ASSESSING TRAVELLERS' PERCEPTIONS for ACHIEVING SUSTAINABLE TRANSPORTATION: A CASE STUDY in KLANG VALLEY

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ABSTRACT
In Malaysia, alleviating traffic congestion in major cities has always been given the top priority. Despite various remedial measures and efforts to improve public transport in Kuala Lumpur, there are nearly 2.2 million private vehicles moving into the city centre daily. A survey involving 700 motorcyclists and car users was conducted in Klang Valley to understand their perception on public transport services as well as to gauge their willingness to switch to public transport. It was established that in general, the public transport services were poorly rated. However, motorists have shown some interests to switch to public transport if incentives were offered. Factors such as comfort and cleanliness, personal status and privacy, stress, safety, sending kids to school and irregular of working hours were found to be significantly different between car users and motorcyclists. A discrete choice model was also developed to explore the social economic factors influencing the use of private vehicles.

1. INTRODUCTION

The number of vehicles in Malaysia has been seen to have increased tremendously at the rate of 8% annually over the past few decades without sign of slowing down. Of all the total number of vehicle ownerships, it was estimated that more than 25% are operated in Klang Valley alone (Mohamad, 2003). Table 1 shows the statistics of vehicles registered in Malaysia from 1996 to 2007. It is also recorded that motorcycles constitute about 49% of the total vehicles and at the same time, 59% (6378 cases) of the total numbers of deaths resulting from road accidents involved motorcyclists and pillion riders were reported in year 2006 alone (Johari et al, 2007).

Table 1   Statistics of New Vehicles Registration in Malaysia Between 1996 – 2007 (Source: Road Transport Department)

Year	Motorcycle	Car	Bus	Taxi	Hire & Drive Car	Goods Vehicle	Others
1996	322145	318765	2620	4358	2545	69234	30844
1997	364214	372343	2947	5257	1800	65160	28396
1998	237776	159642	797	3569	552	11786	6342
1999	236779	296716	506	1925	1724	19987	8102
2000	238695	344847	544	2635	2883	24316	11949
2001	234751	395591	652	3169	1348	25512	13866
2002	222685	419713	919	4446	1242	25415	16768
2003	321234	424753	1014	5542	1232	29975	17041
2004	397977	472116	1290	7746	1797	33169	18268
2005	422255	537900	1568	5002	3411	33532	16440
2006	448,806	458,293	2,023	4,808	2,414	35,974	22,142
2007	484,394	419,449	1,786	3,803	2,478	40,954	6,850

Given the high accident rates involving motorcyclist and pillion riders, various efforts were devoted to study and mitigate the motorcycle related accidents. It is expected that the motorcycle ownerships would continue to rise owing to some contributing factors especially

ease of manoeuvre due to its small size, consequence of traffic congestion due to poor public transportation system, plenty of parking spaces, and burden of high petrol price (Leong and Sadullah, 2007).

According to a study initiated by Syarikat Prasarana Nasional Bhd (SPNB) (The Star, 2006), there were 2.2 million private vehicles moving into the city daily. The present of motorcycles in mixed traffic flow during traffic congestion is extremely dangerous as these motorcycles often weave in and out between the queuing vehicles to speed up their journey. In addition, the excessive influx of private vehicles into Klang Valley has triggered concerns on the associated adverse impacts such as traffic congestion and air pollution that creates considerable pressure on the road network systems. Many decision makers and researchers agreed that this situation is not sustainable. Therefore, this study is to identify the underlying factors affecting the private vehicle use especially the most risky mode of transportation which is motorcycle.

2.   METHODOLOGY

This study was conducted in Klang Valley in May 2007 through questionnaires. The target respondents were car users and motorcyclists.

A total of 700 samples collected. Of which, about 10% of the questionnaires were excluded due to incompleteness. The reasons for incompleteness of the survey forms include the reluctance of respondents to answer several personal questions and the limited time they can spend to answer the survey.   Of the remaining samples (639 samples), 24% were motorcyclists.

The questionnaire comprises of three sections. In the first section, the personal background data were sought. The second section was designed to obtain their travel characteristics such as mode used to work, time of departure, durations and others. In the last section, the respondent was asked to rate their perceptions on the sustainability attributes.

3.   CHARACTERISTICS OF RESPONDENTS

Table 2 presents the characteristics of the respondents in terms of gender and education level. In general, there were more male motorcyclists compared to female which is consistent with the phenomenon in Malaysia. Most of the car users were with higher education qualification.

Table 2 Distribution of Respondents by Gender and Education Level

| | Gender | | | | Education Level | | | | | |
	Female	%	Male	%	Primary	%	Secondary	%	College/ University	%
Car User	224	85.2	261	69.4	12	38.7	131	74.4	342	79.2
Motorcyclist	39	14.8	115	30.6	19	61.3	45	25.6	90	20.8
Total	263	100.0	376	100.0	31	100.0	176	100.0	432	100.0

Table 3 and Table 4 show the distribution of respondents by race and age group. Majority of the respondents were Malay making up 45% of total respondents. About 3% of the respondents were aged below 18 years old and above 55 years old, respectively.

Table 3 Distribution of Respondents by Race

	Malay	%	Chinese	%	Indian	%	Others	%
Car User	207	71.38	183	84.33	82	71.30	13	76.47
Motorcyclist	83	28.62	34	15.67	33	28.70	4	23.53
Total	290	100	217	100	115	100	17	100

Table 4 Distribution of Respondents by Age Group

Age Group	Car User		Motorcyclist		Total	
	No.	%	No.	%	No.	%
< 18 yrs old	11	61.11	7	38.89	18	100.0
18 – 24 yrs old	166	67.21	81	32.79	247	100.0
25 – 30 yrs old	146	78.07	41	21.93	187	100.0
30 – 44 yrs old	110	87.30	16	12.70	126	100.0
45 -55 yrs old	37	84.09	7	15.91	44	100.0
> 55 yrs old	15	88.24	2	11.76	17	100.0

4. RESULTS

From the previous findings (Ho et al., 2008), it was found that in general majority of the motorised users in Klang Valley were not favourable to the services offered by public transport. In choosing car or motorcycle, factors such as comfort and cleanliness, personal status and privacy, stress, safety, sending kids to school and irregular of working hours were identified playing significant role. On the other hand, realising the high accident rates involving motorcyclists and their pillion riders, many strategies were devised to tackle this problem. Thus, one of the series efforts in this research study was to investigate if the motorised users are willing to switch mode based on a list of incentives. The results showed that private vehicles users responded well to the incentives especially if the security systems were to be improved.

In this paper, eight sustainability attributes were identified to further examine motorised users' perceptions. The eight attributes were short-listed from the literature and pilot survey. Figure 1 shows the eight attributes which are classified under 2 categories namely sustainable transportation performance measures and traveller's perception.
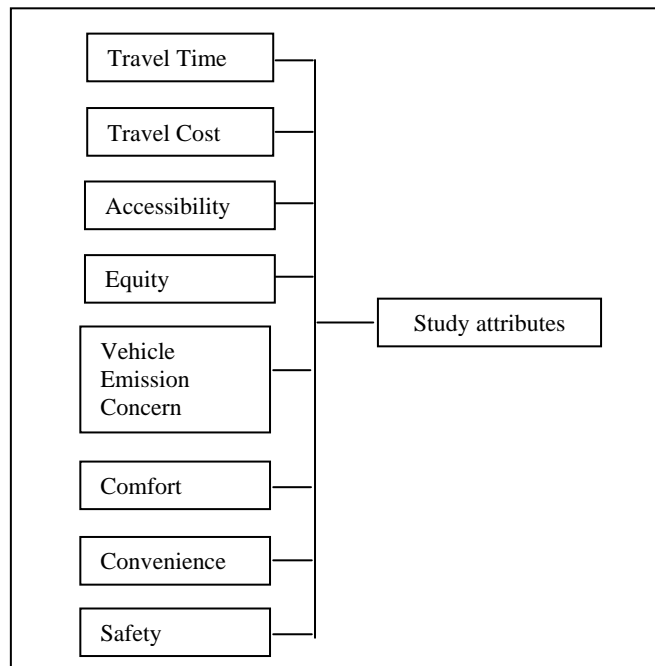

Figure 1   Attributes identified in this study

Table 5 presents the results of the mean score for the eight attributes as well as the t-test results. Respondents were asked to rate their travel time, expenses and other performance offered by their mode of transport on 10-point Likert scale as well as on 5 groups of linguistic variables (Very Low, Low, Moderate, High and Very High). It was found that all the attributes scored below 5 (average) of which total travel objectives to be able to achieved within 3 hours

scored the lowest (2.73 – 2.78). This finding is expected as with the dispersed development and serious traffic congestion in Klang valley, vehicle accessibility is relatively low compared to other well planning countries like Singapore and Tokyo. In terms of perceived security level offered by their mode of transport, it was found that motorcyclists viewed their mean of travel could offer better compared to car users. This may be true as in most of the office complexes, motorcycle parking lots are always near to entrance or management offices. This, in other words, provide higher security level to motorcyclists.

Table 5   Mean score for perceived attributes and t – test results by modes of transport

Attribute	Mode	Mean	Standard Deviation	sig.
Perceived travel time spent to work	Car User	3.02	0.79	0.104
	Motorcyclist	3.11	0.83	
Perceived travel expenses to work	Car User	3.19	0.73	0.099*
	Motorcyclist	3.09	0.96	
Total objectives achieved by travel mode	Car User	2.73	0.94	0.652
	Motorcyclist	2.78	0.91	
Perceived security level	Car User	3.45	0.79	0.063*
	Motorcyclist	3.52	0.95	
Awareness on vehicle emission	Car User	4.36	1.08	0.971
	Motorcyclist	4.18	1.17	
Perceived comfort level	Car User	3.36	0.84	0.065*
	Motorcyclist	3.52	1.00	
Perceived convenience level	Car User	3.39	0.76	0.07*
	Motorcyclist	3.63	0.89	

*Note: * significant at 0.1 level*

Figure 2 and Table 6 illustrate the perceived travel time used to travel to work for car users and motorcyclists. Approximately 63% of the car users in Klang Valley labelled that their daily commute time as moderate. As motorcycle is known as a highly manoeuvrable vehicle, more motorcyclists perceived their travel time higher compared to car users.
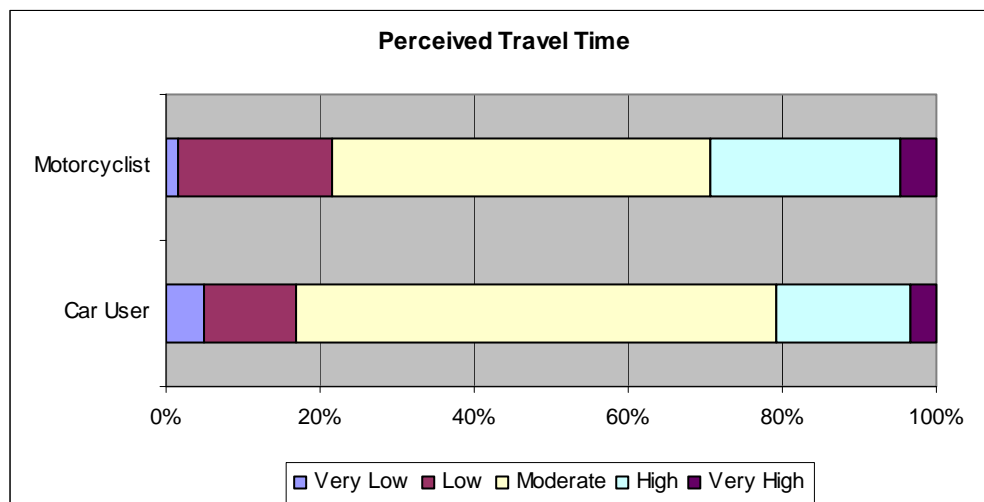

Figure 2   Perceived travel time by drivers and motorcyclists

Table 6 Perceived Travel time

Perceived Travel Time	Very Low (%)		Low (%)		Moderate (%)		High (%)		Very High (%)	
	M	C	M	C	M	C	M	C	M	C
<15 min	0.0	2.2	1.5	6.5	6.2	19.6	0.0	0.0	0.0	0.0
15-30 min	1.5	2.7	9.2	3.8	24.6	28.3	7.7	7.6	0.0	0.0
31-45 min	0.0	0.0	7.7	1.1	9.2	10.9	7.7	3.8	1.5	0.0
46-60 min	0.0	0.0	1.5	0.5	9.2	2.7	7.7	4.9	1.5	1.6
>60 min	0.0	0.0	0.0	0.0	0.0	1.1	1.5	1.1	1.5	0.5

Note: M=motorcyclists; C = car users

Travel expenses were classified into 6 groups as shown in Table 7. Majority of the travellers rated that their monthly expenditure on transport as moderate (Figure 3). Near to 60% of the motorcyclists spent less than RM 300 per month and they rated their expenses between Very Low to Moderate. As travel with car would incur higher cost compared to travelling with motorcycle, generally car users' acceptance level on travel expenses were higher compared with their counterparts who were using motorcycles.

Table 7 Perceived Travel Expenses

Travel Expenses	Very Low (%)		Low (%)		Moderate (%)		High (%)		Very High (%)	
	M	C	M	C	M	C	M	C	M	C
< RM100	1.5	1.1	7.7	1.1	3.1	5.5	0.0	0.0	0.0	0.0
RM 101-200	3.1	1.1	6.2	2.2	23.1	11.5	0.0	3.8	0.0	0.0
RM 201-300	0.0	0.0	3.1	2.7	10.8	16.4	3.1	4.4	4.6	0.0
RM 301-400	0.0	0.0	0.0	0.5	10.8	11.5	7.7	7.7	3.1	0.5
RM 401-500	0.0	0.0	0.0	0.5	3.1	8.7	3.1	4.4	1.5	1.1
> RM500	0.0	0.0	0.0	0.0	3.1	8.7	0.0	3.8	1.5	2.2

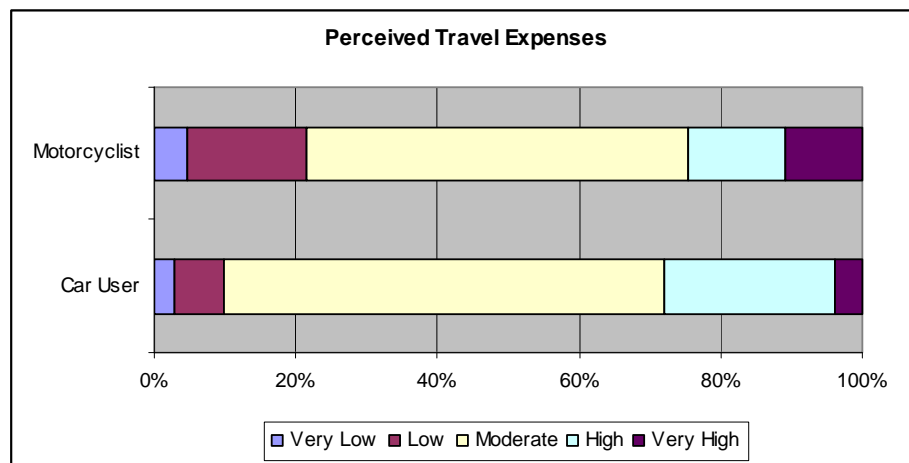Note: M=motorcyclists; C = car users

Figure 3   Perceived Travel Expenses

Travel objective in this study is defined as number of destination or objectives that can be achieved within 3 hours. Table 7 and Figure 4 present the travellers' perceptions on travel objectives achieved within 3 hours in Klang Valley. Given the small size and high accessibility, motorcyclists were able to achieve more travel objectives compared to car drivers.

Table 7 Travel Objectives achieved

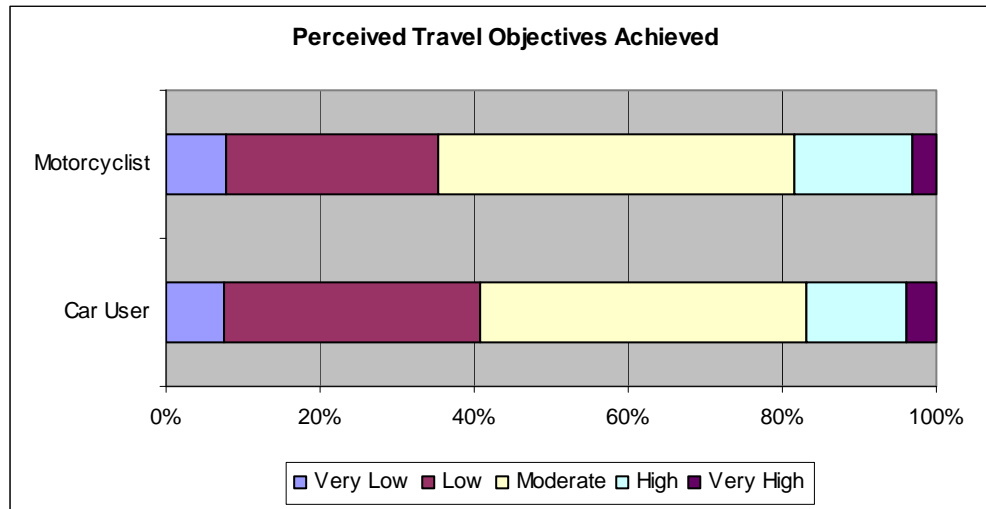| Number of destinations	Very Low (%)		Low		Moderate		High		Very High	
	M	C	M	C	M	C	M	C	M	C
1-2	7.7	7.1	3.1	4.9	0.0	0.0	0.0	0.0	0.0	0.0
3-4	0.0	0.5	24.6	27.2	10.8	2.7	0.0	1.6	0.0	0.0
5-6	0.0	0.0	0.0	1.1	32.3	39.1	7.7	11.4	0.0	1.6
7-8	0.0	0.0	0.0	0.0	3.1	0.5	7.7	0.0	0.0	2.2
9-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.0

Note: M=motorcyclists; C = car users

Figure 4   Travel objectives achieved

Perceived security level in this case refers to the availability of surveillance equipment, security officers and others to provide safe environment for travellers. About 20% of the motorcyclists felt that travelling with motorcycles was very much secured while only 7% of the car users shared the same opinion.

Table 8 Perceived Security Level

Scale	Very Low (%)		Low		Moderate		High		Very High	
	M	C	M	C	M	C	M	C	M	C
1-2	1.5	1.6	3.1	2.2	0.0	0.0	0.0	0.0	0.0	0.0
3-4	1.5	0.0	3.1	4.9	10.8	1.6	0.0	0.0	0.0	0.0
5-6	0.0	0.0	0.0	0.5	30.8	38.6	1.5	1.6	0.0	0.0
7-8	0.0	0.0	0.0	0.0	1.5	1.6	29.2	39.1	0.0	0.0
9-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	16.9	6.5

Note: M=motorcyclists; C = car users

Perceived Security Level

Motorcyclist

Car User

0%   20%   40%   60%   80%   100%

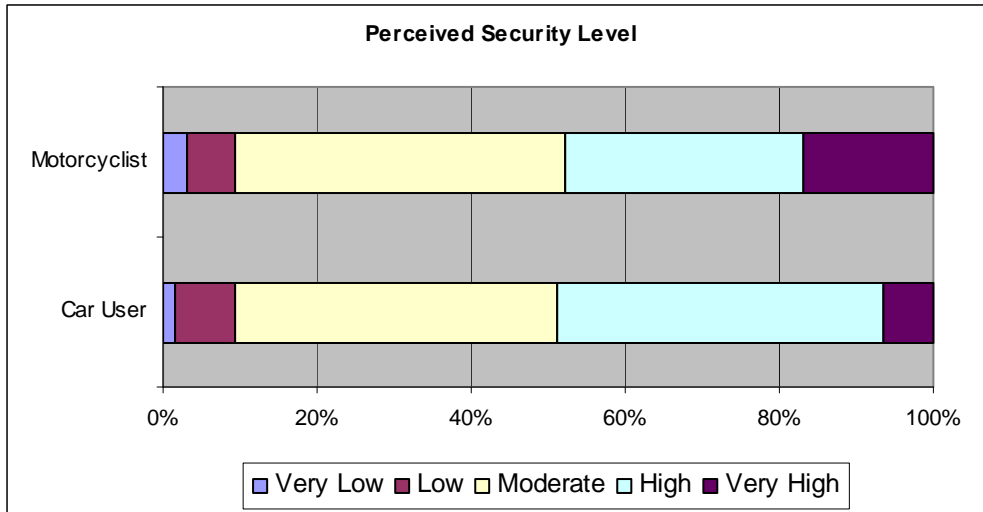☐ Very Low ■ Low ☐ Moderate ☐ High ■ Very High

Figure 5   Perceived security level

Figure 6 and 7 illustrate the perceived comfort and convenience level offered by their mode of transport, respectively. Generally, motorcyclists viewed that their mode of transport was more convenient while car was rated more comfortable compared to motorcycles (see also Tables 9 and 10).
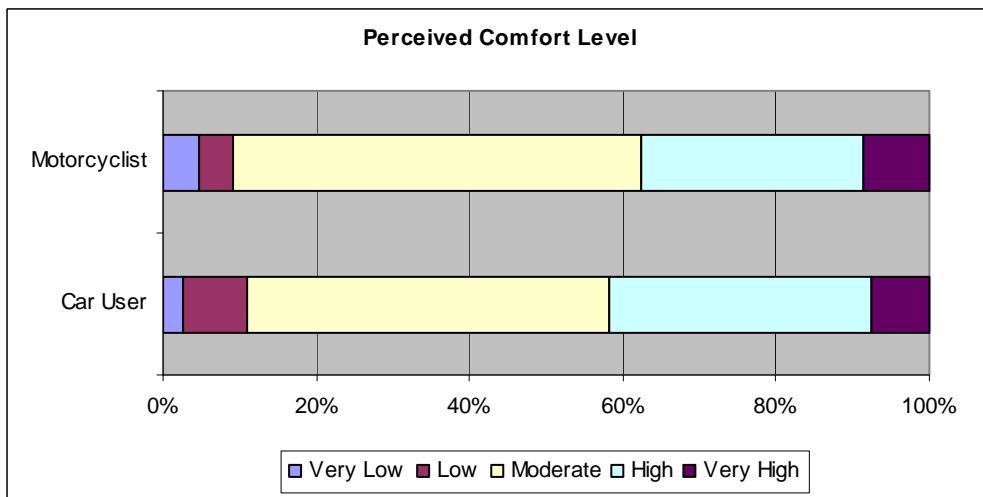
Perceived Comfort Level

Motorcyclist

Car User

0%   20%   40%   60%   80%   100%

☐ Very Low ■ Low ☐ Moderate ☐ High ■ Very High

Figure 6   Perceived comfort level

Table 9 Perceived comfort level

Scale	Very Low (%) M	C	Low M	C	Moderate M	C	High M	C	Very High M	C
1-2	8.6	2.7	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0
3-4	0.0	0.0	6.6	5.4	11.8	2.2	0.0	0.0	0.0	0.0
5-6	0.0	0.0	1.5	0.5	29.2	42.4	1.5	0.0	0.0	0.0
7-8	0.0	0.0	0.0	0.0	16.2	2.7	16.2	27.2	0.0	0.0
9-10	0.0	0.0	0.0	0.0	0.0	0.0	1.5	6.5	6.9	7.6

Note: M=motorcyclists; C = car users

Table 10　　　　　Perceived convenience Level

Scale	Very Low (%)		Low		Moderate		High		Very High	
	M	C	M	C	M	C	M	C	M	C
1-2	1.5	1.6	1.5	2.7	0.0	0.0	0.0	0.0	0.0	0.0
3-4	0.0	0.0	4.6	2.7	4.6	2.7	0.0	0.0	0.0	0.0
5-6	0.0	0.0	0.0	0.0	29.2	46.7	1.5	0.0	0.0	0.0
7-8	0.0	0.0	0.0	0.0	3.1	2.2	29.2	23.9	0.0	0.0
9-10	0.0	0.0	0.0	0.0	0.0	0.0	7.7	10.9	16.9	6.5

Note: M=motorcyclists; C = car users
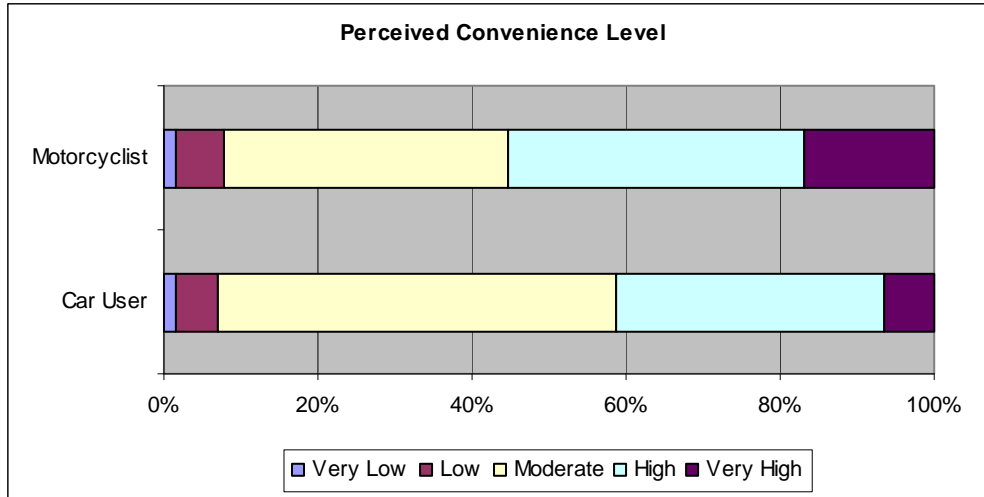
Figure 7　　　　　Perceived convenience level

Figure 8 shows the rating of travellers' awareness on air pollution due to vehicular emission. Though about 50% of the car users realised that vehicular emission had a very high effect on the air pollution, however, it did not deter or reduce their intention to travel with car. This phenomenon is not sustainable and warrant further investigation to explore their travel habits with private vehicles.
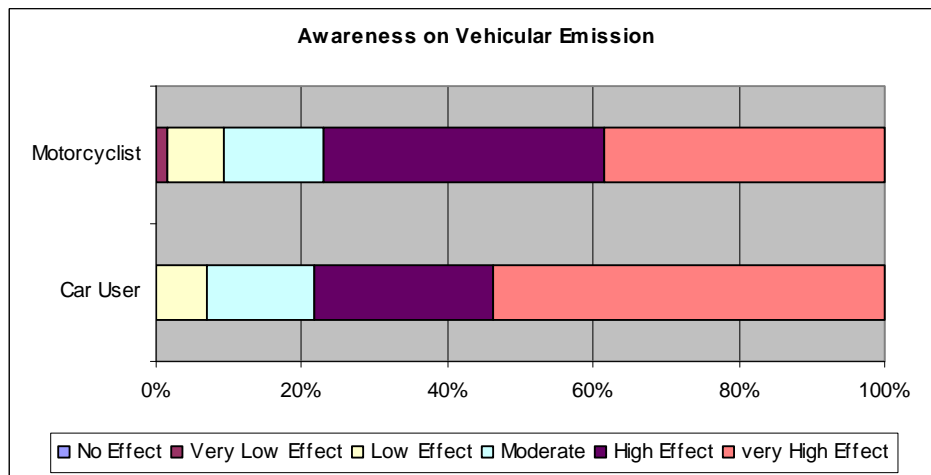

Figure 8　　　　　Awareness on vehicular emission

Logistic regression model was developed to provide an insight into the factors influencing the motorcycle use. The dependent variable is dichotomous: car use or motorcycles use. The study variables include gender, age, education level, occupation, income level, number of family members that reside together, time to reach destination distance to destination and travel expenses. Description of variables used in logistic model was shown in Table 11.

Table 11	Description of variables
Variable	Level
Gender	Male = 1; Female= 0,
Age	Continuous variable
Education	Tertiary=1; otherwise = 0
Occupation	Professional=1; otherwise=o
Income level	Continuous variable
Number of family member	Continuous variable
Time to reach destination	Continuous variable
Distance to distance	Continuous variable
Travel Expenses	Continuous variable

Table 12   Logistic Regression analysis

Variable	B	S.E.	Wald	Sig.	Odd Ratio (OR)
Gender	-.944	.321	8.637	.003*	2.570
Age	.008	.017	.216	.642	1.008
Education	-.103	.319	.104	.747	1.108
Occupation	1.108	.777	2.036	.154	0.330
Income level	-.001	.000	14.335	.000*	0.999
Number of family member	.053	.081	.427	.514	1.055
Time to reach destination	-.001	.013	.008	.927	0.999
Distance to workplace	-.040	.015	6.843	.009*	0.961
Travel Expenses	.000	.000	1.533	.216	1.000
Constant	-.723	1.047	.476	.490	0.516
Summary of Statistics					
Chi-square, df=	66.78 (p<0.001)				
Hosmer – Lemeshow test, χ^2	0.426(df=8, p<0.01)				
-2 log likelihood	291.562				
Nagelkerke R^2	0.256				
Correctly classified car	93.5%				
Correctly classified motorcycle	26.3				
Overall percentage correctly classified	77.3%				
* significant at 0.05 level					

Table 12 presents the logistic regression analysis results for prediction of motorcycle use. The Hosmer and Lemeshow Goodness-of-fit Test result shows 0.426 indicating the model explained the data reasonable well. The Nagelkerke R^2 was in this model is 0.256. The results also indicate that the overall percent correctly classified were 77.3% predicted correctly. The variables such as gender, income level and distance to destination were found significant at the 0.05 level. Male travellers were found 2.6 times more likely to use motorcycle compared to female travellers. The further the work place or the longer commuting time the less likely travellers chose to use motorcycles which was shown by the negative coefficient signs.

Figures 9 and 10 show the motorcycle use probabilities against income level and distance to work place, respectively. Those who earn RM 3000 per month have 2.35% likelihood to use motorcycles and the likelihood reduced to 0.5% for those who earn RM 4500 per month.
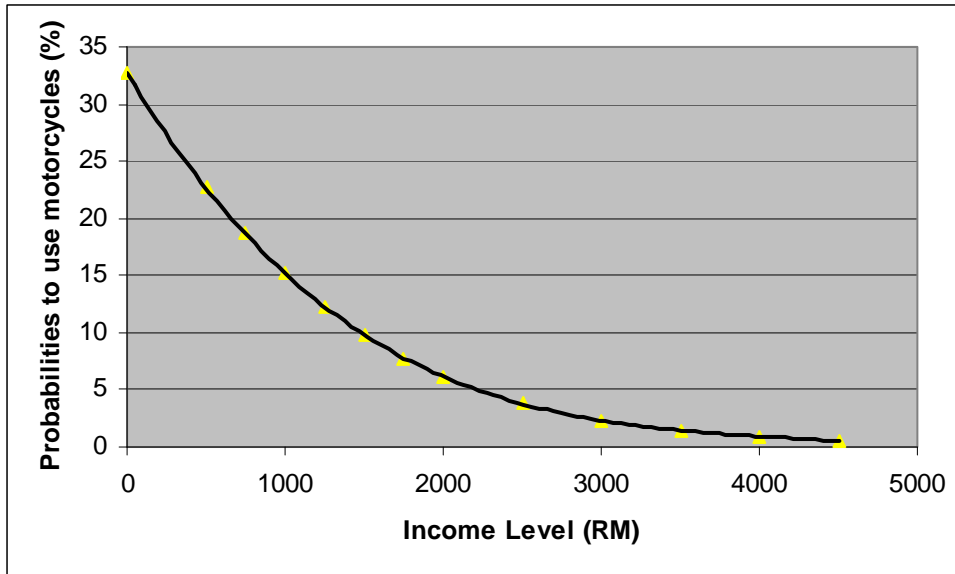
Figure 9 Effect of income level on probabilities to use motorcycles

The longer the travel working distance, the lesser likelihood would be a person to use motorcycle. The probabilities to use motorcycle for those who work as far as 50 km from his house are 6.2%.
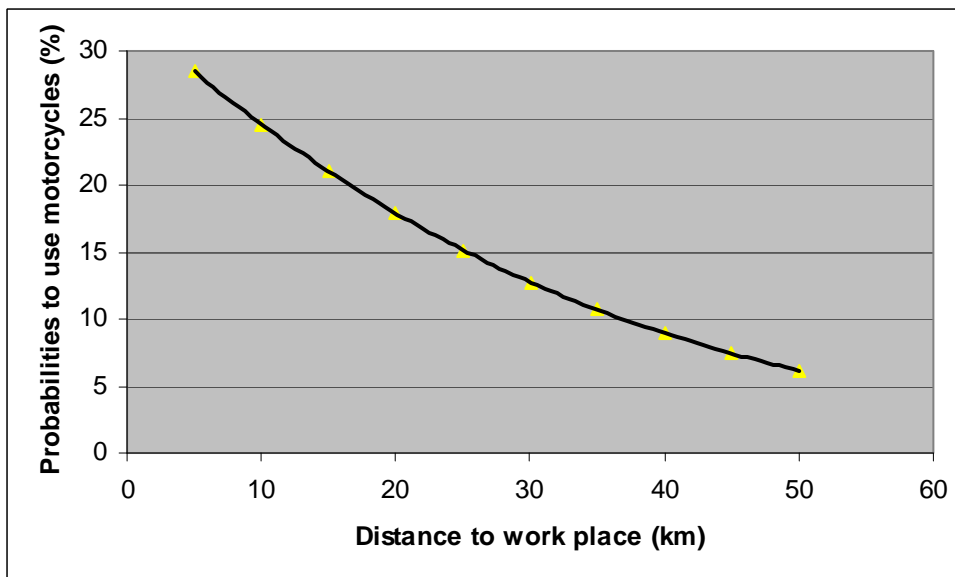

Figure 10 Effect of distance to work place on probabilities to use motorcycles

5.   Conclusion

This study has identified that gender, income level and distance to work place were significant in motorcycle use. Based on the model, male travellers were 2.6 times more likely to use motorcycles compared to female travellers. Though the likelihood to use motorcycles decrease when the distance to work increase, it is expected that motorcycles will continue to be one of the major modes of transportation in city centres during the world economic downturn. Petrol price hike is also seen to be one of the stimulants for traveller to use motorcycles as this phenomenon was observed when petrol price in Malaysia increased by 41% in June 2007. Private vehicle users expressed interests to shift to public transports if given incentives. The findings from this study though is not served as planning guide, but can provide a better perspective to the future planning and development of traffic system.

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