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Factors Affecting the Willingness to Pay for Renewable Energy amongst Eastern Malaysian Households: A Case Study

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ABSTRACT

Energy choices that are made today will greatly influence the climate of tomorrow. In addition to reducing emission of greenhouse gases, renewable energy sources will also enhance future energy security. In this vein, a study utilizing a cross-sectional research design was conducted to examine the factors affecting the willingness to pay for renewable energy (RE) among households in Malaysia. A self-administered questionnaire was used as a tool for data collection. The mean age of the respondents was 42 years, with both genders equally represented. The results indicated that that majority of the respondents were concerned about the environment and showed a positive attitude towards it. Nonetheless, there were differences in the levels of awareness and knowledge with respect to different types of RE. Age and RE awareness were found to have significant relationships with the willingness to pay for renewable energy. The results also indicated that higher educated consumers were more willing to pay for renewable energy, whereas no gender differences were observed. Strengthening support and ultimately adoption of RE products and services have to be intensified as the willingness to pay for RE by the respondents was found to be modest.

Keywords: Renewable energy, household, environment, attitude, willingness to pay

INTRODUCTION

Energy is an important resource for human development and economic growth. Globally, the energy demand has increased in the recent years, and this is in tandem with the rapid economic growth, particularly in developing nations. Fossil fuel, which is a non-renewable energy (NRE) such as oil, coal and gas, provided about 82 percent of the world's demand for energy and it had been identified as the largest single contributor to increased carbon dioxide gas

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(IPCC, 2007). Carbon dioxide is one of the green house gases that have been identified as the main cause of global warming. As such, much research in the recent years has focused on alternative energy sources, particularly renewable energy (RE), such as solar, hydropower, biomass, wind and geothermal. These are in the form of energy that will not be exhausted over time, can be regenerated in a relatively short time and is environmentally friendly.

Malaysia is the 26th largest source of greenhouse gases in the world, a position that places her within the ranks of industrialized nations (United Nation Statistics Division, 2007). Carbon dioxide emission of Malaysia is relatively high as compared to the world's average and other Southeast Asian countries due to her rapid economic growth and industrialization. Malaysia has made a positive start in reducing its carbon footprint by implementing carbon-mitigating projects and adopting several renewable energy and energy efficiency initiatives. For instance, in the Eighth Malaysia Plan (2000), the Government declared renewable resources of energy as the fifth fuel of the nation after petroleum, natural gas, coal and hydro. This commitment was further reinforced in the Ninth Malaysian Plan (2005), where it was manifested with the formation of the Ministry of Energy, Green Technology and Water Malaysia on 9 April 2009. Malaysia is also a signatory to Kyoto Protocol, which means that she is committed to reducing carbon dioxide emission and other green house gases. As a consequent to Copenhagen Climate Change Conference, Malaysia has agreed to reduce its carbon emissions up to 40% by the year 2020 compared to the 2005 level (UNFCC 2009). In the Tenth Malaysia Plan (2010), the Government of Malaysian reaffirmed her commitment to address the issue of climatic change by embarking on various strategies in order to reduce her carbon footprint.

Energy is a critical ingredient for growth and development as well as one of the critical ingredients for the majority of economic and social activities. It was found that there is a direct relationship between energy consumption and economic growth (Aqeel & Butt, 2001). It is thus one of the indispensable factors in ensuring continuous development and economic growth of a nation (Rogner & Popescu, 2001). In order to meet the set target of 40% reduction in carbon emission, while at the same time maintains the economic growth, the nation has to embark on diversification of fuel sources. Hence, greater utilization of renewable energy and energy efficiency drives are necessary. Currently, the main sources of energy in the country are mainly from non-renewable fossil fuels and natural gas (Abdul-Rahman & Lee, 2005). As such, the nation has no option but to move from NRE dependence to NE reliance in the immediate future as it ensures energy security and environmental sustainability. Households constitute an important target group as residential sector was found to consume about 16-50% of the total energy worldwide (Saidur *et al*., 2007) and this share is expected to rise in the future (Abrahame & Steg, 2009).

Factors Affecting the Willingness to pay for RE

Many studies have been undertaken to identify the factors that influence pro-environmental behaviour. Pro-environmental behaviour is defined as a behaviour that consciously seeks to minimize the negative impacts of one's actions on the natural and built world, such as energy conservation (Kollmuss & Agyeman 2002). In the present study, pro-environmental behaviour is the adoption of NE sources by the individuals for their consumption.

RE is a relatively new energy source as compared to NRE that is being promoted for consumption of both the producers and consumers. As such, the public may not be aware of the existence, benefits and options of RE for their adoption. According to the findings of Department of Trade and Industry of Scotland (DTI 2003), knowledge of specific renewable technologies varies considerably among the citizens. A total of 44% of the respondents were found to have good knowledge regarding solar power while only 10% on biomass energy. The study also indicated that solar, hydro-electric and onshore wind power was more understood by the general public as compared to marine and biomass. Similar findings were found by Cutler (2006), where the respondents had greater information on solar, wind and tidal power but very little understanding of biomass. A survey among London residents also showed that the majority of them have heard about solar (95%) and wind power (94%) and most stated that they were more aware of those two as compared to the other RE sources (London Renewable, 2003).

Meanwhile, some studies have shown that knowledge about energy issues plays a central role in influencing their attitude and behaviour towards energy technologies. The awareness of the presence of the RE options and the knowledge regarding them is critical to approval (DTI 2003) and ultimately the willingness to pay for its adoption. For example, the lack of knowledge about biomass may explain very low levels of approval for this technology in the public opinion (McGowan & Sauter, 2005). A survey by Cutler (2006) found that 86.1% of those with some perceived degree of knowledge of the RE were willing to pay something more per month for renewable energy. Meanwhile, the percentage of the respondents who were willing to pay for NE energy increased as more information was given to them (Farhar, 1999). Thus, generating awareness, as well as providing information and education to the public on RE is the first step towards its acceptance and adoption.

Many studies have established that attitude is one of the predictors of behaviour and behavioural intentions (Ajzen & Fishbein, 1980; Bord *et al*., 2000; Poortinga *et al*., 2004). A study by Ivanova (2004) among Queensland consumers shows that those who were concerned about the environment were more willing to pay for RE. Furthermore, those who perceived the negative impacts of electricity generation to the environment were found to be willing to pay more for RE as compared to those

who perceived otherwise. In addition, Patrick (2007) reported that support for RE technologies is motivated by levels of environmental concern, specifically about climatic change.

Socio-demographic factors such as age, gender and educational status are also found to influence environmental knowledge, attitude and behaviour. With regards to age, younger people were found to be more willing to pay for renewable energy as compared to those of the older generation. A study by Cutler (2006) reported that younger persons (18-44 years) were more willing to consider installation of solar water heating and more positive about wind farms and tidal power as compared to those of the older generations. A similar tendency was also noted among the residents in Devon, whereby the respondents who were over 60 years old were less likely to support renewable energy as compared to the younger generation (MORI, 2004). Although the level of RE awareness may be lower among the younger generation (Patrick, 2007), they were shown to be more open to embracing new technology as demonstrated by the above findings.

Gender differences are normally discerned in many environmental studies. A longitudinal study by Zelezny *et al*. (2000) from 1988 to 1998 found that women were significantly more concerned about the environment and had higher participation rate in pro-environmental behaviours than men. Patrick (2007) reported that there was a stronger support by women for new renewable energy development (90%) than men (66%). However, O'Connor *et al*. (2002) found that gender did not predict the willingness to act or the support of environmental policies. Gender roles socialization theory, which stipulates that individuals' behaviours are shaped by gender expectation within the context of cultural norms (Zelezny *et al*., 2000), has been used to explain gender differences in environmentalism. Hence, dissimilarity in the findings regarding gender may be attributed to the differences in the individual culture and traditions.

Meanwhile, educational status is another factor that has been found to influence the willingness to pay for renewable energy. A survey conducted by Ivanova (2004) showed that people of higher educational status were more willing to pay for RE. Similar results were also noted by Wiser (2007), whereby a person who was more willing to pay for RE was more highly educated. They were also found to have accepted renewable technology readily (Gardner & Ashworth, 2007). Other environmental studies seem to indicate similar results, whereby higher educated persons were more likely to reduce green house gases (O'Connor *et al*., 1999) and making more effort to take care of the environment (Patchen, 2006).

In general, there are two strategies involved in dealing with climatic change processes, namely, mitigation and adaptation. Adaptation involves the preventive measures to avoid, prepare for, or respond to potential effects or impacts from climate change. However, mitigation efforts emphasize on reducing and limiting the occurrence of

climatic change. It focuses on tackling the causes of climatic change [such as the increases of Green House Gases (GHGs)] by reducing these emissions at the sources and augmenting the sinks or reservoirs (areas that absorb Carbon Dioxide such as forests and oceans) (McCarthy *et al*., 2001; Semenza *et al*., 2008). Mitigation is a more preferred method as it is cheaper to prevent than to remedying global climate where it would cost one per cent of countries' total GDP, while failing to remedy it would cost 5 per cent of countries' total GDP (Stern, 2006). Hence, changing the consumption pattern of the citizens is one of the mitigation strategies that can be adopted in averting global warming. In order to effectively combat climate change in general and reduce GHGs emissions in particular, efforts are not only required at international and national levels, but voluntary mitigation by individuals also plays a vital role in engaging a more sustainable and low carbon lifestyle (Semenza *et al*., 2008). As such, the adoption of RE sources by the consumers is one of the essential strategies to overcome global environmental catastrophe. With increased prosperity and greater urbanization, Malaysians will undoubtedly continue to adopt a carbon-intensive lifestyle in the future.

Many studies have been conducted in Malaysia on environmental related aspects focusing on the knowledge, attitude, purchasing and consumption pattern of consumer products such as food, clothes and appliances. However, very little focus has been given to social science research on energy, particularly on NRE. In this vein, an exploratory study was undertaken to examine several significant psycho-social factors as discussed above that might affect the willingness to pay for renewable energy. These factors include RE awareness and knowledge, attitude towards environmental concern, age, gender and educational level. The understanding of these factors will enable the government to develop appropriate policies and programmes to enhance public acceptance as it is the key to successful implementation and adoption of RE (Ekins, 2004).

METHODS

The study utilized a cross-sectional research design using the survey method. An urban residential area, Mabel Garden which is located in the City of Kuching, was selected for the study. Kuching is the capital city for the state of Sarawak. The population of Sarawak consists of multi-ethnic groups with a wide variance in terms of socio-economic backgrounds. In order to ensure that the samples for the study are acquainted with the phenomena of the study, a modern residential area was purposively selected for the study. The residential area consisted of 300 link houses and a total of 100 households, which were systematically selected using a sampling fraction of three.

The respondents of the study consisted of the head of the households with both genders equally represented using a quota method. If the house selected was occupied by single individuals or unavailable, successive house was taken as

a replacement. Data were collected using interview survey and as such, the return rate was 100 percent. According Bartlett *et al*. (2001), sample size value that is appropriate for the alpha level of 0.05 from a population of 300 is 85. Hence, one hundred samples selected for the present study is sufficient to generalize the findings to the population selected only.

The questionnaire comprised of five sections that aimed to determine the factors affecting the willingness to pay for renewable energy among the households. Part A consisted of six open-ended and closed-ended questions to gauge the demographic background of the respondents including age, gender, marital status, number of family members, and highest level of educational and total income of the households. Part B consisted of three items which were adopted and adapted from Curry (2004) to measure the environmental awareness. The respondents were asked to rank the level of importance of various social and environmental issues facing the country using a scale of 1 (most important) to 8 (least important). A person can be considered to be "concern about the environment" if the environmental issue is ranked in the top three position (Curry, 2004). Next, the respondents were asked to rank the seriousness of the different types of environmental problems faced by the nation such as global warming, pollution, land degradation, etc., using a similar ranking scale as the previous item. The third question requested the respondents to select only one of the four choices that were given with regards to trade-offs between environmental issues and economic priority. The following section gauged the level of the attitude towards environmental concern which was adopted and adapted from Curry (2004) and Carlson (2004). The attitude towards environmental concern is defined as a person's evaluative state, associated with psychological feelings of distress or worries regarding the natural environment and may be accompanied by supporting behaviour (Carlson, 2004). The scale consisted of 10 items, with a 5-point Likert Scale response format. Two of the questions were negatively worded and hence, they were recorded for data analysis. Part D comprised of 5 items to examine the respondents' awareness on the different types of RE. The questions were adopted and adapted from Curry (2004). It was gauged using a 5 point Likert Scale type ranging from 1 (know a lot) to 5 (haven't heard of it at all). Subsequently, the respondents were asked to indicate their information sources of RE. Ten other items were utilized to gauge the RE awareness level using the five-point Likert scale format. They were adopted and adapted from Renewable Energy Awareness Scale developed by Morgil *et al*. (2006). The last part comprised of five items which was adopted from Farhar (1999) to measure the willingness to pay for renewable energy among the respondents. The response format consisted of a 5-point Likert Scales type, where 1 indicates the "most unfavourable" to 5 which indicates "the most favourable." A pre-test was conducted on the questionnaire using 20

people so as to test for its suitability and reliability. The reliability of the attitude towards the environment, RE awareness and willingness to pay for NE was 0.762, 0.682 and 0.846, respectively, which are therefore acceptable.

In this study, the data were collected using the interview survey method. These data were analyzed using Statistical Package for Social Science (SPSS) version 13.0. A descriptive analysis was used to summarise the patterns of responses of the cases in the samples. Meanwhile, inferential statistical analysis, namely Pearson Correlation test, was employed to examine the relationships among the variables, while ANOVA was used to examine the difference between the educational level and willingness to pay for renewable energy. T-test was administered to determine the differences between genders on the willingness to pay for renewable energy.

RESULTS AND DISCUSSION

The demographic characteristics of the respondents are shown in Table 1. It was found that the majority of the respondents were married (98%) while the remaining 2% were single headed households. The mean age of the respondents was 42.4 years, with average household family members of 4.86. Almost half of the respondents had a total household income of above RM3500 per month (USD1167) and could be classified as low middle income earners. The total score and the ranking of various social, economic and environmental issues in Malaysia by the respondents are presented in Table 2. The data indicate that they were most concerned about the rising cost of living in the country. This could be justified as from February 2007 to January 2009, the total Consumer Price Index went up by 6.38% (Department of Statistics Malaysia, 2009). The concern for the environment was ranked third after health care and it was only rated slightly above crime. Meanwhile, unemployment, road accident, drugs and foreign workers issues were regarded as of lesser importance as compared to the other issues above. From a cross-tabulation analysis of the ranking of socio-economic issues by gender, the data indicated that more males (36%) ranked the rising cost of living as the most important issues facing the nation today as compared to the females (20%). Generally, there was only a slight variation in the ranking of other issues by both genders. Those in the lower education group and presumably of lower income level were found to regard the rising cost of living as the most pressing issue as compared to the higher educated respondents. However, the opposite is true for environmental concern. From the above data, it could be concluded that the respondents were concerned about the environment, as proposed by Curry (2005) that those who placed environment in their top three matters of concern could be considered as an environmentally concerned person. The concern for the environment by the respondents is justified as the data from Malaysian Quality of Life Index (MLQI 2004, the latest figure as of now) which indicates that the environmental index value has been showing a negative trend

TABLE 1
Demographic characteristics of the respondents

Variables	N (%)	Mean	S.D	Min	Max
Age (years)					
18 – 34	38				
35 – 55	42				
56 and above	20	42.41	13.35	22	77
Gender					
Male	50				
Female	50				
Marital status					
Married	98				
Divorced	2				
Number of family members including the respondent					
2 – 3	21				
4 – 6	64				
7 – 9	15	4.86	1.67	2	9
Highest Level of Education					
Primary/Secondary School	44				
Pre-University/College/ University	55				
Total Income of Household					
Below RM 1500	9				
RM 1500 – RM 3000	36				
RM 3001 – RM 5000	35				
Above RM 5000	20				

N = 100

TABLE 2
Level of importance of socio-economic issues in Malaysia

Issues	Total Score	Level of Importance [from 1 to 8]
Rising Cost of Living	287	1
Health Care	384	2
Environment	395	3
Crime	396	4
Unemployment	421	5
Road Accident	520	6
Drugs	593	7
Foreign Workers	604	8

Scale: 1= most important to 8 =least important

indicating deterioration in the quality of the environment in the country.

The respondents' ranking on the seriousness of various environmental problems facing Malaysia at present is shown in Table 3. In particular, air pollution, global warming and destruction of forest were rated as the first, second and third most pressing environmental issues, respectively. Air pollution, especially in the urban areas of the country, is rather apparent. The main source of air pollution is due to mobile sources such as motor vehicles and traffic jam in the city, which is a normal phenomena. This was reflected in the mean value of the Air Pollutant Index of 68.5 (moderate health effects) for the major cities in the country for the year 2008 (Department of Statistics Malaysia 2009). Unexpectedly, global warming, which is a relatively new recognized phenomenon, was the second most environmental concern of the respondents. Land, water and solid waste problems were the next clusters of environmental issues that were perceived rather significantly by the respondents. The cross-tabulation analysis showed that almost 50% of the respondents of both genders regarded haze/air pollution as either the first or the second pressing issue and they seemed to agree that endangered species was the least concern of all. Global warming seemed to be the concern of all the respondents, regardless of their education background and age.

TABLE 3
Level of importance of environmental issues in Malaysia

Environmental Problems	Total Score	Level of Importance [from 1 to 8]
Haze/Air pollution	326	1
Global warming	346	2
Destruction of forest	386	3
Land degradation	414	4
Water pollution	424	5
Solid waste	487	6
Toxic waste	512	7
Endangered species	701	8

Scale: 1= most important to 8 =least important

The respondents' preference between protecting the environment and protecting the economy is shown in Table 3. The results showed that more than half of the respondents (58%) indicated that "both the environment and economy are important, but the environment should come first". However, only 23% of the respondents agreed that both the environment and the economy are important, but the economy should come first. There were 16% of the respondents who preferred that "the highest priority should be given to protect the environment, even if it hurts the economy" Only 3% of the respondents showed no regards for the environment, whereby "the highest priority should be given to economic considerations such as jobs even if it hurts the environment." Thus, 74% (58% plus 16%) of the respondents were of the opinion that the environment should take precedence over economic development. Seemingly, the findings above are similar to that by Curry (2004), where most of the

TABLE 4
Preference between protecting the environment and protecting the economy

Statements	(%)
Both the environment and the economy are important, but the environment should come first.	58
Both the environment and the economy are important, but the economy should come first.	23
The highest priority should be given to protect the environment, even if it hurts the economy.	16
The highest priority should be given to economic considerations such as jobs even if it hurts the environment.	3

respondents were of the opinion that both are important but the environment should take precedence over the economy.

The respondents' attitude towards environmental concern was examined using 10 statements giving a range of possible score of 10 to 50. Higher scores indicate a positive attitude towards environmental concern. The result showed that most of the respondents (71%) have positive attitude towards environmental concern, whereas only 3% of the respondents showed negative attitude towards environmental concern. The remaining 26% of the respondents were with moderate score of attitude towards environmental concern (Table 5). Overall, most of the respondents' attitude towards the environmental concern is positive, as indicated by an average score of 42.68 and this commensurate with the ranking of environment as an important issue.

Table 6 illustrates the respondents' awareness towards the sources of renewable energy. The respondents who selected the response category of 'know a lot' to 'just heard about' are regarded as being aware of sources of RE although the level of awareness varied. The results indicated that the most well-known sources of RE are solar energy, followed by hydro and wind energy. Only a few respondents knew about biomass and geothermal energy. The greater awareness on solar energy is anticipated as domestic solar water heaters are the most visible and apparent to the consumers as compared to other RE products. It was reported that 10,000 domestic solar water heaters were installed in Malaysian homes in 2002 (Malaysia Renewable Energy Report, 2005). As for hydropower energy, Malaysia's first hydroelectric power station was built in 1900 and there are currently a total of 58 hydro-electric stations in the country (Luqman & Fakhrul-Razi, 2009). Furthermore, there is a 2.4 GW hydroelectric project which is presently under construction in Bakun, a place that is located about 650 km from the respondents' residence, Kuching. However, it can be concluded from the responses of the respondents that the majority of them considered themselves as having low level of knowledge about the sources of RE, although the majority (83%) were also found

TABLE 5
Attitude towards environmental concern

Variables	n (%)	Mean	S.D	Min	Max
Renewable Energy Awareness		42.68	4.80	27	50
Low (10 – 30)	3 (3)				
Medium (31 – 40)	26 (26)				
High (41 – 50)	71 (71)				

TABLE 6
Awareness towards sources of renewable energy

Technology or Energy Source	Know a Lot (%)	Know a Little (%)	Know Very Little (%)	Just Heard About it (%)	Haven't Heard of it at all (%)	Level of Awareness
Solar energy	31	47	13	7	2	1
Hydropower energy	35	42	8	12	3	2
Wind energy	16	35	24	19	6	3
Biomass energy	5	25	29	16	25	4
Geothermal energy	5	16	26	21	32	5

to have a moderate level of awareness on general aspects of RE such as its positive impacts to environment (Table 7).

Table 8 shows the distribution of respondents with regards to their main sources of RE information channels (they were allowed to indicate more than one source). The three main sources of information regarding RE was newspaper (90%), magazines (57%) and formal education (45%). Knowledge and information of RE provided by printed mass media in the country particularly newspapers usually highlights specific government projects and related problems. They lack fundamental and in depth knowledge of the subject matter. It is however vital to note that quite a substantial proportion of the respondents have attributed their formal education as one of the main RE information channels. This is reflected in the education background of the respondents, whereby all of them had at least undergone a minimum of 11 years of education (secondary school education). Environmental education is not taught as a single subject in Malaysian schools but integrated in compulsory subjects such as geography, science, and living skills. Knowledge gained through this means is more structured and focused as compared via mass media. The results from a cross-tabulation showed that more educated and younger respondents obtained their knowledge on RE through their formal education as compared to school leavers and older cohorts. However, there is no

TABLE 7
Renewable energy awareness level

Renewable Energy Awareness		n (%)	Mean	S.D	Min	Max
Low	(10 - 30)	1 (1)				
Medium	(31 - 40)	83 (83)				
High	(41 - 50)	16 (16)	37.15	3.46	30	48

difference across gender, education level and age with regards to acquiring RE through reading of the newspapers.

TABLE 8
Sources of RE information

Sources	Percentage
Newspaper	90
Magazine/Brochures	57
Formal education	45
Radio	39
Television	18
Living near RE development	5
Internet	5
Being a member of environmental group	3

The mean value for each of the five statements that were used to gauge the willingness to pay for RE is as shown in Table 9. The data indicated that the respondents were none committal in their willingness to pay for RE (mean=3.08), especially when it entails direct monthly bill payment. However, they were found to be slightly more willing to engage in purchasing RE products and somewhat supportive of the RE policies. The recent announcement of tax reduction on hybrid motor vehicles by the prime Minister of Malaysia during the tabling of Malaysian budget for 2011 was timely. This initiative would enhance the adoption of more green and energy efficient mode of transport by the citizens of the country.

TABLE 9
Mean of five–item on willingness to pay for renewable energy

Items	Mean
How favourable would you pay 10% more in your monthly electric bill for renewable energy?	2.82
How favourable would you pay more for a house that has a renewable energy system already installed, such as Solar Photovoltaic System?	3.07
How favourable would you pay more for renewable energy products? For example, solar water heating	3.27
How favourable would you purchase a fuel efficiency vehicle like hybrid car if it cost 15% to 30% more expensive than traditional fuel engine cars?	3.12
If the government makes a policy to generate 10% of your electricity supply from renewable energy, how favourable would you be willing to pay to support the government's policy?	3.14

Scale: 1= Most Unfavourable; 2= Unfavourable; 3= Neutral; 4= Favourable; and 5= Most Favourable

An independent group t-test indicated that there is no significant difference in the willingness to pay for renewable energy between male and female ($t = 0.0001$, $p > 0.05$). This may be due to the non-gender bias culture, especially with regards

to the accessibility to education in the country. Conversely, a significant difference was found between educational level and consumers' willingness to pay for renewable energy ($t=-3.110$, $p<0.01$). Highly educated respondents (college and tertiary education) were more willing to pay for RE as compared to those with only school certificates. Similar results were also found by other studies, whereby more educated persons were found to be more willing to pay for RE (Ivanova, 2004; Wiser, 2007). Table 9 displays the results of Pearson correlation between age, attitude towards environmental concern and RE awareness level with the willingness to pay. Data indicated that there was a low significant relationship for age ($r= -2.86$, $p<0.01$) and RE awareness ($r=0.285$, $p<0.01$), with the willingness to pay but not for the attitude towards environmental concern ($r=0.013$, $p>0.01$). Therefore, younger respondents and those with greater awareness of RE were found to be more willing to pay for RE. Past research also showed that younger people (Ivanova, 2004; Cutler, 2006; MORI 2004), or those who were more aware of RE (Cutler, 2006; DTI, 2003), were more willing to pay for renewable energy.

CONCLUSION AND IMPLICATIONS

The renewable energy policy in Malaysia was only initiated by the Government in 2001 and is still in its infancy stage. In 2009, less than 1% of the total generated electricity in the nation was from the RE sources which were below a set target of 5% (Tenth Malaysia Plan, 2010). Several initiatives and action plan have been developed to enhance RE production in general but they are not directly associated with consumers per se. This is reflected in the above findings whereby the respondents had only general awareness of RE and were rather reluctant to pay for RE products and services. The results of the study displayed a similar propensity to other environmental research in the country, where high environmental awareness and concern did not correspond with pro-environmental behaviour (Norhasmah *et al*., 2004; Aini *et al*., 2007; Sharifah Azizah *et al*., 2005). Nonetheless, the respondents showed a deep commitment and concern for the environment and this represents a foundation for strengthening RE acceptance and behavioural change. The awareness and knowledge of the Malaysian consumers on RE can further be intensified

TABLE 10
Correlations of age, attitude and awareness with the willingness to pay for RE

Variables	Willingness to Pay for Renewable Energy	
	Correlation (r)	Sig. (2-tailed)
Age	-0.286**	0.004
Attitude towards Environmental Concern	0.113	0.265
Renewable Energy Awareness	0.285**	0.004

** Correlation is significant at 0.01 level.

through a formulation of public education and campaigns that are especially focusing on the educated and the young, as they have been found to be more receptive of RE. Mass media channels, such as newspaper, television and radio, could be used to educate the public in general as they have also been found to be the most common sources of information on RE. Imparting of awareness and knowledge energy and environment at secondary school or tertiary levels should further be enhanced as it has been found to be an effective learning source.

There are other factors that have to be considered in enhancing adoption of RE besides influencing the socio-psychological factors of individuals, such as finance, policies and regulations. RE products and services generally cost more to purchase, and coupled with concern over the rising cost of living, will further thwart their adoption. The European governments have been successful in increasing the consumer demand for green power through implementation of appropriate legislations and incentives. They include, for example, liberalization of the electricity and gas markets and incentives for purchasing of RE products. Similarly, the government of Malaysia has also undertaken some initiatives in this direction, such as the recent exemption of tax on hybrid cars imported to the country. The government of Malaysia is also considering adopting an eco-point (cash-back) system similar to the Japanese, whereby cash coupons will be provided upon purchasing of energy-efficient appliances. As indicated earlier, the products utilizing RE and energy efficient are more expensive than their competing products. As such, tax incentives and subsidies would give consumers incentives to purchase them. In addition, appropriate regulatory and infrastructures (availability and accessibility) have to be put in place so as to provide a conducive atmosphere for RE adoption. In so far as public education is concerned, several government bodies such as Standards and Industrial Research Institute of Malaysia (SIRIM), Energy Commission, Department of Environment and The Ministry of Domestic Trade, Cooperatives and Consumerism have collaborated with various other stake holders, such as consumer organizations and manufacturers in carrying out various initiatives to increase public awareness and adoption of energy efficient and RE products. Mass media channels such as newspaper, magazines, television and radio ought to increase their readiness to sponsor sustainable energy educational programmes as they are rather hesitant to do so (Y. Hafiza, pers. Comm.).

Meanwhile, scholars have recognized that modification of behaviour is a complex issue, whereby various other social-psychological factors interact but not in a predictable manner. It has been acknowledged that lifestyle decisions are seldom based on rational considerations of the facts only but they are influenced by the interaction of subjective factors such emotions, culture, norms, preferences, values, etc. These variables may be explored

in future studies so that RE intervention strategies can be adjusted to accommodate various segments of the society.

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