

E-Waste Management: A New Dimension for Waste Management in India

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Abstract E-waste is a serious environmental and health challenge for many countries, especially those that are rapidly developing. Some countries, like Switzerland, have successfully implemented a formal system for collecting and recycling E-waste, exceeding the EU target of 4 kg/capita. However, other countries, like India, face many barriers to adopting such a system, such as socio-economic factors, lack of infrastructure, and inadequate legislation. This paper reviews and compares the E-waste management practices of different countries. It also proposes a road map for developing a sustainable and effective E-waste management system in India that ensures environmental and occupational safety and health.

The objective of this research is to examine how e-waste management practices affect environmental sustainability and to investigate the level of awareness of e-waste management among countries. The research is based on an empirical study conducted in India using a structured questionnaire. The study covers six key aspects of e-waste: generation, management, composition, reuse, regulation, and education. The results of the study show that there is a low level of awareness of e-waste generation and its treatment practices, but the concept of extended producer responsibility is gaining traction. Despite the efforts made by the authorities, only a small percentage of the population is aware of e-waste management. The respondents are aware

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of the harmful effects of e-waste and its potential for reuse. The respondents also express the need for 'integrating e-waste in the curriculum' of engineering programs.

Keywords e-waste management, environmental sustainability, empirical study, Advance recycling fee

15.1 Introduction

The disposal or recycling of electronic waste is a major challenge for urban solid waste management in India. Electronic waste, or e-waste, refers to discarded electronic devices that come from various sources, such as computers, televisions, phones, air conditioners, toys, and so on (Mittal and Gautam, 2023). The list of e-waste items can be expanded to include other electrical appliances, such as refrigerators, washing machines, dryers, and kitchen utilities, or even airplanes. The rapid development of technology and the changing lifestyle of people have increased the consumption and obsolescence rate of electronic products. Moreover, the import of junk computers from abroad has added to the problem. E-waste contains hazardous materials that can harm human health and the environment if not handled properly.

Computer waste is a major source of e-waste that can harm the environment and human health. A US study estimated that by 2004, more than 315 million computers would be outdated and replaced by new ones. This means that for every new computer sold in 2005, there would be an old one discarded. This creates a huge problem of disposing of the obsolete computers in a safe and sustainable way.

Computers are becoming obsolete faster than ever before, thanks to the rapid pace of innovation and development in the field. Every new breakthrough makes the previous models outdated and less efficient, and consumers are lured by the marketing strategies and incentives to buy new machines instead of upgrading their old ones. This leads to a huge amount of electronic waste, which is often disposed of improperly and without regard for the environmental and health impacts. These devices contain toxic substances that can pollute the Soil, water and air, and harm the living organisms. Therefore, there is an urgent need for better ways of managing and recycling these wastes, and for raising awareness among the consumers about the

consequences of their choices.

E-waste is a serious environmental and health issue in India. It contains harmful substances that can pollute the land, water and air, and harm the people who work with it or live near it. E-waste recycling workers are exposed to many risks and diseases due to the toxic materials. Therefore, it is important to regulate the trade, the technology and the disposal of e-waste in India. This paper examines the e-waste management in India. It focuses on the amount and types of e-waste, as well as the health effects of the toxic substances. It also pays special attention to the computer waste. Moreover, it proposes an integrated plan to improve the e-waste management practices.

15.2 Literature review

Bisoe (2018), Jusco shows plastic road map to four cities, published by The Telegraph study shows plastic road map to four cities by Animesh Bisoe, published in The Telegraph in 2018, discusses how Jusco, a company, has introduced the concept of plastic roads in four cities. The article highlights the benefits of using plastic waste in road construction, such as durability and cost-effectiveness. It also mentions the challenges faced in implementing this technology, including the need for proper waste segregation and recycling infrastructure. Overall, the article showcases Jusco's initiative in promoting sustainable road construction practices using plastic waste.

Bhatt et al. (2017). Mindfulness and affectability of cell phone customers on electronic waste in Delhi-NCR district. In Sustainable shrewd urban communities in India, study focuses on the relationship between mindfulness and the awareness of cell phone users regarding electronic waste in the Delhi-NCR district. It explores the level of knowledge and concern among users about the environmental impact of electronic waste and the extent to which mindfulness influences their behavior towards e-waste management. The chapter sheds light on the importance of promoting mindfulness and raising awareness among cell phone users to encourage responsible handling and disposal of electronic waste in urban areas.

Chandran and Narayanan (2019), report titled "How much e-waste is being generated in

Karnataka?", published on The Deccan Herald website (2019) study focuses on the amount of electronic waste (e-waste) being generated in the state of Karnataka, India. It provides insights into the current e-waste generation levels and highlights the need for effective management and recycling practices. The report aims to create awareness about the environmental impact of e-waste and encourages stakeholders to take proactive measures to address the issue. It explores various approaches and strategies for effectively managing e-waste, including recycling and disposal methods, as well as policy interventions. The study aims to provide insights and recommendations for policymakers, researchers, and stakeholders to improve e-waste management practices and contribute to environmental sustainability.

"How much e-waste is being generated in Karnataka?" The report focuses on the quantification of electronic waste (e-waste) generation in the state of Karnataka, India. It provides insights into the current levels of e-waste being generated and highlights the need for effective management and disposal practices. The report aims to raise awareness about the magnitude of e-waste generation in Karnataka and emphasizes the importance of sustainable e-waste management strategies to mitigate environmental and health risks.

15.3 Objective

- Examining, using examples, the legislative restrictions on efficient e-waste handling strategies for sustainable e-waste improvement.
- Creating guidelines for e-waste management and reverse logistics networks and evaluation of recycling systems for the control of electronic waste.
- Detoxification of metals and India's waste electrical and electronic equipment comparison and disposal.
- Public knowledge and consciousness regarding e-waste in an Indian metropolitan environment and the Effects of unmanaged e-waste dumping on the environment.

15.4 Findings and Discussion

15.4.1 Management of E-Waste

E-waste is a growing problem as technology advances and devices become obsolete. When consumers discard their electronic products, they enter a long and complicated chain of transactions that involves both formal and informal actors. The formal actors include the manufacturers and retailers of computer items, who may have some responsibility for the disposal or recycling of their products. The informal actors include the recyclers, who extract valuable materials from the e-waste, often using hazardous methods that pose risks to their health and the environment. To address these issues, e-waste management strategies may include the following options .

15.4.2 Reuse of Products

Reusing old electronics helps the environment and saves resources. It reduces the need for new materials and energy, and lowers the pollution from manufacturing and using energy. It also helps people who cannot buy new electronics get them at a lower price or for free. Some ways to reuse e-waste are:

- - Selling or donating working devices to others
- Fixing or upgrading broken or outdated devices
- Salvaging parts from unusable devices and using them to make new ones

15.4.3 Recycling

The process of breaking down old or damaged electronics into parts and materials is done by specialized companies that can recover and sell valuable metals, plastics and other substances. However, this process poses serious risks to the health of the workers who are exposed to toxic substances and radiation. Moreover, recycling can only recover a limited amount of materials from electronic waste, such as copper, gold, silver, aluminum, iron, tin, lead, and plastics. The

current system of recycling and disposing electronic waste in India and the existing management system for e-waste are shown in Figures 1 and 2.

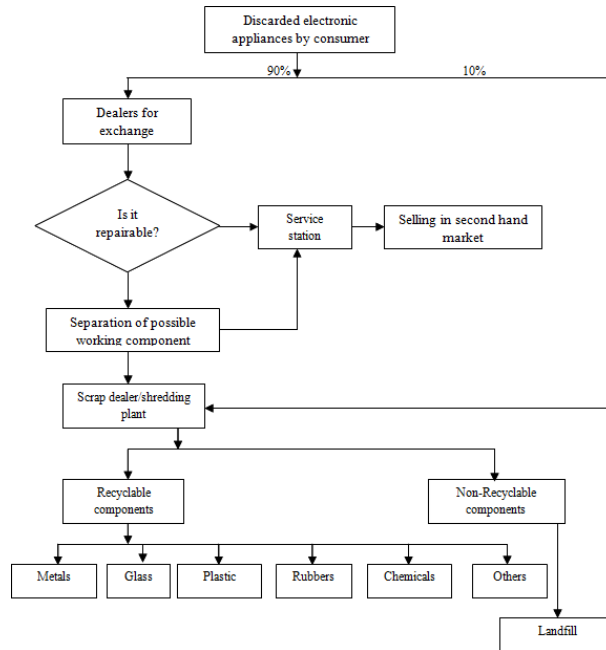


Figure 15.1: E-WASTE MANAGEMENT IN INDIA: OPPORTUNITIES AND PREDICAMENTS UNDER SWACHH BHARAT ABHIYAN Bhuvanesh Kumar Sharma¹ , Avdesh Bhardawaj² , Raghav Bhardwaj³

15.4.4 Conventional Disposal in Landfills

E-waste is a major environmental problem that affects both soil and water quality. When e-waste is disposed of in landfills, it does not decompose quickly, especially if the conditions are dry. This means that e-waste can stay in landfills for a long time, taking up space and releasing harmful chemicals. Some of these chemicals, such as lead, mercury, and cadmium, can leach into the groundwater and contaminate it. The environmental protection agency (EPA) reported that in 1997, about 3.2 million tonnes of e-waste were sent to landfills in the US . The plastics in e-waste are particularly resistant to degradation and can persist in the environment for centuries.

15.4.5 Incineration or Open Burning

The process of recovering copper from old motherboards involves a technique called pit burning. This involves breaking down the circuit boards and exposing the copper foils that are embedded in them. The foils are then burned in a pit to remove the plastic and other materials, leaving behind the copper with some carbon residue. The copper is then washed and sent to another facility for further recycling. The unwanted parts of the motherboard, such as the IC chips and condensers, are also burned in a separate enclosure with a chimney to extract the metals from them.

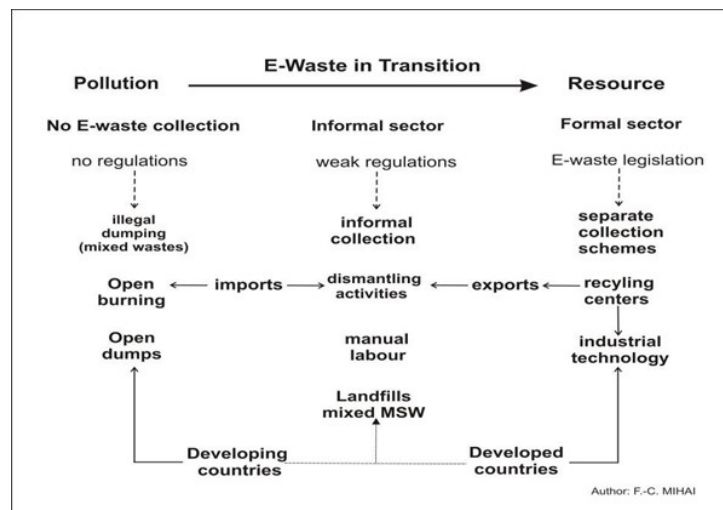


Figure 15.2: E-waste management interactions in a transitional stage

15.5 Conclusion

E-waste is a growing problem in the world, as people buy and discard more and more electronic products, such as mobile phones, computers, TVs, fridges, washing machines and air conditioners. These products contain toxic and hazardous materials that can harm human health and the environment if not disposed of properly. E-waste comes from various sources in India, such as

government, commercial, institutional, research, household and manufacturing sectors. These sectors often sell their waste to the highest bidder, who may be formal or informal recyclers, local collectors or scrap dealers. The current waste management Strategies are mostly technical and environmental, and do not address the social issues and solutions related to E-waste. There is also a lack of public awareness about how to dispose of electronic goods safely and responsibly. The government and the industry agree that E-waste needs to be managed efficiently from a social and environmental perspective, but they need to work together to understand the practical and cultural realities on the ground. The informal sector needs to be integrated into a defined E-waste supply chain, otherwise the goals of the government and industry will be achieved.

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