Asian Journal of Environment, History and Heritage
December 2024 Vol. 8, Issue. 2, p. 11-25
ISSN 2590-4213 e-ISSN 2590-4310
Published by Malay Arts, Culture and Civilization Research Centre,
Institute of the Malay World and Civilization

WHAT DETERMINES THE HOUSEHOLD INTENTION OF DOMESTIC WASTE SEPARATION? AN APPLICATION OF AJZEN'S THEORY OF PLANNED BEHAVIOR

(APAKAH YANG MENENTUKAN NIAT ISI RUMAH MENGASINGKAN SAMPAH DOMESTIK? APLIKASI TEORI TINGKAH LAKU TERANCANG AJZEN)

Muhammad Alif Haiqal Asmizar, Ilhamd Sazali & Nurul Hidayana Mohd Noor

Abstract

Household waste is an integral part of human daily life. However, we often need to realize how important it is to correctly understand, manage, and recycle household waste. Household waste can include various types of waste items that are unwanted or can no longer be used, such as old mattresses, furniture, or broken electrical appliances. Household waste has negative impacts on the environment. This study examines the residents' household intention of domestic waste separation among five main districts (i.e., Rembau, Kuala Pilah, Seremban, Rasah, and Nilai), in Negeri Sembilan, Malaysia. In this study, the Theory of Planned Behavior (TPB) is used which predicts three (3) elements will contribute to the subsequent intention to influence a person's behavior. The three elements are 1) attitude toward waste sorting behavior, 2) subjective norms, and 3) perceived behavioral control. This study adds two new variables, namely, policy and regulation, and facility support ensure the macro perspectives element being included in the model. Three hundred residents were selected through a cluster and convenience sampling method. The study used correlation analysis and multiple regression to test the research model. The study found significant correlations between attitudes toward waste sorting behavior, subjective norms, perceived behavioral control, policy and regulation, facility support, and household intention of domestic waste separation. The regression results also revealed that perceived behavioral control is the most significant predictor. The results of this study are expected to generate ideas and suggestions to improve household waste segregation practices that support recycling.

Keywords: Household Intention, Domestic Waste Separation, Attitude, Subjective Norms, Perceived Behavioral Control, Policy and Regulation, Facility Support

Abstrak

Sisa isi rumah adalah sebahagian daripada kehidupan seharian manusia. Walau bagaimanapun, masyarakat perlu menyedari betapa pentingnya memahami, mengurus dan mengitar semula sisa isi rumah dengan betul. Sisa isi rumah boleh merangkumi pelbagai jenis barang buangan yang tidak diingini atau tidak boleh digunakan lagi seperti tilam lama, perabot atau peralatan elektrik yang rosak. Sisa isi rumah memberi kesan negatif kepada alam sekitar. Kajian ini mengkaji niat isi rumah penduduk di lima daerah utama (Rembau, Kuala

Pilah, Seremban, Rasah, dan Nilai), di Negeri Sembilan, Malaysia untuk mengasingkan sisa domestik. Dalam kajian ini, Teori Tingkah Laku Terancang (TPB) digunakan bagi meramalkan tiga (3) elemen yang akan menyumbang kepada niat seterusnya mempengaruhi tingkah laku seseorang. Tiga elemen tersebut ialah 1) sikap terhadap tingkah laku pengasingan sisa, 2) norma subjektif dan 3) kawalan tingkah laku yang dirasakan. Kajian ini menambah dua pembolehubah baharu, iaitu, dasar dan peraturan dan sokongan kemudahan memastikan elemen perspektif makro dimasukkan ke dalam model. Tiga ratus penduduk telah dipilih melalui kaedah persampelan kelompok dan kemudahan. Kajian ini menggunakan analisis korelasi dan regresi berganda untuk menguji model kajian. Kajian ini mendapati korelasi yang signifikan antara sikap terhadap tingkah laku pengasingan sisa, norma subjektif, kawalan tingkah laku yang dirasakan, dasar dan peraturan, sokongan kemudahan, dan niat isi rumah untuk pengasingan sisa domestik. Keputusan regresi juga mendedahkan bahawa kawalan tingkah laku yang dirasakan adalah peramal yang paling ketara. Hasil kajian ini diharapkan dapat menjana idea dan cadangan untuk menambahbaik amalan pengasingan sisa isi rumah yang menyokong kitar semula.

***Kata Kunci**: Niat Isi Rumah, Pengasingan Sisa Domestik, Sikap, Norma Subjektif, Kawalan Tingkah Laku, Polisi dan Peraturan, Sokongan Kemudahan*

INTRODUCTION

Domestic waste comprises solids and liquids categorized as organic substances and inorganic materials (Guo et al. 2021). Domestic waste is known as waste generated from residential areas, consisting of solid waste, leftovers, plastic, paper, metal, furniture, diapers, liquid waste, cooking oil, and sewage (Nanda & Berruti 2021). An average of 8,547.76 tons of solid waste is collected daily by the Solid Waste Management and Public Cleaning Corporation (SWCorp). This solid waste consists of domestic waste, which amounts to 7,198.30 tons, bulk waste (903.61 tons) and public cleaning waste (438.84 tons). All solid waste collected involved Perlis, Kedah, Pahang, Negeri Sembilan, Melaka, Johor, and the Federal Territories of Kuala Lumpur and Putrajaya (Razali et al. 2020). Thus, the generation of household solid waste or domestic waste is never ending process. However, the peak time of solid waste generation is during the festive season. For the collection of domestic waste, apart from the festive season, the increase in waste generation can be seen on the weekend. The location that generates the most solid waste is the residential area, with approximately 2.5 million premises in all the states concerned and the two Federal Territories (Razali et al. 2020). In Malaysia, housing premises produce much solid waste because they have a more significant number of premises than other premises, such as commercial centers, institutions and others (Shakil et al. 2023). One of the problems that SWCorp often faces in managing solid waste collection operations in this country is that trash cans are not placed outside the house or are not used and stored by the owners of the premises, resulting in the collection not being able to be carried out effectively (Fadhullah et al. 2022). Moreover, some trash bins have been damaged because of vandalism and theft of their components. Many households must also follow the collection schedule (Norsa'adah et al. 2020). Waste is dumped on the shoulder of the road, causing a pile of garbage.

Without proper domestic waste management, it will lead to gradual destruction, pollution epidemic transmission, flash floods, and impact on socioeconomics; an increase in the amount of domestic waste will increase the maintenance costs managed by the government, especially local authorities (Rakhmawati et al. 2023). Maintenance costs that need to be financed by the local government involve landfill maintenance costs, repair of the destruction, treatment of polluted water, and salaries of cleaning workers. The slogan 3R in the recycling campaign is only grand in name but leaves a question mark on its success (Tirkolaee et al. 2020). Based on a report by the National Environmental and Research Center in 2022, Malaysia has a domestic solid waste production rate of nearly 40,000 tons per day. It is expected to increase by 1.5 times in 2050. This is a severe problem because domestic waste is causing pollution and endangering life in ecosystems in Malaysia (Lye et al. 2024).

Data from the Ministry of Natural Resources and the Environment show that in 2019, as much as 90 percent of the 38,000 tons of domestic solid waste per day was not separated but thrown into landfills, causing pollution (Chen et al. 2021). Singapore is one of the world's most efficient countries in domestic waste management, achieving a target of 60 percent recycling and only 2 percent of domestic waste being disposed of in the final landfill by 2020 (Ahamed et al. 2021). The country also practices a usage-based pricing system to motivate its citizens to reduce waste production and practice recycling. Although efforts to improve domestic waste management continue to be implemented in this country, they still need to reach Singapore's performance level. Statistics show that the domestic waste recycling rate in 2022 has increased by almost 33.17 percent, while most waste is still thrown away in landfills (Chen et al. 2021).

The domestic waste recycling campaign may be a failure because some issues still need to be resolved. First, there is a need for awareness of the importance of recycling and waste management (Guo et al., 2021; Maitre-Ekern 2021; Razali et al. 2020). Many individuals still do not understand the damaging impact if waste is not disposed of properly; in addition, adequate and easily accessible infrastructure is still insufficient, especially in rural areas (Lye et al. 2024). Second, the authorities still need to tighten the supervision and enforcement of laws. There are still improper waste collection and disposal activities, especially in illegal factories and farms in Malaysia (Rosli et al. 2023). If the law is not effectively enforced, it affects efforts to preserve the environment and reduces the effectiveness of waste management. An organized waste collection system is absent in some areas, and there is illegal use of final disposal sites that must meet environmental safety standards (Ebekozien et al. 2023).

To overcome the ineffectiveness of the domestic waste recycling campaign, some drastic measures need to be taken, such as increasing public awareness and education about the importance of domestic solid waste recycling and the consequences of environmental pollution, as well as providing sufficient infrastructure and resources such as waste bins and recycling places (Zhou et al. 2022). The community can play a role in managing solid waste in their respective homes by cultivating the practice of recycling (Knickmeyer 2020; Wang 2021). Through recycling, the community not only reduces the production of waste but also generates additional income. Among the measures to reduce the impact of domestic waste disposal are practice 3R, use of the latest technology, law enforcement, education, campaign, and energy waste (WtE) plant (Colvero et al. 2020; Tirkolaee et al. 2020; Tripathi et al. 2020; Zhou et al. 2022). Local authorities should impose heavier fines and punishments aimed at providing awareness to the community. The current laws for managing domestic waste in Malaysia are the Solid Waste Management and Public Cleansing Act 2007 (Act 672) and the Solid Waste Management and Public Cleansing Act (Act 673). As a country with high environmental wealth, success in the domestic solid waste recycling campaign positively impacts the environment and safeguards its sustainability for future generations. Therefore, the cooperation of authorities, citizens, private and public is essential to improve domestic waste management and achieve recycling targets (Colvero et al. 2020). Therefore, this study aimed to examine the influence of attitude, subjective norms, perceived behavioral control, policy and regulation, and facility support on household intention for domestic waste separation. Research on domestic waste separation still needs to be completed in developing countries such as Malaysia. Perspectives from developed countries heavily influence past studies that discuss pro-environmental behavior, while existing works from developing countries generally do not discuss the topic in the Malaysian context (Janmaimool & Khajohnmanee 2020; Rakhmawati et al. 2023).

LITERATURE REVIEW & THEORETICAL FRAMEWORK

Theory of Planned Behavior (TPB)

A social psychologist, Izek Ajzen, developed a critical theory for the connection between attitude and behavior. How is it possible for an attitude to manifest as behavior? It is described by the theory of planned behavior (TPB). TPB is based on various attitude theories, such as learning, value expectation, consistency, and attribution (Ajzen 1991). TPB further develops the Theory of Reasoned Action (TRA). TPB explains the cause of the emergence of intentional behavior. According to TPB,

behavioral intention is determined by three main determinants: attitude, subjective norms, and perceived behavioral control (see Figure 1). The theory is widely used in various sciences that discuss behavior and environmental issues. TPB is a strong theory that predicts and explains behavior.

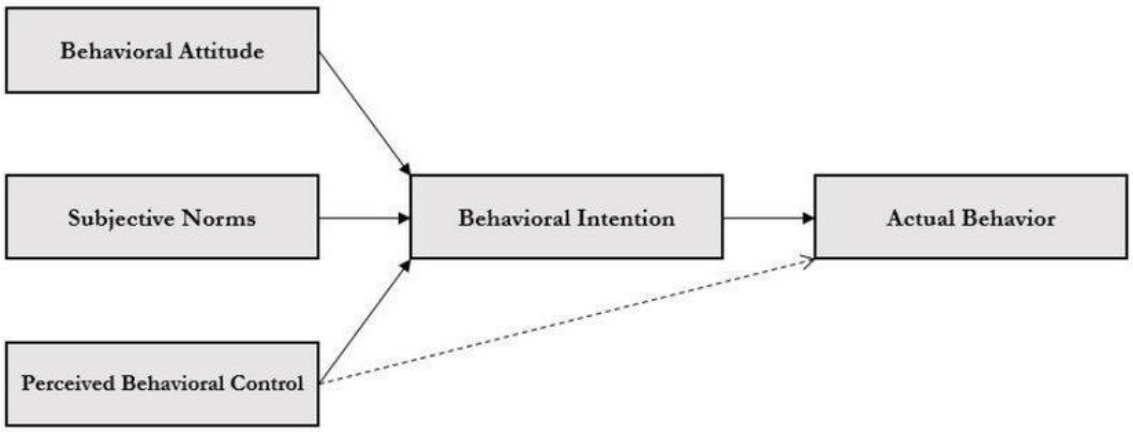

Figure 1: Original TPB Model (Source: Ajzen 1991)

Attitude is "the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question." Individuals have an attitude toward loving the environment when they believe it has positive consequences if protected. Therefore, the attitude will form after individuals evaluate and are ready to accept the benefits and costs that will occur due to specific actions. The proposed TPB by Ajzen is a theory based on the human hedonistic model, which assumes that humans are motivated to avoid risk and seek rewards. Therefore, an attitude manifesting as behavior has gone through rational evaluation. Subjective norms are perceived social pressure to implement or not perform a behavior (Ajzen 2020). In other words, subjective norms are people's opinions that influence the behavioral and motivating decisions of individuals in meeting the expectations of others. Subjective norms are based on the opinion that every individual wants to be evaluated well and accepted by the surrounding community. It is often referred to as social norms (Ajzen 2020). This norm shows that social influence is believed to influence a person's thinking, feelings, and behavior. Through interaction, observations, and information received, individuals form opinions and beliefs about what they should do and what matters is accepted by the community. Individuals should be loyal followers to get social recognition, avoid social sanctions, or be more accepted by the community.

Perceived behavioral control is an individual's feelings about the ease or difficulty they will experience in performing the behavior (Ajzen 2020). Behavioral control is the control the individual owns when individuals evaluate external conditions. A sense of self-confidence is influenced by the individual's ability to analyze resource availability and opportunities that support behavior. The availability of supporting resources is specific. Each behavior has characteristics of resources needed and is sometimes difficult to fulfill. Behavioral control is also related to something that often has a level of relativity. In general, though, self-confidence is a cognitive component and a fundamental aspect of human thought. The environmental intention is the individual's motivation to exert effort to engage in pro-environmental behavior. The intention is the focus of TPB, which shows how hard the individual tries to implement the behavior, no matter how much effort the individual puts into encouraging the behavior. In this study, TPB is used, and in TPB, three (3) elements will contribute to the subsequent intention to influence a person's behavior. These include attitude toward waste sorting behavior, subjective norms, and perceived behavioral control. This study also includes two new variables, policy and regulation, and facility support, which could affect the perceived behavioral control elements.

Determinants of Household Intention to Sort Domestic Waste

Household waste includes everyday waste such as food waste that cannot be recycled, plastic packaging, paper, magazines, containers, and other materials generally associated with household and business activities. It also includes garden waste such as dry leaves, twigs, and other garden waste. Society needs to use appropriate and safe waste containers to prevent environmental pollution. Moreover, the public must consider reducing the use of products that generate a lot of waste, such as single-use packaging. The public needs to take advantage of recycling services provided by the government or private companies. Items that can still be used can be sold or donated to people who need them, reducing the amount of waste that goes to landfills. Reusing items such as shopping bags or plastic containers can also help reduce waste production. Past studies have discovered several determinants that could encourage the public to sort domestic waste. These include attitude, subjective norms, perceived behavioral control, policy and regulation, and facility support.

Attitude

Attitude is a person's behavior, character, and morals (Ajzen 2020). Usually, a person's attitude is based on the heart. However, sometimes, our attitude also reflects how we feel. A person's attitude can change due to feelings, circumstances, or anything that does not please the owner of that attitude. The main difference between attitude and behavior lies in the dimension of evaluation and action. Attitude refers more to the individual's evaluation of an object or situation, while behavior refers more to the action or response performed by the individual (Tamar et al. 2021). However, both are interrelated and influence each other. An individual's attitude can influence their behavior and vice versa. The importance of attitude and behavior in everyday life must be addressed. A positive attitude can also influence the way an individual interacts with other people and the environment (Tian et al. 2020). Therefore, individuals must consider the attitudes and behaviors shown in various situations. Several studies have shown that attitude plays a vital role in individual decisions to influence pro-environmental behavior (Mohd Noor et al. 2023; Wyss et al. 2022). People believe that positive behavior towards the environment will produce positive consequences, while if they have negative behavior, then it will also have negative consequences for the environment (Ajzen 1991). Mohd Noor et al. (2023) discovered that a positive attitude influences waste-sorting behavior. People's values can influence attitudes. Environmental values are defined as supporting value systems for any action that leads to the well-being of the environment. The environmental value system is not independent and is exclusive. Instead, it is subject to economic, political, and intellectual value systems (Henn et al. 2020). Environmental value orientation is generally categorized into two premises: anthropocentric and ecocentric. For some researchers, anthropocentric is expressed as social-altruistic, while ecocentric is expressed as biocentric. From an ethical angle, anthropocentric theory is described as a theory that prioritizes humans (human-centered). Vice versa, the ecocentric concept asserts that each component of the environment has its intrinsic value independent of human evaluation (Chwialkowska et al. 2020).

Subjective Norm

The meaning of norms is guidelines. A subjective norm is an individual perception of whether people who are important to the individual think the behavior should be done (Ajzen 2020). Subjective norms are viewed as a combination of the perceived expectations of individuals or groups that are relevant together to comply with those expectations. In other words, people's perception that most people vital to him think he should or should not do the relevant behavior". Social norms are also differentiated according to the level of binding force. Four types of norms are known to distinguish the binding force of these norms (Legros & Cislaghi 2020). First, the way (usage). This type of norm has the weakest binding force because the sanction for those who violate it is only in the form of ridicule. For example, when eating, people do not burp. Second, customs (folkways). This type of norm is a rule with a binding force that is stronger than usage because it includes repeated actions. An example is respect for elders. Third, code of conduct. This type of norm is a rule that has been accepted by the community and used as a monitoring or control tool, consciously or unconsciously, by the community on its members (Legros & Cislaghi 2020).

Therefore, violation of this norm can lead to severe sanctions. An example is the prohibition of adultery. Fourth, customs. This type of norm is a hereditary rule but very binding. Violation of this norm can also lead to social sanctions (Legros & Cislaghi 2020). An example of this norm is the ban on marrying people of the same clan in Batak customs. The community must play an essential role in separating waste so the 3R concept can be implemented successfully. Public participation in managing solid waste is one of the most essential methods for sustainable waste management in an area. In the context of solid waste management, community involvement means that the community is directly involved in separating, storing, collecting, and recovering solid waste sources (Knickmeyer 2020). Past studies also have discovered that social norms that support pro-environmental behavior, such as recycling, and waste separation, help to influence community behavior (Knickmeyer 2020; Wang 2021). Both Noor and Nordin (2023) and Razali et al. (2020) found that moral norms influence waste separation at source behavior. Similarly, the study by Mohd Noor et al. (2022) indicates that descriptive norms and cognition of consequences significantly influence the intention of Malaysian households to separate waste.

Perceived Behavioral Control

Ajzen (1991) introduced perceived behavioral control into his theory to determine behavioral intention and behavior. Conceptually, perceived behavioral control is the same as self-efficacy, which refers to believing that the intended behavior is under control. However, behavioral control that is considered operational is often evaluated with the ease or difficulty of the behavior. Behavioral control should be linked to intention because one cannot intend to perform behavior that is beyond his or her control. Vice versa, a person is more likely to perform a behavior when they believe they have the ability and resources to implement it. Behavioral control is perceived to influence individual judgments and their ability to engage in certain behaviors (Ajzen 1991). Self-efficacy refers to the set of beliefs we hold about our ability to complete a particular task (Farmer & Dupre 2022). According to psychologist Albert Bandura, the first proponent of the concept, self-efficacy results from experience, observation, persuasion, and emotion. Self-efficacy is linked to academic achievement and the ability to overcome phobias.

According to Bandura, two factors influence whether a person engages in certain behaviors: outcome expectations and self-efficacy. In other words, our ability to achieve a goal or complete a task depends on whether we can do it (self-efficacy) and whether we think it will have good results (outcome expectancy). Self-efficacy has an essential effect on an individual's effort for a given task. A person with high self-efficacy for a given task will be resilient and persevere in the face of obstacles. In contrast, a person with low self-efficacy for the task may disengage or avoid the situation (Enginkaya & Sağlam 2024). For example, households with lower levels of self-efficacy for waste separation may avoid signing up to sort the waste. Sh. Ahmad et al.'s (2022) study has revealed that green self-efficacy affects green behavior. In a similar vein, using samples of 410 Chinese college students, Wang et al. (2021) findings indicate that a significant positive correlation exists between self-efficacy and ecological values and social responsibility.

Policy and Regulation

In Malaysia, solid waste management in the nineties was managed entirely by the local authority, placing related powers under the respective state government. Then, the government took over the authority to manage solid waste in states (Devadoss et al. 2021). This privatization initiative started when the government agreed to gazette Act 672 and Act 673, which offered solid waste management to be implemented by government-appointed companies. One of the earliest companies appointed through this privatization was Alam Flora. The government mandates the separation of household solid waste phased from September 2015. This implementation is based on the rules below the Solid Waste Management and Public Cleansing Act 2007 (Act 672) (Devadoss et al. 2021). The process of separating household solid waste involves separation of household solid waste according to the composition of waste such as plastic, paper, cardboard, glass, metal, electronic waste, hazardous waste from the home, waste bulk, and garden waste, and the separated waste will be collected once a week according to the schedule determined by the concession company that has been appointed. The

implementation of the separation of household solid waste will involve states that have adopted Act 672, namely the Federal Territory of Kuala Lumpur, Putrajaya, Pahang, Johor, Malacca, Negeri Sembilan, Perlis and Kedah (Devadoss et al. 2021).

New regulations for household e-waste will be introduced to implement Extended Producer Responsibility (EPR). According to the 12th Malaysia Plan (RMK12), EPR is a basic approach that places the responsibility on producers to treat and dispose of used products either through self-directed actions or financial contributions (Kamaruddin & Marwan 2021). The document issued by the Economic Planning Unit states that the responsibility will encourage producers to reduce waste at source and encourage the production of environmentally friendly products. This EPR approach will also be expanded later to cover other types and streams of waste, especially packaging materials and single-use plastics (Maitre-Ekern 2021). Under the Malaysia Plan 2021 to 2025, solid waste management will continue to be strengthened to ensure compliance with existing standards to achieve the goal of zero waste, where the enforcement of waste segregation at source and the implementation of the 3R initiative will be intensified. For this purpose, waste collection, segregation, and recycling facilities will be added. Meanwhile, the state government that still needs to adopt the Solid Waste Management and Public Cleansing Act 2007 will be advised to enact or amend related by-laws and ordinances to ensure that all types of waste are managed comprehensively. Meanwhile, to enable immediate action to be taken against environmental criminals, the special environmental crime task force was established to enforce Act 127 and the Water Services Industry Act 2006. From an economic perspective, the cost factor is also seen as an element that influences waste separation practices. Cost is an element covering all forms of finance, energy, or time that needs to be spent to implement waste sorting practices, and these elements have become an obstacle to the successful implementation of domestic waste management (Fadhullah et al. 2022). Consumers' reluctance to pay disposal fees, limited consumer awareness, and insufficient funds and investment are among the reasons for the severe waste problem in Malaysia.

Facility Support

Facility elements are divided into access to facilities and facilities (Tirkolaee et al. 2020). Facilities such as material collection points, transportation, or recycling bins are among the elements that should be provided regularly to encourage users to participate in the recycling program (Zhou et al. 2022). The history of solid waste management can be divided into three main stages: control by local authorities, privatization, and standardization under the federal government. With workforce constraints, the increase in waste disposal, and the problem of lack of landfill sites, the structuring of solid waste management and public cleaning for improvement is essential (Nanda & Berruti 2021). This is because solid waste management requires high costs, focused efforts, and comprehensive monitoring to ensure that waste is managed sustainably for environmental sustainability. Accordingly, efforts through privatization and acquisition are seen as the best way to ensure waste management can be managed in a better, systematic, and focused manner. With the increase in recycling facilities, it is expected that the reuse rate of waste materials will increase significantly. It is also hoped to reduce the amount of waste that goes into landfills (Tirkolaee et al. 2020). Facility establishment is a new added value towards empowerment recovery of benefits from the resulting solid waste (Colvero et al. 2020).

The integration of approaches applied through such facilities is not only able to attract the interest of the community to learn more about the management of solid waste more precisely but even plays a significant role in further increasing awareness of the importance of waste management practice for the well-being of life (Tripathi et al. 2020). Alam Flora, for example, has built a place to collect and place waste obtained from the community. Every leftover sent to this center will be rewarded with monetary incentives such as PETRONAS Mesra Card reward points as appreciation for the involvement in recycling activities (Abd Khair & Ahmad 2021). SWM Environment Sdn. Bhd. is an integrated waste management and public cleansing service provider in the southern region of Peninsular Malaysia. As a step to promote environmental sustainability and help achieve sustainable development goals, SWM Environment Sdn. Bhd. and Coca-Cola Bottlers Malaysia collaborate in providing recycling facilities (SWM Environment 2023). The facility known as the KITARecycle

Coca-Cola Drive-In Center was implemented to foster high awareness in the community regarding domestic waste management. It also intends to cultivate the separation of solid waste and waste management practices through recycling in everyday life. KITARecycle Coca-Cola Drive Thru was started in a residential area in Nilai, Negeri Sembilan. Among the locations are Jentayu @ Enstek, Laman Mawar, Cempaka Seri 1, and Cempaka Seri 2, which are in the residential area of Kota Seri Emas, Nilai (SWM Environment 2023). The center is proof of the firm commitment between the two companies towards more sustainable waste management practices, especially in solid waste segregation and recycling activities. Based on the above reasoning, the following hypotheses are developed:

H1: Attitude significantly influencing household intention for domestic waste separation.
H2: Subjective norms significantly influence household intention for domestic waste separation.
H3: Perceived behavioral control significantly influencing household intention for domestic waste separation.
H4: Policy and regulation significantly influencing household intention for domestic waste separation.
H5: Facility support significantly influences household intention for domestic waste separation.

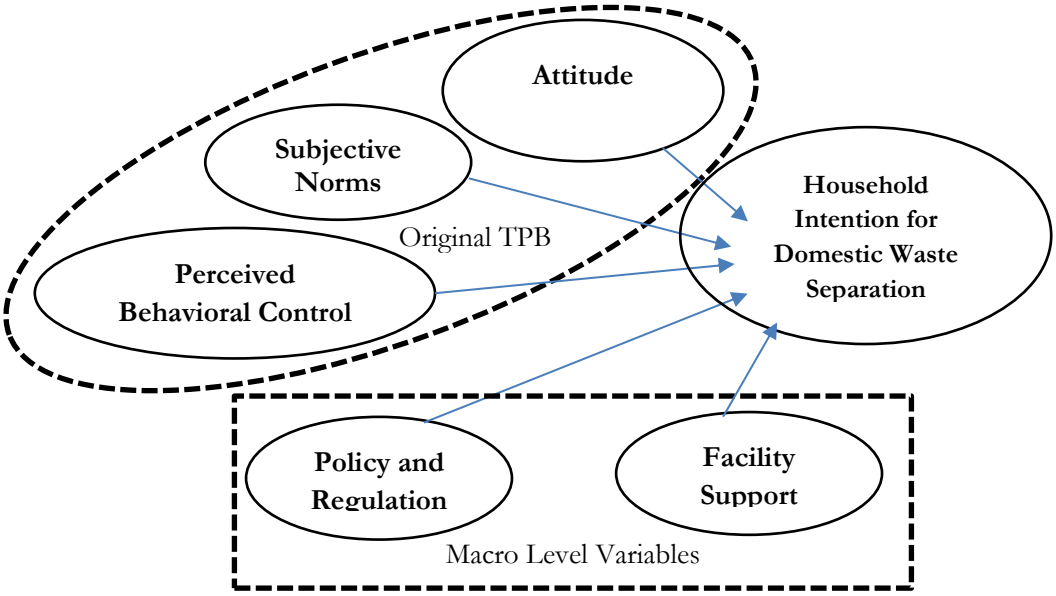

Figure 2. Conceptual Model (Source: Authors' own model)

METHODOLOGY

This study was carried out quantitatively using a survey method for data collection. The population of this study consisted of three hundred households in Negeri Sembilan. Three hundred residents living in five main districts (i.e., Rembau, Kuala Pilah, Seremban, Rasah, and Nilai), in Negeri Sembilan, Malaysia through a cluster and convenience sampling method. The selection of the total sample is based on Green's (1991) formula. Green (1991) provides a rule of thumb of 50+8n (n=number of observations) for regression analyses. In this case, the minimum sample size needed in this study is ninety. Thus, the sample for this study is acceptable at three hundred. This research instrument uses a questionnaire adapted from the previous studies that involves three parts, namely A (Demographics), Part B (Attitude, Subjective Norms, Perceived Behavioral Control, Policy and Regulation, and Facility Support), and Part C (Household Intention for Domestic Waste Separation). A 5-point Likert scale is used in parts B and C. The items adapted from the instrument which has been used by Rakhmawati et al. (2023). The instruments that have been in adapted in this study have good reliability and validity in the past studies (e.g., Mustafa et al. 2022; Rakhmawati et al. 2023). The data obtained were analyzed using descriptive statistics and inferential statistics. Descriptive analysis

was used to describe the demographic characteristics of the selected respondents. In addition, the level of household intention to sort domestic waste is described based on the mean value.

Cronbach's Alpha Test is used first to measure reliability. The coefficient of variation varies from 0 to 1, and a value less than 0.6 shows poor or unacceptable internal reliability. Cronbach's alpha exceeds or is equal to 0.7, which is considered reliable, indicating the reliability strength (Hair et al. 2010). The data normality test is critical in determining the type of statistical test used to analyze the data obtained in an inferential study. Skewness and Kurtosis normality tests will confirm that the data obtained has a normal distribution. The Skewness value should fall within the range of -3 to +3. Moreover, for kurtosis, the range of -10 to +10 needs to be assumed (Kline 2005). Next, inferential analysis is used to describe the relationship between variables. In this study, the analysis used is a correlation and regression test. The coefficient value correlation is shown between -1 to +1. The decision about the hypothesis is based on the level of significance where $p<0.05$, the alternative hypothesis is accepted. Regression tests are used to see how much the independent variables influence household intention to sort domestic waste. Table 1 summarizes the survey items used.

Table 1. Measurement of the Variables

Variable	Items
Attitude	Sorting waste is essential for the environment.
	Sorting waste is good behavior.
	Sorting waste is wise.
	Sorting waste is a beneficial behavior.
	Sorting waste is a very worthy behavior.
Subjective Norms	Most people who are important to me think I should waste separation.
	Most people who are important to me would approve of my waste separation behavior.
	My neighbors expect me to separate household waste.
	My family expects me to separate household waste.
Perceived Behavioral Control	For me, sorting is easy.
	I have the resources, time, and opportunity to sort waste.
	I can sort waste if I am willing.
	The decision to sort waste or not rests solely in my hands.
Policy and Regulation	The separation facilities (bins, waste collection pools) provided by the government are sufficient to facilitate separation.
	Environmental monitoring encourages me to sort waste.
	Government policies encourage me to sort waste.
	Government promotions help me understand the importance of waste sorting.
Facility Support	In my area, there are adequate bins to sort waste.
	In my area, there is an adequate facility to collect sorted waste.
	Sorted waste collection in my area is appropriately managed.
	In my area, the sorted waste collection system is appropriately managed.
Household Intention for Domestic Waste Separation	I plan to start/to continue sorting waste
	I am going to start/to continue sorting waste.
	I intend to start/to continue sorting waste.
	I am willing to start/to continue sorting waste.
	The municipality gives adequate information on waste sorting.

FINDINGS AND DISCUSSION

Table 2 shows the profile of the respondents. Usable questionnaires were received from 258 respondents. From the data, most of the respondents are female (72.1%), and the rest are male respondents (27.9%). Next, most respondents were 22 years old and above (64%). Meanwhile, the highest academic level is a bachelor's degree (80.9%). Three categories were used to classify the present current living area, which is urban, which contributed 127 respondents (49.2%); semi-urban,

which contributed 117 respondents (45.3%); and rural area, which contributed 14 respondents (5.4%). Meanwhile, the current academic undertaking the respondents attained indicated that most had bachelor's degree qualifications (n=183, 70.9%).

Table 2. Demographic Profile

No.	Profile	Frequency (n)	Percentage (%)
1	**Gender**		
	Male	72	27.9
	Female	186	72.1
2	**Age**		
	18-22 years old	93	36.0
	22 and above	165	64.0
3	**Current Living Area**		
	Urban	127	49.2
	Semi-urban	117	45.3
	Rural	14	5.4
4	**Highest Academic Qualification**		
	SPM	9	3.5
	Diploma	62	24.0
	Degree	183	70.9
	Postgraduate	4	1.6
	Others	0	0

As shown in Table 3, the variables used are acceptable and reliable and can be used in the following study (Hair et al. 2010). For Skewness and Kurtosis, the variables used are normally distributed (Kline 2005).

Table 3. Normality & Reliability Results

Variable	Mean	SD	Skewness	Kurtosis	Cronbach's Alpha
Attitude	4.448	0.738	-1.818	4.715	0.899
Subjective Norms	3.907	0.831	0.549	0.333	0.791
Perceived Behavioural Control	4.093	0.772	0.785	0.984	0.846
Policy and Regulation	3.742	1.035	0.537	0.354	0.894
Facility Support	3.430	1.234	0.322	0.953	0.954
Household Intention for Domestic Waste Separation	4.174	0.844	-1.227	2.040	0.948

Table 4. Pearson Correlation Results

		Household Intention for Domestic Waste Separation
Attitude	Pearson Correlation	0.435**
	Sig. (1-tailed)	0.000
	N	258
Subjective Norms	Pearson Correlation	0.559**
	Sig. (1-tailed)	0.000
	N	258
Perceived Behavioural Control	Pearson Correlation	0.574**
	Sig. (1-tailed)	0.000
	N	258

Policy and Regulation	Pearson Correlation	0.385**
	Sig. (1-tailed)	0.000
	N	258
Facility Support	Pearson Correlation	0.389**
	Sig. (1-tailed)	0.000
	N	258

Correlation is a statistical test to determine the relationship between two variables linearly. Therefore, the Pearson correlation is used to see the strength of the relationship between attitude, subjective norms, perceived behavioral control, policy and regulation, facility support, and household intention for domestic waste separation. Based on Table 4, there is a significant positive relationship between attitude (r= 0.435; p < 0.05), subjective norms (r= 0.559; p < 0.05), perceived behavioral control (r= 0.574; p < 0.05), policy and regulation (r= 0.385; p < 0.05), and facility support (r= 0.389; p < 0.05) towards household intention for domestic waste separation.

Table 5. Regression Results

Variables	Beta (β)	Sig. (p)	Tolerance	VIF
Attitude(H1)	0.284	0.000	0.697	1.434
Subjective Norms (H2)	0.183	0.005	0.491	2.037
Perceived Behavioural Control (H3)	0.386	0.000	0.515	1.943
Policy and Regulation (H4)	-0.043	0.554	0.401	2.541
Facility Support (H5)	0.117	0.108	0.394	2.541
R^2	0.476			
Adjusted R^2	0.466			
F Change	45.827			
Sig.	0.000			

Based on Table 5, the study first examined multicollinearity, which refers to the occurrence of a linear relationship between independent variables in a multiple linear regression model. A linear relationship between independent variables can occur in a perfect linear relationship (perfect) and an imperfect linear relationship (imperfect). Furthermore, the value of variance inflation factor (VIF) and tolerance (TOL) can be used to detect the existence of multicollinearity in the regression model. If the VIF value exceeds four or the tolerance is less than 0.2, multicollinearity is problematic (Hair et al. 2010). The results revealed that there is no problem with multicollinearity. Next, the regression result showed that all factors were identified as predictors of the intention to sort waste toward households with an adjusted R square value of 46.6 %. The ANOVA generated in this test also shows a significant probability value. Next, the regression results can be defined as follows: 1) attitude (β =0.284, p=0.000), 2) subjective norms (β =0.183, p=0.005), 3) perceived behavioral control (β =0.386, p=0.000), 4) policy and regulation (β =-0.043, p=0.554), and 5) facility support (β =0.117, p=0.108). Therefore, the study accepts H1, H2, and H3, and reject H4 and H5. Table 5 shows a high beta value, which depicts that the perceived behavioral control (β = 0.386, p = 0.000) proves a high degree of intention to sort waste. It shows that perceived behavioral control is the most significant predictor of the intention to sort waste in the household. Perceived behavioral control refers to the extent to which a person can behave depending on the difficulty and pleasure of acting based on one's experiences and beliefs (Farmer & Dupre 2022). There are two aspects: the first is how a person controls behavior, and the second is the confidence of a person to do something. This is determined by the controlled beliefs in the situation and the internal factors that help in doing the behavior. For instance, a person with high self-efficacy will sort the household waste and have the skills to successfully perform their tasks. Individuals will be more inclined to get involved in waste sorting if they have high self-efficacy (Enginkaya & Sağlam 2024; Sh. Ahmad et al. 2022). Sachitra (2024) found that individuals with high self-efficacy will participate voluntarily in environmental management activities.

Theoretically, this study has contributed new insights to the current environmental literature and studies. The study not only looking the determinant at individual and society level but the current model also examining it from the perspective of macro level (i.e., policy and regulation and facility support). The model also validated the TPB assumption that perceived behavioral control is a strong variable that can have direct and indirect effects on human behavior. In this case, is the intention for sorting waste. As practical implications, every household usually produces household waste. Therefore, family members should pay attention to the waste management process. To optimize waste management, the community can participate by applying the 4R principles: reduce, reuse, recycle, and replace (Bui et al. 2022). In addition to the 4R principle, separating organic and inorganic waste is essential. If this method can be appropriately applied in every household, it will have a significant impact on the environment. First, the principle of reduction has the meaning that the community can put less effort into producing garbage. Second, the principle of reuse is that the community can reuse used containers. Third, recycling is the principle of recycling waste, such as making organic waste compost or handicrafts from used items. Finally, the principle of replace means replacing materials that are not environmentally friendly with environmentally friendly materials. For example, do not use Styrofoam because the material cannot be decomposed naturally (Bui et al. 2022).

The public also should utilize organic waste. The organic waste produced by households is kitchen waste in the form of vegetable waste, food waste, and leaf litter from trees around the house. Kitchen waste can be reused as compost. The method of making compost is simple: collecting organic waste and then piling it in a hole in the yard to rot it. This decomposition uses natural elements, including nitrogen, potassium, and phosphorus (Sayara et al. 2020). Compost fertilizer is suitable for fertilizing plants. Inorganic waste cannot be decomposed naturally. For that reason, households need to recycle. Recycling inorganic waste plays a vital role in reducing environmental pollution (Sayara et al. 2020). Inorganic waste consists of paper, plastic, bottle, and fabric waste. Waste bottles and cans can be recycled into flowerpots. Furthermore, plastic waste can be used to create valuable items such as wallets, bags, table covers, tissue holders, and others. Meanwhile, cloth waste can be made into patchwork crafts useful as wipes and cleaning tools in everyday household life.

Implementing the regulation is part of the government's efforts to increase the recycling rate and reduce the delivery of solid waste to existing landfills running out of space. The authorities must enforce the law by imposing heavier fines and penalties against the offender to raise awareness in the community. Waste-related acts include the Waste Management Act Solids and Public Cleansing 2007 (Act 672) and the Environmental Quality Act 1974. The government can also create recognition related to solid waste segregation practices for those who practice the best solid waste separation. To ensure information related to the separation of solid waste is widely and effectively distributed to all levels of society, there should be increased information dissemination and promotion about waste segregation at the source through various mediums. For example, it is promotion through TV and radio channels; articles published in daily newspapers; social media such as Facebook, Twitter, Instagram, and blogs; distribution of the waste separation guide to all premises; and preparation of leaflets, posters, and others. Education and co-curriculum related to waste separation in causes and practices of 3R at preschool/kindergarten, primary and secondary schools, and higher education need to be implemented. Next, there should be a collaboration with local communities such as Residents Association and Neighboring Committee through the 3R program; with Non-Governmental Organizations (NGOs) through programs for public education and awareness as well as the 3R program; and with various other government and private agencies (Legros & Cislaghi 2020). For example, the KEJORA Region Solid Waste Management and Rural Environment Sustainability course was held on 13th August 2023 at NIOSH Southern Region, Johor Bahru. This course aims to provide specific exposure and explanation to ensure that solid waste management in the villages of the KEJORA Region can be appropriately implemented and managed. Implementing this course can provide exposure and awareness to the rural residents of the KEJORA Region about the mutual importance of maintaining the ecosystem of natural and environmental sustainability in managing rural solid waste.

CONCLUSION

Human life is now inseparable from producing waste. Even the waste generated from human daily routine also shows an increase yearly. However, most of us are still complacent about the state of the earth, which is increasingly unable to digest waste so that humans do not break down. For that reason, this waste that continues to be produced needs to be managed so as not to harm humans or even bring benefits to universal life (Mohd Noor et al. 2022). Several recommendations were identified for the improvement of the future study. First, the study sample is limited to a small sample of households in Negeri Sembilan, Malaysia. Future studies should extend to higher and more comprehensive figures. A comparative study can also be done to determine whether Negeri Sembilan can be used as an example by other cities or states. Second, this study used a cross-sectional survey, and it is not easy to establish cause-and-effect relationships using cross-sectional studies because they only represent one-time measurements of presumed cause and effect. Cross-sectional snapshot times may not be representative of the behavior of the group. Thus, future studies should employ a longitudinal study. Finally, this study used a survey approach, which may lead to a common method variance (CMV) problem. CMV refers to variance attributable to the measurement method rather than the constructs the measures represent. Future studies could employ other techniques such as semi-structured interviews, focus group discussions, observations, or mixed-method research.

REFERENCES

Abd Khair, M.S.A., & Ahmad, P. 2021. A pilot study on waste management services for Mixed Density Housing Scheme. Case study: Section 7, Shah Alam, Selangor, Malaysia. In *IOP Conference Series: Earth and Environmental Science* 685(1): 012001.

Ahamed, A., Vallam, P., Iyer, N.S., Veksha, A., Bobacka, J., & Lisak, G. 2021. Life cycle assessment of plastic grocery bags and their alternatives in cities with confined waste management structure: A Singapore case study. *Journal of Cleaner Production* 278: 123956.

Ajzen I. 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50(2): 179–211.

Ajzen, I. 2020. The theory of planned behavior: Frequently asked questions. *Human Behavior and Emerging Technologies* 2(4): 314–324.

Bui, T.D., Tseng, J.W., Tseng, M.L., & Lim, M.K. 2022. Opportunities and challenges for solid waste reuse and recycling in emerging economies: A hybrid analysis. *Resources, Conservation and Recycling* 177: 105968.

Chen, H.L., Nath, T.K., Chong, S., Foo, V., Gibbins, C., & Lechner, A.M. 2021. The plastic waste problem in Malaysia: Management, recycling, and disposal of local and global plastic waste. *SN Applied Sciences* 3: 1-15.

Chwialkowska, A., Bhatti, W.A., & Glowik, M. 2020. The influence of cultural values on pro-environmental behavior. *Journal of Cleaner Production* 268: 122305.

Colvero, D.A., Ramalho, J., Gomes, A.P.D., de Matos, M.A.A., & da Cruz Tarelho, L.A. 2020. Economic analysis of a shared municipal solid waste management facility in a metropolitan region. *Waste Management* 102: 823-837.

Devadoss, P.M., Agamuthu, P., Mehran, S.B., Santha, C., & Fauziah, S.H. 2021. Implications of municipal solid waste management on greenhouse gas emissions in Malaysia and the way forward. *Waste Management* 119: 135-144.

Ebekozien, A., Samsurijan, M.S., Aigbavboa, C., & Malek, N.M. 2023. Malaysia's low-cost housing solid waste management in the era of COVID-19: The role of fourth industrial revolution technologies. *Management of Environmental Quality: An International Journal* 34(1): 80-98.

Enginkaya, E., & Sağlam, M.H. 2024. Recycling reinforced: The synergistic dynamics of sustainable behavior. *Sustainability* 16(9): 3827.

Fadhullah, W., Imran, N.I.N., Ismail, S.N.S., Jaafar, M.H., & Abdullah, H. 2022. Household solid waste management practices and perceptions among residents in the East Coast of Malaysia. *BMC Public Health* 22: 1-20.

Farmer, H., Xu, H., & Dupre, M.E. 2022. Self-efficacy. In *Encyclopedia of Gerontology and Population Aging,* hlm. 4410–4413. Cham: Springer International Publishing.

Green, S.B. 1991. How many subjects does it take to do a regression analysis. *Multivariate Behavioural Research* 26(3): 499–510.

Guo, W., Xi, B., Huang, C., Li, J., Tang, Z., Li, W., ... & Wu, W. 2021. Solid waste management in China: Policy and driving factors in 2004–2019. *Resources, Conservation and Recycling* 173: 105727.

Hair, J.F., Anderson, R.E., Babin, B.J., & Black, W.C. 2010. *Multivariate data analysis: A global perspective* 7.

Henn, L., Otto, S., & Kaiser, F.G. 2020. Positive spillover: The result of attitude change. *Journal of Environmental Psychology* 69: 101429.

Janmaimool, P., & Khajohnmanee, S. 2020. Enhancing university students' global citizenship, public mindedness, and moral quotient for promoting a sense of environmental responsibility and pro-environmental behaviors. *Environment, Development and Sustainability* 22(2): 957-970.

Kamaruddin, H., & Marwan, M.A. 2021. Extended Producer Responsibility (EPR) in Malaysia–Towards a sustainable waste management system. *The Journal of Contemporary Issues in Business and Government* 27(1): 4490-4497.

Kline, T. 2005. *Psychological testing: A practical approach to design and evaluation*. Sage: USA

Knickmeyer, D. 2020. Social factors influencing household waste separation: A literature review on good practices to improve the recycling performance of urban areas. *Journal of Cleaner Production,* 245: 118605.

Legros, S., & Cislaghi, B. 2020. Mapping the social-norms literature: An overview of reviews. *Perspectives on Psychological Science* 15(1): 62-80.

Lye, C.T., Ng, T.H., & Law, J.W. 2024. The role of general and specific pro-environmental education in household waste management in Malaysia: Evidence from quantile regression. *Environmental Challenges* 15: 100933.

Maitre-Ekern, E. 2021. Re-thinking producer responsibility for a sustainable circular economy from extended producer responsibility to pre-market producer responsibility. *Journal of Cleaner Production* 286: 125454.

Mohd Noor, N.H., Mustafa, M.A.S., Saharom, M., & Shamsol Kamal, N.S.S. 2022. Understanding Malaysian household waste separation: An extended theory of planned behavior. *Malaysian Journal of Sustainable Environment (MySE)* 9(1): 19–35.

Mohd Noor, N.H., Soleman, N.A.F., & Khairul Azuan, A.S. 2023. To recycle or not to recycle? Factors affecting Malaysian residents' intention for recycling e-waste. *Malaysian Journal of Social Sciences and Humanities (MJSSH)* 8(2): e002102.

Mustafa, M.A.S., Noor, N.H.M., & Kamal, N.S.S.S. 2022. Understanding Malaysian household waste separation: An extended theory of planned behaviour. *Malaysian Journal of Sustainable Environment* 9(1): 19-35.

Nanda, S., & Berruti, F. 2021. Municipal solid waste management and landfilling technologies: A review. *Environmental Chemistry Letters* 19(2): 1433-1456.

Noor, N.H.M., & Nordin, N.B. 2023. Reassuring pro-environmental behavior: A goal-framing theory perspective. *Bioresources and Environment* 1(3): 14-26.

Norsa'adah, B., Salinah, O., Naing, N.N., & Sarimah, A. 2020. Community health survey of residents living near a solid waste open dumpsite in Sabak, Kelantan, Malaysia. *International Journal of Environmental Research and Public Health* 17(1): 311.

Rakhmawati, T., Damayanti, S., Jati, R.K., & Astrini, N.J. 2023. An extended TPB model of waste-sorting intention: A case study of Indonesia. *Management of Environmental Quality: An International Journal* 34(5): 1248-1268.

Razali, F., Daud, D., Weng-Wai, C., & Jiram, W.R.A. 2020. Waste separation at source behaviour among Malaysian households: The theory of planned behaviour with moral norm. *Journal of Cleaner Production* 271: 122025.

Rosli, N.A., Aziz, H.A., Pueh, L.L.L., Othman, I.B., Zawawi, M.H., & Hung, Y.T. 2023. Management of various sources of hazardous waste. In *Waste Treatment in the Biotechnology, Agricultural and Food Industries:* Volume 2, hlm. 19-64. Cham: Springer International Publishing.

Sachitra, V. 2024. Exploring the roles of personality traits and self-efficacy on environmental engagement: A Sri Lankan youth survey. *Social Responsibility Journal* 20(4): 740–760.

Sayara, T., Basheer-Salimia, R., Hawamde, F., & Sánchez, A. 2020. Recycling of organic waste through composting: Process performance and compost application in agriculture. *Agronomy* 10(11): 1838.

Sh. Ahmad, F., Rosli, N.T., & Quoquab, F. 2022. Environmental quality awareness, green trust, green self-efficacy, and environmental attitude influencing green purchase behavior. *International Journal of Ethics and Systems* 38(1): 68-90.

Shakil, N.S.M., Azhar, N.A.Z.M., & Othman, N. 2023. Solid waste management in Malaysia: An overview. *Information Management and Business Review* 15(1): 86-93.

SWM Environment. 2023. *SWM Environment, Coca-Cola jalin kerjasama sedia fasiliti kitar semula di Nilai*. Retrieved from https://swm-environment.com/public/media-swm-in-the-news-details?id=628

Tamar, M., Wirawan, H., Arfah, T., & Putri, R.P.S. 2021. Predicting pro-environmental behaviors: The role of environmental values, attitudes, and knowledge. *Management of Environmental Quality: An International Journal* 32(2): 328-343.

Tian, H., Zhang, J., & Li, J. 2020. The relationship between pro-environmental attitude and employee green behavior: The role of motivational states and green work climate perceptions. *Environmental Science and Pollution Research* 27(7) 7341–7352.

Tirkolaee, E.B., Mahdavi, I., Esfahani, M.M.S., & Weber, G.W. 2020. A robust green location-allocation-inventory problem to design an urban waste management system under uncertainty. *Waste Management* 102: 340-350.

Tripathi, A., Tyagi, V.K., Vivekanand, V., Bose, P., & Suthar, S. 2020. Challenges, opportunities and progress in solid waste management during COVID-19 pandemic. *Case Studies in Chemical and Environmental Engineering* 2: 100060.

Wang, X. 2021. Analysis of influencing mechanism on waste separation behavior in Shanghai. *Sustainable Energy Technologies and Assessments* 47: 101479.

Wang, W., Cao, Q., Zhuo, C., Mou, Y., Pu, Z., & Zhou, Y. 2021. COVID-19 to green entrepreneurial intention: Role of green entrepreneurial self-efficacy, optimism, ecological values, social responsibility, and green entrepreneurial motivation. *Frontiers in Psychology* 12: 732904.

Wyss, A.M., Knoch, D., & Berger, S. 2022. When and how pro-environmental attitudes turn into behavior: The role of costs, benefits, and self-control. *Journal of Environmental Psychology* 79: 101748.

Zhou, J., Li, L., Wang, Q., Van Fan, Y., Liu, X., Klemeš, J.J., ... & Jiang, P. 2022. Household waste management in Singapore and Shanghai: Experiences, challenges, and opportunities from the perspective of emerging megacities. *Waste Management* 144: 221-232.

Muhammad Alif Haiqal Asmizar
Faculty of Administrative Science and Policy Studies,
Universiti Teknologi MARA (UiTM), Malaysia
Email: alifhaiqal619@gmail.com

Ilhamd Sazali
Faculty of Administrative Science and Policy Studies,
Universiti Teknologi MARA (UiTM), Malaysia
Email: ilhamdszali@gmail.com

Nurul Hidayana Mohd Noor
Faculty of Administrative Science and Policy Studies,
Universiti Teknologi MARA (UiTM), Malaysia
Email: hidayana@uitm.edu.my

Received: 25th June 2024
Accepted: 9th August 2024
Published: 31st December 2024