PLASTIC, ELECTRIC, AND CONSTRUCTION WASTE MANAGEMENT IN SAVAR, BANGLADESH: CHALLENGES, PRACTICES, AND OPPORTUNITIES

Moriom Akter Nishi*[1], Md. Asifur Rahman[2] and Washilatun Nahar[3]

[1] *Graduate student, European University of Bangladesh, Bangladesh, e-mail: moriomnishi2001@gmail.com*
[2] *Graduate student, American International University Bangladesh (AIUB), Bangladesh, e-mail: asifahnaf220@gmail.com*
[3] *Assistant professor, European University of Bangladesh, Bangladesh, e-mail: nwashilatun@gmail.com*

***Corresponding Author**

ABSTRACT

Bangladesh is experiencing a waste management crisis as a result of its fast urbanization, with building trash, plastic, and e-waste all posing serious risks to the environment and human health. This study uses a mixed-methods approach to examine recycling activities in Savar, including an online survey, interviews with informal garbage workers, and field surveys of recycling stores. According to quantitative study, the informal sector generates 40,300 BDT per day from the processing of 259 kg of plastic garbage and 119 kg of e-waste per day, earning 12,180 BDT. Meanwhile, building waste has economic potential, with recycled steel selling for 60 BDT per kilogram compared to 90 BDT per kilogram of virgin steel. Systemic issues still exist, though, as hazardous activities like open burning of e-waste are common and less than 10% of waste makes it into formal recycling processes. 85.3% of respondents were not aware of recycling initiatives, and 41.2% thought the current systems were useless, according to survey data, highlighting serious knowledge gaps. Yet, 77.5% of respondents said they would be open to taking part in community projects, suggesting that there is a good chance that behavior will change. Formalizing the informal sector, which employs two to four million waste pickers, enacting Extended Producer Responsibility (EPR) laws, and testing automated sorting technologies are the three main intervention points identified in the study. Public-private partnerships have the potential to unleash the 3713.83 BDT/m³ value of recycled aggregates for construction waste. These results support SDGs 11 (Sustainable Cities) and 12 (Responsible Consumption) and are consistent with Bangladesh's National 3R Strategy. The study's methodology, which combines quantitative store data with qualitative worker interviews and public impression surveys, provides a replicable model for waste research in emerging urban areas, even though its concentration on Savar restricts generalizability. The study emphasizes the pressing need for integrated solutions in Bangladesh's garbage industry that strike a balance between environmental preservation and economic growth through community involvement, technology investment, and regulatory reform.

Keywords: *Waste management, Informal sector, Sustainable development, circular economy.*

1. INTRODUCTION

Rapid urbanization and rising consumption have made municipal solid-waste management one of the most pressing environmental challenges in low and middle-income countries (LMICs) (Ferronato & Torretta, 2019). Global analyses reveal that plastic production, use, and discard have grown drastically over the past few decades, with only a small share recycled, and the majority accumulating in landfills or the environment (Geyer et al., 2017). This global trend places particular pressure on densely populated areas, where weak collection systems, limited infrastructure, and expanding informal recovery create complex technical, social, and health problems (Kapucu et al., 2024). Within this broad spectrum of problems, such as plastic, electrical, and electronic waste (e-waste), and construction and demolition (C&D) waste stands out for different reasons. Plastics contribute disproportionately to environmental pollution and clog urban drainage (Villarrubia-Go´mez et al., 2018). E-waste contains high-value but hazardous materials that create occupational and environmental health risks when processed informally (Annamalai, 2015). Earlier studies indicated that C&D waste is produced in very large volumes by rapid construction, especially in LMICs, yet is often unmanaged and under-recovered (Kumar & Agrawal, 2020). These streams present distinct technical, governance, and public-health challenges as well as opportunities for resource recovery (Robinson, 2009). Bangladesh, being a highly populated, dense LMIC, exemplifies these pressures as revealed in national reviews, where plastic, e-waste, and rapidly growing construction & demolition (C&D) debris driven by urban expansion, while collection, sorting, and formal recycling capacity have lagged behind policy commitments (Hossain et al., 2021), (Islam et al., 2023). Although the government has adopted a National 3R strategy (National 3R Strategy for Waste Management, n.d.) and Solid Waste Management Rules (2021) (Dept. of Environment, Chattogram laboratory, n.d.), implementation remains mediocre, and local practice relies heavily on informal actors (Matter et al., 2013). Savar, a pre-urban industrial and logistics hub near Dhaka, typifies this concern. Including high volume of waste generation, constrained municipal services, informal recycling networks, unsafe processing practices, and uneven access to formal disposal routes, makes it an imperative case for lessons applicable across South Asia. With an ever-growing population and intensified urbanization, the country is in serious need of understanding the importance of these multifaceted problems and acting swiftly towards recovery. This particular study addresses three linked objectives:

1. To quantify and describe the local practices and flows for plastic, e-waste, and C&D waste in Savar;
2. To examine the socio-economic role of the informal recycling sector and the risks associated with current recovery methods; and
3. To evaluate opportunities for formalization, market integration, and local policy interventions that can improve recovery system while protecting livelihoods and health.

To achieve these aims, the study uses a mixed-method design, including field surveys and facility visits with collectors and recycling shops, a public survey, and a short market analysis, allowing triangulation between material flows, informal practices, and community attitudes. This research thus links empirical quantification with socio-economic analyses to propose locally grounded pathways for safer, inclusive recovery.

2. LITERATURE REVIEW

An effective waste management system in urbanizing regions requires addressing structural, socio-economic, and policy dimensions, especially where informal systems dominate. Existing literature emphasizes the role of informal workers in waste recovery, narrowed down to high-density regions like South Asia. Globally, over 11 billion tons of solid waste is generated each year, where 15 million people are involved in informal waste management work, which contributes significantly to material recovery, particularly for plastic and e-waste (Kwarteng et al., 2020). However, these informal workers, proceeding every day without any protective gear or equipment, face serious occupational hazards (Imam & Rafizul, 2025).

2.1 Plastic and E-waste

Plastic waste is particularly challenging in LMICs. According to OECD estimates, 113 million tons of such trash are created annually in the Asia-Pacific region; however, only 19% of it is collected, and only 12% is properly recycled (OECD, 2025). In Bangladesh, most waste plastic is collected informally and processed in a very rudimentary procedure (Ankhi et al., 2025). To prevent these issues, national policies (e.g., 3R strategy and 2021 Solid Waste Rules introducing Extended Producer Responsibility) have been designed, and unfortunately, still exist on paper, where in practice, due to a poor and disorganized orthodox collection system and inefficient recycling, a large portion of plastic is burned or dumped rather than being recovered (OECD, 2025). In short, plastic recycling rates are low due to bottlenecks caused by inadequate collection coverage, outdated recycling technology, and regulatory gaps, all of which limit circular recovery. Electronic waste in Bangladesh has increased sharply, though smaller in volume, recycling remains insufficient (Islam et al., 2025). Informal handlers dismantle products to extract metals, often using unsafe methods, such as open burnings and acid baths (Fatema et al., 2025). This leads to exposure to heavy metals and long-term respiratory and neurological effects (Faisal et al., 2025). Despite the recent introduction of e-waste management in Bangladesh (Assessment of Generation of E-waste, Its Impacts on Environment and Resource Recovery Potential in Bangladesh, 2025), studies report very limited formal collection, with most recovery taking place through unregulated urban scrap networks (Akther et al., 2025). The net result is continuing leakage of plastics into the environment, underscoring the need for integrated reforms.

2.2 Construction and demolition (C&D) waste

Construction debris represents another under-managed resource in the region. Rapid construction in South Asia generates large volumes of concrete, brick, and wood debris, but formal recovery systems are scant (Makul et al., 2021). Most countries here lack even basic CDW data and coherent regulations, and no agencies have a clear responsibility on the matter (Hoang et al., 2020). Consequently, most CDW is dumped or loosely piled, despite its high reuse potential. Economically, recycled aggregates and timber could replace virgin inputs and save costs, but market development is “neglected” in practice. Authors recommend policies like mandatory source segregation, green procurement of recycled material, and inclusion of informal brickmakers or contractors in official CDW programs (Lara et al., 2025), (Haque et al., 2025). CDW recovery could be an economic opportunity, but weak or absent policy frameworks mean it remains largely unexploited (Gajzler et al., 2025).

2.3 Public Awareness and Community Perception

Scholars highlight the crucial role of public awareness and community involvement across all waste streams. Successful programs regarding waste management depend on informed citizen behaviour (Hasan, 2004). In contemporary studies, positive attitudes and education are seen as vital enablers of source segregation and recycling (Cabias et al., 2024). In Bangladesh’s context, low public awareness means that mixed waste generation remains high and informal practices persist. Integrating outreach campaigns, participatory collection schemes, and stakeholder training is widely cited as a crucial complement to technical and regulatory measures (Roy et al., 2025).

2.4 Policy Gaps and Governance

Finally, while Bangladesh has adopted key policy tools, including Extended Producer Responsibility (EPR) and source-separation mandates, implementation is limited by poor institutional capacity and low budget allocation. Moreover, enforcement of bans (such as on thin plastic bags) has been inconsistent (Srivastava et al., 2025). Integration of the informal sector into formal waste plans is repeatedly cited as a missing element, without which strategic targets cannot be achieved. Thus, the literature emphasizes that improving waste governance will require not just new laws but dedicated funding, institutional support, and cleaner mandates.

Beyond the creation of policies, however, implementation continues to be a crucial obstacle. Inadequate municipal capacity, insufficient infrastructure funding, lax enforcement, and the systematic exclusion of the informal sector-which presently handles the majority of recyclables are some of the main obstacles. Therefore, strong legal frameworks, ongoing resource allocation, institutional coordination, and participatory governance models that actively involve informal workers are all necessary for successful

implementation. Policy tools like the National 3R Strategy and EPR will continue to perform poorly if these implementation obstacles are not addressed.

3. METHODOLOGY

This chapter outlines the methodological framework used to investigate plastic, electric and construction waste management in Savar. The study aims to evaluate existing recycling practices, assess their socio-economic and environmental impacts, and also identify key challenges and opportunities for improvement. To meet these objectives, a mixed-method design was adopted, combining both qualitative and quantitative approaches. The methodology was implemented in three phases: a) conducting field surveys and interviews with key stakeholders, b) administering an online public survey to assess community awareness and practices, and c) reviewing secondary literature and policy documents. This section details the research design, study area, data collection method, and analytical methods to ensure transparency and replicability.

3.1 Research Design

A pragmatic mixed-method approach was employed to explore the complex nature of waste management. Quantitative data measured the scale and economic aspects, such as daily waste volumes, material prices, and workers' earnings. In contrast, qualitative data from the interviews and field observations explored motivations, challenges, and operational processes. Following a sequential explanatory strategy, quantitative results established the "what" and "how much", while qualitative findings explained the "why" behind the observed patterns. This integration strengthened the validity and depth of the research, providing both statistical and contextual insights.

3.2 Data Collection Methods

Data were collected from both primary and secondary sources to ensure a comprehensive and triangulated analysis. Primary data were collected through field surveys, interviews, and online questionnaires.

- Filed surveys and interviews: Conducted across Savar with waste pickers, feriwala, and recycling shop owners to gather information on collection quantiles, prices, and earnings (Table 1)
- Online public survey: Distributed via Google Forms to assess the awareness, perception, and waste management practices among residents. A total of 102 responses were collected across Savar.

Secondary data (Table 2) were drawn from existing academic literature, govt. policy documents (e.g., National Solid Waste Management Rules 2013), and reports by international organizations and NGOs to contextualize field findings. Data Analysis: A mixed-methods analytical approach was employed to ensure comprehensive interpretation.

Table 1: Primary Field Data Collection Strategy

Stakeholder Group	Sample Size	Data Collected	Tool Used
Waste pickers	15	Daily collection (kg), selling price (BDT/kg)	Structured Interview
Feriwala	15	Daily collection (kg), selling price (BDT/kg)	Structured Interview
Recycling shops	30	Shop size, daily capacity (kg), earnings (BDT)	Structured Survey
E-waste shops	4	Daily capacity (kg), types processed, material prices	Structured Survey

- **Quantitative Analysis:** Data from field and online surveys were processed in Microsoft Excel using descriptive and frequency statistics quantifying operational scales, economic values, and public perceptions.
- **Qualitative Analysis:** Interview and observational data were thematically analysed to identify recurring challenges and contextualize quantitative patterns.
- **Comparative Analysis:** Market prices of recycled and virgin materials were compared to assess economic viability, and findings were cross-analysed across waste streams to identify shared issues.

Table 2: Data Analysis Framework

Data Type	Source	Method	Output
Quantitative	Field survey	Descriptive statistics	Totals, average, economic values
Quantitative	Online survey	Frequency analysis	Percentages, charts
Qualitative	Interviews	Thematic analysis	Explanatory insights

3.3 Study Area

The study was conducted in Savar Upazila, chosen for its rapid urbanization, industrial concentration (e.g., DEPZ), and significant informal recycling sector. Its proximity to Dhaka and diverse land use makes it a representative setting for waste management research. Figure 1 illustrates the Upazila boundaries and data collection sites.

Figure 1: Map of the Study Area (Savar Upazila, Bangladesh)

3.4 Ethical Consideration

The study adhered to strict ethical standards. Verbal informed consent was obtained following the explanation of the research purpose, ensuring voluntary participation and withdrawal rights. Anonymity was maintained through coded identifiers (e.g., Shop 1, Respondent 2), and all data were securely

stored. Sensitive questions were avoided to minimize potential harm, particularly for respondents in comparatively vulnerable socio-economic conditions.

4. RESULT AND DISCUSSION

This chapter presents our findings on plastic, electric and construction waste management in Savar, as outlined in section 3. Data were collected through field surveys, material flow analyses, and an online perception survey. Results are organized by waste stream, followed by an integrated discussion which are linking the findings with existing literature on developing economies. The chapter aims to provide empirical evidence addressing the research objectives and to identify key challenges and opportunities for creating a more sustainable and efficient waste management system in Bangladesh.

4.1 Characteristics of the Waste Recycling Sector in Savar

The recycling sector in Savar consists of a complex, predominantly informal socio-economic network. A survey of 30 plastic recycling shops across six sites (Baipail, Vatpara, Nama Bazar, Radio Colony, Raribari, and Jaleshwar) revealed a clear operational hierarchy. As shown in Table 3, the sector processes about 1162 kg of plastic daily, where large shops (>30 kg/day) representing 26.7% of operations yet handling the majority of the materials, especially in industrial clusters such as Baipail. Spatial patterns indicate the larger facilities are located near transportation routes, while smaller establishments operate in residential zones.

Table 3: Shop Distribution and Processing Capacity by Location

Shop Location	**Large Shops >30 kg/day**	**Medium Shops 15-30 kg/day**	**Small Shops <15 kg/day**	**Total Shops per Location**	**Estimated Daily Processing Capacity (kg)**
Baipail	3	0	0	3	~298 kg (181 Soft + 117 Hard)
Vatpara, Rajashon	2	2	1	5	~142 kg (129 Soft + 85 Hard)
Savar, Nama Bazar	1	3	4	8	~191 kg (145 Soft + 100 Hard)
Radio Colony	1	2	3	6	~82 kg (69 Soft + 46 Hard)
Raribari	1	2	0	3	~70 kg (49 Soft + 41 Hard)
Jaleshwar	0	2	3	5	~71 kg (56 Soft + 46 Hard)
TOTAL	**8**	**11**	**11**	**30**	**~1162 kg (697 Soft + 465 Hard)**

4.2 The Informal Recycling Ecosystem in Savar

Savar's waste management system operates largely within the informal sector, forming an interconnected socio-economic situation driven by economic necessity and opportunity. Rather than a centralized structure, it functions through a hierarchy of actors playing a unique role along the recycling value chain, from collection to preliminary processing. The system comprises three primary tiers:

- Primary Collectors: Waste pickers and feriwala who gather recyclables from households, streets, and industrial sites.
- Aggregators and Processors: Small recycling shop owners who purchase materials from collectors, sort, clean, and shred them before resale to larger buyers.
- End-Market Suppliers: Larger industries that convert processed materials into new products (beyond the scope of this study).

This informal network plays a crucial yet often overlooked role in Savar's urban metabolism. As shown in Table 4, waste management operations frequently handle a disproportionate share of materials, particularly in Baipail.

Table 4: Distribution of Recycling Shops by Size and Total Processing Capacity

Shop Size(by Processing capacity)	Numbr of Shops	Total Estimated Daily Processing Capacity(kg)
Large(> 30 kg/day)	8	~298 kg (Baipail area alone)
Medium(15 − 30 kg/day)	11	Distributed across locations
Small(< 15 kg/day)	11	Distributed across locations
Total	30	~ 1,162 kg

4.3 Scale, Economics, and Spatial Pattern of Plastic Waste Recycling

Plastic is the largest and most profitable waste stream in the study area. Data from 30 shops across six areas show that more than a thousand kg of plastic are recycled daily, where 697kg are soft plastics (bags, wrappers) and about 465 kg of hard plastic (bottles, containers). These shops collectively earn 40,300 BDT per day, reflecting strong economic motivation and a practical solution to plastic pollution. Among the 30 shops, there are 8 large (>30 kg/day), 11 mediums (15–30 kg/day), and 11 small (<15 kg/day) operations.

- Baipail hosts the largest enterprises (298 kg/day).
- Nama Bazar and Vatpara feature mixed-scale shops.
- Residential zones like Radio Colony and Jaleshwar have smaller shops (70–80 kg/day).

This clustering aligns with economic advantages such as large units near industrial clients, smaller ones near households, ensuring efficient material flow and minimized transport costs. At the system's base are waste pickers and feriwala collecting 2.5–5.5 kg/day and 4.5–9.5 kg/day respectively, which accumulates around 260 kg/day supplied to the local shops. Soft plastics can make 15–25 BDT/kg, while hard plastics sell for 5–10 BDT/kg. Although waste pickers bear the greatest labour, feriwala play a vital role by accumulating and selling larger quantities, maintaining efficiency and continuity of the recycling chain.

4.4 Electric Waste (E-Waste) Recycling: High-Value Niche Operations

E-waste recycling in Savar represents a small but highly profitable niche within the informal recycling ecosystem. Field data from our study indicate that a combined daily processing capacity of 119 kg, which generates about 12,180 BDT per day, specifically 120 BDT per kg, far exceeds the profitability of plastic waste. This high economic yield is driven by the recovery of valuable metals such as copper, zinc, aluminium, and mixed electronic components. Table 5 shows estimated daily material recovery and economic value in e-waste shops

Table 5: Estimated Daily Material Recovery and Economic Value in E-Waste Shops

Material Recovered	Avg.Quantity Recovered(kg/day)	SellingPrice(BDT/kg)	Key Source Items
Copper	~ 3.4 kg	962.5	Wiring, motors, circuit boards
Iron/Steel	~ 12.4 kg	375	Casings, structural components
Aluminium	~ 3.9 kg	232.5	Heat sinks, frames
Zinc	~ 2.6 kg	600	Alloys, batteries
Other (Mixed)	~ 7.5 kg	875	Circuit boards, components

E-waste in Savar mainly consists of discarded household and office electronics. While economic incentives lie in metal extraction, informal methods such as acid leaching, open burning, and manual disassembly without protection expose workers to hazardous substances, including lead, mercury, and brominated flame retardants. Although the sector demonstrates high resource efficiency, it poses severe health and environmental risks, which underscores the need for the formulation of regulatory oversight.

4.5 Construction and Demolition (C&D) Waste Recycling

Construction and demolition recycling in Savar is still in its juvenile, semi-informal stage, despite its strong potential for reformation and sustainable growth. The market dynamics indicate a clear economic advantage for using recycled materials, which are 33-38% cheaper than its virgin alternatives, as shown below Table 6.

Table 6: Comparison of Recycled Material Prices with Virgin Material Prices

Material	Price of Recycled Material	Market Price of Virgin Material	Cost Savings
Steel	60 BDT/kg	90 BDT/kg	33%
Bricks	8 BDT/piece	13 BDT/piece	38%
Aggregate	3,713.83 BDT/m^3	6,000.00 BDT/m^3	38%

Currently, informal workers selectively recover steel rods and reusable bricks from demolition sites for resale, while most low-value materials, such as concrete rubble and tiles, are illegally dumped or used as uncontrolled landfill. This inefficient recovery limits the environmental and economic benefits. However, the existing market demand for low-cost building inputs indicates strong potential for a structured C&D recycling system. Strategies such as on-site waste segregation, the establishment of central recycling facilities, and Public-Private-Partnerships (PPPs) could transform C&D waste into valuable aggregates and reduce illegal disposal. With such measures, Savar could turn its construction debris from an environmental burden into a cornerstone of a circular construction economy.

4.6 Public Perception of Waste Management and Recycling

To complement the supply-side analysis of Savar's recycling ecosystem, a public survey was conducted among 102 respondents to assess the awareness, attitudes, and behavioural patterns related to waste management. The findings reveal that while public awareness of environmental issues is relatively high, significant gaps persist between knowledge and actual recycling practices, presenting an "awareness action gap" which is driven by limited infrastructure and poor outreach. For instance, when asked how often they take part in recycling programs for plastic, electric, and construction waste, 35.5% reported doing so regularly, 30.4% occasionally, 26.5% rarely, and 5.6% reported never. This distribution highlights that only one-third of the respondents engage in consistent recycling. Although most respondents identified themselves as very or somewhat aware of recycling's importance, awareness has not translated into continuous action. Environmental concern was cited as the main motivation (62.7%), but this ethical drive faces practical barriers which shown in the below figure 2.

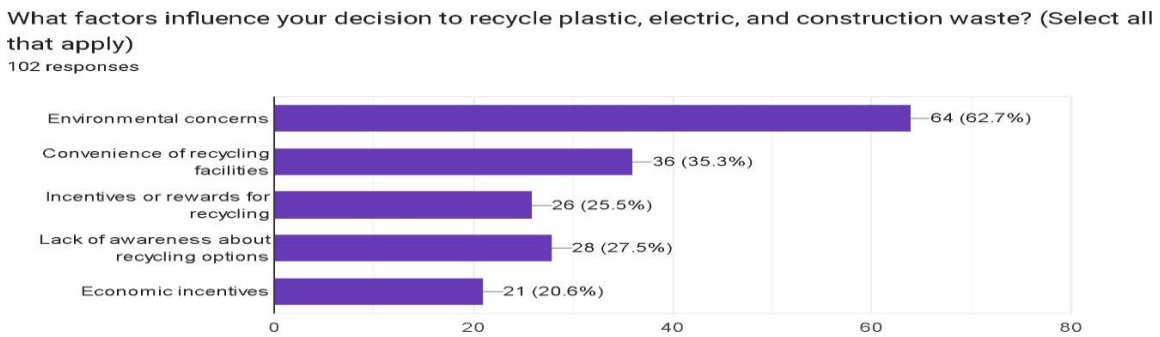

Figure 2: Factor influences of recycling's importance among respondents.

About one-third of the respondents (35.3%) mentioned the lack of convenient recycling facilities as a major deterrent, and only 27.5% reported insufficient awareness of recycling options, underscoring systematic shortcomings. Moreover, 87.3% of the participants stated that they have faced difficulties disposing of plastic, electronic, or construction waste properly, and 41.2% rated Bangladesh's current waste management system as not effective. These perceptions align with the ground realities where the informal sector dominates waste processing with minimal public access to formal collection routes. Despite these constraints, the findings highlight strong latent support for improvement. 77.5% of the respondents said they are very likely or somewhat likely to join community recycling initiatives, while many also expressed willingness to pay more for recycled products, indicating potential for both civic and market-based engagement. We also found that 85.3% of respondents were unaware of any existing national recycling programs or campaigns, revealing a major communication gap. The following Table 7 demonstrates the questions posed to the participants and their responses:

Table 7: The questions posed to the participants and their responses.

Questions	Category 1 (Positive)	Category 2 (Neutral/Moderate)	Category 3 (Negative)
What is your level of awareness regarding the importance of recycling plastic, electric, and construction waste for environmental sustainability?	Very aware (75.5%)	Somewhat aware (20.6%)	Not aware (3.9%)
How important do you think government policies and regulations are in promoting sustainable waste management practices?	Very important (83.3%)	Somewhat important (12.7%)	Not important (4%)
How effective do you think current waste management systems are in Bangladesh in handling plastic, electric, and construction waste?	Very effective (41.5%)	Somewhat effective (27.5%)	Not effective (31.4%)
Are you willing to pay a premium for products made from recycled plastic, electric, and construction waste?	Yes (55.9%)	Maybe (34.3%)	No (9.8%)
How likely are you to support or participate in community-based recycling programs for plastic, electric, and construction waste?	Very likely (77.5%)	Somewhat likely (16.7%)	Not likely (5.8%)
Have you encountered challenges in properly disposing of plastic, electric, or construction waste in your community?	Yes (87.3%)	No (12.7%)	-
Are you aware of any initiatives or projects in Bangladesh aimed at recycling plastic, electric, or construction waste?	Yes (85.3%)	No (14.7%)	-

Our study findings reveal a recycling system at a critical transition point, which is mostly driven by an informal sector that, while often overlooked, serves as a vital socio-economic engine. Integrating public perceptions with field data shows that the informal network is not a problem to be removed but a system to be reformed, strengthened within formal waste management frameworks. The high population density and extensive use of plastic result in more than a thousand kilograms of plastic by the end of the day, which generates over 52,000 BDT in profits. It provides an essential environmental service that the formal sector has yet to match. However, the benefits come with costs, such as low wages, unsafe working conditions, and the absence of regulation that leaves primary collectors highly vulnerable.

- Plastic Paradox: Despite its large volume and economic value, plastic recycling remains technologically weak and socially exploitative, reflecting the informal sector's dominance but also its limits.
- E-Waste Dilemma: With high economic returns (102 BDT/kg) but hazardous recovery practices, e-waste exemplifies the need for formalization and stricter safety standards.
- C&D Waste Opportunity: The 33–38% cost savings from recycled construction materials demonstrate that recycling can be both profitable and sustainable, offering a clear path for public private investment.

4.7 Bridging the Demand-side gap

Public survey data complement the field insights, although 77.5% of respondents are willing to support recycling, only 26.5% do so regularly. This awareness-action gap reflects a system that remains largely informal and inaccessible. The reported dissatisfaction (41.2%) and lack of awareness (27.5%) mirror the absence of formal structures, while 87.3% experience disposal difficulties, which confirms system-antifatigue. By integrating existing manpower, informal infrastructure, and public willingness into a regulated system, Bangladesh can achieve a model of inclusive, safe, and sustainable waste management. Transforming this invisible engine into a transparent, accountable system will not only reduce pollution but also enhance the foundations of equitable urban development.

5. LIMITATIONS

There are a number of limitations to this study. First, the results' applicability to other areas is limited by its concentration on savar upazila. Second, the statistical robustness of quantitative estimates is limited by small sample sizes, especially for e-waste shops (n=4) and informal collectors (n=15 each). Third, associations are found but causal inference is not supported by the cross-sectional design. Fourth, even with triangulation efforts, relying solely on self-reported data may result in recall or reporting bias. Lastly, rather than being measured directly, health and environmental risks are deduced from literature and observation.

6. CONCLUSIONS

This particular study regarding Savar's plastic, e-waste, and construction demolition waste streams demonstrates an informal recycling system that is both productive and precarious. Informal collectors, feriwala, and small recycling shops recover substantial materials, reducing landfill burdens and supporting livelihoods. Yet, the system operates with low remuneration, unhealthy, unsafe practices, and weak access to formal markets. Despite dominating in volumes, plastic recycling faces poor material quality, fragmented value chains, and limited downstream processing. E-waste offers high returns per unit, but generates acute toxic exposures through unsafe disassembly and open burning. C&D waste presents a significant untapped potential if on-site segregation and central processing facilities are introduced. A public survey of the residents revealed strong environmental concern and willingness to participate in awareness campaigns. Still, an awareness-action gap persists due to inadequate infrastructure, poor outreach, and limited enforcement of previously established policies. Priority interventions should therefore combine formalization of informal actors, investment in localized collection and treatment infrastructure, enforcement of EPR, occupational safety standards, and community engagement. Public-private partnerships and targeted pilot projects can translate latent

support into higher recovery rates while improving working conditions and reducing environmental risks.

ACKNOWLEDGMENTS

The authors thank the questionnaire survey participants for their cooperation.

DECLARATION OF USE OF AI

The authors used ChatGPT (OpenAI) to polish the language, check grammar, and enhance the text's readability and fluency while preparing this work. The authors took full responsibility for the final manuscript after using this tool to review and edit the content as necessary.

REFERENCES

Akther, S., Evans, J., & Millington, N. (2025). Solid waste management in dhaka: Understanding the evolution of a waste regime. *Geoforum*, *165*, 104364. doi: 10.1016/j.geoforum.2024.104364

Ankhi, I. J., Hossain, G. A., Faisal, A. K. M., Hasan, M. R. U., Barua, S., & Masud, M. H. (2025). Material flow analysis and risk evaluation of informal and formal e-waste recy- cling processes in bangladesh: Towards sustainable management strategies. *Journal of Cleaner Production*, *497*, 145090. doi: 10.1016/j.jclepro.2024.145090

Annamalai, J. (2015). Occupational health hazards related to informal recycling of e-waste in india: An overview. *Indian journal of occupational and environmental medicine*, *19*(1), 61.

Assessment of generation of e-waste, its impacts on environment and resource recovery potential in bangladesh. (2025). https://surl.li/andxhf.

Cabias, A. G., De Paz, R., Estacion, R., Datiles, E., & Siat, G. O. (2024). Community en- gagement on waste management: Empowering local communities for sustainable waste disposal. *Journal of Community Development*.

Dept. of environment, chattogram laboratory. (n.d.). https://surl.li/znvvhr.

Faisal, A. K. M., Ankhi, I. J., Hossain, G. A., Ahmed, M. M., Siddhpura, M., & Masud, M. H. (2025). Emerging concerns associated with e-waste exposure in bangladesh. *Environ- mental Science and Pollution Research*, *32*(14), 8595–8628. doi: 10.1007/s11356-024- 34518-8

Fatema, K., Hassan, M. N., Hasan, S., & Roy, H. (2025). E-waste recycling in an optimized way for copper recovery by leaching and a case study on e-waste generation and management in dhaka city. *Heliyon*, *11*(1). doi: 10.1016/j.heliyon.2024.e38214

Ferronato, N., & Torretta, V. (2019). Waste mismanagement in developing countries: A re- view of global issues. *International journal of environmental research and public health*, *16*(6), 1060.

Gajzler, M., Nowotarski, P., & Ratajczak, M. (2025). Economic and environmental analysis of using recycled ceramic demolition materials in construction projects. *Sustainability*, *17*(16), 7560. doi: 10.3390/su17167560

Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science advances*, *3*(7), e1700782.

Haque, S. E., Nahar, N., Chowdhury, N. N., Gazi-Khan, L., Sayanno, T. K., Muktadir, M. A., & Haque, M. S. (2025). Identification of recycling potential of construction and demolition waste: challenges and opportunities in the greater dhaka area. *Environmental Monitoring and Assessment*, *197*(6), 646. doi: 10.1007/s10661-025-12315-9

Hasan, S. E. (2004). Public awareness is key to successful waste management. *Journal of Environmental Science and Health, Part A*, *39*(2), 483–492. doi: 10.1081/ESE-120027539

Hoang, N. H., Ishigaki, T., Kubota, R., Yamada, M., & Kawamoto, K. (2020). A review of construction and demolition waste management in southeast asia. *Journal of Material Cycles and Waste Management*, *22*(2), 315–325. doi: 10.1007/s10163-019-00931-4

Hossain, S., Rahman, M. A., Chowdhury, M. A. A., & Mohonta, S. K. (2021). Plastic pollution in bangladesh: A review on current status emphasizing the impacts on environment and public health. *Environmental Engineering Research*, *26*(6).

Imam, S. T., & Rafizul, I. M. (2025). Occupational risks, vulnerabilities, and safety challenges among informal waste workers at the open disposal site in khulna city. *International Journal of Hygiene and Environmental Health*, *266*, 114543. doi: 10.1016/j.ijheh.2024.114543

Islam, M. R., Ruponti, S. A., Rakib, M. R. J., Nguyen, H. Q., & Mourshed, M. (2023). Current scenario and challenges of plastic pollution in bangladesh: a focus on farmlands and terrestrial ecosystems. *Frontiers of Environmental Science & Engineering*, *17*(6), 66.

Islam, M. S., Hasan, M. R., Mostakim, K., Joarder, M. S. A., Hasan, M. H., & Ahmed, M. R. (2025). E-waste management in bangladesh: Environmental impacts, health risks, and sustainable policy strategies. *Cleaner Waste Systems*, 100297. doi: 10.1016/j.clwas.2025.100297

Kapucu, N., Ge, Y., Rott, E., & Isgandar, H. (2024). Urban resilience: Multidimensional perspectives, challenges and prospects for future research. *Urban Governance*, *4*(3), 162–179.

Kumar, A., & Agrawal, A. (2020). Recent trends in solid waste management status, challenges, and potential for the future indian cities–a review. *Current Research in Environmental Sustainability*, *2*, 100011.

Kwarteng, I. K., Kontič, D., Bizjak, T., & Kontič, B. (2020). Assess- ing the role of waste pickers in the recycling industry in accra metropo- lis. *Journal of Geoscience and Environment Protection*, *8*, 73–87. Re- trieved from https://doi.org/10.4236/gep.2020.810005 doi: 10.4236/gep.2020.810005

Lara, J. C. F., El-Fadel, M., Rauf, A., & Khalfan, M. M. A. (2025). Insights and innovations in construction and demolition waste management: Strategic framework for circular mar- ket development. *Resources, Conservation & Recycling Advances*, *XX*, 200288. doi: 10.1016/j.rcradv.2024.200288

Makul, N., Fediuk, R., Amran, M., Zeyad, A. M., de Azevedo, A. R. G., Klyuev, S., & Karelina, M. (2021). Capacity to develop recycled aggregate concrete in south east asia. *Buildings*, *11*(6), 234. doi: 10.3390/buildings11060234

Matter, A., Dietschi, M., & Zurbrügg, C. (2013). Improving the informal recycling sector through segregation of waste in the household–the case of dhaka bangladesh. *Habitat International*, *38*, 150–156.

National 3r strategy for waste management. (n.d.). https://surl.li/piqrzv. (Ac- cessed: [Insert access date])

OECD. (2025). *Regional plastics outlook for southeast and east asia.* Paris. Retrieved from https://doi.org/10.1787/5a8ff43c-en doi: 10.1787/5a8ff43c-en Robinson, B. H. (2009). E-waste: an assessment of global production and environmental impacts. *Science of the total environment*, *408*(2), 183–191.

Roy, N., Abd Manaf, L., & Ramli, A. H. M. (2025). Socio-cultural drivers of waste man- agement practices: A kap-based systematic review with lessons from dhaka and diverse urban contexts. *Waste Management Bulletin*, 100251. doi: 10.1016/j.wmb.2024.100251

Srivastava, A. N., Sikarwar, V. S., Bisen, D., Fathi, J., Maslani, A., Lopez Nino, B. N., & Buryi, M. (2025). E-waste unplugged: Reviewing impacts, valorization strategies and regulatory frontiers for efficient e-waste management. *Processes*, *13*(7), 2014. doi: 10.3390/pr13072014

Villarrubia-Gómez, P., Cornell, S. E., & Fabres, J. (2018). Marine plastic pollution as a planetary boundary threat–the drifting piece in the sustainability puzzle. *Marine policy*, *96*, 213–220.