UNIVERSITI PUTRA MALAYSIA

INTENTION TO PRACTICE WASTE SEPARATION AT SOURCE AMONG HOUSEHOLDS IN PUTRAJAYA, MALAYSIA

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By

SITI AISHAH BINTI MD ISMAIL

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,in Fulfilment of the Requirements for the Degree of Master of Science

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DEDICATION

Alhamdulillah Thank you to Almighty Allah S.W.T for the blessed and everything have been given. Special dedication to my beloved parents, Noor'Aini Hj Abdullah and Md Ismail Sairin as well as my wonderful siblings especially my sisters (Ayza Sariza, Kakak, Efah) and my dearest brothers. I am totally proud to have you in my life. Last but not least, a thousand of thank you to my beloved supporter Muhammad Faiz Abd Malik through his endlessly support, advices and encouragement. Arigatou gozaimashita!

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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Chair : ZainalAbidin Mohamed, PhD
Faculty : Agriculture

In Malaysia, the public concerns on the effects of not separating waste for recycling, the sense of responsibility in managing waste properly as well as their mentality towards cleanliness is still very low. The widespread and open dumping in Malaysia had caused the landfill site worsening while source separation for recycling is at a minimal. Moreover, the generation of municipal solid waste has increased more than 91% over the past decade and the biggest contributor to waste generation was city dwellers of the urban country which constituted more than 65% of the total population. The households are the initial sources of solid waste and became the country's main generator of municipal solid waste (MSW). It was found that promoting recycling and waste separation at the household level as a good method to reduce the amount of waste generated, costs of waste collection and raised public health. Therefore, households are encouraged to engage in waste separation at source. Thus, it is important to understand what drives household intend to practice waste separation at source before any program or campaign on waste separation are implemented.

Waste separation at source is been introduced by stages starting on 1st September 2015 by government in eight states including Putrajaya to enhance recycling activities of waste material generated. Hence, this study was undertaken to identify variables which are significantly influence household intention to engage in waste separation at source in selected areas in Putrajaya. The modified Theory of Planned Behaviour (TPB) is applied in the study. Three hundred and twelve (312) respondents with different housing strata were selected using systematic stratified random sampling.

The results revealed that 67% of the respondents had aware of waste separation at source program and 100% of them intend to do waste separation at home. The study revealed four factors, namely attitude, subjective norms, knowledge and perceived behavioural control which have significantly predicted the intention among households at practicing

waste separation. These factors contributed 70.06% in determining households with intention to practice waste separation. The ordinal analysis indicated the relationship of intention for the implementation of new waste separation with the socio-economic variables such as gender, marital status, family size, education level, type of houses and income also influenced the household's intention to practice waste separation at source.

Subsequently, the attitude, subjective norm and knowledge were positively related to the households' intention to engage in waste separation, whereas perceived behavioural control was insignificant. Based on the parallel estimate, the observed significance was 0.817 ($p>0.05$), indicating consistency in the observed data and the Pseudo R-Square of 42.10% indicated that all predictors were able to explain the households' intention. The waste separation issue is widely discussed globally, and this study can contribute to the current literature focusing in selected areas with different housing strata. Thus, understanding the attitudes and factors that shape the intention to separate waste at source can be instrumental for policy development to educate and create awareness among the household's behaviours to participate in waste separation at source.

Abstrak tesis dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

HASRAT UNTUK MEMPRAKTIKKAN PENGASINGAN SISA PEPEJAL DI PUNCA DALAM KALANGAN ISI RUMAH DI PUTRAJAYA, MALAYSIA

Oleh

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Di Malaysia, kebimbangan orang ramai terhadap implikasi tidak mengasingkan sisa untuk kitar semula, rasa tanggungjawab dalam menguruskan sisa dengan betul serta mentaliti mereka terhadap kebersihan masih sangat rendah. Pembuangan terbuka secara meluas di Malaysia telah menyebabkan tapak pelupusan semakin terjejas manakala pengasingan sisa untuk kitar semula adalah sangat minima. Selain itu, penjanaan sisa pepejal perbandaran telah meningkat lebih daripada 91% sepanjang dekad yang lalu dan menjadi penyumbang terbesar kepada penjanaan sisa adalah penduduk di bandar mewakili sebanyak 65% daripada jumlah penduduk. Isi rumah merupakan sumber utama terhadap sisa pepejal dan menjadi penjana utama sisa pepejal perbandaran (MSW) negara. Didapati bahawa dengan mempromosikan kitar semula dan pengasingan sisa di peringkat isi rumah adalah kaedah terbaik bagi mengurangkan jumlah sampah yang dijana, kos kutipan sisa dan meningkatkan kesihatan awam. Oleh itu, isi rumah digalakkan terlibat di dalam pengasingan sisa di punca. Sehubungan itu, adalah penting untuk memahami apa yang mendorong keinginan isi rumah untuk melaksanakan pengasingan sisa di punca sebelum sebarang program atau kempen berkaitan dilaksanakan.

Pengasingan sisa di punca telah diperkenalkan secara berperingkat mulai 1 September 2015 oleh kerajaan di lapan negeri termasuk Putrajaya untuk meningkatkan aktiviti kitar semula bahan buangan yang dijana. Oleh itu, kajian ini dijalankan untuk mengenal pasti pembolehubah yang mempengaruhi hasrat isi rumah untuk melibatkan diri dalam pengasingan sisa di punca di kawasan terpilih di Putrajaya. Teori Kelakuan Terancang (TPB) yang diubah suai telah digunakan dalam kajian ini. Seramai tiga ratus dua belas (312) responden yang menetap di kediaman strata berbeza telah dipilih menggunakan pensampelan rawak berstrata bersistematik.

Dapatan menunjukkan bahawa 67% daripada responden menyedari tentang program pengasingan sisa di punca dan 100% daripada mereka berhasrat melaksanakan pengasingan sisa di rumah. Kajian ini mendedahkan empat faktor iaitu sikap, norma subjektif, pengetahuan dan kawalan tingkah laku yang diramalkan mempengaruhi keinginan dalam kalangan isi rumah untuk mempraktikkan pengasingan sisa. Faktor-faktor ini menyumbang 70.06% dalam menentukan isi rumah mempunyai hasrat untuk mempraktikkan pengasingan sisa. Analisis ordinal menunjukkan hubungan antara hasrat untuk pelaksanaan pengasingan sisa yang baharu dengan pemboleh ubah sosio-ekonomi seperti jantina, status perkahwinan, bilangan ahli keluarga, tahap pendidikan, jenis rumah dan pendapatan juga mempengaruhi hasrat isi rumah untuk mempraktikkan pengasingan sisa di punca.

Selanjutnya, sikap, norma subjektif dan pengetahuan juga mempunyai hubungan positif terhadap hasrat isi rumah untuk terlibat dalam pengasingan sisa sementara kawalan tingkah laku dilihat tidak mempengaruhi. Berdasarkan kepada anggaran selari, nilai diperhatikan adalah 0.817 di mana ($p>0.05$), menunjukkan konsistensi dalam data yang diperhatikan dan nilai 'Pseudo R-Square' sebanyak 42.10% menunjukkan bahawa semua pembolehubah dapat menjelaskan hasrat isi rumah. Isu pengasingan sisa telah dibincangkan meluas secara global, dan kajian ini dapat menyumbang kepada kajian semasa yang memfokuskan kepada kawasan terpilih dengan strata perumahan yang berbeza. Oleh itu, dengan memahami sikap dan faktor-faktor yang membentuk hasrat untuk mengasingkan sisa di punca boleh dijadikan kayu ukur pembangunan dasar untuk mendidik dan mewujudkan kesedaran dalam tingkah laku isi rumah untuk terlibat dalam pengasingan sisa di punca.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follow:

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

MSW	Municipal Solid Waste
UN-ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
C&D	Construction and demolition
KPKT	Kementerian Kesejahteraan Bandar, Perumahan dan Kerajaan
EU-PSWMP	EU-Perak Solid Waste Management Plan
MHLG	Ministry of Housing and Local Government
NSP	National Strategic Plan
3Rs	Reduce, Reuse, Recycle
1MBOD	1 Million Bottles One Dream
SWCorp	Solid Waste and Public Cleansing Management Corporation
LA	Local Authorities
NSWMD	National Solid Wastes Management Department
RCRA	Resources Conservation and Recovery Act
MSWM	Municipal Solid Waste Management
EPSM	Environment Protection Society Malaysia
TRA	Theory of Reasoned Action
TPB	Theory of Planned Behaviour
PBC	Perceived Behavioural Control
NGOs	Non-Governmental Organizations
DOSM	Department of Statistic Malaysia
EFA	Exploratory Factor Analysis
KMO	Keiser-Meyer-Olkin
OR	Odd Ratio
β	Exponential Beta Exp
$e\beta$	Odd Ratio
POM	Proportional Odds Model
SPSS	Statistical Package for Social Science

CHAPTER 1

INTRODUCTION

Solid waste generation and management has become a concerning issue in most countries occurring at any level. Ineffective solid waste management and disposal including incomplete collecting system coverage, improper collection services, open dumping and uncontrolled open burning, as well as the informal waste picking or scavenging activities have impacted the environment and human health. In Malaysia, much has been debated on the waste management issue that regulation has been introduced and implemented to ensure a clean environment and healthy living condition. This chapter discusses the global waste management practices**,** Solid Waste Management Practices and Disposal in Malaysia, National Development Plans and Solid Waste Management Plan, Waste Separation at Source in Malaysia, the problem and the objectives of the current study.

1.1 Global Solid Waste Management Practices

Several alternatives were undertaken to manage solid waste properly. In the waste management hierarchy, the technology and practices conducted towards waste management cycle consisting the elements of reduction, collection and transportation to the final disposal. According to the World Bank (2012), the efficiency and effectiveness of the solid waste management depends on crucial factors such as financial sources, policy priority, social norms, and environmental aspects. Based on the waste hierarchy method, the waste reduction seems to be the most preferred practice towards managing waste issues. The waste management practices applied by different countries based on income level were compared among the elements involved. According to Pharino (2017), higher income countries are more advanced and efficient in managing waste by following the concept of the hierarchy by recycling the waste into a resource. There are seven elements in the hierarchy where practices of source reduction need to be considered. In terms of source reduction, the 3R program which emphasized on reduce, reuse and recycle was implemented to help minimize the waste generation. The findings showed that higher income countries had effectively raised the 3Rs' awareness through educational program implemented to minimize the waste generation. Meanwhile, the low-income countries the program did not reached the target as the rate of waste produced are lower in low income country. To encourage public to engage with the waste segregation requires significant efforts to change their behaviour as well as providing adequate facilities such as different bins for different wastes and the incentive scheme to ensure the sustainability of waste reduction in the long-term by the public (Storey et al., 2013) and UN-ESCAP (2015).

The second element in the waste hierarchy is waste collection at the point of production such as residential, institutional, commercial and industrial sectors to the place of the waste should be treated or disposed. According to Hoornweg and Bhada-Tata (2012), the

low income countries such as in African regions have low in collection rates which is around 41% while in high-income countries such as Japan, Italy, Germany and others have high collection rates which is on average of 98%. Aleluia and Ferrao (2016) also reported similar findings where the waste collection rates in high-income countries are relatively closer to 100% compared low-income and lower-middle income countries. In short, the waste collection rates were higher in most of the larger and richer cities compared to smaller cities due to the limited financial resources by the local governments to support workers to improve the services.

Furthermore, in high-income countries the recycling practices are more advanced with the adoption of technology to ease and facilitate sorting and recycling materials to be processed. Therefore, the recycling rate is higher in high-income countries. For instance, Singapore has achieved 44% of recycling rate out of their waste whereas the low-and middle-income countries has only achieved 8 to 11% of waste recycling (Ngoc and Schnitzer, 2009). Evidently, the cities in developing countries such as Vietnam, the recycling rates found in range from 20% to 30%. Composting is an alternative to reduce the amount of waste being sent to the landfill. It is also beneficial when the waste segregation at the point of its generation is carried out effectively by the community. In fact, composting has been widely practiced in high-income countries compared to low-income countries. In developing countries, composting is practiced at the household-scale to centralized plants (Aleluia and Ferrao, 2016).

The incineration method is somehow included in the waste hierarchy in some of the countries as it is one of the effective methods used to minimize the waste capacity, as well as to save the space of landfill. However, incineration is a costly method incurring large capital with high maintenance cost that requires technical operations and instruments to control the emission of gas residues (Thi et al., 2015). According to Hoornweg and Bhada-Tata (2012), the incineration method can only be adopted by high-income countries instead of the low-income countries as the waste management using incineration very costly than the land filling method. In addition to the limited waste separation amount at source, the higher moisture content in the wastage composition generated by low-income countries affects the performance of incineration process.

Land filling, or known as dumping method, is widely used by low-income and developing countries. The wastes are burned openly at the dumping site of landfill. In comparison to high-income countries, cutting-edge techniques are employed to recover biogas where the waste is converted into energy as means to overcome dependence on landfill. Besides, there is the compliance to policy and regulation on environmental and energy enforced by the legislative body within a country. Although the open dumping and land filling is still being openly practiced in middle-income countries, controlled and sanitary landfills are managed as an effort to contain the increasing greenhouse gas emissions (Adhikari et al., 2009).

The cost in waste management differs among different countries. The land filling remains as the conventional method in managing the municipal solid waste disposal (MSW) among the authorities in developing countries (Agamuthu, 2013). According to Hoornweg and Bhada-Tata (2012), the low-income countries spent 80% to 90% of the

MSW management financial support on collection while the smaller amount is allocated on disposal. The middle-income countries, on the one hand, spent 50% to 80% of the budget on the collection and waste disposal. Contrary, the high-income countries spent only 10% or less of the budget on collection while allocating the larger budget on waste treatment facilities and implementing waste management programs such as recycling and recovery as a means to reduce costs and simultaneously encourage active participation among the community.

1.2 Solid Waste Management Practices and Disposal in Malaysia

The municipal solid waste is defined by the World Bank as a residential, industrial, municipal, commercial, institutional, construction and demolition (C & D) waste. The capacity of solid waste generation is predicted to increase by approximately 2.2 billion metric tonnes per year by 2025. Municipal solid waste generation continues to increase, and its management has become a major problem until now especially in Malaysia due to the rapid increase in volume and its composition (Agamuthu et al., 2009). Solid waste disposal is strongly related to the costs involved and also a burden to local governments and companies due to the high management and operational costs. In Malaysia, 33,000 tonnes of waste were collected daily and the cost required in managing the solid waste management purposes accounted about RM1.4 billion a year (KPKT, 2015).

The population of Malaysia in 2017 is 32.0 million. The key statistics on population and demographic highlighted that 75.5% of the citizens live in urban areas whereas the 24.5% live in rural areas (Department of Statistics Malaysia, 2017). The volume and daily generation of MSW in the country accelerated with increasing number of populations along with economic growth, modernization and affluent lifestyle and higher rate of food consumption (Ghani et al., 2013). In 2012, the total waste generated by Malaysian was about 33,000 tonne/day and the amount has been rise up to 38,000 tonne/day in 2015. The amount of domestic solid waste generation had shown that the rate exceeds the expectations assigned by the Japan International Cooperation Agency of 30,000 tonnes by 2020 (Berita Harian, 2016). Moreover, the Department of Solid Waste and Public Cleansing Management Corporation (SWCorp) has been estimated on the average generation rate of the waste ranging 0.8kg/capita/day to 1.12kg/capita/day in 2016. It is expected to increase from 0.8kg/capita/day to 1.7kg/capita/day in 2020 with the factors of the increasing population growth assumed to be about 4% per year and the recycling rate of the country increasing from 17.49% in 2016 to 22% in 2020.

High generation rate of solid waste in Malaysia takes place due to rapid economic growth, rural-urban migration, lifestyle changes together with the significant improvement of living standard. The increase of solid waste generation over the years happens without any changes in the habits and attitudes of Malaysians in managing their waste properly. It is found that the solid waste generation also increases at an uncontrollable rate due to plastic and paper materials usage in packaging as the materials become dispensable to the consumers (Malahkahmad et al., 2010; Jalil, 2010).

Solid waste management is the biggest environmental issue in Malaysia. The main disposal method applied in managing the increase of solid waste generation highly depending on landfills (Moh and Manaf, 2014; Nagapan et al., 2012). Moreover, the existence of solid waste management practices in Malaysia where solid waste collected and disposed of without any incentive to recycle will lead to excessive waste collection, resulting in uncontrolled disposal, increasing cost and reducing the lifespan of an existing landfill (Oteng-Ababio, 2014). Generally, solid waste composition in Malaysia was dominated by municipal solid waste (MSW) which is about 64% with the remaining consisting of industrial waste, commercial waste and construction waste (EU-PSWMP, 2009).

Landfills is the most effective facilities used as final MSW disposal method in Malaysia as it is the most economical one. In Malaysia it was approximately 93.5% of municipal solid waste (MSW) is sent directly to the landfill or dumpsites without proper sorting, whilst there is only 5.5% of MSW being recycled and 1.0% composted (Periathamby et al., 2009). The amount of MSW disposed in the current 176 operating landfills is more than 30,000 tonnes/day. If this phenomenon continues, the existing landfills will be affected within a short period of time and leads to environmental pollution.

The solid waste production and population growth are strongly related. Studies have shown that the amount of waste generated increases with population growth (Abushammala et al., 2011). Table 1.1 shows the detail composition of waste sent to landfills in Malaysia. The main component in Malaysian municipal solid waste is organic waste/food waste. The major component of waste generated is food waste which contains high organic compound, contributing 44.5%. Plastics and disposable diaper contributed 13.2% and 12.1%, respectively. According to Fauziah and Agamuthu (2010), a larger amount of Malaysian municipal solid waste is recyclables including paper, plastic, glass, metal and aluminium. Recyclable items contribute about 30% of the total waste, which is considered valuable materials to be disposed into landfill. Therefore, disposing these valuable materials into the landfill could implicate the loss of resources, as well as rapid utilization of landfill space and reduce the life-span of landfills in this country.

Table 1.1. Solid Waste Composition in Malaysia

Category	Percentage (%)
Organic/ Food Waste	44.5
Plastic	13.2
Paper	8.5
Disposable diaper	12.1
Garden Waste	5.8
Glass	3.3
Metal	2.7
Textile	3.1
Tetra pax	1.6
Rubber	1.8
Leather goods	0.4
Wood	1.4
Household hazardous waste	1.3

Others	0.5
Total	100

(Source: Ministry of Housing and Local Government, 2016)

Malaysians habit of disposing waste indicates a potential of diverting waste via recycling methods. However, the problem in terms of material recovery is that different kinds of wastes are mixed together causing high moisture content and this reduces the value of the recyclable items.

1.3 National Development Plans and Solid Waste Management Plan

The development of solid waste management policy and plan strategies by Government has been implemented in Malaysia to cope with solid waste problem. The necessary solution on waste problem needed to be taken at any level from local to global (Botetzagias et al., 2015). Therefore, the development of solid waste management policy and plan strategies under the introduced legislation should be realistic geographically and culturally (Agamuthu, et al., 2009). The specific national development plans and solid waste management plans has been considered as an important role in transforming solid waste management policy and plan strategies in Malaysia.

1.3.1 Tenth Malaysia Plan

The Government in its Tenth Malaysia plan has targeted the country to be zero waste by 2020. The effort includes waste reduction, reuse, recovery and recycling to minimize the quantity of the wastes from being sent to the landfills. Despite the high amount of waste produced, the standards of waste management in Malaysia are still poor due to outdated and poor documentation of waste generation rates and composition, improper storage, collection systems, indiscriminate disposal of municipal wastes as well as inefficient utilization of disposal site. Improper solid waste management will contribute in climate change. Decomposing waste produces methane gas while the production of new products to meet consumer demand will produce greenhouse emissions as well as the excessive use of natural resources. Concerning the waste generation issue in the Tenth Malaysia Plan (2011-2015), the government has closed, rehabilitated or upgraded the existing 112 unsanitary landfills across the nation to sanitary landfills. The system has made it compulsory for homeowners to separate waste at source and recycle (Tenth Malaysia Plan, 2010).

1.3.2 Eleventh Malaysia Plan

The plan was further carried out in the Eleventh Malaysian Plan (2016-2020) with the emphasis on promoting waste separation at source especially at the household levels. The 3R awareness and education programmes were invested to create better consumption and waste disposal behaviour as well as to promote waste separation at source for households (Eleventh Malaysia Plan, 2016). The implementation of waste separation at source could help in achieving recycling outcomes. According to the plan, the waste

separation at source for households was implemented in selected states in September 2015 and subsequently in other states in the Eleventh Plan.

1.3.3 ABC Plan (The Action Plan for a Beautiful and Clean Malaysia)

Ministry of Housing and Local Government (MHLG) has created the ABC's Plan in order to reduce the amount of solid waste generation. However, there was no legal and instrument to implement the plan. This plan developed as a road map for better solid waste management in Malaysia which is leading to the first and second recycling program in 1993 and 2000. According to Moh and Manaf, (2014), the first national recycling program failed and the rate of recycling were still low due to lack of public response and participation caused by low demand for recyclable materials, inability to sustain the program among the local authorities, poor collection services, ineffective awareness program, lack of policy and master plan focusing on recycling. Then, the second national recycling program in 2000 was conducted in order to develop 3Rs habit together with other awareness campaigns and television advertising. However, the practice of sorting waste for recycling remains poor among Malaysians.

1.3.4 National Strategic Plan for Solid Waste Management

The National Strategic Plan for Solid Waste Management (NSP) was developed in 2002 and adopted in 2005 with the aims of providing basis for SWM policies and measures in Peninsular Malaysia until 2020. The NSP sets the key strategy for achieving sustainable waste management through reduction, reusing and recycling, the use of appropriate technology, facilities and equipment to provide a sustainable and comprehensive solid waste management services. The Action Plan are provided as guidance to the Malaysian government as well as stakeholders in implementing NSP, recommending the activities to address the SWM issues including the formulation of the "3R Master Plan" which is the basis of Waste Minimization Master Plan. Furthermore, the NSP emphasizes on the importance of reducing waste generation at the source and it needs to be implemented. The NSP discovered the lack of legal instruments that can influence the waste generators towards waste reduction. The "Zero Waste" concept has been implemented by the NSP as a long term method instead of preparing other tasks to be done in the short term (MHLG, 2006).

1.4 Waste Separation at Source in Malaysia

The handling of municipal solid waste management has been challenging due to the increasing solid waste and it is essential that the Malaysian government paid attention on findings solution to reduce the amount of solid waste generation effectively. Additionally, in Malaysia, it was found that households is the main generator source of municipal solid waste (MSW) consisting of recyclable materials about 70% to 80% of waste composition found to be sent to landfills (Moh and Manaf, 2014) compared to other waste generator. In addition, the projection of future waste generation in Malaysia has been conducted involving households and business entity as shown in Table 1.2.

Table 1.2. Projection of Waste Generation in Malaysia (2015 – 2020)

Year	2015	2016	2017	2018	2019	2020
	Unit in tonnes/year					
Households	8,403,769	8,683,279	8,972,084	9,270,496	9,578,833	9,897,425
B. Entities	4,456,887	4,695,419	4,946,718	5,211,466	5,490,384	5,784,230
Total	12,860,656	13,378,698	13,918,803	14,481,962	15,069,217	15,681,654

(Source: Ministry of Housing and Local Government Malaysia, 2006)

The Table 1.2 shows that the assumption of waste generation for the year of 2020 in Malaysia. As recorded, the household waste generation dominated with huge amount of waste produced compared to other business entities. In 2015, the amount of waste generated is 8,403,769 tonnes/year and it tremendously increases to 9,270,496 tonnes/year in 2018. Then again, the estimation of households' waste generation in 2019 is about 9,578,833 tonnes/year and it tends to be higher in 2020 which accounted about 9,897,425 tonnes/year. While the business entities show a parallel increase of waste generated year by year which is slower than households. This assumption has been made with no significant changes in lifestyle considered other factors are constant. Therefore, this alarming situation in waste generation prompted the Malaysian government to launch the various programs and campaigns in order to address the waste generation issue.

Various campaigns have been conducted by the government and the private sector, but the awareness for recycling among Malaysians is still at low level even though it has more benefits for life (Berita Harian, 2016). This also supported by Omran et al. (2009) people refused to practice the waste recycling behaviour although they has knowledge and awareness which lead to improper waste management. The practicing of 3R could help in protect the environment, public health, but the process is rarely concerned by the public. Most of Malaysian people do not concerned about recycling and they do not realize that recycling can create jobs opportunities as side income easily. Realizing the importance of the practice, the pattern of increasing solid waste from time to time as well as focusing on changing Malaysian behaviour in minimising waste, the government has further assigned the Waste Separation at Source (Eleventh Malaysia Plan, 2016). In this Eleventh Malaysia Plan, the government is focusing on adopting waste separation behaviour among the community through any activities and investing more in order to address the critical waste issue. Hence, government has come out with strategy emphasized in changing Malaysia behaviour especially on waste separation at source which is launched on 1st September 2015.

There are also some research had been conducted to assist in waste reduction generated in this country such as the study emphasising on benefit cost analysis on economic feasibility of construction waste minimisation (Begum et al., 2006), Sreenivasan et al. (2012) focuses on solid waste management in Malaysia as well as other research focusing on food waste separation (Pakpour et al., 2014; Ghani et al., 2013; Eisted and Christensen, 2011). Based on literature, it is noticed that the research conducted in

Malaysia on household waste separation were less and due to this, the present study was conducted to explore the solid waste separation intention among households in selected at Putrajaya.

According to Kementerian Kesejahteraan Bandar, Perumahan dan Kerajaan, KPKT (2015), the purpose of waste separation at source focusing on housing premises is because the 33,000 tonnes of solid generated daily stems from home and only 10.5% of the solid waste was recycled while the rest were disposed at the landfill. Moreover, uncontrolled solid waste generation will create negative effects towards the environment, human and animal health, as well as causing serious impacts to the financial and socio economic losses in the country (Fadhilludin, 2015). The effort was implemented by the government is to reduce 40% of solid waste by sending it directly to landfills. Information and brochures related to solid waste separation at source with the objective of engaging households to practice recycling were distributed. The program was also undertaken to achieve the goal of 22% recycling rate in 2020.

Due to this, the 3Rs campaign (Reduce, Reuse, and Recycle) had been intensified through the separation of waste at the source. The 3Rs campaign had been established in 2000 and it was maintained as the main driving force towards a sustainable solid waste management. In addition, various approaches were also implemented by MHLG to manage solid waste problem such as "1 Million Bottles One Dream" (1MBOD) campaign to provide clear indication on the importance of waste separation at source. This also helps in transforming the community awareness to practice recycling activities while initiating their intention to preserve and save the earth. Elsewhere, Alam Flora.Sdn.Bhd who is responsible in handling solid waste in states such as Pahang,Federal Territories of Kuala Lumpur and Putrajaya has provided free garbage bins with a capacity of 120 litres in the residential area. The residual waste such as kitchen waste, contaminated materials, food waste and disposal diapers should be placed inside the garbage bin while for the recyclable wastes such as bulky waste, garden waste, paper, plastic and others (i.e. glass/ceramics, electronic waste, hazardous waste) need to be placed next to garbage bin.

Waste separation was seen as a good strategy that could not only reduce the amount of waste produced but also practical. The cost of solid waste management is not only reduced but the efficiency of recycling and the quality of recyclable materials can be improved as well granted that the occupants sorted the waste correctly (Rousta and Ekstrom, 2013). According to Fadhilludin (2015) the waste separation helps in increasing the life-span of landfill in Malaysia. The 3R activities which intensified through waste separation at source has been identified as the most effective steps in reducing a total of solid waste generation and delivered to landfills (National Solid Waste Management Department, 2015).

Overall, the waste separation at source is undeniably a successful method that has been widely practiced in most developing countries to manage solid waste problem as a long-term solution (Charuvichaipong and Sajor, 2006). Moreover, the participation rate of recycling in Malaysia is low due to the poor practice of recycling program at home. Therefore, there is an urgency to adopt waste separation practice especially among the

household. The success of waste separation at source depends on residents' intention, willingness and their proper environmental practices. This is supported by Babaei et al. (2015) in the study on recycling attitudes in developing countries revealed that there are high level of awareness and positive perception on waste separation, unfortunately only a few participate to separate the waste. The implementation of this waste separation at source is not an easy task as it requires the full commitment from the public to participate in the practices at home.

1.5 Problem Statement

In Malaysia, the household is identified as the primary contributor to waste generat1ion. Recyclable materials composed 70-80% of the total waste composition that is dumped into landfills (Moh and Manaf, 2014). Uncontrollable generation of solid waste will not only implicate negatively towards environmental, human and animal health but also incur serious financial and socio-economic losses. Therefore, household solid waste management needs to be addressed with urgency. "Separation of Solid Waste at Source" program was introduced by the Ministry of Housing and Local Government (MHLG) at various stages in eight states covering Federal Territory of Kuala Lumpur, Putrajaya, Pahang, Johor, Melaka, Negeri Sembilan, Perlis and Kedah in September, 2015. Despite the Solid Waste Management and Public Cleansing Act 2007 (Act 672), residents were only fined starting on 1 June 2016 to provide more preparation time to the landowners, as well as to raise their awareness on the importance of practicing separation of solid wastes at home.

The solid waste separation at source is heavily promoted, especially in the residential area of Putrajaya. According to Solid Waste and Public Cleansing Management Corporation SWCorp in 2016, Putrajaya generated 16.26 tonnes of recyclable waste, the second lowest among the six states that have been involved in the implementation of waste separation at the source under Solid Waste Management and Public Cleansing Act 2007 (Act 672). The data shows that the participation of residents of Putrajaya in waste separation at source is needed where proper planning must be implemented to avoid wastage in sources and energy due to inaccurate disposal methods.
Moreover, managing the program would prove an uphill task given the habitual practices of Malaysian at disposing waste in a plastic bag. Therefore, each household need to know the proper practices to implement solid waste separation programs at the source to ensure that domestic waste can be systematically and efficiently disposed of. Moreover, households also need to be aware of the bin provided only can be used for recyclable waste and domestic waste only. With the efforts taken by related parties, it is a priority for this study to be conducted to identify households' intention to engage in practicing waste separation at source since the concept and campaigning waste separation are relatively new in Malaysia.

In short, the assessment needs to be carried out to ensure a successful implementation of waste separation at source in the selected residential areas in Putrajaya. Moreover, the intentions of the implementation of the solid waste separation at source must be identified since the public have been aware of the importance of waste separation yet they do not practice waste separation. The successful of waste separation at source also

depends on residents' intention, willingness and their proper environmental practices. Hence, it is essential to identify and analyse the predictors that will affect the households' intention to perform in solid waste separation at source. In addition, the present study also aims to determine whether the waste separation at the source program could cultivate the attitude, awareness toward better waste management practices regardless different strata of housing estates.

1.6 Research Questions

(i) Do households aware and know how to participate in waste separation at source?
(ii) What are the factors that could influence household's intention to practice waste separation?
(iii) What are the factors significantly influence the intention to participate in separating waste at source among the household?

1.7 Objective of the Study

The general objective of the study is to investigate the households' intention to practice waste separation at source.

The specific objectives are:
(i) To determine the respondents' awareness and knowledge towards waste separation at source.
(ii) To identify the underlying factors influencing household towards the intention to practice waste separation at source.
(iii) To determine the extent of TPB construct that are significantly influencing the intention to practice waste separation at source.

1.8 Significance of the Study

1.8.1 Government and Private Sectors

The study could help the government and private sectors in creating the waste separation program effectively. Information on the factors that drive the households' intention to practice waste separation at home such as attitude, knowledge, and their socio-demographic characteristics (i.e. age, type of house, etc.) can be utilized by parties such as Ministry of Housing and Local Government, National Solid Wastes Management Department (NSWMD), Solid Waste and Public Cleansing Management Corporation and other concessionaires to help shaping the attitude and improve the efficiency of waste separation in the societies.

Furthermore, the study can provide information on the acceptance level among households toward waste separation program. This would provide an opportunity for the government and private companies to form strategies that can help efficient

implementation of waste separation programs. Such strategies include better dissemination of information and promotion on waste separation at source through various media i.e. radio channels, newspapers, while establishing consistent public awareness on the benefits of waste separation. This study will also benefit the local authorities (LA) towards better planning for their municipal solid waste in their jurisdiction area with useful information on the level of awareness, knowledge, and the contribution of the household towards waste separation at source as well as other environmental program. Information on the factors that significantly affect the households' intention to practice waste separation would enable the state's local authorities for better planning and proper management of their program.

1.8.2 Households

The present study would prove beneficial for the household as a medium to voice their opinions and problems regarding solid waste management program established in their area. The survey conducted on waste separation program at source could not only help educates the household to manage waste properly starting at home, but also increases the level of knowledge and awareness on the national plans and programs.

1.9 Organization of the Study

This chapter explains the issues related to the respondents' intention to perform waste separation activities. Chapter two reviews the previous studies relevant to the research problem and explains the findings that affect the various shapes towards waste separation intention-behaviour among respondents. Theories of models related to current study are also reviewed. Chapter three describes the theoretical framework and analytical tools used to measure the data. The sampling trends, questionnaire and data collection are also described. Chapter four elaborates the results of the study. Chapter five discusses findings of the study. Recommendations such as strategies and action plans were discussed for future endeavours. Finally, the restrictions and the conclusion of the study are described in chapter five.

1.10 Chapter Summary

This chapter explained briefly on the solid waste management that has become a concerning issue especially in developing countries including Malaysia. Focus is also emphasized on the waste separation programs being promoted and implemented in Malaysia. Finally, the problem statement, objective of the study, significance and the organization of the study are also described in this chapter.

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PUBLICATION

Research Paper

Md Ismail, S. A., Terano, R., Mohamed, Z. A. & Khaidy, H. (2019). Consumers' Preference in Dining at Malaysian Brand Fast Food Restaurants. *International Journal of Agriculture, Environment and Bioresearch*, 4(5), 113-122. (Published)

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