UNIVERSITI PUTRA MALAYSIA

SOURCE SEPARATION OF SOLID WASTE FOR RECYCLING PRACTICE AT HOUSEHOLD LEVEL IN JOHOR AND SELANGOR, MALAYSIA

MOH YIING CHIEE

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By

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

December 2017

Here is the strongest rock in the world
Metamorphosed through furious heat and demanding pressure
Unswerving strength and endurance and silently ready to engage
It was never really the same since then
Yet it remains grounded to its roots
Warmly it glows and silently announces
All these, for you, I give
I become this rock for you to bloom

You may have thought that I didn't notice
Sometimes it seems that I forget
Your struggle and sacrifice
All in the name of family
For the comfort and stability
I may seem nonchalant
But I pick up everything
Keep them closely in my heart

For being my source of strength
Allowing me to keep dreaming and
The freedom to pursue my passion
Having you in good health
Earnestly I pray and wish for
Reminding myself
How blessed I am
To be your daughter

Mom, Dad,
This is dedicated to you.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

SOURCE SEPARATION OF SOLID WASTE FOR RECYCLING PRACTICE AT HOUSEHOLD LEVEL IN JOHOR AND SELANGOR, MALAYSIA

By

MOH YIING CHIEE

December 2017

Chair : Latifah Abd Manaf, PhD
Faculty : Environmental Studies

Beginning June 1st, 2016, source separation of solid waste for recycling practice is mandatorily enforced with compound taking effect at household level in Malaysia as part of the country's transformed strategy towards sustainable solid waste management. However, not all states in Malaysia share similar policy approach in introducing and sustaining the practice among households. Addressing that, this study evaluated source separation of solid waste for recycling practice from the perspectives of the main organizations and households in two of the most populated states that represent different policies of solid waste management in Malaysia, specifically Johor and Selangor. Based on purposive sampling, 19 lead officers representing solid waste management organizations in both states participated in the semi-structured interviews. Data derived from interview transcripts were analyzed and the interpretations were corroborated with the documents provided by participants. This study also conducted questionnaire survey involving randomly selected respondents from each area of jurisdiction under local authorities in both states. The sampling successfully gathered 589 respondents from Johor and 806 respondents from Selangor. This study also adopted Theory of Planned Behaviour (TPB) to provide a more nuanced view of the practice among households in both states. Based on the interviews, the overall management in Johor and Selangor were different in terms of expectations and organizational structure and system. However, participants revealed similar conflicts of interest between organizations and households in both states. Despite comparatively similar challenges in resources, personnel, and technicality, participants in Selangor encountered issues that were more apparent without specific regulatory instrument. As for households, majority were supportive of mandatory approach regardless of the type of policy implemented ($U = 232134.5$, $z = -0.839$, $p = 0.402$). Households' responses on perception towards solid waste, challenges faced, expectations, and willingness to participate were comparatively similar between both states. Meanwhile, attitude explained significantly more of the variance in behavioural intention for households in Johor (r

= 0.56, $p < 0.01$) than in Selangor ($r = 0.43$, $p < 0.01$). Similarly, moral norm explained significantly more of the variance in behavioural intention for households in Johor ($r = 0.70$, $p < 0.01$) than in Selangor ($r = 0.63$, $p < 0.01$). Interestingly, there was also a statistically significantly difference in the strength of the correlation between attitude and moral norm for households in both states where attitude explained significantly more of the variance in moral norm for households in Johor ($r = 0.77$, $p < 0.01$) than in Selangor ($r = 0.72$, $p < 0.01$). Standard multiple regression were subsequently performed for cases of Johor and Selangor, which revealed that the inclusion of moral norm increased the predictiveness of TPB based on the results of three proposed models. Obtained principal component analysis results revealed attitude, moral norm, and behavioural intention loaded strongly on a single component, suggesting these components may not be separately considered. This also reaffirmed the unique association between attitude and moral norm on behavioural intention of households, despite under different policy approach. Meanwhile, the one-way between-groups multivariate analysis of variance results revealed that gender, age group, and education level do not play a defining attribute in determining households' overall behaviour in both states. The number of children in household, however, may have potential influence over households' moral norm under mandatory approach (Johor), $F (2, 586) = 4.67$, $p = 0.010$, partial eta-squared = 0.016 using a Bonferroni adjusted alpha level of 0.01. Conclusively, this study addressed pertinent issues and challenges within the existing solid waste management system in the context of source separation of solid waste for recycling practice at household level in Malaysia from multifaceted perspectives. In this context, this study also proposed and recommended a framework of planning and management, implementation, and evaluation based on the obtained qualitative findings and quantitative results.

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

AMALAN PENGASINGAN SISA PEPEJAL DI PUNCA UNTUK KITAR SEMULA PADA PERINGKAT ISI RUMAH DI JOHOR DAN SELANGOR, MALAYSIA

Oleh

MOH YIING CHIEE

Disember 2017

Pengerusi : Latifah Abd Manaf, PhD
Fakulti : Pengajian Alam Sekitar

Mulai 1 Jun 2016, amalan pengasingan sisa pepejal di punca untuk kitar semula dikuatkuasa secara mandatori pada peringkat isi rumah di Malaysia sebagai salah satu strategi untuk mentransformasikan negara ke arah pengurusan sisa pepejal secara mampan. Walau bagaimanapun, tidak semua negeri di Malaysia mempunyai pendekatan dasar yang sama dalam memperkenalkan dan mengekalkan amalan ini dalam kalangan isi rumah. Dengan itu, kajian ini menilai amalan pengasingan sisa pepejal di punca untuk kitar semula dari kacamata organisasi utama yang bertanggungjawab dalam pengurusan sisa pepejal dan isi rumah di dua negeri yang mempunyai kepadatan penduduk tertinggi di Malaysia, iaitu Johor dan Selangor. Berdasarkan kaedah persampelan bertujuan, 19 pegawai dari organisasi yang bertanggungjawab di kedua-dua negeri telah mengambil bahagian dalam sesi temubual separuh berstruktur. Hasil temubual dianalisis dan ditaksir dengan bahan yang disediakan oleh para pegawai yang terlibat. Selain itu, kajian soal selidik juga dijalankan dengan penglibatan isi rumah dari setiap kawasan di bawah kuasa pihak berkuasa tempatan secara rawak di kedua-dua negeri. Seramai 589 responden dari Johor dan 806 responden dari Selangor terlibat dalam kajian soal selidik ini. Kajian ini juga mengadaptasikan Teori Tingkahlaku Terancang untuk mendapatkan gambaran yang lebih jelas tentang amalan pengasingan sisa pepejal di punca untuk kitar semula dalam kalangan isi rumah di kedua-dua negeri. Secara keseluruhannya, analisis kajian temubual mendedahkan perbezaan dalam pengurusan sisa pepejal di Johor dan Selangor dari segi jangkaan, struktur dan sistem organisasi. Walau bagaimanapun, terdapat persamaan konflik di antara organisasi dan isi rumah di kedua-dua negeri. Walaupun organisasi dari kedua-dua negeri menghadapi kekangan dari segi sumber, kakitangan dan teknikal, organisasi di Selangor menghadapi isu yang lebih serius dan lebih-lebih lagi, tanpa rangka kerja pengawalseliaan yang lebih khusus. Bagi isi rumah pula, majoriti menyokong pendekatan dasar mandatori tanpa

mengira jenis dasar yang dilaksanakan ($U = 232134.5$, $z = -0.839$, $p = 0.402$). Persepsi isi rumah di kedua-dua negeri terhadap sisa pepejal, kekangan yang dihadapi dan kesanggupan untuk mengambil bahagian dalam aktiviti-aktiviti yang diketengahkan dalam kajian soal selidik adalah serupa. Selain itu, komponen sikap menjelaskan lebih banyak variasi bagi komponen niat tingkahlaku dalam kalangan isi rumah di Johor ($r = 0.56$, $p < 0.01$) berbanding dengan isi rumah di Selangor ($r = 0.43$, $p < 0.01$). Begitu juga bagi komponen norma moral yang menjelaskan variansi yang lebih tinggi bagi komponen niat tingkahlaku dalam kalangan isi rumah di Johor ($r = 0.70$; $p < 0.01$) berbanding dengan isi rumah di Selangor ($r = 0.63$, $p < 0.01$). Menariknya, terdapat juga perbezaan statistik yang signifikan bagi korelasi antara sikap dan norma moral isi rumah di kedua-dua negeri, yang mana komponen sikap menjelaskan variasi yang lebih tinggi secara signifikan bagi komponen norma moral di Johor ($r = 0.77$, $p < 0.01$) berbanding dengan Selangor ($r = 0.72$, $p < 0.01$). Berdasarkan tiga model yang dicadangkan, keputusan analisis regresi berganda mendedahkan kemasukan komponen norma moral ke dalam model meningkatkan ramalan model Teori Tingkahlaku Terancang. Keputusan analisis komponen utama menunjukkan komponen sikap, norma moral dan niat tingkahlaku digabungkan di bawah satu komponen utama yang sama. Ini menunjukkan pertimbangan ke atas ketiga-tiga komponen ini tidak perlu secara berasingan dan mendedahkan hubungan unik antara komponen sikap dan norma moral terhadap niat tingkahlaku isi rumah walaupun di bawah pendekatan dasar yang berbeza. Sementara itu, keputusan analisis variansi antara kumpulan yang diperoleh menunjukkan bahawa jantina, kumpulan umur dan tahap pendidikan tidak memainkan peranan yang penting dalam tingkahlaku isi rumah di kedua-dua negeri. Walau bagaimanapun, bilangan anak dalam isi rumah mungkin mempunyai pengaruh terhadap norma moral isi rumah di bawah pendekatan dasar mandatori (Johor), $F (2, 586) = 4.67$, $p = 0.010$, eta kuadrat parsial = 0.016 dan menggunakan nilai 0.01 sebagai penyesuaian aras alpha Bonferroni. Secara keseluruhannya, kajian ini telah mengetengahkan pelbagai isu dan masalah dalam sistem pengurusan sisa pepejal khasnya dalam aspek pengasingan sisa pepejal di punca untuk kitar semula pada peringkat isi rumah di Malaysia dari pelbagai perspektif. Dalam konteks ini, kajian ini juga telah menyarankan satu rangka kerja bagi perancangan dan pengurusan, pelaksanaan serta penilaian berdasarkan dapatan kajian kualitatif dan kuantitatif.

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And a pat on the back—yes, I did it.

I certify that a Thesis Examination Committee has met on 15 December 2017 to conduct the final examination of Moh Yiing Chiee on her thesis entitled "Source Separation of Solid Waste for Recycling Practice at Household Level in Johor and Selangor, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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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 Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
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LIST OF ABBREVIATIONS

ABC Plan	Action Plan for a Beautiful and Clean Malaysia
Act 672	Solid Waste and Public Cleansing Management Act 2007
Act 673	Solid Waste Management and Public Cleansing Corporation Act 2007
GIS	Geographic Information System
JICA	Japan International Cooperation Agency
JPSPN	National Solid Waste Management Department
JUPEM	Department of Survey and Mapping Malaysia
NSP	National Strategic Plan
SWCorp	Solid Waste and Public Cleansing Management Corporation
SWM Environment Sdn Bhd	Southern Waste Management Environment Sdn Bhd
TPB	Theory of Planned Behaviour
WM-MP	Waste Minimization Master Plan

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Issues of solid waste management transcend boundaries with its complex and costly management. Solid waste management is closely linked to urban sustainability (Liang & Zhang, 2012). How we deal with solid waste today determines how solid waste affects the environment (Zhang et al., 2016), and it greatly reflects the state of progress we have achieved. A well-functioning solid waste management is a proxy of good and effective governance (Aleluia & Ferrão, 2016). Similar to many other countries globally, inefficient solid waste collection systems and improper disposal practices are major inadequacies for Malaysian solid waste management (Zamali et al., 2012), also with an uncontrollable increase in the amount of solid waste generated (Abdul Jalil, 2010; Agamuthu & Fauziah, 2011). Malaysians generate approximately 33,000 tons of solid waste per day (Mokhtar, 2013; SWCorp, 2014) with 95% of solid waste collected being disposed at landfills (NSP, 2005).

However, disposing solid waste at landfills or open dumps is not publicly regarded as an environmental problem. In fact, landfilling process has been so overstressed that many of these disposal sites have exceeded its operating capacity. Landfills and open dumps create nuisance, provide breeding ground for pests, and pose health hazards and pollution. Landfilling adversely affects the environment and contaminates the soil and groundwater (Carvalho & Marques, 2014). Addressing these concerns, besides incinerator, sanitary landfills are usually opted. However, most of these disposal sites remain not upgraded due to the cost and space needed for upgrading to sanitary landfills or constructing incinerators. Solid waste continues to be compacted and piled as high as they are allowed; otherwise, ignited to obtain more space at the disposal sites. Thus, with almost non-existential recovery attempt, organic waste and recyclable materials are continuously disposed at landfills.

With an overall recycling rate of 10.5% (SWCorp, 2015), the recycling rate of other Asian countries is higher than Malaysia's: Nepal (12%), Bangladesh (13.8%), Pakistan (20%), Sri Lanka (23.5%), cities in Vietnam (12.2%-23.5%), Mongolia (51%) (Shapkota et al., 2006), Philippines (25%) (Andin, 2006), Korea (66%), Singapore (61%), Taiwan (60%), Thailand (22%), and Japan with plastic recycling rate of 77% (SWCorp, 2014). Undoubtedly, recyclable materials in Malaysia are not fully recovered and recycled despite the significant dominance of recyclable materials in the overall solid waste composition (Agamuthu et al., 2009; Mohamed Osman et al., 2009; SWCorp, 2015). Apart from that, illegal dumping is as much as of a social problem where solid waste is simply disposed inexpensively at anyone's convenience, anywhere. Illegal dumping cases in Malaysia are ubiquitous but rather intermittent over certain areas.

1.2 Problem Statement

Addressing the aforementioned issues of solid waste in Malaysia, Solid Waste and Public Cleansing Management Act 2007 (Act 672) was formulated. Basically, the overall management of solid waste in Malaysia are presently divided into two groups, which are (1) under Act 672 and (2) not under Act 672. With regards to Act 672, this leads us to the central topic of this study—source separation of solid waste for recycling practice at household level in Malaysia. With Malaysia's transition towards sustainable solid waste management, source separation of solid waste for recycling practice has deemed as a sustainable option because of its potential to reduce the amount of solid waste disposed at landfills, considering the dominance of recyclable materials in the overall solid waste composition (SWCorp, 2015).

Typically, households gather their solid waste in plastic bags and place these bags in solid waste bins (for landed properties) or storage containers (for high-rise properties). With the enforcement of mandatory source separation of solid waste for recycling strategy nationwide with compound taking effect in majority of states under Act 672 starting from June 1st, 2016, households are responsible to separate solid waste at source for recycling. Meanwhile, appointed private contractors collect solid waste based on a fixed collection schedule with a collection frequency of three times per week where recyclable materials are collected once per week and non-recyclable materials are collected twice in the same week.

Nevertheless, solid waste collection system in certain states in Peninsular Malaysia remains as usual, with collection frequency of three times per week as well. These states are Selangor, Perak, and Pulau Pinang. It is not mandatory for households in these states to separate solid waste at source for recycling, as solid waste management in these states are not under Act 672.

As federalization and privatization are yet to be fully established and do not include all states in Malaysia, the roles and responsibilities of main organizations in solid waste management (namely local authorities, private concessionaires, and SWCorp) specifically source separation of solid waste for recycling practice remain ambiguous. This poses severe constraint on the planning and management of solid waste at all levels throughout Malaysia. Furthermore, there are also other significant issues and challenges faced by both organizations and households in source separation of solid waste for recycling practice, which hinder efforts of initiating and sustaining the practice at household level, regardless of the different policies in solid waste management in Malaysia.

As a corollary, this has fostered debate on how different (or possibly, how effective) the management of solid waste particularly source separation of solid waste for recycling practice is for states under Act 672 from other states that are not under Act 672, and households' perspectives towards practicing source separation of solid waste for recycling under mandatory approach (under Act 672) as opposed to voluntary approach (not under Act 672).

1.3 Research Objectives

In general, this study evaluated source separation of solid waste for recycling practice at household level in selected states of Malaysia from the perspectives of organizations and households. The specific objectives of this study were as follows:

1) To assess the perspectives of local authorities, private concessionaires, and SWCorp in Johor and Selangor towards source separation of solid waste for recycling practice at household level;
2) To assess challenges, perceptions, and willingness to participate with regards to source separation of solid waste for recycling practice among households in Johor and Selangor;
3) To examine relationships among components of Theory of Planned Behaviour (TPB) and demographic profile attributes in source separation of solid waste for recycling practice at household level; and
4) To identify factors affecting households in source separation of solid waste for recycling practice.

1.4 Research Questions

With respect to the first objective, this study investigated the following question:

i. What are the differences in the management of solid waste particularly source separation of solid waste for recycling practice at household level between organizations in Johor and Selangor of different policies of solid waste management?

With respect to the second objective, this study focused on the following questions:

ii. Are there any significant differences in the support of mandatory source separation of solid waste for recycling, sources of information, and perceived economic value and generation of recyclable materials among households in Johor and Selangor?
iii. What are the main challenges in source separation of solid waste for recycling practice among households in Johor and Selangor?
iv. What is the perception towards good solid waste management among households in Johor and Selangor?
v. What are households' expected improvements from organizations in Johor and Selangor with regards to source separation of solid waste for recycling practice?
vi. What do households in Johor and Selangor willing to contribute or participate?

With respect to the third objective, this study investigated the following questions:

vii. What are the levels of attitude, subjective norm, perceived behavioural control, moral norm, and behavioural intention among households in source separation of solid waste for recycling practice?

viii. What are the relationships between attitude, subjective norm, perceived behavioural control, moral norm, and behavioural intention among households in Johor and Selangor?
ix. Is there any difference in the relationships among components of Theory of Planned Behaviour (TPB) between Johor and Selangor with regards to source separation of solid waste for recycling practice among households?
x. How well do attitude, subjective norm, perceived behavioural control, and moral norm predict behavioural intention of source separation of solid waste for recycling practice? How much variance in behavioural intention scores can be explained by scores of these four scales? Which is the best predictor of behavioural intention among these four scales?
xi. Are there any significant differences in attitude, subjective norm, perceived behavioural control, moral norm, and behavioural intention in source separation of solid waste for recycling practice between households in Johor and Selangor based on gender, age group, education level, and number of children in household?

With respect to the final objective, this study focused on the following questions:
xii. What factors that significantly predict the likelihood of households' reported willingness to practice source separation of solid waste for recycling in Johor and Selangor?
xiii. What is the underlying factor structure of components of Theory of Planned Behaviour (TPB) in explaining factors affecting households in source separation of solid waste for recycling practice based on case studies of Johor and Selangor?

1.5 Scope of Study

With respect to different management of solid waste, this study unravelled various perspectives towards source separation of solid waste for recycling practice at household level among related organizations and households in Johor and Selangor, Malaysia.

SWM Environment Sdn Bhd, which represents operating private concessionaires in Malaysia, is an integrated solid waste management and public cleansing provider to Johor, the second most populated state in Peninsular Malaysia (after Selangor state) and the most populated state under Act 672 in Malaysia. Despite under Act 672, local authorities in Johor may not be related to the roles and responsibilities of solid waste management but they were included in this study to ensure its possible relevance. On the contrary, solid waste management in Selangor, the most populated state in Peninsular Malaysia, remains under the jurisdiction of local authorities.

With that, the state of Johor was selected in representation of solid waste management under Act 672 while the state of Selangor was selected as representation of areas that are not under Act 672. The list of local authorities in both Johor and Selangor states is provided in **Table 1.1**. The sampling area for this study

was confined to all 15 areas of jurisdiction under local authorities in Johor and 12 areas of jurisdiction in Selangor.

There are three different types of local authorities, which are (1) city council, (2) municipal council, and (3) district council. Referring to the Ministry of Urban Wellbeing Housing and Local Government (2017), city councils are upgraded municipal councils to city level with the largest population (not less than 500,000 people) and annual income (more than RM 100 million) compared to municipal and district councils. Meanwhile, municipal councils are urban-based areas with population of more than 150,000 people and annual income of more than RM 20 million. District councils, on the other hand, are focused on rural areas with smaller population (of less than 150,000 people) and annual income of less than RM 20 million. Areas within the jurisdiction of city and municipal councils are regarded as urban areas while areas within the jurisdiction of district councils are rural areas.

Table 1.1: Local authorities in states of Johor and Selangor

	Local authorities in Johor		Local authorities in Selangor
1	Johor Bahru City Council	1	Shah Alam City Council
2	Batu Pahat Municipal Council	2	Petaling Jaya City Council
3	Johor Bahru Tengah Municipal Council	3	Ampang Jaya Municipal Council
4	Kluang Municipal Council	4	Kajang Municipal Council
5	Kulai Municipal Council	5	Klang Municipal Council
6	Muar Municipal Council	6	Selayang Municipal Council
7	Pasir Gudang Municipal Council	7	Sepang Municipal Council
8	Kota Tinggi District Council	8	Subang Jaya Municipal Council
9	Labis District Council	9	Hulu Selangor District Council
10	Mersing District Council	10	Kuala Langat District Council
11	Pontian District Council	11	Kuala Selangor District Council
12	Segamat District Council	12	Sabak Bernam District Council
13	Simpang Renggam District Council		
14	Tangkak District Council		
15	Yong Peng District Council		

This study incorporated both qualitative and quantitative methods to obtain the necessary data in line with the objectives of this study. The focus of interview aspect (qualitative) included lead officers (participants) of solid waste management in local authorities of both states, SWM Environment Sdn Bhd Johor (Main Branch), and SWCorp Johor (Main Branch) where participants were selected through purposive sampling method. Meanwhile, the focus of questionnaire survey aspect (quantitative) was inclusive of all households (respondents) residing within the areas of these two states where respondents were selected through random sampling method.

1.6 Significance of Study

Solid waste management is, in fact, the biggest environmental problem globally (Omran et al., 2009; Son, 2014) and Malaysia is of no exception (Mohamed Osman et al., 2009). With the enforcement of mandatory source separation of solid waste for recycling strategy at household level in September 1st, 2015, with compound taking effect beginning June 1st, 2016, this study significantly extends the existing knowledge base of source separation of solid waste for recycling practice. It is regarded as an initial effort to fill the knowledge gap in the scope of source separation of solid waste for recycling practice at household level as well as to unravel how exactly different solid waste management policies function in initiating and sustaining participation of households to practice source separation of solid waste for recycling.

Assessing the perspectives of local authorities, private concessionaires, and SWCorp while reviewing solid waste management policy and plan strategies over the years (1970–2016) bring into perspective the issues and challenges of current solid waste management and source separation for recycling practice in Malaysia from multifaceted aspects. These findings contribute to various stakeholders in solid waste management on initializing and enhancing future projects of sustainable solid waste management at household level, not limited to source separation of solid waste for recycling practice.

Subsequently, given the centrality of this study in source separation of solid waste for recycling practice at the most fundamental level—at household level, comprehending households' current perspectives towards source separation of solid waste for recycling practice with the adoption of TPB provides improved understanding over factors affecting households in practicing source separation of solid waste for recycling, considering that they are presently under different policies of solid waste management. On another note, this study also plays a significant role in bridging the gap between organizations and households in terms of compatibility in the roles and responsibilities they play towards improved cooperation while meeting current demands from both organizations and households.

Additionally, the integration of Geographic Information System (GIS) provides tremendous potential of mapping and visualization. In fact, this approach initiates extension of state of the art information on source separation of solid waste for recycling practice for the assessment, characterization, and future monitoring towards improved planning and management of solid waste at household level in Malaysia.

In a nutshell, this study provides significant contributory outcomes and pertinent recommendations on related policy and plan strategies in source separation of solid waste for recycling practice. With the first step taken towards sustainable solid waste management through mandatory source separation of solid waste for recycling strategy, the outcomes of this study, undoubtedly, serve as a catalyst and stimulate

future research, and provide tailored recommendations towards improving the discussed issues and challenges within the existing solid waste management system in Malaysia. Conclusively, this study also recommends a framework based on the obtained qualitative findings and quantitative results specifically in the context of source separation of solid waste for recycling practice at household level in Malaysia.

1.7 Thesis Organization

Overall, this thesis consists of five chapters, which is organized as follows:

Chapter 2 presents critical and comprehensive review of various literatures regarding solid waste management and related policy and plan strategies in Malaysia. With respect to the main focus of this study—source separation of solid waste for recycling practice, this chapter further unravels opportunities for recycling in Malaysia and highlights its issues and challenges from multifaceted aspects. Literature review further elaborates on the behavioural theory adopted in this study (Theory of Planned Behaviour—TPB) and its fundamental components. This chapter also reveals an overview of Geographic Information System (GIS) and mapping techniques.

Chapter 3 provides descriptions and justifications of the overall study framework and research design applied in this study. Besides description of selected study areas, sample size, instrumentation, data collection, sampling strategies, and qualitative as well as quantitative data analysis are described in details in this chapter.

Chapter 4 presents a complete account of the interview findings and questionnaire survey results obtained as well as interpretations in relation to the objectives and research questions.

Chapter 5 concludes the main findings and significance of this study before drawing conclusions with respect to each of the objectives and research questions. In this chapter, limitations of this study and relevant recommendations for future research are also discussed.

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