

HOUSEHOLD WASTE SEGREGATION IN PETALING JAYA, SELANGOR: A KAP PILOT STUDY

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Abstract. This study presents a pilot investigation aimed to measure Knowledge, Attitudes, and Practices (KAP) towards household waste segregation among communities in Petaling Jaya, Selangor. A quantitative survey approach was employed, involving 32 respondents aged 18 years old and above. The instrument comprised four sections: demographic profile, Knowledge, Attitudes, and Practices on waste segregation, with items adapted from previous studies. Data were collected through face-to-face questionnaire survey to enhance response accuracy. Reliability analysis using Cronbach's Alpha indicated good internal consistency for the attitude construct ($\alpha = 0.865$) and excellent reliability for the practice construct ($\alpha = 0.969$), while the knowledge construct showed lower reliability ($\alpha = 0.587$), suggesting the need for further refinement. Validity was ensured through expert review and pilot testing. Findings based on Bloom's cut-off revealed that most respondents demonstrated good levels of knowledge (96.9%) and attitudes (93.8%) toward waste segregation. However, practices levels were slightly lower, with 78.1% categorized as good, indicating a gap between awareness and actual behavior. Overall, the instrument is suitable for the main study, with minor improvements recommended for the knowledge scale to enhance measurement consistency.

Keywords: attitudes, knowledge, practices, segregation, urban

Introduction

Solid waste refers to unwanted or discarded materials generated from human activities that require proper disposal (Latif et al., 2012). It typically includes household, commercial, and industrial waste in solid or semi-solid form. In rapidly urbanizing regions, particularly within developing nations like Malaysia, solid waste management has escalated into a critical challenge. The convergence of population growth, economic expansion, and shifting consumption habits has led to a surge in municipal waste, straining traditional infrastructure (Othman et al., 2013; Kaliyaperumal, 2004). The generation of solid waste in Malaysia has escalated over time due to fast urbanization and population growth. As of now, overall waste generation has increased to 33,000 tonnes daily. This corresponds to 1.17 kilograms per individual daily (Portus et al., 2024). Consequently, domestic waste segregation at source has emerged as a fundamental strategy for improving recycling yields and fostering environmental sustainability (Viechtbauer et al., 2015) at the individual level. As this also been agreed by Likert (1832) which stated that source segregation is a viable method to enhance the efficacy of waste recycling, recovery, and reuse initiatives. Segregation waste at the source is vital for diverting debris from overcapacity landfills and reducing the overall ecological footprint; however, despite institutional mandates and public advocacy, household compliance remains inconsistent across many urban centres (Martianto et al., 2024; Saphores et al., 2006). This persistent gap underscores the necessity of investigating the psychological and social drivers that influence individual environmental participation.

The Knowledge, Attitudes, and Practices (KAP) framework provides a robust lens through which to analyse these environmental behaviours. Within this framework, Knowledge encompasses an individual's understanding of the mechanics and benefits of waste segregation, while Attitudes represent the underlying perceptions and readiness to participate in green initiatives. Practices, in turn, denote the tangible, everyday actions of sorting waste within the home (Wan et al., 2014). While literature often suggests that increased Knowledge and positive Attitudes correlate with improved Practices, this link is frequently disrupted by practical barriers such as inadequate facilities, time limitations, and perceived inconvenience (Wu et al., 2022; Ramayah et al., 2012). In the Malaysian context, the government has launched numerous source-segregation campaigns to address these issues, yet a significant "value-action gap" persists in high-density areas (Othman et al., 2013). Petaling Jaya, Selangor, as a burgeoning urban hub, faces intensified waste generation due to its rapid development, making it a critical site for behavioural research. Identifying the specific drivers of local habits in this area is essential for developing effective, localized interventions. This study seeks to evaluate the current levels of Knowledge, Attitudes, and Practices regarding household waste segregation among residents of Petaling Jaya. By identifying the core determinants of resident participation, this research intends to support the design of more effective policies and strategic frameworks for sustainable waste management across Malaysia's urban landscape.

Review of literature

The escalating volume of solid waste has emerged as a global environmental crisis, propelled by rapid population expansion, urbanization, and evolving consumption trends. Inefficient disposal methods, such as open dumping and an over-reliance on landfills, contribute to severe ecological and public health repercussions, including widespread pollution, the exhaustion of natural resources, and increased greenhouse gas emissions (Kihila et al., 2021; Ahmed and Ali, 2004). In developing nations like Malaysia, these issues are compounded by infrastructural deficits, inconsistent enforcement, and minimal public engagement in sustainable initiatives. Consequently, it is vital to implement a comprehensive waste management strategy that integrates technical operational efficiency with active public involvement. Domestic waste segregation constitutes a primary pillar of modern waste management systems, as it improves the purity of recyclables, prevents cross-contamination, and maximizes the reclamation of valuable resources (Hertzog, 2008). Nevertheless, the efficacy of source segregation is heavily contingent upon the KAP of individuals, alongside their inherent motivation to adopt environmentally responsible behaviours (Barr, 2007). This literature review evaluates the fundamental concepts of solid waste and segregation through both global and Malaysian lenses. Furthermore, it analyses the behavioural determinants within the Knowledge, Attitudes, and Practices framework, while assessing the alignment of these factors with the Sustainable Development Goals (SDGs) to identify critical gaps in current research.

Conceptual overview of solid waste and waste segregation

Solid waste is broadly categorized as any discarded or redundant material resulting from human endeavours, spanning residential, commercial, and industrial origins (Vicente and Reis, 2008). A primary subset of this is municipal solid waste (MSW),

which encompasses the diverse array of everyday items, such as organic matter, plastics, paper, glass, and metals, generated within households and local communities (Ziegenfuss et al., 2021). Household waste, specifically, constitutes a major share of MSW and is inextricably linked to contemporary lifestyle choices and domestic consumption trends (Guerrero et al., 2013). Waste segregation involves the systematic sorting of materials into distinct categories, such as organic, recyclable, and residual waste, at the initial point of generation (Hertzog, 2008). This fundamental practice serves as a pillar of sustainable management by bolstering recycling productivity, preventing the degradation of materials through contamination, and significantly lowering the volume of refuse destined for landfills (Taber, 2018). Within the Malaysian framework, waste segregation is legally enforced under the Solid Waste and Public Cleansing Management Act 2007 (Act 672). While this legislation mandates that households separate their waste to optimize national recycling goals, the ultimate success of these regulatory measures remains heavily reliant on the KAP of the public.

Global and domestic perspectives on solid waste management

On a global scale, the management of solid waste has evolved into an urgent environmental crisis, fuelled by accelerated urbanization, demographic expansion, and economic growth. Projections indicate that global waste production will surge from 2.01 billion tonnes to approximately 3.4 billion tonnes by 2050 (Latif et al., 2012). Developing nations are disproportionately affected by this trend, as they often grapple with substandard infrastructure, restricted fiscal capacity, and inconsistent regulatory oversight, which frequently lead to hazardous outcomes such as open dumping and unregulated landfilling (Ahmed and Ali, 2004). Within the Malaysian context, the volume of solid waste is on a steady upward trajectory, about 33,000 tonnes daily in 2021 (Portus et al., 2024), which now surpassing 38,000 tonnes (Tchobanoglous and Kreith, 2002). While the government has introduced strategic initiatives, notably the National Solid Waste Management Policy in 2005 and the Waste Separation at Source Program in 2015, national recycling rates have not yet achieved the benchmarks set by developed economies (Cronbach, 1951). Consequently, landfilling remains the primary disposal method in Malaysia, a reliance that exacerbates land scarcity, heightens greenhouse gas emissions, and increases the risk of leachate-related pollution.

Table 1 presents household waste generation data in Malaysia, indicating a slight decrease in the national per capita waste generation rate following the inclusion of approximately 6 million residents from Sabah and Sarawak. Compared to Peninsular Malaysia, both Sabah and Sarawak exhibit lower household waste generation rates. Consequently, the national average stands at 0.76 kg/capita/day, which is marginally lower than the 0.8 kg/capita/day recorded in Peninsular Malaysia (Kaza et al., 2018).

Table 1. Average household waste generation in Malaysia, 2012.

Housing Type	Area Type	Population	Per Capita (kg/cap/day)	Total (MT/day)
Low Cost Landed	Urban	2,675,954	0.74	1,988
	Rural	2,019,579	0.69	1,397
	Overall	4,695,533	0.72	3,384
Low Cost High-rise	Urban	3,778,052	0.63	2,394
	Rural	830,781	0.71	586
	Overall	4,608,833	0.65	2,981
Medium Cost Landed	Urban	8,167,292	0.89	7,245
	Rural	3,377,231	0.67	2,276
	Overall	11,544,523	0.82	9,521
High-Medium cost High-rise	Urban	2,366,232	0.89	2,095
	Rural	-	-	-

	Overall	2,66,232	0.89	2,095
High Cost Landed	Urban	20,124,970	0.80	16,025
	Rural	1,981,574	0.68	1,343
	Overall	5,119,014	0.71	3,646

Significance of waste segregation and domestic practices

At the household level, waste segregation serves as a vital instrument for sustainable waste management. By separating materials at the point of origin, residents enable more effective recycling and resource recovery, which directly diminishes the burden on landfills and preserves natural resources (Fadhullah et al., 2022). Furthermore, systematic segregation plays a critical role in curbing environmental pollution and facilitating the broader transition toward a circular economy. Individual household practices are the primary determinants of the success of these environmental initiatives. Routine domestic activities, including food preparation, consumption habits, and disposal methods, directly dictate both the volume and the specific composition of solid waste generated (Moh and Abd Manaf, 2017). Despite the clear benefits, many households do not consistently engage in proper segregation. This failure is often attributed to a deficit in Knowledge, the perceived inconvenience of the task, or the presence of inadequate physical facilities. Research indicates that even when residents possess a high level of awareness regarding proper waste management, their actual Practices regarding waste segregation may remain stagnant due to deep-seated behavioural barriers and a lack of personal motivation (Hassan et al., 2000). Therefore, improving waste management outcomes in urban centres like Petaling Jaya requires a multifaceted approach. To bridge the gap between positive Attitudes and tangible actions, it is essential to integrate targeted educational outreach with reliable infrastructure and continuous public awareness campaigns.

Drivers of waste segregation practices and public participation

The adoption of waste segregation behaviour is shaped by a complex interplay of socio-economic, environmental, and institutional drivers. Primary determinants include education levels, household income, the size of the family unit, and the physical accessibility of waste management infrastructure. Furthermore, consistent exposure to environmental awareness programs significantly influences an individual's propensity to participate in green initiatives (Barr, 2007). Community participation remains a vital cornerstone for any effective waste management system. Active engagement from local residents is necessary to ensure that waste segregation, recycling, and disposal protocols are followed correctly. However, despite the importance of this involvement, participation rates often falter due to a lack of knowledge, a deficit of tangible incentives, and the inconsistent enforcement of existing regulations (Hertzog, 2008). The role of infrastructure is equally significant in determining local practices. The presence of conveniently located recycling bins, reliable collection services, and accessible disposal systems acts as a catalyst for households to maintain consistent segregation habits. Conversely, when facilities are inadequate or poorly maintained, it serves as a deterrent to responsible waste management (Hassan et al., 2000). Beyond physical and economic factors, social influence and community norms are powerful drivers of individual action. When waste segregation is normalized as a collective standard within a neighbourhood, individuals are more likely to align their own Practices with those of their peers. Consequently, fostering a sense of shared responsibility and strengthening community engagement are essential strategies for

improving long-term waste management outcomes in urban environments like Petaling Jaya.

Knowledge, Attitudes, and Practices (KAP) approach in household waste management

The KAP framework serves as a cornerstone for analysing environmental behaviour, particularly within the field of waste management. This model posits a sequential relationship wherein an individual's Knowledge informs their Attitudes, which subsequently dictates their tangible Practices (Barr, 2007). Knowledge represents the cognitive dimension of the framework, involving an individual's grasp of waste management principles, ecological consequences, and the specific advantages of waste segregation. Research suggests that elevated levels of environmental Knowledge correlate with a deeper awareness of sustainability, which often acts as a precursor to more responsible disposal behaviours (Wu et al., 2022). Attitudes encompass the affective and evaluative dimension, reflecting an individual's internal perceptions, core beliefs, and their general readiness to participate in waste segregation. Generally, a positive Attitude toward environmental conservation is a strong predictor of increased engagement in sustainable household routines (SWCorp Malaysia, 2023). Practices constitute the behavioural dimension, referring to the actual, observable actions taken to manage waste, such as the consistent sorting of recyclables and adherence to proper disposal protocols. However, scholars often identify a "value-action gap" where high levels of Knowledge do not translate into consistent Practices. This disconnect is frequently caused by external constraints, such as perceived inconvenience or a deficit in localized infrastructure (Hassan et al., 2000). Ultimately, the KAP framework demonstrates that successful waste management outcomes require more than mere awareness; they necessitate a fundamental behavioural shift supported by an enabling environment. Therefore, conducting a detailed analysis of Knowledge, Attitudes, and Practices is vital for developing precision-targeted interventions designed to improve domestic waste segregation in urban centres like Petaling Jaya.

Waste segregation and the Sustainable Development Goals (SDGs)

The implementation of effective waste management and segregation is intrinsically linked to the United Nations SDGs, acting as a vital catalyst for global sustainability. These initiatives directly support SDG 3 (Good Health and Well-being) by curbing environmental contamination and reducing the public health hazards associated with unregulated disposal practices. At the metropolitan level, robust waste frameworks are essential for achieving SDG 11 (Sustainable Cities and Communities), as they foster cleaner, more resilient urban environments. Simultaneously, such efforts advance SDG 12 (Responsible Consumption and Production) by encouraging recycling and maximizing resource efficiency throughout the lifecycle of consumer goods. Furthermore, domestic waste segregation serves as a critical mechanism for SDG 13 (Climate Action). By diverting organic materials away from landfills, these Practices significantly lower the emission of potent greenhouse gases, most notably methane [20]. When residents in areas like Petaling Jaya actively participate at the household level, they serve as direct contributors to these international sustainability benchmarks. Within the Malaysian landscape, harmonizing local waste protocols with the SDGs is more than a global commitment; it is a fundamental requirement for securing long-term ecological health and fostering sustainable urban growth. By assessing the knowledge and attitudes

of the citizenry, policymakers can better align national strategies with these overarching global objectives.

Materials and Methods

This quantitative study was conducted as a pilot study to examine the Knowledge, Attitudes, and Practices (KAP) related to household waste segregation. A total of 32 respondents participated in the survey using a convenience sampling approach. The sample size of 32 respondents is considered adequate for a pilot study, as pilot studies are primarily conducted to evaluate the feasibility, clarity, and reliability of research instruments rather than to produce generalizable findings. According to Wilson et al. (2006), pilot study sample sizes can be determined based on methodological considerations, particularly when the objective is to identify potential issues in study design and data collection procedures. Furthermore, previous methodological literature suggests that a sample size ranging between 30 and 50 participants is generally sufficient for pilot studies to assess internal consistency and preliminary trends. Therefore, the use of 32 respondents in this study is appropriate for achieving the objectives of instrument testing and preliminary analysis of Knowledge, Attitudes, and Practices (KAP) related to household waste segregation in Petaling Jaya. Data for this study were collected through a self-administered questionnaire distributed both online (via Google Forms) and in person to residents of Petaling Jaya using a convenience sampling approach. The inclusion criteria required respondents to be at least 18 years old and currently residing within Petaling Jaya. To ensure that participants were genuinely from the study area, the questionnaire included a screening question and a postcode section, where only responses with valid Petaling Jaya postcodes were retained for analysis. In addition, respondents were asked to confirm their residential status in Petaling Jaya before proceeding with the survey. This approach helped to verify the geographical relevance of the sample and ensured that the data collected accurately represented the target population within the study area.

The research instrument consisted of structured questionnaires incorporating dichotomous and Likert-scale items to measure the variables under study. Dichotomous scales were applied for Section A, where responses were coded as 1 (Yes/True) and 0 (No/False). In addition, a 5-point Likert scale was used in Section B for attitudinal and behavioural measurements, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The use of Likert scales in Section C is widely accepted in social science research for measuring attitudes and perceptions (Moh and Abd Manaf, 2014; Boone Jr and Boone, 2012). The questionnaire was structured to examine the distribution of items across the three main variables as presented in *Table 2*: Knowledge, Attitude, and Practice. The knowledge construct was measured using 10 items covering segregation basics, organic waste, recyclables, hazardous waste, environmental impact awareness, and information awareness. Attitude was measured using 15 items reflecting respondents' perceptions towards waste segregation, while practice was assessed using 20 items focusing on segregation frequency, types of waste segregated, recycling methods, waste reduction practices, access to resources, and social influence. The questionnaire design is consistent with the KAP framework, which is widely used to assess environmental behaviour and public awareness (Latif et al., 2012). The reliability of the instrument was assessed using Cronbach's Alpha, as presented in *Table 3*. Cronbach's Alpha is a commonly used measure of internal consistency in survey research (Troschinetz and

Mihelcic, 2009; DeVon et al., 2007). Based on the reliability thresholds, the attitude construct demonstrated good internal consistency ($\alpha = 0.865$), while the practice construct showed excellent reliability ($\alpha = 0.969$). The knowledge construct recorded a lower reliability value ($\alpha = 0.587$), indicating relatively weak internal consistency that may require further refinement. Overall, the pilot study serves to evaluate the suitability and consistency of the instrument prior to the main data collection (Hoornweg and Bhada-Tata, 2012). Further statistical analysis was conducted using IBM SPSS Statistics to support subsequent data analysis and interpretation.

Table 2. *Distribution of items in the survey.*

Section	Variable	Construct	No of items	Total	Cronbach Alpha
A	Knowledge	Segregation Basics	2	10	0.587
		Organic Waste Knowledge	3		
		Recyclables Knowledge	3		
		Hazardous Waste Knowledge	3		
		Environmental Impact Awareness	3		
		Information & Awareness	1		
B	Attitude	Attitude on Waste Segregation	15	15	0.865
C	Practice	Segregation Frequency	4	20	0.969
		Types of Waste Segregated	5		
		Recycling Methods	4		
		Waste Reduction Practices	2		
		Access to Resources	3		
		Social Influence	2		

Table 3. *Reliability levels, Cronbach's Alpha range and interpretations.*

Reliability Level	Cronbach's Alpha range	Interpretation
Excellent	0.9 and above	Indicates very high internal consistency
Good	0.80-0.89	Reflects strong internal consistency
Acceptable	0.70-0.79	Indicates acceptable internal consistency
Questionable	0.60-0.69	Reflects questionable internal consistency
Poor	Below 0.6	Indicates poor internal consistency

Study area

The study area for this research is Petaling Jaya; a highly urbanized city located in the Petaling District within the Klang Valley region. Petaling Jaya is situated approximately 10 kilometers west of Kuala Lumpur and is well connected by major transportation networks, including the New Klang Valley Expressway (NKVE), Federal Highway, and Damansara–Puchong Expressway (LDP). Its strategic location and accessibility have contributed significantly to its rapid urban development, transforming it into a dynamic metropolitan area characterized by diverse residential, commercial, and industrial land uses. Over the past few decades, Petaling Jaya has experienced substantial population growth and urban expansion, driven by economic development, improved infrastructure, and increasing demand for housing within the Klang Valley. The city comprises a heterogeneous population, including working professionals, students, and families from various socio-economic and cultural backgrounds. This diversity makes Petaling Jaya a suitable and representative location for examining household waste segregation behaviour and understanding variations in environmental practices among different population groups (Afroz et al., 2011). *Figure 1* illustrates the location of the study area in Petaling Jaya, Selangor. Rapid urbanization in Petaling Jaya has led to increased consumption patterns and a corresponding rise in municipal solid waste generation, reflecting broader global trends. Urban areas tend to generate higher volumes of waste due to intensified economic activities and evolving lifestyles,

which place significant pressure on waste management systems (Latif et al., 2012). In Malaysia, the expansion of urban populations has been closely associated with challenges such as inadequate waste segregation, over-reliance on landfills, and limited public participation in recycling initiatives (Hoffmann et al., 2024). Therefore, Petaling Jaya provides a relevant and critical context for conducting a pilot study on household waste segregation, particularly in assessing knowledge, attitudes, and practices (KAP) among urban residents.

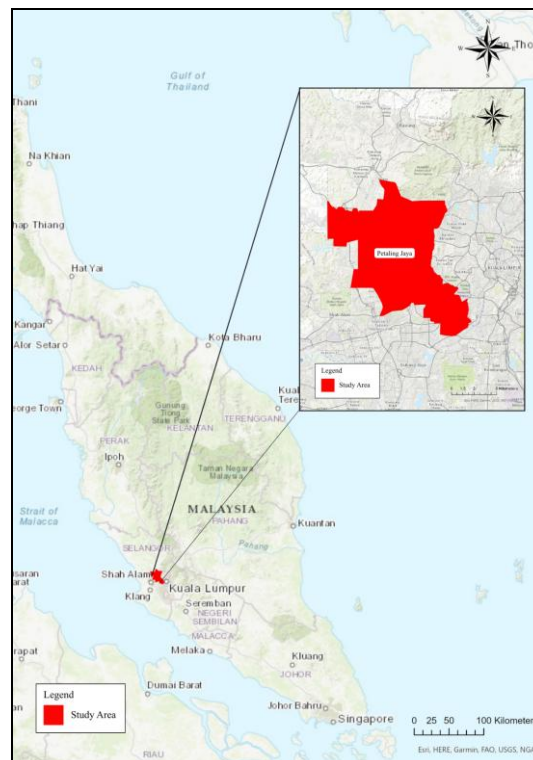


Figure 1. Study area.

Results and Discussion

Demographic analysis

According to Ziegenfuss et al. (2021), demographic data are commonly presented in percentages to describe the characteristics of the sample and to enhance the generalizability of the findings. Such reporting provides a clear overview of participants' profiles and facilitates better interpretation of the study context. With reference to *Table 4*, the sample consists of 46.9% male and 53.1% female respondents. In terms of age distribution, the majority of respondents fall within the 20–24 age group (28.1%), followed by those aged 45–49 (18.8%) and 25–29 (15.6%), while smaller proportions are observed across other age categories. Regarding marital status, more than half of the respondents are married (53.1%), followed by single individuals (40.6%), and a small percentage categorized as others (6.3%). The educational background of respondents indicates that a large majority have attained higher education (93.8%), while only 6.3% possess secondary-level education. In terms of occupation, students represent the largest group (25%), followed by respondents in the government sector (21.9%), and equal proportions in the private sector and self-

employment (18.8% each). Smaller percentages are observed among unemployed individuals (9.4%) and pensioners (6.3%).

Table 4. Demographic profile.

Question	Demographic Profile	Categories	Percentage (%)
DV1	Gender	Male	46.9
		Female	53.1
DV2	Age	18 – 19	3.1
		20 – 24	28.1
		25 – 29	15.6
		30 – 34	6.3
		40 – 44	3.1
		45 – 49	18.8
		50 – 54	12.5
		55 and above	12.5
DV3	Marital Status	Single	40.6
		Married	53.1
		Others	6.3
DV4	Educational Background	Secondary	6.3
		Higher Education	93.8
DV5	Occupation	Self- Employed	18.8
		Government Sector	21.9
		Private Sector	18.8
		Unemployed	9.4
		Student	25
		Pensioner	6.3
DV6	Monthly Income	No Income	46.9
		< RM5249	31.3
		RM5250 – RM11819	18.8
		>RM11820	3.1
DV7	Household Size	2 – 3	9.4
		4 – 6	75
		>6	15.6
DV8	Type of Residence	Apartment/Flat	6.3
		Terrace	53.1
		Semi- Detached	15.6
		Bungalow	25
DV9	Length of Stay	<1 year	9.4
		1 – 5 years	25
		6 – 10 years	9.4
		>10 years	56.3
DV10	Residential Postcode	46000	9.4
		46100	40.6
		46200	6.3
		46300	6.3
		47300	28.1
		47800	9.4

With respect to monthly income, nearly half of the respondents reported having no income (46.9%), followed by those earning below RM5249 (31.3%) and those within the RM5250–RM11819 range (18.8%), while only a small proportion earns above

RM11820 (3.1%). In terms of household size, the majority of respondents live in households of 4–6 members (75%), followed by households with more than six members (15.6%) and smaller households of 2–3 members (9.4%). Regarding residential characteristics, terrace houses are the most common type of residence (53.1%), followed by bungalows (25%), semi-detached houses (15.6%), and apartments or flats (6.3%). In terms of length of stay, the majority of respondents have lived in the area for more than 10 years (56.3%), followed by those residing for 1–5 years (25%), while smaller proportions fall within shorter durations.

Finally, the distribution of respondents across residential postcodes shows that the largest proportion resides in the 46100 area (40.6%), followed by 47300 (28.1%), with smaller percentages distributed across other postcode areas. The inclusion of a postcode item in the questionnaire served not only to examine spatial variations in household waste segregation practices, but also as a screening mechanism to ensure that respondents were genuinely residing within Petaling Jaya. This step was essential to maintain the geographical validity of the dataset, as responses from individuals outside the study area were excluded from analysis. By verifying respondents' location through postcode, the study ensures that the findings are accurately representative of the target population and can be reliably used for publication and analysis. Additionally, postcode data enables the exploration of how differences in infrastructure, municipal services, and socio-economic conditions across neighborhoods may influence KAP, thereby supporting more targeted and context-specific policy recommendations.

Reliability

Several techniques, including parallel form test-retest, Kuder-Richardson, and Cronbach's Alpha, are commonly employed to assess the reliability of questionnaires. In this study, the Cronbach's Alpha method was specifically applied to evaluate the internal consistency of the developed scales, following the recommendations of Aithal and Aithal (2020). The analysis was conducted separately for the three constructs: Knowledge, Attitude, and Practice, as presented in *Table 5*, *Table 6*, and *Table 7*, respectively. The Knowledge scale yielded a Cronbach's Alpha of 0.587 (*Table 5*), indicating a poor level of internal consistency. This suggests that some items may not fully align conceptually and may require revision in future studies. The Attitude scale demonstrated a Cronbach's Alpha of 0.865 (*Table 6*), reflecting good reliability, while the Practice scale achieved an excellent Cronbach's Alpha of 0.969 (*Table 7*), indicating a very high level of internal consistency.

Table 5. Knowledge scale reliability for waste segregation.

Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	0.000	0.590
2	0.000	0.590
3	0.069	0.603
4	0.074	0.722
5	0.000	0.590
6	0.000	0.590
7	0.000	0.590
8	0.000	0.590
9	0.709	0.415
10	0.000	0.590
11	0.709	0.415

12	0.699	0.459
13	0.000	0.590
14	0.000	0.590
15	0.699	0.459

Table 6. Attitude scale reliability for waste segregation.

Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	0.360	0.867
2	0.593	0.852
3	0.688	0.843
4	0.512	0.858
5	0.690	0.845
6	0.534	0.857
7	0.310	0.876
8	0.702	0.842
9	0.723	0.839
10	0.760	0.839

Table 7. Practice scale reliability for waste segregation.

Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	0.942	0.965
2	0.637	0.969
3	0.839	0.966
4	0.911	0.965
5	0.942	0.965
6	0.757	0.967
7	0.664	0.969
8	0.652	0.969
9	0.811	0.966
10	0.647	0.968
11	0.842	0.966
12	0.781	0.967
13	0.825	0.966
14	0.653	0.968
15	0.911	0.965
16	0.911	0.965
17	0.649	0.968
18	0.724	0.967
19	0.762	0.967
20	0.724	0.967

Item analysis for each scale included inter-item correlations, item-total correlations, and Cronbach's Alpha if an item was deleted. All inter-item correlations were positive, indicating that items were conceptually coherent. Low inter-item correlations would suggest non-discriminating items, whereas extremely high correlations could indicate redundancy or multidimensionality (Elmosaad et al., 2023). For the Attitude and Practice scales, all items showed satisfactory item-total correlations, confirming that each item contributed meaningfully to the overall scale. Overall, the results indicate that the Attitude and Practice scales have sufficient reliability for research purposes. The Knowledge scale, however, requires refinement to improve internal consistency. These findings support the robustness of the questionnaire and provide a solid foundation for subsequent data collection and analysis.

Bloom's cut-off

The levels of KAP toward household waste segregation were categorized using Bloom's cut off criteria, which is a widely adopted method in KAP studies to classify

respondents' performance into graded levels (e.g., good, moderate, poor). Bloom's original framework classifies scores into good (typically $\geq 80\%$), moderate (60 – 79%), and poor ($< 60\%$) based on the percentage of total possible score, and has been applied in various questionnaire based health and behavior research (e.g., knowledge, attitude, and practice studies) to interpret respondents' levels of understanding and behavior toward specific topics (Alwidyan et al., 2025).

Knowledge, Attitude, and Practice levels of households toward waste segregation

Based on Bloom's cut-off criteria, the majority of respondents demonstrated high levels of Knowledge and Attitude toward waste segregation. The result was found as shown in *Table 8*. For Knowledge, most respondents (96.9%) scored in the "Good" category, with only 3.1% classified as "Moderate," indicating that households generally possess adequate knowledge regarding waste segregation. Similarly, the Attitude scale showed that 93.8% of respondents had a "Good" attitude, while 6.3% were at a moderate level, reflecting a generally positive mindset toward waste segregation. In terms of Practice, the results were slightly more varied: 78.1% of respondents scored "Good," 6.3% "Moderate," and 15.6% "Poor," indicating that while most households demonstrate proper waste segregation practices, a small proportion still require improvement. Overall, these findings suggest that although knowledge and attitudes toward waste segregation are strong among households in Petaling Jaya, Selangor, practice lags slightly behind, highlighting the need for interventions that translate knowledge and attitude into consistent behavioral practices.

Table 8. KAP levels based on Bloom's cut-off criteria.

Scale	Level	Frequency (n)	Percent
Knowledge	Moderate	1	3.1
	Good	31	96.9
Attitude	Moderate	2	6.3
	Good	30	93.8
Practice	Poor	5	15.6
	Moderate	2	6.3
	Good	25	78.1

This pilot study underscores the importance of developing a reliable and valid instrument to assess KAP toward household waste segregation in urban communities. The findings reveal that although respondents exhibit high levels of knowledge and positive attitudes, these do not consistently translate into actual waste segregation practices. This supports existing literature indicating the presence of a "value–action gap," where environmental awareness does not necessarily lead to behavioural change due to external barriers such as convenience and infrastructure limitations (Barr, 2007). Recent studies further confirm that this gap remains a persistent issue, as individuals often struggle to translate pro-environmental values into actual behavior due to behavioral, social, and contextual constraints (Recio-Román et al., 2024; Singh et al., 2014). Moreover, experimental evidence shows that factors such as perceived insignificance of individual actions and uncertainty of outcomes can further weaken the link between environmental attitudes and behavior (JPSPN, 2013).

In the context of responsibility in managing the waste, each stakeholders play their own role. Waste should be managed wisely in order to reduce the amount of waste on

the landfill thus in order to avoid any environmental pollution and health impact towards the surrounding. Public and individual as the waste generator should practice the sustainable consumption and practices in order to reduce the amount of waste generation. Public and individual should take part in recycling their waste as recycling is one of the pillars in sustainable waste management practices. Government should play their own role as the one who provide the rules and regulations in managing the waste including the waste recycling. Rules and regulations for example Act 672 is important as the reference materials and should be follow. However, the shortcoming from the rules and regulations are the enforcement by the government themselves. The inadequacy from the enforcement by the government is one of the factors on waste management weaknesses. The waste management company is the responsibility bodies in managing the waste. From the process of collection, transportation, segregate and dispose the waste is managed by the waste management company.

Conclusion

The reliability analysis demonstrates that the attitude and practice constructs are sufficiently robust for research application, while the knowledge construct requires further refinement to improve internal consistency, consistent with recommendations in instrument development studies (Troschinetz and Mihelcic, 2009). Notwithstanding this constraint, the instrument establishes a robust methodological basis for the primary study and adds significant value to the expanding field of Knowledge, Attitudes, and Practices-based environmental research. Furthermore, this study highlights the critical role of community behaviour in achieving sustainable waste management, particularly in rapidly urbanizing areas like Petaling Jaya. Effective interventions should therefore extend beyond awareness campaigns to include improved facilities and policy enforcement, as emphasized in previous studies on waste management behaviour (Hertzog, 2008). As highlighted in Othman et al. (2013), Malaysia should embrace an inclusive evolution in solid waste management by inviting the public to play a more active role in decision-making processes. This shift transforms the relationship between citizens and their environment, encouraging a vibrant sense of shared ownership and civic pride where every resident feels empowered to contribute to a cleaner nation. By continuing to enhance local facilities and providing transparent, accessible information on recycling, authorities and stakeholders are building a dynamic partnership with the community. This collaborative model inspires a proactive culture of sustainability, ensuring a greener future for Malaysia through collective action and informed, enthusiastic engagement. Future research is recommended to involve a larger sample size and explore additional socio-environmental factors to enhance the applicability and generalizability of the findings.

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Conflict of interest

The authors confirm that there is no conflict of interest involve with any parties in this research study.

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