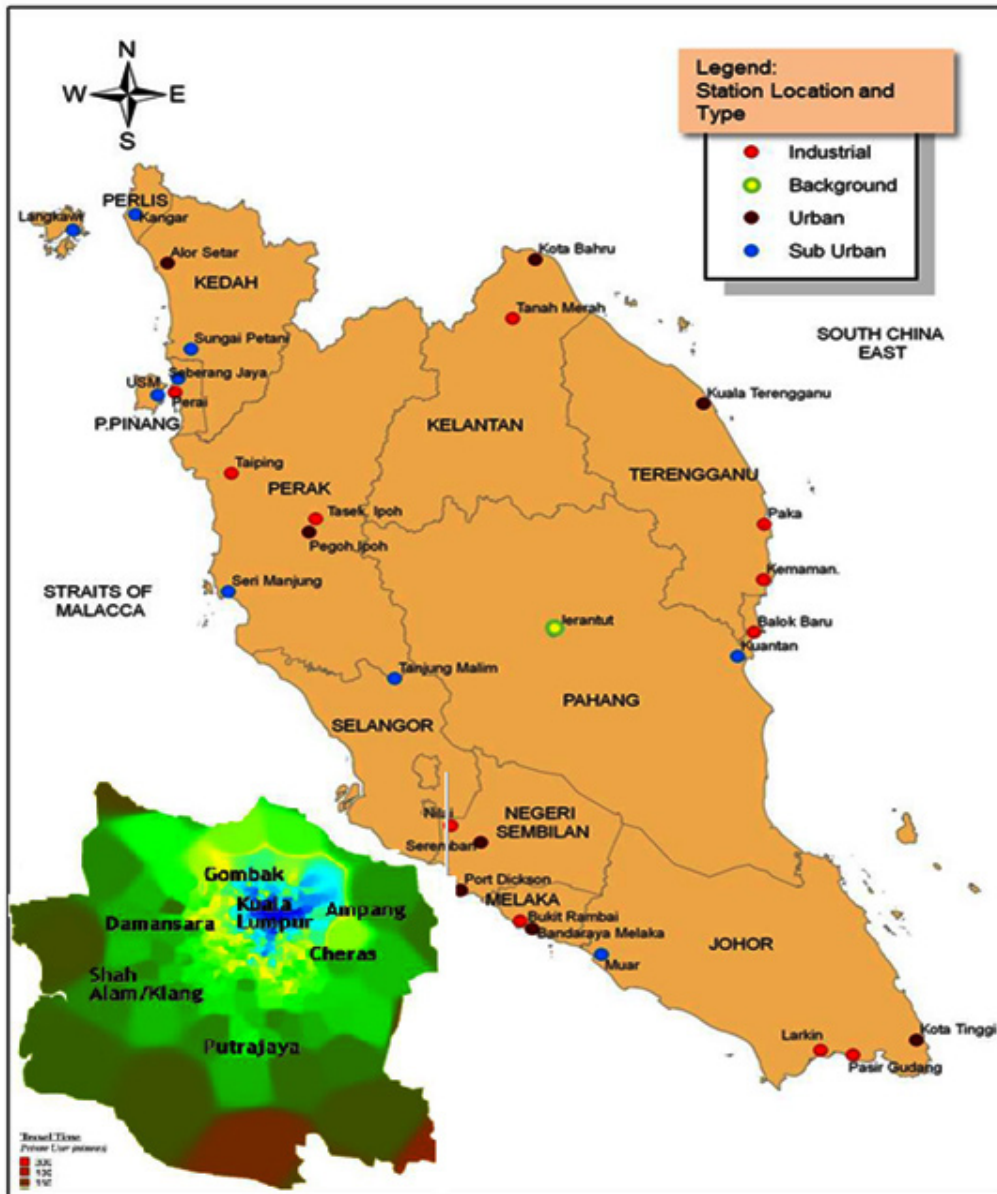

Fig. 1: Study area Source DOE Malaysia, 2014

The first step in designing the questionnaire was to conduct series of focus group studies with Land Public Transport (SPAD) Malaysia, university lecturers and people. The focus group study helped us to select the intervention policies scenarios as realistic as possible. A pre-test of 30 respondents was conducted to test the clarity and length of the questionnaire. Final questionnaire was administered in the 5 areas of Klang Valley region using structural random sampling. The selected areas were Shah Alam, Klang, Putra Jaya, Kula Lumpur and Gombak.

The first part of the questionnaire included questions on respondents' perceptions and awareness regarding transportation induced air pollution problems. The second part asked some questions to obtain respondents experience with air pollution related health symptoms. The third section of questionnaire included questions to gauge information on respondents current travel behaviour, their access to public transport, number of private vehicles at house, and their main usage of their vehicle in daily and weekly basis.

The forth part of questionnaire presented respondents with the new policies which aimed to internalize external cost via increasing toll, parking fee and introducing congestion fee simultaneously with significant improvement in attributes of public transport such as access, travel time and comfort (Figure 2). These policies were draw from Malaysian strategic plan and also discussion with experts. In order to have the most reliable intervention program respondents were asked to provide us with their daily trip characteristics. These were included their average one way travel time in day, one way toll, parking fee and their walking distance from home or office to the parking or vice versa. Respondents then were asked whether under new presented policies are willing to shift to the public transport. The last part of the questionnaire was designed to gain information on respondents' socioeconomic profile.

RESULTS AND DISCUSSION

Respondents' socio-demographic characteristics are presented in Table 1. The results show that the average age of respondents was 35 years old. Majority of respondents were male (63.4%) and Malaysian nationals (97%). View point of marital status most of the respondents (more than 70%) were married with average family size of 2 which is less than Malaysian reported 4.2 household average size in 2010. From educational point of view majority of respondents (47%) had bachelor degree, 19.7% had master and higher education degree, 19% had diploma, 8.1% professional certificate,
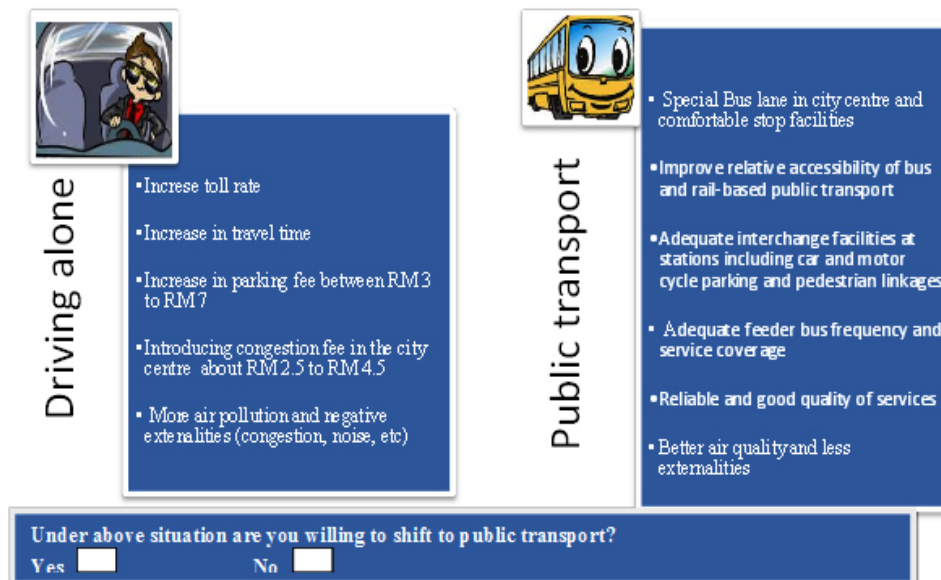

Driving alone
- Increase toll rate
- Increase in travel time
- Increase in parking fee between RM3 to RM7
- Introducing congestion fee in the city centre about RM2.5 to RM4.5
- More air pollution and negative externalities (congestion, noise, etc)

Public transport
- Special Bus lane in city centre and comfortable stop facilities
- Improve relative accessibility of bus and rail-based public transport
- Adequate interchange facilities at stations including car and motor cycle parking and pedestrian linkages
- Adequate feeder bus frequency and service coverage
- Reliable and good quality of services
- Better air quality and less externalities

Under above situation are you willing to shift to public transport?
Yes ☐   No ☐

Fig. 3: Attributes of public and private transport for year 2030

5.3% secondary school and finally 2% had primary school education. Respondents' average income was between RM 3000-5000 per month which projects Malaysian average income in year 2014.

From respondents more than 90% were aware that Klang Valley region is suffering from diverse range of environmental problems. Respondents then were asked to name the most important environmental problems they have been faced in their daily life and are concern about it. To most of them (more than 65%) air pollution was their first concern. In the next section we presented respondents with some air pollution related symptoms (cough, dizziness, sore throat, running nose, irritation in eyes and throat, chest heaviness) and asked them whether they have experienced any of them in the past year and they can highly correlate it to air pollution rather than flue. Results showed that 82% of respondents had experienced one or more symptoms during past year.

Respondents then were presented with scenarios on negative effect of transportation on environment and public health. The scenarios were followed by questions on respondents' degree of awareness about provided information. From respondents 7.7% were not aware at all, 58.6% were somehow aware and 33.7% were completely aware about negative effect of transportation on health and environment. When respondents asked about their concern about air pollution, 11% said that they are not concern at all, 54% were sometimes concern and 35% were always concern about advert effect of air pollution in their daily life. Further investigation in the obtained results showed that, highly educated people were more aware and concerned about negative effects of air pollution, as expected. However, to our surprise no specific trend was observed between income class and awareness and concern variables. The results showed that mostly people with income between RM5000-7000 were more aware and concern about diverse impacts of air pollution compare to lower or higher income group. Crosstabulation between income and education group showed that the income class for people with college degree and above is spread mostly around RM5000-7000. This, hence, determines the fact that people awareness is mostly related to their education level than their income, in our case study.

From gender perspective, however, women were slightly more aware and concern about transportation related air pollution compared to men (42.7% vs. 34%). The results also indicated that, while, younger persons (between 30-45 years old) had more knowledge and awareness about negative impacts of transportation on human and environment, older people (50-60 years old) were more concern about this negative impacts.

Accordingly, majority of respondents (74%) believed that both government and citizens should cooperate in lowering the level of negative impacts of transportation on human health. When respondents asked to rate the efficiency of public transport in their area 74% described it as inefficient. Majority of the respondents commute to work during morning peak hours, between 7am to 9am, and more than 70% commute to home during evening peak hours, between 5pm to 8pm. The average number of vehicles per household was 3. The main usage of car in a daily basis was for work and sending children to school, while, in the weekly base they mentioned shopping and visiting friends and families as well.

Respondents' current travel characteristics showed that maximum travailing time was 50 minutes while the minimum was 10 minutes. The maximum amount that has been paid as a toll fee was RM 7 and the minimum was RM 0. Finally, the maximum parking fee was mentioned as RM 10 per day, while the minimum was RM 0 which mean those respondents have an access to a free parking. Respondents then were presented with new policies which included increase in the number of unhealthy days and travel time and cost by 25%, 50% and 75% of the current condition accompanied by simultaneous health and environmental improvement, higher access, more comfort and reliability using more efficient public transport. The private vehicle commuters then were asked whether under new policies they are willing to shift to the public transport. Results of analysis showed that almost 70% of respondents would shift to an efficient public transport. Results demonstrate that if the cost and/or time of private transport increase, respondents have potential to shift to the efficient public transport. The efficiency of public transport is also very crucial in commuters' decision.

Table 1: Respondents Socio demographic profile

Variable	Frequency	Percentage	Mean	St. Deviation
Age			35	10.89
Gender			0.68	0.46
Male	174 295	56.31		
Female	135 137	43.69		
Citizenship			0.93	0.25
Malaysian	402	93.2		
Other	30	6.8		
Marital Status			0.72	0.44
Single	111	25.7		
Married	321	74.3		
Household size			2.00	1.72
Education			15.34	2.44
Primary School	7	1.6		
Secondary School	20	4.6		
Diploma	82	19		
Professional certificate	35	8.1		
Bachelor degree	203	47		
Master and higher	85	19.7		
Income group (RM)			4.41	2.08
<2000	32	7.4		
2001-3000	42	9.7		
3001-4000	95	22		
4001-5000	85	19.7		
5001-6000	48	11.1		
6001-7000	38	7.9		
7001-8000	47	10.9		
8000<	49	11.3		
Number of vehicles per household			2.61	0.94
1	26	6		
2	212	49.1		
3	111	25.7		
4	81	16.0		
4<	2	0.5		

CONCLUSION

Current study was conducted to gauge information on characteristics and level of knowledge and awareness of current car users on transport related health and environmental problems. This study also tried to gage the effect of transportation policy change on private car users. The study area selected as one of the most congested area in Malaysia. With the rise in income level and private vehicle ownership and decline in public transport efficiency, road transportation remains the main contributor to air pollution in Malaysia. The results of this study showed that government intervention through citizens' education or applying kind of Pigovian tax to internalize external costs could be considered as efficient policies in decreasing the number of individual cars in Klang Valley. This study

suggests that, awareness and traffic management can significantly influence residence mode choice behaviour. Approaches such as the promotion of efficient, environmental friendly public transport and improvements in the flow of traffic can considerably lower emission rates. Effective strategies such as reducing travel activities, specially single-occupancy travel, and promotion of modal shifts, have potentials to reduce local pollutants, traffic congestions and greenhouse gases emission.

REFERENCES

1.   Ministry of transport Malaysia Transport statistics Malaysia. http://statistics.gov.my/portal/index.php?option=com_content&view=article&id=363&lang=en accessed September 2014.
2.   Economic Performance and Prospects Malaysia. Available online: http://www.treasury.gov.my/pdf/ekonomi/le/1213/chap3.pdf accessed on September 2013.
3.   Almselati ASI, Rahmat RAOK & Jaafar O. An overview of urban transport in Malaysia. Social Sci; 6: 24-33 2011.
4.   Department of Environmnet Malaysia. Malaysia Environmental Quality Report. Available online: http://enviro.doe.gov.my/view.php?id=558 accessed August 2014.
5.   Afroz R, Hassan MN, & Ibrahim NA. Review of air pollution and health impacts in Malaysia. *Environmental research*; 92   : 71-77 2003.
6.   Ling OHL, Ting KH, Shaharuddin A, Kadaruddin A, & Yaakob, M J. Urban growth and air quality in Kuala Lumpur city, *Malaysia. Environ Asia*, 3**(2)**: 123-8 2010.
7.   Azmi S Z, Latif MT, Ismail AS, Juneng L, & Jemain AA. Trend and status of air quality at three different monitoring stations in the Klang Valley, Malaysia. Air Quality, Atmosphere & Health, 2010; 3**(1)**: 53-64.
8.   Rahman SA, Hamzah MS, Wood AK, Elias MS, Salim A, Ashifa N, & Sanuri E (). Sources apportionment of fine and coarse aerosol in Klang Valley, Kuala Lumpur using positive matrix factorization. *Atmospheric Pollution Research*, 2011; 2**(2)**.
9.   Leh, O LH, Ahmad S, Aiyub K, Jani YM, & Hwa T K. Urban air environmental health indicators for Kuala Lumpur city. *Sains Malaysiana*; 41**(2)**: 179-191 2012.
10.   Dominick D, Juahir H, Latif MT, Zain SM, & Aris AZ. Spatial assessment of air quality patterns in Malaysia using multivariate analysis. *Atmospheric Environment*; 60: 172-181 2012.
11.   Zahari M, Zin WZW, Ismail N, & Ni TH. Association between air pollution and hospital admission: Case study at three monitoring stations in Malaysia. In PROCEEDINGS OF THE 3RD INTERNATIONAL CONFERENCE ON MATHEMATICAL SCIENCES, 1602: 1178-1184. AIP Publishing 2014.
12.   Ahamad F, Latif MT, Tang R, Juneng L, Dominick D, & Juahir H. Variation of surface ozone exceedance around Klang Valley, *Malaysia. Atmospheric Research*: 139: 116-127, 2014.
13.   Mohamad J. Urban transport and growth management strategies: A tale of two Southeast Asian Cities at the dawn of the new millennium. Geografia: *Malaysian J. of Society and Space*, 2005;1**(1)**: 11-22.
14.   Hossain M. Integrated management of Malaysian road network operations through ITS Initiatives: issues, potentials and challenges. In International Seminar on Intelligent Transport Systems (ITS) in Road Network Operations, Kuala Lumpur, Malaysia 2006.
15.   AK IS, Stevenson M, & Hariza A. Mode choice model for vulnerable motorcyclists in Malaysia. Traffic injury prevention, 7**(2)**: 150-154 2006.
16.   Nurdden A, Rahmat RAOK, & Ismail A. Effect

of transportation policies on modal shift from private car to public transport in Malaysia. *Journal of applied Sciences*, ; 7**(7)**: 1013-1018 2007.

17. Dissanayake D, Kurauchi S, Morikawa T, & Ohashi S. Inter-regional and inter-temporal analysis of travel behaviour for Asian metropolitan cities: Case studies of Bangkok, Kuala Lumpur, Manila, and Nagoya. *Transport Policy*, 19**(1)**: 36-46 2012.

18. Shariff NM. Private vehicle qwnership and transportation planning in Malaysia. In International Conference on Traffic and

Transportation Engineering 2012.

19. Khoo HL, & Ong GP. Understanding Sustainable Transport Acceptance Behavior: A Case Study of Klang Valley, Malaysia. International Journal of Sustainable Transportation, 9**(3)**: 227-239 2015.

20. Afroz R, Masud MM, Akhtar R, & Duasa JB. Survey and analysis of public knowledge, awareness and willingness to pay in Kuala Lumpur, Malaysia–a case study on household WEEE management. Journal of Cleaner Production; 52: 185-193 2013.