



**UNIVERSITI PUTRA MALAYSIA**

***DETERMINANTS OF HOUSEHOLDS' INTENTION TO PRACTISE SOLID  
WASTE SEGREGATION-AT-SOURCE IN SELANGOR, MALAYSIA***

**CHENG KAI WAH**

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By

**CHENG KAI WAH**

**Thesis Submitted to the School of Graduate Studies, Universiti  
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Doctor of Philosophy**

**June 2020**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in  
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**June 2020**

**Chair : Syuhaily Osman, PhD**  
**Faculty : Human Ecology**

Municipal solid waste management is the most critical environmental problem in Malaysia. The main purpose of this research was to explore the current scenarios of intention to practise solid waste segregation-at-source among households in Selangor; to evaluate the levels of attitude, subjective norms, environmental concerns, environmental knowledge, and intention to practise solid waste segregation-at-source; to investigate the relationships between households' attitude, descriptive norm, and injunctive norm with the intention to practise solid waste segregation-at-source; as well as to ascertain the mediating effect of environmental concerns and the moderating effect of environmental knowledge between households' attitude, descriptive norm, and injunctive norm with the intention to practise solid waste segregation-at-source. A total of 400 residents living in the townships of the nine districts of Selangor were selected via a multistage sampling method. A self-administrated bilingual questionnaire was used to collect the quantified research data. The measurements were adapted and adopted from different sources to examine the key variables in this research. The results revealed that descriptive norm [ $p = 0.038$  ( $p \leq 0.05$ ),  $r = 0.104$ ] and injunctive norm [ $p = 0.000$  ( $p \leq 0.001$ ),  $r = 0.317$ ] have positive relationships with the intention to practise solid waste segregation-at-source. However, the results also revealed that there was an insignificant relationship between attitude [ $p = 0.139$  ( $p > 0.05$ ),  $r = 0.074$ ] and the intention to practise solid waste segregation-at-source. Hence, it was excluded from the further mediation and moderation test throughout the research. In terms of mediation test, the egoistic concern [ $p = 0.001$  ( $p \leq 0.001$ ),  $t = 3.182$ ] as well as the altruistic concern [ $p = 0.000$  ( $p \leq 0.001$ ),  $t = 4.462$ ] were found to mediate the

significant relationship between injunctive norm and intention to practise solid waste segregation-at-source. From the perspectives of moderation test, the results postulated that environmental knowledge did not moderate the relationships between descriptive norm [ $p = 0.511$  ( $p > 0.05$ ),  $t = 0.658$ ] and injunctive norm [ $p = 0.519$  ( $p > 0.05$ ),  $t = 0.645$ ] with the intention to practise solid waste segregation-at-source. The findings provide an insight for the Malaysian citizens, governmental bodies, non-governmental organisations, and voluntary bodies to strengthen the sense of responsibility to maintain the cleanliness of the environment. The current research data, in particular, is able to provide a direction to the Malaysian governmental bodies, including National Solid Waste Management Department, Solid Waste Management and Public Cleansing Corporation, Malaysian Ministry of Energy, Science, Technology, Environment and Climate Change as well as Malaysian Ministry of Housing and Local Government in their future policy planning and implementation. Instead of using the ordinary self-administrative bilingual questionnaire, future research is recommended innovating different mode of instrumentation to evaluate the respondents' behavioural changes for creating a comprehensive understanding of the solid waste segregation-at-source policy among Malaysian citizens.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia  
sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

**PENENTU NIAT ISI RUMAH DALAM PENGAMALAN PENGASINGAN SISA  
PEPEJAL DI PUNCA DI SELANGOR, MALAYSIA**

Oleh

**CHENG KAI WAH**

**Jun 2020**

**Pengerusi : Syuhaily Osman, PhD**  
**Fakulti : Ekologi Manusia**

Pengurusan sisa pepejal perbandaran merupakan masalah alam sekitar yang paling genting di Malaysia. Tujuan utama kajian ini adalah untuk meneroka keadaan semasa niat isi rumah dalam pengamalan pengasingan sisa pepejal di punca di Selangor; untuk menilai tahap sikap, norma subjektif, keprihatinan alam sekitar, pengetahuan alam sekitar dan niat pengamalan sisa pepejal di punca; untuk menyiasat perkaitan antara sikap, norma deskriptif dan norma injunktif dengan niat isi rumah dalam pengamalan pengasingan sisa pepejal di punca; serta memastikan kesan pertengahan keprihatinan alam sekitar dan kesan perantaraan pengetahuan alam sekitar dalam perkaitan antara sikap, norma deskriptif dan norma injunktif dengan niat isi rumah dalam pengamalan pengasingan sisa pepejal di punca. Seramai 400 orang penduduk yang tinggal di sembilan daerah Selangor yang telah dipilih melalui kaedah persampelan rawak berlapis. Soal selidik dwibahasa yang ditadbir sendiri telah digunakan untuk mengumpul data kajian berbentuk kuantitatif. Pengukuran disesuaikan dan diterima pakai dari sumber berlainan untuk memeriksa pemboleh ubah utama dalam kajian ini. Hasil kajian menunjukkan norma deskriptif [ $p = 0.038$  ( $p \leq 0.05$ ),  $r = 0.104$ ] dan norma injunktif [ $p = 0.000$  ( $p \leq 0.001$ ),  $r = 0.317$ ] mempunyai hubungan positif terhadap niat pengamalan pengasingan sisa pepejal di punca. Walau bagaimanapun, hasil kajian juga menunjukkan terdapat hubungan tidak signifikan antara sikap [ $p = 0.139$  ( $p > 0.05$ ),  $r = 0.074$ ] terhadap niat pengamalan pengasingan sisa pepejal di punca. Oleh itu, pemboleh ubah itu telah dikecualikan daripada ujian pertengahan dan ujian perantaraan yang selanjutnya sepanjang kajian dijalankan. Dari segi ujian pertengahan, keprihatinan berbentuk egoistik [ $p = 0.001$  ( $p \leq 0.001$ ),  $t = 3.182$ ] dan keprihatinan berbentuk altruistik [ $p = 0.000$  ( $p \leq 0.001$ ),  $t = 4.462$ ] didapati menengah hubungan antara norma injunktif dengan niat pengamalan sisa pepejal di punca. Dari perspektif ujian perantaraan, hasil kajian menunjukkan pengetahuan alam sekitar tidak mengantara hubungan antara norma deskriptif

[ $p = 0.511$  ( $p > 0.05$ ),  $t = 0.658$ ] dan norma injunktif [ $p = 0.519$  ( $p > 0.05$ ),  $t = 0.645$ ] dengan niat pengamalan sisa pepejal di punca. Hasil kajian ini memberi gambaran kepada rakyat Malaysia, badan kerajaan, badan bukan kerajaan dan badan sukarela untuk meningkatkan nilai tanggungjawab terhadap penjagaan kebersihan alam sekitar. Data kajian ini secara khususnya dapat memberi panduan kepada badan-badan kerajaan Malaysia, termasuklah Jabatan Pengurusan Sisa Pepejal Negara, Perbadanan Pengurusan Sisa Pepejal dan Pembersihan Awam, Kementerian Tenaga, Sains, Teknologi, Alam Sekitar dan Perubahan Iklim Malaysia dan Kementerian Perumahan dan Kerajaan Tempatan Malaysia dalam perancangan dan pelaksanaan dasar-dasar mereka pada masa hadapan. Selain menggunakan soal selidik dwibahasa ditadbir sendiri yang biasa, kajian masa hadapan dicadangkan mencipta kaedah instrumentasi berlainan bagi menilai perubahan gelagat responden untuk membentuk satu pemahaman tentang polisi pengasingan sisa pepejal yang menyeluruh dalam kalangan rakyat Malaysia.

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**Syuhaily Osman, PhD**

Associate Professor  
Faculty of Human Ecology  
Universiti Putra Malaysia  
(Chairman)

**Zuroni Md Jusoh, PhD**

Senior Lecturer  
Faculty of Human Ecology  
Universiti Putra Malaysia  
(Member)

**Nur Jasmine Lau Leby, PhD**

Senior Lecturer  
Faculty of Human Ecology  
Universiti Putra Malaysia  
(Member)

---

**ZALILAH MOHD SHARIFF, PhD**

Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date:

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# CHAPTER 1

## INTRODUCTION

### 1.1 Research Background

Malaysia is a transition country that is experiencing fast population growth (Chua, Bashir, Tan, and Chua, 2019), rapid lifestyle change (Ali, Ibrahim, Liyana, and Lam, 2019), high industrialisation and urbanisation (Lim, Lee, Bong, Lim, and Klemes, 2019), along with aggressive economic development (Yaacob, Ibrahim, and Nasir, 2019) and changes in consumption (Abas and Wee, 2014). These changes in national development have raised a number of major environmental concerns (Jeong, Jang, Day, and Ha, 2014) in terms of energy security, municipal solid waste volume (Murad and Siwar, 2007), and day-to-day solid waste generation in Malaysia.

Several authors have carried out an excellent analysis and provided historical insights into the chronology of solid waste management policy and action in the context of Malaysia. At the end of the 1970s, local authorities were responsible for the transport of solid waste and for street cleanliness under the Local Government Act 1976 (Sakawi, Gerrard, Andy, and Aiyub, 2002). At that moment, local authorities were paying less attention to efforts to segregate solid waste, to recycling strategies, and to a centralised waste management system (Jalil, 2010). Consequently, there had not yet been a specific national plan for the management of solid waste. The implementation of the Action Plan for a Beautiful and Clean Malaysia (ABC Plan) by the Malaysian Ministry of Housing and Local Government in 1987 was aimed solely at establishing and integrating a solid waste management system to maintain environmental sustainability, enhance public health, clean-up of cities, and reduce the volume of solid waste generation through recycling (Manaf, Samah, and Zukki, 2009).

The recycling programme started in Malaysia in the first place since 1993, but it has not progressed significantly. It was therefore re-launched by the Malaysian Ministry of Housing and Local Government in December 2000 (Manaf et al., 2009). This is because the first recycling programme cannot be considered a successful environmental protection programme due to lukewarm attitude and lack of household participation (Knussen, Yule, MacKenzie, and Wells, 2004).

However, efforts for the recycling programme at national level are then carried forward to the subsequent Malaysian Plans, including the Third Outline Perspective Plan (2001-2010), the Integrated Solid Waste Management (2001), the National Strategic Plan for Solid Waste Management (2005), the Master Plan on National Waste Minimisation (2006), the Solid Waste and Public

Cleansing Management Act (2007), the Scheme for Household Waste Management (2011), and the enforcement of Act 672 (2011). In line with the Government's efforts to improve the management of solid waste, the Malaysian Ministry of Housing and Local Government also declared 11<sup>th</sup> November as the National Recycling Day, which aims to meet the national recycling target of 22 per cent (Afroz, Rahman, Masud, and Akhtar, 2017) and the recovery of 100 per cent of urban waste by 2020 (Bong, Ho, Hashim, Lim, Ho, Tan, and Lee, 2017). Indeed, the best way to manage waste generation should start from waste reduction at source (Almasi, Dargahi, Mohammadi, Asadi, Poursadeghiyan, Mohammadi, ... and Yarmohammadi, 2017), i.e. eliminating the generation of household solid waste at source and practising recycling behaviour for reuse or recovery of waste materials.

Solid waste segregation-at-source is seen as the most essential approach (Akil, Foziah, and Ho, 2017) in many rapidly growing towns and cities in developing countries (Banerjee and Sarkhel, 2020) to minimise the amount of waste generated before being transferred to waste disposal sites and landfills (Wang, Tang, Long, Higgitt, He, and Robinson, 2020). However, household solid waste management (Moh and Manaf, 2014) is identified as major barrier to local authorities in many urban areas around the world. In this current context, the solid waste segregation-at-source is interpreted as distinguishing between the different components of "useful" material and the waste stream on the basis of their different categories at the place where it produced before the collection of waste takes place (Iacovidou, Velenturf, and Purnell, 2019).

Unscientific and inadequate municipal solid waste practices have led to low environmental quality problems in Malaysia (Khajuria, Yamamoto, and Morioka, 2010; Nadi, Shamshiry, and Mahmud, 2011). The use of open ground storage or unsightly makeshift containers may impair the city's beautiful image and cause visual pollution (Chung, Muda, Omar, and Manaf, 2016). Visual pollution is an aesthetic concern. People who have a high esthetic value in contact with the environment can significantly increase the overall well-being of individuals (Tweed and Sutherland, 2007) and vice versa, since preferences and perceptions of the visual environment are segments of what makes the environment psychologically comfortable.

Besides that, rapid industrialisation and urbanisation have altered the properties of solid waste generated in a nation. The solid wastes characteristics in Malaysia have been described as a very high organic component content of 45 per cent compared to other developed countries, including Japan (26%), United States (25%), and Germany (14%) (Samah, Manaf, Ahsan, Sulaiman, Agamuthu, and D'Silva, 2013). They also have a bulk density of more than 200 kg/m<sup>3</sup> and a high moisture content. Indeed, social transformation, along with a significant increase in municipal solid waste generation, has been identified as a major consequence of Malaysia's rapid urbanisation (Murad and Siwar, 2007). The average amount of daily solid waste disposed of has increased by 100.75 per cent from 19 000 tonnes in 2005 to 38 142 tonnes of solid waste in

2018. A solid waste management system must therefore be up-to-date in order to match the composition, quantity, and quality of solid waste.

Waste materials are usually categorised according to their different properties, quality, and components. In Malaysia, paper, aluminium, e-waste, plastic, metal, glass and other recyclables will be first sorted at the point of generation of waste. They are then collected in separate containers, which in turn improve the recycling rate and ensure the efficiency of disposal at household level. Table 1.1 presents statistics for each collection of recyclable waste based on their different categories as of 30<sup>th</sup> September 2019.

**Table 1.1: Categories of Solid Waste Landfills Sites by State Statistics in Malaysia as of 30<sup>th</sup> September 2019**

State	Number of Operating Sites			Number of Terminated Sites
	Sanitary	Non-Sanitary	Inert	
Johor	1	8	-	28
Kedah	2	2	-	11
Kelantan	-	10	-	10
Melaka	1	-	-	7
Negeri Sembilan	1	2	-	16
Pahang	2	8	-	22
Perak	1	15	-	15
Perlis	1	-	-	2
Pulau Pinang	1	-	1	1
Sabah	1	21	-	4
Sarawak	3	43	-	20
Selangor	3	2	3	15
Terengganu	1	8	-	12
Federal Territory of Kuala Lumpur	-	-	-	10
Federal Territory of Labuan	1	-	-	-
Federal Territory of Putrajaya	-	-	-	-
<b>TOTAL</b>	<b>19</b>	<b>119</b>	<b>4</b>	<b>173</b>

Source: National Solid Waste Management Department (2019).

Generally, as of 30<sup>th</sup> September 2019, there were 142 waste disposal sites under the responsibility of Malaysian local authorities, of which 19 out of 142 solid waste landfill sites were classified as sanitary landfill sites, 119 of which were classified as non-sanitary landfill sites, while the remaining 4 were classified as inert landfill sites. Surprisingly, Sarawak (43) has been recorded as the state with the most non-sanitary landfill sites. It was followed by Sabah (21) and Perak (15) but there are no municipal landfill sites in the Federal Territory of Kuala Lumpur and the Federal Territory of Putrajaya.

According to research conducted by the United Nations Development Programme in 2008, the majority of municipal landfill sites in Malaysia are still unable to accommodate the amount of solid waste production because they have reached the maximum capacity level. Accordingly, this research has assumed that scavenging activities should be prohibited and that existing environmental threat practices should be immediately stopped. However, local households should actively support household waste minimisation strategies (Cole, Osmani, Quddus, Wheatley, and Kay, 2014), including recycling campaigns, to achieve the target of 22 per cent of the national recycling rate in Malaysia by 2020 and, subsequently, to achieve the goal of sustainable waste management.

For this reason, the Malaysian Ministry of Housing and Local Government has gradually introduced mandatory waste segregation-at-source policy for all Malaysian citizens under the Solid Waste and Public Cleansing Management Act 2007 (Act 672). It is an act that has been revised in the context of the 11<sup>th</sup> Malaysian Plan (2016 – 2020). Likewise, it is an offence under the law not to separate solid waste at source according to solid waste composition, namely cardboard, plastic, paper, food waste, glass, metal, farm waste, and lump waste by 1 September 2015. However, it is important to note that despite the implementation and planning of transformational recycling strategies and solid waste segregation-at-source, there are still several barriers to the success of recycling practices and solid waste segregation-at-source (Moh and Manaf, 2014).

## **1.2 Problem Statement**

The most critical environmental problem in Malaysia is the management of solid waste (Moh and Manaf, 2014). Specifically, municipal solid waste is a solid waste composition that is at the most dominant (64%) (Economic Planning Unit, 2015) compared to other categories of waste in Malaysia, including commercial waste, construction waste, and industrial waste (Fodor and Klemes, 2012). Municipal solid waste commonly includes all community waste, in particular household solid waste (Daskal, Ayalon, and Shechter, 2020).

Interestingly, the amount of solid waste generated has always been seen as a challenging issue (Otitoju and Seng, 2014) as it is closely linked to the country's population growth (Agamuthu and Fauziah, 2011). Statistically, solid waste generation is increasing by more than 90.0 per cent, with the population growing in Malaysia, for the timeline of every 10 years (Jalil, 2010). While the number of solid waste generation is projected to reach 30 000 tonnes by 2020, Malaysian households have, unfortunately, already generated approximately 33 000 tonnes of household waste per day in 2012 (Aja and Al-Kayiem, 2014) compared with approximately 18 000 tonnes in the last 10 years (Zhao, Wang, Lu, Damgaard, and Christensen, 2009).



Compared to previous literature, research regarding the attitude and intention of a household to practise solid waste segregation-at-source is rare. To date, existing literature has explored a variety of general pro-environmental behaviours including the combination of transport, energy, and food consumption behaviour (Gatersleben, Murtagh, and Abrahamse, 2014), energy-saving behaviour (Ajzen, Joyce, Sheikh, and Cote, 2011), and recycling (Nigbur, Lyons, and Uzzell, 2010). In general, these previous researchers have agreed that attitude is an important predictor of behavioural intention. Unfortunately, it pointed out that although an individual has a favourable attitude towards undertaking that recycling behaviour, they have not been able to practise such positive behaviour that can improve the quality of their natural environment (Hassan, Noordin, and Sulaiman, 2010). This situation explains that people tend to take longer to break old traditions and change their current attitudes and practices (Albarracin and Shavitt, 2018). In addition, Trang, Lee, and Han (2019) pointed out that consumers tend to have a negligible attitude towards sustainable products in developing countries. These varied research findings call for a more in-depth investigation of the current scenario of intention to practise solid waste segregation-at-source among households in Selangor.

Meanwhile, the dimensions of the subjective norm – descriptive norm and injunctive norm – are another focus of this research. The influence of the descriptive norm on individual behaviour is a classical concern for research in the field of social psychology (Ioannou, Zampetakis, and Lasaridi, 2013). General research has shown that telling people what other people commonly do is an effective way to bring about some changes in some of the targeted behaviours of a group of individuals, including the pro-environmental behaviour (Goh, Ritchie, and Wang, 2017). A few researchers have found that the descriptive norm has an effect on pro-environmental behaviour (Van Cauwenberg, Clarys, De Bourdeaudhuij, Ghekiere, de Geus, Owen, and Deforche, 2018). There are also some recommendations for considering the descriptive norm for predicting recycling behaviour (Eriksson and Forward, 2011). To date, however, no existing academic research (Elgaaied-Gambier, Monnot, and Reniou, 2018) has shown an examination of the causal relationship between the descriptive norm and the intention to practise solid waste segregation-at-source.

Besides the descriptive norm, it is worth noting that no previous research has investigated the injunctive norm for understanding the intention to practise solid waste segregation-at-source. Indeed, understanding for which injunctive norm feedback is informative conduct that helps to guide the formation of certain pro-environmental behaviours for local communities (Merrill, Miller, Balestrieri, and Carey, 2016). For this reason, similar research related to energy-saving (Ertz, Karakas, and Sarigollu, 2016; Meijer, Catacutan, Sileshi, and Nieuwenhuis, 2015), excessive drinking (Gronhoj and Thogersen, 2012; Prince and Carey, 2010), and green behaviour (Johe and Bhullar, 2016; Wan and Shen, 2015) has been adopted in order to provide an exciting opportunity to fill the literature-based research gap in order to advance general knowledge of injunctive norms.

From the point of view of environmental concerns, the existing literature on environmental concerns is still scarce in the current field of research, namely the intention to practise the solid waste segregation-at-source. As a result, this current scenario still lead to an understanding of environmental concerns, which remains unclear to the body of knowledge. In addition to enriching existing literature, this research is the first attempt to distinguish the variable of single environmental concern into three dimensions (egoistic concern, altruistic concern, biospheric concern). Consequently, this specific variable, in turn, acts as a mediating variable between the attitude, the subjective norm (descriptive norm, injunctive norm), and the intention to practise the solid waste segregation-at-source in order to provide some useful alternatives for improving the natural environment in Malaysia. In other words, the present researcher proposes that the attitude and the subjective norm have an indirect effect on the intention to practise solid waste segregation-at-source through the environmental concerns.

This current research is also a preliminary study that explores and fills the gap in existing literature by treating environmental knowledge as a moderating variable between attitude, subjective norms, and the intention to practise solid waste segregation-at-source. General research has reported that environmental knowledge plays an important role in improving environmentally friendly behaviour (Tong, Anders, Zhang, and Zhang, 2020) among a group of people. Consumers should therefore be given the opportunity to gain sufficient environmental knowledge through either formal or informal education (Hunter, Laursen, and Seymour, 2007), as environmental knowledge appears to be the key indicator (Safari, Salehzadeh, Panahi, and Abolghasemian, 2018) for increasing their awareness of a number of pollution issues and other environmental issues (Tong et al., 2020). However, the important role of environmental knowledge in the environmental impact of human industrial production is not well understood (Alexy, Anklam, Emans, Furfari, Galgani, Hanke, ... and Sokull Kluettgen, 2020). This specific phenomenon tends to cause most people to fail to act in an environmentally responsible manner (Grob, 1995). This is because they are sensitive enough about the environmental issues that have occurred around them. As a result, many households appeared to underestimate the extent of critical environmental problems (Kollmuss and Agyeman, 2002).

Finally, in terms of pro-environmental research, taking into account trends in solid waste management in Malaysia, the concept of recycling and solid waste segregation-at-source has only recently been introduced (Moh and Manaf, 2014). There is therefore still a lack of useful and relevant information in this specific field of research, particularly in the local context. This situation can be seen from most of the previous research which focusses solely on recycling (Tiew, Basri, Watanabe, Zain, Er, and Deng, 2019), sustainable development (Macovei, 2015; Musa, Yacob, and Abdullah, 2019; Otitoju and Seng, 2014; Wan and Shen, 2015), and sustainable food products buying intention (Yogananda and Nair, 2019). In addition to that, despite the implementation and planning of transformative recycling and solid waste segregation-at-source strategies, there are still many challenges to achieving the recycling and solid

waste segregation-at-source objective in order to meet the national recycling target of 22 per cent by 2020 (Moh and Manaf, 2014). By realising scarce knowledge and research in this field, this current research provides an essential opportunity to explore the gaps in knowledge and its literature.

### **1.3 Research Questions**

This aim of this research is to explore the mediating effect of environmental concerns and the moderating effect of environmental knowledge in the relationships between attitude and subjective norms with a view to the intention to practise solid waste segregation-at-source in Selangor, Malaysia. Based on the research issues discussed above, the following research questions are of interest and should be addressed in this research:

1. What are the current scenarios of intention to practise solid waste segregation-at-source?
2. What are the levels of attitude, subjective norms (descriptive norm and injunctive norm), environmental concerns (egoistic concern, altruistic concern, and biospheric concern), environmental knowledge, and intention to practise solid waste segregation-at-source?
3. Are there any relationships between a household's attitude and subjective norms (descriptive norm and injunctive norm) with the intention to practise solid waste segregation-at-source?
4. To what extent do environmental concerns (egoistic concern, altruistic concern, and biospheric concern) mediate the relationships between a household's attitude and subjective norms (descriptive norm and injunctive norm) with the intention to practise solid waste segregation-at-source?
5. To what extent does environmental knowledge moderate the relationships between a household's attitude and subjective norms (descriptive norm and injunctive norm) with the intention to practise solid waste segregation-at-source?

## **1.4 Research Objectives**

The research questions referred to above, after being investigated and analysed, will be able to respond to the following research objectives.

### **1.4.1 General Objective**

Overall, the aim of this current research is to address the mediating effect of environmental concerns and the moderating effect of environmental knowledge in the relationships between a household's attitude and subjective norms with a view to the intention to practise solid waste segregation-at-source in Selangor, Malaysia.

### **1.4.2 Specific Objectives**

1. To explore current scenarios of intention to practise solid waste segregation-at-source among households in Selangor.
2. To evaluate the levels of attitude, subjective norms (descriptive norm and injunctive norm), environmental concerns (egoistic concern, altruistic concern, and biospheric concern), environmental knowledge, and intention to practise solid waste segregation-at-source among households.
3. To investigate the relationships between the household's attitude and subjective norms (descriptive norm and injunctive norm) with the intention to practise solid waste segregation-at-source.
4. To ascertain the mediating effect of environmental concerns (egoistic concern, altruistic concern, and biospheric concern) in the relationships between the household's attitude and subjective norms (descriptive norm and injunctive norm) with the intention to practise solid waste segregation-at-source.
5. To examine the moderating effect of environmental knowledge in the relationships between the household's attitude and subjective norms (descriptive norm and injunctive norm) with the intention to practise solid waste segregation-at-source.

## 1.5 Research Hypotheses

The present research proposed that the following hypotheses should be examined based on the research objective 3, 4, and 5.

- H<sub>a1</sub>: There is a significant relationship between a household's attitude and the intention to practise solid waste segregation-at-source.
- H<sub>a2</sub>: There is a significant relationship between a household's descriptive norm and the intention to practise solid waste segregation-at-source.
- H<sub>a3</sub>: There is a significant relationship between a household's injunctive norm and the intention to practise solid waste segregation-at-source.
- H<sub>a4</sub>: Egoistic concern does mediate the significant relationship between a household's attitude with the intention to practise solid waste segregation-at-source.
- H<sub>a5</sub>: Egoistic concern does mediate the significant relationship between a household's descriptive norm with the intention to practise solid waste segregation-at-source.
- H<sub>a6</sub>: Egoistic concern does mediate the significant relationship between a household's injunctive norm with the intention to practise solid waste segregation-at-source.
- H<sub>a7</sub>: Altruistic concern does mediate the significant relationship between a household's attitude with the intention to practise solid waste segregation-at-source.
- H<sub>a8</sub>: Altruistic concern does mediate the significant relationship between a household's descriptive norm with the intention to practise solid waste segregation-at-source.
- H<sub>a9</sub>: Altruistic concern does mediate the significant relationship between a household's injunctive norm with the intention to practise solid waste segregation-at-source.

- H<sub>a</sub>10: Biospheric concern does mediate the significant relationship between a household's attitude with the intention to practise solid waste segregation-at-source.
- H<sub>a</sub>11: Biospheric concern does mediate the significant relationship between a household's descriptive norm with the intention to practise solid waste segregation-at-source.
- H<sub>a</sub>12: Biospheric concern does mediate the significant relationship between a household's injunctive norm with the intention to practise solid waste segregation-at-source.
- H<sub>a</sub>13: Environmental knowledge does moderate the significant relationship between a household's attitude with the intention to practise solid waste segregation-at-source.
- H<sub>a</sub>14: Environmental knowledge does moderate the significant relationship between a household's descriptive norm with the intention to practise solid waste segregation-at-source.

## **1.6 Significance of Research**

Based on the established goal, the significance of this current research can be considered threefold, including contributions to literature, theoretical, and managerial. The points of view are discussed as follows.

Firstly, from the perspective of the contribution to the literature, this current research aims to contribute to this growing area of research by bridging the gap that exists in previous relevant literature due to the fact that the reading articles used to examine the interrelationships between the attitude, descriptive norm, injunctive norm, egoistic concern, altruistic concern, biospheric concern, environmental knowledge, and the intention to practise solid waste segregation-at-source are limited and scarce in existing literature. Accordingly, the present researcher sees this research as one of the first preliminary research that focusses solely on the intention to practise solid waste segregation-at-source after this particular policy, which was recently launched by the Malaysian Ministry of Urban Wellbeing, Housing, and Local Government in 2015. As a result, this current research is significant to explore a new field of research by providing concrete references for future direction in an effort to further expand, as well as a more accurate picture of the intention to practise solid waste segregation-at-source in a local context that has scarcely been targetly by previous researchers.

Predominantly, with regard to the theoretical perspective, this is the first research that integrates the Value-Basis Theory, Theory of Reasoned Action, Focus Theory of Normative Conduct as well as Fietkau-Kessel Model to predict the intention to practise solid waste segregation-at-source. The present researcher sees this particular aspect as a contribution to the body of knowledge, because there is no existing literature that has integrated these theories into a common research framework to determine the intention of households to practise solid waste segregation-at-source. In addition to that, environmental concerns and environmental knowledge have been introduced for the first time as mediating variable and a moderating variable in this particular scope of research, in order to create a new, valid, and reliable framework for research. The present researcher therefore claims that this research is significant to theoretical because of its ability to test the effectiveness of the proposed research framework as well as to identify significant correlations between the key variables by combining several theories and model in the research.

Ultimately, in terms of the contribution to managerial, this research provides an important insight to advance understanding by providing a more detailed explanation of the specific field of research, namely the intention to practise solid waste segregation-at-source. Thus, the Malaysian non-governmental organisations predict, for an instant, that the Waste Management Association of Malaysia would potentially benefit from the research findings by developing more relevant and workable grassroots-oriented pro-environmental activities. This initiative is intended to provide a platform for the general public to improve their environmental knowledge. It can therefore be one of the alternatives to solve the current problems of solid waste as well as to increase the public's concern for environmental cleanliness. As a result, Malaysian citizens will be able to improve their capability and empower themselves to protect the natural environment for the welfare of their current and future generations. This situation is due to the fact that environmental knowledge can create, improve, and enhance environmental awareness, in turn instilling a sense of responsibility for the cleanliness of surrounding areas among households in Selangor, Malaysia.

### **1.7 Scope and Limitations of Research**

This aim of this research is to explore current scenarios of the households' intention to practise solid waste segregation-at-source in Selangor, Malaysia. Indeed, Selangor is purposely chosen as the research location due to its highest population density, the highest households consumption rate, aggressive economic development, the greatest urbanisation, the potential to be transformed into a low carbon city, and its unique geographical background compared to other states and federal territories in Malaysia (see Section 3.3).

The present research assesses attitude, different dimensions of the subjective norms (descriptive norm and injunctive norm) and environmental concerns (egoistic concern, altruistic concern, and biospheric concern), environmental knowledge as well as the intention to practise solid waste segregation-at-source. More specifically, this current research is intended to investigate the relationships between a household's attitude and subjective norm with the intention to practise solid waste segregation-at-source. It is then followed by an examination of the mediating effect of environmental concerns in the relationships between the attitude and subjective norms with the intention to practise solid waste segregation-at-source. The moderating effect of environmental knowledge in the relationships between a household's attitude and subjective norm with the intention to practise solid waste segregation-at-source is also established.

Besides that, the respondents are the 400 male and female households who are currently living in the housing areas of the nine districts of the state of Selangor, namely Sabak Bernam, Kuala Selangor, Klang, Kuala Langat, Sepang, Hulu Langat, Gombak, Petaling, and Hulu Selangor. In order to obtain a valid and reliable representative for this research, the number of respondents is determined by using the sample size determination equation proposed by Yamane (1967). The multistage sampling method is also used to ensure that the selected respondents are more precise for the output of the research. As a result, a set of self-administrated bilingual questionnaires is distributed to the respondents during data collection.

Unfortunately, several research limitations should be stated in this section because they can potentially affect the quality of the findings of the present research. Firstly, due to time and budget constraints, this research is limited to only 400 respondents. Using the formula proposed by Yamane (1967) to estimate the desired sample sizes, although it is assumed that the number of households, i.e. respondents engaged in this particular research, is sufficient to be carried out in Selangor. However, this sample size may lead to the issue of representativeness at the end of this research compared to the actual population of Malaysian citizens as a whole. As a result, the generalisation of the final findings of the research is still not warranted in this current research.

Secondly, another likely limitation is that current research is confined to exploring and reviewing current scenarios of intention to practise solid waste segregation-at-source among households in Selangor, Malaysia. Accordingly, this research has only prominence in the nine districts of Selangor, with the exception of twelve other states and three federal territories in Malaysia prior to the start of this research. Although the present research location will not be large enough to cover to the whole area of Malaysia, it does provide some useful and important information on the factors affecting the intention to conduct solid waste segregation-at-source among male and female households at the specific research location.



Last but not least, social desirability is a further potential limitation of this research. Social desirability bias is often found in self-reported data (Podsakoff and Organ, 1986; Sackett and Harris, 1984; Sackett, Burris, and Callahan, 1989). The respondents may be dishonest in responding to the instruments provided. There is a strong tendency for households to express their socially desirable responses to research of this nature (Smithikrai, 2008). To present themselves more favourably, households may not be willing to admit their undesirable behaviour to the truth. They may be more likely to give positive answers. The respondents may therefore attempt to inflate their perceived identity by completing questionnaires in such a way that they either over-report good behaviour or under-report bad behaviour. Thus, the accuracy of the data collected may not be perfect, as it depends on the honesty of the participants while responding to the instruments. As a result, in an attempt to reduce the effect of dishonesty, it is assumed that the anonymity of the respondents will be used to ensure greater confidence in the final findings of the research (Bennett and Robinson, 2000).

## **1.8 Definition of Terminologies**

Eight variables are involved in this current research. These include attitude, descriptive norm, injunctive norm, egoistic concern, altruistic concern, biospheric concern, environmental knowledge as well as the intention to practise solid waste segregation-at-source. Each variable is defined in terms of its conceptual and operational definitions.

### **1.8.1 Attitude towards Intention to Practise Solid Waste Segregation-at-Source**

**Conceptual :** Negative or positive assessment of the likelihood of separation of solid waste on the basis of its different properties, which in turn are highly capable of generating influence within the population (Baawain, Al-Mamun, Omidvarborna, Al-Mujaini, and Choudri, 2019).

**Operational :** In the present research, the tools of previous research have been adapted on the basis of respondents' tendency to respond negatively or positively to their relative intention through five scales of Strongly Disagree (1) to Strongly Agree (5).

### **1.8.2 Descriptive Norm towards Intention to Practise Solid Waste Segregation-at-Source**

Conceptual : The perception of the individual (Abdullah, Idris, and Saparon, 2017) towards the tendency of the majority of others to separate unwanted subjects from their origin of production on the basis of different properties. (Ryoo, Hyun, and Sung, 2017).

Operational : In this research, the descriptive norm was measured on the basis of the respondents' thoughts on the action of their key referents, which led them to portray the targeted "appropriate" behaviour in five scales from Never (1) to Always (5).

### **1.8.3 Injunctive Norm towards Intention to Practise Solid Waste Segregation-at-Source**

Conceptual : Perceptions of individuals (Prince and Carey, 2010) towards the level of approval (Merrill et al., 2016) or acceptability (Ecker, Dean, Buckner, and Foster, 2019) of most of their key people who have judged that the intention to perform certain repeated actions of sorting unwanted materials into different categories is a "right" thing to do in a society (Correge, Clavel, Christophe, and Ammi, 2017).

Operational : In the context of this research, it was measured by items tested on the response of households ranging from Strongly Disapproval (1) to Strongly Approval (5) (Ecker et al., 2019) in terms of their belief in acceptability of the level of disapproval or approval of others in terms of their intention to portray certain daily waste sorting procedures in life.

#### **1.8.4 Egoistic Concern towards Intention to Practise Solid Waste Segregation-at-Source**

Conceptual : It is a specific psychological factor (Stern, 2000) that relates to people who focus mainly on the impact of environmental issues and the impact of environmental degradation on a personal level.

Operational : The extent of environmental degradation towards self-interest, including “me”, “my lifestyle”, “my health”, and “my future” is assessed in this research (Schultz, 2000).

#### **1.8.5 Altruistic Concern towards Intention to Practise Solid Waste Segregation-at-Source**

Conceptual : Concern about the effects of environmental deterioration (Ar, 2012) that would jeopardise the health and wellbeing of other people (Stern and Dietz, 1994) on the environment.

Operational : Five items pertaining to the environmental concerns of other people are adapted in the assessment to focus on the impact of natural environmental degradation on human beings.

#### **1.8.6 Biospheric Concern towards Intention to Practise Solid Waste Segregation-at-Source**

Conceptual : Biospheric concern refers to the concern of all living things (Schultz, Gouveia, Cameron, Tankha, Schmuck, and Franek, 2005) in nature due to environmental deterioration.

Operational : This research focusses on the effects environmental damage on plants, birds, marine life, ecosystems, and animals.

### **1.8.7 Environmental Knowledge towards Intention to Practise Solid Waste Segregation-at-Source**

Conceptual : It refers to factual information that has a powerful influence (Tong et al., 2020) on the relationships, concepts or facts related to the ecosystem and its surrounding environment (Paco and Lavrador, 2017) generated by interacting and observing with the non-human and human world.

Operational : In this research, an adaption of the measurement was made to reflect the current context on the impact of human activities on the environment and general information on how domestic waste is produced and how it affects the environment (Tong et al., 2020).

### **1.8.8 Intention to Practise Solid Waste Segregation-at-Source**

Conceptual : A tendency to systematically perform a repeated and typical action of separating unwanted material or matter into different elements according to their recycling potential (Charuvichaipong and Sajor, 2006).

Operational : This term was used to indicate the extent to which targeted respondents intend to carry out waste sorting activities into the required fractions at the place of waste generation – at the source.

## **1.9 Organisation of Thesis**

To achieve the research objectives, this thesis consists of five chapters. Each chapter represents a different stage of the research process. Chapter One provides an introduction to research and provides an overview of the relevant research background and problem statement. Next, research questions, as well as research objectives, are outlined in the following sections. As far as the scope of this research is concerned, the limitations of this research show the focus of current research. The contribution of research has emerged through the significance of the research. This chapter concludes with the definition of terminologies used in research.

Chapter Two outlines a comprehensive review of the literature on research variables and their relationship to variables. Moreover, this chapter elaborates on the mediating effect and the moderating effect shown in the proposed research framework. This chapter also discusses the development of relevant research hypotheses based on the specific research objectives of the present research. The theoretical basis is established in order to develop the research framework for this current research. As a result, the research framework created specifically for this research was shown at the end of this chapter.

Chapter Three shows the methodology used in this research. This chapter deals primarily with research design, research location, sampling procedure, research instrumentation, pre-test assessment, validity and reliability issues as well as data collection techniques. This chapter concludes with the discussion of data analysis techniques applied to the research objectives of the present research.

Chapter Four focusses in particular on the findings and discussions of this research. Discussion of the results of the analysis of the demographic characteristics of the respondents, general questions on the solid waste segregation-at-source, descriptive analysis as well as inferential statistics used according to the research objectives proposed in this research. The research findings were followed in each section. This chapter concludes with the testing of hypotheses and its summary.

Chapter Five presents a summary of the research, conclusions, implications, and recommendations for the future direction of research. This chapter begins with a summary of the key findings of this research. Moreover, this chapter sets out the findings on the basis of the proposed research objectives that reflect the discussions in this research. The theoretical implications, as well as the policy implications, are outlined in the following section. The final part of this chapter is the recommendation for future research.

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## BIODATA OF STUDENT

Cheng Kai Wah obtained his bachelor's degree in Consumer Studies with Advocacy and Consumer Education as its minor in 2015 and Master of Science in the field of Consumer Science, specialising in the field of sustainable consumption, from Universiti Putra Malaysia, at the age of 26. He enrolled in his Doctor of Philosophy under the same field of specialisation in 2018. Cheng Kai Wah was appointed as a Graduate Research Fellow at the Department of Resource Management and Consumer Studies, Faculty of Human Ecology, Universiti Putra Malaysia since 2015. Prior to that, he had been employed as a relief teacher or *Guru Sandaran Tidak Terlatih* at Sekolah Jenis Kebangsaan (Cina) Foon Yew 5, Pasir Gudang in 2011.

Cheng Kai Wah has been awarded the Best Paper Award in the 23<sup>rd</sup> Malaysian Consumer and Family Economics Association National Seminar 2019. Other than his achievements in his academic and research, in 2020, Cheng Kai Wah has been also appointed as the Secretary-General of the Human Ecology Postgraduate Students' Association Executive Council, Universiti Putra Malaysia. Prior to this appointment, he was the Deputy Secretary of the Zhong Hua Cultural Arts Society, Universiti Putra Malaysia (2014 – 2015), a candidate of the Students' Representative Council, Universiti Putra Malaysia (2014 – 2015) as well as an executive committee member of the Students' Highest Council at Universiti Putra Malaysia from 2013 to 2014.

Cheng Kai Wah is a Malaysian, born in Mersing, Johor on 14<sup>th</sup> February 1991 and raised in Johor Bahru, Johor.

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