

HOUSEHOLD USER AWARENESS TOWARDS ELECTRONIC WASTE (E-WASTE) COLLECTION SYSTEM AND RECYCLING BEHAVIOUR

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ABSTRACT: This study examines household awareness and participation in electronic waste (e-waste) recycling, crucial for sustainable waste management. The awareness levels, knowledge gaps, and influencing factors among households, emphasizing the environmental and health risks associated with improper e-waste disposal were investigated. A survey questionnaire was distributed among household users over the country and the 154 household users participate in this survey. The research identifies significant gaps in knowledge about e-waste disposal methods and awareness of recycling centers, exacerbated by logistical barriers such as transportation issues (67.5%). Primary information sources include social media (57.1%) and mass media (36.7%), highlighting their role in shaping public awareness. Despite challenges, a portion of households express willingness to recycle e-waste, indicating opportunities for targeted interventions. The findings stress the necessity for extensive educational campaigns and improved access to recycling facilities to promote sustainable e-waste practices and mitigate environmental impacts.

KEYWORDS: *Household e-waste, e-waste collection system, awareness*

1.0 INTRODUCTION

In recent times, technological advancements across various sectors have intensified competition among manufacturing firms and industries in the production of electrical and electronic goods. Consequently, a growing array of household products has accumulated, posing environmental challenges [1]. Improper collection and recycling of defective and unused electronic equipment jeopardize valuable material recovery, significantly threatening the environment. The proliferation of digital devices, driven by the Internet of Things (IoT), amplifies the potential for generating substantial volumes of electronic waste (e-waste) if not properly managed [2]. Moreover, the significance of recycling waste electrical and electronic equipment (WEEE) has risen in response to dwindling resource supplies and production materials [3]. Managing e-waste is now integral to solid waste management due to its hazardous substances and heavy metals, including valuable materials like copper and other precious metals, underscoring the critical need for effective waste treatment methods [4] managing used electronic and electrical equipment (e-waste).

The effectiveness of e-waste collection systems hinges on public awareness. Several studies have investigated how local populations dispose of their household electronics. Sustainable management practices rely on three key factors: perception, disposal habits, and consumer awareness [5] responsible management and recycling of electronic waste (e-waste). Numerous case studies have explored community awareness regarding household electronic waste disposal within specific regions and countries. Awareness levels vary significantly based on locality and national context. Urban residents generally exhibit better attitudes towards managing household electronic waste. Factors influencing e-waste disposal behavior and

awareness include income, education, age, and gender, as noted by Borthakur and Govind (2019) [6].

According to a study conducted by J. Shi et al. (2020), the effectiveness of e-waste collection systems in many developing nations is hindered by insufficient environmental awareness and the growth of informal economies [7]. The authors recommended establishing a residential e-waste collection network and launching a corresponding public service advertising campaign to counter illicit recycling practices. Numerous researchers, including Z. Wang et al. (2021), Nisha et al. (2022), Borthakur and Govind (2019), and Ganesan et al. (2021), have examined issues related to household behavior and awareness [8] due to their significant global warming potential (GWP [9]) which is detrimental to the environment and human health. This study aimed to assess consumer awareness, perception, and disposal methods of e-waste management and its determinants in a semi-urban area of northern Tamil Nadu. **MATERIALS AND METHODS:** It was a mixed-method approach using a sequential explanatory technique with both quantitative and qualitative methods in adult e-consumers. Quantitative data were collected from 350 participants selected via simple random sampling using score-based semi-structured questionnaire. Qualitative data were obtained purposely from eight selected consumers such as recyclers, local leaders, and importers of electronics using key informant interviews. Sociodemographic details and disposal practices were summarized as frequencies and percentages. The independent t-test and linear regression analysis were used to obtain the determinants. Qualitative data were analyzed thematically. **RESULTS:** Of the 350 participants (208 males and 142 females [6] [10].

In addressing the issue of e-waste recycling effectively, it is essential to prioritize the e-waste collection system, a pivotal phase in the process. Operating an efficient e-waste collection system hinges on comprehending consumer awareness, attitudes and actions regarding e-waste collection and recycling.

2.0 AWARENESS AND BEHAVIOUR TOWARDS E-WASTE COLLECTION SYSTEM

Awareness encompasses consumers' perceptions, understanding, sentiments, and knowledge, while behavior refers to consumers' actions in the past, present, or anticipated future. Therefore, understanding the awareness and behavior of e-product consumers is crucial for identifying patterns in their consumption of electronic products and the generation of e-waste. Therefore in this study aims to identify the awareness and behaviour of e-waste collection and recycling behaviour among household users.

2.1 Methodology

The awareness of household users has been investigated through a survey questionnaire to access the awareness of household users. This method is a step of the need for analysis to perform the Fuzzy Delphi method in further study [11]. In this phase of need analysis, convenience sampling was conducted. The sampling size of this study is determined G Power calculation software. The sampling size obtained in this study is 150 respondents for the purpose of need analysis.

2.1.1 Questionnaire design and data collection

In order to learn more about customers' awareness of and participation in the collecting and recycling of electronic waste, a semi structured questionnaire was created. The general overview of the study will be presented at the outset of the questionnaire survey. Additionally, the study's goal will include expressed clearly. Furthermore, the significance of the replies' authenticity was underlined to reduce study ambiguity. There will be a remark to ensure that respondents' private information is secure and private.

This phase was conducted using needs analysis survey questionnaire distributed among household consumers all over the country. The needs analysis survey was distributed and been answered by 154 household user who willing to participate in the study. The demography of respondents was identified as in Table 1.0.

Table 1.0: Respondent background

Age	20 – 59 years old
Gender	Male and Female
Education background	SPM to PhD
Location	City and Rural

2.2 Findings of the need of analysis

There are 9 questions about the awareness and recycling behavior of the household consumer towards the broken electrical and electronic appliances management constructed.

1. Q1 Do you have broken EE appliances at your place/home?

The result showed most of the respondents have broken EE appliances at their home. This indicates the household e-waste must should have good knowledge on how to dispose the electrical and electronic waste after reaching their end of life.

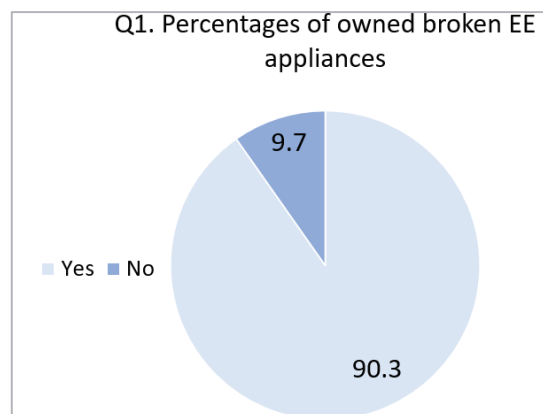


Figure 1.0: Percentages of owned broken EE appliances

2. Q2 What you did to your broken EE appliances within 6 months?

Figure 2.0 illustrates household user behavior towards electronic waste (e-waste) disposal reveals diverse practices. A significant majority (51.5%) of respondents keep e-waste at home, indicating a prevalent habit of stockpiling rather than active disposal. A concerning proportion (20.9%) disposes of e-waste by throwing it into regular dustbins, potentially posing environmental risks due to improper handling. Approximately 17.9% give e-waste to collectors, suggesting a reliance on informal channels for disposal. Only a small fraction (6%) utilize formal e-waste recycling centers, highlighting a need for increased awareness and accessibility to these facilities. The practice of donating e-waste to relatives and friends is minimal (3.7%), indicating a limited understanding of sustainable disposal methods. Addressing these behaviors through targeted education and improving infrastructure could enhance responsible e-waste management practices among household users.

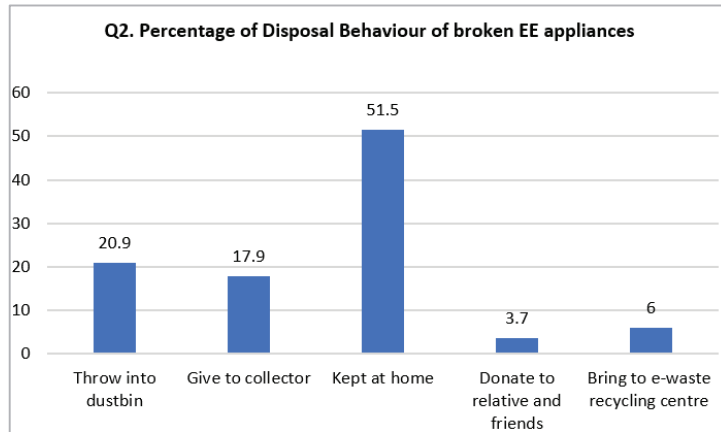


Figure 2.0: Percentages of Disposal behaviour of household user

3. Q3 If you have kept the broken EE appliances. State the reason the reason you doing so?

The study identifies key reasons why many households retain electronic waste (e-waste) instead of disposing of it properly. According to Figure 3.0, approximately 31% lack knowledge about proper disposal methods, revealing a significant gap in awareness. Another 25% plan to repair their e-waste, indicating a preference for extending device lifespan. Emotional attachment (11%), reluctance to sell (11%), and transportation issues (9%) also contribute to retention. Addressing these barriers through education, repair initiatives, improved access to recycling facilities, and better incentives could enhance e-waste management practices among households.



Figure 3.0: Percentages of household user who resist to dispose

4. Q4 Have you heard about Electrical and Electronic Equipment Waste (E-waste)?

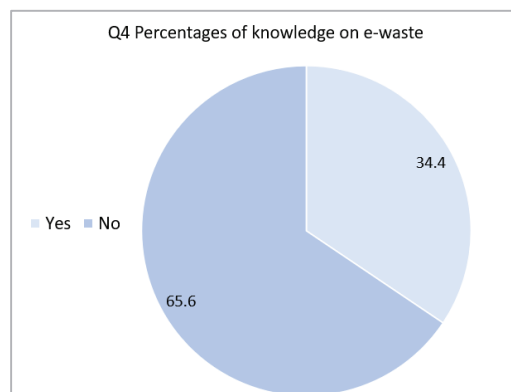


Figure 4.0: Percentages on e-waste awareness

The study reveals a significant awareness gap among household users regarding electronic waste (e-waste). A majority (65.6%) have never heard of e-waste, highlighting a critical lack of knowledge about its environmental and health impacts. In contrast, 34.4% are aware of e-waste, indicating varying levels of familiarity with proper disposal methods. This disparity underscores the urgent need for comprehensive educational initiatives to inform about e-waste dangers, promote responsible recycling, and encourage reuse of electronics.

5. Q5 Have you heard about e-waste recycling centre near your place?

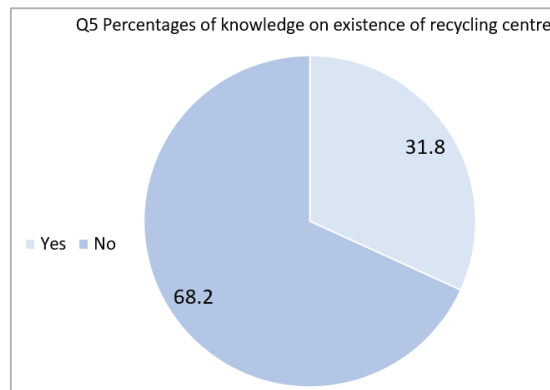


Figure 5.0: Percentages of household user aware on existence of recycling center

Figure 5.0 highlights a significant lack of awareness among household users regarding nearby e-waste recycling centers, with 68.2% unaware of their existence. This indicates a critical knowledge gap in local resources for proper disposal and recycling of electronic devices. Conversely, 31.8% of respondents are aware of these facilities, suggesting some understanding of their benefits in responsibly managing electronic waste to mitigate environmental and health risks. The substantial disparity in awareness underscores an urgent need for targeted educational efforts aimed at informing the public about the accessibility, services, and environmental advantages of e-waste recycling centers. Enhancing awareness through effective communication and community outreach initiatives is essential for encouraging greater participation in recycling programs and fostering sustainable waste management practices among household users.

6. Q6 If yes, where do you get the information?

The study reveals that a significant number of household users primarily obtain information about e-waste recycling centers from social media (57.1%) and mass media (36.7%), highlighting the influential role of digital and traditional media in raising awareness about recycling services. In contrast, physical signage and personal networks such as friends and relatives contribute minimally (2% each) to public knowledge on recycling options for electronic devices. The absence of mentions for government portals like e-SWISS indicates potential shortcomings in utilizing official channels for disseminating information on e-waste management.

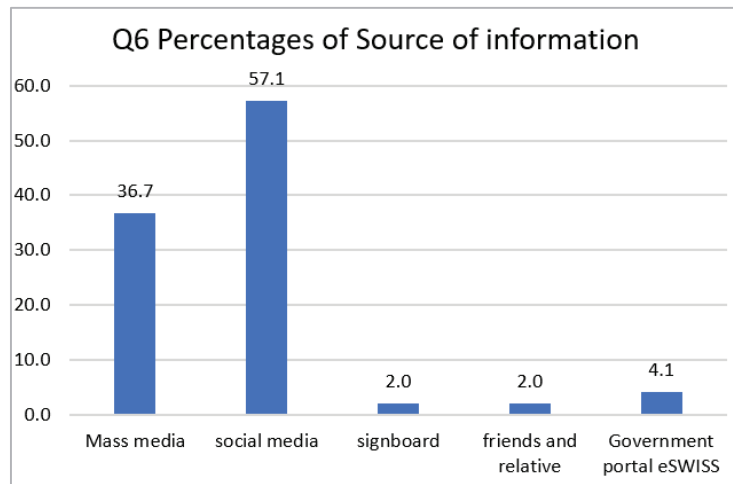


Figure 6.0: Percentages of source of information

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7. Q7 Have you ever send e-waste to the nearest recycling centre?

Based on the findings, a significant majority of household users, 79.2%, exhibit resistance towards sending e-waste to recycling centers, highlighting reluctance or barriers towards proper disposal methods. This resistance underscores potential factors such as perceived inconvenience, lack of awareness about recycling benefits, or concerns over data security and privacy. Conversely, 14.9% express willingness to send their e-waste for recycling, indicating a smaller but notable segment open to environmentally responsible practices.

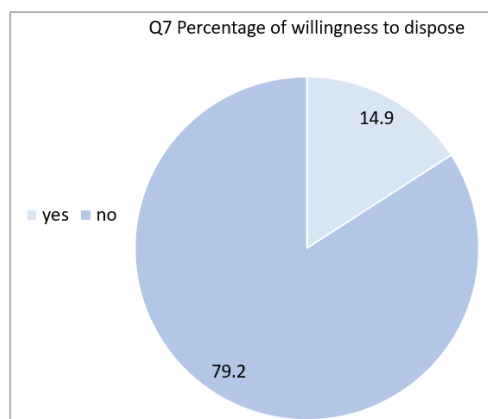


Figure 7.0: Percentage on household user willingness to dispose

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8. Q8 If not, what is the reason you not doing so?

Based on the findings as in Figure 8.0, several key reasons emerge for household users' reluctance to send e-waste to recycling centers. A significant barrier is the lack of knowledge about where these centers are located, with 49.2% citing this as a hindrance. Additionally, 22.1% indicate not having access to transportation as a limiting factor, highlighting logistical challenges in accessing recycling facilities. A smaller proportion (8.2%) cite lack of awareness about the importance of recycling, while a similar percentage (8.2%) mention time constraints. Some users (4.1%) prefer giving e-waste to collectors, potentially due to convenience or existing habits. Another 8.2% choose to keep e-waste at home, possibly due to uncertainty about disposal methods or sentimental reasons

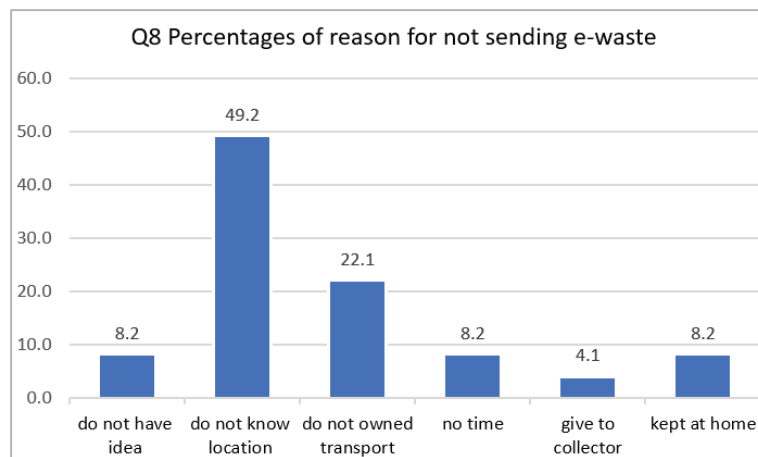


Figure 8.0: Percentages of household user's reason reluctant to dispose

9. Q9 Do you problem to move the large broken electrical appliance to the recycling centre?

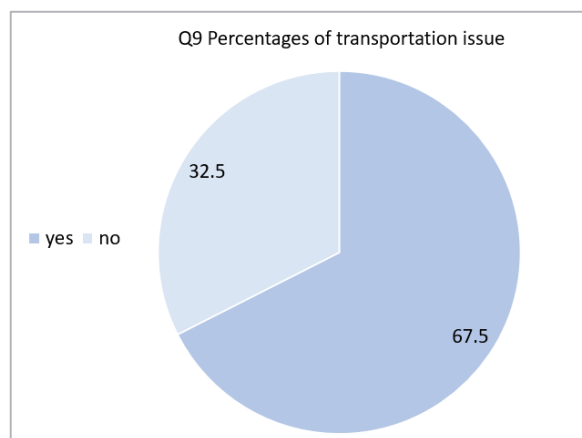


Figure 9.0: Percentages on household user having transportation issue

Based on the findings in Figure 9.0, a significant majority of household users, 67.5%, face transportation issues when it comes to managing electronic waste (e-waste). This highlights a substantial barrier that impedes their ability to access recycling centers or drop-off points for proper disposal. Transportation challenges could include lack of personal vehicles, limited

access to public transportation, or inconvenient locations of recycling facilities. These issues contribute to the accumulation of e-waste in homes rather than its proper disposal through formal recycling channels. Addressing transportation barriers is crucial for improving participation rates in e-waste recycling programs. Potential solutions may involve establishing mobile collection services, enhancing public transportation routes to include recycling centers, or collaborating with community organizations to provide transportation assistance for e-waste disposal. By mitigating these challenges, households can more effectively contribute to sustainable waste management efforts and reduce environmental impacts associated with improper e-waste disposal practices.

3.0 CONCLUSION

This study highlights significant gaps in household user awareness regarding electronic waste (e-waste) collection systems and recycling. Many respondents lack understanding of e-waste disposal methods and the environmental consequences of improper disposal. Transportation challenges further limit participation in recycling programs. The findings underscore the critical need for comprehensive educational initiatives to inform the public about e-waste management benefits, improve disposal awareness, and enhance access to recycling facilities. Collaborative efforts among government, community organizations, and recycling stakeholders are essential to address these challenges. Moving forward, targeted campaigns via mass and social media, improved signage, and expanded transportation options are crucial for increasing household engagement in e-waste recycling and promoting sustainable practices for a healthier environment.

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