

FACTORS THAT EFFECT ENVIRONMENTAL AWARENESS AMONG RESIDENTS REGARDING THE DISPOSAL OF E- WASTE IN TAMAN DESA RASAH

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Article history

Received date : 11-6-2023

Revised date : 12-6-2023

Accepted date : 25-7-2023

Published date : 15-8-2023

To cite this document:

Ab Rahman, F. A., Ahmad Fadzil, M. N. F., Ishak, M. M. H., & Mohd Jody, J. (2023). Factors that effect environmental awareness among residents regarding the disposal of e-waste in Taman Desa Rasah. *Journal of Islamic, Social, Economics and Development (JISED)*, 8 (55), 15 - 30.

Abstract: *E-waste, which refers to discarded electronic equipment, parts, and materials, poses a serious threat to environmental sustainability and energy conservation. Raising community awareness about sustainable e-waste management is essential to address this issue. This article aims to assess the level of ecological consciousness in the Taman Desa Rasah community toward e-waste management. Quantitative research methods and convenience sampling were employed, with 200 participants completing a questionnaire tool over the course of the study. Data were analyzed using SPSS software. The study revealed that while respondents had a high level of e-waste management knowledge, their attitudes and practices were only moderate. These findings can serve as a valuable reference for government, non-governmental organizations, authorities, and the community to establish a more sustainable and responsible approach to e-waste management in their community.*

Keywords: *E-waste management awareness, E-waste management knowledge, E-waste management attitudes, E-waste management practices, Malaysian*

Introduction

Sadly, e-waste disposal has become a global issue due to massive pollution in the environment. The improper disposal of e-waste has caused a yearly increase of thirty to sixty million tonnes globally, something that needs to be urgently addressed. The lack of an effective solution to control e-waste production and recycling is causing the issue's escalation. The disposal of e-waste to emerging nations has intensified the problem since countries receiving the electronic waste lack proper resources to process or recycle the items sustainably, creating hazards to human health. Besides, illegal dumping of e-waste generates larger risks of toxicity due to leaks within the landfill (Needhidasan, Samuel & Chidambaram, 2014). Effectively, the existence of e-waste contamination is a harsh reality.

Despite growing concerns over the environmental impact of e-waste disposal, there remains a significant gap in public awareness and understanding of proper disposal practices. In particular, little is known about the level of environmental awareness among consumers in developing countries, where e-waste often ends up in informal recycling operations with serious health and environmental consequences (Ezeah, Fazakerley, & Roberts, 2013). Hence, this paper aims to address this deficiency by exploring the attitudes and behaviors of consumers towards e-waste disposal in a community context.

In recent years, the issue of e-waste disposal has gained significant attention due to its detrimental effects on the environment and human health. Vision 2020 aims to achieve sustainable development in Malaysia, and an effective e-waste disposal management system is crucial to realize this vision. However, the current system is in its infancy and requires significant development (Jayaraman, 2019). Young consumers play a crucial role in expanding the e-waste issue, and it is essential to study their attitudes and behavior to address this problem (Khan et al., 2019).

To address this issue, it is essential to promote awareness and knowledge among residents about e-waste disposal management. This study aims to educate Taman Rasah residents about the effects of e-waste on the environment and human health and provide recommendations on how to manage e-waste effectively. The study will investigate the relationship between e-waste management knowledge, attitudes, and practices among Taman Desa Rasah residents, Seremban 3. Through initiatives that cater to the needs and skills of the neighborhood, the residents can collectively address this issue.

In addition, The *Masyarakat Madani* framework also emphasizes the importance of sustainable urban development, which is closely related to SDG 11 (Sustainable Cities and Communities). Both the *Masyarakat Madani* framework and SDG 11 aim to promote sustainable and resilient cities and communities, and to ensure that urbanization is managed in a way that is environmentally sustainable and socially inclusive (Center for Civic Education, 2005).

The aim of this study is to evaluate the level of ecological consciousness in the Taman Desa Rasah community towards e-waste management. The specific objectives are to: (i) determine the impact of knowledge on e-waste management on environmental awareness among the community in Taman Desa Rasah, Seremban 3; (ii) assess whether attitudes towards e-waste management affect the environmental awareness of the community in Taman Desa Rasah, Seremban 3; and (iii) identify the influence of practices on e-waste management on environmental awareness among the community in Taman Desa Rasah, Seremban 3. This study will not only increase environmental awareness among residents but also provide useful

recommendations for managing e-waste. It is crucial to understand the factors that impact environmental awareness and their attitudes and practices regarding e-waste. With this information, residents can take the necessary steps to address the issue collectively.

Problem Statement

E-waste is an issue that transcends geographical boundaries, and its impact is continuing to worsen. Unlike biodegradable materials, e-waste takes millions of years to decompose, making its disposal very challenging. Given the complexity of separating, disposing of, and managing electronic equipment, hazardous substances like lead, mercury, and cadmium have become prevalent in electronic devices, contributing to health issues. Poorly disposed of electrical equipment can damage the environment and pose a threat to human health, making it a global environmental concern (Abalansa et al., 2021).

Equally important is the efficiency of e-waste collection systems, as their effectiveness plays a significant role in building successful e-waste management systems. Failing to properly address the negative consequences of e-waste recycling, both formally and informally, would pose a significant challenge to both the environment and people. Therefore, it is critical to thoroughly investigate and address the impact of e-waste recycling on the environment and the general public, including recyclers (Ilankoon et al., 2018).

In Malaysia, the situation has become even more dire, as most landfills are already at capacity due to e-waste accumulation from shorter lifespans of electronic devices. Malaysia's approach to solving this e-waste issue would require immediate action, including sustainable e-waste management methods and long-term policies to control e-waste production before it becomes too severe.

The issue of electronic waste or e-waste has become a pressing concern globally due to the presence of harmful metals and chemicals. The situation is compounded by the fact that e-waste contains essential metals, including precious and base metals. Despite this, there are considerable economic benefits associated with value recovery from e-waste (Yong et al., 2019). This has prompted researchers, such as Bradley et al. (2020), to investigate the adverse effects of urban garbage on public health and the environment. However, while the scientific community has paid considerable attention to this issue, what is often overlooked is the role of psycho-social and behavioral factors that contribute to the lack of public interest in urban ecosystem design.

It is important to recognize the detrimental impact of e-waste on the environment and public health, but it is equally essential to acknowledge the economic potential associated with value recovery. Governments and relevant stakeholders must take measures to encourage the proper disposal of e-waste, seeking to convert it into economically viable resources. Unfortunately, despite the critical nature of this issue, many individuals remain apathetic towards the implementation of environmentally friendly urban ecosystems. Understanding the elements that contribute to this lack of interest is crucial in addressing the issue effectively.

Creswell (2012, 2015) emphasizes the importance of identifying research questions and problem statements that are specific, focused, and clear. He also stresses the significance of connecting the research problem to existing literature and theoretical frameworks. In the context of sustainable e-waste management methods and long-term policies, Creswell's approach would entail reviewing existing literature on e-waste management, identifying gaps in the literature

and research questions, and formulating a clear and specific problem statement that addresses the identified gaps. By understanding the factors that contribute to the lack of proper e-waste disposal, researchers can develop sustainable e-waste management methods and policies that address these factors and mitigate the negative impact of e-waste on the environment and public health.

In conclusion, e-waste is a growing concern globally and requires urgent attention from all stakeholders. While there are considerable economic benefits associated with value recovery from e-waste, there is a need for coordinated efforts to encourage the proper disposal of e-waste. Furthermore, understanding the psycho-social and behavioral factors that contribute to a lack of public interest in urban ecosystem design is crucial for effective action to address the broader issue of e-waste.

Literature review

Definitions of Term

E-waste management awareness

Refers to the level of understanding and knowledge that individuals or groups have about the proper handling and disposal of electronic waste (e-waste). This can include knowledge about the environmental impact of e-waste, as well as the potential health hazards associated with improper disposal (Nnorom & Osibanjo, 2008).

E-waste management knowledge

Refers to the specific information and skills that individuals or groups have about the proper handling and disposal of e-waste. This can include knowledge about the different types of e-waste, as well as the various methods of disposal and recycling that are available (Osibanjo & Nnorom, 2012).

E-waste management attitudes

Refers to the beliefs, values, and opinions that individuals or groups hold about the proper handling and disposal of e-waste. This can include attitudes towards the environmental impact of e-waste, as well as the importance of proper disposal and recycling (Zhang & Song, 2014).

E-waste management practices

Refers to the actual behaviors and actions that individuals or groups take in relation to the handling and disposal of e-waste. This can include practices such as reusing, recycling, and properly disposing of e-waste (Ongondo, Williams, & Cherrett, 2011).

Theory of Planned Behavior (TPB)

When discussing knowledge, attitude, and practice in shaping behavior, the most relevant theoretical framework is the Theory of Planned Behavior (TPB) (Ajzen, 1991). TPB proposes that behavior is determined by intention, which is in turn influenced by three factors: attitude toward the behavior, subjective norms, and perceived behavioral control. Attitude toward the behavior refers to an individual's evaluation of the behavior as positive or negative. Subjective norms refer to an individual's perception of the social pressure to perform or not perform the behavior. Perceived behavioral control refers to an individual's belief in their ability to perform the behavior.

Research has shown that TPB is effective in predicting and explaining a wide range of behaviors, including health-related behaviors, environmental behaviors, and consumer behaviors (Ajzen, 1991; Armitage & Conner, 2001; Bamberg & Schmidt, 2003). By using TPB, researchers can identify the specific factors that influence behavior and develop interventions to promote behavior change.

However, it is possible that the authors of the study you are referring to chose not to use TPB for various reasons. Perhaps they wanted to explore other theoretical frameworks or they found that TPB was not the most appropriate framework for their research question. It is important to note that while TPB is a widely used and effective framework, it may not be the best fit for every research question or context.

Factors Influencing Environmental Awareness

Knowledge

The process of gathering, analyzing, storing, exchanging, and utilizing environmental knowledge effectively is known as knowledge management (Mohajan, 2017). Contrary to common belief, the term "knowledge management" was first coined by renowned scientist and expert Peter Drucker in the early 1980s. Understanding knowledge has always been significant in human activity, and this has led to the development of knowledge management over time. With the emergence of advanced technologies, it became necessary to manage, obtain, use, and share information more efficiently.

In the twenty-first century, people strive to maintain their competitiveness, and they must know how to use knowledge effectively. Applying knowledge to environmental processes is crucial to achieving long-term environmental benefits (Xue, 2017). According to Anand and Walsh (2016), knowledge is composed of information, skills, and expertise. The main goal of knowledge sharing is to make knowledge visible and highlight its value in everyday life, encourage people to share knowledge, and establish an infrastructure for knowledge management (Merlo, 2016).

On the other hand, knowledgeable individuals can enhance their productivity, creativity, and life satisfaction (Chou et al., 2015). Uhumure (2021) found that knowledge and perception of e-waste are the two most significant factors that lead to appropriate waste management. This indicates that household participation in e-waste management depends on their knowledge of the best ways to control the waste stream. Hence, it is crucial to promote educational and awareness-raising activities through all platforms to change households' perception of e-waste and promote environmental consciousness. Since communication and action are vital components of an educational context, knowledge, such as knowledge about e-waste, spreads and influences people's behavior (Azodo, 2017).

Attitude

An attitude refers to a predetermined pattern of thinking or feeling about a specific object or subject. According to Borriello (2019), philosophical preconceptions symbolize "the sum of a man's prejudices and beliefs, prejudice or bias, preconceived views, ideas, fears, dangers, and convictions towards any particular topic." Attitudes play a crucial role in determining how individuals carry out specific actions. Although attitudes may not be observed externally, they can be evaluated through responses of approach or avoidance, approval, or disapproval, and attraction or repulsion. Nevertheless, attitudes may change with time as individuals acquire new perspectives.

The findings of the Delcea (2020) study reveal that homeowners' inclination to recycle their e-waste hinges significantly on their attitudes toward the environment and recycling. This underscores that people who engage in e-waste recycling do so because they understand how it preserves natural resources and helps address environmental issues. Therefore, it is essential to create educational programs aimed at boosting the public's perception of the benefits of recycling in protecting natural resources while reducing landfills and greenhouse gas emissions. Consequently, through a proper understanding of e-waste recycling's advantages, homeowners will be motivated to recycle their unwanted electronic products, and residents will be encouraged to recycle e-waste.

Practice

Environmental protection can be enhanced through e-waste management techniques (Widiyanto, 2019). Pollution has contributed to global warming and has reduced the appeal of the environment. To promote community health and derive economic benefits from managed e-waste in the future, appropriate e-waste management methods should be used to prevent e-waste production.

Methodology

Research Design

The research design for this section will be a quantitative survey and cross-sectional study (Sekaran, 2003). The quantitative survey will aid in measuring the target audience's views, opinions, and behaviors in response to a given study purpose. As a result, it can generalize findings from a broader sample population. Furthermore, the researcher decides to perform a cross-sectional study because it is simple to capture information in a population and collect preliminary data to assist subsequent research (Sekaran, 2003).

Unit of Analysis and Sample Size

This study focuses on the relationship between knowledge, attitude, practice of e-waste disposal, and environmental awareness among residents in a particular area. Hence, the unit of analysis in this study is the occupants who live in the Taman Desa Rasah area. In social science research, the unit of analysis is the primary entity under study (Gorichanaz, 2018). The most frequently studied unit is an individual, followed by groups, social organizations, and social objects. Adopting a unit of analysis is a way to dissect a phenomenon into several predetermined components that enable empirical research. An analysis unit can benefit all kinds of social studies, but nomothetic, quantitative studies are where its implications are most apparent. In addition, based on the table of Krejcie & Morgan (1970), the population of Taman Desa Rasah is approximately 200 residents; hence, the sample size will be 127 respondents.

Sampling Technique

A researcher employs sampling as a method (process or tool) to methodically select a smaller group of representative items or persons (a subset) from a preset population to serve as subjects (data sources) for observation or experimentation following the study's objectives (Sharma, 2017). Researchers frequently utilize sampling since it is challenging to assess the entire population. Although a subset, it is a helpful sample for research because it is accessible, inexpensive, and handy. A predetermined number of samples is delivered to the target population, which is then shown as the population. Mixed sampling, non-probability sampling, and probability sampling are the three types of sampling procedures. Each method needs a

different way to collect the response as a sample size to become the study subject because several types of sampling fall under those three approaches.

Convenience sampling is a type of non-probability sampling method that involves selecting participants based on their availability and willingness to participate in the study. This method is commonly used in research studies that have limited time and resources, as it allows researchers to quickly gather data from a small group of individuals. In the case of the Taman Desa Rasah residents, convenience sampling was chosen as the most appropriate method to collect data because the target population is easily accessible, and the questionnaire was administered online using a Google Form. This method allowed respondents to participate from any location, making it more convenient for them to respond to the questionnaire. The effectiveness of this strategy lies in its simplicity and ease of use. Since the questionnaire was administered online, respondents could answer the questions immediately, and their responses were automatically saved on a Google Spreadsheet, eliminating the risk of data loss or missing. Furthermore, convenience sampling is a cost-effective and time-saving method that is often used in studies where a large sample size is not required. In this study, convenience sampling was used to gather data from a small group of individuals, which was sufficient for the purposes of the research.

Measurement/Instrumentation

The primary indicator of this study's questionnaire is the respondents' degree of agreement with the questions. To achieve the objective of the research, each number on the measurement will represent a point and be computed using statistical methods. The linear scale used to evaluate respondents' responses to each question is the most appropriate scale for this study. This linear scale verifies how much the respondents understand the topic of the study and how it relates to their way of life or daily activities.

The linear scale in this study uses numbers as frequency meters and straightforward justifications for each given value. For instance, 1 indicates Strongly Disagree, 2 indicates Disagree, 3 indicates Mixed Feeling, 4 indicates Agree, and 5 indicates Strongly Agree with the questions. Each of these linear scale indicators provides the respondents with a view and perspective on the study's size. As a result, the researchers may predict the sample size for the ultimate conclusion early on based on the replies. The researchers will then use and analyze the data to draw a conclusion about their study. To help the respondents comprehend the questions and provide thoughtful responses, this study questionnaire is available in English and Bahasa Melayu. Pyrczak and Tcherni-Buzzeo (2019) and Pyrczak (2014) recommend the use of realistic evaluation in the evaluation of research in academic journals. This study employs quantitative research methods and convenience sampling, and the data analysis is conducted using SPSS software.

Findings and Discussion

Research Analysis

Table 1: Correlation Result

| Variables | | Result | Hypotheses |
|-----------|------------------------|----------------|---------------------|
| Knowledge | Pearson Correlation, r | 0.792** | HA1 accepted |
| | Sig. (2-tailed), p | 0.000 | |
| | N | 114 | |
| Attitude | Pearson Correlation, r | 0.591** | HA2 accepted |
| | Sig. (2-tailed), p | 0.000 | |
| | N | 114 | |
| Practice | Pearson Correlation, r | 0.569** | HA3 rejected |
| | Sig. (2-tailed), p | 0.000 | |
| | N | 110 | |

Source: Self-develop by the researchers

The results in Table 1 demonstrate a significant positive relationship between knowledge and environmental awareness ($r= 0.792^{**}$, $p=0.000$, $p < 0.05$), supporting the acceptance of HA1 and rejection of HO1. Likewise, the findings indicate a moderate positive relationship between attitude and environmental awareness ($r= 0.591^{**}$, $p=0.000$, $p < 0.05$), which rejects HO1 and supports HA1. Moreover, the results demonstrate a moderate positive relationship between practice and environmental awareness ($r= 0.569^{**}$, $p=0.000$, $p < 0.05$), rejecting HO1 and supporting HA1.

Objective 1: To Examine the Practice of E-Waste Management May Affect the Environmental Awareness Among Community in Taman Desa Rasah, Seremban 3

Based on the findings, the study shows a significant and positive relationship between knowledge and environmental awareness ($p=0.000$). According to Aboughaly et al. (2020), consumer knowledge and awareness will play a crucial role in decreasing e-waste, assisting in managing e-waste disposal, and improving recycling efforts. Special focus must be paid to enhancing consumer knowledge of e-waste management and disposal practices (Bimir, 2020). Public understanding is necessary to develop an electronic waste management system (Verma et al., 2020). According to Almulhim (2022), much scientific journal research has been conducted on household e-waste knowledge and awareness, as well as their usage, disposal, storage, recycling, and repair behavior. It is critical to assess local consumer awareness and knowledge about e-waste disposal, according to Arain et al. (2020). Furthermore, research in Saudi Arabia examines households' desire to participate in e-waste management and their degree of awareness of e-waste management.

Objective 2: To Examine the Attitude on E-Waste Management May Affect the Environmental Awareness Among Community in Taman Desa Rasah, Seremban 3

Based on the findings, the study demonstrates a significant and positive relationship between attitude and environmental awareness. The primary issue facing Malaysia's e-waste situation is Malaysians' attitude towards recycling (Mamat et al., 2007). Nixon et al. (2008) evaluated the impact of environmental attitudes and beliefs on California's willingness to pay for electronic trash recycling. According to Gurauskienė (2008), consumers should be fully educated to alter

their attitude towards e-waste, which can lead to behavior changes induced by various incentives (health, money, safety, etc.). Numerous researchers have found that favorable public attitudes are influenced by awareness, knowledge, and perception (Jim, 2002). Lin (2012) discovered that attitudes shape pro-environmental behavioral intentions. Research on Household Attitudes and Action Towards Garbage in Ireland indicates that local governments collect, manage, and dispose of household waste through contracts with firms to perform the essential services or provide the services themselves (Davies, 2005). According to Iyer (2018), environmental concern attitude stems from a person's self-concept and the degree to which an individual believes themselves to be an intrinsic part of the natural environment.

Objective 3: To Examine the Practice of E-Waste Management May Affect the Environmental Awareness Among Community in Taman Desa Rasah, Seremban 3

Based on the findings, a positive relationship exists between household practices and environmental awareness. According to Hicks et al. (2005), Nokia China acquired around 0.5 tons of batteries and chargers since users prefer to sell used mobile phones on the secondary market, a widespread practice in China and other developing nations. Dhir (2021) found that raising awareness about laptop usage and disposal in Japan had a beneficial influence on laptop disposal habits and raised recycling rates. Due to a lack of awareness about environmental preservation, Chinese customers commonly sell e-waste to peddlers and individual collectors (Wang et al., 2017). In-depth regional studies are required to understand consumers' perspectives on e-waste management to involve them in sustainable e-waste management practices (Ramzan et al., 2019). The respondents' usual techniques for dealing with electronic trash included hoarding, giving to friends and family, selling to informal recyclers, using exchange offers, sending to professional recyclers, and others (Chi et al., 2011). Considerable research has been conducted to ascertain inhabitants' awareness, willingness, and actions toward sustainable e-waste management procedures in China (Wang et al., 2018).

Research Recommendations

Improve Public Education and Awareness

The lack of knowledge and understanding about efficient waste management procedures is one of the major restrictions encountered throughout the developing world. Education and awareness are the keys to eliminating waste. Furthermore, early childhood education is critical to ensuring that future generations contribute to long-term Municipal Waste Management practices. Most low/middle-income nations cannot provide efficient SWM collection services due to limited resources, a lack of facilities such as trucks and infrastructure, poor route planning, a lack of technical know-how, and insufficient environmental education and awareness (Sinthumule et al., 2019). According to Ardoin et al. (2020), environmental education involves more than the unidirectional flow of information; it strengthens environmental attitudes, awareness, knowledge, and skills for affirmative environmental action. According to Singhirunnusorn et al. (2017), waste separation improves marginally with age. The elderly segregate their trash more than the young. Other studies in developing nations show that most elderly generations are ready to sort their garbage (Babaei et al., 2015). According to UNESCO (2015), environmental education can raise people's knowledge of the environment and its associated concerns. The United States Environmental Protection Agency (EPA) (2018) considers environmental education to include more than just environmental facts. Environmental knowledge is a term used to describe environmental concepts and behavior patterns (Laroche et al., 2001).

According to Olsen et al. (2020), teachers are the fundamental keys to developing students' knowledge and skills through education to preserve human life, sustainable environmental behavior, and sustainable development. Increased environmental knowledge promotes awareness of environmental issues, which may lead to individuals taking action to safeguard the environment (Bamberg et al., 2007). According to Martnez-Borreguero et al. (2019), instructors in impoverished nations need more practical expertise and comprehension of what they teach. This is because most of the country's higher institutions that educate instructors need a controlled waste management curriculum. According to Galarpe and Heyasa (2017) and Ifegbesan (2011), teachers in developing countries need better waste management practices due to a lack of knowledge and awareness. Their area of expertise or certification determines the instructors' awareness and understanding of waste management or environmental concerns, the type of institution attended, and their own teaching experience (Kranert et al., 2012), which is vital in developing nations.

Encouraging Recycling

Effective recycling depends on having adequate infrastructure, as noted by Yoreh et al. (2014). While the number of recyclers is important, citizen engagement is equally significant, as mentioned by Julia et al. (2016). Understanding the recycling infrastructure of a scheme is essential for participation, while fear of placing garbage in the wrong bin is a common reason for not recycling, according to Kelly (2006). Government and private groups both play a vital role in addressing social and environmental challenges and improving individual and societal well-being, as Stephan et al. (2016) suggest. Many businesses are now participating in neighborhood environmental initiatives and recycling programs, as participation in these programs can lead to both environmental corporate social responsibility and an improvement in business financial performance, as noted by Lioui et al. (2012) and Huang et al. (2011), respectively. Establishing community recycling programs and encouraging individual engagement in such programs are highly strategic, as Shrum et al. (1994) state. However, a thorough understanding of the motives of people participating in recycling is necessary, as well as considering the target audience's perspectives when developing environmental communications to encourage pro-environmental activities, as suggested by Kronrod et al. (2012). The role of morality in understanding recycling has been a major research topic (Thøgersen, 1996), as has the intrinsic pleasure that some individuals derive from operating in an environmentally responsible manner (Taufik et al., 2015; De Young, 2000). Given the complexity of the decision to recycle, further study is necessary to provide a more thorough understanding of the factors that impact recycling behavior, as noted by Botetzagias et al. (2015). In-depth research on related influences is also crucial for educating governments and organizations that aspire to engage a significant percentage of people in or support recycling initiatives, as Cleveland et al. (2012) suggest.

Conclusion

According to the findings of this study, respondents commonly manage e-waste by handling used appliances. They exchange them for new ones, drop them off at recycling centers, keep them in stores or outdoors, dispose of them with other trash, or give them to friends and family. The study found that the community's e-waste management knowledge is high, but their attitudes and practices are at a medium level. This indicates that while the public has good awareness of e-waste management, daily practice still needs improvement. Additionally, respondents in Taman Desa Rasah had average e-waste management methods that could be enhanced over time.

The study also revealed that most respondents are aware of the proper e-waste management method and the detrimental impact of e-waste on the environment. However, in some areas, insufficient e-waste collection infrastructure causes respondents to dump e-waste in rivers and pile it alongside other solid waste. Therefore, gathering data on the public's actual knowledge, attitudes, and practices in e-waste management is necessary to improve information dissemination and examine the community's limitations on implementing practical and sustainable e-waste management.

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