



DRIVERS OF E-WASTE RECYCLING BEHAVIOR IN URBAN SRI LANKA: THE ROLE OF ECONOMIC INCENTIVES, CONVENIENCE, AND ENVIRONMENTAL AWARENESS

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Electronic waste (e-waste) is a growing global environmental issue driven by rapid technological change, shorter product lifespans, and rising consumer demand. In Colombo and other urban areas of Sri Lanka, formal recycling is limited, with informal practices prevailing despite increasing environmental awareness. This study examines how economic incentives, convenience, and environmental awareness influence formal e-waste recycling among urban households and explores the motivations and barriers affecting participation. This study used a convergent sequential mixed-methods design combining quantitative surveys and qualitative interviews. The quantitative phase surveyed 250 households across five municipal councils using Likert-scale items from prior studies, analysed with descriptive statistics, correlations, and regression models. The qualitative phase included 25 purposively selected households, analysed thematically to capture contextual insights. Ethical procedures, including informed consent, confidentiality, and voluntary participation, were strictly followed.

Results indicate a clear attitude–behaviour gap. Despite high environmental awareness ($M = 4.40$), formal recycling participation was very low ($M = 1.42$), with most households storing e-waste or selling it to informal collectors. Convenience was the strongest predictor of formal recycling ($r = 0.676$, $\beta = 0.694$, $p < 0.05$), while economic incentives and awareness had no significant effect. Age and education influenced behaviour—older individuals engaged more in informal practices, whereas higher-educated households showed greater formal participation; income showed no effect. Qualitative findings revealed four key themes: “Convenience is King,” highlighting ease of access; “Awareness and Trust as Catalysts,” showing knowledge alone is insufficient without system credibility; “Money Helps, but It’s Not the Driver,” indicating incentives are secondary; and “System Needs Structural Intervention,” emphasizing infrastructural gaps. Consistent with the Theory of Planned Behaviour, perceived behavioural control was central to recycling decisions.

The study recommends a hybrid strategy integrating improved infrastructure, targeted awareness, community engagement, transparency, and modest incentives. Embedding convenient and trustworthy recycling options into daily urban life can close the gap between environmental intention and action in e-waste management.

Keywords: e-waste, economic incentives, convenience, environmental awareness, recycling behaviour

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INTRODUCTION

Electronic waste (e-waste) is a rapidly escalating global challenge driven by rapid technological innovation, shortened product lifespans, and growing consumer demand for new devices. E-waste comprises discarded electrical and electronic products that no longer serve their intended function, such as mobile phones, televisions, and computers (Pinto, 2008). Global e-waste generation reached 7.8 kg per capita in 2022—a 56% increase since 2010—highlighting the urgency of sustainable e-waste management (Global E-Waste Monitor, 2024).

In Sri Lanka, particularly in urban centers like Colombo, the e-waste burden is intensified by limited formal recycling infrastructure, heavy reliance on informal disposal practices, and behavioral factors such as emotional attachment to obsolete devices (Ranasinghe & Athapattu, 2020). Despite the presence of 17 licensed e-waste collectors nationwide, low public awareness, logistical constraints, and restricted access to formal channels continue to sustain the dominance of the informal sector.

Understanding the behavioral determinants of formal e-waste recycling is essential for effective policy and intervention design. While prior studies identify multiple drivers of recycling behavior (Thukral et al., 2023), this study focuses on three key factors: economic incentives, convenience, and environmental awareness. Economic rewards may encourage participation, convenience reduces practical barriers, and environmental awareness—shaped by education and values—can promote responsible disposal. Yet, the combined influence of these factors on household e-waste recycling in Sri Lanka remains underexplored.

Accordingly, this study seeks to investigate the following research questions:

- RQ1. To what extent do economic incentives, recycling convenience, and environmental awareness influence formal e-waste recycling behavior in urban Sri Lankan households?
- RQ2. What complementary effects emerge from the interaction among these factors?

The insights derived from these inquiries further lead to the following question:



RQ3. Why do households elect to participate—or refrain from participating—in formal e-waste recycling despite the presence of motivating conditions?

METHODOLOGY

This study adopted a convergent sequential mixed-methods design grounded in pragmatism, integrating quantitative rigor with qualitative depth to examine e-waste recycling behaviors. A deductive approach guided the quantitative phase using established constructs, while an inductive approach informed the qualitative phase to capture context-specific insights. The research combined a household survey with semi-structured interviews, enabling triangulation and complementarity of findings. The target population comprised approximately 341,985 urban households in Colombo, Sri Lanka. A sample of 250 households was selected via proportional convenience quota sampling, stratified across five municipal councils to ensure geographic representativeness and practical feasibility. The qualitative phase involved purposive sampling of 25 households, with data collection continuing until thematic saturation.

Quantitative data were collected through a structured questionnaire using 5-point Likert scales adapted from validated instruments measuring economic incentives, convenience, environmental awareness, and recycling behavior. Analyses were conducted in SPSS, with acceptable internal consistency (Cronbach's α : incentives = 0.852; convenience = 0.711; awareness = 0.811; behavior = 0.637) and confirmed sampling adequacy (KMO = 0.736; Bartlett's test $p < 0.001$). Descriptive statistics, correlation analyses, and regression models examined hypothesized relationships.

Qualitative data were gathered via in-person semi-structured interviews exploring motivations, barriers, and perceptions of e-waste recycling. Thematic analysis followed Braun and Clarke's (2006) six-phase framework, with manual open coding used to identify and refine key themes. Ethical standards were strictly observed: informed consent was obtained, participation was voluntary with the right to withdraw, and anonymity and confidentiality were maintained. All procedures adhered to institutional ethical guidelines and principles of responsible research conduct.

RESULTS AND DISCUSSION

Survey findings revealed mixed attitudes and practices toward e-waste recycling among Colombo households. Respondents reported moderate support for economic incentives ($M = 3.89$), high perceived convenience barriers ($M = 4.11$), and strong environmental awareness ($M = 4.40$). Despite this awareness, behaviors remained largely neutral—storing unused e-waste at home ($M = 4.37$) or selling to informal collectors ($M = 4.23$)—with minimal engagement in formal recycling ($M = 1.42$), highlighting a pronounced attitude–behavior gap.



Correlation analysis identified convenience as the dominant factor influencing behavior, showing a strong positive association with formal recycling ($r = 0.676$, $p < 0.01$) and negative associations with neutral ($r = -0.600$, $p < 0.01$) and negative behaviors ($r = -0.641$, $p < 0.01$). In contrast, economic incentives ($r = 0.042$, $p = 0.511$) and environmental awareness ($r = 0.038$, $p = 0.553$) were not significantly related to recycling behavior. Regression analysis confirmed convenience as a strong positive predictor of formal recycling ($\beta = 0.694$, $p < 0.05$) and a negative predictor of informal practices ($\beta = -0.772$, $p < 0.05$), underscoring the critical role of logistical ease and infrastructure availability. Demographic analysis revealed that older households were more likely to engage in negative behaviors, while higher education was associated with formal recycling. Income had no significant effect, suggesting that structural and contextual barriers, rather than economic capacity, primarily shape recycling behavior.

Overall, these findings demonstrate a clear attitude–behavior gap: high environmental awareness does not translate into formal recycling, and convenience—not incentives or knowledge—is the key determinant. Given these unexpected patterns, a qualitative follow-up was conducted to explore underlying motivations, perceptions, and systemic barriers, aiming to explain why awareness failed to translate into action and how factors such as trust, habit, and infrastructure constraints influence household decision-making.

The qualitative findings identified four interrelated themes:

1. **Convenience as the key determinant** – Households prioritized ease, particularly doorstep collection.
2. **Awareness and trust as catalysts** – High environmental awareness was undermined by low trust in formal systems.
3. **Financial incentives support but do not drive behavior** – Rewards were appreciated but insufficient as primary motivators.
4. **Need for structural intervention** – Poor access, coordination, and systemic inefficiencies were significant barriers.

These findings suggest that household e-waste recycling is driven less by environmental intent or knowledge and more by tangible structural conditions, including the availability of convenient infrastructure, trust in formal collection systems, and practical ease of participation. This aligns with the Theory of Planned Behavior (TPB), which emphasizes perceived behavioral control—one’s belief in their ability to act despite external constraints—as a key determinant of behavior (Ajzen, 1991).

Cognitive Dissonance Theory (CDT) further explains that while individuals may recognize the environmental harm of e-waste, barriers and mistrust generate psychological discomfort, leading to justification of improper disposal or disengagement (Miller et al., 2015; Safa’at et al., 2019; Waheed et al., 2023).



Evidence indicates that clear infrastructure, credible incentives, and supportive policies can reduce dissonance and promote pro-environmental behavior (Harmon- Jones et al., 2024; Sabbir et al., 2023; Agarwal et al., 2024). In this study, even environmentally aware households acted only when recycling was perceived as accessible, trustworthy, and manageable within daily routines. The absence of nearby collection points or credible disposal options lowered perceived control, while mistrust in proper handling further reduced motivation.

Overall, the mixed-methods results underscore that behavioral intention alone is insufficient where systemic inefficiencies and mistrust exist. Interventions should therefore go beyond awareness campaigns or financial incentives, prioritizing the removal of logistical and psychological barriers to enhance the feasibility, reliability, and accessibility of formal e-waste recycling.

Dimension	Quantitative Findings	Qualitative Themes	Interpretive Insights
Convenience / Infrastructure	Strongest predictor of positive recycling ($r = 0.676, \beta = 0.694, p < 0.05$); negatively associated with neutral/negative behaviors	“ <i>Convenience is King</i> ” – households prioritize ease, especially doorstep collection	Behavior is driven by perceived behavioral control (TPB); accessible infrastructure is a critical enabler
Environmental Awareness	High awareness ($M = 4.40$); no significant correlation with behavior ($r = 0.038, p = 0.553$)	“ <i>Awareness and Trust as Catalysts</i> ” – awareness exists but low trust in formal systems limits action	Awareness alone is insufficient; trust and system reliability determine action.
Economic Incentives	Moderate support ($M = 3.89$); not a significant predictor ($r = 0.042, p = 0.511$)	“ <i>Money Helps, but It’s Not the Driver</i> ” – incentives appreciated but insufficient alone	Incentives alone don’t change behavior; context and mindset do
Behavior Patterns	Low positive engagement ($M = 1.42$); high neutral ($M = 4.37$) and negative behaviors ($M = 4.23$)	“ <i>System Needs Structural Intervention</i> ” – poor access, coordination, and infrastructure are barriers	Behavior needs enabling conditions; logistics and trust are key.



Demographics	Age ↑ → negative behavior; education ↑ → formal recycling; income → no effect.	Themes emphasize practical and systemic barriers rather than demographic factors	Demographics moderate but do not override the importance of convenience, trust, and infrastructure
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CONCLUSION AND RECOMMENDATIONS

This study found that convenience is the main driver of formal e-waste recycling among Colombo households, while economic incentives and awareness had limited impact. Older households were more likely to engage in negative practices, and higher education supported formal recycling. Trust, accessibility, and ease of participation were critical.

Recommendations:

A. Infrastructure & System Design

1. Doorstep collection via public–private partnerships.
2. E-waste bins at public points and along municipal routes.

B. Awareness & Engagement

3. Targeted media campaigns for older and underserved populations.
4. Community involvement to foster ownership and coordinate initiatives.

C. Trust & Incentives

5. Certification and traceable receipts for formal recyclers.
6. Modest rewards, such as utility discounts or mobile credits.

A hybrid approach combining structural reforms, behavioral nudges, and stakeholder engagement is essential to embed recycling into daily routines and ensure sustainability.

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