Effective E-Waste Management- Potential Road Map for Cities

Research Study
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Regional Centre for Urban & Environmental Studies
All India Institute of Local Self-Government, Mumbai
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Preface

In recent decades, the proliferation of electronic devices and technological advancements has transformed the way we live, work, and communicate. While these innovations bring convenience and efficiency, they also contribute to a growing environmental challenge: electronic waste, or e-waste. The improper disposal of e-waste poses significant risks to human health, environmental sustainability, and resource conservation, making effective e-waste management imperative for the well-being of our planet and future generations.

The topic of e-waste management has garnered increasing attention from policymakers, environmentalists, and stakeholders worldwide. In the context of rapidly urbanizing environments, where the consumption and disposal of electronic devices are on the rise, Indian cities play a pivotal role in shaping strategies and implementing initiatives to address the e-waste crisis. Recognizing the urgent need for action, this research study explores the theme of 'Effective E-waste Management – A Potential Road Map for Indian Cities'.

The primary objective of this study is to develop a comprehensive roadmap for enhancing e-waste management practices in Indian cities. By synthesizing existing knowledge, analyzing policy frameworks, and identifying best practices, this research seeks to provide actionable insights and recommendations for policymakers, urban planners, and other stakeholders involved in e-waste management efforts in the Indian context.

Through a multidisciplinary approach encompassing environmental science, policy analysis, and urban planning, this study aims to address key questions and challenges related to e-waste management specific to Indian cities, including:

- What are the current e-waste management practices and challenges in Indian cities?

- What are the legal, policy frameworks and regulatory mechanisms exist to govern e-waste management in Indian cities?

- How can Indian cities develop effective strategies and action plans to improve e-waste collection, recycling, and disposal?

- What are the roles and responsibilities of various stakeholders, including government agencies, industries, and the public, in promoting sustainable e-waste management practices in Indian cities?

- What are the potential benefits, opportunities, and constraints associated with different e-waste management approaches in the Indian context?

This research study is intended to serve as a resource for policymakers, practitioners, researchers, and ULBs working towards the common goal of achieving effective e-waste management in Indian cities. By fostering dialogue, collaboration, and innovation within the Indian context, we aspire to pave the way for a more sustainable and resilient future, where electronic waste is managed responsibly, and Indian cities thrive in harmony with the environment.

We hope that this study, supported by the Ministry of Housing & Urban Affairs (MoHUA), Government of India (GoI) under its annual research plan for the Regional Centre for Urban and Environmental Studies (RCUES) of All India Institute of Local Self Government (AIILSG) Mumbai will contribute to the collective efforts aimed at addressing the e-waste challenges in Indian cities, inspiring transformative action, and fostering a culture of sustainability and stewardship in our urban landscapes.

Acknowledgement

RCUES of AIILSG, Mumbai takes this opportunity to put on record our deep appreciation for the Ministry of Housing & Urban Affairs (MoHUA), Government of India (GoI) for providing us an opportunity to working on this study.

RCUES of AIILSG, Mumbai also takes opportunity to express gratitude towards Shri. Ranjit Chavan, President, AIILSG and Dr. Jairaj Phatak, IAS (Retd.), Director General, AIILSG for providing their valuable guidance and support to complete this study. We express sincere thanks to Dr. (Prof.) Sneha Palnitkar, Chief Executive Officer, Waste Management & Research Centre, AIILSG for providing necessary subject input and extending continued support in completing this study.

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Director
RCUES, AIILSG, Mumbai.

Table of Content

List of Tables

List of Graphs

List of Figures

Abbreviations

1. ASSOCHAM - Associated Chambers of Commerce and Industry of India
2. CPCB - Central Pollution Control Board
3. DAY-NULM – Deendayal Antyodaya Yojana -National Urban Livelihood Mission
4. EEEs - Electrical and Electronic Equipment (EEEs)
5. EPR - Extended Producer Responsibility
6. E-Waste - Electronic Waste
7. E-Web - Electronic-Web
8. GESP - Global E-waste Statistics Partnership
9. GoI – Government of India
10. MRF - Material Recovery Facilities
11. MPCB - Maharashtra Pollution Control Board
12. NGO – Non-Government Organization
13. SPCB - State Pollution Control Boards
14. SWM- Solid waste management
15. PCs - Personal Computers
16. PPP - Public-Private Partnerships
17. SHG- Self-help groups
18. SBM – Swachh Bharat Mission
19. ULB – Urban Local Body
20. WEEE - Waste Electrical and Electronic Equipment

Chapter 1 - Introduction

Background and Scope:

The world today is distinguished by fierce global competition and rapid technological development. Humans rely heavily on Electrical and Electronic Equipment (EEEs) to live a comfortable life. As a result, demand and consumption have increased the prospects for EEE trade, resulting in the creation of the Electronic-Web (E-Web) around the world. Customers' needs are mostly changing in short periods of time, either due to the product's shorter life lifetime or because of more advanced gadgets in the market or at lower prices. Eventually, the owner dismisses the outdated EEE and it becomes Waste Electrical and Electronic Equipment (WEEE), often known as E-waste.

Figure 1 : E-Waste Bin

A colloquial, widely used term on a global scale to refer to electronic products that have outlived their "useful life" is e-waste. E-waste consists of electronic product by-products, including domestic appliances, mobile phones, and personal computers (PCs). The rapid rate of obsolescence combined with the acceleration of technological change renders electronic products obsolete very rapidly. One of the most rapidly expanding components of the existing waste management system is electronic product disposal. [In contrast to conventional municipal waste, electronic waste (E-waste) is characterized by a greater danger due to its composition of thousands of toxic components. This includes harmful chemicals and heavy metals, including lead, cadmium, mercury, and arsenic, among others. Improper treatment of E-waste through rudimentary recycling techniques or disposal in unsecured landfills can result in environmental contamination and adverse health effects for human beings. An estimated 70% (Kentucky Resources Council) of heavy metals discovered in landfills in the United States originate from electronic waste. Prolonged exposure to these compounds during improper e-waste recycling can have adverse effects on health. Informal e-waste workers often lack health precautions, making this more important.

According to the Associated Chambers of Commerce and Industry of India (ASSOCHAM), over 80% of e-waste workers in India experience respiratory issues such as difficulty breathing, discomfort, coughing, and choking due to inadequate safety measures.

1.1 Types of E-Waste:

Electronic waste, commonly referred to as e-waste, encompasses a wide array of discarded electronic devices and equipment that have reached the end of their useful life. The diverse nature of e-waste includes various categories of electronic products, such as consumer electronics (e.g., mobile phones, laptops, tablets), household appliances (e.g., refrigerators, washing machines, televisions), IT equipment (e.g., desktop computers, printers, servers), and communication devices (e.g., routers, modems, landline phones). Additionally, e-waste also includes electronic components, accessories, and peripherals, such as batteries, cables, chargers, and circuit boards. The complexity and diversity of e-waste poses unique challenges for its management and recycling, requiring specialized processes and technologies to ensure effective resource recovery and environmental protection.

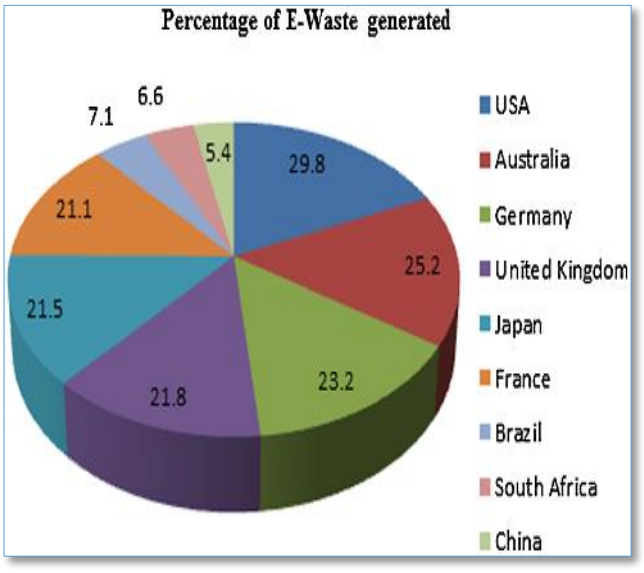
Due to the substantial presence of an unauthorized sector, proper e-waste recycling is critical for the sustainable development of the developing world, as it is directly linked to environmental concerns. The aggregate metric kilotons of electronic waste produced annually in India amount to approximately 1,641. In Maharashtra, specifically the city of Mumbai, produces the most electronic waste of different categories. This is followed by Tamil Nadu, West Bengal, Andhra Pradesh, Delhi, Uttar Pradesh, Karnataka, Gujarat, Madhya Pradesh, and Punjab. Additionally, only 15% of e-waste is generated by individual households; the government, public, and private sectors collectively generate approximately 70% of the total e-waste (Gallagher, 2014).

Figure 2: Types of E-Waste

E-waste generation has emerged as a significant global environmental challenge, driven by the rapid proliferation of electronic devices and technological advancements.

According to recent estimates by the Global E-waste Monitor, the world generated approximately 59.4 million metric tons of electronic waste in 2022, with this figure expected to rise to 74.7 million metric tons by 2030. The escalating consumption of electronic products, coupled with shortening product lifecycles and increasing rates of obsolescence, contributes to the exponential growth of e-waste worldwide. Addressing the complexities of e-waste management requires concerted efforts from governments, industries, and civil society to implement sustainable solutions and promote responsible consumption and disposal practices on a global scale.

Figure 3: Percentage of E-Waste Generated



Against this background, The RCUES of AIILSG, Mumbai undertook a research study on 'Effective E-Waste Management - Potential Road Map for Cities', under its annual research plan. The study is supported by MoHUA GoI.

1.3 Research Methodology:

The type of research methodology adopted for this study is qualitative and analytical, allowing for an in-depth analysis of e-waste management practices across the Indian cities: Pune and Mumbai of Maharashtra state. The research data primarily comprises e-waste data from Indian cities, obtained through both primary and secondary sources.

1.4 Data Collection Method:

Primary data collection involved the use of questionnaires (Annexure 1) and in-person interviews with personnel from Municipal Corporations and officials from the Maharashtra Pollution Control Board (MPCB), Mumbai, Private Service providers in E-waste. Additionally, secondary data sources such as reports, journals, newspapers, and websites were utilized to supplement the primary data and provide comprehensive insights into e-waste management practices.

1.5 Sources of Data Collection:

Primary data collection was facilitated through structured questionnaires (Annexure I) and interviews, enabling direct engagement with key stakeholders involved in e-waste management. Secondary data sources included reports and publications from reputable sources, particularly those provided by the Ministry of Electronics & Information Technology, (MEITy), GoI, as well as various journals, newspapers, and websites focusing on environmental issues and e-waste management.

This study includes a qualitative and analytical research methodology to explore the effectiveness of e-waste management practices in Indian cities. The research data primarily consists of e-waste statistics and information pertaining to Indian cities.

Chapter 2 - E-Waste Literature Review

2.1 What is E-Waste?

Electronic waste (e-waste) has emerged as a significant environmental and health concern globally, fueled by the rapid pace of technological advancement and the resulting obsolescence of electronic devices. Effective management of e-waste is crucial to mitigate its adverse impacts on human health, the environment, and natural resources. This literature review aims to synthesize existing knowledge, policies, and studies on e-waste management, examining both global perspectives and the specific context of India.

Figure 4: What is E-Waste?

Globally, e-waste generation has surged in recent years, driven by increased consumerism, shorter product life cycles, and technological innovations. Studies estimate that around 53.6 million metric tons of e-waste were generated worldwide in 2019 alone. However, effective management of e-waste remains a challenge in many countries due to inadequate infrastructure, limited awareness, and informal recycling practices.

Following are the key issues and challenges associated with se-waste management globally, including:

- **Informal recycling**: A significant portion of e-waste is handled through informal recycling sectors in developing countries, leading to environmental pollution and health hazards.
- **Resource recovery**: E-waste contains valuable materials such as gold, silver, and rare earth metals, yet recycling rates remain low due to inefficient collection and recycling processes.
- **Environmental and health impacts**: Improper disposal and recycling of e-waste contribute to soil and water contamination, as well as exposure to toxic substances such as lead, mercury, and brominated flame retardants.

The European Union has implemented the Waste Electrical and Electronic Equipment (WEEE) Directive, which mandates extended producer responsibility, recycling targets, and eco-design requirements for electronic products. Similarly, Japan has established the Home Appliance Recycling Law, which enforces recycling responsibilities on manufacturers for various home appliances. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal aims to regulate the international movement of e-waste and promote environmentally sound management practices. Additionally, South Korea has introduced the Act on the Promotion of Saving and Recycling of Resources, which includes measures for managing electronic waste effectively.

2.2 E-Waste Management in India:

India stands at a critical juncture in its efforts to address the burgeoning challenge of e-waste management, particularly with the introduction of the new e-waste rules in 2022. As one of the world's fastest-growing economies and a rapidly digitizing society, India is witnessing an unprecedented surge in the consumption and disposal of electronic products. Against this backdrop, the effective management of e-waste has become a paramount concern for policymakers, industry stakeholders, and environmentalists alike.

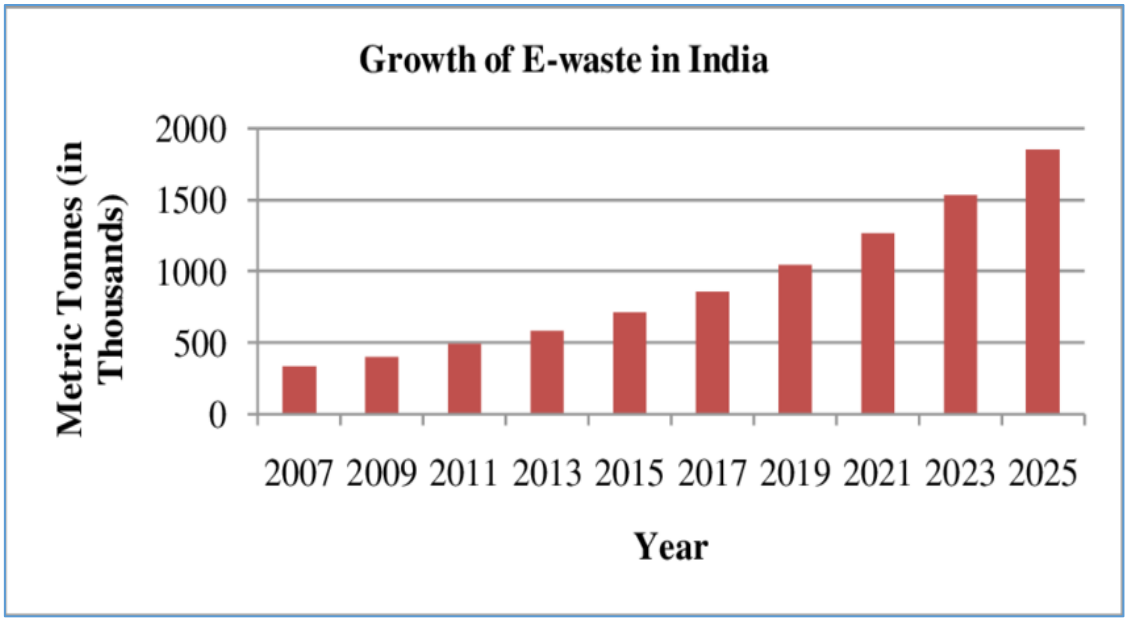
Figure 5: Most common E-Waste

India confronts issues in handling e-waste because of fast urbanization, a booming consumer electronics market, and an informal recycling sector. According to the Central Pollution Control Board (CPCB), India generated more than 10 lakh tons of e-waste in 2019-20, an increase from 7 lakh tones in 2017-18. The most common types of e-waste are waste circuit boards, old cable wires and old radiators. Against this, the e-waste dismantling capacity has not been increased from 82 lakh tones since 2017-18 (CPCB 2020).

In 2018, the Ministry of Environment, Forests & Climate Change (MoEFCC), GoI had told the tribunal that 95% of e-waste in India is recycled by the informal sector and scrap dealers unscientifically dispose of it by burning or dissolving it in acids. In 2019, the country generated around 3.2 million metric tons of e-waste, ranking as the world's third-largest generator. However, India's e-waste management infrastructure is undeveloped, with large gaps in collection, recycling, and disposal operations. India's rapid economic expansion and rising consumption have resulted in an increase in e-waste output, creating serious environmental and health dangers. To address this issue, India adopted the E-Waste Management Rules in 2016, which were later revised in 2018, and 2021. These guidelines seek to create a regulatory framework for the ecologically responsible handling of e-waste throughout its lifecycle, from generation to disposal (Annexure 2).

The growth of e-waste in India, as illustrated in the Graph 1, has been exponential over the past two decades, reflecting the country's rapid technological advancement and increasing consumerism. According to estimates from the Central Pollution Control Board (CPCB 2020), e-waste generation in India has witnessed a significant rise from approximately 1.5 million metric tons in 2007 to an estimated 3.5 million metric tons in 2025.

Graph 1: Growth of E-waste in India



This surge in e-waste generation can be attributed to factors such as the expanding middle class, rising disposable incomes, and the widespread adoption of electronic devices across various sectors, including telecommunications, information technology, and consumer electronics. As India continues to undergo socio-economic development and urbanization, the challenge of managing e-waste sustainably becomes even more critical, necessitating proactive measures to address this growing environmental concern.

Government of India's Key Provisions on the E-Waste Rules:

1. Extended Producer Responsibility (EPR): EPR is a policy framework that holds manufacturers, importers, and brand owners accountable for managing the environmental impacts of their products, including their end-of-life disposal, within Indian cities. The concept recognizes that producers have a significant role to play in mitigating the environmental consequences of their goods throughout the product lifecycle.

Figure 6: What is EPR?

In the context of Indian cities, where rapid urbanization and increasing consumption patterns contribute to mounting waste management challenges, EPR serves as a critical tool for shifting the burden of waste management away from municipal authorities and onto the shoulders of those who produce goods. By incentivizing manufacturers to design products that are easier to recycle, reuse, or safely dispose of, EPR aims to promote resource conservation, reduce pollution, and enhance the efficiency of waste management systems in Indian urban areas. Through the implementation of EPR initiatives, Indian cities can work towards achieving more sustainable consumption and production patterns, ultimately contributing to the overall environmental well-being of urban communities.

2. Collection Targets: Producers are required to collect a certain percentage of the e-waste generated from their products, based on sales data and historical collection rates. These targets are periodically revised to encourage greater participation in e-waste management.

3. E-Waste Management Authorities: State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) are designated as the nodal agencies responsible for enforcing the e-waste rules at the state level and granting authorizations to e-waste recyclers and dismantlers.

4. Authorized E-Waste Handlers: The rules specify criteria for authorizing e-waste recyclers and dismantlers, ensuring compliance with environmental standards and worker safety regulations.

5. Awareness and Capacity Building:

The E-Waste Rules, 2016 emphasize the importance of public awareness and capacity building initiatives to promote responsible e-waste management practices among stakeholders, including producers, consumers, and recyclers.

2.4 Implementation Challenges and Opportunities:

Despite the regulatory framework provided by the e-waste rules, several challenges persist in the effective implementation of e-waste management in India:

Informal Sector Dominance: A significant portion of e-waste recycling in India is carried out by the informal sector, which operates outside the regulatory framework, leading to environmental pollution and health hazards.

Infrastructure Constraints: Limited infrastructure for e-waste collection, segregation, and recycling, particularly in smaller cities and rural areas, hampers formal e-waste management efforts.

Enforcement and Compliance: There is a need for greater enforcement of the e-waste rules and monitoring of compliance among producers, recyclers, and consumers to ensure adherence to regulatory requirements.

2.5 Swachh Bharat Mission (SBM) 2.0 and E-Waste Management:

The Swachh Bharat Mission (SBM) 2.0, launched in October 2021, aims to accelerate efforts towards achieving universal sanitation and cleanliness in India. While the primary focus of SBM is on solid waste management, including household and municipal waste, e-waste management is also integrated into the mission's objectives.

Figure 7: Swachh Bharat Mission 2.0

Integration of E-Waste Management into SBM 2.0:

1. Citizen Awareness: SBM 2.0 emphasizes the importance of public awareness and behavior change campaigns to promote responsible waste management practices, including segregation of e-waste at source.

2. Infrastructure Development: The mission allocates funds for the development of waste management infrastructure, including e-waste collection centers, material recovery facilities, and recycling units, to enhance the formal e-waste management ecosystem.

3. Stakeholders Engagement: SBM 2.0 encourages multi-stakeholder collaborations and partnerships to leverage resources and expertise for effective e-waste management, involving government agencies, industries, civil society organizations, and the citizen.

4. Digital Solutions: The mission promotes the use of digital technologies and platforms for monitoring and tracking e-waste management operations, enhancing transparency, and accountability in the process.

In response to the escalating e-waste problem, India has enacted several policy initiatives and regulatory frameworks. The E-Waste Management Rules, 2016, introduced extended producer responsibility, collection targets, and environmentally sound recycling standards for e-waste management. Furthermore, the SBM emphasizes cleanliness and waste management, including e-waste, at the city level.

E-waste management is a complex and multifaceted issue that requires concerted efforts from governments, industries, and civil society to address effectively. While global initiatives and policy frameworks provide valuable insights, context-specific approaches are needed to tackle the e-waste challenge in India. By leveraging existing knowledge and building on policy interventions, India can move towards sustainable e-waste management practices, safeguarding both public health and the environment.

E-waste management in India is undergoing significant transformation with the implementation of the new e-waste rules and integration into initiatives like the SBM 2.0. While challenges persist, there are also opportunities for innovation, collaboration, and capacity building to create a more sustainable and circular economy for electronic products in India.

By leveraging the regulatory framework provided by the e-waste rules and the holistic approach of SBM 2.0, India can move closer towards achieving its goals of responsible e-waste management, environmental

sustainability, and public health protection. Continued efforts from all stakeholders are essential to overcome existing challenges and realize the vision of a cleaner and greener India.

Chapter 3 - Role of Urban Local Bodies in E-waste Management

Urban Local bodies (ULBs) play a crucial role in e-waste management, as they are responsible for implementing policies, coordinating collection efforts, ensuring proper disposal, and raising awareness among citizens. The Maharashtra Pollution Control Board (MPCB) plays a crucial role in regulating and monitoring e-waste management activities within the state. MPCB implements and enforces e-waste management policies and regulations, conducts inspections of e-waste handling facilities, and collaborates with municipal authorities and other stakeholders to ensure compliance with environmental standards.

The ULBs encompass various stages of the e-waste management process:

1. Policy Implementation: ULBs are tasked with implementing national and regional policies related to e-waste management. This includes enforcing regulations such as extended producer responsibility (EPR), collection targets, and environmentally sound disposal practices as outlined in the E-Waste (Management) Rules, 2016.

2. Segregation and Collection: ULBs are responsible for setting up collection centers and organizing e-waste collection drives in collaboration with stakeholders. In Mumbai, the Brihanmumbai Municipal Corporation (BMC) implements the e-waste collection initiatives. BMC has established multiple e-waste collection centers across the city to facilitate the proper disposal and recycling of electronic waste. Similarly, Pune Municipal Corporation (PMC) has set up designated e-waste bins and collection points as part of their waste management strategy. These initiatives aim to reduce the environmental impact of e-waste and promote sustainable urban living. They oversee the segregation of e-waste at source to ensure proper categorization and minimize contamination. They facilitate the segregation of e-waste at source, encouraging households, businesses, and industries to separate electronic items from regular waste for proper disposal and recycling.

3. Transportation and Logistics: ULBs manage the transportation of collected e-waste to authorized recycling or disposal facilities. They ensure compliance with transportation regulations and coordinate logistics to streamline the movement of e-waste from collection points to treatment facilities.

4. Recycling and Treatment: ULBs collaborate with authorized e-waste recyclers and treatment facilities to process collected e-waste in an environmentally sustainable manner. They monitor the recycling process to ensure compliance with regulatory norms and the use of safe and efficient recycling techniques. They encourage the adoption of innovative technologies for e-waste recycling and resource recovery, promoting a circular economy approach.

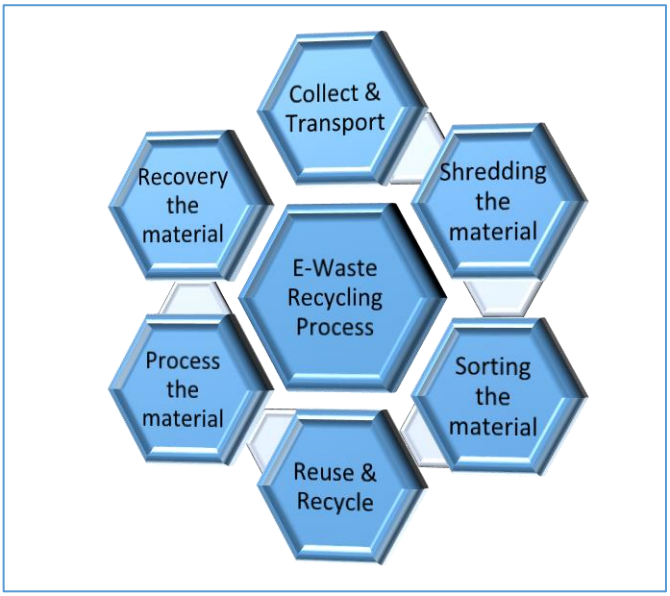


Figure 8: E-Waste Recycling Process

5. Enforcement and Compliance: ULBs enforce e-waste regulations and monitor compliance among producers, consumers, and recyclers. They conduct regular inspections of e-waste handling facilities to ensure adherence to environmental and safety standards, taking enforcement actions against violators as necessary. They act against unauthorized e-waste collectors, recyclers, and disposers to prevent illegal dumping and ensure environmental protection.

6. Collaboration and Stakeholders Engagement: ULBs foster collaboration with relevant stakeholders, including government agencies, industry associations, non-governmental organizations (NGOs), and the informal sector.

They engage in dialogue, partnerships, and capacity-building initiatives to strengthen the e-waste management ecosystem and promote inclusive participation.

7. Public Awareness and Education: ULBs conduct awareness campaigns and educational programs to inform citizens about the importance of e-waste management, the hazards of improper disposal, and the benefits of recycling. These initiatives aim to promote behavioral change and encourage responsible e-waste disposal practices. They organize workshops, seminars, and awareness campaigns to educate people about e-waste management practices, including segregation at source and proper disposal methods.

8. Stakeholder Engagement: Local bodies engage with stakeholders such as residents, businesses, industries, NGOs, and government agencies to foster collaboration and partnership in e-waste management efforts. They facilitate dialogue and consultation forums to address stakeholder concerns, gather feedback, and mobilize support for e-waste initiatives.

Overall, local bodies play a pivotal role in ensuring the effective management of e-waste within their communities, contributing to environmental sustainability, public health protection, and resource conservation. In developed nations, for instance, more efficient collection and recycling rates for electronic waste have resulted from the implementation of innovative, advanced recycling technology (Table 1).

Table 1. E-waste rules and regulation, recycling rate and technology in India and some other countries

	INDIA	EUROPEAN UNION	USA
Regulation	E-waste (Management) Rules, 2016	Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU & Restriction of Hazardous Substances Directive (RoHS) 2011/65/EU	Resource Conservation and Recovery Act (RCRA), 1976 Environmental Protection Agency (EPA) Cathode Ray Tube Rules
Main recycling approach	Mechanical technology (including manual dismantling)	Advance mechanical technology/ smelter technology	Advanced mechanical technology, pyro-metallurgical smaller scale using hydrometallurgical technology
Recycling rate	**'438085.62 MTA' (2016) 5% (2011)**	**42% (2022)**	**40% (2013)**

Source: **E.R.I. (2022). Countries with E-Waste Legislation in 2022.**

3.1 Current E-waste legislations:

India, with its burgeoning population and rapid technological advancement, confronts a formidable challenge in managing the escalating volume of e-waste generated across the country. The exponential growth of e-waste

underscores the critical need for robust regulatory frameworks and proactive measures to ensure effective management and environmental sustainability. In response to this pressing issue, India introduced a new e-

waste policy in 2022, signaling a paradigm shift towards stringent regulations aimed at addressing the challenges of e-waste management.

Under the new policy, businesses operating in India's electronic sector are mandated to adhere to ambitious e-waste recycling targets, with a minimum requirement of recycling 80% of their e-waste by 2025. To facilitate a gradual transition towards this target, interim goals have been set, requiring businesses to recycle at least 60% by 2023 and 70% by 2024. Non-compliance with these targets will incur penalties in the form of "Environment Compensation," thereby incentivizing adherence to recycling obligations and promoting accountability among stakeholders.

Illustrating the practical implications of these regulations, several Indian states and municipalities have implemented innovative e-waste management initiatives. For instance, the city of Pune and Bengaluru has established dedicated e-waste collection centers and partnered with authorized recyclers to facilitate the proper disposal and recycling of electronic devices. Similarly, Mumbai has introduced awareness campaigns to educate citizens about the importance of responsible e-waste disposal and the availability of collection points across the city.

Figure 9 : E-Waste Collection Centre, Pune

Furthermore, India's exploration of the "right to repair" framework exemplifies its commitment to promoting consumer empowerment and sustainability in e-waste management. By granting consumers the freedom to repair electronic devices independently or seek repair services from third-party providers, India aims to extend the lifespan of electronic products and minimize their environmental footprint. This initiative aligns with the principles of a circular economy, where products are reused, repaired, and recycled to maximize resource efficiency and reduce waste generation.

In tandem with regulatory measures, the Ministry of Environment, Forest and Climate Change (MoEFCC), GoI has enacted the 'E-waste Management Rules 2021,' which underscore the concept of Extended Producer Responsibility (EPR). These rules mandate manufacturers to take responsibility for the entire lifecycle of their products, including collection, recycling, and environmentally sound disposal of e-waste. To enforce compliance with these regulations, India has established monitoring mechanisms and designated enforcement agencies tasked with ensuring adherence to e-waste management guidelines.

Moreover, recognizing the need for innovative solutions to address e-waste challenges, India has explored the integration of mobile recycling facilities into its e-waste management strategies. These mobile units, equipped with advanced pre-processing technology, aim to streamline e-waste collection and processing, particularly in remote or underserved areas. By leveraging mobile recycling facilities, India seeks to enhance its capacity for e-waste recycling and extend the reach of sustainable e-waste management practices across diverse geographical regions.

In conclusion, India's proactive approach towards e-waste management exemplifies its commitment to environmental sustainability and responsible resource management. Through a combination of stringent regulations, innovative initiatives, and stakeholder collaboration, India is poised to address the complex challenges posed by e-waste while fostering a culture of sustainability and environmental stewardship. By embracing circular economy principles and harnessing the potential of technology and policy innovation, India can pave the way for a greener and more sustainable future.

Chapter 4 - Research Findings

Following the insightful interviews with the Regional Officer of the Maharashtra Pollution Control Board (MPCB), several critical information was gathered regarding the current e-waste scenario in Pune City. The discussion revolved around the challenges faced in e-waste management, particularly concerning dismantling and segregation by various handlers, notably the informal sector. An emphasis was placed on the significance of data protection in e-waste management, highlighting the need for stringent measures, especially in the digital age. The implementation of collection drives equipped with crushers to ensure the immediate destruction of hard disks was underscored as a crucial step in safeguarding sensitive data.

However, it was acknowledged that infrastructural inadequacies, particularly in heavy metal dismantling, remain a significant hurdle. Despite efforts to collect e-waste through mobile vans with crushers, there is a pressing need for improved infrastructure to facilitate proper dismantling and processing. Additionally, the meeting shed light on the significant volumes of e-waste generated, with examples cited of households contributing substantial amounts, necessitating effective segregation and subsequent processing.

Furthermore, discussions revealed potential collaborations with foreign entities, such as Korean and Japanese partners, showcasing interest in contributing their technological expertise to e-waste management efforts in Maharashtra. Despite the existence of comprehensive e-waste rules, the challenge lies in the effective implementation by authorized agencies, with instances of illegal activities observed in e-waste collection and processing. Notably, concerns were raised regarding the lack of provisions for recycling lithium batteries and solar panels, despite their increasing prevalence in electronic devices and vehicles.

In conclusion, the meeting and visits to e-waste collection sites in Pune and Pimpri Chinchwad Municipal Corporations highlighted the urgency for comprehensive infrastructural development, stringent enforcement of regulations, and collaborative partnerships to address the multifaceted challenges of e-waste management in Pune City and beyond. It underscored the need for holistic approaches, from collection to processing, to ensure environmentally sustainable practices and mitigate the adverse impacts of e-waste on public health and the environment.

Figure 10 : Pune Swachh Reuse Recycle Centre

In recent years, the exponential growth of e-waste has emerged as a pressing environmental and public health concern, particularly in the urban areas of India. As the country undergoes rapid industrialization, urbanization, and digitalization, the proliferation of electronic devices and gadgets has contributed to a surge in e-waste generation.

Against this backdrop, the need for effective e-waste management strategies has become increasingly urgent to mitigate the adverse environmental and social impacts associated with improper disposal and recycling of electronic products. This research endeavors to explore and analyze the current state of e-waste management in Indian urban areas, shedding light on key trends, challenges, and opportunities for enhancement of potential road map for cities. Through a comprehensive examination of e-waste generation, composition, collection rates, recycling efficiency, policy frameworks, public awareness, and engagement, this study aims to provide valuable insights that can inform policy formulation, industry practices, and community interventions to promote sustainable e-waste management practices and foster a circular economy in India.

1. Trends in E-Waste Generation:

The Central Pollution Control Board (CPCB) has highlighted a concerning trend in the escalating generation of electronic waste (e-waste) within urban areas of India. This surge in e-waste generation, observed between 2015 and 2020, underscores the growing digitalization and consumption of electronic devices across the country. Factors contributing to this trend include rising disposable incomes, technological advancements leading to shorter product lifecycles, and the proliferation of electronic gadgets in both residential and commercial sectors.

2. E-Waste Composition:

A detailed examination of e-waste composition within Indian urban areas reveals a complex mix of discarded consumer electronics, including obsolete appliances, mobile phones, and computers. Mobile phones emerge as the primary contributors, constituting nearly 40% of the total e-waste generated (CPCB 2022). The ubiquitous presence of smartphones and their rapid turnover due to technological obsolescence significantly contributes to this dominance. Computers and peripherals follow closely, representing 25% of e-waste, while domestic appliances such as refrigerators, washing machines, and televisions contribute 15% (UNU, 2022).

3. E-Waste Collection Units under ULB Initiatives:

Mumbai and Pune have taken significant strides in managing e-waste through initiatives implemented by their respective Urban Local Bodies (ULBs). The Brihanmumbai Municipal Corporation (BMC) and Pune Municipal Corporation (PMC) have set up dedicated e-waste collection units to streamline the process of e-waste management. These units are strategically located to ensure accessibility and convenience for residents, promoting responsible disposal of electronic waste.

In Mumbai, BMC has established several e-waste collection centers across the city, making it easier for citizens to dispose of their e-waste properly. These centers are equipped with the necessary facilities to safely handle and store e-waste before it is transported to authorized recycling units. Similarly, in Pune, PMC's initiatives include the setup of Swachh Reuse Recycle Centers that not only collect e-waste but also focus on refurbishing and reusing electronic items, thereby extending their lifecycle and reducing waste generation. Both BMC and PMC have also launched awareness campaigns to educate the public about the importance of proper e-waste disposal and the environmental and health hazards posed by improper handling of e-waste. These initiatives reflect a proactive approach by the ULBs in Mumbai and Pune to address the growing e-waste challenge and promote sustainable urban living.

Despite concerted efforts to bolster e-waste collection infrastructure, collection rates remain distressingly low across many Indian cities. The current estimate suggests that only a fraction, approximately 20%, of the total e-waste generated is collected through authorized channels. This deficiency in collection rates is attributed to a myriad of challenges, including inadequate awareness among citizens, logistical constraints, fragmented collection systems, and the prevalence of informal e-waste recycling networks that operate outside regulatory frameworks.

4. Recycling Efficiency:

A closer examination of recycling efficiency exposes disparities in the recovery rates of different materials within e-waste streams. While precious metals such as gold, silver, and platinum boast impressive recovery rates exceeding 90%, the recovery rates for hazardous substances and plastics lag significantly behind, averaging around 30%. The discrepancy in recovery rates is primarily attributed to technological limitations and logistical hurdles associated with the dismantling and processing of complex electronic products.

5. Policies Regarding E-Waste Management and Compliance:

The landscape of e-waste management policies and regulatory compliance in Indian cities exhibits notable variations in enforcement and implementation. While certain municipalities have successfully implemented

EPR schemes and stringent regulations to regulate e-waste management practices, others grapple with challenges stemming from limited institutional capacity, resource constraints, and enforcement gaps. The absence of uniformity in policy implementation underscores the need for concerted efforts to harmonize regulations and strengthen enforcement mechanisms nationwide.

6. Public Awareness and Community Engagement:

International Telecommunication Union (2023) studies conducted among residents highlight a growing awareness of e-waste issues in Indian urban areas, with approximately 70% expressing a willingness to dispose of electronic devices responsibly. Despite this encouraging trend, tangible participation in e-waste recycling programs remains disappointingly low, with only 30% of respondents actively engaging in collection campaigns or recycling initiatives. The gap between awareness and action underscores the need for targeted education and outreach efforts to mobilize citizens towards sustainable e-waste management practices.

Figure 11: Awareness campaign by AIILSG

7. Obstacles and Prospects:

Several obstacles pose formidable challenges to the efficient management of electronic waste in Indian urban areas. These include inadequate infrastructure for e-waste collection and recycling, the prevalence of informal e-waste recycling networks operating outside regulatory frameworks, and limited recycling capabilities for certain materials. However, amidst these challenges lie opportunities for improvement. Embracing technological solutions for e-waste tracking and tracing, promoting circular economy initiatives to encourage product reuse and remanufacturing, and fostering stronger public-private partnerships are potential avenues for enhancing e-waste management practices in Indian cities.

4.1 Key Analysis of 2023 E-waste Data:

- In 2023, electronic waste amounted to approximately 6.5 million tons (MT), representing a growth of about 15% over a span of five years.
- The continent of Asia produced the most e-waste, totaling around 26.0 MT, followed by the Americas with 13.8 MT, and Europe with 12.6 MT. Oceania and Africa produced 0.8 MT and 3.1 MT, respectively.
- Most of the electronic waste comprised both sizable and small devices, including monitors, displays, lamps, telecommunication equipment, and temperature exchange equipment.
- In 2023, less than 17% of electronic waste was collected and recycled. An estimated USD 60 billion worth of high-value, recoverable materials, including platinum, gold, silver, copper, and palladium, were primarily disposed of by landfilling or incineration rather than being collected for treatment and reuse.
- India is now among the 83 countries that have implemented national e-waste policies, laws, or regulations, up from 78. The International Telecommunication Union's goal of increasing the proportion of nations with e-waste legislation to 50% is still progressing slowly (International Telecommunication Union, 2023).

Chapter 5 – Policy Recommendations

5.1 Potential Roadmap for improving E-waste management in Indian cities –

Following the research findings and analysis of critical insights into the current state of e-waste management in urban areas of India, highlighting significant trends, challenges, and opportunities for improvement. A potential roadmap can be drawn for the Indian cities by leveraging data-driven insights and adopting a collaborative, multi-stakeholder approach, with the policymakers along with the industrialists, and civil society. *A roadmap towards sustainable e-waste management practices:* Through concerted efforts and strategic interventions, India can mitigate the environmental impacts of e-waste, promote resource recovery, safeguard public health and environmental quality for future generations.

Highlights of the strategic E-waste management roadmap:

1. Policy Framework Enhancement:

Amendment and Strengthening of E-Waste Rules: Review and update the E-Waste (Management) Rules to address emerging challenges and incorporate best practices in e-waste management. Incorporate E-Waste Management in Urban Planning: Integrate e-waste management considerations into city development plans, including zoning regulations, waste management infrastructure design, and sustainable procurement practices.

EPR Enforcement: Strict enforcement of EPR provisions to ensure producers bear responsibility for collection, recycling, and safe disposal of e-waste from their products.

Incentives and Penalties: Introduce incentives for compliance with e-waste regulations and impose penalties for non-compliance, encouraging adherence to environmentally sound practices.

2. Infrastructure Development:

Establishment of Collection Centers: Set up decentralized e-waste collection centers in urban and semi-urban areas to facilitate convenient disposal for residents and businesses.

Material Recovery Facilities (MRFs): Invest in MRFs equipped with advanced technologies for efficient sorting, dismantling, and recycling of e-waste components.

Capacity Building: Provide training and capacity-building programs for municipal staff, recyclers, and informal sector workers to enhance skills and knowledge in e-waste management.

3. Public Awareness and Education:

Launch multimedia campaigns to educate citizens about the importance of proper e-waste disposal, the hazards of informal recycling, and the benefits of recycling and resource recovery.

School and Community Programs: Integrate e-waste management education into school curricula and organize community workshops to raise awareness and promote behavioral change.

4. Stakeholder Engagement and Collaboration:

Public-Private Partnerships (PPP): Foster collaboration between government bodies, industry stakeholders, NGOs, and community organizations to develop and implement e-waste management initiatives.

Engagement with Informal Sector: Formalize and integrate informal e-waste recyclers into the formal recycling ecosystem through training, capacity building, and recognition of their role in waste management.

Figure 12 : Aundh (Pune) Swachh Reuse Recycle Centre

5. Research and Innovation:

Support data-driven research and innovation in e-waste management technologies and processes. Allocate resources for research institutions, universities, and start-ups to develop innovative solutions for e-waste recycling, resource recovery, and circular economy initiatives.

Learn from global examples such as **the "Urban Mining Innovation Centre"** in Belgium, Europe, which focuses on developing advanced techniques for recovering valuable materials from e-waste, contributing to sustainable resource management and economic growth. Technology Adoption: Encourage research and innovation in e-waste recycling technologies, including advanced separation techniques, resource recovery methods, and circular economy approaches. Also, supporting pilot projects to test innovative e-waste management solutions and assess their feasibility and scalability in real-world settings.

The following cities exemplify how innovative approaches, and the integration of technology can enhance e-waste management practices, making them more efficient, sustainable, and community-focused:

i. **Bengaluru:** The city has pioneered the use of IoT (Internet of Things) for real-time monitoring of e-waste collection and processing. The initiative aims to enhance the efficiency and transparency of e-waste management operations.
ii. **Hyderabad:** The Telangana government has partnered with private enterprises to establish e-waste recycling hubs equipped with advanced technologies for resource recovery and safe disposal. These hubs also focus on generating employment opportunities for the local population.
iii. **Chennai:** The Greater Chennai Corporation has introduced a mobile application that enables residents to schedule e-waste pickups, track the disposal process, and receive information on e-waste management practices. This app has significantly improved citizen participation in e-waste recycling efforts.

6. Monitoring and Evaluation:

Statistics in the public domain indicate that India ranks third in terms of e-waste generation, following the United States and China. Improving the implementation of e-waste collection, processing, and recycling will be facilitated by broadening the definition of electronic waste and electronic equipment, specifying the recycling objective with an appropriate implementation mechanism, and elucidating the penalties for violations of Rule 2022. The potential regulation of e-waste collection centers, producer responsibility organizations, and dealers under Rule 2022 could have been considered to foster a thriving recycling market, given the substantial role they also fulfil.

7. Continuous Review and Adaptation:

Periodic Review: Conduct regular reviews of e-waste management policies, programs, and outcomes to identify areas for improvement and adaptation to changing circumstances. Flexibility and Innovation: Embrace flexibility and innovation in policy implementation, allowing for experimentation and adjustment based on evolving needs and technological advancements.

This roadmap provides a comprehensive framework for enhancing e-waste management in Indian cities, emphasizing the importance of policy coherence, infrastructure development, stakeholder engagement, innovation, and continuous monitoring and evaluation. Implementation of these strategic policies and actionable steps can contribute to building a sustainable and circular economy for electronic products, while minimizing environmental and health risks associated with e-waste.

5.2 Key Actionable Steps:

- **Planning and Scheduling:** ULBs should develop a schedule for organizing periodic e-waste collection drives across different neighborhoods and commercial areas within the city.
- **Regular Collection Drives:** Implement regular collection drives to encourage the proper disposal of e-waste by residents and businesses, thereby reducing illegal dumping and promoting recycling efforts.
- **Public Awareness Campaigns:** Conduct comprehensive awareness campaigns through various channels such as social media, local newspapers, community events, and educational institutions to inform residents and businesses about the importance of e-waste recycling and the dates and locations of upcoming collection drives.
- **Collaboration with Stakeholders:** Collaborate with local NGOs, educational institutions, businesses, and e-waste recycling firms to facilitate the logistics of collection drives, including transportation, sorting, and recycling of collected e-waste.
- **Accessibility and Convenience:** Ensure that collection points are conveniently located and easily accessible to residents and businesses. Consider establishing multiple collection points across different areas of the city to maximize participation.
- **Monitoring and Evaluation:** Implement mechanisms to monitor the effectiveness of collection drives, including tracking the volume of e-waste collected, participation rates, and feedback from participants. Evaluate the success of each drive and make necessary adjustments for future iterations.
- **Legal and Regulatory Compliance**: Ensure compliance with relevant laws, regulations, and guidelines governing the collection, transportation, and disposal of e-waste, including obtaining necessary permits and adhering to environmental and safety standards.

5.3 How to Develop Effective Strategies for E-Waste Management in Indian Cities?

E-waste has emerged as a significant environmental challenge globally, with India being one of the largest generators of electronic waste. According to recent data from the Global E-waste Statistics Partnership (GESP), India generated approximately 3.5 million metric tons of e-waste in 2025, representing a significant increase from previous years. The exponential growth of e-waste in Indian cities underscores the urgent need for comprehensive strategies and action plans to address this pressing issue.

1. Public Awareness and Education:

Data analysis from Indian cities reveals a lack of awareness among residents and businesses about the proper disposal of e-waste. Implement targeted public awareness campaigns utilizing data-driven insights to educate the public about the environmental impacts of e-waste and promote responsible disposal practices.

Global examples, such as the "Recycle My Electronics" campaign in Canada and the "E-Waste Challenge" in Singapore, demonstrate the effectiveness of public education initiatives in increasing e-waste recycling rates and reducing illegal dumping.

Figure 13: Awareness Campaigns

2. Establishment of Collection Infrastructure:

Analyze e-waste collection data from Indian cities to identify gaps in infrastructure and service coverage. Develop a network of designated e-waste collection centers strategically located across urban areas to facilitate convenient and accessible disposal for residents and businesses.

Learn from global best practices, such as the EPR schemes in European countries, where manufacturers are mandated to establish collection systems for end-of-life electronics, leading to increased collection rates and recycling efficiencies.

Figure 14: Collection Camp

3. Incentivize E-Waste Recycling:

Utilize data analysis to assess the effectiveness of existing incentive programs and identify opportunities for improvement. Implement incentive-based schemes, such as deposit-refund systems or tax incentives, to encourage individuals and businesses to recycle their e-waste.

Draw inspiration from successful models like the "Cash for Trash" program in Taiwan, which offers financial incentives for recycling e-waste, resulting in higher collection rates and reduced environmental pollution.

4. Public-Private Partnerships (PPP):

Analyze data on PPP initiatives in e-waste management from Indian cities to evaluate their effectiveness and scalability. Foster collaboration between government agencies, private sector companies, and civil society organizations to leverage resources and expertise in implementing e-waste management initiatives.

Emulate successful PPP models from countries like Japan, where public-private partnerships have led to the development of advanced e-waste recycling technologies and infrastructure, resulting in high recycling rates and resource recovery.

5. Regulatory Compliance and Enforcement:

Analyze regulatory frameworks and enforcement mechanisms in Indian cities to identify gaps and areas for improvement. Strengthen enforcement of e-waste regulations through stringent monitoring, regular inspections, and penalties for non-compliance.

Take inspiration from countries like South Korea, where strict enforcement of e-waste regulations has led to significant improvements in collection rates and recycling efficiencies, driving the growth of a robust e-waste management industry.

By adopting a comprehensive approach informed by data analysis and leveraging global best practices, Indian cities can develop effective strategies and action plans for e-waste management. These efforts are crucial not only for mitigating environmental pollution and health hazards but also for promoting sustainable development and a circular economy for electronic products.

Subsequently, an enhanced e-waste management in India can also be approached by promoting formal recycling, the Indian government has introduced E-waste Recycling Credits (ERCs) for organizations that channel e-waste to approved recycling centers. The E-Waste Rules classify e-waste categories, which could be linked to ERC rewards. Organizations could earn ERCs based on the type of e-waste supplied, using these credits to offset energy bills. This initiative aims to encourage informal sector businesses to formalize their operations and establish links with certified recycling centers.

ERCs could be piloted in major cities like Mumbai, Pune, Delhi and Bangalore, where government and industrial sectors generate over 70% of e-waste. The government could also co-fund infrastructure upgrades at existing recycling centers and incentivize the creation of new units through public-private partnerships. State governments might develop grant schemes to help small informal recycling centers upgrade to meet environmental and safety standards.

Improving recycling efficiency requires deploying mature recycling technologies alongside existing manual methods. India's extensive plastics processing sector, for instance, could be leveraged to recycle plastics from

e-waste more effectively. The government could promote joint ventures between international and domestic companies to establish large industrial e-waste recovery plants, funded through a mix of private and public investment.

As new electronic devices enter the market, the composition of e-waste changes, necessitating investment in R&D for innovative recycling technologies. For instance, the surge in smartphone usage in India highlights the need for recycling lithium-ion batteries, which current rules do not adequately cover.

The Indian government should support research into future-oriented recycling technologies that can transform new e-waste streams into high-value products. This proactive approach would ensure that India's e-waste management policies and practices remain effective and sustainable in the face of rapidly evolving technology.

Chapter 6 - Way Forward

Effective e-waste management is critical to mitigating environmental hazards and promoting sustainability in Indian cities. This chapter outlines a comprehensive way forward for improving e-waste management by focusing on strengthening regulatory frameworks, incentivizing sustainable practices, increasing public awareness and engagement, and enhancing infrastructure and stakeholder collaboration.

Figure 15 : Recycle E-Waste

The introduction of the new e-waste management regulations in 2022 offers India a substantial opportunity to transition towards a circular economy model for managing e-waste. A circular economy approach prioritizes sustainable resource utilization through the reduction, reuse, and recycling of materials to minimize waste generation and environmental impact. Given the emergence of e-waste as a significant environmental concern, integrating circular economy principles into e-waste management strategies is imperative. By broadening the scope of the E-Waste (Management) Rules, 2016 to encompass informal sector workers and cooperatives, India can leverage the potential of the informal sector to promote a circular economy for e-waste. Actively involving informal sector workers in e-waste collection, dismantling, and recycling activities not only enhances e-waste management practices but also improves environmental protection, safeguards laborers' health and working conditions, and creates employment opportunities for more than one million individuals engaged in the informal e-waste recycling sector.

1. Strengthening Regulatory Frameworks:

- Formalizing E-Waste Collection:

Creating a comprehensive regulatory framework for e-waste collection is essential. This framework should incorporate mandatory registration and licensing of collection centers and recyclers to formalize and standardize the process. Implementing strict enforcement mechanisms will ensure compliance and accountability.

- E-Waste Tracking and Certification:

Establishing a blockchain-based system to track the entire lifecycle of electronic devices can enhance transparency and accountability. Each device would have a digital certificate recording its manufacturing, ownership, and disposal history. This system will facilitate better monitoring and control of e-waste management practices.

2. Incentivizing Sustainable Practices:

- E-Waste Tax Credits for Manufacturers:

Implementing a tax credit system that incentivizes electronics manufacturers to design products with extended lifespans and repairability features is crucial. This approach aims to promote eco-friendly design practices while discouraging planned obsolescence, ultimately reducing the volume of e-waste generated.

- Economic Instruments:

The EPR policy needs to be rethought to strengthen collection logistics. Economic instruments such as an advanced recycling fee (ARF) or disposal fee on electronic products can fund the development of end-of-life

product markets. The revenue generated can be used to subsidize consumers, fund recyclers, and support informal sector workers through training and social security.

- Public-Private Partnerships (PPPs):

Encouraging collaborations between government agencies and private sector entities can enhance e-waste management infrastructure. PPPs can facilitate the establishment of modern recycling facilities and the development of innovative solutions for e-waste treatment.

3. Increasing Public Awareness and Community Engagement:

- E-Waste ATMs:

Installing E-Waste ATMs in public places can encourage individuals to deposit old electronic devices in exchange for small financial incentives or vouchers for public transportation or essential goods. These ATMs can also feature educational displays to raise awareness about e-waste recycling.

- E-Waste Art and Awareness:

Promoting awareness through art installations made from e-waste can effectively engage the public. Encouraging artists to create sculptures or exhibits in public spaces can visually depict the magnitude of the e-waste problem and emphasize the importance of proper disposal.

- Public Awareness Campaigns:

Increasing public awareness is critical. Producers should be mandated to run awareness campaigns through grassroots organizations. The government should integrate e-waste awareness with other waste streams and conduct research on effective messaging techniques.

4. Enhancing Collection and Recycling Infrastructure:

- Expanding Authorized Collection Centers:

Increasing the number of authorized e-waste collection centers across cities is essential to ensure convenient access for residents. These centers should be equipped with the necessary facilities to safely handle and store e-waste until it is transported to recycling units.

- Upgrading Recycling Facilities:

Investing in advanced recycling technologies and infrastructure can improve the efficiency and effectiveness of e-waste recycling processes. This includes upgrading existing facilities and establishing new ones to handle the growing volume of e-waste.

5. Strengthening Stakeholders Collaboration

- Role of Urban Local Bodies (ULBs):

  ULBs play a crucial role in implementing e-waste management policies at the local level. They are responsible for overseeing e-waste collection, segregation, and recycling processes, as well as conducting public awareness campaigns. Strengthening their capacity through targeted training programs and adequate resource allocation is essential for enhancing their effectiveness in enforcing regulations.

  For instance, in Mumbai and Pune, ULBs have successfully implemented dedicated e-waste collection units that have significantly improved waste management outcomes. In Mumbai, the Brihanmumbai Municipal Corporation (BMC 2023) has established a network of e-waste collection centers that facilitate the proper disposal and recycling of electronic waste. Similarly, the Pune Municipal Corporation (PMC 2023) has set up e-waste collection points and partnered with local recyclers to streamline the process.

These successful models demonstrate the potential for replicating similar e-waste collection units in cities across multiple states. By adopting these best practices and scaling up efforts, other urban centers can improve their e-waste management systems, enhance recycling rates, and reduce environmental impact.

- Engaging Informal Sector Waste Recycle Workers:

Recognizing the informal sector as a key stakeholder in e-waste management is crucial. Integrating informal sector workers into the formal e-waste management system through training and certification programs can improve their working conditions and ensure environmentally sound recycling practices. Providing financial and technical support to these workers can facilitate their transition to the formal sector.

- Facilitating Stakeholder Consultations:

The government should facilitate consultations among various stakeholders, including NGOs, private entities, and registered recyclers, under the Ministry of Environment, Forest, and Climate Change. This will help build trust and identify effective solutions for e-waste management.

Addressing the e-waste challenge requires a multi-faceted approach that integrates regulatory frameworks, technological advancements, public awareness, and stakeholder collaboration. By formalizing e-waste collection, incentivizing eco-friendly designs, introducing innovative solutions like E-Waste ATMs, and promoting educational initiatives, India can pave the way towards a more sustainable and responsible e-waste management system. This roadmap not only aims to mitigate the environmental and health risks associated with e-waste but also seeks to harness its potential for resource recovery, thereby contributing to a circular economy and a greener future for Indian cities. Implementing these strategies will necessitate concerted efforts from government bodies, industries, and the public, underscoring the importance of collective action in achieving long-term sustainability goals.

Implementing these strategies will require concerted efforts from government agencies, industry stakeholders, and the public. By adopting a holistic approach to e-waste management, Indian cities can mitigate the environmental and health risks associated with electronic waste, promote sustainable urban development, and lead the way towards a greener future.

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ANNEXURE I

E-Waste Management Questionnaire for Municipal Corporations

1. General Information:

- Name of the Municipal Corporation:
- Contact Person:
- Position/Title:
- Date of Interview:

2. E-Waste Collection and Quantification:

a. What is the estimated annual quantity of e-waste collected by the Municipal Corporation?

b. How is the e-waste quantified and categorized (by weight, type, source, etc.)?

c. Are there any specific collection points or centres designated for e-waste within the city? If yes, how many and where are they located?

3. Methods of E-Waste Collection:

a. What are the primary methods used for collecting e-waste within the city?

b. Are there any collaborations with private entities or recycling agencies for e-waste collection? If yes, please provide details.

c. How frequently is e-waste collected from households or businesses?

4. E-Waste Disposal and Recycling:

a. What are the primary disposal methods employed for e-waste by the Municipal Corporation?

b. Are there any specialized facilities or units for e-waste recycling or treatment within the city limits?

c. How is the treated or recycled e-waste utilized or disposed of afterward?

5. Challenges and Barriers:

a. What are the major challenges faced by the Municipal Corporation in effectively managing e-waste?

b. Are there any regulatory or infrastructure limitations hindering efficient e-waste management?

c. How does the Municipal Corporation handle hazardous e-waste components during disposal or recycling processes?

6. Policies and Future Plans:

a. Are there existing policies or guidelines specific to e-waste management formulated by the Municipal Corporation?

b. What are the future plans or initiatives does the Corporation have in place to enhance e-waste management within the city?

7. Stakeholder Involvement:

a. How does the Municipal Corporation engage with stakeholders (industries, NGOs, residents) regarding e-waste management?

b. Are there any awareness programs or educational campaigns conducted to promote responsible e-waste disposal?

8. Collaborations and Funding:

a. Are there any collaborations with state or central government bodies for funding or support in e-waste management?

b. How does the Municipal Corporation allocate its budget towards e-waste management activities?

9. Success Metrics and Monitoring:

a. What Key Performance Indicators (KPIs) does the Municipal Corporation use to measure the success of e-waste management efforts?

b. How is the progress in e-waste management monitored and evaluated by the Corporation?

10. Additional Comments or Suggestions:

Is there any additional information or suggestions you would like to provide regarding e-waste management in your Municipal Corporation?

ANNEXURE II

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE NOTIFICATION

Chapter I Preliminary

1. Short title and commencement. - (1) These rules may be called the E-Waste (Management) Rules, 2022.

(2) They shall come into force from the 1st day of April 2023.

2. Application. - These rules shall apply to every manufacturer, producer refurbishers, dismantler and recycler involved in manufacture, sale, transfer, purchase, refurbishing, dismantling, recycling, and processing of e-waste or electrical and electronic equipment listed in Schedule I**,** including their components, consumables, parts and spares which make the product operational but shall not apply to -

(a) waste batteries as covered under the Battery Waste Management Rules, 2022.
(b) packaging plastics as covered under the Plastic Waste Management Rules, 2016.
(c) micro enterprise as defined in the Micro, Small and Medium Enterprises Development Act, 2006 (27 of 2006); and
(d) radio-active waste as covered under the provisions of the Atomic Energy Act, 1962 (33 of 1962) and rules made there under.

3. Definitions. (1) In these rules, unless the context otherwise requires, -

(a) 'Act' means the Environment (Protection) Act, 1986 (29 of 1986).
(b) 'Bulk consumer' means any entity which has used at least one thousand units of electrical and electronic equipment listed in Schedule I, at any point of time in the Financial Year and includes e-retailers.
(c) 'Business' means manufacturing, production, assembling and import of electrical and electronic equipment as listed in Schedule I and refurbishing, recycling, disposal and treatment of e-waste.
(d) 'Component' means one of the parts of a sub-assembly or assembly of which a manufactured product is made up of and into which it may be resolved and includes an accessory or attachment to another component.
(e) 'Consumables' means an item, which participates in or is required for a manufacturing process or for functioning of the electrical and electronic equipment and may or may not form part of end – product and items which are substantially or totally consumed during a manufacturing process shall be deemed to be consumables.
(f) 'Dismantler' means any person or entity engaged in dismantling of used electrical and electronic equipment into their components and having authorization from concerned State Pollution Control Board or Pollution Control Committee as per the guidelines of the Central Pollution Control Board.
(g) 'Disposal and treatment' mean any operation which does not lead to recycling, recovery or reuse and includes physicochemical or biological treatment, incineration and deposition in secured landfill.
(h) 'End-of-life' of the product means the time when the product is intended to be discarded by the user.
(i) 'Environmentally sound management of e-waste' means taking all steps required to ensure that e-waste is managed in a manner which shall protect health and the environment against any adverse effects which may result from such e-waste.
(j) 'Electrical and electronic equipment' means equipment which is dependent on electric current or electro-magnetic field to become functional and also the equipment for the generation, transfer and measurements of the electricity.
(k) 'E-retailer' means an individual or company or business entity that uses an electronic network such as internet, social media, telephone or any other media, to sell its goods.
(l) 'E-waste' means electrical and electronic equipment**,** including solar photo-voltaic modules or panels or cells, whole or in part discarded as waste, as well as rejects from manufacturing, refurbishment and repair processes.
(m) 'Extended producer responsibility' means responsibility of any producer of electrical or electronic equipment as given in Schedule-I for meeting recycling targets as per Schedule-III and Schedule-IV, only through registered recyclers of e-waste to ensure environmentally sound management of

such waste.

(n) 'facility' means any location wherein the process incidental to the collection, reception, storage, segregation, refurbishing, recycling, disposal and treatment of e-waste are carried out.

(o) 'Historical e-waste' means e-waste generated from electrical and electronic equipment as specified in Schedule-I which was available on the date from which these rules come into force.

(p) 'manufacturer' means a person or an entity or a company as defined in the Companies Act, 2013 (18 of 2013) or a factory as defined in the Factories Act, 1948 (63 of 1948) or Small and Medium Enterprises as defined in the Micro, Small and Medium Enterprises Development Act, 2006 (27 of 2006), which has facilities for manufacture of electrical and electronic equipment as specified in Schedule-I.

(q) 'Orphaned products' means non-branded or assembled electrical and electronic equipment as specified in Schedule-I or those produced by a company which has closed its operations.

(r) 'part' means an element of a sub-assembly or assembly including its component, spares or accessory not normally useful by itself and not amenable to further disassembly for maintenance purposes.

(s) 'portal' means the online system developed by the Central Pollution Control Board for the purposes of these rules.

(t) 'producer' means any person or entity who, -

(i) manufactures and offers to sell electrical and electronic equipment and their components or consumables or parts or spares under its own brand; or

(ii) offers to sell under its own brand, assembled electrical and electronic equipment and their components or consumables or parts or spares produced by other manufacturers or suppliers; or

(iii) offers to sell imported electrical and electronic equipment and their components or consumables or parts or spares; or

(iv) who imports used electrical and electronic equipment; irrespective of the selling technique used such as dealer, retailer, e-retailer, etc.

(u) 'recycler' means any person or entity who is engaged in recycling and reprocessing of waste electrical and electronic equipment or assemblies or their components or their parts for recovery of precious, semi-precious metals including rare earth elements and other useful recoverable materials to strengthen the secondary sourced materials and having facilities as elaborated in the guidelines of the Central Pollution Control Board made in this regard.

(v) 'refurbisher' means any person or entity repairing or assembling used electrical and electronic equipment as listed in Schedule-I for extending its working life over its originally intended life and for same use as originally intended and selling the same in the market.

(w) 'Schedule' means the Schedule appended to these rules.

(x) 'spares' means a part or a sub-assembly or assembly for substitution which is ready to replace an identical or similar part or sub-assembly or assembly including a component or an accessory; and

(y) 'target' means the quantity of e-waste to be recycled through registered recycler by the producer in fulfilment of extended producer responsibility.

Chapter II

(2) Words and expressions used in these rules and not defined but defined in the Act shall have the same meanings as respectively, as assigned to them in the Act. **Extended Producer Responsibility Framework**

4. Registration. - (1) The entities shall register on the portal in any of the following category, namely: -

(a) manufacturer.

(b) producer.

(c) refurbisher; or

(d) recycler.

(2) In case any entity falls in more than one category under sub-rule (1), then the entity shall register under those categories separately.

(3) No entity referred to in sub-rule (1) shall carry out any business without registration.

(4) The entities registered under sub-rule (1) shall not deal with any unregistered manufacturer, producer, recycler or refurbisher.

(5) Where any registered entity furnishes false information or willfully conceals information for getting registration or return or report or information required to be provided or furnished under these rules or in case of any irregularity, the registration of such entity may be revoked by the Central Pollution Control Board for a period up to three-years after giving an opportunity to be heard and in addition, environmental compensation charges may also be levied as per rule 22 in such cases.

(6) The Central Pollution Control Board may charge such registration fee and annual maintenance charges from the entities seeking registration under these rules based on capacity of e-waste generated or recycled or handled by them as laid down by the Central Pollution Control Board with the approval of the Steering Committee.

Chapter III - Responsibilities

5. Responsibilities of the manufacturer. – All manufacturers shall have to, -

(1) register on the portal.

(2) collect e-waste generated during the manufacture of any electrical and electronic equipment and ensure its recycling or disposal.

(3) file annual and quarterly returns in the laid down form on the portal on or before end of the month succeeding the quarter or year to which the return relates.

6. Responsibilities of the producer. - The producer of electrical and electronic equipment listed in Schedule I shall be responsible for -

(1) registration on the portal.

(2) obtaining and implementing extended producer responsibility targets as per Schedule-III and Schedule-IV through the portal:

Provided that the producer having extended producer responsibility plan under the provisions of the erstwhile E-Waste (Management) Rules, 2016 shall migrate under these rules as per the procedure laid down by the Central Pollution Control Board with approval of Steering Committee.

(3) creating awareness through media, publications, advertisements, posters or by any other means of communication.

(4) file annual and quarterly returns in the laid down form on the portal on or before the end of the month succeeding the quarter or year to which the return relates.

7. Responsibilities of the refurbisher. – All refurbisher shall have to, -

(1) register on the portal.

(2) collect e-waste generated during the process of refurbishing and hand over the waste to registered recycler and upload information on the portal.

(3) ensure that the refurbished equipment shall be as per Compulsory Registration Scheme of the Ministry of Electronics and Information Technology and Standards of Bureau of Indian Standards framed for this purpose.

(4) file annual and quarterly returns in the laid down form on the portal on or before the end of the month succeeding the quarter or year to which the return relates.

8. Responsibilities of bulk consumer. - Bulk consumers of electrical and electronic equipment listed in Schedule I shall ensure that e-waste generated by them shall be handed over only to the registered producer, refurbisher or recycler.

9. Responsibilities of the recycler. - All recycler shall have to, -

(1) register on the portal.

(2) ensure that the facility and recycling processes are in accordance with the standards or guidelines laid down by the Central Pollution Control Board in this regard from time to time.

(3) ensure that the fractions or material not recycled in its facility is sent to the respective registered recyclers.

(4) ensure that residue generated during recycling process is disposed of in unauthorized treatment storage disposal facility.

(5) maintain record of e-waste collected, dismantled, recycled and sent to registered recycler on the portal and make available all records for verification or audit as and when required.

(6) file annual and quarterly returns in the laid down form on the portal on or before the end of the month succeeding the quarter or year, as the case may be, to which the return relates.

(7) accept waste electrical and electronic equipment or components not listed in Schedule-I for recycling if they do not contain any radioactive material and same shall be uploaded on the portal.
(8) create awareness through media, publications, advertisements, posters or by such other means of communication.
(9) account for and upload information about any non-recyclable e-waste or any quantity which is not recycled and disposed of.
(10) take help of dismantlers for recycling purposes:

Provided that it shall be the responsibility of recycler to ensure proper material flow to and from those dismantlers and the dismantler shall give dismantled material to registered recycler only and maintain record of the same.

10. Responsibilities of State Government or Union territories. - (1) The Department of Industry in the State and Union territory or any other government agency authorized in this regard by the State Government or the Union territory, as the case may be, shall ensure earmarking or allocation of industrial space or shed for e-waste dismantling and recycling in the existing and upcoming industrial park, estate and industrial clusters.

(2) Department of Labor in the State and Union territory or any other government agency authorized in this regard by the State Government or the Union territory shall, -
(a) ensure recognition and registration of workers involved in dismantling and recycling.
(b) assist formation of groups of such workers to facilitate setting up of dismantling facilities.
(c) undertake industrial skill development activities for the workers involved in dismantling and recycling.
(d) undertake annual monitoring and to ensure safety and health of workers involved in dismantling and recycling.

Chapter IV

11. Procedure for storage of e-waste. - Every manufacturer, producer, refurbisher and recycler may store the e-waste for a period not exceeding one hundred and eighty days and shall maintain a record of sale, transfer and storage of e-wastes and make these records available for inspection and the storage of the e-waste shall be done as per the applicable rules or guidelines for the time being in force:

Provided that the Central Pollution Control Board may extend the said period up to three hundred and sixty-five days in case the e-waste needs to be specifically stored for development of a process for its recycling or reuse.

Chapter V

12. Management of solar photo-voltaic modules or panels or cells. –

(1) These rules shall be applicable to solar photo-voltaic modules or panels or cells, subject to the provisions of this chapter.

(2) Every manufacturer and producer of solar photo-voltaic modules or panels or cells shall, -
(i) ensure registration on the portal.
(ii) store solar photo-voltaic modules or panels or cells waste generated up to the year 2034-2035 as per the guidelines laid down by the Central Pollution Control Board in this regard.
(iii) file annual returns in the laid down form on the portal on or before the end of the year to which the return relates up to year 2034-2035.
(iv) ensure that the processing of the waste other than solar photo-voltaic modules or panels or cells shall be done as per the applicable rules or guidelines for the time being in force; ensure that the inventory of solar photo-voltaic modules or panels or cells shall be put in place distinctly on portal.
(v) Comply with standard operating procedure and guidelines laid down by the Central Pollution Control Board in this regard.

(3) Recycler of solar photo-voltaic modules or panels or cells shall be mandated for recovery of material as laid down by the Central Pollution Control Board in this regard.

Chapter VI

13. Modalities of the extended producer responsibility Regime. – (1) All producers shall fulfil their extended producer responsibility obligation as per Schedule-III and Schedule-IV, in doing so they may also take help of third-party organizations such as producer responsibility organizations, collection centres, dealers etc.:

Provided that the extended producer responsibility shall lie entirely with the producer only.

(2) The extended producer responsibility for each product shall be decided based on the information provided by the producers on the portal and the individual product's life period as laid down by the Central Pollution Control Board in this regard and the targets specified in Schedule-III and Schedule-IV.

(3) (i) The producer shall fulfill their extended producer responsibility through online purchase of extended producer responsibility certificate from registered recyclers only and submit it online by filing quarterly return.

(ii) The details provided by the producer and registered recycler shall be cross-checked on the portal.

(iii) In case of any difference, the lower figure shall be considered towards fulfilment of extended producer responsibility obligation of the producer.

(iv) The certificates shall be subject to environmental audit by the Central Pollution Control Board, or any other agencies authorized by the Central Pollution Control Board in this regard.

14. Extended producer responsibility Certificate Generation. – (1) Recycling. - (i) The Central Pollution Control Board shall generate extended producer responsibility certificate through the portal in favour of a registered recycler in the format laid down by it in this regard.

(ii) (a) The quantity eligible for generation of extended producer responsibility certificate shall be calculated by the following formula namely:

$$*Q_{EPR} = Q_p \times C_f$$

**the Q_{EPR} is the quantity eligible for generation of the certificate, Q_p is the quantity of the end product and C_f is the conversion factor (quantity of inputs required for production of one unit of output)*

(b) Conversion factor C_f for each product shall be determined by Central Pollution Control Board with the approval of the steering committee.

(iii) The validity of the extended producer responsibility certificate shall be two years from the end of the financial year in which it was generated, and the expired certificate automatically extinguished after the period unless extinguished earlier as per the provisions of these rules.

(iv) Each extended producer responsibility certificate shall have a unique number containing year of generation, code of end product, recycler code and a unique code and the extended producer responsibility certificates shall be in the denominations of 100, 200, 500 and 1000 kg or such other denominations as may be laid down by the Central Pollution Control Board with the approval of the Steering Committee.

(2) Refurbishing. – (i) The e-waste shall also be allowed for refurbishing and refurbisher shall have to get registered on the portal and based on the data provided, refurbishing certificate shall be generated in favor of a registered refurbisher in the format laid down by it in this regard.

(ii) On production of the refurbishing certificates purchased from the registered refurbishers, the extended producer responsibility of the producers shall be deferred by the duration as laid down by the Central Pollution Control Board for the corresponding quantity of e-waste and shall be added to the extended producer responsibility of the producer upon expiry of the extended life of the refurbished product.

(iii) To incentivise refurbishing, only 75 per cent of the deferred quantity shall be added to the extended producer responsibility of the producer for recycling upon expiry of the extended life of the refurbished product.

Example: **-** If a producer has extended producer responsibility obligation of 100 tons in the year 2023-2024 and he purchases recycling certificate of 60 tons and refurbishing certificate of 40 tons and the concerned item has extended life of five years due to refurbishing.

In this case 60 tons of the extended producer responsibility of the producer shall be achieved in the year 2023-2024 itself and 75 per cent of the reaming 40 ton i.e. 30 tons shall be carried over and added to the extended producer responsibility of that producer for the year 2028-2029 for that item.

(iv) The extended producer responsibility obligation shall be extinguished only after end-of-life disposal through a registered recycler and producing extended producer responsibility certificate and not by refurbishing certificate.

15. Transaction of extended producer responsibility certificates. - (1) A producer may purchase extended producer responsibility certificates limited to its extended producer responsibility liability of current year (Year Y) plus any leftover liability of preceding years plus 5 per cent of the current year liability.

(2) The extended producer responsibility obligation shall have to be fulfilled by the producers by proportionately purchasing extended producer responsibility certificate on quarterly basis.

(3) As soon as the producer purchases extended producer responsibility certificate, it shall be automatically adjusted against its liability and priority in adjustment shall be given to earlier liability and the extended producer responsibility certificate so adjusted shall be automatically extinguished and cancelled.

(4) As soon as the producer purchases refurbishing certificates its extended producer responsibility liability shall be deferred automatically for the relevant quantity of the product, for the duration as laid down by the Central Pollution Control Board.

(5) The availability, requirement and other details of the extended producer responsibility certificate and refurbishing certificates for every producer or recycler or refurbisher shall be made available on the portal.

(6) All the transactions under these rules shall be recorded and submitted by the producers or recyclers on the portal at the time of filing of quarterly returns.

Chapter VII

REDUCTION IN THE USE OF HAZARDOUS SUBSTANCES IN THE MANUFACTURE OF ELECTRICAL AND ELECTRONIC EQUIPMENT AND THEIR COMPONENTS OR CONSUMABLES OR PARTS OR SPARES

16. Reduction in the use of hazardous substances in the manufacture of electrical and electronic equipment and their components or consumables or parts or spares. –

(1) Every producer of electrical and electronic equipment and their components or consumables or parts or spares listed in Schedule I shall ensure that, new electrical and electronic equipment and their components or consumables or parts or spares do not contain Lead, Mercury, Cadmium, Hexavalent Chromium, polybrominated biphenyls and polybrominated diphenyl ethers beyond a maximum concentration value of 0.1 per cent by weight in homogenous materials for lead, mercury, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers and of 0.01 per cent by weight in homogenous materials for cadmium.

(2) Components or consumables or parts or spares required for the electrical and electronic equipment placed in the market prior to the 1st May, 2014 may be exempted from the provisions of sub-rule (1) provided reduction of hazardous substances compliant parts and spares are not available.

(3) The applications listed in Schedule-II shall be exempted from the provisions of sub- rule (1).

(4) Every producer of applications listed in Schedule-II shall ensure that the limits of hazardous substances as given in Schedule-II are to be complied with.

(5) Every producer shall provide the detailed information on the constituents of the equipment and their components or consumables or parts or spares along with a declaration of conformance to the reduction of hazardous substances provisions in the product user documentation.

(6) Imports or placement in the market for new electrical and electronic equipment shall be permitted only for those which are compliant with the provisions of sub-rules (1) and (4).

(7) The manufacture and supply of electrical and electronic equipment used for defense and other similar strategic applications shall be excluded from the provisions of sub- rule (1).

(8) Every producer shall provide information on the compliance of the provisions of sub-rule (1) and this information shall be in terms of self-declaration.

(9) Manufacturers shall use the technology or methods to make the product recyclable.

(10) Manufacturers shall ensure that components or part made by different manufacturer are compatible with each other to reduce the quantity of e-waste.

(11) The Central Pollution Control Board shall conduct random sampling of electrical and electronic equipment placed on the market to monitor and verify the compliance of reduction of hazardous substances provisions and the cost for sample and testing shall be borne by the producer and the random sampling shall be as per the guidelines laid down by the Central Pollution Control Board in this regard.

(12) If the product does not comply with reduction of hazardous substances provisions, the producer shall take corrective measures to bring the product into compliance and withdraw or recall the product from the market, within a reasonable period as per the guidelines laid down by the Central Pollution Control Board in this regard.

(13) The Central Pollution Control Board shall lay down the methods for sampling and analysis of hazardous substances as listed in sub-rule (1) with respect to the items listed in Schedule-I and Schedule-II and enlist the labs for the said purpose.

Chapter VIII Miscellaneous

17. Duties of Authorities. - Subject to the other provisions of these rules, the authorities shall perform duties as specified in Schedule-V.

18. Annual Report. - The Central Pollution Control Board shall submit an annual report to the Ministry of Environment, Forest and Climate Change regarding status of implementation of the e-waste management rules with quantitative and qualitative analysis along with its recommendations, within one month of the end of the financial year.

19. Transportation of e-waste. - Transportation of waste generated from manufacturing or recycling destined for final disposal to a treatment, storage and disposal facility shall follow the provisions under the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

20. Accident reporting. - Where an accident occurs at the facility processing e-waste or during transportation of e-waste, the producer, refurbisher, transporter, dismantler, or recycler shall report immediately to the concerned State Pollution Control Board about the accident through telephone and e-mail.

21. **Appeal. -** (1) Any person aggrieved by an order of suspension or cancellation or refusal of registration or its renewal passed by the Central Pollution Control Board, within a period of thirty daysfrom the date on which the order is communicated to him, prefer an appeal to the Additional Secretary or Joint Secretary, Ministry of Environment, Forest and Climate Change duly nominated by the Central Government in this regard.(2) The Appellate Authority may entertain the appeal after expiry of the said period of thirty days if it is satisfied that the appellant was prevented by sufficient cause from filing the appeal in time.

22. Environmental Compensation. - (1) The Central Pollution Control Board shall lay down guidelines for imposition and collection of environmental compensation on any entity in case of violation of any of the provision of these rules and guidelines issued hereunder and the said guidelines shall be in accordance with these rules and shall be approved by the Ministry of Environment, Forest and Climate Change.

(2) The Central Pollution Control Board shall also lay down guidelines for imposition and collection of environmental compensation on the producer in case of non-fulfilment of obligations set out in these rules and transaction or use of false extended producer responsibility certificate and the said guidelines shall be in accordance with these rules and shall be approved by the Ministry of Environment, Forest and Climate Change.

(3) The environmental compensation shall also be levied on unregistered producers, manufacturer, refurbisher, recyclers and any entity which aids or abets the violation of these rules.

(4) (i) Payment of environmental compensation shall not absolve the producer from the extended producer responsibility as specified in these rules and the unfulfilled extended producer responsibility for a particular year shall be carried forward to the next year and so on and up to three years.

(ii) In case, the shortfall of extended producer responsibility obligation is addressed after one year, 85 per cent of the environmental compensation levied shall be returned to the producer.

(iii) In case, the shortfall of extended producer responsibility obligation is addressed after two years, 60 per cent of the environmental compensation levied shall be returned to the producer, and in case, the shortfall of extended producer responsibility obligation is addressed after three years, 30 per cent of the environmental compensation levied shall be returned to the producer, thereafter no environmental compensation shall be returned to the producer.

(5) False information resulting in over generation of extended producer responsibility certificates by recycler shall result in revocation of registration and imposition of environmental compensation which shall not be returnable and repeat offence, violation of these rules for three times or more shall also result in permanent revocation of registration over and above the environmental compensation charges.

(6) (i) The funds collected under environmental compensation shall be kept in a separate Escrow account by the Central Pollution Control Board and the funds collected shall be utilized in collection and recycling or end of life disposal of uncollected, historical, orphaned e-waste and non-recycled or non-end of life disposal of e-waste on which the environment compensation is levied, research and development, incentivising recyclers, financial assistance to local bodies for managing waste management projects and on other heads as decided by the committee.

(ii) The modalities and heads for utilization of the funds shall be decided by the Steering Committee with the approval of the Ministry of Environment, Forest and Climate Change.

23. Prosecution. - Any person, who provides incorrect information required under these rules for obtaining extended producer responsibility certificates, uses or causes to be used false or forged extended producer responsibility certificates in any manner, willfully violates the directions given under these rules or fails to cooperate in the verification and audit proceedings, may be prosecuted under section 15 of the Act, 1986 and this prosecution shall be in addition to the environmental compensation levied under rule 22.

24. **Verification and Audit. –** The Central Pollution Control Board by itself or through a designated agency shall verify compliance of these rules by producers, manufacturer, refurbisher, dismantlers and Recyclers through random inspection and periodic audit, as deemed appropriate to act against violations of the provisions of these rules as per rule 22.

25. Steering Committee. - (1) There shall be a Steering Committee under the Chairmanship of Chairman, Central Pollution Control Board to oversee the overall implementation of these rules and the Steering Committee shall comprise of following other members in addition to the chair, namely: -

(a) one representative of the Ministry of Environment, Forest and Climate Change.
(b) one representative of the Ministry of Electronics and Information Technology.
(c) one representative of the Ministry of New and Renewable Energy.
(d) one representative of the Ministry of Housing and urban Affairs.
(e) a maximum of two representatives of the electrical and electronic equipment Producer and Manufacturer Association.
(f) a maximum of two representatives of the E-Waste Recycler Associations.
(g) one representative of State Pollution Control Board or Pollution Control Committee as co-opted by the Chairman of the Steering Committee.
(h) Head of the Concerned Division of the Central Pollution Control Board – Member- Convener.

(2) The steering committee shall be responsible for overall implementation, monitoring and supervision of these rules and it shall also decide upon the disputes arisen from time to time and on representations received in this regard, and shall refer to the Ministry of Environment, Forest and Climate Change any substantial issue arisen or pertaining to these rules.

(3) The steering committee shall review and revise the guidelines or extended producer responsibility target or addition of new Electrical and Electronic Equipment in Schedule I, in view of the technological advancements and other factors with the approval of the Central Government.

SCHEDULE - I

[See rules 2, 3 (b), 3 (c), 3 (m), 3 (o), 3 (p), 3 (q), 3 (v), 6, 8, 10 (7), 16 (13)]

Categories of electrical and electronic equipment including their components, consumables, parts, and spares covered under the rules.

Sl. No.	Categories of electrical and electronic equipment	Electrical and electronic equipment code
(i)	**Information technology and telecommunication equipment**:	
	Centralized data processing: Mainframes, Minicomputers	ITEW1
	Personal Computing: Personal Computers (Central Processing unit with input and output devices)	ITEW2
	Personal Computing: Laptop Computers (Central Processing unit with input and output devices)	ITEW3
	Personal Computing: Notebook Computers	ITEW4
	Personal Computing: Notepad Computers	ITEW5
	Printers including cartridges	ITEW6
	Copying Equipment	ITEW7
	Electrical and Electronic Typewriters	ITEW8
	User terminal and Systems	ITEW9
	Facsimile	ITEW10
	Telex	ITEW11
	Telephones	ITEW12
	Pay telephones	ITEW13
	Cordless telephones	ITEW14
	Cellular telephones	ITEW15
	Answering System	ITEW16
	Products or equipment of transmitting sound, images, or other information by telecommunications	ITEW17
	BTS (all components excluding structure of tower)	ITEW18
	Tablets, I-PAD	ITEW19
	Phablets	ITEW20
	Scanners	ITEW21
	Routers	ITEW22
	GPS	ITEW23
	UPS	ITEW24
	Inverter	ITEW25
	Modems	ITEW26
	Electronic data storage devices	ITEW27
(ii)	**Consumer Electrical and Electronics and Photovoltaic Panels:**	
	Television sets (including sets based on Liquid Crystal Display and light Emitting Diode Technology)	CEEW1
	Refrigerator	CEEW2
	Washing Machine	CEEW3
	Air- Conditioners excluding centralized air conditioning plants	CEEW4
	Fluorescent and other Mercury containing lamps	CEEW5
	Screen, Electronic Photo frames, Electronic Display Panel, Monitors	CEEW6
	Radio sets	CEEW7

	Set top Boxes	CEEW8
	Video Cameras	CEEW9
	Video Recorders	CEEW10
	Hi-Fi Recorders	CEEW11
	Audio Amplifiers	CEEW12
	Other products or equipment for the purpose of recording or reproducing sound or images including signals and other technologies for the distribution of sound and image by telecommunications	CEEW13
	Solar panels/cells, solar Photovoltaic panels/cells/modules.	CEEW14
	Luminaires for fluorescent lamps except for luminaires in households	CEEW15
	High intensity discharge lamps, including pressure sodium lamps and metal halide lamps	CEEW16
	Low pressure sodium lamps	CEEW17
	Other lighting or equipment for the purpose of spreading or controlling light excluding filament bulbs	CEEW18
	Digital camera	CEEW19
(iii)	**Large and Small Electrical and Electronic Equipment**	
	Large cooling appliances	LSEEW1
	Freezers	LSEEW2
	Other large appliances used for refrigeration, conservation and storage of food	LSEEW3
	Clothes dryers	LSEEW4
	Dish Washing Machines	LSEEW5
	Electric cookers	LSEEW6
	Electric stoves	LSEEW7
	Electric hot plates	LSEEW8
	Microwaves, Microwave Oven	LSEEW9
	Other large appliances used for cooking and other processing of food	LSEEW10
	Electric heating appliances	LSEEW11
	Electric radiators	LSEEW12
	Other large appliances for heating rooms, beds, seating furniture	LSEEW13
	Electric fans	LSEEW14
	Other fanning, exhaust ventilation and conditioning equipment	LSEEW15
	Vacuum cleaners	LSEEW16
	Carpet sweepers	LSEEW17
	Other appliances for cleaning	LSEEW18
	Appliances used for sewing, knitting, weaving and other processing for textiles	LSEEW19
	Iron and other appliances for ironing, mangling and other care of clothing	LSEEW20
	Grinders, coffee machines and equipment for opening or sealing containers or packages	LSEEW21
	Smoke detector	LSEEW22
	Heating Regulators	LSEEW23
	Thermostats	LSEEW24
	Automatic dispensers for hot drinks	LSEEW25
	Automatic dispensers for hot or cold bottles or cans	LSEEW26

	Automatic dispensers for solid products	LSEEW27
	Automatic dispensers for money	LSEEW28
	All appliances which deliver automatically all kinds of products	LSEEW29
	Indoor air purifier	LSEEW30
	Hair dryer	LSEEW31
	Electric shaver	LSEEW32
	Electric kettle	LSEEW33
	Electronic display panels/board/visual display unit	LSEEW34
(iv)	**Electrical and Electronic Tools (With the exception of large- Scale Stationary Industrial Tools)**	
	Drills	EETW1
	Saws	EETW2
	Sewing Machines	EETW3
	Equipment for turning, milling, sanding, grinding, sawing, cutting, shearing, drilling, making holes, punching, folding, bending or similar processing of wood, metal and other materials	EETW4
	Tools for riveting, nailing or screwing or removing rivets, nails, screws or similar uses	EETW5
	Tools for welding, soldering, or similar use	EETW6
	Equipment for spraying, spreading, dispersing or other treatment of liquid or gaseous substance by other means	EETW7
	Tools for mowing or other gardening activities	EETW8
(v)	**Toys, Leisure and Sports Equipment**	
	Electrical trains or car racing sets	TLSEW1
	Hand-held video games consoles	TLSEW2
	Video games	TLSEW3
	Computers for biking, diving, running, rowing, etc.	TLSEW4
	Sports equipment with electric or electronic components	TLSEW5
	Coin slot machines	TLSEW6
(vi)	**Medical Devices (With the Exception of All Implanted and Infected Products)**	
	Radiotherapy equipment and accessories	MDW1
	Cardiology equipment and accessories	MDW2
	Dialysis equipment and accessories	MDW3
	Pulmonary ventilators and accessories	MDW4
	Nuclear Medicine Equipment and accessories	MDW5
	Laboratory equipment for in vitro diagnosis and accessories	MDW6
	Analysers and accessories	MDW7
	Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET) Scanner, Computed Tomography (CT) Scanner, & Ultrasound Equipment along with accessories	MDW8
	Fertilization tests equipment and accessories	MDW9
	Other electric appliances/equipment/kits used for preventing, screening, detecting, monitoring, evaluating, reviewing, examining, investigating, probing, treating illness sickness, disease, disorder, affliction, infection, injury, trauma, abuse or disability including the Mobiles, Tablets or any other device	MDW10

	with the features having the potential of sex selection and their accessories	
(vii)	**Laboratory Instruments**	
	Gas analyzer	LIW1
	Equipment having electrical and electronic components	LIW2

SCHEDULE - II

[See rules 16(3), 16(4), 16(13)]

Applications, which are exempted from the requirements of sub-rule (1) of rule 16	
Sl. No.	**Substance**
1.	Mercury in single capped (compact) fluorescent lamps not exceeding (per burner):
(a)	for general lighting purposes <30 W: 2.5 mg
(b)	for general lighting purposes ≥ 30 W and <50 W: 3.5mg
(c)	for general lighting purposes ≥ 50 W and <150 W: 5mg
(d)	for general lighting purposes ≥150 W: 15 mg
(e)	for general lighting purposes with circular or square structural shape and tube diameter ≤17 mm: 7mg
(f)	for special purposes:5 mg
2.(a)	Mercury in double-capped linear fluorescent lamps for general lighting purposes not exceeding (per lamp):
(1)	Tri-band phosphor with normal lifetime and a tube diameter < 9mm (e.g.T2): 4mg
(2)	Tri-band phosphor with normal lifetime and a tube diameter ≥ 9 mm and ≤ 17 mm (e.g. T5): 3 mg
(3)	Tri- band phosphor with normal lifetime and a tube diameter >17 mm and ≤ 28 mm (e.g. T8): 3.5 mg
(4)	Tri-band phosphor with normal lifetime and a tube diameter >28 mm (e.g. T12):3.5 mg
(5)	Tri-band phosphor with long lifetime (≥25000 h):5mg
2.(b)	Mercury in other fluorescent lamps not exceeding (per lamp):
(1)	Linear halo phosphate lamps with tube >28 mm (e.g. T 10 and T12):10 mg
(2)	Non-linear halo phosphate lamps (all diameters):15mg
(3)	Non-linear tri-band phosphor lamps with tube diameter >17 mm (e.g.T9):15 mg
(4)	Lamps for other general lighting and special purposes (e.g. induction lamps):15mg
3.	Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for special purposes not exceeding (per lamp):
(a)	Short length (≤ 500 mm):3.5mg
(b)	Medium length (>500 mm and≤1500 mm): 5mg
(c)	Long length (>1500 mm): 13mg
4.(a)	Mercury in other low pressure discharge lamps (per lamp): 15mg
(b)	Mercury in High Pressure Sodium (vapour) lamps for general lighting purposes not exceeding (per burner) in lamps with improved colour rendering index Ra>60:
(b)-I	P ≤155 W: 30 mg
(b)-II	155 W < P ≤405 W: 40 mg
(b)-III	P >405 W: 40 mg

(c)	Mercury in other High-Pressure Sodium (vapour) lamps for general lighting purposes not exceeding (per burner):
(c)-I	P≤155 W:25mg
(c)-II	155 W < P ≤ 405 W:30 mg
(c)-III	P >405 W:40 mg
(d)	Mercury in High Pressure Mercury (vapour) lamps (HPMV)
(e)	Mercury in metal halide lamps (MH)
(f)	Mercury in other discharge lamps for special purposes not specifically mentioned in this Schedule
5.(a)	Lead in glass of cathode ray tubes
(b)	Lead in glass of fluorescent tubes not exceeding 0.2% by weight
6.(a)	Lead as an alloying element in steel for machining purposes and in galvanized steel containing up to 0.35% lead by weight
(b)	Lead as an alloying element in aluminum containing up to 0.4% lead by weight
(c)	Copper alloy containing up to 4% lead by weight
7.(a)	Lead in high melting temperature type solders (i.e. lead-based alloys containing 85% by weight or more lead)
(b)	Lead in solders for servers, storage and storage array systems, network infrastructure equipment for switching, signaling, transmission, and network management for telecommunications
(c)	Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezo electronic devices, or in a glass or ceramic matrix compound.
(d)	Lead in dielectric ceramic in capacitors for a rated voltage of 125 V AC or250 V DC or higher
(e)	Lead in dielectric ceramic in capacitors for a rated voltage of less than 125V AC or 250 V DC
8.(a)	Cadmium and its compounds in one shot pellet type thermal cut-offs
(b)	Cadmium and its compounds in electrical contracts
9.	Hexavalent chromium as an anticorrosion agent of the carbon steel cooling system in absorption refrigerators up to 0.75% by weight in the cooling solution
(a)	Lead in bearing shells and bushes for refrigerant-containing compressors for heating, ventilation, air conditioning and refrigeration (HVACR) application.
10.(a)	Lead used in C-press compliant pin connector systems
(b)	Lead used in other than C-press compliant pin connector systems
11.	Lead as a coating material for the thermal conduction module C- ring
12.(a)	Lead in white glasses used for optical applications
(b)	Cadmium and lead in filter glasses and glasses used for reflectance standards.
13.	Lead in solders consisting of more than two elements for the connection between the pins and the package of microprocessors with a lead content of more than 80% and less than 85% by weight
14.	Lead in solders to complete a viable electrical connection between semi-conductor dies and carrier within integrated circuit flip chip packages.
15.	Lead in linear incandescent lamps with silicate coated tubes
16.	Lead halide as radiant agent in high intensity discharge (HID) lamps used for professional reprography applications.

17.(a)	Lead as activator in the fluorescent powder (1% lead by weight or less) of discharge lamps when used as specialty lamps for diazo printing reprography, lithography, insect traps, photochemical and curing processes containing phosphors such as SMS ($(Sr, Ba)_2Mg\ Si_2O_7$: Pb)
(b)	Lead as activator in the fluorescent powder (1% lead by weight or less) of discharge lamps when used as sun tanning lamps containing phosphors such as BSP ($Ba\ Si_2O_5$: Pb)
18.	Lead with PbBiSn-Hg and PblnSn-Hg in specific compositions as main amalgam and with PbSn-Hg as auxiliary amalgam in very compact energy saving lamps (ESL)
19.	Lead oxide in glass used for bonding front and rear substrates of flatfluorescent lamps used for Liquid Crystal Displays (LCDs)
20.	Lead and cadmium in printing inks for the application of enamels on glasses, such as borosilicate and soda lime glasses
21.	Lead in finishes of fine pitch components other than connectors with a pitch of 0.65 mm and less
22.	Lead in solders for the soldering to machine through hole discoidal and planar array ceramic multilayer capacitors
23.	Lead oxide in surface conduction electron emitter displays (SED) used in structural elements, notably in the seal frit and frit ring.
24.	Lead oxide in the glass envelope of black light blue lamps
25.	Lead alloys as solder for transducers used in high-powered (designated to operate for several hours at acoustic power levels of 125 dB SPL and above) loudspeakers
26.	Lead bound in crystal glass
27.	Cadmium alloys as electrical/mechanical solder joints to electrical conductors located directly on the voice coil in transducers used in high-powered loudspeakers with sound pressure levels of 100 dB(A) and more
28.	Lead in soldering materials in mercury free flat fluorescent lamps (which e.g. are used for liquid crystal displays, design or industrial lighting)
29.	Lead oxide in seal frit used for making window assemblies for Argon and Krypton laser tubes
30.	Lead in solders for the soldering of thin copper wires of 100 µm diameter and less in power transformers
31.	Lead in cermet-based trimmer potentiometer elements
32.	Mercury used as a cathode sputtering inhibitor in DC plasma displays with a content up to 30 mg per display
33.	Lead in the plating layer of high voltage diodes based on a zinc borate glass body
34.	Cadmium and cadmium oxide in thick film pastes used on aluminum bonded beryllium oxide
35.	Cadmium in color converting II-VI LEDs (<10 µg Cd per mm of light- emitting area) for use in solid state illumination or display systems.

SCHEDULE - III

[See rules 3(m), 6(2), 13(1), 13(2)]

Sl. No.	Year (Y)	E-Waste Recycling Target (by weight)
1.	2023 -2024	60% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product
2.	2024 -2025	60% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product
3.	2025 -2026	70% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product
4.	2026-2027	70% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product
5.	2027-2028	80% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product
6.	2028-2029 onwards	80% of the quantity of an EEE placed in the market in year Y-X, where 'X' is the average life of that product

Note: ***(1) E-waste recycling target shall be reviewed and may be increased after the end of the year 2028- 2029.***

(2) The importers of used electrical and electronic equipment shall have 100% extended producer responsibility obligation for the imported material after end of life, if not re-exported.
(3) E-Waste recycling targets shall not be applicable for waste generated from solar photo-voltaic modules or panels or cells.

SCHEDULE - IV

[See rules 3(m), 6(2), 13(1), 13(2)]

Extended Producer Responsibility targets for producers, who have started sales operations recently, i.e. number of years of sales operations is less than average life of their products mentioned in the guidelines issued by the Central Pollution Control Board from time to time.

Sl. No.	Year	E-Waste Recycling Target (by weight)
1.	2023-2024	15% of the sales figure of financial year 2021-22
2.	2024-2025	20% of the sales figure of financial year 2022-23
3.	2025-2026 onwards	20% of the sales figure of the financial year two years back

Note: (1) Once the number of years of sales operation equals the average life of their product mentioned in the guidelines issued by Central Pollution Control Board, their extended producer responsibility obligation shall be as per Schedule-III.

(2) E-Waste recycling targets shall not be applicable for waste generated from solar photo-voltaic modules or panels or cells.

SCHEDULE - V

[See rule (17)]

List of Authorities and corresponding Duties

Sl. No.	AUTHORITY	COPRRERSPONDING DUTIES
1.	Central Pollution Control Board	(1) Operation and maintenance of Extended Producer Responsibility Portal and monitoring of Extended Producer Responsibility compliance. (2) Coordination with State Pollution Control Boards (3) Prepare and issue guidelines and Standard Operating procedures for collection, storage, transportation, segregation, refurbishment, dismantling, recycling and disposal of e-waste under these rules from time to time, and issue necessary Forms/ Returns for implementation of these rules. (4) Conduct random checks for ascertaining compliance of the e-waste rules and may take help of Customs/State Government or any other agency (ies). (5) Documentation, compilation of data on e-waste and uploading on websites of Central Pollution Control Board. (6) Actions against violation of these rules. (7) Conducting training programs to develop capacity including State Pollution Control Boards and Urban Local Bodies officials. (8) Conducting awareness programs on e-waste management, RE/CE label, legislation to make consumers responsible towards product usage and safe disposal. (9) Integrate all stakeholders with the centralized digital system. (10) Submit Annual Report to the Ministry. (11) Enforcement of provisions regarding reduction in use of hazardous substances in manufacture of electrical and electronic equipment. (12) Interaction with IT industry for reducing hazardous substances. (13) Set and revise targets for compliance with the reduction in use of hazardous substance in manufacture of electrical and electronic equipment from time to time. (14) Ensure RoHS compliance and its certifications through a recognized lab and its mandatory checks. (15) Any other function delegated by the Ministry under these rules from time to time.
2.	State Pollution Control Boards or Pollution Control Committees of Union territories	(1) Incentivization of e-waste. (2) Monitoring and compliance of Extended Producer Responsibility as directed by Central Pollution Control Board. (3) Conduct random inspection of recycler and refurbisher and monitoring recycling capacity utilization.

		(4) Implementation of programmes to encourage environmentally sound recycling. (5) Any other function delegated by the Ministry/ Central Pollution Control Board under these rules.
3.	Responsibilities of Local Bodies (Urban and Rural).	(1) To ensure that e-waste, if found to be mixed with Municipal Solid Waste is properly segregated, collected and is channelized to registered recycler or refurbisher. (2) To ensure that e-waste pertaining to orphan products is collected and channelized to registered recycler or refurbisher. (3) To facilitate setting up e-waste collection, segregation and disposal systems. (4) Conducting training sessions to develop capacities of the urban and rural local bodies.
4.	Responsibilities of Port authority under Indian Ports Act, 1908 (15 of 1908) and Customs Authority under the Customs Act, 1962 (52 of 1962).	(1) Verify the import or export with respect to Extended Producer Responsibility under these rules. (2) Inform the Central Pollution Control Board of any illegal traffic for necessary action. (3) Act against importer for violations under the Indian Ports Act, 1908 or the Customs Act, 1962.
5.	Responsibilities of Bureau of Indian Standards/ Ministry of Electronics and Information Technology	Issuing standards for refurbished products. Bureau of Indian Standards/ Ministry of Electronics and Information Technology shall also develop guidelines for refurbishers with respect to Compulsory Registration Scheme.

Annexure III

Authorized dismantlers/ recyclers, registered with CPCB

Sr. No	Authorised (Expert areas)	Quantity *(Metric Ton per annum)*
1.	Ramky E-waste Recycling Facility, Maheswaram Andhra Pradesh	10000
2.	Earth Sense Recycle Pvt.Ltd., Maheshwaram Mandal, Andhra Pradesh	1800
3.	Ash Recyclers, Hoskote, Banalore	120
4.	New Port Computer Services (India)Private Limited, Bommasandra, Bangalore	500
5.	EWaRDD & Co., Bommanahalli, Bangalore	600
6.	E-R3 Solutions Pvt. Ltd., Peenya, Bangalore (Only Printer Cartridge)	1,20,000 Units
7.	Ash Recyclers, Thimmiah Road, Bangalore	120
8.	E-Parisara Pvt. Ltd., Nelamangala, Bangalore	1800
9.	Surface Chem Finishers, Bangalore	600Kg/Annum
10.	Jhagadia Copper Ltd., Jhagadia, Gujarat *(Shredded PCBs/Mother Board only)*	12000
11.	ECO Recycling Limited, Thane, Maharashtra	7200
12.	Earth Sense Recycle Pvt. Ltd., Thane, Maharashtra	360
13.	Hi-Tech Recycling India (P)Ltd., Mulshi, Pune, Maharashtra	500
14.	Earth Sense Recycle Pvt. Ltd., Manesar, Gurgaon, Haryana	1200
15.	Green scape eco management Pvt. Ltd., Alwar, Rajasthan	450
16.	Trishyiraya Recycling India Pvt. Ltd., Tambaram, Chennai	740
17.	TES AMM Private Limited, Sriperumpudur, Tamil Nadu	30000
18.	Global E-waste Management and Services (GEMS), Kancheepuram, Tamil Nadu	387
19.	Victory Recovery & Recycle Technologies India Pvt.Ltd., Thiruvallur, Tamil Nadu (ICs, PCBs, Solder Dross *(Pb bearing Waste) and PCBs assemblies)*	6000
20.	Ultrust Solutions (India)Pvt.Ltd., Thiruvallur, Tamil Nadu	1500
21.	INAA Enterprises, Sriperumpudur, Chennai	300
22.	TIC Group India Pvt. Ltd., Noida U.P.	1000
23.	Attero Recycling Pvt. Ltd., Haridwar, Uttarakhand	12000

(*Source : http://www.cpcb.nic.in/divisionsofheadoffice/hwmd/e-Waste.pdf*).

List of the Units Registered with MPCB as Recyclers / Reprocesses E-Waste Recyclers

Sr. No.	Name of the Unit	Waste Permitted andQuantity allowed
	REGION – KALYAN	
1.	**M/s. Earth Sense Recycle Private Limited,** A-7, Gala No.1,2 &3, Ground Floor, Prerana Comples,Dapoda Road, Villl-Val, Bhivandi	E-Waste - 360 MTA
2.	**M/s. Green World Recycling** Pritesh Complex, Building No. B-12, Gala No. 7,8, Anjur Phata, Village Val, Tal: Bhiwandi, Dist: Thane	E-Waste - 1000 MTA
	REGION – NAVI MUMBAI	
3.	**M/s. Eco Friend Industries**, A-205, TTC Industrial Area, Pawane Village, ThaneBelapur Road, Navi Mumbai – 400 710.	E-Waste - 1000 MTA
4.	**M/s. Antony Revive e Waste Pvt. Ltd.** W-154, TTC, Pawane Village, Navi Mumbai – 400 710	E-Waste -1000 MTA
	REGION – RAIGAD	
5.	**M/s. Mercury Metal industry**, Plot no. D-48, MIDC Mahad, Tal: -Mahad, Dist:Raigad,	E-Waste - 250 MTA
6.	**M/s. Shabbir Traders,** Plot No. 999(7), Kiravali Narayan Kutir Udyog Mandal,Vill. Adivali, Tal. Panvel. Dist. Raigad	E-Waste - 240 MTA
	REGION – THANE	
7.	**M/s. Eco Recycling Limited** Eco House, Near Top Glass Enclave, Bhoipada, Sativali Road, Vasai (East), Thane-401208	E-Waste - 7200 MTA
8.	**M/s. Justdispose Recycling Pvt. Ltd.** A-103/104/110/119, Arvind Industrial Estate,Navghar, Tal: - Vasai, Dist: - Thane	E-Waste - 500 MTA
	REGION – PUNE	
9.	**M/s. High-Tech Recycling Pvt. Ltd.** Sr. No. 571/572, Nr. Silver Fort Hotel, A/P. Bhogaon,Tal. Mulashi, Pune	E-Waste - 500 MTA
	REGION – PUNE	
10.	**M/s. E-Recon Recycling,** Gate No. 94, Village Chitegaon, to Paithan,Aurangabad	E-Waste - 1000 MTA

Regional Centre for Urban & Environmental Studies (RCUES)
All India Institute of Local Self-Government, Mumbai (AIILSG)

M. N. Roy Human Development Campus, Plot No.6, F' Block,
Opp. Government Colony Bldg. 326, Near Uttar Bhartiya Sangh,
New Link Road, Bandra (E), Mumbai-400051.
Tel. No. : 8657622550/51/52/54, Email.: dir.rcues@aiilsg.org ; rcuestraining@aiilsg.org
Website: www.aiilsg.org/rcues