Malaysians' Knowledge and Awareness Towards Recycling Electrical Devices

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ABSTRACT

The rapid advancement of electrical and electronic technologies has contributed to a significant increase in electronic waste (e-waste) generation worldwide, including in Malaysia. Frequent replacement of electronic devices due to technological innovation, functional limitations, and consumer preferences has intensified concerns regarding improper e-waste disposal. This study aims to examine Malaysians' knowledge and awareness towards e-waste management, particularly in relation to recycling electrical and electronic devices. A quantitative research approach was employed using a structured questionnaire distributed through Google Forms to Malaysian respondents aged 18 years and above. The questionnaire focused on respondents' demographic background, purchasing behavior, disposal practices, and levels of knowledge and awareness regarding e-waste management. The findings revealed that respondents demonstrated a very high level of knowledge regarding the importance of electronic waste management with m=4.13, as well as a very high level of awareness toward the importance of managing electronic waste responsibly with m= 4.34.

Keywords: e-waste, awareness, attitude, recycling, Malaysia

INTRODUCTION

E-waste is defined as any electrical device that is broken, old, or no longer used by the owner. In Malaysia, the amount of e-waste is growing fast because people change their phones and laptops very often to follow new trends. Unlike organic waste, electronics contain toxic materials like mercury and cadmium that can poison the soil if buried in a landfill. This research highlights the importance of using official collection points registered with the Department of Environment to ensure these items are processed safely (Ya'acob & Nur, 2023).

E-waste contains both valuable materials, such as copper and gold, and hazardous substances, including lead and brominated flame retardants (Ye et al., 2022). When e-waste is improperly handled, especially through informal recycling or improper disposal, it can cause very serious health risks to workers and communities that live nearby. Despite these dangers, public awareness of safe e-waste disposal methods remains relatively low in many regions and countries, including Malaysia (Heacock et al., 2019). The huge volume of e-waste created by the electronics sector is beginning to have serious implications (Jain et al., 2023).

In recent years, the consumption of electronic products has increased due to affordability, innovation, and changing consumer lifestyles. Many users replace devices not because they are broken, but because newer models offer better features. This pattern contributes to shorter product life cycles and a growing accumulation

of e-waste. Without proper management, these discarded electronics can release toxic substances that contaminate soil, water, and air (Zeng et al., 2020). We should prepare before any problems arise. In terms of the environment, this means we must learn how to manage our old electronics before they damage our health and water supply.

This study aims to evaluate the level of public awareness and understanding of e-waste management practices. It focuses on how individuals' awareness of e-waste issues and their disposal behaviors. Understanding these aspects is important for developing effective strategies to encourage the responsible disposal and recycling of electronic products, especially as Malaysia's annual e-waste generation is projected to reach 24.5 million units by 2025 (The E-waste Inventory Project in Malaysia, 2020).

The purpose of e-waste management is to safely dispose of electronic items, preventing toxic materials from polluting the environment, such as water and air, and to recover valuable resources. By default, our health will also be taken care of, which is one of the most valuable and the government's main priorities. Additionally, proper electrical devices disposal management prevents data security threats by reducing the disclosure of sensitive information and encourages sustainable development through creating revenue while fostering global environmental goals (Goh & Sukri, 2024).

Tony Fry, a cultural theorist and philosopher from Britain, once said, "Does what we create justify what we destroy?" This statement highlights how we, as humans, take some things in our lives for granted, just because we have the privilege to dispose of something easily. In the digital era, rapid technological advancement has led to a growing problem of electronic waste, commonly known as e-waste. As more Malaysians buy the latest smartphones and laptops, the old ones are often thrown away incorrectly. This research aims to examine the level of public awareness and knowledge regarding e-waste management, recognizing that improper disposal of electronic devices poses serious environmental and health risks (Alias, 2021).

In conclusion, e-waste is an increasing environmental concern that requires urgent attention, and protecting Malaysia's natural environment from toxic waste demands both knowledge and action. As electronic consumption continues to grow, effective management strategies are essential to minimize environmental harm and safeguard public health. This research enhances understanding of public awareness and behavior related to e-waste, offering insights that can help develop more effective policies and initiatives. Although e-waste is a challenging issue, it can be managed if each individual takes a small step to dispose of their gadgets properly.

Problem Statement

Industry authorities and waste management officials in Malaysia continue to face increasing challenges related to electronic waste (e-waste), including waste electrical and electronic equipment. Malaysia has seen a steady rise in e-waste generation due to rapid technological advancement and high consumption of electronic devices (Global E-waste Monitor, 2024). Although regulatory frameworks and recycling initiatives exist, public participation in proper e-waste disposal remains inconsistent, particularly at the household level.

Previous studies indicate that Malaysians generally have basic knowledge of the environmental and health risks linked to improper e-waste disposal. However, this knowledge does not always lead to proper disposal practices. For example, people often store unused devices at home or throw them away with household trash, showing a gap between awareness and action (Mahat et al., 2025).

Demographic factors such as age, occupation, household income, and residential location significantly influence awareness, attitudes, and disposal behaviors. Although younger and urban populations may be more exposed to environmental information and sustainability campaigns, high awareness doesn't always lead to consistent recycling practices without proper infrastructure and convenience. Variations in income levels and occupational backgrounds can also affect perceptions of responsibility and willingness to engage in proper e-waste management.

The increasing use of electronic devices has further boosted e-waste volumes. Limited involvement in formal recycling programs is often due to perceptions that recycling facilities are hard to access. Unequal access to

formal recycling infrastructure continues to hinder effective public participation and leads to low national e-waste collection rates (Global E-waste Monitor, 2024).

Furthermore, the demand for sustainable e-waste management infrastructure has become more urgent as landfill capacity in Malaysia continues to decrease while e-waste generation increases with population growth and consumption patterns (Global E-waste Monitor, 2024). Addressing the gap between awareness, attitudes, and actual disposal behavior is therefore essential. By examining Malaysians' knowledge and awareness of recycling electrical devices, this study aims to provide empirical evidence to support policymakers and stakeholders in improving public education efforts, increasing access to recycling facilities, and strengthening sustainable e-waste management strategies in Malaysia.

METHODOLOGY

Research Design

This study employed a quantitative research design using a cross-sectional survey method to examine Malaysians' knowledge and awareness of e-waste management. Data were collected using a structured questionnaire distributed online via Google Forms. The use of an online questionnaire allowed for efficient data collection from respondents across different regions in Malaysia.

- **Sample**

This study employed a purposive sampling method to select respondents who were relevant to the research focus on e-waste and e-waste management. Participants were required to be 18 years old and above to ensure that responses were provided by individuals who were sufficiently mature and capable of understanding issues related to environmental sustainability. Respondents were selected from various regions across Malaysia, and only Malaysian citizens were included to ensure that the findings accurately reflected the local context and public awareness of e-waste issues in the country.

The minimum required sample size was calculated using the Raosoft Sample Size Calculator, which indicated that at least 385 respondents were needed to achieve a 95% confidence level for a large population. However, a total of 386 respondents successfully participated in this study, exceeding the minimum sample size requirement. This larger sample size further strengthened the reliability of the findings and supported robust statistical analysis.

Overall, the sampling approach and sample size used in this research were appropriate for examining the level of knowledge and awareness regarding the importance of e-waste and e-waste management among the public in Malaysia.

- **Research Instrument**

The research instruments were designed to collect and measure data relevant to the study's focus. A questionnaire was used as the main research instrument and was divided into three sections. The first section focused on the demographic information of the respondents. The second section examined the respondents' level of knowledge towards the importance of e-waste, while the third section assessed their level of awareness towards the importance of e-waste management (Ridzuan et al., 2018).

The demographic section of the questionnaire consisted of 11 questions designed to collect basic background information about respondents, such as their age, gender, education level, and other relevant traits. The numerical part of the questionnaire had 30 questions, all directly tied to the research objectives. These questions used a five-point rating scale: 1 for Strongly Disagree, 2 for Disagree, 3 for Neutral, 4 for Agree, and 5 for Strongly Agree. The questions featured straightforward wording, a clear structure, and relevance to everyday experiences, making them easy for respondents to understand.

- **Data Analysis**

The data collected were analyzed using the Statistical Package for Social Sciences (SPSS) version 31. The data analysis process involved designing the questionnaire, distributing the survey to the targeted respondents, and uploading the collected responses into SPSS for analysis. The survey questions were developed in accordance with the objectives of the study to ensure the relevance and validity of the data collected.

FINDINGS AND DISCUSSIONS

Section A: Demographic Background

Table 1.0 Demographic Characteristics of Respondents

Demographic	**Frequency**	**Percentage %**
Sex		
Male	125	32.4
Female	261	67.6
Age		
18 years old -23 years old	225	58.3
24 years old -29 years old	102	26.4
30 years old -35 years old	34	8.8
36 years old and above	25	6.5
Ethnicity		
Malay	329	85.2
Chinese	42	10.9
Indian	5	1.3
Bumiputra	9	2.3
Current Residing Area		
Urban	237	61.4
Suburban	133	34.5
Rural	15	3.9
Current Residing State		
East Coast (Pahang, Kelantan, Terengganu)	92	23.8
Northern Region (Perak, Penang, Perlis & Kedah)	53	13.7

Central Region (Kuala Lumpur, Selangor & Putrajaya)	176	45.6
Southern Region (Negeri Sembilan, Melaka & Johor)	52	13.5
East Malaysia （Sabah & Sarawak）	13	3.4
Occupation		
Student	228	59.1
Government Sector	51	13.2
Private Sector	74	19.2
Self-employed	17	4.4
Unemployed	12	3.1
Retired	4	1
Household Income		
B40 (RM 0 - RM 5,249）	144	37.3
M40 (RM 5,250 - RM 11,819）	165	42.7
T20 （RM 11,820 and above）	77	19.9

According to Table 1.0, most respondents were female (67.6%), while males made up 32.4%. The majority were aged 18–23 years (58.3%), indicating that the survey primarily involved young adults. In terms of ethnicity, Malay respondents formed the largest group (85.2%), and most respondents lived in urban areas (61.4%). The Central Region had the highest participation at 45.6%. Regarding occupation, students dominated the sample (59.1%), followed by private and government sector employees. Lastly, most respondents were from the M40 income group (42.7%), followed by B40 (37.3%) and T20 (19.9%), reflecting a balanced household income distribution.

Section B: Level of Knowledge Towards the Importance of E-Waste

Table 2.0 Level of Knowledge Towards the Importance of E-Waste

Item	**Mean**
I believe valuable materials from recycled e-waste could be used to make new products	4.49
I am sure e-waste requires special treatment before disposal	4.48
I believe e-waste releases toxic chemicals, causing air pollution	4.37
I think e-waste impose health risks or environmental hazard	4.21
I have heard the term "e-waste"	4.09
I am aware of the sources of e-waste	3.94

I know how to manage e-waste	3.79
I have read about e-waste recently	3.65
OVERALL	**4.13**

Respondents clearly understood the benefits of recycling, as shown by their strong agreement that valuable materials from recycled e-waste could be used to create new products (M = 4.49). They also generally acknowledged important aspects of e-waste, such as its environmental impact and the importance of proper disposal (M = 4.13). Research indicates that many electronic products contain valuable metals like gold, silver, and copper, which can be effectively reclaimed and reused, reducing the need for extracting virgin resources and lowering environmental effects (Cucchiella et al., 2015).

These findings highlight the importance of educating the public about the economic and ecological value of recycled e-waste, reflecting the high level of knowledge reported by respondents in this study. This aligns with research by Islam, Uddin, and Huda (2025), which suggests that awareness of the benefits of e-waste recycling for the environment and resource recovery can foster positive attitudes toward responsible waste management. Similarly, Hasbullah, Muthusamy, Naseri, and Yahya (2025) found that positive attitudes and perceived ease of recycling significantly boost people's intentions to engage in e-waste recycling. However, some studies show that even when people are aware and knowledgeable about recycling e-waste, it does not always lead to actual recycling behavior due to external barriers or a lack of comprehensive understanding (Zhang et al., 2022). Overall, these studies demonstrate the link between knowledge, awareness, and recycling behavior, as well as the complex gap between attitudes and actual actions (Ridzuan et al., 2012).

Section C: Level of Awareness Towards the Importance of E-Waste Management

Table 3.0 Level of Awareness Towards the Importance of E-Waste Management

Item	Mean
I think industrial companies need to intervene to help curb e-waste issues	4.57
I believe e-waste recycling imposed positive environmental impacts	4.55
I believe the proper e-waste recycling measures help improve our health	4.54
I believe that having good awareness about e-waste helps improve e-waste management	4.52
I will dispose the e-waste correctly	4.45
I will separate e-waste from other garbage	4.43
I am responsible for the e-waste in my own home	4.39
I believe current e-waste management is using modern technological innovations	4.37
I have sufficient awareness on e-waste issues	4.20
I am aware about the existing state law concerning e-waste recycling	4.06
I believe it is convenient to find an e-waste recycling center	3.67
OVERALL	**4.34**

The respondents most strongly agreed that industrial companies need to take action to help reduce e-waste issues, as indicated by the highest mean score (M = 4.57), which reflects a strong belief that corporate responsibility is crucial in effective e-waste management. Most respondents are very aware of the importance of managing e-waste and its benefits for human health and environmental protection, as shown by an overall awareness level of 4.34. Previous studies have highlighted that manufacturers and industrial stakeholders play a key role in lowering e-waste through initiatives such as Extended Producer Responsibility (EPR), eco-design, and organized take-back systems, which greatly improve collection and recycling efficiency (Global E-waste Monitor, 2017; Forti et al., 2020).

This finding aligns with earlier research emphasizing the significance of public awareness and industry involvement in advancing sustainable waste management practices (Huang, 2023; Goh & Sukri, 2025). Sustainable e-waste management systems are strengthened by corporate efforts like expanding manufacturer responsibility and promoting environmental accountability (Huang, 2023).

However, Abd-Mutalib et al. (2024) argue that despite positive views on corporate responsibility, many companies show poor implementation and lack genuine commitment, which reduces the effectiveness of corporate efforts in achieving sustainable e-waste outcomes.

CONCLUSION

This research aimed to examine Malaysians' level of knowledge and awareness towards the importance of e-waste management, particularly in relation to recycling electrical devices. Data was collected using a structured questionnaire to assess respondents' understanding of e-waste issues and their awareness of proper management practices. The findings provide valuable insights into the current level of public readiness to support sustainable e-waste management in Malaysia.

Overall, the level of knowledge towards the importance of e-waste recorded an average score of (M = 4.13), indicating a generally high level of understanding among respondents. Participants demonstrated strong awareness that valuable materials from recycled e-waste can be reused to produce new products, that e-waste releases toxic chemicals which contribute to environmental pollution, and that electronic waste requires special treatment before disposal. However, areas such as reading about e-waste recently and knowing how to manage e-waste practically showed slightly lower average scores, suggesting that although respondents understand the concept of e-waste, continuous exposure to information and hands-on knowledge may still need improvement.

Similarly, the level of awareness towards the importance of e-waste management achieved an overall average score of (M = 4.34), reflecting positive attitudes and responsible intentions among respondents. Many respondents strongly believe that proper e-waste recycling brings positive environmental impacts, improves public health, and requires active involvement from industrial companies. Respondents also expressed readiness to dispose of e-waste correctly and to separate electronic waste from other household waste. Nevertheless, convenience in accessing e-waste recycling centers recorded a lower average score of 3.67, indicating that accessibility remains a practical barrier despite high awareness.

The slight gap between high awareness and practical convenience suggests that while respondents possess strong positive attitudes, external limitations such as limited recycling facilities, insufficient public visibility of collection points, and uneven information distribution may hinder consistent e-waste recycling behaviour. Improving infrastructure, strengthening policy communication, and increasing community engagement could help bridge this gap.

In conclusion, this study reveals that Malaysians demonstrate high levels of knowledge and awareness regarding e-waste management, supported by strong average scores in both dimensions. However, greater emphasis should be placed on improving accessibility, strengthening public education efforts, and enhancing awareness of existing regulations to translate positive attitudes into sustained behavioral practices. Future research may explore additional factors influencing participation in e-waste recycling, including convenience, incentives, and demographic influences, to further support sustainable environmental management in Malaysia.

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