
Attitudinal Implications and Behavioral Preferences to Electricity Consumption and Conservation in Putrajaya, Malaysia

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Abstract

The future demand of energy, mostly electricity, has been anticipated to escalate consequently as a result of the driving forces such as population growth, construction of buildings, endless appetites for economic growth and infrastructural developments. Therefore, this study assessed the influence of attitudes and behavioural preferences to electricity consumption and conservation among the civil service employees of the various ministries in Putrajaya, Malaysia. This study also attempted to relate attitudinal influence and actions of the civil service employees to the trends of electricity consumption in Putrajaya. The information derived from questionnaire survey conducted among the civil service workers of the ministries revealed that: (i) the civil service employees have positive attitudes towards electricity consumption and they practice favourable actions which promote green policy through electricity conservation; (ii) majority of the civil service employees have negative perceptions about population growth control; (iii) yearly electricity consumption trend in Putrajaya shows persistence increase in electricity consumption which affirms the predictions about future increase in electricity demand; (iv) annual increase in electricity consumption trend in Putrajaya after the implementation of green growth policy indicates that this policy is gradually working.

Keywords

Attitudes; Behavior; Electricity; Consumption; Conservation

INTRODUCTION

The global population is expected to rise from its current 7 billion to 8-10 billion by 2050 (Lutz & Kc, 2010). The implications of this projected increase in population will be increased in demand for resources such as electricity, food, clothing, shelter etc. The growing population have triggered the constant increase in the demand for more buildings either at the residential or organizational levels. The buildings contribute immensely to energy consumption as reported by the U.S. energy information administration (U.S. EIA, 2015). In the absence of energy, life existence and economic growth become practically none realistic because almost all human activities and economic processes basically depend on energy and this tells a great deal why most of the developing countries are still lacking behind. (Schumacher, 1973) also supported this view on the inevitable role of energy in our present world when he stated that "There is no substitute to energy. The whole edifice of modern society is built on it. It is not (just

another commodity) but the precondition of all commodities, a basic factor equal with air, water, and earth". As a result of the huge roles played by energy, some terms such as energy conservation, sustainable energy, renewable energy, and energy consumption have become very popular today.

Poortinga et al. (2003) noted that contemporarily, there is a great shift in the rationale behind energy conservation in comparison to the primitive era. The rationale behind energy conservation in the primitive era was attributed to oil problems and an impending energy shortage. But today the reason driving the campaign for energy conservation is due to environment costs emanating from energy consumption process which gives rise to the global pressing issues such as; pollution and global warming. Malaysia is a developing country that is striving greatly towards becoming a developed country just as the United States of America, Australia, and many European Nations. It is pertinent to note that for Malaysia to attain this

level of developed country, it requires higher output of energy to power all the sectors of the country. These sectors such as; industrial, commercial, building, agricultural, infrastructures, and all other sectors require adequate and affordable energy for optimal outputs that in return triggers the national growth. Just like most developing nations, Malaysia depends hugely on none environmental friendly electricity generation source known as the thermal station. The thermal station generates electricity through combustion processes. Malaysia generates 88.2% electricity through the thermal stations, 8.3% from hydro, and 3.5% from co-Gen (Energy Commission, 2013) . The negative environmental impacts of electricity generation through thermal combustion system can never be over emphasized. Based on world population trend, it's estimated that the global energy demands will progressively increase in the future. IEA (2015) has postulated that the global energy consumption would rise to one-third by the year 2040 and this increase would be highly influenced by Asia and Africa. Population increase and human attitudes remain the key players triggering this increase through the various sectors such as; industry, building, agriculture and others. The increase in awareness on the importance of energy and environmental impacts of energy consumption has given birth to the growing global campaign on energy conservation and the needs to conserve our environment. To contribute to this global campaign, there are needs for the minimization and sustainability of energy consumption and attitudinal refinement both at the global, national, and the household levels.

Although energy remains the life wire of our modern societies as a result of the unarguable fact that all sectors of the society inevitably depends on energy for daily operations and without energy the optimal outputs or contributions from the various sectors such as; industries, commercial, agriculture, building, transportation, tourism, and so on, societal growths remains unattainable. The impacts of energy consumption should not be neglected, i.e. as we appreciate the tremendous roles of energy to societal growth, it's also important not to neglect the negative impacts of energy consumption. United Nations environment program (UNEP, 2007) acknowledges the impacts of energy consumption by reviling that there are costs either monetary or

environmental from all forms of energy consumption. UNEP further pointed that the great challenge facing all nations is how to select sustainable energy source, technologies that are most suitable to societal goals at an affordable rate, and with a minimal negative impacts on the environment. Globally, it has been predicted that energy consumption would increase in the future and that this increase would be driven by the developing nations such as Malaysia. There is no doubt about the assertion that the developing nations would contribute most to the predicted increase due to the facts that most developing nations lacks the technologies, techniques, huge capital, stable political process, to sustainably choose or manage their energy requirements compare to the developed nations. Based on the above mentioned limitations confronting the developing nations, majority of the developing nations are still hugely dependent on local or none renewable energy sources to generate their energy needs. Malaysia for instance, generates 88.2% electricity through the thermal stations. The negative impacts of this thermal system of energy generation in terms of (global warming, green environment, and ecosystem disturbance) as it involves generating energy through the heat from burning process are tremendous.

According to Oh et al. (2010), Malaysia electricity generation and consumption is expected to increase in the future and a clear evidence of this is the noticeable increase between the years 2000 – 2010 (69,280 GWh to 137,909 GWh). This tremendous increase is attributed to some factors such as population growth which in turn create many other contributing factors, and also the people's attitudes. In order to curb this growing concerns of increasing energy consumption and its resultant environmental impacts, Malaysia has adopted sustainable development and launched national green technology policy in 2009. This is to play their part as a nation to the global campaign on sustainable development and green growth economy and environmental conservation. Sustainable development and green growth economy has become issues of global interest since the UN conference on environment and development (UNCED, 1992). The energy sector has been identified as one of the various key sectors and pillars to play a crucial role towards the actualization of this global

vision of green growth economy and environmental conservation (KeTTHA, 2009). The energy sector helps to achieve the green economy and environmental conservation by choosing alternatively the renewable energy sources, technologies and techniques that best minimizes energy consumption and the negative impacts on the environment. Malaysian government decided to sustainably develop Putrajaya and Cyberjaya as the leading townships in green technology as an example to drive other parts of the country into green townships. This study will contribute to the objectives of the national green technology policy by taking into consideration the attitudes and the practicable actions in Putrajaya to energy consumption and conservation.

The importance of electricity to humankind and societal growth are obvious. Generally, almost all human activities are hugely and inevitably dependent on energy and no individual or nation can claim ignorant of this fact. Hannah. (2012) stated that energy plays important roles in the development of human society and that since the pre-historic era till date, humankind and their activities are being influenced by energy either knowingly or unknowingly. United Nations environment program (UNEP, 2007) elucidated the importance of energy to economic development. This is realistically obvious in the sense that the level of development of any nation is a reflection of their energy capacity and this also clarifies the great gap between the developed countries and the developing countries in terms of development because of energy variations. Schumacher (1973) strongly supported the roles of energy and in his view; he stated that energy is a precondition or foundation upon which all the goodness and activities of our modern world are built. Based on his view, there is no substitute to energy and the usefulness of energy is equal with air, water, and earth. Many Scholars has predicted global increase in energy demand in the future and the developing nations are said to be the pioneers of the driving force for this estimated increase in future energy demands. The increase in future energy demand is due to some inevitable driving factors such as population growth which in turn creates other contributing factors such as; high demands for buildings, industrialization, agriculture, income level etc. Population and economic growth plays huge impacts in energy demand and there is no controversy why developing nations (China

and India) has been pointed by many literatures as the drivers of increase because they are the most populous nations in the world and also with none stopping appetites for economic growth. This view is upheld by the BP. BP Energy (2015) when it stated that population rise and individual income influence energy consumption and that china and India are the main influence outside the Organization for Economic Cooperation and Development (OECD) growth which are estimated to be the global biggest and third biggest economies correspondingly by 2035. Both China and India in conjunction would produce about 1/3 of the world population and gross domestic products.

There are growing concerns about the danger facing the global environment and this brings about the global pressing issues such as; global warning, climate change, pollution, waste management, water shortage. Unsustainable energy sources such as thermal stations which involves continuous burning of organic matters or burning of flammable liquid materials to generate heat which are tapped for energy generation has been identified as the major factor leading to the above mentioned global issues affecting the world today. According to Van et al. (2011) , quantity of greenhouse-gases (GHGs) such as CO₂ in the atmosphere is currently increasing at a high pace and these are traceable to unsustainable energy generation source through burning process. It should be recalled that most developing nations, Malaysia inclusive are mainly relying on burning process for energy generation. This means the negative impacts of these systems are also enormous in the developing nations. Based on the present global crucial issues, people are beginning to realize the negative impacts of unfriendly energy sources and in the process of trying to proffer solutions to these problems, some essential terms such as; energy conservation, sustainable and renewable energy has come into play. The awareness on energy conservation is growing very popular as many nations and researchers are concerned about the best reliable, affordable, and acceptable means of saving energy in order to minimize the growing environmental impacts.

Energy conservation means any action or technology utilized to reduce energy usage

either at the household or organizational levels. This definition correspond to Cleveland and Morris (2006) view of energy conservation as “a collective terms for activities that reduces end- use demand for energy by reducing the services demanded”. Apart from environmental gains from saving energy, it also makes sense economically to save energy because lesser consumption means lesser bills payment. According to Goldemberg (2000) the process of generating and consumption of energy should not alter the life qualities of any living things, i.e. man, biodiversity, and the entire ecosystem. Integrating the importance of energy to humankind with the negative impacts of energy consumption, presents a huge challenge to energy conservation. Since we can't do without energy, the question begging for answers is how we could use energy without or with minimized negative environmental impacts. According to Mohon et al, (1983) there are two common systems for conserving energy; technology approach and the behavioral approach. Technology approach saves energy by using technological equipment / techniques, while the behavioral approach just as the name implies involves change in human attitudes / managements through awareness, incentives, skills evolvment.

Societal Attitudes also determines the choices of energy and the rates of consumption. The meaning of attitude is very complex and it varies among individuals and also depending on the circumstance under investigation, and as a result there are many definitions of attitude by many scholars and no single definition of attitude has emerged over the years. Bulletin (1950) defined attitudes simply in terms of the chances that an individual will manifest a particular behavior in a given situation. Based on the definitions propounded by Thurstone in 1946) and Wagner in 1969, two schools of thought pertaining to the structural nature of attitudes have evolved (Thurstone's school of thought and Wagner's school of thought) (Edwards, 1946). Thurstone in 1946 defined attitudes as the power of positive or negative that affect psychological object. Thurstone referred psychological object as; any individual, sign, expression, slogan, or opinion upon which people can have differences about positive or

negative affect. Wagner in 1969 believes that attitude encompasses affective, cognitive, and behavioral aspects which correlate, appropriately, to personal assessment of, understanding of, and tendency to behave toward the object of the attitude. *Thurstone's school of thought* believes that attitudes are only evaluative in terms of (positive – negative or favorable – unfavorable) in perspective. *Wagner's school of thought* believes that attitudes is more than just evaluative aspects and that it includes the three domains of learning; cognitive, affective, and psychomotor.

Since no society can thrive without energy, and energy consumption have cost effects (monetarily and environmentally), it becomes very imperative for all nations to perpetually seek for balance in energy consumption to minimize the negative impacts and promote integrative sustainable environment and economy. In order to maintain the balance between energy consumption and sustainable green environment, United Nations have been contributing immensely through various international conventions on a global scale. On a National scale, Malaysia has pledged their support and based on this ground, this study aims to access attitudes and practicable actions to electricity consumption and conservation in Putrajaya.

METHODS

This study employed quantitative approach to assess the attitudes and the practiced actions towards electricity consumption and conservation, and also to analyze the influence of attitudes and practiced actions on electricity consumption trend in Putrajaya, Malaysia. The focus of this study is based on electricity energy and the civil service employees of the various ministries are the target population of the study. There are 53,552 total populations of the civil service employees in the 24 ministries in Putrajaya according to the information given by Development and Management of Strategic Information Division (DMSID), Putrajaya. Questionnaire were distributed to 384 civil service employees as the sample population based on the table for determining sample by Krejcie & Morgan (1970). Electricity data was sourced from TNB Putrajaya, and the questionnaires were distributed and retrieved from respondents within four working weeks. Systematic sampling technique was utilized in

this study to sample 12 ministries out of the total 24 ministries. Based on this sampling method, the odd number was randomly chosen as the starting point and then every odd number from 1 to 24 ministries were systematically selected for sampling following the guideline of Polonsky & Waller (2015). 32 questionnaires were distributed to each of the 12 selected ministries and the data obtained were analyzed using IBM SPSS version 22 and MS Excel 2013.

RESULTS AND DISCUSSION

Demographic traits of respondents

The demographic traits of respondents are given in Table 1. The table shows that number of female respondents (66.9%) was much higher than that of the male respondents (33.1%). The table also revealed that most of the respondents (46.9%) belong to the age group of 18 – 32 years old, (45.6%) of the respondents belong to the age bracket of 33 – 46 years old, and (7.6%) of the respondents are aged between 47 – 60 years old. The table further shows that none of the respondents are less than 18 years old and above 60 years old. Majority of the respondents (70%) resides in Putrajaya, while (30%) of the respondents lives outside Putrajaya.

Table 1. Demographic data of respondents

Variables		Frequency	Percent
Gender	Male	127	33.2
	Female	257	66.9
Age Group	18-32	180	46.9
	33-46	175	45.6
	47-60	29	7.6
Resident	Live in Putrajaya	268	69.8
	Outside Putrajaya	116	30.2

Gender difference in attitudes towards electricity consumption in Putrajaya

The difference between the male and female attitude towards electricity consumption is shown using the independent sample t-test in table 2. This table shows that the male’s mean score (20.10) is higher than that of the female’s mean score (19.72), therefore, it implies that the male respondents have more positive attitudes towards electricity consumption than the female respondents.

There is no significant difference between the male and the female attitudes on electricity consumption because the significant value *P* (0.146) is above the significant level (0.05).

Table 2. Independent student t-test on attitude towards electricity consumption

Gender	n	Mean	t-value	Sig-value (P)
Male	127	20.10	1.455	0.146
Female	257	19.72		

P > 0.05

Table 3. Independent sample t-test on practiced actions towards electricity conservation

Gender	n	Mean	t-value	Sig-value (P)
Male	127	10.09	1.380	0.168
Female	257	9.68		

P > 0.05

Gender difference in practiced actions to support green policy through electricity conservation

The difference between the male and female in terms of practiced actions to support green policy through electricity conservation is shown using the independent sample t-test in table 3. The table also reveal that the male’s mean score (10.09) is higher than that of the female’s mean score (9.68), therefore, the male respondents are more pragmatic in terms of actions which support green policy through electricity conservation than the female respondents. There is no significant difference between the male and the female in terms of practiced actions to support green policy through electricity conservation because the significant value *P* (0.168) is above the significant level (0.05). However, improving the female employee’s attitudes through awareness is essential for electricity conservation. Interestingly, the mean score of male and female in table 2 and table 3 are closely related and this shows great link between the first objective (attitudes) and the second objective (actions).

Age group differences in attitudes and practiced actions towards electricity consumption and conservation

The analysis of variance (ANOVA) was conducted to examine the civil service employee’s age group differences in attitudes and practiced actions towards electricity

conservation. Table 4 shows the age group differences in attitudes, while Table 5 revealed the age group differences in terms of the practiced actions. The results from Table 4 & 5 shows there are no significant differences between and within the age groups in terms of attitudes and the practiced actions because the significant values (*P*) are greater than the significant level (0.05).

Electricity consumption trend in Putrajaya from 2000 to 2015

In order to ascertain electricity consumption trend in Putrajaya, the total yearly electricity consumption data in Putrajaya before (2000 – 2008) and after (2009 – 2015) the implementation of green growth policy was used in this study. Based on the results, the electricity consumption trends were clearly presented in figure 1 & 2 showing the yearly consumption trend, while figure 3 & 4 show the annual increase in consumption. Figure 1 & 2 shows progressive rise in yearly electricity consumption in Putrajaya before and after the implementation of green growth policy. This increase in consumption is likely to continue in the future and this explicitly confirmed the predictions by many authors that electricity consumption will increase in the future. Figure 3 & 4 shows the annual increase in electricity consumption in Putrajaya before and after the implementation of green growth policy. Before the implementation of the policy as shown in figure 3, the trend shows persistence annual increase in consumption from the year 2001 to 2005, but there was a huge drop in the year 2006 (26,693,993.56 million kwh) which is the lowest annual increase in electricity consumption in Putrajaya till date and followed by the year 2007.

Table 4. One Way ANOVA for age groups difference attitudes towards electricity consumption

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14.415	2	7.207	1.2	
Within Groups	2288.210	381	6.006		
Total	2302.625	383			

P > 0.05

The annual increase in consumption escalated vigorously from the year 2008. After the implementation of green growth policy in figure 4, the trend shows persistence annual

decrease in consumption from the year 2009 to 2012, but there was annual increase in the year 2014 and the trend decreased again in the year 2015. The year 2009 recorded the highest annual increase in electricity consumption in Putrajaya (162,125,974 million kwh). Interestingly, the year 2009 was the year Malaysia implemented the green growth policy and this implies that the tremendous increase in annual electricity consumption within this period (2008 to 2009) was one of the reasons the country decided to adopt the green growth policy in the year 2009.

Relating the results in attitudes) and practiced actions to the yearly electricity consumption trend before and after the implementation of green growth policy in Putrajaya (figure 1 & 2), it shows there is no significant influence of the attitudes and the practiced actions on the yearly electricity consumption trend in Putrajaya because despite the overall result which shows that the respondents practice the actions which enhance electricity conservation, electricity consumption continues to increase progressively on the annual basis. The reasons for this insignificant influence could be due to population growth, rapid constructions of more buildings and other factors. The implications of this yearly increase in electricity consumption will be annual increase in environmental impacts as the country depends hugely on heat energy through various combustion sources.

Table 5. One Way ANOVA for age groups difference in practiced actions towards electricity conservation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	43.123	2	21.562	2.901	.056
Within Groups	2831.377	381	7.431		
Total	2874.500	383			

P > 0.05

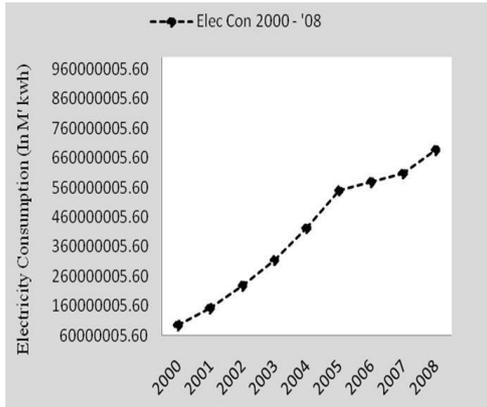


Figure 1. Total yearly electricity consumption in Putrajaya before Green Growth policy

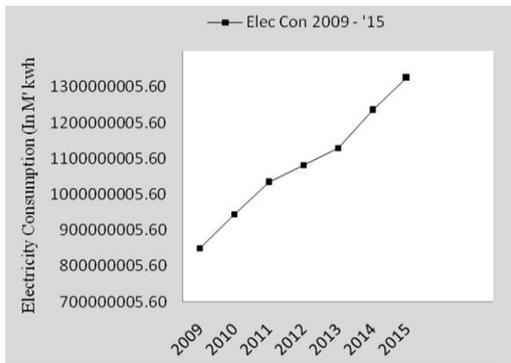


Figure 2. Total yearly electricity consumption in Putrajaya after Green Growth policy

However, relating the results in table 2 (attitudes) and table 3 (practiced actions) to the annual increase in electricity consumption trend before and after the implementation of green growth policy (figure 3 & 4), it indicates there is a significance influence of the attitudes and the practiced actions on the annual electricity consumption in Putrajaya. Because the annual increase in consumption before the implementation of green growth policy (figure 3) shows more of persistence increase annually, while the annual increase in consumption after the implementation of green growth policy (figure 4) shows more of persistence decrease annually. Therefore, this means that the green growth policy is gradually working because since the implementation of the policy, the annual increase in electricity consumption in Putrajaya has not exceeded the highest annual increase in consumption recorded in the year 2009 which was the year the policy was implemented, and also the trend after implementation shows more continuous

decrease. Although the yearly electricity consumption in Putrajaya continues to increase progressively, if the annual increase in electricity consumption in Putrajaya continues to decrease persistently as in figure 4, then the yearly persistence increase in consumption would change on the long run.

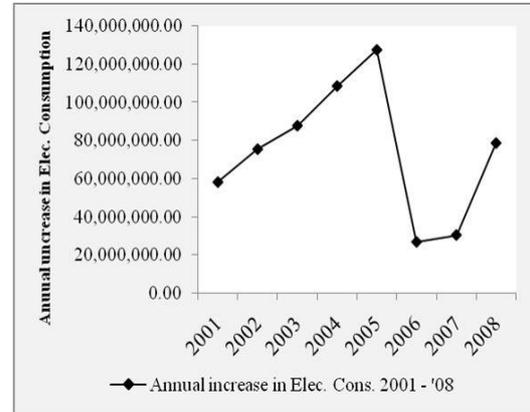


Figure 3. Annual increase in electricity consumption in Putrajaya before Green Growth policy

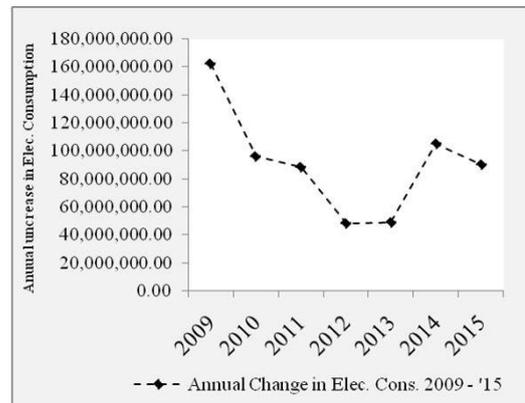


Figure 4. Annual increase in electricity consumption in Putrajaya after Green Growth policy

CONCLUSION

Electricity is a vital energy source and its contributions to our modern society are undeniably huge. There is a strong correlation between the environment and our various sources of energy and all choices regarding energy source are dependent on some factors such as; income levels, technology, climatic factors, economic growth, political factors, population growth, and environmental conservation etc. The processes of generating electricity have resulted to various

environmental concerns mostly the types of energy generated through various combustion processes. Owing to this environmental issues and the above listed factors, all nations now seeks for the best and more friendly energy sources and also the needs to conserve the existing energy sources. This study was conducted in Putrajaya, Malaysia, to ascertain the civil service employee's attitudes and actions toward electricity consumption and conservation. Based on the overall results obtained in this study, the civil service employees have more positive attitudes towards electricity consumption which are favourable to electricity conservation. However, the result shows unfavourable attitude for the fifth statement because higher number of the respondent disagree to the statement that population growth control is the best way to save electricity. The result also revealed that the respondents practiced actions which facilitate electricity conservation. The experimented t-test shows no significant difference between the male and the female in terms of attitudes and actions towards electricity consumption as the result revealed that the male have slightly more positive attitudes to electricity consumption which also influence their conservative actions toward electricity conservation slightly above the female counterpart. Electricity data shows progressive increase in yearly electricity consumption which indicates that the positive attitudes and favourable practiced actions have insignificant influence on the yearly electricity consumption trend. The rationale behind this lack of influence of attitudes and actions on the yearly electricity consumption trends could be due to population growth, continuous constructions of more buildings and other factors. Interestingly, the information extracted from electricity data shows significance influence of the positive attitudes and favourable practiced actions on the annual increase in electricity consumption as the trend shows more persistence decreasing line for annual increase in electricity consumption after the implementation of green growth policy. The annual increase in electricity consumption trend stipulates that the green growth policy is slowly functioning and if it continues to decrease over a long period, then the progressive yearly electricity consumption trend in Putrajaya would slow down. Therefore, it's recommended to increase public awareness on the benefits of saving electricity and the needs for population growth

control. More investments on renewable energy are required in order to minimize the negative environmental impacts resulting from the high reliance on the non-renewable combustion source. Also, further studies are required to clearly elucidate the correlation between attitudes, actions and electricity consumption trends.

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