Recycling Behaviour of Residents in Cities of Tomorrow

Saripah Abdul Latif[1,a]

[1]Universiti Teknologi MARA Kelantan,
Kota Bharu Campus 15050 Kota Bharu,
Kelantan, Malaysia

[a]saripah@kelantan.uitm.edu.my

Keywords: Recycling behaviour; environmental knowledge; environmental values

Abstract. To ensure sustainability in the cities of tomorrow, the environment quality or ecological balance, where it has been lost, need to be restored. If the urban residents fail to behave pro-environmentally, the creation of green cities will remain as a dream. The aim of this study is to gauge the role of city residents in the process of greening the cities through their recycling behaviour. Environmental value is tested as a mediator in the relationship between environmental knowledge and recycling behaviour of urban residents. A total of 1098 Malaysian city dwellers act as the sample to test the proposed model. Structural equation modelling (SEM) is used to obtain measurement models and structural models. Conclusively, environmental knowledge affects the inculcation of environmental values in the residents of urban areas, which in turn affects their recycling behaviour. It is hoped that the findings of this study should be able to facilitate the decision making process of local governments in their efforts to ascertain sustainability with green residents playing the role for cities of tomorrow. In furtherance, it is recommended that the study should be replicated in other cities, to confirm the findings of the present study.

Introduction

Green consumer behavior cannot be viewed simply in terms of purchasing and the choice of products. Consumers may respond to the green challenge in a wide range of ways other than purchasing; involving the way they use, maintain, replace and dispose of products. The evolution of academic investigation of green issues also has mirrored the evolution of environmental sensitivity in the general populace. Numerous studies have addressed the characteristics of environmentally conscious consumers or green consumers. Arguably, green consumerism is still a very limited phenomenon, regarding both the share of green consumers in the overall population and the willingness to participate in recycling of used packaging even amongst those concerned about the environment.

Rising quality of life is often related to a high rate of resource consumption. This entails to the creation of an unintended and negative impact on the urban environment. Past researches showed three key trends in the issue of household waste management: increase in volume of waste generated by urban residents; change in the quality of waste generated; and the disposal method of waste collected. Most of the time, massive amount of waste generated is far beyond the handling capacities of urban governments. Promoting the implementation of urban residents' sustainable consumption behaviour has become a real challenge to city managers. The city's environmental protection depends on two aspects, the first is sustainable production of firms; the second is residents' pro-environmental behaviour (Hu, Dong and Yang, 2013). If urban residents fail to behave pro-environmentally, a gradual but sure deterioration of the environment is due in the near future.

As a developing country, Malaysia is being challenged hugely for its effort in becoming a sustainably developed country. Some examples of environmental issues that need to be managed by Malaysian government are urban air quality, river water quality, deforestation, household wastes and hazardous wastes from the industries. Accordingly, various policies and strategies are currently being developed and implemented by the government in order to ensure sustainable development (Saripah,Mohd Shukri, Yeop Hussin and Zainudin, 2012). Kollumuss & Agyeman (2002) described pro-environmental behaviour as a behaviour that consciously seeks to minimize the negative impact of one's action on the natural and built environment (example minimize resource and energy consumption, use of non-toxic substances, reduce waste production and including recycling behaviour).

The commonly accepted fact is without adequate knowledge of the factors that lead people to participate in recycling, it is very difficult to develop effective and sustainable policies (Schultz et al, 1995 in Clay, 2005 in Saripah, Yeop Hussin and Zainudin 2013). A question arises here. If we improve environmental knowledge, will it increase proenvironmental behaviour? Saripah et al (2013), stated that environmental education effort aimed at both the public and at students should be emphasized by the city managers and the government. They further suggested that environmental education could be embedded in the school syllabus, from as early as pre-school level, whilst city managers may organize periodical anti-littering campaigns for the public. This is to increase the awareness toward and to inculcate values of the environment among the residents. Once the residents have the environmental values inculcated in them, supposedly they would behave pro-environmentally or become green residents.

This study examines the relation between environmental knowledge and recycling behaviour of the residents in urban areas, with environmental values as the mediator. The first objective of the study is to determine the causal relationship between environmental knowledge and recycling behaviour. Another objective is to enlighten the mediating effect of environmental values between environmental knowledge and recycling behaviour.

Literature Review

The question of what shapes pro-environmental behavior is such a complex one. In their research, Kollmuss and Agyeman (2002) found both environmental knowledge and environmental values are internal factors that influence pro-environmental behaviour, or specifically recycling behaviour. They further added that although numerous theoretical frameworks have been developed to explain the gap between the possession of environmental knowledge and environmental values, and displaying recycling behaviour, no definitive explanation has yet been found. Early models of pro-environmental behaviour was based on a linear progression of environmental knowledge leading to environmental awareness and concern (attitude), which in turn was thought to lead to pro-environmental behaviour. These rationalist models assumed that educating people about environmental issues would automatically result in more pro-environmental behavior (.Kollmuss and Agyeman, 2002). However, these models from the early 1970s were soon proven to be wrong by Ajzen and Fishbein in their 1980's Theory of Planned Behaviour. Ajzen and Fishbein maintain that people are essentially rational, in that they make systematic use of information available to them.

Pro-environmental behaviour can be explained by sociological and psychological factors. Based on the model of Fietkau and Kessel (1981) in Kitzmuller (2013), environmental knowledge is shown to have an indirect effect on pro-environmental behaviour. The task of knowledge is to affect the factor of environmental values and this leads to positive or negative environmental behaviour. Schahn and Giesinger (1993) in Kitzmuller (2013) stated that although there is no direct influence of knowledge, it is a necessary variable because pro-environmental action is only possible if people know what they can or could do. Without knowledge, there will be no chance to act in an environmentally friendly way. However, there are some studies that claim only a small fraction of pro-environmental behaviour can be linked to environmental knowledge (.Kollmuss and Agyeman, 2002). Kempton et al (1995) in Kollmuss and Agyeman (2002) in their study imply that environmental knowledge per se is not a prerequisite for recycling behaviour.

Environmental values do play a role in influencing recycling behaviour or pro-environmental behaviour. Saripah et al (2012) found that environmental values have significant influence on recycling behaviour where the measure of recycling behaviour could be used as a measurement of pro-environmental behaviour. Consumers or household residents who have better environmental values, or who are more pro-environment, would have higher participation in recycling. They further added that cultural differences, especially in terms of environmental knowledge may affect the environmental values of the consumers, which consequently affect the way consumers act or behave. Price and Pitt (2011) summarised three main variables influencing recycling behaviour. They are environmental values, situational factors and psychological variables. Environmental values are defined as an individual's orientation towards the environment and the natural world. Those who have strong moral norms are more likely to act on environmental knowledge (Barr et al., 2005; Olofsson & Ohman, 2006). Values are responsible for shaping much of our intrinsic motivation Kollmuss and Agyeman (2002) do not attribute a direct relationship to environmental knowledge and recycling behaviour. However, it is posited that the longer an individual receives the education, the more extensive is the knowledge about environmental issues.

More recent findings from a research by Ogel and Kimzan in 2016 also shows a positive and statistically significant relationship between environmental knowledge and attitudes towards recycling. Halkos et al. (2018), found that even with moderate level of environmental knowledge, their respondents still show pro-environmental behaviour. Knowledge in waste management is found to be very important by Zakianis et al. (2017) for waste sorting during recycling behaviour in Indonesia.

After the reviews of the above said literatures, three hypotheses have been developed;

H1: Environmental knowledge has significant and direct effects on recycling behaviour H2: Environmental knowledge has significant and direct effects on environmental value H3: Environmental value has significant and direct effects on recycling behaviour

Theoretically, the endogenous variable is recycling behaviour and the exogenous variable is environmental knowledge. In this study, it is hypothesized that environmental value mediates or intervenes the relationship between environmental knowledge and recycling behaviour. That is, how significant is the role played by environmental value in linking the effect of environmental knowledge on recycling behaviour?

Methodology

The population for this study is the residents of five large urban neighborhoods in Malaysia, namely Kuala Lumpur, Penang, Johor Bahru, Kota Kinabalu and Kuching. These are the five largest cities in Malaysia and all have the provision of recycling facilities. Each city receives services from a different service provider. Kuala Lumpur, the capital of Malaysia is served by Alam Flora Sdn Bhd, Johor Bahru is served by SWM Sdn Bhd, whilst Penang, Kota Kinabalu and Kuching are served by their own town councils. Another service provider, E-Idaman Sdn Bhd renders its services for Perlis and Kedah, which are not included in this study.

The sampling framework for the study is the areas where there are recycling bins provided. Exclusions are for those areas without the bins. The sample size for this study is 1098, consisting of 260 respondents from Kuala Lumpur, 149 respondents from Johor Bahru, and 251, 137 and 301 for Penang, Kota Kinabalu and Kuching consecutively. The measurement of recycling behaviour, environmental knowledge and environmental values uses questionnaires as the tool. The structured self-administered questionnaire was designed to measure all three constructs in the study.

There are two parts of the analysis: namely measurement model and structural model. The measurement model for each construct is analysed for its validity and reliability prior to modelling the structural model. Before data analyses are carried out, data mining and descriptive analysis for demographic variables are done. This is followed by factor analysis, determining the normality of the data, and finally hypotheses are tested. Data is analysed using structural equation modeling (SEM). The statistical package Analysis of Moment Structures (AMOS) is used to analyse for model fit (Goodness of fit index), predictive power (regression) and significance of paths for the specified model proposed.

Results and Discussions

Descriptive statistics show that the sample is almost equally represented by both genders which are 45.8 percent males and 54.2 percent females. The majority of the respondents live in medium cost housing and they are from medium-income level. All skewness values lie between-1.0 and 1.0 in the data mining process. Data is considered normally distributed and is therefore acceptable to proceed with the parametric analysis procedure.

Analysing the mediation effect of environmental value

The study is interested to determine the mediation role of a construct namely environmental value in the relationship between environmental knowledge and recycling behaviour. All three constructs involved in this study are latent and they are measured using a set of generated items in a questionnaire. The environmental knowledge is measured using five items; the environmental value is measured using six items, while recycling behaviour is also measured using six items. According to Zainudin (2012), the researcher needs to assess the measurement model for all latent constructs for uni-dimensionality, validity, and reliability prior to modeling the structural model (SEM).

The confirmatory factor analysis: Analysing the measurement model

Thus, this study performed the Confirmatory Factor Analysis (CFA) procedure for all latent constructs using the pooled CFA as proposed by Zainudin (2012). The CFA results showed that the measurement model for all constructs surpassed the requirement for uni-dimensionality, validity, and reliability. For instance the values of Cronbach's Alpha exceeded 0.7; the measures of Composite Reliability (CR) exceeded 0.6, and finally the Average Variance Extracted (AVE) exceeded 0.5. More importantly the Fitness Indexes for both the measurement model and structural model have exceeded the required level. The Fitness Indexes indicate the extent of how fit is the proposed model to the empirical data at hand (Zainudin, 2012). According to Zainudin (2012), SEM requires the RMSEA value lower than 0.08; the CFI index greater than 0.9; and the ratio of Chi square/Degree of freedom should be lower than 5.0.

The structural equation modelling: Analysing the mediation effect

Once the latent constructs passed the CFA stage, the study modelled the structural model for further analysis. The study assessed the mediation effect using the method proposed by Zainudin (2012). According to Zainudin (2012), there are two effects involved namely direct effect and indirect effect. Firstly, the direct effect of environmental knowledge on recycling behaviour must exist and be significant. After the mediator environmental value entered the model, the direct effect is reduced. If it reduces but is still significant, then partial mediation occurs. However, if it is no longer significant, then full mediation occurs (Zainudin, 2012). The result shows that the direct effect of environmental knowledge is significant ($\beta1 = 0.32$, P-value<0.001). Thus, the hypothesis that the direct effect of respondents' environmental knowledge on their recycling behaviour is significant has been supported. The findings also show that when the mediator construct, namely environmental value enters the model, the direct effect of environmental knowledge on recycling value has decreased from 0.32 to 0.14. Therefore, the mediation has been established. The type of mediation would depend on the result of the preceding hypotheses. It is found that the direct effect of environmental knowledge on recycling behaviour is no longer significant ($\beta1 = 0.14$, P-value=0.089) after the mediator entered the model. Thus, the hypothesis that the direct effect of respondents' environmental knowledge on their recycling behaviour is not supported. The effect of environmental knowledge on environmental value is significant ($\beta3 = 0.45$, P-value<0.001) and the effect of environmental value on recycling behaviour is also significant ($\beta2 = 0.41$, Pvalue<0.001). Therefore, the type of mediation that exists here is called full mediation. Conclusively, the environmental knowledge of the residents should generate their concern on environmental value so that the recycling behaviour among urban residents at large could be achieved.

Conclusion

This study examines the relation between environmental knowledge and recycling behaviour of the residents in urban areas, with environmental values as the mediator. The layout of the research is put down in two objectives. The first objective of the study is to determine the causal relationship between environmental knowledge and recycling behaviour. Another objective is to enlighten the mediating effect of environmental values between environmental knowledge and recycling behaviour. Subsequently, three hypotheses are posited and tested by using structural equation modelling. The first hypothesis is environmental knowledge has significant and direct effects on recycling behaviour. The second one is environmental knowledge has significant and direct effects on environmental value and the last hypothesis is environmental value has significant and direct effects on recycling behaviour. The results show that initially the direct effect of environmental knowledge on recycling behaviour is significant. Therefore the first hypothesis is supported. It means that environmental knowledge is an antecedent for recycling behaviour. This finding conform to past researches by Kollmuss and Agyeman (2002) and Kitzmuller (2013). However, when environmental value is introduced as the mediator linking the relationship between environmental knowledge and recycling behaviour, the effect of environmental knowledge on recycling behaviour is no longer significant. On the other hand, the effect of environmental knowledge on environmental value and environmental value on recycling behaviour are both significant. Both hypothesis two and hypothesis three are supported. This shows that environmental value is a full mediator for environmental knowledge and recycling behaviour. It means that environmental value intervenes the relationship between environmental knowledge and recycling behaviour. That is why when environmental value enters the model, the direct effect of environmental knowledge on recycling behaviour is no longer significant. This finding is similar to the model proposed by Fietkau and Kessel (1981) and part of the model by Kollmuss and Agyeman (2002). They do not attribute a direct relationship to environmental knowledge and recycling behaviour. Instead it is shown in this study that environmental value mediates the relationship.

The implication here is that environmental educators, city managers and policy makers should pay serious attention to the role of environmental value as the intervening variable between environmental knowledge and pro-environmental behaviour. As Chawla (1999) has pointed out, environmental value of individuals is determined by their experiences. So what kinds of experiences are we going to provide to our people to convert them into green residents? As an avenue for future research it is suggested that community-based social marketing is included in the study of recycling behaviour apart from some other conventional educational strategies. Another effort is by delivering community counselling to build awareness that may change the behaviours of urban residents. For further research, the construct environmental knowledge may be broken down to abstract (general) knowledge and concrete (specific) knowledge to obtain more insightful findings. For best result, research is to be duplicated in more cities throughout the world.

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