TRANSPARENCY INTERNATIONAL BANGLADESH

Social movement against corruption

E-WASTE

MANAGEMENT IN BANGLADESH: GOVERNANCE CHALLENGES AND WAY FORWARD

MANAGEMENT IN BANGLADESH:
GOVERNANCE CHALLENGES AND WAY FORWARD

E-Waste Management in Bangladesh: Governance Challenges and Way Forward

Research Advisers

Dr. Iftekharuzzaman, *Executive Director, TIB*
Professor Dr. Sumaiya Khair, *Adviser Executive Management, TIB*
Muhammad Badiuzzaman, *Director, Research and Policy, TIB*

Researchers

Abdullah Zahid Osmani, *Research Associate, Environment and Climate Finance, TIB*
Nabil Haque, *Coordinator, Environment and Climate Finance, TIB*

Research Assistants

Nipun Sarker, *Research Assistant, Environment and Climate Finance, TIB*
Rifat Bin Hossain, *Research Assistant, Environment and Climate Finance, TIB*
Sushmita Barua, *Research Assistant, Environment and Climate Finance, TIB*

Acknowledgement

We sincerely thank all the stakeholders and experts we contacted and interviewed for this study for their invaluable data, information, observations, thoughts, and suggestions. We especially want to thank Professor Dr. Shahinoor Islam and his colleagues, Hridoy Roy and Mahmud Kamal Bhuiyan from BUET, for their contribution to explore the relationship between climate change and e-waste. Our sincere gratitude also goes to our colleagues in the Research and Policy Division for their valuable research inputs. We are grateful to Dr. Iftekharuzzaman, Executive Director of TIB, and Professor Dr. Sumaiya Khair, Adviser to the Executive Management, for their ongoing guidance and insights that ensure the scientific rigor and methodological excellence of this study. A special thanks to Muhammad Badiuzzaman, Director and Shahzada M Akram, Senior Research Fellow of the Research and Policy Division for their support in reviewing and editing this report. The support from Nazneen Ahmed and Md. Tariqul Islam from Environment and Climate Finance project was invaluable to the completion of this report. We also appreciate the dedication, hard work, and constant support from the research assistants throughout this project.

Contact

Transparency International Bangladesh
MIDAS Center (Levels 4 & 5)
House 5, Road 16 (New), 27 (Old)
Dhanmondi, Dhaka-1209, Bangladesh
Phone: (+8802) 41021267-70
Email: info@ti-bangladesh.org
Website: www.ti-bangladesh.org
Facebook: www.facebook.com/TIBangladesh

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ASYCUDA	Automated System for Customs Data
ATM	Automated Teller Machine
BBS	Bangladesh Bureau of Statistics
BEST	Bangladesh Environmental Sustainability and Transformation
BSW	Bangladesh Single Window
BTRC	Bangladesh Telecom Regulatory Authority
DoE	Department of Environment
ECDS	Environment, Natural Resource, Climate and Disaster Statistics
ECR	Environmental Conservation Rules
EEE	Electronic and Electrical Equipment
EoL	End of Life
EPR	Extended Producer Responsibility
EV	Electric Vehicle
EVM	Electronic Voting Machine
FEMA	Federal Emergency Management Agency
GHG	Greenhouse Gas
HIES	Household Income and Expenditure Survey
HS	Harmonized System
MOEFCC	Ministry of Environment, Forest and Climate Change
ITU	International Telecommunication Union
PCB	Printed Circuit Board
PIC	Prior Informed Consent
PPP	Public Private Partnership
PRO	Producer Responsibility Organization
PV	Photovoltaic
STRONGG	Strong, Transparent, Responsive, Open Networks for Good Governance
UNU	United Nations University
WEEE	Waste Electronic and Electrical Equipment

PREFACE

Transparency International Bangladesh (TIB) works with a vision of an effectively governed Bangladesh where public affairs, business, politics, and the daily lives of the people will be free from corruption, and all powers exercised at all levels will be held accountable. To achieve this, TIB carries out various activities that include research and evidence-based policy advocacy on important issues, institutions, and sectors of public interest, raising awareness, building the capacity of stakeholders, and actively engaging citizens, especially young people, to encourage better governance and fight corruption. Accordingly, ensuring good governance and promoting integrity in environmental management have become key focus areas for TIB, particularly because of high vulnerability to environmental degradation and climate change. Governance in waste management, including e-waste, is essential for preventing environmental pollution, reducing greenhouse gas emissions, and protecting public health.

This study on *E-Waste Management in Bangladesh: Governance Challenges and the Way Forward*, was undertaken to analyse the challenges of good governance in e-waste management in Bangladesh and explore ways to address them. The specific objectives of the study included identifying challenges in the regulatory framework for e-waste management, assessing stakeholders' compliance with applicable legal obligations, highlighting the link between e-waste management and climate change, and providing recommendations to address the identified challenges.

The study finds that the Hazardous Waste (E-waste) Management Rules (2021) outline clear responsibilities for each stakeholder in the e-waste management stream, including producers, consumers, collectors, storage providers, transporters, repairers, and recyclers. According to the rules, producers, importers, and distributors of electronic and electrical equipment are held accountable for collecting e-waste for recycling or disposal, with a collection target of 10% in the first year and increasing to 50% by the fifth year from the start date of the rules' implementation. Four years into implementation, there is still no credible nationwide inventory to measure progress against these targets. Moreover, the Department of Environment (DoE) has failed to take any visible and effective measures to bring any producer, importer, or distributor into its registration scheme under these rules.

On the other hand, this study uncovered that the informal actors in e-waste management are not 'truly informal'; the majority operate with trade licenses and other business registrations. These actors are invisible to the DoE but not to other government bodies. Although they play a vital role in diverting e-waste from landfills, their segregation, storage, and crude dismantling processes harm workers' health and the environment. The lack of seriousness on the part of DoE and urban local bodies in implementing e-waste rules poses integrity risks, as their limited capacity and flawed procedures negatively affect their ability to fulfil their mandates with integrity, thereby compromising sustainable e-waste management.

Irregularities prevail in the export of e-waste and the import of reconditioned electronics and e-waste, which are banned. One of the largest e-waste exporters has been exporting exceeding the approved volume under the Prior Informed Consent (PIC) process of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1993), to which Bangladesh is a signatory. Despite being prohibited under the e-waste rules and import policy order, reconditioned office equipment, computers, and electronic goods are imported and widely available in the market. The most shocking finding, however, is that since the adoption of the Hazardous Waste (E-waste) Management Rules (2021), 14,985 tons of e-waste have been imported into Bangladesh during 2022-2024, which is banned under this law and the import policy order. Amid declining foreign currency reserves, USD 700,000 was spent to import this volume of e-waste, making Bangladesh a net importer of e-waste.

Based on these findings, the report outlines twelve recommendations for DoE and other governmental bodies. The Hazardous Waste (E-waste) Management Rules (2021) require amendment to broaden their scope to cover solar panels, electric vehicles, and other emerging electronics. Export conditions and penalties for different types of non-compliance must be added in the amendment. Separate guidelines are needed to help stakeholders adopt practices that reduce harm to human health and the environment. To guide informal sector actors in implementing environmentally safe e-waste handling, a roadmap is recommended, with sufficient funding to implement it. A national inventory of e-waste must be developed in accordance with United Nations guidelines to measure progress against collection and recycling targets accurately. The capacities of the customs department and the DoE must be enhanced to implement the e-waste management rules. Coordination between government agencies must also be improved by establishing a

national coordination committee, modeled on the one outlined in the Solid Waste Management Rules (2021).

Implementing these recommendations requires careful attention to avoid the mistakes that led to the current challenges in e-waste governance. An e-waste system developed without a participatory approach is likely to face challenges such as a lack of stakeholder buy-in, unrealistic expectations, and regulations that don't match ground realities. While comprehensive regulation is crucial, it is also essential to have specific guidelines and clear implementation plans. Decisions for the sector should rely on two main elements: credible field data and stakeholder input gathered through participatory and inclusive approaches. When working with informal actors in the e-waste sector, it is also important to avoid the perennial conflict of livelihood versus the law.

This research was conducted by Abdullah Zahid Osmani, Research Associate, and Nabil Haque, Coordinator of the Environment and Climate Finance project at TIB. Special thanks go to Professor Dr. Sumaiya Khair, Adviser of Executive Management, for her valuable advice and guidance throughout the study. Gratitude is also extended to Muhammad Badiuzzaman, Director of Research and Policy, for his critical review of the report and editorial support. I also appreciate the contribution of all other relevant colleagues, especially the Research and Policy Division and the Energy Governance project, for their valuable feedback and support in completing this report.

We believe that the information, analyses, and recommendations presented in this report will be valuable and helpful in promoting good governance and integrity in e-waste management in Bangladesh. We welcome readers' suggestions and recommendations.

Iftekharuzzaman
Executive Director

CHAPTER 1

INTRODUCTION

Introduction

The rapid growth of digital connectivity and increased consumption of household electronics have led to the accumulation of Waste Electrical and Electronic Equipment (WEEE). Electronic waste (E-waste) is electrical and electronic equipment discarded by users due to lack of use or when it has reached the end of its usable life. It encompasses various electronic devices such as telecommunications and information technology equipment, large household items, lighting equipment, medical devices, monitoring and control devices, consumer electronics, electrical tools, sports and leisure equipment, toys, mobile phones, and computers. According to the Global E-Waste Monitor 2024, a record 62 billion kg of e-waste was generated globally in 2022, equivalent to an average of 7.8 kg per capita per year.[1]

In developed countries, authorised local governments or private entities are responsible for collecting e-waste. At the same time, it is processed at advanced facilities equipped with well-managed infrastructure and technologies to ensure the safe and efficient extraction of valuable materials. Any remaining waste is disposed of in accordance with landfill and incineration regulations.[2] On the other hand, in developing countries, e-waste is gathered in an unofficial, dispersed, and illegal manner by various businesses, merchants, or governmental entities. E-waste in developing countries is informally recycled to extract valuable elements using rudimentary technology without proper occupational safety precautions.[3] The leftover electronic waste frequently ends up in landfills, releasing harmful substances like heavy metals into the soil and water sources. Open burning of e-waste is also widely practiced to recover metals, such as steel, aluminium, and copper from wires, capacitors, and other components. However, the plastics encasing most electronics contain brominated flame retardants. Open burning of such plastics will directly harm waste workers and contribute to air pollution from toxic fumes.[4]

---

1 Baldé et al. (2024). *Global E-waste Monitor*. Geneva/Bonn: International Telecommunication Union (ITU) and United Nations Institute for Training and Research (UNITAR).

2 Sthiannopkao, S., & Wong, M. H. (2013). Handling e-waste in developed and developing countries: Initiatives, practices, and consequences. *Science of The Total Environment*, *463–464*. doi: 10.1016/j.scitotenv.2012.06.088.

3 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)*, e41453. doi: 10.1016/j.heliyon.2024.e41453.s

4 Islam, Md. K., Khatun, Mst. S., & Mourshed, M. (2024). An in-depth analysis and review of management strategies for E-waste in the south Asian region: A way forward towards waste to energy conversion and sustainability. *Heliyon*, *10*(7), e28707. doi: 10.1016/j.heliyon.2024.e28707

E-waste moves through multi-party and multilayer distribution systems, making the management system highly complex. Recycling e-waste is crucial for recovering valuable materials and reducing the environmental and health impacts of improper disposal. However, high collection and dismantling costs have led to the development of complex criminal schemes to collect e-waste from several countries and ship it to Asia and Africa[5]. Standards for the import/export of e-waste vary across countries, creating obstacles to crackdowns on illegal trading and leading to a boom in e-waste smuggling.[6]

1.1 Situation in Bangladesh

Given the country's large population and the lack of necessary infrastructure, managing WEEE presents enormous challenges. Currently, no centralized data is available on e-waste generated and recycled in the country. Table 1 shows the range of e-waste generated as reported in other studies. The methodological differences and e-waste covered in these studies show a wide range of annual e-waste generation: from 170 million kg to 600 million kg in 2021.

TABLE 1: Estimates of annual and projected e-waste generation in Bangladesh

Reference	Annual e-waste generated		Estimated generation in the future	
	Assessment Year	Million kg	Forecast Year	Million kg
BUET (2018)[7]	2017	310	2035	4620
'*Waste Statistics of Bangladesh*'- BBS (2022)	2021	170	-	-
Global E-Waste Monitor (2024)[8]	2022	350	-	-
Roy et al. (2022)[9]	2021	600	2050	10,000

5 UNODC (2024). *Cash in the trash: the role of corruption, organized crime and money laundering in waste trafficking*. United Nations Office on Drugs and Crime.

6 Liu, K., Tan, Q., Yu, J., & Wang, M. (2023). A global perspective on e-waste recycling. *Circular Economy*, *2*(1), 100028. https://doi.org/10.1016/j.cec.2023.100028

7 *Assessment of Generation of E-Waste, Its Impacts on Environment and Resource Recovery Potential in Bangla*desh – a 2018 baseline survey funded by the Department of Environment (DoE) and conducted by the Centre for Environmental and Resource Management (CERM) of Bangladesh University of Engineering and Technology (BUET).

8 C. P. Baldé et al. (2024). *Global E-waste Monitor*. Geneva/Bonn: International Telecommunication Union (ITU) and United Nations Institute for Training and Research (UNITAR).

9 Roy, H., Rahman, T. U., Suhan, Md. B. K., Al-Mamun, Md. R., Haque, S., & Islam, Md. S. (2022). A comprehensive review on hazardous aspects and management strategies of electronic waste: Bangladesh perspectives. *Heliyon*, 8(7), e09802. https://doi.org/10.1016/j.heliyon.2022.e09802

These estimated amounts are worrying, considering the limitations of existing institutional recycling capacity in Bangladesh and the dominance of the informal sector. Informal sectors control the recycling process in Bangladesh, and only 3% of total e-waste generated gets recycled through formal actors, which is much lower than in other developing countries.[10] Various initiatives, such as *Digital Bangladesh,* the establishment of Hi-Tech Parks, and Information Technology (IT) Parks, that strive to transform Bangladesh into a technologically advanced country and a software hub, will undoubtedly generate significant volumes of e-waste over the next one to two decades. However, compliant e-waste recycling could create a $500 million annual economic opportunity for Bangladesh if government-approved recyclers manage this waste.[11]

E-waste recycling is an example of a formal governance limitation. Many countries have extensive formal rules, laws, roles, and modes of implementation. However, this is not enough, and local actors must agree on the resources, logistics, and ultimate destination. Problems arise from a lack of collectively constructed governance, i.e., mechanisms for dealing with e-waste that the actors have collectively developed.[12] The Hazardous Waste (E-waste) Management Rules (2021) outline clear responsibilities for each stakeholder in the e-waste management stream, including producers, consumers, sorting facility providers, collectors, storage providers, transporters, retailers, repairers, and recyclers. Despite the enactment of the Hazardous Waste (E-waste) Management Rules (2021), no improvement has been observed in the country's overall e-waste management. According to the rule, electronics and electrical equipment producers are held accountable for collecting e-waste for recycling or disposal, with a collection target of 10% in the first year and increasing to 50% by the fifth year from the start date of the rule's implementation. The lack of centralized data is also hampering the assessment of progress against these targets.

---

[10] Roy, H., Islam, Md. S., Haque, S., & Riyad, M. H. (2022). Electronic waste management scenario in Bangladesh: Policies, recommendations, and case study at Dhaka and Chittagong for a sustainable solution. *Sustainable Technology and Entrepreneurship*, *1*(3), 100025. https://doi.org/10.1016/j.stae.2022.100025

[11] TBS Report (2024, October 15). *E-waste business is worth $500 million*. https://www.tbsnews.net/economy/e-waste-recycling-offers-500m-annual-business-potential-bangladesh-experts-966921

[12] Giglio, E., Pedro, F., Carvalho, L. C., & Xara-Brasil, D. (2023). The governance of E-waste recycling networks: Insights from São Paulo City. *Waste Management*, *161*, 10–16. https://doi.org/10.1016/j.wasman.2023.02.027

With the rule entering its fifth year, it is an opportune moment to analyse the governance challenges of e-waste management in Bangladesh. The objective of this report is to identify the governance challenges and provide specific recommendations to overcome them. This study highlights the sector's evolution after the issuance of the Hazardous Waste (E-Waste) Management Rules (2021). Whereas the health and environmental impacts of e-waste in Bangladesh have been adequately documented,[13] the climate implications of e-waste remain understudied in the national context. This study also addresses this knowledge gap and the associated governance challenges.

1.2 Research Objectives

This report aims to uncover initiatives aimed at preventing harm from sub-standard e-waste management from a governance lens. The dominance of informal actors in e-waste management and the resulting environmental harm demonstrate that formal governance alone is not sufficient to achieve desirable results. Therefore, the overall objective of this study is to analyse the challenges of good governance in e-waste management in Bangladesh and explore ways to overcome them. The specific objectives are -

- Identifying the challenges of the regulatory framework for e-waste management
- Assessing compliance with the applicable legal obligations for stakeholders involved in e-waste management
- To highlight the relevance of the informal sector in e-waste management
- To highlight the relationship between e-waste management and climate change
- To provide recommendations to address the existing governance challenges

The e-waste governance mechanism was analysed using six indicators of good governance (compliance with laws, coordination, transparency, accountability, corruption and irregularities, and participation). Table 2 presents the analytical framework based on the governance indicators.

[13] 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), e41453. https://doi.org/10.1016/j.heliyon.2024.e41453

TABLE 2: Analytical framework based on good governance indicators

Indicators	Field of observation
Compliance with laws	• Relevant laws, regulations, policies, and international conventions
Coordination	• Inter-communication and coordination between government agencies.
Transparency	• Information disclosure/information management related to e-waste management
Accountability	• Mandates for EEE producers, including recycling targets. • Performance of the regulator in implementing the e-waste rules. • E-waste management practices and practices of large end-user consumers.
Corruption and irregularities	• Undue influence to obtain environmental clearance and other registrations • Existing practices in the import and export of old electronics, • The customs clearance process
Participation	• For the formulation and implementation of relevant policies – - Participation of electronic equipment manufacturers and recyclers - Participation of the informal sector

This report does not cover the management of Used Lead-Acid Batteries (ULABs), as they are regulated under a separate Statutory Regulatory Order (SRO), which makes automotive battery producers responsible for their recycling.[14] As lead-acid batteries are mainly used in the automotive sector, they are considered automotive waste, not e-waste.[15] This study primarily focused on the five categories of electrical and electronic items mentioned in the Hazardous Waste (e-waste) Management Rules (2021): household appliances, monitoring and control equipment, medical equipment, automatic machines, IT and communication equipment.

[14] Jamal, R., Al Alam, M. A., Sayeed, K. M. A., Ahmed, S. A., Haque, N., Hossain, M. M., & Sujauddin, M. (2024). Patching sustainability loopholes within the lead-acid battery industry of Bangladesh: An environmental and occupational health risk perspective. *Sustainable Production and Consumption*, *48*, 435-445.

[15] Li, M., Liu, J., & Han, W. (2016). Recycling and management of waste lead-acid batteries: A mini-review. *Waste Management & Research, 34*, 298 - 306. https://doi.org/10.1177/0734242x16633773.

The following chapter discusses the methodology of this study. The third chapter introduces the laws, policies, and regulatory authorities for e-waste management in Bangladesh. Chapter four discusses the governance challenges of e-waste management. Chapter five covers the participation of women & children in e-waste management, while chapter six describes the relationship between e-waste management and climate change. The seventh chapter presents the overall observation and the recommendations of this study.

CHAPTER 2

METHODOLOGY

Methodology

This mixed-method study seeks to understand the governance challenges of current e-waste management and fulfill the research objectives in Section 1.2 Data collection techniques comprised document review, semi-structured interviews, field observation, and a qualitative survey of informal e-waste scrap shops. Figure 1 shows the range of stakeholders reached for this study between May and October 2025.

a. Document review

This study reviewed available studies and data on e-waste management and e-waste generation in Bangladesh. In addition, peer-reviewed and grey literature were used for a technical review of applicable international and local regulations for e-waste management and disposal, covering an extended range of policy areas (environment, information technology, electronic products, import and export), to identify local and international requirements for e-waste generation, collection, refurbishment, reuse, recycling, and disposal.

The legal frameworks that were analysed for this study include –

- Hazardous Waste (E-Waste) Management Rules (2021)
- Environmental Conservation Rules (2023)
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- Import and Export Policy Order

b. Technical assessment

This study includes a chapter focusing on the climate implications of e-waste in Bangladesh. It covers the contribution of e-waste to climate change, e-waste management following climate-change-induced natural disasters, and the effects of climate mitigation policies on e-waste related to electric-vehicle and solar photovoltaic (PV) diffusion. This was achieved through research into available figures and statistical data and by applying appropriate models to estimate the e-waste burden following climate-induced natural disasters.

c. Observation

One of the objectives of this study was to assess compliance with current regulations on e-waste. An observation checklist was designed to verify the mandated presence of hazardous materials and recycling information on the packaging of select household appliances (10 brands across eight categories of household items).

d. Cross-sectional qualitative survey

Since the informal sector handles the majority of e-waste management activities in Bangladesh, its perspective on governance challenges is captured through a qualitative survey. Although there are several peer-reviewed studies on the e-waste value chain through the informal sector, their experiences with regulations and regulatory bodies remain underexplored. This study employed a qualitative survey of informal e-waste businesses, colloquially known as *Bhangari* shops, to assess whether the scope of their operations aligns with the regulatory categories. The survey was qualitative, prioritising contextual data over statistical generalization. Other information recorded includes their years of operation, the number of women employed, and their propensity to register the business. The available literature identified hotspots of these informal activities clustered in Dhaka and Chattogram. Therefore, the survey covered 84 *Bhangari* shops from these two hotspots.

e. Interviews

Respondents were chosen for interviews based on their direct involvement in e-waste management and related institutional decision-making. Due to the networked relationships among the state, recyclers, and waste generators, many interviewees were accessed through direct referrals. All participants were informed about the study and did not receive compensation. After verbally explaining the research process and objectives, all personal data from their engagement was stored securely. The interview transcripts were referenced in the report by their respective codes. Their codes identify their roles in e-waste management: REC for recyclers, BWG for bulk waste generators, GOV for government officials, EEE for electrical and electronics manufacturers, and EXP for experts. The 29 interviewees included appointed bureaucrats from the Bangladesh government, as well as professionals from local NGOs, academia, banking and finance sectors, universities, and industry associations.

f. Online survey

An online survey was launched in June 2025 to understand awareness levels and behaviour patterns regarding everyday electronic items nearing the end of their life. 675 anonymous responses were recorded through this online survey shared through TIB's social media page. The full results of the survey is presented in Appendix A of this report.

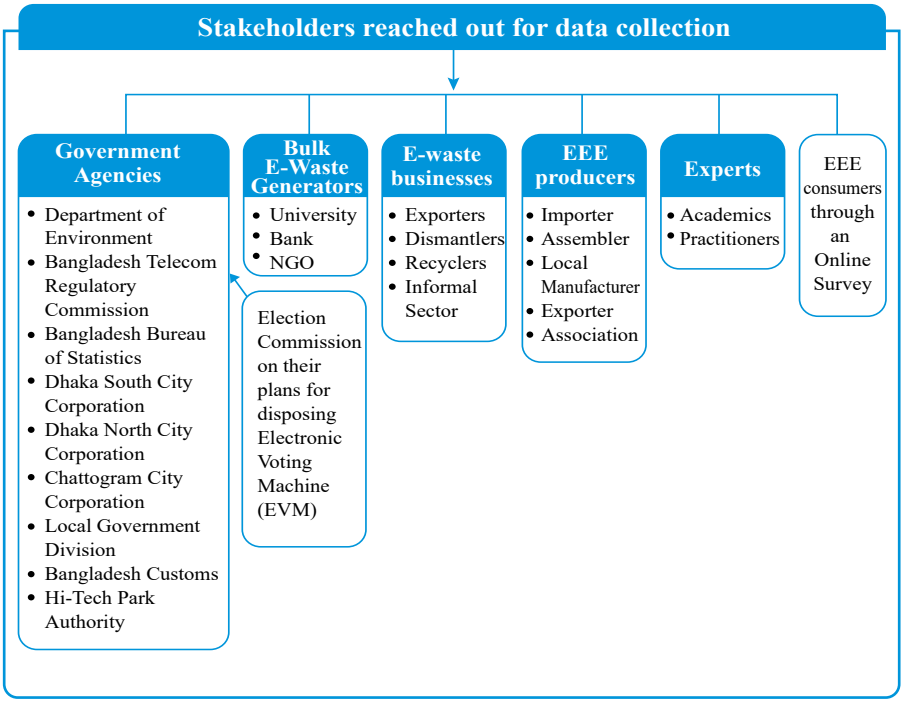


FIGURE 1: The range of stakeholders covered in the research

CHAPTER 3

E-WASTE MANAGEMENT IN BANGLADESH

E-Waste Management in Bangladesh

Bangladesh has a legislative framework for e-waste management. Several laws address e-waste, and the following section outlines the relevant laws governing it.

3.1 Legal Framework

3.1.1 Hazardous Waste (e-waste) Management Rules (2021)

The Hazardous Waste (e-waste) Management Rules (2021) is the first formal legislation regarding E-waste management in Bangladesh that enables large e-waste producers to store and recycle waste systematically. It obligates regulated entities to manage e-waste and restrict the use of certain hazardous substances in Electrical and Electronic Equipment (EEE). Schedule 1 of the E-Waste Management Rules classifies e-waste under five categories: household appliances, monitoring and control instruments, medical equipment, automatic dispensers, and IT & telecommunication equipment. Regulated entities include manufacturers, assemblers, importers, distributors, traders of EEE, and those involved in storage, transport, refurbishing, dismantling, recycling, disposal, and export of WEEE. They are obliged to get registration and environmental clearance certificates from DoE {Rule 10 & 12}, keep information on the collection of e-waste using the prescribed Form-6 {Rule 16}, and submit an annual report within 60 days after each fiscal year according to Form-7 {Rule 16} of E-waste Management Rules (2021).

The E-waste management rules (2021) introduce the Extended Producer Responsibility (EPR) framework for e-waste management, requiring producers of almost all EEE to register with the Department of Environment (DoE). They are mandated to have an approved e-waste management plan and reach collection targets of 10% in 2022, increasing annually by 10 percentage points to 50% in 2026. Table 3 outlines other mandates, disaggregated by the responsible entities.

TABLE 3: Specific rules from the Hazardous Waste (e-waste) Management Rules (2021)

Obligation	Rule no.	Responsibility of
Mention the country, company & serial code, and the registered e-waste collection point on the product's package, or make the information available to consumers	Rule 3	EEE Manufacturer or assembler
Collect e-waste from consumers and deliver it to a dismantler or recycler		
Restricting the storage of e-waste for more than 180 days	Rule 13	
Adopts the Extended Producer Responsibility (EPR) framework	Rule 7	
Report any accident according to Form 8	Rule 20	Recycler
Monitor the collection and recycling procedure; Designate a site for e-waste disposal; Raise awareness	Rule 23	City corporations, Municipalities
The divisional and district offices of DoE are responsible for e-waste monitoring. They will send an annual report to the central office by 30 September and forward it to the government by 30 November	Rule 17	DoE
Designated information management officer	Rule 10	

Rule 14 sets limits on the use of hazardous substances in EEE (as mentioned in Schedule 3). Manufacturers must reduce the use of hazardous substances to the levels identified within five years of the implementation of the E-Waste Rules. However, the government can extend this deadline. It also states that all data about reducing the use of hazardous substances and which ones are still present shall be recorded in the product information booklet. Rule 15 restricts importing, donating, and gifting used and refurbished EEEs unless research and educational institutions use them with relevant authorization.

At the user's end, Rule 7 makes individual consumers and bulk e-waste generators responsible for delivering e-waste to a designated trader or collection center or auctioning it to a specific dismantler, recycler, or repairer. Rule 3 (10) states that sellers, manufacturers, and recyclers should reimburse

consumers who return EEE products. Rule 23(3) states that the DoE, local government institutions, and EEE manufacturers/importers/distributors will raise public awareness to encourage the delivery of e-waste to collection points. Noncompliance with these rules may result in imprisonment for up to 2 years, a fine of up to 200,000 BDT, or both. Repeat offenders may face imprisonment for 2-10 years and/or a fine of 2,00,000 to 10,00,000 BDT.

3.1.2 Environmental Conservation Rules 2023

The Environmental Conservation Rules (2023) replaced the 1997 rules, which had been in effect for over 25 years. The new rules, promulgated by the Ministry of Environment, Forest and Climate Change (MoEFCC), are a critical step in modernizing the country's approach to environmental management, aiming to address contemporary challenges like rapid industrialization, urbanization, and climate change. The ECR 2023 rules are applicable for setting up recycling facilities for e-waste management. The 2023 rules maintain the colour-coded system but with an updated and expanded list of projects. Under ECR 1997, e-waste recycling facilities were classified as 'Red' category operations, indicating they had severe environmental impacts and required the most stringent regulatory controls. The reclassification to the 'Orange' category under ECR 2023 reflects a more moderate risk profile. An Initial Environmental Examination (IEE) is sufficient to obtain an Environmental Clearance Certificate (ECC) for the 'orange' category. In contrast, a full Environmental Impact Assessment (EIA) is mandatory in the 'Red' category. However, DoE has the authority to upgrade a facility to 'Red' based on scale, hazardous material handling (e.g., cathode ray tube glass, lithium batteries), or location sensitivity. ECC obtained under both the orange and red categories is scheduled for renewal annually.

3.1.3 Basel Convention

Bangladesh ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal in 1993. Article 6 of the Basel Convention establishes a system of obtaining Prior Informed Consent (PIC) from importing states before any shipment of hazardous waste. States exporting hazardous materials must obtain consent from the relevant authorities in the importing and transit states before the former can permit such exports. The exporting state may delegate this responsibility to the waste generator or exporter. Exporter states may also permit the exporter to operate under a general notification, under which hazardous wastes or other wastes with the same physical and chemical characteristics are shipped regularly

to the same disposer via the same customs office of exit, entry, and transit. However, this arrangement is subject to the consent of the importing and transit states. The general notification and written consent for such a scheme may only cover exports for 12 months.[16]

A key issue with e-waste imports is distinguishing between actual e-waste and old, usable electronics that will soon become e-waste. The Convention permitted the transboundary movement of hazardous substances for reuse or recycling. This ambiguity allowed e-waste to be shipped by falsely labeling it as second-hand products intended for reuse and recycling. These loopholes, among others, led to the adoption of the *Basel Convention Ban Amendment*, which completely bans the transboundary movement of any hazardous substance, even when intended for reuse and recycling. The *Basel Convention Ban Amendment* went into effect on May 12, 2009, and Bangladesh has yet to ratify it. However, without a notification of non-acceptance, Bangladesh automatically became a party to the *E-waste Amendments*, which took effect on January 1, 2025[17]. The goal of the *E-waste amendment* is to expand controls over the transboundary movement of e-waste and to make all electronic and electrical waste subject to the PIC process. The Basel Convention does not prescribe strict, automatic penalties for non-compliance. Instead, it emphasizes a "dual approach" combining soft (managerial) measures - such as assistance, capacity building, and dialogue - with hard (enforcement) measures, including sanctions and dispute settlement, though the latter are rarely used.

3.1.4 Import and Export Policy of Bangladesh

E-waste export from Bangladesh is not prohibited according to the Export Policy 2024-2027. Although this export policy does not mention e-waste exports, it emphasizes the export of EEE and software & IT products as high-priority sectors. The support provided by the Government of Bangladesh to these sectors could increase the volume of e-waste generated in the country as the required EEE from manufacturers and the import of IT equipment reach end-of-life. The latest import policy order covers 2021 to 2024, which includes a list of prohibited goods, specifically identifying "*reconditioned office equipment, photocopier, typewriter machine, telex, phone and fax, old computer, old computer accessories, old electronic goods*". All kinds of waste imports are also prohibited unless otherwise specified in the order.

---

[16] Mott MacDonald (2018). *Final Report on Analysis of Current E-waste Management Scenario in Bangladesh Feasibility & Project Structuring Study for E-Waste Management Facility for Hi-Tech Park Authority.*

[17] https://www.basel.int/Countries/StatusofRatifications/EwasteAmendments/tabid/10103/Default.aspx

3.2 Institutional Framework

Since e-waste recycling is complex and involves several intermediaries, there are conflicts of diverse nature, including disputes over objectives, knowledge, values, and culture of sustainability. The actors need to make collective decisions regarding actions, functions, powers, and hierarchies. Figure 2 illustrates the relationships among stakeholders for e-waste management in Bangladesh, while Figure 3 describes the responsibilities of the actors under the existing legal framework.

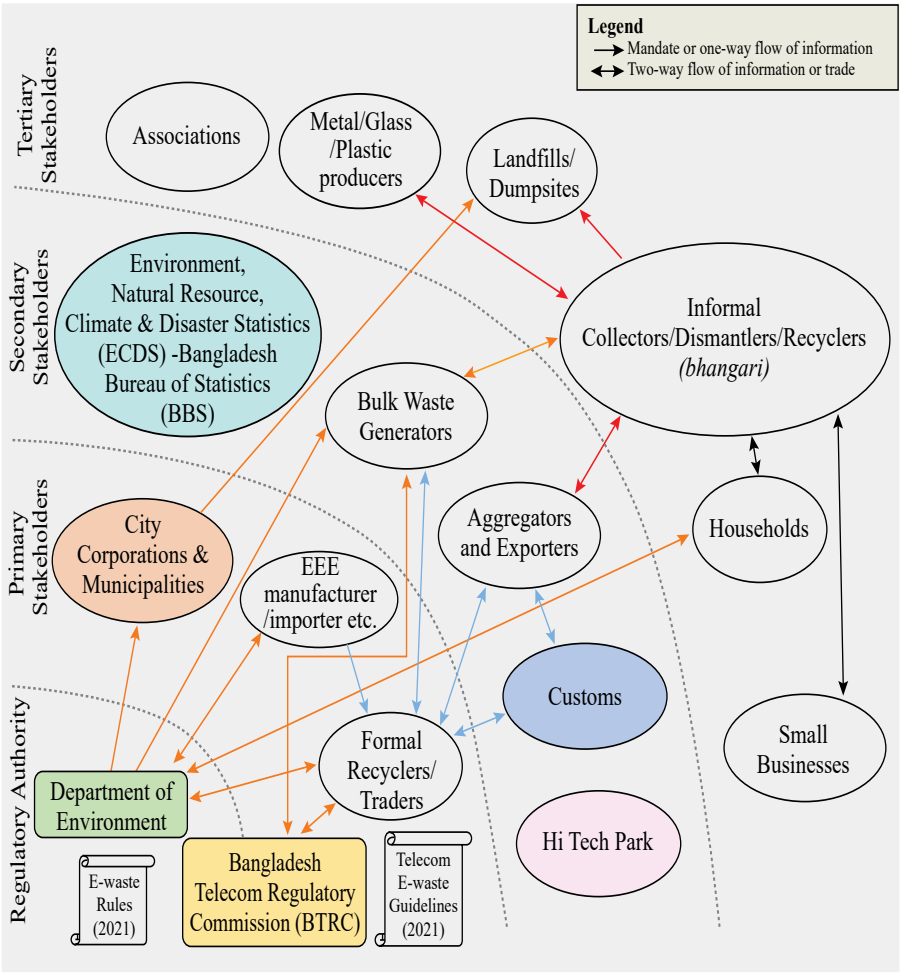


FIGURE 2: E-waste stakeholders in Bangladesh

3.2.1 Department of Environment (DoE)

The Department of Environment (DoE) is the main government agency responsible for formulating and implementing environmental protection rules and regulations. The foundational law authorizing this power is the Bangladesh Environment Conservation Act (1995). On June 10, 2021, after nearly 10 years of talks[18], DoE published the Hazardous Waste (e-waste) Management Rules. In recent years, DoE has empowered subnational offices with responsibilities for environmental clearance, monitoring, and enforcement. It has also created a specialized technical unit of 'Chemical and Waste Management', which oversees regulations related to solid waste, e-waste, and international conventions, including the Basel, Rotterdam, Stockholm, and Minamata conventions. The responsibilities of DoE specific to this regulation are provided in section 3.1.1 and illustrated in Figure 3.

3.2.2 Local Government Institutions (LGIs)

LGIs play pivotal roles in waste management across rural, semi-urban, and urban settings. City corporations & municipalities oversee door-to-door collection of household and institutional waste. They are responsible for comprehensive waste management, including planning and implementing systems for collection, transportation, processing, and disposal. They also operate transfer stations, dustbin networks, and landfill sites, some of which are equipped with waste-processing facilities. The LGIs are expected to facilitate environmentally sound e-waste management by enforcing the *Hazardous Waste (E-waste) Management Rules (2021)* and by designating e-waste collection sites within municipal waste collection areas to enable separate handling. Their responsibilities stem indirectly from broader mandates on solid waste, municipal services, and environmental compliance, including coordination with DoE guidelines.

3.2.3 Bangladesh Telecom Regulatory Commission (BTRC)

BTRC regulates telecom e-waste in Bangladesh by setting rules, granting approvals, and monitoring telecom e-waste handlers. It acts as the primary regulatory authority for telecom-related e-waste under the oversight of the Department of Environment (DoE). As the standard-setting organization and regulator, BTRC defines licensing conditions, handling protocols, and documentation requirements. It administers the *Guidelines on Telecom E-Waste Management and Recycling System* issued in 2022, under the

[18] Baldé et al. (2024). *Global E-waste Monitor*. Geneva/Bonn: International Telecommunication Union (ITU) and United Nations Institute for Training and Research (UNITAR).

Telecommunication Act, 2001 (2010 Amendment). The guidelines identify telecom e-waste generators as manufacturers, importers, users, and repairers of telecom equipment, including carriers and broadcasters. It mandates consumer-centered e-waste collection, bans its handling in populated areas, and prohibits marketing refurbished equipment. E-waste management in the telecom sector requires prior approval from BTRC. Telecom e-waste must be processed only by DoE-approved recyclers under joint oversight. BTRC also has enforcement authority and can prosecute organizations causing environmental harm during e-waste processing.

3.2.4 Customs Department

A set of key legal and procedural frameworks governs Bangladesh's import regulations. The *Customs Act 2023* serves as the foundational legislation for customs operations, covering procedures for valuation, appeals, penalties, and enabling digital processing through the ASYCUDA World system. The *Import Policy Order* outlines the categories of goods that are prohibited, restricted, or freely importable, and sets specific conditions for importing industrial raw materials, capital machinery, and consumer goods. Complementing these rules is the *Tariff Schedule 2025-2026*, which details the applicable duties and taxes for each Harmonized System (HS) code, helping importers accurately calculate the total tax incidence.

The customs clearance process in Bangladesh follows a structured sequence to ensure compliance with import regulations. It starts with the electronic submission of the Bill of Entry through the Automated System for Customs Data (ASYCUDA), where the importer or their agent provides shipment details and the declared value. Upon arrival at ports, consignments undergo physical examination. Customs officers inspect the goods to verify if they are new and match the import documents. If items are found to be used (e.g., machinery or electronics), this is reported both digitally in ASYCUDA and through a physical report. Based on this, the consignment moves to the relevant assessment group of officers. If the group determines the goods are prohibited, a formal adjudication order is issued by the Executive Officer. For consignments valued at 50 lakh BDT or more, the case is forwarded to the commissioner for approval. If discrepancies are found, such as declaring used items as new, the consignment is reviewed by the relevant assessment group. If deemed prohibited, a confiscation order is issued by the Commissioner. When the Commissioner issues an order, the consignment is confiscated, making it ineligible for release. Since the shipment has been seized, the next step is management action. For used electronics and similar items, the committee,

which includes representatives from the DoE and other administrative bodies, collectively decides on the consignment. Because the shipment is confiscated, it is not eligible for auction. In such cases, the committee usually determines that the goods must be destroyed. However, there are no specific instructions for the destruction of used or waste electronic or electrical equipment.

Around 90% of import consignments pass through customs with only a basic gate-level check, where officers briefly verify the presence of the declared items. Only 10% of import consignments undergo a thorough physical examination, where goods are unpacked and matched against import documents. Every consignment also undergoes scanning. There are two types of scanning involved: regular scanning and another conducted under the Megaport Initiative, which checks for radioactive materials. However, this Megaport scanning facility is not available at every exit gate. After inspection and verification, the importer pays all applicable duties and taxes, and then the goods are released from the port or bonded warehouse.[19]

3.2.5 Hi-Tech Park

Under the ongoing World Bank-funded Bangladesh Environmental Sustainability and Transformation (BEST) project, a specific component focuses on environmentally sound e-waste treatment and providing technical assistance for certification standards and incentives. Component 4, with a revised budget of $25 million, will support the Bangladesh Hi-Tech Park Authority in developing a pilot e-waste management facility in Kaliakoir Hi-Tech Park through a design-build-operate Public-Private Partnership (PPP) arrangement. This pilot will demonstrate the technical, financial, environmental, and social feasibility of e-waste management. It is assumed that the facility will process all e-waste generated in hi-tech parks across the country and approximately 33% of the e-waste streams in Dhaka district, with an estimated annual capacity of 100,000 tons.[20]

3.2.6 Bangladesh Bureau of Statistics (BBS)

As part of the Ministry of Planning, the Bangladesh Bureau of Statistics (BBS) is responsible for providing statistical information to guide decision-making and the development process. Under the Bangladesh Environmental Statistics Framework (BESF) 2016–2030, an integrated

[19] Interview transcripts – KII_GOV_2 and KII_GOV_3

[20] Mott Macdonald (2019). *Options and Models for the Development of E-waste Processing Facilities. Feasibility & Project Structuring Study for E-waste Management Facility for Hi-Tech Park Authority.* Reference # 397574|3|A

approach to collecting, analyzing, and disseminating environmental data and information is planned, aligned with national priorities and plans. The Environment, Natural Resource, Climate and Disaster Statistics (ECDS) wing of the Bangladesh Bureau of Statistics (BBS) is the principal institutional mechanism for developing and institutionalizing environmental statistics in Bangladesh. Its mandate encompasses systematically collecting, compiling, and analyzing data on environmental conditions, natural resource utilization, climate change impacts, and disaster occurrences. The wing's activities are driven by specific objectives that collectively support evidence-based environmental governance. These include conducting national-level surveys on climate change and natural disasters to monitor their socio-economic and environmental impacts; compiling and updating the *Bangladesh Environmental Statistics* regularly using primary and secondary data; and undertaking specialized surveys on environmental protection expenditure, resource management, waste management, and environmental research and development. ECDS also prioritizes integrating spatial and statistical data by developing geospatial-based environmental web applications, enabling the mapping of environmental indicators alongside demographic and socio-economic variables.

A particularly notable activity lies in the domain of solid waste management and environmental expenditure monitoring. The *Environmental Protection Expenditure, Resource and Waste Management (EPER&WM) Survey 2022* and the *Municipal Waste Management (MWM) Survey 2022* represent the first comprehensive national-level assessments of waste generation, handling, disposal, and recycling, as well as the associated financial contributions by industrial, municipal, and household entities. These surveys provide granular insights into waste composition, collection frequency, recycling rates, and budgetary allocations, serving as critical inputs for developing integrated waste management policies, identifying infrastructure gaps, and promoting sustainable waste management practices. According to the *Municipal Waste Management Survey 2022*, e-waste accounted for approximately 2.29% of the total solid waste generated across all municipalities during 2020-2021. Another Household-Based Environmental Survey (HBES) captures household-level behaviour and perceptions of waste disposal and environmental quality. Using HBES, ECDS published Waste Statistics of Bangladesh in 2022, reporting that the annual volume of e-waste generated is 0.17 million tons, significantly lower than the estimates from other studies.

3.3 Synthesis

Based on the legal and institutional mandates for e-waste covered in sections 3.1 and 3.2, the obligations of all stakeholders are outlined in Figure 3. These obligations are then assigned to each category of obligated entities, regulatory and supporting bodies.

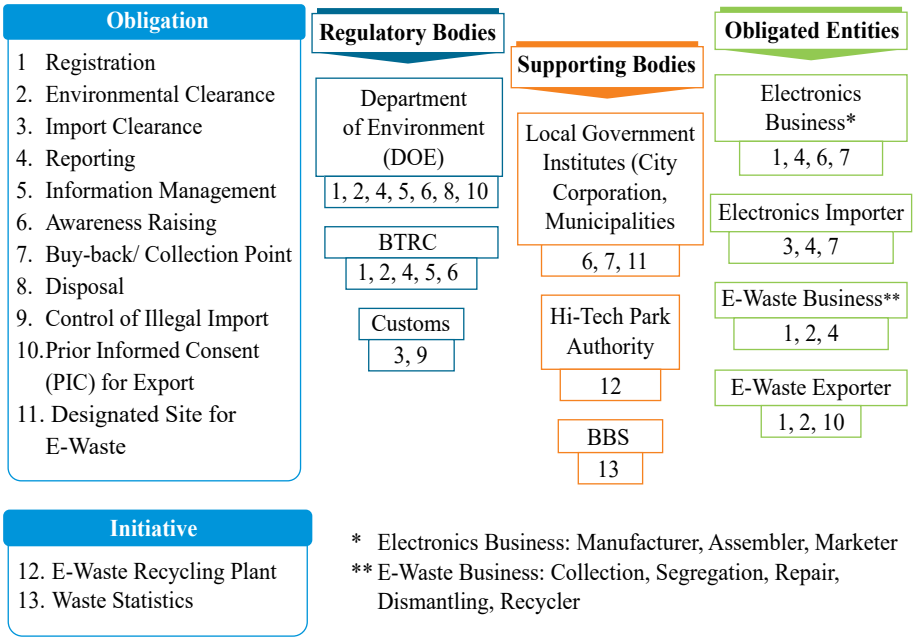


FIGURE 3: Regulatory and institutional landscape governing e-waste management in Bangladesh

CHAPTER 4

GOVERNANCE CHALLENGES

Governance Challenges

This section summarises the research findings, where information obtained from document analysis was triangulated with empirical and primary data and information gathered during interviews and surveys.

4.1 Data Gaps Challenge Transparency and Accountability

Accurate data on the quantities and movement of e-waste is crucial for establishing and implementing sustainable management systems and supporting relevant policies and laws. However, Bangladesh lacks official statistics, sales data, or other relevant information needed to calculate the mass and material flows of e-waste and its fractions after processing. As a result, the volumes and the remaining valuable materials or hazardous components left after informal e-waste dismantling are largely unknown.[21] The e-waste rules were recently enacted, and so far, there is no integrated system capable of monitoring and assessing e-waste accurately. Current methods for estimating e-waste are based on previous or comparable statistics. The latest data on e-waste generation from ECDS comes from a household survey and does not include averages of the weights and lifespans of electronic and electrical equipment.

Although the E-waste Management Rules (2021) require data submission from EEE producers and recyclers, only the recyclers currently submit information through annual and sometimes quarterly reports.[22] DoE also collects e-waste volume data during the PIC approval process for export. These fragmented records are kept separately because no central authority maintains a comprehensive database or inventory of e-waste generated in Bangladesh. To better understand e-waste tonnages and compositions, it is important to measure all collected e-waste and conduct regular analysis of its makeup. In theory, even if DoE can ensure all formal and informal sector

[21] Ankhi, I. J., Hossain, G. A., Faisal, A. K. M., Hasan, Md. R.-U., Barua, S., & Masud, M. H. (2025). Material flow analysis and risk evaluation of informal and formal E-waste recycling processes in Bangladesh: Towards sustainable management strategies. *Journal of Cleaner Production*, *497*, 145090. DOI: 10.1016/j.jclepro.2025.145090

[22] Interview Transcript: IDI_REC_2

operators report their annual processed volumes, it would only reflect the e-waste that has been managed, not forecasted e-waste generation when EEE in use reach their end of life. This gap exists because EEE producers are not currently registered,[23] so DoE remains unaware of the total amount of EEE produced annually in the country. Figure 4 illustrates the narrow scope of the current data collection, which is insufficient to provide a comprehensive understanding of e-waste generation in Bangladesh.

Complicating matters further, no data are available on the sale or current use of medical equipment (X-ray machines, imaging equipment, etc.) in Bangladesh. There was insufficient data available to allow the production of e-waste to be calculated from the number of hospitals, patients or the population as a whole. In addition, the current e-waste generation assessment does not include EEE or e-waste from ship-breaking activities in Bangladesh. This is due to the lack of data integration, and the waste from ship-breaking activities is regulated under other regulations. EEE obtained from shipbreaking activities includes products across all e-waste categories, such as TVs, air-conditioning units, cables, etc., which are second-hand and in demand in Chattogram.

While fragmentation and lack of coordination can be blamed for government agencies' failure to gather and disclose data, the failure of EEE manufacturers to report their production volumes for e-waste management indicates a lack of business integrity in adhering to national regulations. As many of these EEE manufacturers expand with various government support for the industry, it may be possible to estimate e-waste from EEE manufacturing once plant operations and capacities are clarified. Progress toward the current e-waste management targets mentioned in Schedule 2 of the E-waste Management Rules cannot be effectively monitored without establishing a national inventory.

[23] Interview Transcript: KII_GOV_9

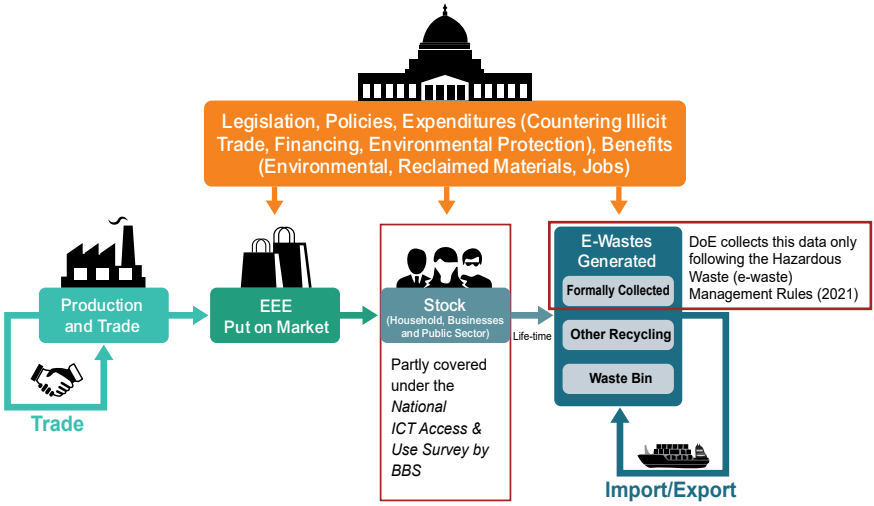


FIGURE 4: Comparing Bangladeshi practice with measurement framework for e-waste statistics *(Adapted from Forti V., Baldé C.P., Kuehr R. (2018)).*[24]

4.2 Gaps in Regulatory Mandates

Multiple respondents have highlighted the gaps in the existing regulations for e-waste. Specifically, the experts on our interview panel criticized the lack of guidelines to help informal operators comply with the rules.[25] The targets for e-waste collection were also poorly thought out in the absence of EPR guidelines.[26] The targets introduced in the E-waste rules are a policy diffusion from India's *E-waste (Management and Handling) Rules (2011)*, which adopted the EPR. However, in the Indian context, producers generally manage e-waste through third parties called Producer Responsibility Organizations (PROs), who act as authorised entities responsible for e-waste collection and ensure its environmentally friendly treatment and disposal. India's E-waste Rules were amended in 2023, setting e-waste collection targets for producers.[27] However, in the case of Bangladesh, only targets are adopted without a supplemental EPR guideline. Although the mandate has been given to EEE producers to collect e-waste, EPR is not explicitly mentioned in the E-waste Management Rules (2021), creating a legal definitional ambiguity.

[24] Forti V., Baldé C.P., Kuehr R. (2018). *E-waste Statistics: Guidelines on Classifications, Reporting and Indicators, second edition*. United Nations University, ViE – SCYCLE, Bonn, Germany.

[25] Interview transcript: KII_EXP_3

[26] Interview transcript: KII_EXP_5

[27] Gaur, T. S., Yadav, V., Mittal, S., Singh, S., and Khan, M.A. (2025). E-Waste Management Challenges in India from the Perspective of Producer Responsibility Organizations. *IEEE Access*, *13*. DOI: 10.1109/ACCESS.2025.3553203.

The Hazardous Waste (e-waste) Management Rules (2021) only mention occupational health and safety in Rule 8.10, which requires dismantlers to ensure workers' awareness of these matters. There is no explicit consideration of health and safety measures to protect workers and the environment from the risks associated with handling e-waste containing hazardous materials. The categories of e-waste in Schedule 1 are also not comprehensive.[28] The e-waste categories not covered in the existing rules include electrical and electronic tools (blowers, drill machines, etc.), toys, drones, leisure, and sports equipment. The management of solar photovoltaic (PV) modules and panels is also not covered, despite Bangladesh having a high penetration rate of solar home systems (SHS), which are reaching end-of-life or becoming inactive due to enhanced grid access.

Other shortcomings of the existing rules include vague provisions on incentives and penalties for individual e-waste generators. As mentioned in section 3.1.1, Rule 7 makes the individual consumer and bulk e-waste generator responsible for delivering the e-waste to a specific trader or collection center or auctioning it to a particular dismantler, recycler, or repairer. It is unclear how this rule will be enforced. Moreover, the auctioning process for bulk e-waste generators needs further enhancement, stipulating that only DoE-registered companies can participate in auctions. This lack of update of government procurement and asset disposal rules has resulted in e-waste being auctioned to unregistered companies and informal operators who only need a trade license to participate. Not requiring e-waste auction participants to be registered under the E-waste Management Rules (2021) creates a disadvantage for registered recyclers. Formal firms cannot compete with informal operators in collection/preprocessing due to higher operating costs when abiding by environmental and labour laws.

Although the Environmental Conservation Rules (2023) apply to all industrial operations, only e-waste recycling is identified for obtaining environmental clearance certificates. Among other groups identified in the E-waste Management Rules (e.g., dismantlers, storage, repairers, etc.), it is unclear which groups are required to obtain registration and which require a clearance certificate. There is a need for clarity on what activities environmental clearance allows successful applicants to perform. Another significant gap in the E-waste Management Rules is the conditions that any party must fulfill to export e-waste or e-waste components. The process of PIC approval could have been institutionalized through this national regulation.

The shipbreaking industry is not only a significant source of e-waste in the country, but the spare working electronics recovered during ship dismantling

[28] Interview transcript: KII_EXP_3

are also marketed in Bangladesh. Although the import of old electronics is prohibited, the sale/use of old electronics from the shipbreaking industry is not mentioned in the E-Waste Rules (2021) and the Import Policy Order. As for the e-waste recovered from ship-breaking yards, neither the Bangladesh Ship Recycling Rules (2020) nor the Hazardous Waste (e-waste) Management Rules (2021) cover it.

All electrical items of a dismantled ship are marketed in Chattogram.

A worker is separating the plastic cover of recovered wires from dismantled ships.

TABLE 4: Summary of the compliance gaps and challenges of the relevant regulations and policies for e-waste management in Bangladesh.

Hazardous Waste (e-waste) Management Rules (2021)				
Reference	**Obligated Party**	**Mandate/ Responsibility**	**Regulatory Gap**	**Implementation Gap & Challenges**
Rule # 3	EEE manufacturers, importers, distributors, etc.	• Collect e-waste from customers and supply it to dismantlers or recyclers. • Establish private or collective collection centers for e-waste and provide private or collective financing to meet the costs of environmentally sound management. • Provide the name, address, telephone number, and email address of the registered e-waste collection center on the product/packaging to the consumer to facilitate proper management. • Creating awareness by publishing information on hazardous materials and the risks of not recycling.		• No e-waste collection centers have been established so far. • To date, no private or collective funding mechanisms have been established. • Information on e-waste was not found on the product/packaging for the products covered in our observational study. • Awareness activities regarding hazardous materials and the risks of non-recyclability were not organized.
Schedule # 2		• Collecting e-waste for recycling or disposal, with a collection target of 10% in the first year and increasing to 50% by the fifth year from the start date of the rules' implementation.		• There is neither a roadmap for achieving these goals nor a record of progress that has been made against these goals.

Hazardous Waste (e-waste) Management Rules (2021)				
Reference	**Obligated Party**	**Mandate/ Responsibility**	**Regulatory Gap**	**Implementation Gap & Challenges**
Rule # 7	Individual consumers and bulk waste generators	• Drop off e-waste at a designated storage facility or collection center. • Organize auctions to dispose of e-waste to collection centers, repairers, dismantlers, recyclers, or repair facilities.		• No measures have been taken to inform consumers about this. • Due to the lack of guidelines for e-waste disposal, bulk waste generators could not be held accountable.
Rule # 23	Local Government Institutions (LGIs)	• City corporations and municipalities will identify e-waste collection points at household waste disposal sites. • Create awareness on disposing of e-waste at collection points • DoE and LGIs will supervise e-waste management	• It is not stated what will happen to e-waste after dropping it at the collection points. • It is not specified which e-waste will fall under Rule 23 and which will be collected by the producers under Rule 7. • There is no guidance on how these activities will be coordinated.	• No e-waste collection points at household waste disposal sites have been identified. • No initiatives have been taken to create monitoring systems and public awareness.

Hazardous Waste (e-waste) Management Rules (2021)				
Reference	**Obligated Party**	**Mandate/ Responsibility**	**Regulatory Gap**	**Implementation Gap & Challenges**
Rule # 10, 12 & 16	EEE producers, importers, and E-waste businesses	• EEE manufacturers, large importers, and E-waste collectors, traders, stockpilers, dismantlers, recyclers, and exporters will have to get registered. • Annual reporting is mandatory using forms 6 and 7. • The registrant will have to get an environmental clearance certificate under the Environment Conservation Rules (1997).		• To date, only seven recyclers have registered with the DoE. • No EEE manufacturer, importer, distributor, or retailer has registered with the DoE under this e-waste regulation. • Registered companies do not maintain e-waste information as per Form 6, and the DoE does not ensure the collection and compliance of annual reports as per Form 7.
Rule # 10	DoE	• A designated officer will monitor whether environmentally sound management of e-waste is being followed. • The officer will maintain and publish the list of registrants and related information.	One officer can't monitor the environmentally sound management of e-waste.	• There is no designated officer in the department for data management under these rules. • The list of registrants is not open to the public.

Environmental Conservation Rules (2023) amendment				
Reference	**Obligated Party**	**Mandate/Responsibility**	**Regulatory Gap**	**Implementation Gap & Challenges**
Schedule # 1	Commercial E-waste recyclers	The commercial e-waste recycling industry has been re-classified to 'orange' category, which was previously classified as 'red' (Environmental Conservation Rules, 1997).	Only recyclers are classified under these rules. Other e-waste business categories are absent.	It is unclear who is required to obtain environmental clearance in e-waste management and who is not.
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1992)				
Reference	**Obligated Party**	**Mandate/Responsibility**	**Regulatory Gap**	**Implementation Gap & Challenges**
Article 6	Ratifying countries	Prior Informed Consent (PIC) is required for the import or export of hazardous waste.	No penalties are specified for exports and imports carried out without a PIC.	

Telecom e-waste management and recycling guidelines (2022)				
Reference	**Obligated Party**	**Mandate/Responsibility**	**Regulatory Gap**	**Implementation Gap & Challenges**
Guidance # 5	Telecom operators, importers, manufacturers, and e-waste businesses	• Obligated entities shall obtain approval from BTRC for e-waste management and recycling as per the form in Attachment-1 and shall submit an annual report of activities. • They shall obtain permission from BTRC for the management of old, used, and unrepairable equipment/e-waste lots as per the form in Attachment-2.		• The obligation to obtain registration and submit annual reports to both BTRC and the DoE results in repetition of the same work. • According to the BTRC guidelines, a separate clearance certificate has to be obtained from the DoE for each telecom e-waste lot subjected to destruction/dismantling. This is an additional burden for both the e-waste businesses and the DoE.
Import Policy Order 2021-2024				
Reference	**Obligated Party**	**Mandate/Responsibility**	**Regulatory Gap**	**Implementation Gap & Challenges**
Appendix 1	All importers	• According to the list of prohibited goods, reconditioned office equipment, old computers, and electronic goods are not eligible for import. • Unless otherwise provided in this order, the import of all types of waste materials is prohibited.		Despite the ban on importing refurbished electronic equipment and e-waste under the Import Policy Order and the E-Waste Management Rules, such imports cannot be stopped because there is no system to identify these import shipments.

4.3 Informality

As seen in many developing countries, including Bangladesh, the collection and processing of electronic waste are managed mainly by the informal sector, which serves as a vital source of income for many individuals.[29] Informal e-waste collection is mainly conducted through door-to-door services, often involving the simultaneous collection of other discarded household items, such as paper and plastics. Informal recyclers offer financial compensation to citizens for e-waste collected, providing a convenient and profitable service for households. The informal e-waste management sector is mainly composed of self-employed workers and small-scale businesses belonging to economically and socially disadvantaged groups. Informal recycling is the most significant governance challenge of e-waste management, as it involves crude techniques that expose the workers and the environment to toxic pollutants emitted during the separation of reusable components and the recovery of valuable metals. Informal recycling is often difficult to trace because it is conducted in precarious, environmentally hazardous settings.

The first layer of informal e-waste management stakeholders consists of collectors who sort household discarded e-waste (e.g., paper, metal objects, electronics) from mixed waste collection points, waste transfer points, and landfills. After cleaning and sorting, they sell the e-waste to *Bhangaris*, a local recycling shop that performs partial dismantling and recycling. They sell their products to aggregators or commodity traders, who resell e-waste components in domestic and foreign markets. *Bhangaris* have the most stable business in this informal chain, with some running their businesses for more than 15 years through small shops ranging from 40 to 200 square feet; most of these shops are rented or owned.[30] Multiple studies have identified Dhaka and Chattogram as having the largest number of informal *Bhangari* shops, as these two cities are considered e-waste hubs that generate more e-waste than other cities in Bangladesh.[31] *Bhangari* shops collect 40 to 2,000 kg of e-waste on average monthly. Dismantled materials are typically sold to commodity traders or exporters who ship them to China, generating monthly sales of

[29] Islam, Md. K., Khatun, Mst. S., & Mourshed, M. (2024). An in-depth analysis and review of management strategies for E-waste in the south Asian region: A way forward towards waste to energy conversion and sustainability. *Heliyon*, *10*(7), e28707. https://doi.org/10.1016/j.heliyon.2024.e28707

[30] Akter, N., & Hossain, M. I. (2025). Structure, actors, and interdependencies between informal and formal e-waste management supply chain in Bangladesh. *Journal of Cleaner Production*, *522*, 146146. https://doi.org/10.1016/j.jclepro.2025.146146

[31] Khan, A. R., Saadat, A. H. M., & Motalib, M. A. (2019). Status of Electronic Waste Generation in Bangladesh: A Review. *International Journal of Innovative Science and Research Technology, 4*(8).

approximately 1.12–1.63 million BDT.[32] However, these figures are likely underestimates, as shop owners tend to underreport the actual data. It is also unclear how aggregators are exporting this e-waste.

This research study conducted a qualitative survey to understand the reach of the E-waste regulations on *Bhangari* shops four years into implementation. The survey took place in the identified hotspots of Dhaka – Nimtoli, Elephant Road, Mohammadpur, and Tongi, while the hotspots in Chattogram covered Ice Factory Road, Coxy Market, etc. This survey's specific purpose was to identify *Bhangari* shops in the categories mentioned in the E-waste Management Rules (2023), as these informal operators often perform multiple roles. The survey found that the majority of informal e-waste businesses are involved in e-waste collection, followed by segregation, and only a few are directly involved in dismantling and recycling. It was previously assumed that enterprises and employees engaged in informal e-waste management are not registered and lack trade documentation. However, the qualitative survey of 84 informal enterprises in this research found that although none have registered under the E-waste Management Rules (2021), the informal actors have other registrations, such as trade licenses (Table 5). This suggests that e-waste businesses may be outside the DoE's enforcement purview, but they are not truly informal, as they engage in some form of government registration.

TABLE 5: Registration status of informal e-waste businesses

Common Combinations	Number of Registrations	Count	Percentage
Trade License only	1	47	56.0%
Trade License + Tax ID (TIN)	2	27	32.1%
Trade License + TIN + Business ID (BIN)	3	2	2.4%
No certificates	0	8	9.5%

The survey also found the mean age of e-waste businesses is 15.2 years. Although it is not new information that informal e-waste businesses existed before the regulations took effect in 2021, their existence is not reflected in the rules, which do not provide an integration pathway. Despite the decade-long deliberations for drafting e-waste management rules, the informal sector's participation was minimal. Significant barriers thwarting informal economy participation include prejudicial attitudes towards e-waste workers, the non-

[32] 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), e41453. https://doi.org/10.1016/j.heliyon.2024.e41453

existent voice of informal actors in policymaking, and insufficient spending to achieve a formal management transition.

4.4 Accountability Challenges – Lack of Enforcement

Like most environmental regulations in Bangladesh, enforcement of the e-waste management rules is low. To date, only seven recyclers have obtained registration under the Hazardous Waste (E-waste) Management Rules. However, hundreds of e-waste businesses in the informal sector primarily collect e-waste, as described in section 4.3. Direct non-compliance with rules 6, 8 & 13 of the e-waste management rules is evident among these informal businesses. For example, under Rule 6, e-waste collectors must adopt environmentally friendly methods and transport e-waste safely, but most informal collectors don't adhere to it. According to rule 8, a dismantler must register and obtain a clearance certificate to properly conduct e-waste shredding, segregation, and disposal activities without adversely affecting the stockpile, environment, or public health. However, unregistered e-waste dismantlers do not comply with these requirements, putting workers' health at risk and harming the environment. Informal e-waste storage businesses also do not comply with the legal obligation to have adequate fire-extinguishing systems and take precautionary measures to ensure that e-waste does not mix with soil, water, or air.

An informal dismantler separating fuses using a hammer without personal protective equipment.

E-waste is stored outdoors, with no fire-extinguishing systems in sight.

No EEE producers have registered under the e-waste management rules. It is also stated in the rules that the name of the company, address, and contact information of the trader or seller, as well as the information on the registered collection centers, shall be displayed on the product or on the product label, or this information shall be provided to consumers or large consumers. However, in our observational study, this was missing for most of the everyday household appliances used in Bangladesh. A lack of awareness and outreach from DoE about this regulation was found in our interviews with several EEE manufacturers.

Despite the mandate to take back e-waste from consumers, high transportation costs are among the identified barriers affecting EEE sellers' collection activities and the expansion of such operations nationwide. Specifically, this is challenging for large appliances that require an established reverse logistics system for efficient and safe transportation. Small household appliances (e.g., irons, electric heaters, rice cookers), IT and telecom equipment (e.g., handsets, routers), and consumer electronics (e.g., music players, ceiling fans, remotes) offer low economic value to households and are thus sold to *Bhangaris*. In contrast, large household appliances (e.g., washing machines, refrigerators, air conditioners) and consumer electronics (e.g., TV, flatscreen, computer, laptop, mobile phone) are primarily traded in the secondhand market and with the company from whom new products of these kinds are bought (i.e.,

in exchange of the old product they get a price concession) due to the greater perceived and actual economic value realized by the households.[33] Our observational study also confirmed this pattern: buy-back activities are more prevalent for large household appliances (Figure 5a). On the other hand, our online survey found that 73% of consumers did not encounter a product buy-back offer at the time of a new purchase (Figure 5b).

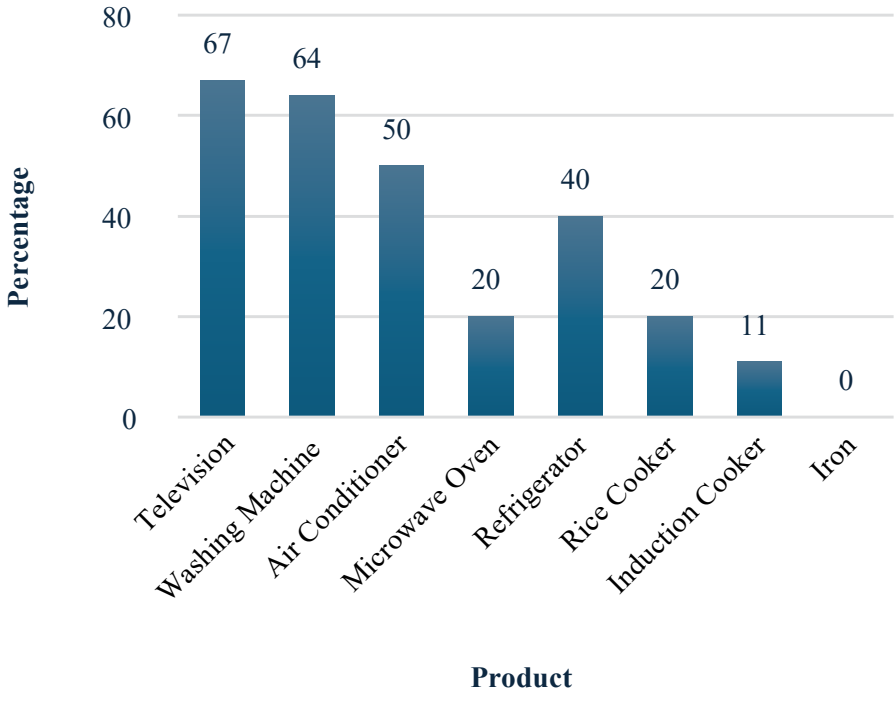


Figure 5a: Buy-back offers for eight commonly used household items

[33] Akter, N., & Hossain, M. I. (2023, December 17). The integration of formal and informal channels to manage e-waste. *The Business Standard*. https://www.tbsnews.net/thoughts/integration-formal-and-informal-channels-manage-e-waste-758914

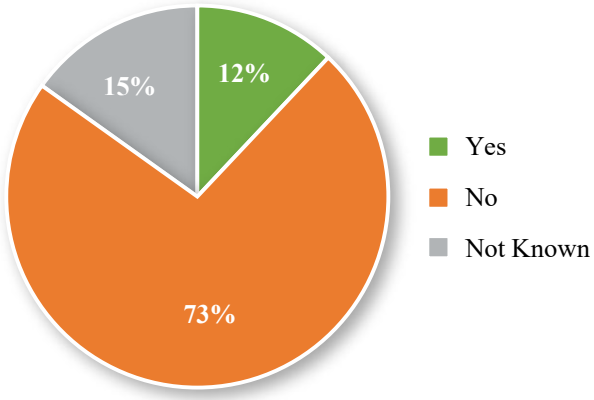


Figure 5b: Results of the online survey about respondents' exposure to product buy-back offers

Registration is the responsibility of the 'Chemical and Waste Management' wing at DoE, whereas the enforcement wing enforces the E-waste management rules at DoE. Registering EEE producers is not a priority, especially given the competing interests of other environmental regulations that demand more attention.[34] The DoE lacks a comprehensive information system to manage monitoring and enforcement data effectively and to handle environmental complaints from citizens. Although DoE publishes annual reports of its activities, there are no systematic publications of environmental quality data in a user-friendly format, nor detailed information on its enforcement activities, such as industry names, violations, and fines imposed during inspections.[35]

4.5 Institutional Coordination

Despite the involvement of multiple government agencies regulating e-waste in Bangladesh, coordination is lacking, complicating compliance with regulations and increasing costs for recyclers. This is clearly evident to registered formal recyclers, who treat telecom e-waste as a predictable waste stream. However, the registration and reporting requirements under the DoE and BTRC create duplication of compliance tasks and increase their administration costs. Moreover, due to the security implications of telecom e-waste containing signal equipment, there are requirements for the presence of additional law enforcement agencies during the destruction process of

[34] Interview transcript: KII_GOV_9

[35] World Bank (2023). *Building Back a Greener Bangladesh: Country Environmental Analysis*. Washington DC, The World Bank Group.

e-waste lots. Due to the lengthy nature of meetings at both organizations and the difficulty of coordinating the relevant agencies' schedules, formal registered recyclers must wait a long time to dismantle e-waste lots. They have to incur storage costs while waiting for the joint No Objection Certificate (NOC), which affects their turnover.[36] The number of meetings held to issue NOCs has increased in recent years, as shown in Figure 6a, but it still takes an average of 1.5 months to hold these meetings (Figure 6b). Increasing the frequency of such meetings or simplifying this NOC process will positively affect e-waste recycling businesses.

There are seven organisations registered with the DoE for e-waste management. The number is 14 in BTRC, of which 7 organizations are registered with both organizations, while the remaining 7 operate without being registered with the DoE. This is a glaring example of a lack of inter-agency coordination, as the two regulators do not share information on how many e-waste businesses are registered under their jurisdictions. There is no integrated e-waste management action plan between the DoE and the local government institutions, such as the city corporations and municipalities. Unlike the Solid Waste Management Rules (2021), there are no provisions for a national coordination committee under the Hazardous Waste (e-waste) Management Rules (2021). Such an arrangement is deemed necessary to design locally appropriate action plans and to determine progress against them[37].

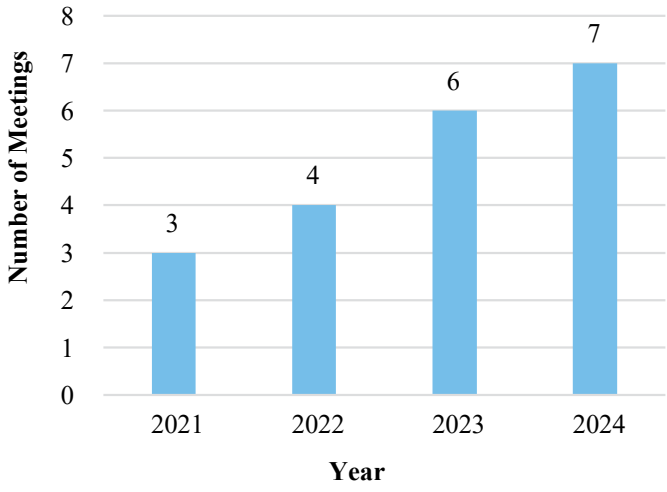


FIGURE 6a: Number of meetings for issuing NOC

[36] Interview transcript: IDI_REC_3
[37] Interview transcript: KII_GOV_8

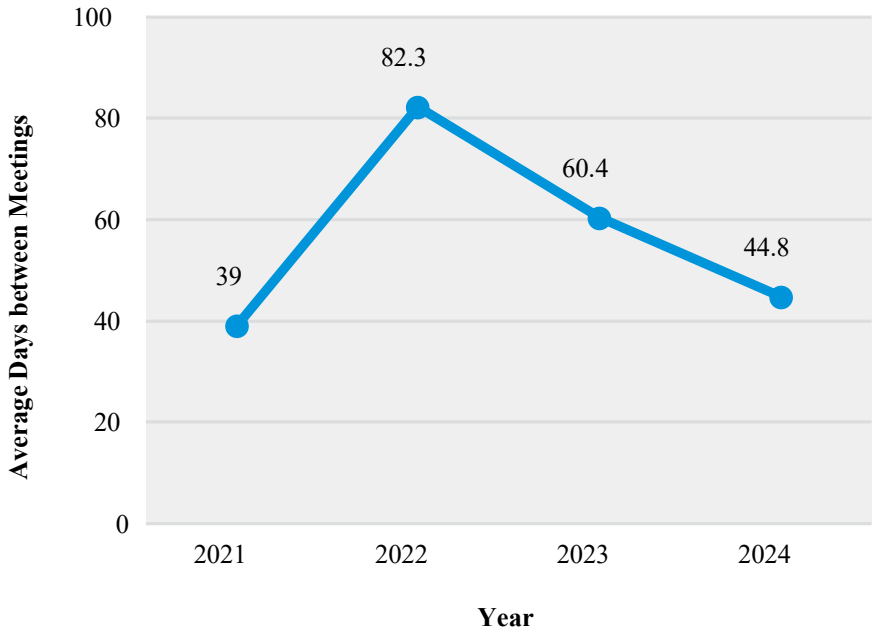


FIGURE 6b: Average gaps between the meetings

Based on information received from the DoE, delays in arranging meetings to approve the PIC for e-waste export were also observed (Figure 7 and b). Since the DoE issues the PIC certificate directly to the exporter,[38] customs authorities cannot verify its authenticity. Actors with an incentive to bypass the Basel Convention rules, which can be time-consuming and costly, may exploit monitoring gaps by falsely declaring the type of waste being shipped or indicating incorrect destination countries.[39] The largest e-waste exporter in Bangladesh took advantage of this lax monitoring, as detailed in the next section, discussing corruption risks and irregularities.

[38] Interview transcript: KII_GOV_9

[39] Isarin, N., Camargo, B. C., and le Roux, A. C. (2023). *Dirty deals: Case studies on corruption in waste management and trade*. Working Paper 49 / Environmental Corruption Deep Dive Series, Basel Institute on Governance. Available at: https://baselgovernance.org/publications/deepdive2-waste

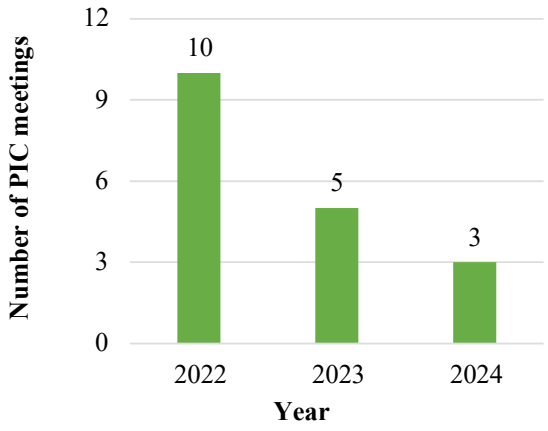


FIGURE 7a: Number of meetings for issuing PIC

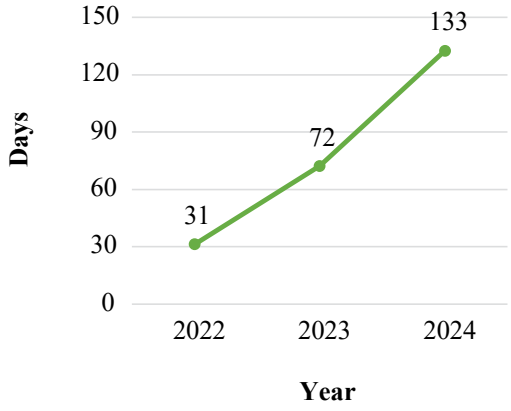


FIGURE 7b: Average gaps between the meetings

4.6 Corruption Risks & Irregularities

Identifying corruption risks involves mapping the points along the chain where public-sector actors interact with private-sector actors.[40] In the case of e-waste management in Bangladesh, this occurs on multiple fronts, as

[40] Isarin, N., Camargo, B. C., and le Roux, A. C. (2023). *Dirty deals: Case studies on corruption in waste management and trade*. Working Paper 49 / Environmental Corruption Deep Dive Series, Basel Institute on Governance. Available at: https://baselgovernance.org/publications/deepdive2-waste

illustrated in Figure 3. The key permitting authority is the DoE for registration and environmental monitoring, while the customs department checks import and export conditions related to e-waste. A few formal e-waste recyclers have reported cases of illegal financial transactions to obtain registration and environmental clearances.[41] On the other hand, informal e-waste businesses have also reported cases of illegal financial transactions to obtain licenses or to continue their business.

Apart from the national e-waste management rules, compliance with the Basel Convention is also low, as evidenced by ongoing illegal trade in hazardous wastes. Exportation is a predominant activity surrounding e-waste recycling in Bangladesh. Due to inadequate infrastructure for complete processing, most registered recycling facilities in Bangladesh focus on pre-processing e-waste through dismantling. Components that are among the most valuable (e.g., PCBs) tend to be recycled in facilities abroad (e.g., Japan, South Korea, Spain, and Singapore) that have the required technology to extract the precious metals. Comparing data from DoE's PIC clearance and customs department export records, it can be seen that the largest e-waste exporter has exported volumes exceeding the approved volume under PIC for the last three years (Figure 8). This irregularity results from a lack of oversight of e-waste exports and a coordination gap among regulators.

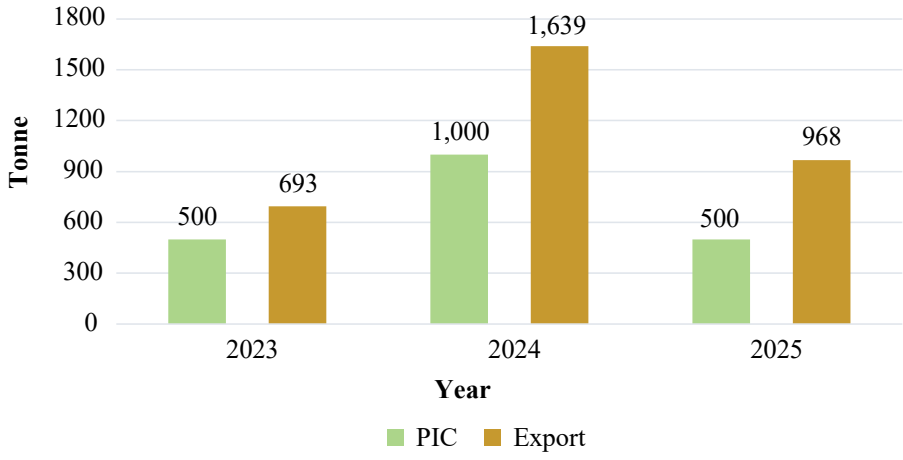


FIGURE 8: Comparison of PIC vs Export of the largest e-waste exporter from 2022 to 2025

[41] Interview Transcripts of IDI_REC_1 and IDI_REC_4

Although there are several reports of e-waste being imported into Bangladesh,[42] there is very little data on the amount imported. This was not a regulated, legal activity before the promulgation of Hazardous Waste (e-waste) Management Rules (2021), so it was not possible to obtain information on the amounts and types of e-waste imported and on what happens to it.[43] This may be a valuable source of income for some informal e-waste businesses in Bangladesh. Still, without full regulation and monitoring, it is not possible to quantify or determine the end use or disposal point of the e-waste. In addition to e-waste generated by the ship breaking activity itself, ship breaking yards may also be involved in illegally importing e-waste in containers on ships brought to Bangladesh for dismantling.[44]

Through interviews with the customs department and subsequent queries submitted to them, data were obtained for the import of goods under HS chapter 8549, which is dedicated to e-waste. It was found that since the enactment of e-waste management regulations, $700,000 worth of e-waste materials have been imported in the last 3 years (2022-2024). The amount of e-waste imported illegally over the past three years was 14,985 tons (Figure 9), which is more than the amount of e-waste components exported (4,040 tons of PCBs and scrap). This makes Bangladesh a net importer of e-waste. However, this is likely an underestimation, as there may be cases of misdeclaration in which waste is imported under other HS codes.

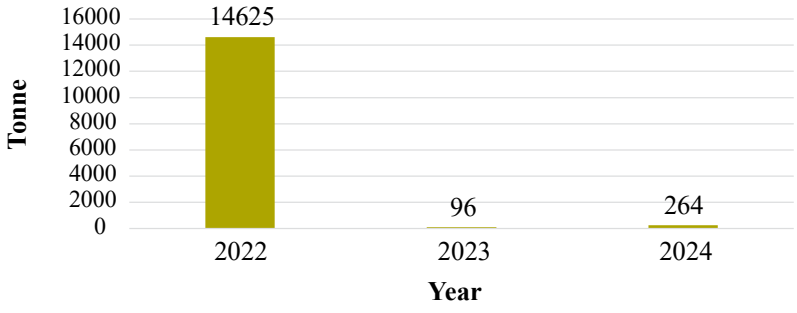


FIGURE 9: Annual trend of imported e-waste volume to Bangladesh

[42] Islam, Md. K., Khatun, Mst. S., & Mourshed, M. (2024). An in-depth analysis and review of management strategies for E-waste in the south Asian region: A way forward towards waste to energy conversion and sustainability. *Heliyon*, *10*(7), e28707. https://doi.org/10.1016/j.heliyon.2024.e28707

[43] Mott MacDonald (2018). *Final Report on Analysis of Current E-waste Management Scenario in Bangladesh Feasibility & Project Structuring Study for E-Waste Management Facility for Hi-Tech Park Authority.*

[44] Environment and Social Development Organization - ESDO (2011). *Report on Illegal import and trade off of e-waste in Bangladesh*.

The importers from the obtained data were grouped by the economic sectors to which they belong. Figure 10 shows that the apparel sector has the highest share of e-waste importers. Further analysis of the commercial descriptions of imports from the obtained dataset shows that many records are listed as 'spare parts for textile machinery'. Nevertheless, the continued import of e-waste despite being prohibited under the e-waste management rules and the import policy order is a significant irregularity. The discovery of spare parts being imported under HS codes for e-waste additionally shows a lack of clarity in regulations and a lack of inter-agency coordination.

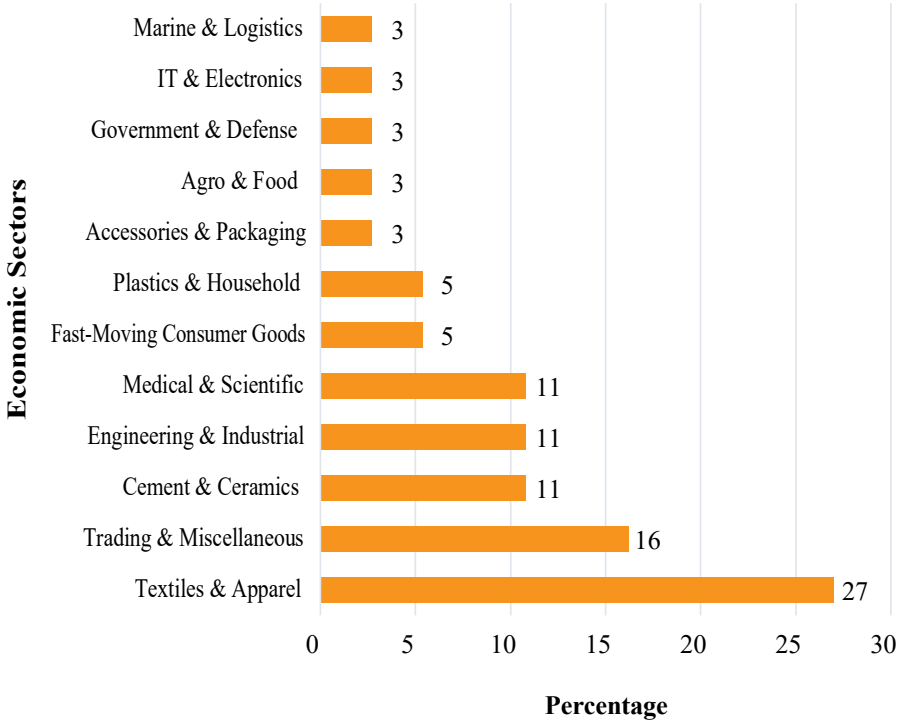


FIGURE 10: Classification of e-waste importers according to economic sectors

4.7 Low Awareness of E-Waste Regulations and Risks

Low awareness of e-waste among EEE users also contributes to governance challenges, as it creates a pathway for e-waste to end up in the informal sector, which cannot guarantee later traceability or environmentally sound disposal. Due to information gaps, most citizens in the country unintentionally mix

e-waste with their daily generated solid waste.[45] This e-waste, disposed of as household waste, often ends up in solid waste landfills or open dumpsites. Incorrect disposal is prevalent with small appliances, indicating that size influences the product's destination at end-of-life.[46] Although current regulations require producers of EEE to collect e-waste and conduct awareness campaigns, these rules are not being followed.

As part of this study, an online survey was conducted to assess the general public's knowledge and practices regarding e-waste management. 675 participants completed the survey, with 76% living in urban areas and over 60% being youths (more details about the survey respondents are provided in Appendix A). As shown in Figure 10, 88% of respondents did not receive instructions on how to dispose of their old electronic devices. Consequently, 72% of them left their last unused and unrepairable electronic products at home. Among those who sold it, it was sold to a *Bhangari*.

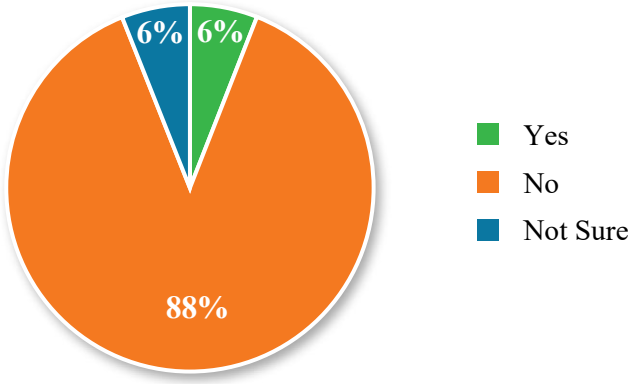


FIGURE 11: Instructions received by users about e-waste (N=675)

[45] Ankhi, I. J., Hossain, G. A., Faisal, A. K. M., Hasan, Md. R.-U., Barua, S., & Masud, M. H. (2025). Material flow analysis and risk evaluation of informal and formal E-waste recycling processes in Bangladesh: Towards sustainable management strategies. *Journal of Cleaner Production*, *497*, 145090. doi: 10.1016/j.jclepro.2025.145090

[46] Rodrigues, A. C., Boscov, M. E., & Günther, W. M. (2020). Domestic flow of e-waste in São Paulo, Brazil: Characterization to support public policies. *Waste Management*, *102*, 474-485.

The responsibility for raising public awareness also rests with the local government institutions (city corporations and municipalities) and the DoE. Rule 23 of the Hazardous Waste (e-waste) Management Rules (2021) states that city corporations and municipalities should designate separate e-waste collection points at household waste collection sites, and efforts should be made to educate the public about submitting e-waste to these points. However, four years after the rules took effect, no e-waste collection points have been established at household waste collection sites, and no initiatives have been undertaken to raise public awareness.

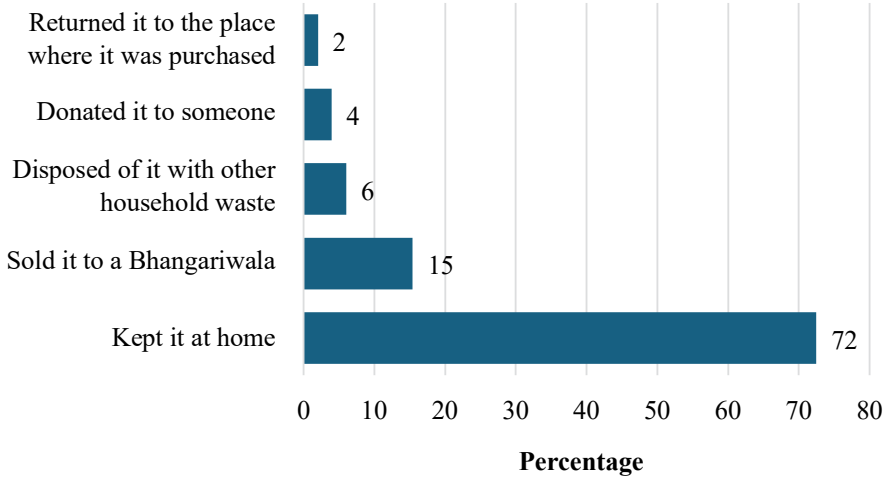


FIGURE 12: Prevalent e-waste practices among survey respondents (N=675)

CHAPTER 5

WOMEN AND CHILDREN IN E-WASTE MANAGEMENT

Women and Children in E-Waste Management

Compared to other waste streams, e-waste is a relatively recent phenomenon, with regulatory history dating back two decades in developed countries. As the informal sector manages the bulk of e-waste in developing countries, there is a risk that extracting metals using hazardous processes and chemicals will expose workers to improper handling, toxic fumes, and other harmful substances. Global studies indicate that chronic exposure to such practices might disproportionately impact women and children by affecting neonatal development, impacting hormonal levels and immune function. The World Health Organization (WHO) estimates that worldwide, around 2.9–12.9 million women and 18 million children may be working as informal waste labourers and thus exposed to e-waste hazards.[47]

Limited quantified data is available globally to provide insight into women's roles in e-waste management. Women may be part of the informal workforce purely through their relationship with owners or employees in the sector (e.g., wives, sisters, and mothers of e-waste collectors or aggregators may participate to support their male relatives), or they may be in this sector to seek employment. Women in the informal workforce may be more prominent in non-specialized, unpaid roles. In India, women are often found working at specific tasks, such as wire stripping or waste collection, which are at the bottom of the waste management system pyramid.[48] Anecdotal evidence suggests that some skill-related biases may deliberately exclude women from decision-making in e-waste management at all levels. As women are only partially visible in the formal sector at the management level, the skill-related bias may persist there as well.

Given the globally documented limited evidence on women's experiences in e-waste management, this study sheds light on the situation in Bangladesh from the perspectives of e-waste businesses in the formal and informal sectors.

---

47 WHO (2021). *Children and digital dumpsites: e-waste exposure and child health*. Geneva: World Health Organization.

48 UNEP-IETC (2022). *The role and experience of women in E-waste Management.* Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/41533/womem_waste.pdf?sequence=3&isAllowed=y

Female employees in the largest e-waste recycling plant in Bangladesh.

5.1 Gender Bias in Formal and Informal E-Waste Management

Gender bias in e-waste management influences individual behaviours and organizational practices, shaping how electronic waste is handled, who participates in decision-making, and the effectiveness of sustainability initiatives. The survey on informal *Bhangari* shops and interviews with formal recyclers highlight variation in women's participation by firm size and type. In some formal recyclers, women were found working on segregation tasks. Conversely, in the survey of 84 *Bhangari* shops, only four had women employees performing similar segregation tasks—none of the *Bhangari* shops in Chattogram employed women. When asked about reasons for not hiring women, various reasons were provided, which are thematically summarised in Table 6.

TABLE 6: Reasons given by informal e-waste businesses for not employing women

Reason	Dhaka (n=42)	Chattogram (n=38)	Total (n=80)
The perception that women are not physically capable of this work	15	21	36
Negative social attitudes toward women working outside the home	17	8	25
Safety concerns for women	8	7	15
Other	2	2	4

Increasing the visibility of women in the sector will help counter societal prejudices that discourage women from 'technical sectors' while providing role models to many.

5.2 Prevalence of Child Labour

Despite the growing importance of the e-waste sector due to rapid urbanization and technological advancement, regulatory mechanisms remain underdeveloped in protecting children from the health and safety risks associated with their potential involvement in e-waste handling. It is unclear how many children are involved in e-waste management in Bangladesh. However, since an alarming number of children already work in waste management,[49] their presence in informal e-waste collection, segregation, and dismantling is not surprising. There is also no record of employment in the informal sector, suggesting that child labour may be used and that there will be no employment benefits, such as sick leave, pensions, or healthcare. Children working near e-waste recycling sites are exposed to toxic air that can reduce lung function, damage the immune system, and affect growth parameters.[50]

A document analysis examined a range of key national and international policy and legal instruments related to child labour in Bangladesh. These include:

- The Bangladesh Labour Act 2006
- National Child Labour Elimination Policy 2010
- The Children's Act 2013

[49] Tasnim. T. (2025, August 6). Childhood buried in Trash. *The Daily Star.* Available at: https://www.thedailystar.net/news/bangladesh/news/childhood-buried-trash-3956391

[50] Directorate General of Medical Education (2025). *A Handbook on Children's Health and the Environment.* Published by DGME, Government of Bangladesh, with support from UNICEF.

- ILO Convention No. 182 on the Worst Forms of Child Labour
- National Profile on Occupational Safety and Health in Bangladesh 2019
- National Plan of Action to Eliminate Child Labour 2020–2025
- The Annual Report on the Worst Forms of Child Labour (2022)
- Centre for Policy Dialogue (CPD) and the Bangladesh Legal Aid and Services Trust (BLAST) recommendations for the Labour Reform Commission

As the Hazardous Waste (e-waste) Management Rules were adopted in June 2021, the strategies and roadmaps developed before 2021 make limited references to child labour in e-waste management. The *National Plan of Action to Eliminate Child Labour 2020–2025* listed 38 hazardous forms of child labour, as identified in a 2013 government order. However, e-waste management is notably absent from this list. A significant development occurred in 2022 when the government of Bangladesh revised its official list of hazardous work prohibited for children, adding five new sectors: dried fish production; informal steel-based work; brick and stone production, collection, and transportation; tailoring and informal garment manufacturing; and waste management. The inclusion of waste management represents a critical advancement, as it formally acknowledges this sector as hazardous and inappropriate for child labour. In the next five-year national plan of action, the list can include e-waste as a subsector, the related transportation subsector, and electric rickshaws. The latter has become essential for electric mobility, but it has also become a rising sector for child employment.[51] There is a significant gap in reliable data on the e-waste labour market and e-waste management, particularly regarding the health impacts of e-waste. Collecting reliable data on child labour in the e-waste sector can support the development of subsequent iterations of the national action plan to eliminate child labour and strategies to remediate the health impacts of children already exposed to this trade.

[51] Baby, R. (2025, October 6). Bangladesh not on track to eradicate child labour. *The Daily Ittefaq*.

CHAPTER 6

CLIMATE CHANGE AND E-WASTE IN BANGLADESH

Climate Change and E-Waste in Bangladesh

E-waste is a rapidly growing source of greenhouse gas emissions, mainly due to energy-intensive production, improper disposal, and low recycling rates. Transitioning to improved recycling and circular economy models can substantially reduce the climate impact of e-waste and support global climate goals. On the other hand, climate-induced natural disasters can generate significant quantities of e-waste.[52] Floods, in particular, pose serious challenges for e-waste management. When electronic devices are submerged, water infiltration often damages electrical components. It accelerates the release of hazardous substances such as lead, mercury, and cadmium, which can leach into surrounding soils and water bodies, creating long-term environmental and health risks.[53] Bangladesh's geographic location, with its low-lying terrain, extensive river networks, and monsoon climate, makes it highly susceptible to floods and storm surges. An estimate of the e-waste generated by such natural disasters is provided in this chapter, with the caveat that data gaps hinder accurate estimation with local granularity.

6.1 Contribution of E-Waste to Climate Change

Improper e-waste management is itself an increasingly significant contributor to GHG emissions. Inadequate recycling practices lead to greater reliance on the production of new electronic goods, which consume more energy and emit more greenhouse gases.[54] As practiced in many developing countries, open incineration of mixed waste is common in Bangladesh due to inadequate disposal infrastructure. As e-waste is part of mixed waste in Bangladesh, the release of harmful gases and toxic compounds takes place when waste is burned

[52] Santhiya, P., & Das, A. (2024). A multi-objective solid transportation model for e-waste recovery in the post-disaster phase under an uncertain environment. *Environment, Development and Sustainability*, 1-43. doi: 10.1007/s10668-024-05757-1.

[53] Osman, N. A., Abidin, S. N. Z., Ibrahim, F. I., & Kamarazaly, M. A. (2025, June). Analyzing Stakeholder Views on Sustainable E-Waste Management Post-Flood. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1516, No. 1, p. 012007). IOP Publishing. doi: 10.1088/1755-1315/1516/1/012007.

[54] Fawole, A. A., Orikpete, O. F., Ehiobu, N. N., & Ewim, D. R. E. (2023). Climate change implications of electronic waste: strategies for sustainable management. *Bulletin of the National Research Centre*, *47*(1), 147. doi: 10.1186/s42269-023-01124-8.

indiscriminately.[55] Furthermore, refrigerators and air conditioning units that have reached the end of life may contain refrigerants and insulating foams that release hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs), which are potent greenhouse gases if not properly managed during disposal.[56] Since refrigerators and air conditioners have a big resale market through informal repair shops in Bangladesh, the proper disposal of refrigerants and insulating foams cannot be ensured.

Air conditioner refurbishing markets openly store and dismantle them.

Refrigerator compressors are being stored and dismantled in unsafe ways.

[55] Moyen Massa, G., & Archodoulaki, V. M. (2023). Electrical and electronic waste management problems in Africa: Deficits and solution approach. *Environments*, *10*(3), 44. doi: 10.3390/environments10030044.

[56] Castro, P. J., Aráujo, J. M., Martinho, G., & Pereiro, A. B. (2021). Waste management strategies to mitigate the effects of fluorinated greenhouse gases on climate change. *Applied Sciences*, *11*(10), 4367. doi: 10.3390/app11104367.

6.2 E-Waste resulting from Climate Mitigation

Bangladesh faces a looming challenge with solar photovoltaic (PV) waste, which is expected to reach approximately 5.496 million tons between 2025 and 2060, including 874,134 tons of glass, 77,206 tons of plastic, 121,407 tons of aluminium, 39,487 tons of silicon, and 6,719 tons of copper.[57] Despite this significant volume, the country currently lacks any legal framework or dedicated policy for managing PV waste. The Hazardous Waste (e-waste) Management Rules (2021) do not classify solar panels as electronic waste, leaving them outside formal waste regulation and recovery mechanisms.

Another major source of e-waste from climate mitigation is electric vehicles. Between fiscal years 2022 and 2025, Bangladesh imported 16,724 electric vehicles. However, due to limited data on their size and composition, estimating the amount of e-waste they will generate was not possible. The number of EVs is expected to increase, driven by climate policies for the transportation sector. The draft *Electric Vehicle Industry Development Policy (2025)* only mentions battery disposal but does not address the management of other e-waste from electric vehicles. Nevertheless, section 6.1 of that policy states that by 2030, at least 30% of government vehicle purchases will be electric vehicles. Additionally, the 3rd Nationally Determined Contribution (NDC) has set an unconditional target to have 30% of all passenger vehicles electric by 2035.

6.3 Estimation of E-Waste Generation from the 2022 Flood

In 2022, heavy monsoon rains, compounded by upstream water flows from India's northeast, inundated vast areas of the Sylhet division, leaving millions stranded and creating a severe humanitarian crisis. This flood, described by experts as more severe than the catastrophic events of 1998 and 2004, caused extensive damage to housing and household assets. Consequently, a considerable amount of EEE became non-functional and entered the waste stream. Floods of this scale often submerge appliances such as refrigerators, televisions, fans, smartphones, radios, and air conditioners, leading to permanent damage from water ingress, short circuits, and corrosion. An estimated 7.2 million people were affected by the sudden flash floods and prolonged waterlogging across seven northeastern districts.[58] Based on the Household Income and Expenditure Survey (HIES), the average household

[57] Tasnim, S. S., Rahman, M. M., Hasan, M. M., Shammi, M., & Tareq, S. M. (2022). Current challenges and future perspectives of solar-PV cell waste in Bangladesh. *Heliyon*, *8*(2). doi: 10.1016/j.heliyon.2022.e08970.

[58] UNICEF Bangladesh Country Office (2022, June 22). *Humanitarian Situation Report No. 3: Northeastern Flood.* https://www.unicef.org/media/122901/file/Bangladesh-Floods-Humanitarian-SitRep-22-June-2022.pdf

size in Bangladesh in 2022 was 4.26 persons. This suggests that almost 1,704,380 households were affected by the flood.

The average flood depth during the event was approximately 70 cm, a level high enough to cause significant damage to most household appliances located on the ground floor. The depth-damage relationship from the Federal Emergency Management Agency's (FEMA) HAZUS model[59] was used to estimate the proportion of damaged EEE. According to this model, a water depth of around 0.7 m results in approximately 35% damage to household contents, with a likely range of 30-40%. This proportion was then applied to the estimated EEE stock to determine the weight of damaged items. To assess the stock of EEE in affected households, specific ownership rates for each appliance type were applied. A recent report indicates that 74.5% of households own at least one smartphone, 53.4% own a refrigerator, and 2.28% own an air conditioner.[60] Similarly, 62.2% of households have a television, while 14.9% own a radio[61]. The *Demographic and Health Survey* further reports that 96% of households own at least one electric fan.[62] These ownership proportions, combined with the estimated number of affected households, were used to determine the total number of each appliance type likely present in flood-impacted homes prior to the disaster. Finally, average unit weights for each appliance in Table 7 were used to calculate the total weight of flood-generated e-waste by multiplying the estimated number of damaged units in each category by their average weights and summing the results.

[59] Nastev, M., & Todorov, N. (2013). Hazus: A standardized methodology for flood risk assessment in Canada. *Canadian Water Resources Journal*, *38*(3), 223-231. doi: 10.1080/07011784.2013.801599.

[60] Parvez, S. and Chakma, J. (2024, March 25). More households use refrigerators, ACs as income grows. *The Daily Star.* Available at: https://www.thedailystar.net/business/economy/news/more-households-use-refrigerators-acs-income-grows-3574161

[61] Bangladesh Sangbad Sangstha. (2023, July 17). *Proportion of households in the country with mobile phones is 97.9%: BBS.* https://www.bssnews.net/news-flash/136879

[62] National Institute of Population Research and Training (NIPORT) and ICF (2023). *Bangladesh Demographic and Health Survey 2022: Key Indicators Report*. Dhaka, Bangladesh, and Rockville, Maryland, USA: NIPORT and ICF.

TABLE 7: Average unit weights for each type of appliance[63]

EEE	Weight (kg)
Smartphone	0.1
Refrigerator	30
Air Conditioner	55
Television	24
Radio	2
Fan	7

Based on these calculations, the 2022 floods are estimated to have generated approximately 24,013 tons of e-waste. While this calculation provides an approximation rather than an exact measurement, it is grounded in widely accepted post-disaster damage assessment methods. It offers a realistic indication of the magnitude of e-waste generation during large-scale floods. This estimation highlights the critical intersection between climate-induced disasters and e-waste management challenges in Bangladesh. Floodwaters not only damage valuable household assets but also mobilize toxic components such as lead, mercury, and cadmium into the environment, especially when e-waste is improperly handled in the aftermath.

6.4 Challenges of Estimating E-Waste Generation from Natural Disasters

While the flood-based e-waste estimation for Bangladesh provides an informed approximation, several limitations underscore the need for caution and further refinement. By applying a uniform national average household size of 4.26, significant regional variation is being overlooked. Northeastern districts, where flood damage was concentrated, may differ substantially in household composition, and division-level size data would yield more accurate counts of affected households. The appliance ownership rates likely differ between urban and rural areas (with urban households owning more devices). Still, the estimates do not include emerging e-waste streams such as e-cigarettes or solar panels, which may contribute increasingly to total waste volumes. Moreover, the use of FEMA's HAZUS damage-depth relationship poses model-extrapolation risks; localized calibration is needed to adapt its

[63] Widyarsana, I. M. W., & Nurdiani, D. A. (2024). Identification of electronic waste (e-waste) generation from the household and non-household sectors in Indonesia and its sustainable management system. In *E3S Web of Conferences* (Vol. 485, p. 05006). EDP Sciences. doi: 10.21203/rs.3.rs-391423/v1.

damage curves. International experience shows that while FEMA's HAZUS loss estimation model provides a structured framework for flood damage assessment, it requires significant localization before being applied outside North America. Canada, for instance, formally adopted HAZUS by replacing U.S. default exposure data with Canadian building inventories and calibrating damage functions. At the same time, case studies in Peru and Japan have demonstrated how local building typologies and post-disaster survey data can be mapped to HAZUS categories and used to validate depth–damage relationships against observed flood or tsunami impacts. To achieve similar applicability in Bangladesh, the model would need to be tailored with building typology classifications linked to HAZUS taxonomies, and locally derived depth–damage curves for household assets. Lastly, while Bangladesh has legal frameworks for both disaster management and e-waste, it lacks a disaster waste management protocol with specific provisions for e-waste, resulting in the absence of a dedicated system to handle this hazardous waste stream in the aftermath of a disaster.

CHAPTER 7

OBSERVATIONS AND RECOMMENDATIONS

Observations and Recommendations

7.1 Overall Observations

Understanding how e-waste is currently managed is a crucial starting point for Bangladesh to improve its e-waste management system. The main challenges in Bangladesh's e-waste management include ineffective enforcement of laws, poor stakeholder participation, and a lack of additional guidelines and action plans. The absence of centralized systems to aggregate data is one of the most significant structural barriers to e-waste management. The limited availability of e-waste statistics makes it hard to evaluate the effectiveness of existing legislation. Although the Hazardous Waste (e-waste) Management Rules (2021) provide a broad legal framework, specific guidelines and implementation plans are needed to help stakeholders comply with the rules. Improving e-waste management requires amending guidelines on public procurement and disposal. This will help reduce the buildup of e-waste in public and commercial institutions, including sensitive devices like Electronic Voting Machines (EVMs) and Automated Teller Machines (ATMs). The current rules require other government agencies to fulfill specific responsibilities and set unrealistic goals for regulated entities. As a result, the existing regulations do not reflect the actual situation on the ground.

There is no government-led e-waste infrastructure in place, making it difficult for households to dispose of unused electronic devices safely. This gap has not only led to the illegal dumping of e-waste, harming the environment, but also opened opportunities for the informal sector to step in. The large volume of discarded electronics and the lack of a formal disposal system have resulted in the emergence of remanufacturers, recyclers, and various collection options, such as collection points and door-to-door services.[64] These informal businesses now handle most of the e-waste generated in the country. Efforts to enforce regulations and shut down polluting recycling facilities create conflicts between people's livelihoods and the law. However, like the rest of the world, Bangladesh's e-waste problem is set to soar if recycling infrastructure and

[64] Derks, M., Bidmon, C., & Ciulli, F. (2024). Circular e-waste ecosystems in necessity-driven contexts: The impact of formal institutional voids. *Business Strategy and the Environment, 33*(4), 3733–3747. doi: 10.1002/bse.3652

policies are not rapidly implemented. This will be driven mainly by the rise in clean technologies such as solar panels and electric vehicles, which are currently not covered by existing e-waste regulations.

The World Bank-funded BEST project can support efforts to update existing regulations and introduce supplementary guidelines, alongside investments in infrastructure to establish an advanced e-waste recycling facility. Other development partners and the government itself must also prioritize learning and capacity building for all government agencies responsible for e-waste management. Choices made for the sector should be based on two key elements – data from the ground and input from stakeholders. Building an e-waste system is not a one-time effort. Governments need to invest in continuous system improvements, prioritising knowledge sharing, technical expertise, and inclusive decision-making.

7.2 Recommendations

7.2.1 Amend the Hazardous Waste (E-Waste) Management Rules 2021

Strengthening the legal framework is a crucial step toward successful e-waste management. To address the shortcomings of the current rules discussed in section 4.2, the E-waste Management Rules need to be revised. The scope of e-waste in Schedule 1 should be expanded to include components of electric vehicles, solar PV systems, drones, toys, leisure, and sporting equipment. While the existing rules impose penalties for non-compliance, more clarity is needed regarding penalties for non-registration. Similarly, the incentives and fund exchanges in return for WEE also require clarification. Specific auction rules for e-waste by bulk waste generators can be further developed in the amendment. Conditions for allowing e-waste exports should also be clarified to ensure they align with the PIC requirements of the Basel Convention. A national coordination committee, modelled on the one outlined in the Solid Waste Management Rules (2021), can also be set up, comprising members from the customs department, BTRC, and Hi-Tech Park Authority.

7.2.2 Develop a Technical Guideline for E-Waste Management

A technical guideline for e-waste management should be developed, which will include:

- The environmental management and occupational health and safety measures that need to be maintained at recycling precincts;
- The conditions non-formal recyclers must meet to obtain registration and clearance;

- Specific instructions for handling harmful components in e-waste;
- A disaster waste management protocol with a detailed plan for managing e-waste generated during disasters.

Additional guidelines are needed to specify which e-waste businesses can operate with registration only and which require additional environmental clearance certificates. The guidelines should also cover e-waste generated from end-of-life electric vehicles (EVs) and the management of mostly imported end-of-life hospital equipment. Furthermore, the guidelines can outline plans to build capacity in e-waste management through national learning institutions. For example, a technical diploma on handling e-waste could be offered to recyclers, while short courses can be developed for producers and government employees. International organizations can also support training for national stakeholders to help strengthen capacities at urban local bodies.

7.2.3 Develop an EPR Directive for E-Waste

While amended Hazardous Waste (e-waste) Management rules establish the legal framework, dedicated EPR implementation guidelines can clarify roles, harmonize systems, and enhance enforcement in ways that rules alone cannot achieve. A separate EPR guideline should be prepared for companies involved in manufacturing, assembling, importing, and marketing electronic equipment. A phased approach should be outlined to identify which EEE categories will be included in the EPR during the initial years. Digital registration and reporting systems should be developed for Obliged Entities and PROs.

7.2.4 Establish a National Inventory of E-Waste

The available information regarding e-waste generation and composition in Bangladesh is neither sufficiently comprehensive nor reliable to estimate current and future e-waste production accurately. The regulatory bodies (DoE and BTRC) collect data from recyclers in a fragmented way,[65] and this data only offers a snapshot of e-waste managed formally. On the other hand, the ECDS-BBS household survey, which captures e-waste, assumes respondents are aware of the categories of e-waste. The depth of the survey, covering all aspects of waste behaviour, may also lead respondents to misidentify EEE that will potentially become e-waste.

The current practice of estimating e-waste generation in Bangladesh deviates significantly from the internationally agreed-upon measurement framework for

[65] Interview Transcripts of KII_GOV_9 and KII_GOV_10.

e-waste, which is based on flows and stocks of EEE and e-waste. Bangladesh does not track data of e-waste based on indicators that are internationally identified[66] –

- Total EEE put on the Market (unit kg per capita)
- E-waste generated (unit kg per capita)
- E-waste formally collected (unit kg per capita)
- E-waste collection rate (%), measured as a ratio of formally collected e-waste against the total e-waste generated

The international best practice calls for tracking EEE sales, linking trade and national production statistics. Equation to calculate EEE is 'Put on Market' = Imports – Exports + Domestic Production, where imports and exports data can be sourced from customs, while the Ministry of Industry and associations can provide data on domestic production. While UNU promotes this model, it will need further tailoring in the Bangladesh context, as ship-breaking yards are a significant source of second-hand EEE. The total units of each of several EEE types are converted to weight using the average weight data of that type. Using empirical lifespan data from UNU, the expected e-waste quantity once EEE reach end-of-life can be determined.[67]

Along with revamping the tracking of EEE generation for e-waste calculations, an e-inventory Management Information System (MIS) would help accurately assess e-waste generation and standardize purchase and disposal data for e-products. The e-inventory MIS would enable better supervision of e-product purchasing processes, primarily by improving the geographic location of old e-products within government and commercial offices, which are significant generators of e-waste[68]. It would be advantageous if BBS could serve as the lead agency for gathering e-waste data and recording it in a format that makes it accessible and suitable for annual analysis. Through ECDS, BBS already conducts household surveys on e-waste that can be used for validation. Additionally, BBS separately conducts ICT access and usage surveys, providing data on EEE stock used by households and firms. Data from these surveys are reported to the International Telecommunication Union (ITU)

66 Wagner, M. (2019). *General principles of e-waste statistics.* Regional Workshop on Environment Statistics and Climate Change Statistics. UNU-VIE Sustainable Cycles Programme.

67 Kumar, S., & Rawat, S. (2018). Future e-Waste: Standardisation for reliable assessment. *Government Information Quarterly*, *35*(4), S33–S42. https://doi.org/10.1016/j.giq.2015.11.006

68 Bakhiyi, B., Gravel, S., Ceballos, D., Flynn, M. A., & Zayed, J. (2018). Has the question of e-waste opened a Pandora's box? An overview of unpredictable issues and challenges. *Environment International*, *110*, 173–192. https://doi.org/10.1016/j.envint.2017.10.021

under 19 indicators.[69] Since a reporting mechanism between ITU and BBS is already in place, BBS can seek technical assistance from ITU to improve the country's e-waste data management.

The updated system for tracking EEE and e-waste generation is crucial to monitor progress toward the collection targets specified in Schedule 3 of the E-waste Management Rules (2021). If the data is sufficiently detailed at the local level, it can also assist city corporations and municipalities in planning collection centers and landfill sites for hazardous e-waste components. Accurate estimates of e-waste generation rates will also benefit future investors interested in establishing e-waste recycling centers in Bangladesh, including those interested in the PPP arrangement that the World Bank-supported Hi-Tech Park project aims to attract.

7.2.5 Prepare a Roadmap for Integrating Informal Collectors

The E-waste Management Rules (2021) have overlooked the role of informal actors in e-waste management, who handle most of the e-waste in Bangladesh. Survey results from this study confirmed that their years of operation predate the 2021 regulations, yet their involvement in shaping these regulations was not ensured. Cracking down on this sector through stricter rules could cause more harm than good, as it endangers the livelihoods of many vulnerable people. A more practical approach would be to integrate informal activities in the recycling system by creating a better framework. Recognizing and integrating informal actors into a well-established regulatory system will provide much-needed protection for vulnerable communities working at these facilities.[70] This will also help the government and established institutions direct more e-waste to the formal recycling sector, benefiting the national economy.

A successful and sustainable e-waste management system in Bangladesh will need both informal and formal e-waste sectors. While the informal sector is the most efficient, cost-effective, quick responder, and adaptable to the growing problems caused by increasing e-waste, the formal sector can offer scalability, advanced technologies, and compliance with environmental regulations and standards.[71] As shown in the alternative decentralized model in Table 10,

[69] BBS (2025). 1st Quarterly Report. ICT Access and Use Survey 2025-2026

[70] General Economics Division (2025). *Bangladesh Voluntary National Review 2025*. Bangladesh Planning Commission, p. 61.

[71] Ankhi, I. J., Hossain, G. A., Faisal, A. K. M., Hasan, Md. R.-U., Barua, S., & Masud, M. H. (2025). Material flow analysis and risk evaluation of informal and formal E-waste recycling processes in Bangladesh: Towards sustainable management strategies. *Journal of Cleaner Production*, *497*, 145090. https://doi.org/10.1016/j.jclepro.2025.145090

removing the informal sector from treatment functions and restricting its role to centralized collection can decrease negative environmental impacts.[72]

TABLE 8: Models for integrating informal e-waste businesses

<table>
<tr><th>Status Quo</th><th colspan="2">Alternative Decentralized Model</th></tr>
<tr><td>All stakeholders under both sectors need DoE registration.</td><td>Registration under urban local bodies, e.g., city corporations, municipalities.</td><td>DoE registration and environmental clearance certificate.</td></tr>
<tr><td><table><tr><th>Informal</th><th>Formal</th></tr><tr><td>Collection</td><td>Collection</td></tr><tr><td>Refurbisher</td><td>Refurbisher</td></tr><tr><td>Dismantling</td><td>Dismantling</td></tr><tr><td>Recycling</td><td>Recycling</td></tr><tr><td>Export</td><td>Export</td></tr></table></td><td colspan="2"><table><tr><th>Informal</th><th>Formal</th></tr><tr><td>Collection</td><td>~~Collection~~</td></tr><tr><td>Refurbisher</td><td>~~Refurbisher~~</td></tr><tr><td>~~Dismantling~~</td><td>Dismantling</td></tr><tr><td>~~Recycling~~</td><td>Recycling</td></tr><tr><td>~~Export~~</td><td>Export</td></tr></table></td></tr>
<tr><td>Implications:
• Formal companies cannot compete for e-waste bidding as they have a price disadvantage compared to unregistered informal firms.
• Number of regulated entities surpasses DoE's enforcement capacity.</td><td colspan="2">Implications:
• DoE can collaborate with the Department of Inspection for Factories and Establishments (DIFE) to shut down informal recyclers whose operations are polluting.
• Symbiosis can develop, tapping the informal actors' collection efficiency and the formal actors' recycling infrastructure.</td></tr>
</table>

7.2.6 Establish a Separate Trade License Category for E-Waste Businesses

As highlighted in section 4.3, the survey revealed that most informal e-waste businesses possess trade licenses and other business registrations. Therefore, they are considered informal by the DoE but not by other government agencies. However, even in city corporation and municipality databases for trade licenses, it is difficult to determine the total number of such businesses because the trade licenses are issued under an "other" category. If trade licenses and other registrations were issued under a specifically created category for e-waste businesses, managing their activities in accordance with recommendation 7.2.5 would become easier.

[72] Akter, N., & Hossain, M. I. (2023, December 17). The integration of formal and informal channels to manage e-waste. *The Business Standard*. https://www.tbsnews.net/thoughts/integration-formal-and-informal-channels-manage-e-waste-758914

7.2.7 Strengthen the Customs Department for its Role in E-Waste Management

Effective customs controls are essential to prevent the illegal cross-border movement of e-waste. The recent launch of the Bangladesh Single Window (BSW) marks a move toward a fully automated online system for import and export clearance. While BSW includes DoE's PIC clearance under the Basel Convention, developing more consistent definitions and codes for e-waste can help customs better identify and track shipments. Specialized training for customs officers is vital for recognizing, classifying, and handling e-waste shipments, including distinguishing used electronics from waste. Conducting regular spot checks of imports and exports ensures that enforcement can be applied if shipments are inaccurately recorded. Customs will also need advanced scanning and detection tools at border points to uncover concealed or mislabeled e-waste. Strengthening collaboration between DoE and customs can facilitate joint inspections and knowledge sharing to ensure compliance with the E-waste Management Rules and the Basel Convention.

7.2.8 Develop an E-Waste Disposal Policy for all Bulk Waste Generators

Interviews for this study revealed that informal actors take part in auctions for e-waste from bulk waste generators because the government's asset disposal rules have not been updated to include specific provisions for e-waste. Although a draft *Asset Disposal Policy* was introduced in 2022, it has yet to be finalized. Various government ministries, departments, and agencies follow the *Public Procurement Rules (2008*) to auction WEEE reaching end-of-life to the highest bidder. Private institutions and organizations have their own policies for auctioning WEEE items that are no longer in use. There are also no specialized policies for disposing of electronic voting machines (EVMs) and bank Automated Teller Machines (ATMs). Since informal e-waste businesses can bid in these auctions using only their trade licenses, formal recyclers find it difficult to access enough e-waste because they cannot compete with bids from informal actors. It is recommended that an e-waste management guideline be created for bulk waste generators such as government offices and commercial businesses. The guidelines should include best practices for managing EEE inventories, storage standards, and auction rules that prevent bidding by businesses not registered under the Hazardous Waste (e-waste) Management Rules.

7.2.9 Add E-Waste Provisions in the Draft National Electric Vehicle (EV) Policy

The draft *Electric Vehicle Industry Development Policy (2025)* should include detailed guidelines for managing non-battery e-waste generated by electric vehicles, which includes power electronics, control electronics, and high-voltage wiring. These contain valuable but sometimes hazardous materials and are best handled through WEEE-style dismantling and specialized recycling, not just traditional car shredding. EPR guidelines should be developed for electric vehicle manufacturers and importers. Since only a few domestic companies produce electric vehicles, such as rickshaws and scooters, adopting an EPR framework for EVs will be relatively more straightforward for both these companies and importers.

7.2.10 Increase Public Awareness about E-Waste Management

Sensitizing citizens and educating them about their role in successful e-waste management is a crucial step forward. Most developing countries face low public awareness of the hazards of e-waste and its negative environmental impact, which allows informal e-waste management to flourish. The limited understanding and awareness among the general public in Bangladesh are mainly due to a lack of education about waste management. Therefore, it is essential to teach people of all ages about proper e-waste disposal and the environmental risks of hazardous practices. This can be achieved through government-led national campaigns, partnerships with educational institutions, and leveraging technology to reach everyone via SMS, mobile notifications, and social media platforms.[73] Early education in the school system can also help raise awareness of the direct and indirect environmental and health benefits of proper e-waste recycling.[74]

7.2.11 Build the Capacity of DoE as a Regulatory Authority

The capacity of the DoE must be increased to enforce existing e-waste management regulations and design complementary standards and guidelines. A system must be implemented to automate the registration and reporting requirements under the Hazardous Waste (e-waste) Management Rules (2021). DoE should begin identifying opportunities for automation and

[73] Ankhi, I. J., Hossain, G. A., Faisal, A. K. M., Hasan, Md. R.-U., Barua, S., & Masud, M. H. (2025). Material flow analysis and risk evaluation of informal and formal E-waste recycling processes in Bangladesh: Towards sustainable management strategies. *Journal of Cleaner Production*, *497*, 145090. https://doi.org/10.1016/j.jclepro.2025.145090

[74] Omondi, E. A. (2022). Complexity of E-Waste and its Management Challenges in Developing Countries – A Review. *International Journal of Environmental Sciences & Natural Resources*, *31*(2). doi: 10.19080/IJESNR.2022.31.556309

creating an e-waste information system, ideally integrated with other waste streams. This can involve e-waste inventories, producer registration, and licensing of recycling actors. Implementing EPR in the absence of these basic automations is a far cry.

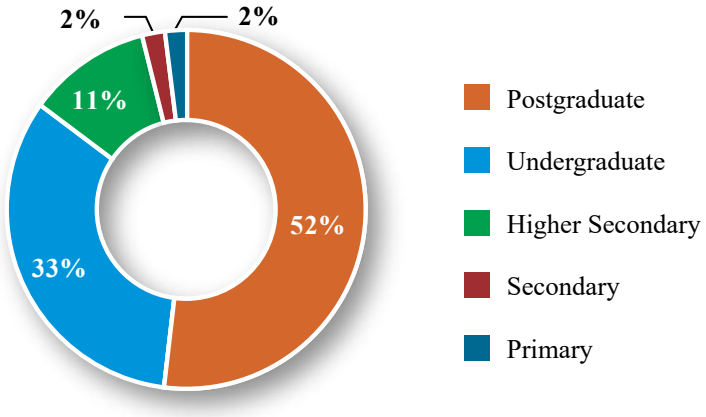
7.2.12 Enhance Institutional Coordination for Effective E-Waste Management

The DoE will need support from other government agencies to gather data and enforce e-waste regulations. Interaction between government departments should increase in frequency to ensure regular meetings are held to process PICs and other clearances for the destruction of telecom e-waste. A coordination mechanism must be established among all stakeholders involved in e-waste management, including the Department of Environment, BTRC, local government institutions, and others. As mentioned in section 7.2.1, this could take the form of a national coordination committee, similar to the one under the Solid Waste Management Rules (2021). With the introduction of an EPR scheme for e-waste, a national working group could be formed to discuss the opportunities and challenges of the EPR system and e-waste management as a whole. As the Hi-Tech Park Authority prepares to invite interested parties through a public-private partnership to build an e-waste recycling plant, coordination is essential to ensure that e-waste collected nationwide, under the supervision of urban local bodies, reaches the site in Kaliakor, Gazipur.

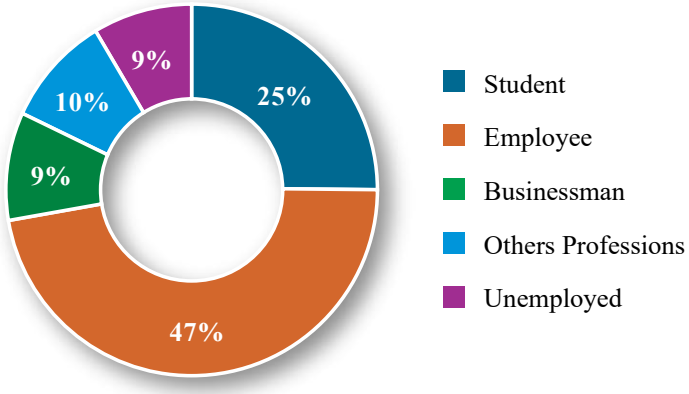
APPENDIX A

APPENDIX A

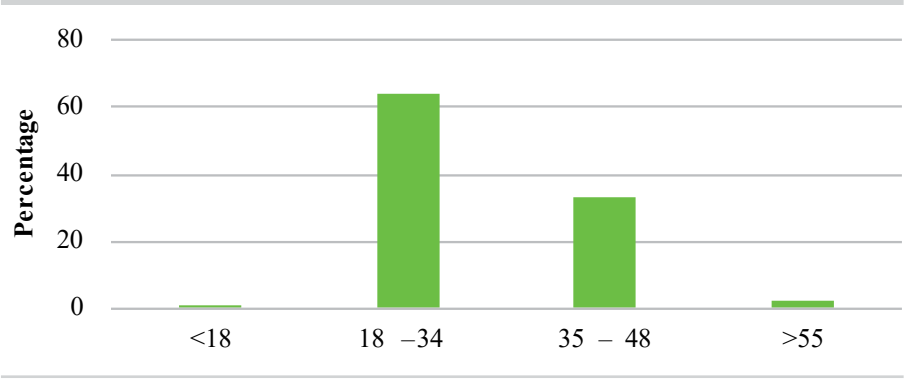
The following charts outline the profiles of the 675 respondents who participated in the online survey to assess awareness levels and behaviour patterns regarding everyday electronic items nearing the end of their lifespan. This survey was available from June 2025 to October 2025.



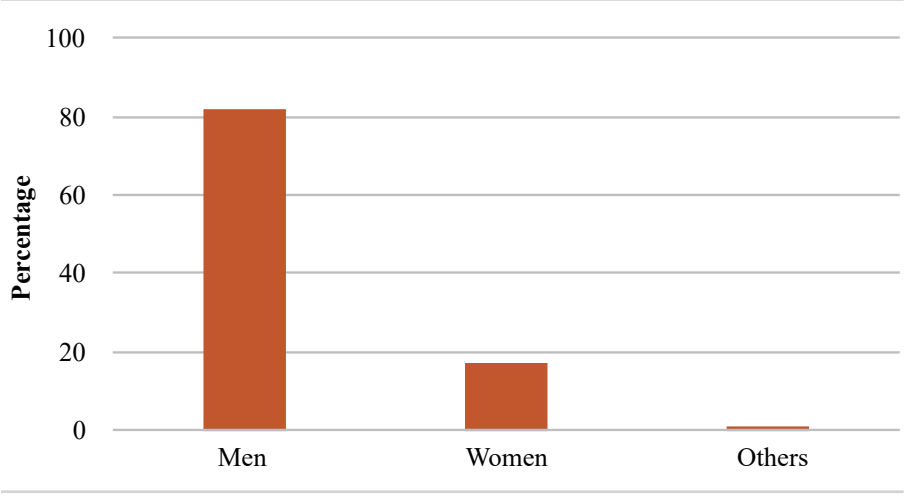
Educational qualification



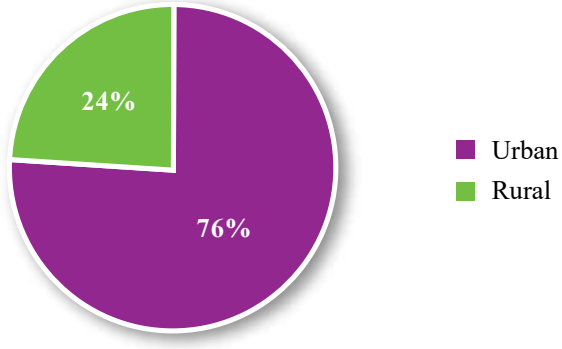
Occupation



Age distribution



Gender distribution



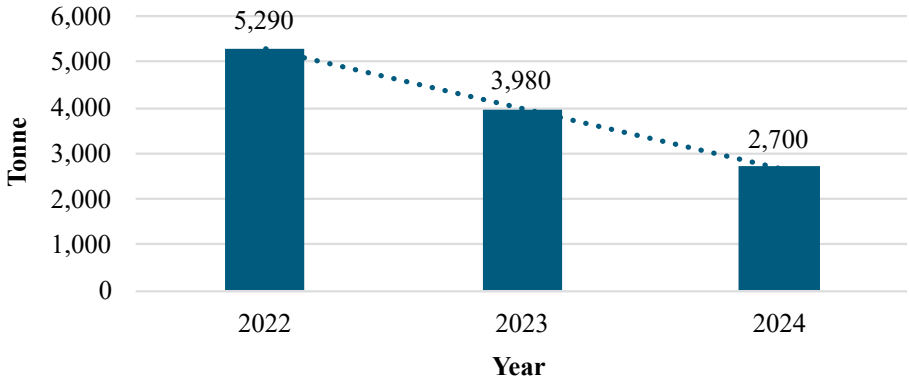
Locality of The Respondents

APPENDIX B

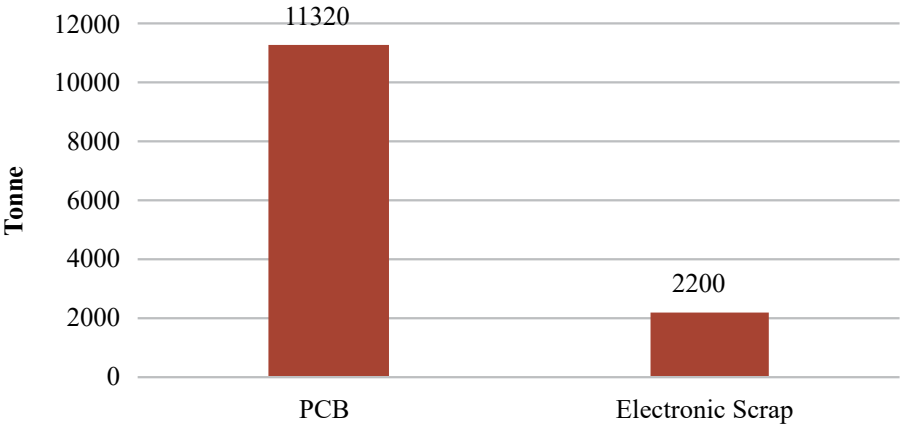
APPENDIX B

As part of this study, e-waste export-related data were received from the DoE (PIC-related) and the customs department. While irregularities were reported in the main text, the following figures provide a general overview of e-waste exports from Bangladesh.

Visualizing the PIC-related data obtained from DoE

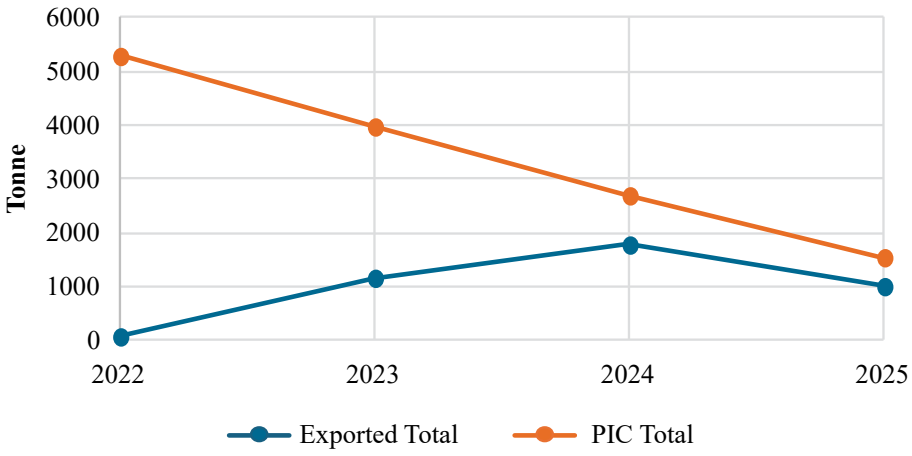


A downward trend in e-waste wxport is observed

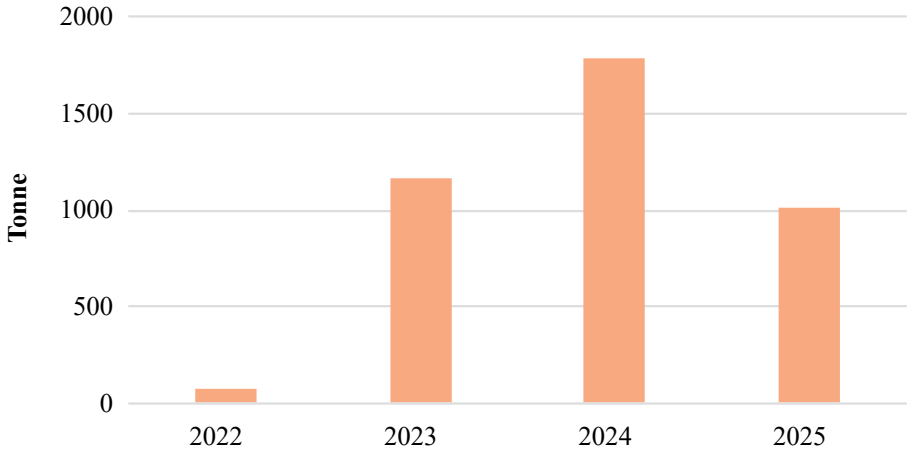


E-waste components exported during 2022-2024

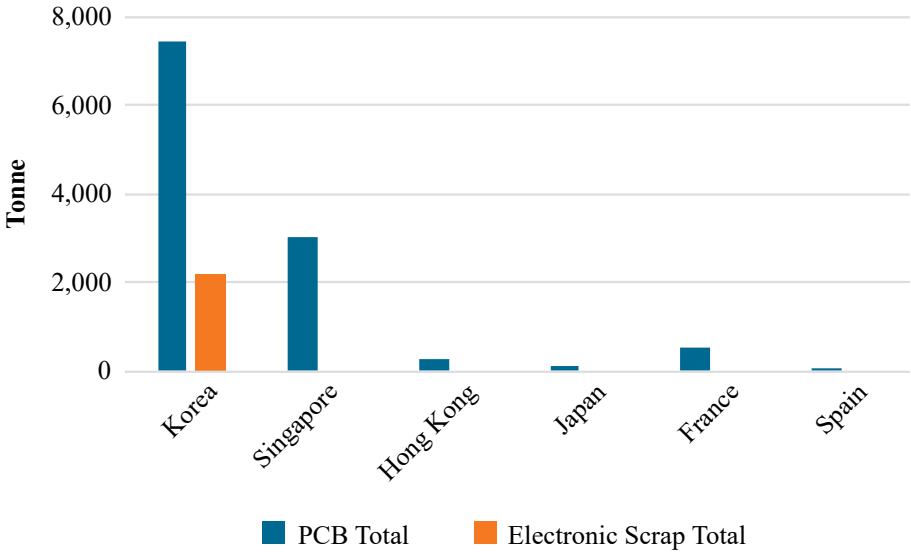
Comparing PIC data with the actual export data received from the customs department



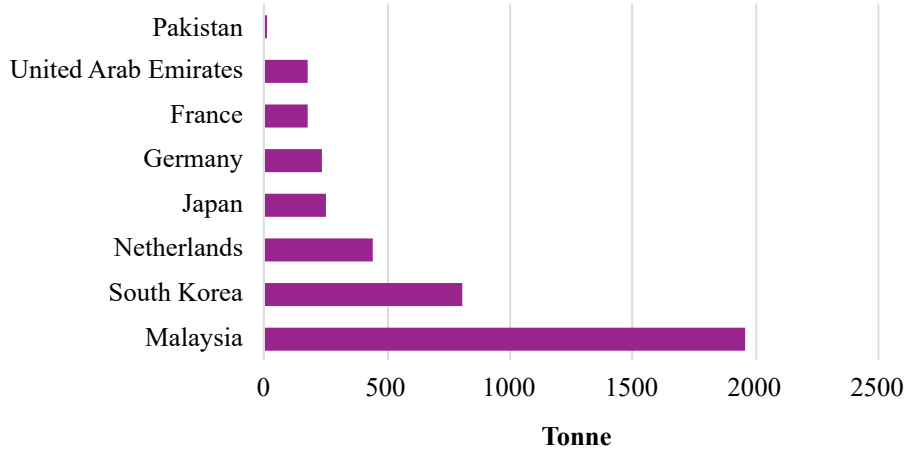
Annual volume exported < Annual PIC allotted



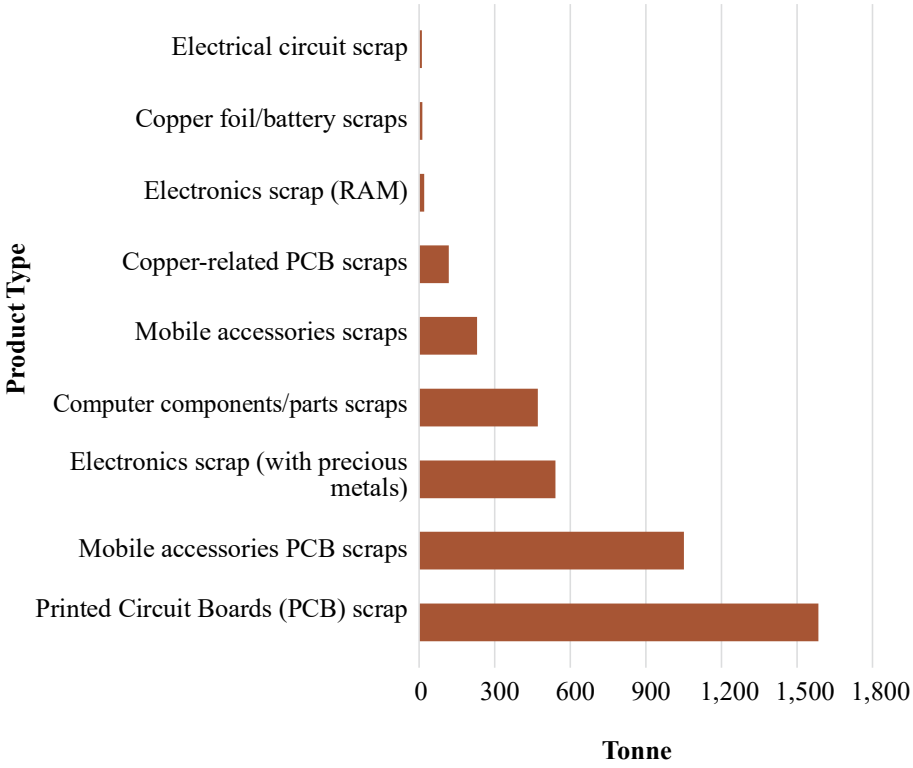
E-waste exported from Bangladesh



E-waste exported to countries with PIC



E-waste is also exported to other countries



The e-waste export data from customs was disaggregated by product type

TABLE B1: Export of E-Waste from Bangladesh (by HS Code)

HS Code	Type of E-Waste	Common Description (Simplified)	Examples / Notes
85491100	Electrical Circuit Scrap	Waste electrical circuits and components	Old or broken circuit assemblies
85491200	Printed Circuit Assemblies for Telephones	Discarded circuit parts from telecommunication devices	Damaged or obsolete phone boards
85491900	Other Electrical Parts Scrap	General electronic or electrical waste not elsewhere specified	Mixed electrical parts, wiring boards
85492100	Semiconductor Device Scrap	Waste or defective semiconductor components	Chips, transistors, diodes
85492900	Electronic Scrap Containing Precious Metals	E-waste containing gold, silver, or copper	Printed circuit boards, RAM, computer parts
85493100	Parts of Electronic Assemblies	Components removed from devices for recycling	Computer or industrial machine boards
85493900	Other Electronic Components Scrap	Miscellaneous electronic waste	Sensors, connectors, small circuits
85499100	Battery & Copper Foil Scrap	Scrap from battery materials and copper foils	Battery foil waste, metal residues
85499900	Mixed Electronic Scrap (Other)	General PCB and mobile accessory scrap	Mobile accessories, PCB boards, copper alloy scraps

REFERENCES

References

Akter, N., & Hossain, M. I. (2023, December 17). The integration of formal and informal channels to manage e-waste. *The Business Standard*. https://www.tbsnews.net/thoughts/integration-formal-and-informal-channels-manage-e-waste-758914 (Accessed 18 February, 2025)

Akter, N., & Hossain, M. I. (2025). Structure, actors, and interdependencies between informal and formal e-waste management supply chain in Bangladesh. *Journal of Cleaner Production*, *522*, 146146. https://doi.org/10.1016/j.jclepro.2025.146146

Ankhi, I. J., Hossain, G. A., Faisal, A. K. M., Hasan, Md. R.-U., Barua, S., & Masud, M. H. (2025). Material flow analysis and risk evaluation of informal and formal E-waste recycling processes in Bangladesh: Towards sustainable management strategies. *Journal of Cleaner Production*, *497*, 145090. https://doi.org/10.1016/j.jclepro.2025.145090

Baby, R. (2025, October 6). Bangladesh not on track to eradicate child labour. *The Daily Ittefaq*. Available at: https://shorturl.at/3Rwyi (Accessed: 7 October, 2025)

Bakhiyi, B., Gravel, S., Ceballos, D., Flynn, M. A., & Zayed, J. (2018). Has the question of e-waste opened a Pandora's box? An overview of unpredictable issues and challenges. *Environment International*, *110*, 173–192. https://doi.org/10.1016/j.envint.2017.10.021

Baldé et al. (2024). Global E-waste Monitor. Geneva/Bonn: International Telecommunication Union (ITU) and United Nations Institute for Training and Research (UNITAR).

Bangladesh Sangbad Sangstha. (2023, July 17). *Proportion of households in the country with mobile phones is 97.9%: BBS*. https://www.bssnews.net/news-flash/136879 (Accessed: 5 August, 2025).

BBS (2025). 1st *Quarterly Report. ICT Access and Use Survey 2025-2026*. Available at: https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/7683435c_2ad1_4c2e_bcd5_00be5395163b/2025-12-17-04-22-049a5cc69abe27ee7702266ad616f307.pdf (Accessed: 20 December 2025).

BUET (2018). *Assessment of Generation of E-Waste, Its Impacts on Environment and Resource Recovery Potential in Bangladesh*. Centre for Environmental and Resource Management (CERM) of Bangladesh University of Engineering and Technology (BUET).

Castro, P. J., Aráujo, J. M., Martinho, G., & Pereiro, A. B. (2021). Waste management strategies to mitigate the effects of fluorinated greenhouse gases on climate change. *Applied Sciences, 11*(10), 4367. doi: 10.3390/app11104367.

Derks, M., Bidmon, C., & Ciulli, F. (2024). Circular e-waste ecosystems in necessity-driven contexts: The impact of formal institutional voids. *Business Strategy and the Environment*, *33*(4), 3733–3747. https://doi.org/10.1002/bse.3652

ESDO (2011). *Report on Illegal import and trade off of e-waste in Bangladesh.* Environment and Social Development Organization (ESDO). Available at: https://ipen.org/sites/default/files/t/2012/09/Report-on-Illegal-import-and-trade-off-of-e-waste.pdf (Accessed: 15 July, 2025)

Fawole, A. A., Orikpete, O. F., Ehiobu, N. N., & Ewim, D. R. E. (2023). Climate change implications of electronic waste: strategies for sustainable management. Bulletin of the National Research Centre, 47(1), 147. doi: 10.1186/s42269-023-01124-8.

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), e41453. https://doi.org/10.1016/j.heliyon.2024.e41453

Forti V., Baldé C.P., Kuehr R. (2018). *E-waste Statistics: Guidelines on Classifications, Reporting and Indicators, second edition*. United Nations University, ViE – SCYCLE, Bonn, Germany.

Frantz Schneider, A., Aanestad, M., & Carvalho, T. C. (2024). Exploring barriers in the transition toward an established e-waste management system in Brazil: A multiple-case study of the formal sector. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-024-05188-y

Gaur, T. S., Yadav, V., Mittal, S., Singh, S., and Khan, M.A. (2025). E-Waste Management Challenges in India from the Perspective of Producer

Responsibility Organizations. *IEEE Access*, *13*. DOI: 10.1109/ACCESS.2025.3553203.

General Economics Division (2025). *Bangladesh Voluntary National Review 2025*. Bangladesh Planning Commission. Available at: https://gedkp.gov.bd/wp-content/uploads/2025/07/Bangladesh-Voluntary-National-Review-2025.pdf (Accessed: 15 September, 2025).

Giglio, E., Pedro, F., Carvalho, L. C., & Xara-Brasil, D. (2023). The governance of E-waste recycling networks: Insights from São Paulo City. *Waste Management*, *161*, 10–16. https://doi.org/10.1016/j.wasman.2023.02.027

Isarin, N., Camargo, B. C., and le Roux, A. C. (2023). *Dirty deals: Case studies on corruption in waste management and trade*. Working Paper 49 / Environmental Corruption Deep Dive Series, Basel Institute on Governance. Available at: https://baselgovernance.org/publications/deepdive2-waste (Accessed: 12 March, 2025).

Islam, Md. K., Khatun, Mst. S., & Mourshed, M. (2024). An in-depth analysis and review of management strategies for E-waste in the south Asian region: A way forward towards waste to energy conversion and sustainability. *Heliyon, 10*(7), e28707. https://doi.org/10.1016/j.heliyon.2024.e28707

Jamal, R., Al Alam, M. A., Sayeed, K. M. A., Ahmed, S. A., Haque, N., Hossain, M. M., & Sujauddin, M. (2024). Patching sustainability loopholes within the lead-acid battery industry of Bangladesh: An environmental and occupational health risk perspective. *Sustainable Production and Consumption, 48*, 435-445. https://doi.org/10.1016/j.spc.2024.05.030

Khan, A. R., Saadat, A. H. M., & Motalib, M. A. (2019). Status of Electronic Waste Generation in Bangladesh: A Review. *International Journal of Innovative Science and Research Technology, 4*(8).

Kumar, S., & Rawat, S. (2018). Future e-Waste: Standardisation for reliable assessment. *Government Information Quarterly*, *35*(4), S33–S42. doi: 10.1016/j.giq.2015.11.006

Li, M., Liu, J., & Han, W. (2016). Recycling and management of waste lead-acid batteries: A mini-review. *Waste Management & Research, 34*, 298 - 306. https://doi.org/10.1177/0734242x16633773.

Liu, K., Tan, Q., Yu, J., & Wang, M. (2023). A global perspective on e-waste recycling. *Circular Economy*, *2*(1), 100028. https://doi.org/10.1016/j.cec.2023.100028

Mahmud, I., Sultana, S., Rahman, A., Ramayah, T., & Cheng Ling, T. (2020). E-waste recycling intention paradigm of small and medium electronics store managers in Bangladesh: An S–O–R perspective. *Waste Management & Research: The Journal for a Sustainable Circular Economy*, *38*(12), 1438–1449. https://doi.org/10.1177/0734242X20914753

Mott MacDonald (2018). *Final Report on Analysis of Current E-waste Management Scenario in Bangladesh: Feasibility & Project Structuring Study for E-Waste Management Facility for Hi-Tech Park Authority*. Reference # 397574|3|A.

Moyen Massa, G., & Archodoulaki, V. M. (2023). Electrical and electronic waste management problems in Africa: Deficits and solution approach. *Environments, 10*(3), 44. doi: 10.3390/environments10030044.

Nastev, M., & Todorov, N. (2013). Hazus: A standardized methodology for flood risk assessment in Canada. *Canadian Water Resources Journal, 38*(3), 223-231. doi: 10.1080/07011784.2013.801599.

National Institute of Population Research and Training (NIPORT) and ICF (2023). *Bangladesh Demographic and Health Survey 2022: Key Indicators Report*. Dhaka, Bangladesh, and Rockville, Maryland, USA: NIPORT and ICF.

Omondi, E. A. (2022). Complexity of E-Waste and its Management Challenges in Developing Countries – A Review. *International Journal of Environmental Sciences & Natural Resources*, *31*(2). doi: 10.19080/IJESNR.2022.31.556309

Osman, N. A., Abidin, S. N. Z., Ibrahim, F. I., & Kamarazaly, M. A. (2025, June). Analyzing Stakeholder Views on Sustainable E-Waste Management Post-Flood. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1516, No. 1, p. 012007). IOP Publishing. doi: 10.1088/1755-1315/1516/1/012007.

Parvez, S. and Chakma, J. (2024, March 25). More households use refrigerators, ACs as income grows. *The Daily Star*. Available at: https://www.thedailystar.net/business/economy/news/more-households-use-refrigerators-acs-income-grows-3574161 (Accessed: 15 July, 2025).

Pedro, F., Giglio, E., Velazquez, L., & Munguia, N. (2021). Constructed Governance as Solution to Conflicts in E-Waste Recycling Networks. *Sustainability*, *13*(4), 1701. https://doi.org/10.3390/su13041701

Rodrigues, A. C., Boscov, M. E., & Günther, W. M. (2020). Domestic flow of e-waste in São Paulo, Brazil: Characterization to support public policies. *Waste Management*, *102*, 474-485. https://doi.org/10.1016/j.wasman.2019.10.052

Roy, H., Islam, Md. S., Haque, S., & Riyad, M. H. (2022). Electronic waste management scenario in Bangladesh: Policies, recommendations, and case study at Dhaka and Chittagong for a sustainable solution. *Sustainable Technology and Entrepreneurship, 1*(3), 100025. https://doi.org/10.1016/j.stae.2022.100025

Roy, H., Rahman, T. U., Suhan, Md. B. K., Al-Mamun, Md. R., Haque, S., & Islam, Md. S. (2022). A comprehensive review on hazardous aspects and management strategies of electronic waste: Bangladesh perspectives. *Heliyon, 8*(7), e09802. https://doi.org/10.1016/j.heliyon.2022.e09802

Santhiya, P., & Das, A. (2024). A multi-objective solid transportation model for e-waste recovery in the post-disaster phase under an uncertain environment. *Environment, Development and Sustainability*, 1-43. doi: 10.1007/s10668-024-05757-1.

Sthiannopkao, S., & Wong, M. H. (2013). Handling e-waste in developed and developing countries: Initiatives, practices, and consequences. *Science of The Total Environment*, 463–464. doi: 10.1016/j.scitotenv.2012.06.088.

Tasnim, S. S., Rahman, M. M., Hasan, M. M., Shammi, M., & Tareq, S. M. (2022). Current challenges and future perspectives of solar-PV cell waste in Bangladesh. *Heliyon, 8*(2). doi: 10.1016/j.heliyon.2022.e08970.

TBS Report (2024, October 15). *E-waste business is worth $500 million*. The Business Standard. https://www.tbsnews.net/economy/e-waste-recycling-offers-500m-annual-business-potential-bangladesh-experts-966921 (Accessed: 17 October, 2024).

Theis, N. (2021). The Global Trade in E-Waste: A Network Approach. *Environmental Sociology*, *7*(1), 76–89. https://doi.org/10.1080/23251042.2020.1824308

UNEP-IETC (2022). *The role and experience of women in E-waste Management*. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/41533/womem_waste.pdf?sequence=3&isAllowed=y (Accessed: 15 March, 2025).

UNICEF Bangladesh Country Office (2022, June 22). *Humanitarian Situation Report No. 3: Northeastern Flood.* https://www.unicef.org/media/122901/file/Bangladesh-Floods-Humanitarian-SitRep-22-June-2022.pdf (Accessed: 15 August, 2025).

UNODC (2024*). Cash in the trash: the role of corruption, organized crime and money laundering in waste trafficking*. United Nations Office on Drugs and Crime.

Wagner, M. (2019). *General principles of e-waste statistics.* Regional Workshop on Environment Statistics and Climate Change Statistics. UNU-VIE Sustainable Cycles Programme.

WHO (2021). *Children and digital dumpsites: e-waste exposure and child health. Geneva*: World Health Organization.

Widyarsana, I. M. W., & Nurdiani, D. A. (2024). Identification of electronic waste (e-waste) generation from the household and non-household sectors in Indonesia and its sustainable management system. *In E3S Web of Conferences (Vol. 485*, p. 05006). EDP Sciences. doi: 10.21203/rs.3.rs-391423/v1.

World Bank (2023). *Building Back a Greener Bangladesh: Country Environmental Analysis*. Washington, DC: The World Bank Group.

E-WASTE

MANAGEMENT IN BANGLADESH: GOVERNANCE CHALLENGES AND WAY FORWARD

Transparency International Bangladesh (TIB) works with a vision of an effectively governed Bangladesh where public affairs, business, politics, and the daily lives of the people will be free from corruption, and all powers exercised at all levels will be held accountable. To achieve this, TIB carries out various activities that include research and evidence-based policy advocacy on important issues, institutions, and sectors of public interest, raising awareness, building the capacity of stakeholders, and actively engaging citizens, especially young people, to encourage better governance and fight corruption. Accordingly, ensuring good governance and promoting integrity in environmental management have become key focus areas for TIB, particularly because of high vulnerability to environmental degradation and climate change. Governance in waste management, including e-waste, is essential for preventing environmental pollution, reducing greenhouse gas emissions, and protecting public health.

This book, titled *E-Waste Management in Bangladesh: Governance Challenges and the Way Forward*, is being published based on the research report with the same title launched on December 30, 2025. TIB undertook this study to analyze the challenges of good governance in e-waste management in Bangladesh and explore ways to address them. The specific objectives of the study included identifying challenges in the regulatory framework for e-waste management, assessing stakeholders' compliance with applicable legal obligations, highlighting the link between e-waste management and climate change, and providing recommendations to address the identified challenges.

Transparency International Bangladesh (TIB)
MIDAS Centre (Levels 4 & 5)
House 05, Road 16 (New) 27 (Old), Dhanmondi, Dhaka 1209
Tel: (+880-2) 41021267-70, Fax: (+880-2) 41021272
info@ti-bangladesh.org TIBangladesh
www.ti-bangladesh.org