Chapter 2
Environmental Impacts of E-Waste: Pollution and Resource Depletion

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ABSTRACT

Electronic materials/components that have reached the end of their functional life cycle are considered electronic waste (e-waste). Electronics contain potentially hazardous or toxic elements, which many people are unaware of; thus, they must be handled with care when not required anymore. Every product created leaves harmful effects on environment. Copper, gold, silver, platinum etc. are rich resources found in e-waste that can be recovered and utilized again. Loss of these resources, however, results from incorrect disposal, which accelerates the depletion of natural resources. Landfill and burning of e-waste are responsible for various types of pollution and a lot of impact on human health. New technologies have been applied to manage these wastes at low cost and sustainable ways. However, there are numerous difficulties and challenges in managing various types of waste. The aim of this chapter is to classify various types of waste and their impact on the environment. It also explores the management of waste by new technologies and challenges faced at the time of management of waste.

DOI: 10.4018/979-8-3693-1018-2.ch002

1. INTRODUCTION

Electric and electronic items now play a more important role in our daily activities than any time before. Due to fast growing technological and increasing demands of new gadgets (laptop, phone, tablet, inverter, printers etc.), lot of used electric and electronic materials have been throwing without any concerned. The volume and numbers of these items are increasing day by day which is very alarming conditions for the globe. Electronic products have integral role in our routine work more than ever before. These habits increase financial burden as well as pose hazardous effects on the environment if they are not disposed/recycled in a proper manner and contribute to E-waste (Jain et al., 2023). Various hazardous elements/compounds including lead, cadmium, mercury, lithium, zinc, nickel, barium, poly-brominated compounds etc. may enter the environment from discarded electronic devices. When electronic debris is disposed of in landfills, harmful compounds leach into groundwater, harming both aquatic and terrestrial species. This may have an impact on the wellness of people in developing nations where the majority of electronic garbage is disposed. However, it is also possible to recover the elements like silver, gold, copper, aluminum etc. if the discarded products are recycled after proper disposal (Manikandan et al., 2023). If not disposed/handled properly these may have adverse effects on human, plants and animals through various exposure routes. Figure 1 depicts the different ways to handle the electronic waster and the consequences associated with each approach. Recycling, reusing or refurbishing the devices is the safest approach to reduce their impact on environment and health. Other options of electronic waste treatment pose many occupational hazards as well as release many toxins into the environment which may further lead to many health implications. To ensure the safe handling of these devices after their useful life, awareness is also required at consumer end and their disposal should be prohibited along with municipal solid waste. Moreover, E-waste disposal units for formal management of E-waste should be available and proper guidance manual should be available within the waste handling organizations for processing of E-waste. Forti et al., 2020 estimated that by 2030 E-waste generation will exceed 74 million tons globally but the recycling is being done at much lesser pace. Mor et al., 2021 in a study related to awareness of E-waste management practices. It is discussed that the users are aware that hazardous materials are present in E-waste, but not aware about their adverse on health and environment. There is a need to adopt sustainable approach for production, utilization and disposal of E-waste (Sinha, 2011; Bekabil, 2020; Yabe et al., 2010; Zeng & Li, 2016).

Since October 2019, only 71% of global population was under national E-waste policy or regulation, which was only 44% in 2014. Countries like India and China have national legislative laws in place, but only 78 of the 193 countries have an E-waste national policy. The European Union has produced guidelines for hazardous substances and waste electrical and electronic equipment (WEEE). (Murphy et al., 1998). Good policies and legal regulations can only be made when you have good E-waste data. The data includes quantity and flow of E-waste, monitoring, controlling, illegal dumping and improper treatment. Good data minimize the generation of E-waste and promote recycling and refurnishing of E-waste creates green jobs.

Ananno et al 2021 have been studied the analysis and management of E-waste in Bangladesh. A government agency ought to oversee the entire waste management system. Given its attention to environmental welfare, the Ministry of Forests and Environment appears to be the most pertinent ministry in this situation. There should be an E-waste management and regulatory board (EMRB). This board will supervise and address the nation's progress in E-waste management. Additionally, the board will finance waste management initiatives across the country, encourage widespread adoption of waste management