WASTE SEGREGATION BEHAVIOUR AT SOURCE: ATTITUDE, PERCEIVED BEHAVIOURAL CONTROL, SUBJECTIVE NORM, AND ENVIRONMENTAL EDUCATION

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Introduction

Municipal solid waste management has emerged as a big challenge not only because of the environmental hygiene and human health concerns but also due to huge quantities of waste generated (Shaw, 2008). Waste dumping and landfilling may also cause many negative harmful environmental impacts and serious environmental degradation (Shaw, 2008). However, it can be said that many of the environmental problems today are actually caused by attitudes rather than by technical problems (Ifegbesan, 2008) because it takes a long time to break the old traditions and alter the current attitudes and practices (Bacinschi, 2010). However, research, education, and public participation are some of the useful tools for long-term improvement and changes in the ethics and attitude of public towards proper waste management (Pappu, Saxena, & Asolekar, 2007).

Besides that, it is important to know that, non-governmental organizations are seeking to change the attitudes of the businessman, young people, and household so as they will appreciate that waste and its environmental effects are relevant to them (Moh and Abd Manaf, 2014). In addition to that, they have a significant role to play in bringing about community benefits via reuse, recycling and waste minimization (Athanassiou & Zabaniotou, 2008) for a better and ideal living environment in the future (Eusuf, Ibrahim, Shamzani, & Affendy, 2011).

The existing literature of perceived behavioural control variable is still scarce on understanding the waste segregation behaviour at source. Hence, similar research which is related to sustainable management, recycling and solid waste management (Hurlimann, 2009; Koc & Kuvac, 2016; Lewis, 2009) have been adopted in this research. Agamuthu and Fauziah (2011) justified that most of the residents in Petaling Jaya knew about the importance and

meaning of recycling but only 22.0 percent of them practice it every day. This statement shows that there are still very few people who perceive that they are actually able to perform the recycling behaviour in their daily life. The given reasons were that waste collection infrastructure, for instance, recycling bin and the location to dispose of their household waste were not easily available. Hence, it has limited the willingness of the public and community to perform the recycling behaviour (Agamuthu, Khidzir, & Hamid, 2009).

The current research also offers some important insights into the perspective of subjective norm. This research is designed in order to highlight the influences of subjective norm on waste segregation behaviour at source among households because many previous researchers only explained its role in general pro-environmental behaviour (Adejoke, Mji, & Mukhola, 2014; Ioannou, Zampetakis, & Lasaridi, 2013; Tan & Azman, 2011; Tesfai, Nagothu, Simek, & Fucik, 2016) but still not mainly emphasizing it on waste segregation behaviour at source yet. This can be seen that many scholars identified that household's attitude related to recycling activities are affected by active support and the involvement of community residential committees for public participation (Zhuang, Wu, Wang, Wu, & Chen, 2008). Trudel, Argo, and Meng (2015) also contended that altruistic, regulatory factors and social influences are some of the factors why certain groups of the community can develop strong recycling habits.

Ultimately, in terms of research, there is still a lack of information on waste segregation behaviour at source. Most of them are focusing on recycling and environmental protection. Moreover, the environmental education should be given serious attention in order to generate knowledge about biophysical and the environmental problems around us (Meligrana and Andrew, 2003). Having knowledge about the environment by means of education reveals that lecturers, professors, and instructors are responsible to give applied skill and theoretical understanding to the students about environmental science (Hunter, Laursen and Seymour, 2007). For instance, Iwan Budhiarta, Siwar and Hassan Basri (2012) argued that the lack of knowledge and expertise related to recycling on the part of authorities have made the programmes ineffective in educating the general public. Low knowledge level about solid waste management among citizens is one of the obstacles to reach the goal of environmental protection (Saeed, Hassan and Mujeebu, 2009). Likewise, it is essential for households to gain knowledge and know more about waste segregation-at-source so as they are able to perform the behaviour in the right way. Hence, in the context of Malaysia, this research is aimed to provide an exciting opportunity to fill up the research gap in literature so as to advance the knowledge about waste segregation behaviour at source.

Literature Review

Attitude

Environmental attitudes were presented as a major component and indicator of environmental behaviour (Kalantari, Shabanali, Fami, Asadi, & Mohammadi, 2007). Favourable attitudes will assist an individual to play a significant role in preserving the environment (Bradley, Waliczek, & Zajicek, 1997). This circumstance can be further explained by the attitudes among households on the generated waste which can greatly affect their willingness to cooperate and participate in waste segregation behaviour at source (Otitoju & Seng, 2014).

Literature body of attitude variable is still scarce in the area of waste segregation behaviour at source as there are a relatively small number of discussions focused on it so far. However, environmental attitudes and psychological and situational variables have been reflected as important predictors of recycling behaviour. A wide variety of successful research on general ecological behaviour, as well as housing recycling (Chen & Tung, 2010; Davis, Phillips, Read, & Iida, 2006; do Valle & Assaker, 2016; Knussen *et al*., 2004; Mannetti, Pierro, & Livi, 2004; Vincente & Reis, 2008) have been conducted based on the attitude variable.

Perceived behavioural control

Perceived behavioural control is typically operationalised by asking respondents directly how difficult or easy of an individual to adopt a specific behaviour or task. It can be examined by anticipated impediments or obstacles and past experience (Ajzen, 1991). Hartig & Staats (2003) defined perceived behavioural control as an individual's belief and perception of their ability in portraying a specific behaviour (Ajzen, 2005), according to the external forces and their abilities that can influence alternatives. More comprehensively, perceived behavioural control is typically operationalised by asking respondents directly how difficult or easy of an individual to adopt a specific behaviour or task. It can be examined by anticipated impediments or obstacles and past experience (Ajzen, 1991).

To the best of knowledge, there is no specific research which is primarily focusing on waste segregation behaviour at source by employing perceived behavioural control as a predictor (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007) that has been found in the context of Malaysia (Masud, Al-Amin, Junsheng, Ahmed, Yahaya, Akhtar, & Banna, 2016). In this current research,

it is assumed that Malaysian citizens should not be over-emphasised about their own ability to perform waste segregation-at-source as their daily routine.

Subjective norm

Subjective Norm is determined by the total set of accessible normative beliefs (Ajzen, 2005) which is concerned to the expectation of a person's referents (Ajzen, 1991) important to them. In other words, subjective norm refers to what individuals believe other key people in their lives who think about whether the individuals believe other key people in their lives who think about whether the individual should engage in certain behaviour. Hence, in this current research, the households who live in Putrajaya will help to view perception of the following key referents: (1) friends; (2) family members; (3) neighbour; (4) people whom important to respondents; (5) acquaintances; (6) culture in a country; and (7) colleagues, in their engagement of waste segregation behaviour at source.

Subjective norm plays an important role in inculcating the recycling behaviour. Unfortunately, there are scarce studies which focused specifically in the field of waste segregation-at-source in Malaysia. Therefore, the present research has assumed that more research is required for investigating the connection and possibility of the subjective norm in the prediction of waste segregation behaviour at source in order to close the gap of literature by analysing the influence of subjective norm on the waste segregation behaviour at source for the local context.

Environmental education

The publication of Development, Implementation and Evaluation of Environmental Education Programmes by Stapp and William (1973) triggered a firestorm in the research on environmental education after the growth of public awareness about environmental concerns since the late 1960s (Lukco, Bernard, Disinger, & John, 1981). Environmental education is well connected to education for sustainable development, which is analysed by Zsoka, Szerenyi, Szechy, & Kocsis (2013) as "a field of enquiry which seeks to understand how do sustainability may be advanced in the curriculums and operational activities of higher education institutions", with an effort to "play the traditional role of transforming societies and serving the greater public good". Thus, both environmental education and education for sustainable development have the similarities and they are complementary to each other.

Nevertheless, McKeown and Hopkins (2003) highlight the importance of protecting natural environment by developing the environmental consciousness and awareness to a society. However, West (2015) criticized that the literature of environmental education on an understanding of various environmental problems are limited. Similarly, in term of research-based discussion, there is still no information which can be found between environmental education and waste segregation behaviour at source. Thus, this present research is designed in order to contribute to the body of knowledge by covering this literature gap.

Methodology

The respondents of this research were focused on a total of 400 male and female households who are living at the housing areas of Putrajaya namely; Precinct 5, Precinct 8, Precinct 9, Precinct 10, Precinct 11, Precinct 14, Precinct 15, Precinct 16, Precinct 17, and Precinct 18. The sample size of respondents was calculated by using sample size determination equation which proposed by Yamane (1967) in order to obtain a reliable and valid representative for this research.

The systematic sampling method was employed in selecting the respondents to engage in this present research. Therefore, the sample is chosen by selecting a random starting point and then picking every 10^{th} element in succession from sampling frame to answer the questionnaire. In other words, the sampling unit would be 10, 20, 30, 40, and so on until a total of four hundred respondents are selected in the present research to answer the bilingual questionnaire. The bilingual questionnaire consisted of five sections: Section A (Socio-Economic and Socio-Demography Profile), Section B (Attitude), Section C (Perceived Behavioural Control), Section D (Subjective Norm), and Section E (Environmental Education). These sections were measured based on a five-point Likert scale which ranged from "option 1" for "strongly disagree" to "option 5" for "strongly agree". This was used to indicate the degree of agreement or disagreement of respondents towards each of the statement. Finally, all the collected data were analysed by using IBM SPSS Statistics Version 24.0.

Results and Discussions

Respondents' socio-economic and socio-demographic profile

Table 1 portrayed the socio-demographic and socio-economic information of 400 surveyed respondents. The general socio-economic profile for this research was characterized by their monthly household income. Meanwhile,

the socio-demographic information of respondents included sex, age, ethnic group, and marital status.

Table 1: Distribution of Respondents' Socio-Demographic and Socioeconomic Information, N=400

Variables	Number of Respondents	Percentage (%)
Sex [a]		
Male	161	40.3
Female	239	59.8
Age (years old)		
≤ 21	30	7.5
22 – 31	158	39.5
32 – 41	118	29.5
42 – 51	74	18.5
52-61	18	4.5
> 61	2	0.5
Mean = 33.6		
Ethnic Group [a]		
Bumiputera	375	93.8
Chinese	14	3.5
Indian	9	2.3
Others	2	0.5
Marital Status [a]		
Never married	237	59.3
Married	159	39.8
Widowed	2	0.5
Divorced	2	0.5
Separated	0	0.0
Monthly Household Income [a]		
≤ RM 3000	111	27.8
RM 3001 – RM 5000	142	35.5
RM 5001 – RM 7000	73	18.3
RM 7001 – RM 9000	36	9.0
> RM 9000	38	9.5
Mean = 3789.46		

Note: N = Total number of respondents, % = Percentage, [a] = Totals do not sum to 100.0 due to rounding.

As illustrated in Table 1, about 60.0 percent of the respondents were female and the rest were male respondents. As for the ethnic composition, Bumiputera respondents (93.8%) appeared as the largest group in the sample. It was followed by the distribution of Chinese and Indian households, comprising of 3.5 percent and 2.3 percent respectively. Of the cohort of 400

respondents, there were about two-fifths of respondents aged between 22 and 31 years old. The mean age of respondents as a whole was 33.6 years old. In addition, a mainstream of the households was categorized in never married group (59.3%). Lastly, the largest proportion (35.5%) of monthly household income was found in the category of RM 3001 to RM 5000. The mean of monthly household income was RM 3789.46 in the research.

Attitude of respondents on waste segregation behaviour at source

The respondents' attitudes on waste segregation behaviour at source were examined by ten statements whereby they were assessed by using percentage score in order to determine the attitude of respondents on a five-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (5). The section was coded 1 to 5 so that higher score refer to more favourable attitude. Table 2 presents the respondents' assessment for each statement which applied in this section.

Table 2: Descriptive Analysis of Attitude on Waste Segregation-at-Source, N = 400

No.	Statements	Total Frequency / (%)				
		1	2	3	4	5
1.	I would feel guilty if I did not segregate my household waste.	35 (8.8)	35 (8.8)	148 (37.0)	155 (38.8)	27 (6.8)
2.	It would be wrong of me not to segregate my household waste.	36 (9.0)	48 (12.0)	117 (29.3)	167 (41.8)	32 (8.0)
3.	I find the idea of waste segregation behaviour at source is interesting.	31 (7.8)	37 (9.3)	103 (25.8)	171 (42.8)	58 (14.5)
4.	I am not interested in the idea of waste segregation behaviour at source. *	106 (26.5)	167 (41.8)	78 (19.5)	42 (10.5)	7 (1.8)
5.	My feeling about waste segregation behaviour at source is positive.	31 (7.8)	6 (1.5)	52 (13.0)	213 (53.3)	98 (24.5)
6.	I find the idea of waste segregation behaviour at source unpleasant. *	115 (28.7)	160 (40.0)	72 (18.0)	46 (11.5)	7 (1.8)

Table 2 (continues)

No.	Statements	Total Frequency / (%)				
		1	2	3	4	5
7.	My feelings towards waste segregation behaviour at source are favourable.	25 (6.3)	13 (3.3)	86 (21.5)	217 (54.3)	59 (14.8)
8.	Waste segregation behaviour at source is tiring and time-consuming to me. *	63 (15.8)	136 (34.0)	110 (27.5)	74 (18.5)	17 (4.3)
9.	All citizens have their own responsibilities in practicing waste segregation behaviour at source every day.	23 (5.8)	11 (2.8)	29 (7.2)	159 (39.8)	178 (44.5)
10.	I found that waste segregation behaviour at source is an important skill in reducing the cost of solid waste management.	26 (6.5)	15 (3.8)	42 (10.5)	164 (41.3)	152 (38.0)

Note: % = Percentage, N = Total number of respondents, 1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree, * = Negative statement

As presented in Table 2, the results showed that the statement of "All citizens have their own responsibilities in practicing waste segregation behaviour at source every day" indicated the highest percentage (44.5%) among households for "strongly agree" (5) response. Respondents do agree that waste segregation-at-source is an important skill (41.3%). In addition to that, they will feel guilty (38.8%) and it will be their fault (41.8%) if they do not segregate their household waste. Respondents also agreed that they have positive feeling (53.3%) that the idea of waste segregation behaviour at source is interesting (42.8%) and favourable (54.3%) to them. However, the other three statements of "I am not interested in the idea of waste segregation behaviour at source" (41.8%), "I find the idea of waste segregation behaviour at source unpleasant" (40.0%), and "Waste segregation behaviour at source is tiring and time-consuming to me" (34.0%) indicated the highest percentage for "disagree" (2) response. It can be interpreted that they do not have unpleasant feedbacks and negative comments on waste segregation behaviour at source.

Perceived behavioural control of respondents on waste segregation behaviour at source

The measurement of perceived behavioural control in this research comprises of nine statements with five-point Likert scales range from (1) strongly disagree to (5) strongly agree. Table 3 depicts the respondents' assessment for each statement used in this section.

Table 3: Descriptive Analysis of Perceived Behavioural Control on Waste Segregation-at-Source, N = 400

No.	Statements	Total Frequency / (%)				
		1	2	3	4	5
1.	I feel that I should not waste anything if it could be used again.	4 (1.0)	7 (1.8)	28 (7.0)	197 (49.3)	164 (41.0)
2.	I think that I am willing to involve in waste segregation-at-source activities.	7 (1.8)	11 (2.8)	79 (19.8)	213 (53.3)	90 (22.5)
3.	Waste segregation-at-source activities are under my control.	15 (3.8)	47 (11.8)	177 (44.3)	132 (33.0)	29 (7.2)
4.	I feel easy to segregate my household solid waste.	24 (6.0)	70 (17.5)	125 (31.3)	152 (38.0)	29 (7.2)
5.	I know how to segregate my household waste.	13 (3.3)	46 (11.5)	129 (32.3)	176 (44.0)	36 (9.0)
6.	I know the place to take my household waste for recycling.	36 (9.0)	71 (17.8)	111 (27.8)	143 (35.8)	39 (9.8)
7.	Waste segregation behaviour at source is very beneficial to me.	9 (2.3)	19 (4.8)	140 (35.0)	187 (46.8)	45 (11.3)
8.	I have plenty of opportunities to do waste segregation at home.	23 (5.8)	61 (15.3)	124 (31.0)	159 (39.8)	33 (8.3)
9.	I think I need to separate the waste and recycle them at home.	7 (1.8)	20 (5.0)	74 (18.5)	234 (58.5)	65 (16.3)

Note: % = Percentage, N = Total number of respondents, 1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree

According to the results, the higher score indicates the degree of agreeableness towards the influence of perceived behavioural control among respondents on the particular situation whilst lower score indicates less agreeableness. After analysing all statements employed in testing this

variable, the findings showed that the statement of "Waste segregation-at-source activities is under my control" indicated the highest percentage (44.3%) among involved households for the "not sure" (3) response. However, it is worth to note that these surveyed respondents do agree that waste segregation behaviour at source is very beneficial to them (46.8%). They also tend to agree that they have plenty of opportunities (39.8%) to be involved in waste segregation-at-source activity (53.3%) by separating and recycling the waste at home (58.5%) because these respondents do agree that they should not waste anything if it could be used again (49.3%). In addition to that, they feel easy (38.0%) to perform waste segregation-at-source because they know the method (44.0%) and the locations (35.8%) to take their household wastes for recycling.

Subjective norm among respondents on waste segregation behaviour at source

With the aim of examining the subjective norm on waste segregation behaviour at source, seven statements with five measurement scales denoted from (1) strongly disagree to (5) strongly agree were retained in order to assess the measured scale. The frequency and percentage distribution for each statement is displayed in Table 4.

Table 4.8: Descriptive Analysis of Subjective Norm on Waste Segregation-at-Source, N = 400

No.	Statements	Total Frequency / (%)				
		1	2	3	4	5
1.	Most of my friends think that household recycling is a good thing to do.	15 (3.8)	41 (10.3)	172 (43.0)	140 (35.0)	32 (8.0)
2.	Most of my family members think that I should segregate my waste.	22 (5.5)	58 (14.5)	119 (29.8)	158 (39.5)	43 (10.8)
3.	My neighbours think that I should segregate my waste for recycling.	30 (7.5)	62 (15.5)	210 (52.5)	76 (19.0)	22 (5.5)
4.	Most people who are important to me think that I should engage in household waste segregation.	23 (5.8)	46 (11.5)	186 (46.5)	123 (30.8)	22 (5.5)
5.	It is hard to see any acquaintance of mine make waste segregation.	25 (6.3)	57 (14.2)	120 (3.0)	156 (39.0)	42 (10.5)

Table 3 (continues)

No.	Statements	Total Frequency / (%)				
		1	2	3	4	5
6.	The culture in this country supports the activities regarding waste segregation-at-source.	53 (13.3)	117 (29.3)	112 (28.0)	94 (23.5)	24 (6.0)
7.	My colleagues think that I should carry out waste segregation-at-source activities.	26 (6.5)	62 (15.5)	199 (49.8)	86 (21.5)	27 (6.8)

Note: % = Percentage, N = Total number of respondents, 1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree

As the findings shown in Table 4, the statement of "The culture in this country supports the activities regarding waste segregation-at-source" indicated the highest percentage (29.3%) among households for "Disagree" (2) response. In other words, respondents do agree that culture in a certain country does play an important role to support waste segregation-at-source. In addition to that, respondents who engaged in this survey were not sure about the roles of their important people (46.5%), friends (43.0%), colleagues (49.8%) as well as their neighbours (52.5%) in influencing them to perform waste segregation behaviour at source. However, the other two statements of "Most of my family members think that I should segregate my waste" (39.5%) and "It is hard to see any acquaintance of mine make waste segregation" (39.0%) indicated the highest percentage for agree (4) response, showing that they do agree that family members and acquaintance will play significant role to influence respondents to portray this behaviour in daily routine.

Environmental education among respondents on waste segregation behaviour at source

To evaluate the environmental education, a measured scale consisting of nine statements was established and employed. A five-point Likert scale ranging from (1) strongly disagree to (5) strongly agree was applied in a bid to assess the measurement of environmental education. Subsequently, Table 5 will present the frequency and percentage distribution for each statement used in this section.

Table 4.11: Descriptive Analysis of Environmental Education on Waste Segregation-at-Source, N = 400

No.	Statements	Total Frequency / (%)				
		1	2	3	4	5
1.	I have been told by educators about the importance of waste segregation behaviour at source for recycling.	30 (7.5)	55 (13.8)	48 (12.0)	194 (48.5)	73 (18.3)
2.	I have learned about what items can be recycled.	24 (6.0)	17 (4.3)	33 (8.3)	224 (56.0)	102 (25.5)
3.	I have attended some courses, seminars, and workshops on the environment.	75 (18.8)	125 (31.3)	70 (17.5)	101 (25.3)	29 (7.2)
4.	I often take part in the environmental awareness campaign.	74 (18.5)	148 (37.0)	77 (19.3)	86 (21.5)	15 (3.8)
5.	I have learned that waste segregation-behaviour at source will create a better environment.	28 (7.0)	17 (4.3)	46 (11.5)	193 (48.3)	116 (29.0)
6.	I have been informed that waste segregation-behaviour at source can save energy.	32 (8.0)	15 (3.8)	49 (12.3)	212 (53.0)	92 (23.0)
7.	I have learned that waste segregation behaviour at source can help in protecting the environment.	28 (7.0)	8 (2.0)	27 (6.8)	198 (49.5)	139 (34.8)
8.	I have learned from a speaker of seminar who said that waste segregation behaviour at source can preserve natural resources.	42 (10.5)	42 (10.5)	75 (18.8)	165 (41.3)	76 (19.0)
9.	I have explored about information on waste segregation behaviour at source by using search engine optimisation such as Google and Yahoo.	43 (10.8)	86 (21.5)	80 (20.0)	135 (33.8)	56 (14.0)

Note: % = Percentage, N = Total number of respondents, 1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree

The descriptive analysis in this section was incomparable to past research because it should be noted that this present research represented as one of the preliminary attempts to explore the variable of environmental education to enhance the understanding about waste segregation behaviour at source.

As the data revealed in Table 5, it also can be concluded that a large group of respondents agreed that they have been told by educators (48.5%) and speaker of a seminar (41.3%) about the importance of waste segregation-at-source. They have learned about what items can be recycled (56.0%) and the way to protect the environment (49.5%) in order to save energy (53.0%) and preserve natural resources (41.3%). Therefore, they can create a better environment (48.3%) for future generation. However, the other two statements of "I have attended some courses, seminars, and workshops on the environment" (31.3%) and "I often take part in environmental awareness campaign" (37.0%) indicated the highest percentage for disagree (2) response. It can be assumed that the number of courses, seminars, workshops on environmental protection as well as environmental awareness campaign should be organised more frequently so that citizens have more opportunities to take part in these kinds of pro-environmental programmes. Fortunately, 33.8 percent of respondents do agree that they should take the initiative to explore the information on waste segregation-at-source by using search engine optimisation, i.e., Google and Yahoo in order to culture the behaviour of waste segregation-at-source.

Conclusion

Of the research cohort of 400 respondents, there was 40.3 percent of male (n = 161) and 59.8 percent of female (n = 239) households. The average age of the respondents in this research was 33.6 years old. In addition to that, Bumiputera respondents (93.8%) appeared as the largest group in the sample. It was followed by the percentage distribution of Chinese and Indian households, comprising 3.5 percent and 2.3 percent respectively. A mainstream of the households was categorised in the never married group (59.3%). The largest proportion of monthly household income was found in the category of RM 3001 to RM 5000 (35.5%).

Ultimately, a descriptive investigation was performed on attitude, perceived behavioural control, subjective norm, and environmental education with waste segregation behaviour at source. The results inferred that, in overall, a high percentage of households living in Putrajaya were perceived as having a low level of waste segregation behaviour at source performance compared to the other percentage distribution of respondents in the research. Assessment of the overall factors which influenced the households with waste segregation

behaviour at source has indicated that the majority of the respondents were recognised having favourable attitude. Most notably, surveyed households were also found that households were highly influenced by perceived behavioural control and environmental education but moderately influenced by the subjective norm.

References

Adejoke, O., Mji, A., & Mukhola, M. (2014). Students' and teachers' awareness of and attitude towards environmental pollution: a multivariate analysis using biographical variables. *Journal of Human Ecology*, *45*(December 2011), 167–175.

Agamuthu, P. & Fauziah, S.H. (2011). Challenges and issues in moving towards sustainable landfilling in a transitory country - Malaysia. *Waste Management and Research : The Journal of the International Solid Wastes and Public Cleansing Association, ISWA*, *29*(1), 13–9. https://doi.org/10.1177/0734242X10383080

Agamuthu, P., Khidzir, K.M., & Hamid, F.S. (2009). Drivers of sustainable waste management in Asia. *Waste Management and Research : The Journal of the International Solid Wastes and Public Cleansing Association, ISWA*, *27*(7), 625–633. https://doi.org/10.1177/0734242X09103191

Ajzen, I. (1991). The theory of planned behavior. *Orgnisational Behavior and Human Decision Processes*, *50*, 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I. (2005). *Attitudes, Personality, and Behaviour* (second ed.). New York: McGraw-Hill International.

Athanassiou, M. & Zabaniotou, A. (2008). Techno-economic assessment of recycling practises of municipal solid wastes in Cyprus. *Journal of Cleaner Production*, *16*(14), 1474–1483. https://doi.org/10.1016/j.jclepro.2007.09.001

Bacinschi, Z. (2010). Waste management practices used in the attempt to protect the environment. *In Proceedings of the 3rd WSEAS International Conference on Engineeringmechanics, Structures, Engineering Geology*, (March), 378–382.

Bradley, J.C., Waliczek, T.M., & Zajicek, J.M. (1997). Relationship between demographic variables and environmental attitude of high school students. *Journal of Natural Resources: Life Science Education*, *26*, 102-104.

Chen, M.F. & Tung, P.J. (2010). The moderating effect of perceived lack of facilities on consumers' recycling intentions. *Journal of Environment and Behaviour*, *42*(6), 824–844.

Davis, G., Phillips, P.S., Read, A.D., & Iida, Y. (2006). Demonstrating the need for the development of internal research capacity: understanding recycling participation using the Theory of Planned Behaviour in West Oxfordshire, UK. *Resources, Conservation and Recycling*, *46*(2), 115–127.

Do Valle, P.O. & Assaker, G. (2016). Using partial least squares structural equation modeling in tourism research: a review of past research and recommendations for future applications. *Journal of Travel Research*, *55*(6), 695–708. https://doi.org/10.1177/0047287515569779

Eusuf, M.A., Ibrahim, M., Shamzani Affendy, M.D., & Islam, R. (2011). Solid waste generation characteristics: the Malaysian local authorities' outlook. *Planning Malaysia*, *9*, 51–76.

Hartig, T. & Staats, H. (Eds.). (2003). Restorative environments. *Journal of Environmental Psychology*, *23*, 103–198.

Hunter, A., Laursen, S.L., & Seymour, E. (2007). Becoming a scientist: the role of undergraduate research in students' cognitive, personal, and professional development. *Science Education*, *91*(1), 36–74. https://doi.org/10.1002/sce

Hurlimann, A.C. (2009). Responding to environmental challenges: an initial assessment of higher education curricula needs by Australian Planning Professionals. *Environmental Education Research*, *15*(907457876), 643–659. https://doi.org/10.1080/13504620903244159

Ifegbesan, A. (2008). Exploring secondary school students' understanding and practices of waste management in Ogun State, Nigeria. *International Journal of Environmental and Science Education*, *3*(3).

Ioannou, T., Zampetakis, L.A., & Lasaridi, K. (2013). Psychological determinants of household recycling intention in the context of the theory of planned behaviour. *Fresenius Environmental Bulletin*, *22*(7 A), 2035–2041.

Iwan Budhiarta, Siwar, C. & Hassan Basri. (2012). Current status of municipal solid waste generation in Malaysia. *International Journal on Advance Science Engineering Information Technology*, *2*, 16–21. https://doi.org/10.18517/ijaseit.2.2.169

Kalantari, K., Fami, H.S., Asadi, A., & Mohammadi, H.M. (2007). Investigating factors affecting environmental behavior of urban residents: A case study in Tehran City-Iran. *American Journal of Environmental Science*, *3*, 67–74

Knussen, C., Yule, F., MacKenzie, J., & Wells, M. (2004). An analysis of intentions to recycle household waste: the roles of past behaviour, perceived habit, and perceived lack of facilities. *Journal of Environmental Psychology*, *24*(2), 237–246. https://doi.org/10.1016/j.jenvp.2003.12.001

Koc, I. & Kuvac, M. (2016). Preservice science teachers' attitudes toward environment. *International Journal of Environmntal and Science Edcuation*, *11*(13), 5925–5941.

Lewis, J.L. (2009). Student attitudes toward impairment and accessibility: an evaluation of awareness training for urban planning students. *Vocations and Learning*, *2*(2), 109–125. https://doi.org/10.1007/s12186-009-9020-y

Lorenzoni, I., Nicholson-Cole, S., & Whitmarsh, L. (2007). Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change*, *17*(3–4), 445–459.

Lukco, B.,, Disinger, J., & John, F. (1981). *Eric Clearinghouse for Science, Mathematics, and Environmental Education Fact Sheets*. National Institute of Education, Washington, D.C.

Mannetti, L., Pierro, A., & Livi, S. (2004). Recycling: planned and self-expressive behaviour. *Journal of Environmental Psychology*, *24*(2), 227–236

Masud, M. M., Al-Amin, A. Q., Junsheng, H., Ahmed, F., Yahaya, S. R., Akhtar, R., & Banna, H. (2016). Climate change issue and theory of planned behaviour: Relationship by empirical evidence. *Journal of Cleaner Production*, *113*, 613–623. https://doi.org/10.1016/j.jclepro.2015.11.080

McKeown, R. & Hopkins, C. (2003). EE p ESD: Defusing the worry. *Environmental Education Research*, *9*, 117-128, DOI: 10.1080/13504620303469

Meligrana, J.F. & Andrew, J.S. (2003). Role-playing simulations in urban planning education: a survey of student learning expectations and outcomes. *Planning Practice and Research*, *18*(1), 95–107. https://doi.org/10.1080/0269745032000132673

Moh, Y.C. & Abd Manaf, L. (2014). Overview of household solid waste recycling policy status and challenges in Malaysia. *Resources, Conservation and Recycling*, *82*, 50–61. https://doi.org/10.1016/j.resconrec.2013.11.004

Otitoju, T. & Seng, L. (2014). Municipal solid waste management: household waste segregation in Kuching South City, Sarawak, Malaysia. *American Journal of Engineering Research*, *6*, 82–91. Retrieved from http://www.ajer.org/papers/v3(6)/K0368291.pdf

Pappu, A., Saxena, M.. & Asolekar, S.R. (2007). Solid wastes generation in India and their recycling potential in building materials. *Building and Environment*, *42*(6), 2311–2320. https://doi.org/10.1016/j.buildenv.2006.04.015

Saeed, M.O., Hassan, M.N., & Mujeebu, M.A. (2009). Assessment of municipal solid waste generation and recyclable materials potential in Kuala Lumpur, Malaysia. *Waste Management*, *29*(7), 2209–2213. https://doi.org/10.1016/j.wasman.2009.02.017

Shaw, P.J. (2008). Nearest neighbour effects in kerbside household waste recycling. *Resources, Conservation and Recycling*, *52*(5), 775–784. https://doi.org/10.1016/j.resconrec.2007.11.004

Stapp, W.B. (1973). *Development, Implementation, and Evaluation of Environmental Education Programs (K-12)*, ED 094 960.

Tan, P.S. & Azman, N. (2011). The relationship between commitment towards environment and pro-environment behaviour among university students. *Jurnal Personalia Pelajar*, *14*, 11–22.

Tesfai, M., Nagothu, U.S., Šimek, J., & Fučík, P. (2016). Perceptions of secondary school students' towards environmental services: a case study from Czechia. *International Journal of Environmental and Science Education*, *11*(12), 5533–5553.

Trudel, R., Argo, J.J., & Meng, M.D. (2015). Trash or recycle? how product distortion leads to categorization error during disposal. *Environment and Behavior*, 1–20. https://doi.org/10.1177/0013916515577635

Vincente, P. & Reis, E. (2008). Factors influencing households' participation in recycling. *Waste Management and Research*, *26*, 140-146.

West, S.E. (2015). Understanding participant and practitioner outcomes of environmental education. *Environmental Education Research*, *21*(1), 45–60.

Yamane, T. (1967). *Elementary Sampling Theory*: Prentice-Hall.

Zhuang, Y., Wu, S.W., Wang, Y.-L., Wu, W.X., & Chen, Y.X. (2008). Source separation of household waste: a case study in China. *Waste Management (New York)*, *28*(10), 2022–2030. https://doi.org/10.1016/j.wasman.2007.08.012

Zsóka, Á., Szerényi, Z.M., Széchy, A., & Kocsis, T. (2013). Greening due to environmental education? environmental knowledge, attitudes, consumer behavior and every day pro- environmental activities of Hungarian high school and university students. *Journal of Cleaner Production*, *48*, 126–138.