INTEGRATING HOUSEHOLD E-WASTE WITH GENERATOR, COLLECTION CENTER AND RECOVERY FACILITIES FOR IMPROVEMENT OF SCHEDULED WASTE MANAGEMENT IN MALAYSIA

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The increasing accumulation of household electronic waste (e-waste) in Malaysia poses significant environmental challenges, particularly due to the hazardous components in electronic devices. Figure 1 illustrates a clear upward trend in e-waste generation from 2014 to 2023, reflecting the growing reliance on electronic devices and the corresponding rise in discarded electronic waste. Starting at 146.7 MT in 2014, e-waste generation steadily increased, peaking at 2657.32 MT in 2022. This substantial growth can be attributed to factors such as rising electronic consumption, shorter product life cycles and population growth. Notably, there were significant surges in 2018 and 2021, with e-waste volumes reaching 1000.1 MT and 2650 MT, respectively. The increase in 2021 may be linked to the pandemic-driven acceleration of technological adoption for remote work and online learning. Despite minor fluctuations, such as the declines observed in 2017 (174.4 MT) and 2020 (702.2 MT), the overall trend remains upward. These dips may be attributed to economic factors, market conditions, or temporary changes in electronic consumption patterns. The slight decrease in 2023, from 2657.32 MT in 2022 to 2528 MT, could suggest improvements in recycling efforts or a temporary slowdown in electronic device usage. This sustained growth in e-waste highlights the urgent need for improved e-waste management systems, robust recycling infrastructure and public awareness initiatives. Without effective measures, the environmental consequences of improper e-waste disposal, such as soil contamination, water pollution and greenhouse gas emissions, will intensify. Additionally, reclaiming valuable materials from e-waste through efficient recycling practices can promote resource conservation and contribute to a circular economy. The data underscores the critical importance of addressing the challenges posed by increasing electronic consumption to mitigate environmental impacts.

This study aims to evaluate public awareness of the environmental impacts of improper e-waste disposal and examine household compliance with proper disposal practices as outlined in existing regulations. The research utilized surveys, interviews, data analysis and site visits to investigate public knowledge, attitudes and practices regarding e-waste management in Malaysia. The survey focused on six types of electrical and electronic equipment (EEE): television sets, personal computers, mobile phones, refrigerators, air conditioners and washing machines.

Findings revealed that while 87% of respondents were aware of e-waste, only 18% knew it was listed as scheduled waste under the Environmental Quality (Scheduled Wastes) Regulations 2005. Although 91% of respondents understood the negative effects of e-waste, only 21% were aware of registered collection centers. Furthermore, disposal methods showed that 35% of households brought their e-waste to a collection/recycling center, 20% still discarded e-waste with municipal waste, and 32% sold it to informal collectors.

Recyclers in Malaysia comply with regulatory requirements and have proper facilities for e-waste management, but public awareness and logistical challenges remain significant issues. Addressing resource constraints such as inadequate government support and infrastructure, alongside enhancing public education and stakeholder collaboration, is crucial for improving e-waste recycling and disposal. Site visits to collection centers and partial recovery facilities provided insight into the actual handling and dismantling processes of e-waste. These visits highlighted the need for stricter compliance with proper disposal practices, especially regarding hazardous materials. Additionally, the study proposes the development of a user-friendly system to integrate existing platforms, such as the Electronic Scheduled Waste Information system (ESWIS) and MyEwaste, to enhance e-waste management and tracking (Figure 2). This research highlights the importance of improving public awareness campaigns and strengthening Malaysia's e-waste collection and recovery framework. The findings will contribute to policy recommendations to reduce improper disposal and ensure sustainable e-waste management practices across the country.

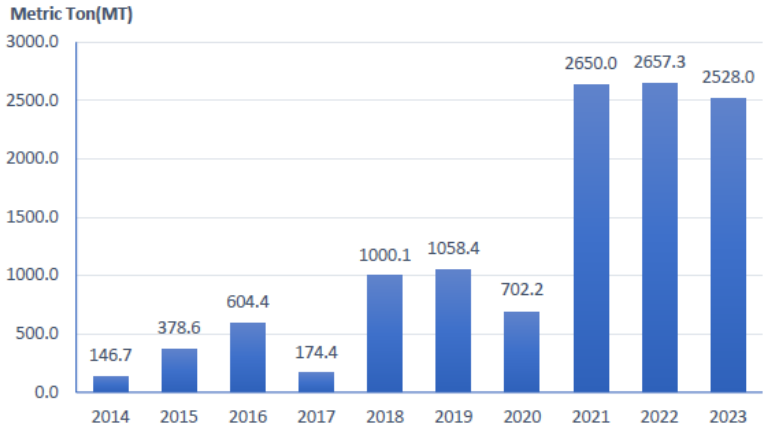

Figure 1. Annual collection of electronic waste in Malaysia, 2014–2023 (source: DOE Malaysia)

Figure 2. Electronic Scheduled Waste Information system (ESWIS) and MyEwaste, to enhance e-waste management and tracking