
Waste Management Behavior of Households in Klang Valley, Malaysia

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Abstract - Enhancing demand side management is among the focus of Malaysia in its effort to pursue green growth throughout 2016 to 2020. Per capita waste disposal in the country is 0.3 to 1.2 kg and only a mere 2% is recycled. There is huge potential for reducing solid wastes in the country through a more sustainable waste management approach such as reducing, recycling and proper disposal. This paper explores the result of a quantitative study conducted via a survey questionnaire on 118 households around Klang Valley. Applying the protection motivation theory, an ordinary least squares regression is applied to data to determine the significant factors affecting waste management behavior of households. Several elements of waste management behavior are investigated, such as waste avoidance, green purchases and reuse and recycle behavior. Results of study show that coping and threat appraisal processes significantly affect waste disposal and reuse and recycle behavior. For green purchasing and waste avoidance behavior, they are affected by coping appraisal but not threat appraisal process. The study suggests that if the government can promote the information on how severe contaminated environments can have on humans and their surroundings, it can lead to more responsible disposal of waste as well as can increase reuse and recycling activities of households. Apart from that, highlighting the positive impact an individual person's action can bring to the environment may increase reuse and recycling, waste avoidance and disposal and green purchase activities of the society, particularly the households.

Keywords - *green purchases, protection motivation theory, reuse and recycling, waste disposal, waste avoidance,*

ARTICLE INFO

Received 30 March 2021

Received in revised form 1 May 2021

Accepted 15 June 2021

Published 22 June 2021

I. Introduction

Today's society faces a number of environmental issues, among which municipal solid waste (MSW) is of great concern. The world generates 2.01 billion tonnes of MSW every year, with approximately 33 percent is not managed sustainably; and by 2050, total waste generation in a number of regions of the world is expected to at

least double (Kaza et al., 2018). In 2016, 5 percent of global greenhouse gas emissions were contributed by solid untreated open landfills (Kaza et al., 2018). Enhancing demand side management is among the focus of Malaysia in its effort to pursue green growth throughout 2016 to 2020 (Ministry of Economic Affairs, 2015). For managing municipal waste, this means more sustainable consumption and waste management by consumers. The variety of wastes generated has contributed to various environmental problems including rising greenhouse gases and toxic leachate from landfills. Malaysian households produce 18,000 tons of household daily where daily per capita waste disposal is 0.8- 1.2 kg and only 2.0% is recycled (Fauziah et al, 2004).

The national solid waste management policy in Malaysia aims to establish a holistic and integrated solid waste management that protects public health and conserves the environment. This is to be done based on a waste management hierarchy that gives priority to waste reduction via reduce-reuse-recycle, waste treatment and final disposal (Ministry of Housing and Local Government, 2017). There is in fact huge potential for reducing solid wastes in the country through a more sustainable waste management approach such as reducing, recycling and proper disposal.

Regarding the willingness to recycle, Teo (2016), revealed two distinct types of behaviors namely proactive and reactive behaviors where willingness to recycle differed across the two groups. The behavior of the proactive group was significantly influenced by recycling benefits and convenience to recycling facilities while only habitual recycling was significant for the reactive group. Another important factor that would enhance awareness on environmental conservation, as discovered by Ahmad et al (2020), is an application of green marketing concept where the eco-packaging and environmental advertisement significantly influenced consumer purchasing behavior.

In addressing social problems such as waste management through research, the Protection Motivation Theory (PMT) is a suitable theoretical framework to utilize (Wescott et al, 2017). The PMT describes how individuals are motivated to react in a protective way towards a perceived threat (Rogers, 1975). The PMT has been applied in various studies, such as for predicting the adoption of protective technologies (Chenowich et al, 2009; Woon et al, 2005) and determining pro-environmental behavior such as waste and water management and recycling (Janmaimool, 2017; Liu et al, 2018). In Janmaimool (2017), the PMT model applies the ordinary least squares regression to estimate the behavior.

This study proposes a model that predicts sustainable waste management behaviors using the PMT. The behavior under study follows a hierarchy of sustainable waste management behavior -- waste avoidance, green purchases, reuse and recycle and waste disposal. While PMT has been used for many environmental studies, literature illustrating its use for predicting waste management behavior, especially for specific waste management behavior is scant. This study attempts to model such behavior for the Klang Valley area in Malaysia using the framework developed in Janmaimool (2017).

II. Literature Review

The protection motivation theory (PMT) was originally founded by Rogers (1975) to help understand fear appeals and how people cope with them. This theory suggests that there are four factors that influence a person's intentions to safeguard him from any harmful or threatening event. The factors are (i) the perceived severity of a threatening event, (ii) the perceived probability of the occurrence, or vulnerability, (iii) the efficacy of the recommended preventive behavior, and (iv) the perceived self-efficacy.

Protection motivation arises from the threat appraisal and coping appraisal. The threat appraisal assesses the severity of the situation and the coping appraisal is how an individual responds to the situation. The coping appraisal, which consists of response efficacy and self-efficacy, focuses on the adaptive responses. It determines the ability of a person to cope with a threat. The PMT and its two components of threat appraisal and coping appraisal have been commonly applied mainly in health-related issues to study the behavior of people involved in unhealthy lifestyles such as smoking, drug abuse and alcoholism. For instance, threat appraisal and coping appraisal were applied in a study on cancer survivors (McGinty et al., 2012), pandemic flu (Teasdale et al., 2012), athlete' coping styles (Dias et al., 2012), treatment for infertility (Benyamini et al., 2004), healthy eating behavior (McKinley, 2009) and many other health-related problems including mental illness.

Besides health-related studies, many researchers have also applied the PMT in other fields of study and it has proved to be effective. For example, employing the PMT in the study of usage of illegal software, it was found that self-efficacy and response efficacy has a significant relationship with the behavioral intention of Generation Z's intention to comply with educational software anti-piracy laws (Miraja et al., 2007). This is also supported in

a tourism study by Wang et al. (2019), who found that both threat and coping appraisals can enhance travelers' protection motivations, which in turn affect their actual behaviors. There are also various other fields of study that employ the PMT (Martin et al., 2007; Burns et al., 2017; Ireland, 2011).

The application of PMT in the study of environmental problems is equally significant. There is a growing concern over many environmental problems especially on ozone depletion, greenhouse effect and global warming, deforestation, loss of biodiversity and disposal of waste. For instance, PMT was used in predicting the American and Korean students' intentions to engage in behaviors that can help mitigate climate change (Kim et al., 2013). The results indicate that one's attitude toward the prevention of climate change, perceived severity of climate change, response efficacy, and self-efficacy regarding climate change prevention were significant predictors of one's intentions to engage in pro-environmental behaviors. The PMT was also applied in many other studies (Raineart & Christensen, 2017; Bockarjova & Steg, 2014; Lam, 2015; Cismaru, 2011; Horng, 2014).

In waste management, numerous studies with or without the application of PMT have been conducted with the final aim to create pro-environmental behaviors among individuals of all ages. For example, a study by Xiao et al. (2017) found that the influencing factors behind public participation in waste management were poorly understood in China and that citizen knowledge and social motivation are the more influential factors than institutional factors. Another study also found that structural contexts (eg. recycling system) as well as cultural factors influence the extent to which people engage in waste management (Mintz et al., 2019).

Meanwhile, Janmaimool, (2017) has applied the PMT to examine individuals' engagement in sustainable waste management behaviors (SWMBs). The SWMBs include waste avoidance, green purchasing, reuse and recycle, and waste disposal. The study found that respondents' self-efficacy could explain all types of SWMBs. Nevertheless, response efficacy was not a significant predictor of all behaviors. People's perceived severity of adverse consequences caused by pollutants could significantly explain their waste disposal and reuse and recycle behaviors, and the perceived probability of being impacted by pollutants could explain only reuse and recycling behaviors.

In the Malaysian perspective, many studies have also been done in the waste management although the application of PMT is rather limited. These studies include the challenges in waste management (Behzad et al., 2011), waste minimization using composting (Bashir et al., 2018), waste management in construction industry (Begum et al. 2009) and many others. Because the PMT is a useful framework to understand and predict what motivates people to change their behavior, it is applied in this study to predict sustainable waste management behaviors. It is hoped that this study will provide scholars and policymakers with significant insights into promoting sustainable waste management.

III. Study Methodology

Research model and instruments

This study proposes a model that predicts sustainable waste management behaviors using the PMT. The behavior under study follows the hierarchy of sustainable waste management behavior: waste avoidance, green purchases, reuse and recycle and finally waste disposal and maintains the two main predictors of the PMT model – threat appraisal and coping appraisal. The overall and specific dependent variables under study are expected to show positive relationship with threat and coping appraisals.

Information pertaining to threat appraisal, coping appraisal and the relevant environmental behavior in the PMT framework was obtained using quantitative approach. A survey questionnaire was set, in which statements are used to obtain responses for the dependent and independent variables. The study closely followed statement sets observed in Janmaipool (2017), which examined waste management behavior using PMT.

The dependent variable is the engagement level in sustainable waste management behavior, which is represented by 4 types of behavior namely waste avoidance, green purchases, reuse and recycle and waste disposal. Each behavior is explained using 2 item questions with responses measured in 5-point Likert scale measurement from never to regularly.

Independent variables are threat and coping appraisals. Threat appraisal is represented by perceived severity of adverse consequences of waste pollution and perceived probability of receiving impact from waste pollution. For threat appraisal, questions asked are "How severely can pollutants from wastes affect humans?" and "What is the possibility that pollutants will impact you?". Coping appraisal is measured for self-efficacy and response efficacy. For coping appraisal, questions asked are "Is it possible to change your behavior into sustainable waste management behavior?" and "Can a single person's action contribute to better environmental quality?". All statements representing both appraisals require 5-point Likert scale responses from low to high.

Data collected were analyzed for descriptive analysis and processed using linear regression.

Survey and respondents

In order to obtain data, a survey was administered via Google Form using a convenience sampling method. A total of 119 survey responses were collected during late 2019. Respondents are residing in Klang Valley. The respondents were largely well educated as 67% of the 119 respondents have college degrees and 35% have diplomas. Most of the respondents (76 respondents or 63.9%) were of age 24 or less. Around 20.2% were of age 24 to 34 and the remaining were those between 35 to 64 years old.

Respondents were categorized into several income groups based on the B40-M40-T20 categories set by the government. During the time of study, the B40 group were people in the population who had gross monthly income of less than RM3680, which was gross household earning of less than RM3860. A total of 62 people (or 52.1%) of respondents fell into this category. While 32.8% (or 39 respondents) earned gross household income between RM3860 and RM8319 (the M40 income group) and the remaining 15.1% of respondents were earning more than RM8320 (the T20 income group).

In terms of where respondents reside, 55.6% of respondents were from urban areas, and the remaining were from suburban (27.7%) and rural (16%). This is a good approximation of the Klang Valley population as most of the Klang Valley areas are urban areas. In terms of religion which can loosely represent race, data is skewed towards the Malay samples as 94.1% are Muslims. Data is also skewed towards the female gender, as 79% of the respondents were females.

IV. Regression outcome

Multiple linear regression output shows that coping and threat appraisal play a role in determining sustainable waste management behavior of households. However, specific waste management practices are found to be related to specific types of appraisal.

For instance, the ways households dispose of waste are significantly affected by both coping and threat appraisals. This means that households do regard environmental pollution as a threat to human health and they believe that actions of individuals can improve environmental quality. Table 2 shows the outcome of an OLS regression with goodness of fit measured by Adjusted R-squared of 0.334. This value of adjusted R-squared is reasonable given that the study uses a cross-sectional design. In table 2, coping and threat appraisals are both strongly significant in determining waste disposal behavior (with p-value = 0.004 for coping appraisal and p-value = 0.002 for threat appraisal).

Table 2: Predictors of waste disposal behavior

	coeff	sig	R-squared	Adjusted R-squared	F-value	F-sig	DW	VIF
Coping appraisal	0.305	0.004						1.891
Threat appraisal	0.326	0.002						1.891
Constant	0.98	0.001						
Model summary			0.345	0.334	30.527	0.000	1.913	

Apart from waste disposal behavior, green purchasing behavior is found to be significantly affected by coping appraisal (p-value = 0.001). The green purchase questions asked relate to avoiding the purchase of food packaged in environmentally damaging packages. It also relates to purchasing environmentally friendly products such as organic products, biodegradable products and returnable containers and using safe carrier bags. The regression model (table 3) shows goodness of fit of R-square of 0.235, which is acceptable for a cross sectional study. Result shows that coping appraisal is strongly significant (at p-value = 0.01) in determining green purchase behavior. For instance, when one believes that he or she is able to allocate time and effort towards identifying and/or obtaining green products, it is very likely that they will make green purchase decisions.

Table 3: Predictors of green purchase behavior

	coeff	sig	R-square	Adjusted R-square	F-value	F-sig	DW	VIF
Coping appraisal	0.354	0.001						1.891
Threat appraisal	0.103	0.295						1.891
Constant	1.339	0.000						
Model summary			0.235	0.222	17.794	0.000	2.255	

Waste avoidance is another element being analyzed. It is found (table 4) that coping behavior is significant (p-value = 0.000) in determining waste avoidance behavior. Questions that relate to waste avoidance are refusing a plastic carrier bag during shopping and using reusable containers instead of single-use ones. It shows that when a person believes that households can make a difference in maintaining environmental quality through his or her actions, it can lead to waste avoidance. The waste avoidance model is acceptable with goodness of fit that is R-square of 0.224.

Table 4: Predictors of waste avoidance behavior

	coeff	sig	R-square	Adjusted R-square	F-value	F-sig	DW	VIF
Coping appraisal	0.434	0.000						1.891
Threat appraisal	0.047	0.668						1.891
Constant	1.418	0.000						
Model summary			0.224	0.211	16.787	0.000	1.891	

Reuse and recycle is another component of sustainable waste management behavior. It is found (table 5) that both coping and threat appraisals are significant (at 99% significance level) in determining reuse and recycle behavior. Model has a good fit with an R-square value of 0.389. This indicates that in order to increase reuse and recycle of potential waste materials, households need to feel that pollutants caused by improperly disposed waste can affect human health. Reuse and recycling will also increase with the belief that individuals can contribute to improvement of environmental quality and the person can change his or her behavior to be more sustainable.

Table 5: Predictors of reuse and recycle behavior

	coeff	sig	R-square	Adjusted R-square	F-value	F-sig	DW	VIF
Coping appraisal	0.355	0.001						1.891
Threat appraisal	0.345	0.001						1.891
Constant	0.935	0.002						
Model summary			0.389	0.385	37.938	0.000	1.928	

Overall, it is found that coping and threat appraisals can affect reuse and recycle as well as waste disposal behavior. As for green purchases and waste avoidance behaviors, they are affected by coping appraisal and not threat appraisal.

V. Conclusion

The study suggests that if the government can promote the information on how severe the impact of contaminated environments can have on humans and their surroundings, it can lead to more responsible disposal of waste as well as increase reuse and recycling activities of households. Apart from that, highlighting on the positive impact an individual person's action can bring to the environment may increase reuse and recycling, encourage waste avoidance and better waste disposal as well as more green purchase activities of the society, particularly the households.

Acknowledgments

This paper was earlier presented at the 9th IIMS International Conference at Hanoi, Vietnam. The study was supported by the Faculty of Business Management (FBM), UiTM via Faculty Research Grant [Project code: 600-IRMI 5/3DDF (FPP) (014/2019)].

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