

## 10. Electronic Waste Management: Some Issues

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### **Abstract:**

In modern contemporary society electronic industry is one of the world's largest and rapidly growing manufacturing industries, has provided leverage to the socio-economic and technological growth of developing society of India. However, consequences of its consumer oriented growth combined with rapid product obsolescence and technological advances are a new environmental challenge – the growing menace of “Electronics Waste” or e-waste. The word ‘waste’ and the act of ‘wasting’ are human inventions. Waste doesn't exist in nature. In nature, everything has a purpose. Wasting results in long-term harmful consequences for humans, nature and the economy. The e-waste has become a matter of concern in today's world because of the presence of toxic and hazardous substances presents in electronic goods and if not managed properly on timely basis, it can have adverse effects on environment. Hence, there is a need to adopt sustainability practices to tackle the growing threat of e-waste. This paper on the basis of secondary data highlights an overview of the problem of e-waste globally as well as in Indian context and its effects on our environment as well as on individual's health and provided some concrete solutions to tackle the issue.

### **Keywords:**

Electronics, e-waste, Environment, Sustainability.

### **10.1 Introduction:**

E-waste is a popular informal name for electronic products nearing the end of their useful life. Anything that runs on electricity/battery or has wire and completed its life is e-waste. Electronic waste may be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets and refrigerators. E-wastes are considered dangerous, as certain components of some electronic products contain materials that are hazardous, depending on their condition and density. The hazardous content of these materials pose a threat to human health and environment. Discarded computers, televisions, VCRs, stereos, copiers, fax machines, electric lamps, cell phones, audio equipment and batteries if improperly disposed can leach lead and other substances into soil and groundwater. Electronic industry is one of the most well renowned world's largest manufacturing industries which has provided some leverage to the socio-economic and technological growth of developing society of India. However, with the impact of higher consumer oriented growth with rapid increase of product obsolescence and the technological advancement is new environmental challenge

The growing menace of “Electronics Waste or e-waste that consists of obsolete electronic devices. We already manage our Solid waste management which is already serious concern for our country but now days it is becoming more complicated by the invasion of e-waste, particularly computer waste.

## **10.2 What Is Waste?**

Merriam-Webster defines waste as “refuse from places of human or animal habitation”. The World Book Dictionary defines waste as “useless or worth-less material; stuff to be thrown away”. Unfortunately, both definitions reflect a widespread attitude that does not recognise waste as a resource. Zero Waste America defines waste as “a resource that is not safely recycled back into the environment or the marketplace”. This definition takes into account the value of waste as a resource, as well as the threat unsafe recycling can present to the environment and public health. The word ‘waste’ and the act of ‘wasting’ are human inventions. Waste doesn’t exist in nature. In nature, everything has a purpose. Humans for short-term convenience and short-term profit created waste. Wasting results in long term harmful consequences for humans, nature and the economy.

## **10.3 Types of Waste:**

“Hazardous Waste” means a solid waste or combination of solid wastes which because of its quantity, concentration or physical, chemical or infectious characteristics may – (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

“Medical Waste” means any solid waste which is generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biological. “Mixed Waste” means waste that contains both hazardous waste and source, special nuclear, or by-product material subject to the Atomic Energy Act of 1954.

“Solid Waste” means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining and agricultural operations and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under section 1342 of title 33, or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended.

“Transuranic Waste” means material contaminated with elements that have an atomic number greater than 92, including neptunium, plutonium, americium, and curium, and that are in concentrations greater than 10 Nano curies per gram, or in such other concentrations as the Nuclear Regulatory Commission may prescribe to protect the public health and safety.

“High-level radioactive Waste” means – (A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (B) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation.

“Low-level radioactive Waste” means radioactive material that – (A) is not high-level radioactive waste, spent nuclear fuel, transuranic waste, or by-product materials defined in section 2014 (e)(2) of this title; and (B) the Commission, consistent with existing law, classifies as low-level radioactive waste.

“Solid Waste”: Garbage, refuse, sludge and other discarded solid materials including solid waste materials resulting from industrial, commercial and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial waste-water effluents, dissolved materials in irrigation return flows or other common water pollutants. Unless specifically noted otherwise, the term “solid waste” as used in these guidelines shall not include mining, agricultural and industrial solid wastes; hazardous wastes; sludge’s; construction and demolition wastes; and infectious wastes.

**Municipal Solid Waste:** The term ‘municipal solid waste’ means all waste materials discarded for disposal by households, including single and multifamily residences, and hotels and motels. The term also includes waste materials generated by commercial, institutional, and industrial sources, to the extent such wastes are essentially the same as waste normally generated by households or were collected and disposed of with other municipal solid waste as part of normal municipal solid waste collection services, and regardless of when generated, would be considered conditionally exempt small quantity generator waste.

Examples of municipal solid waste include food and yard waste, paper, clothing, appliances, consumer product packaging, disposal diapers, office supplies, cosmetics, glass and metal food containers, elementary or secondary school science laboratory waste, and household hazardous waste. Such term shall include debris resulting from construction, remodeling, repair, or demolition of structures other than debris that is not otherwise commingled with other municipal solid waste and has been determined by the generator, to be contaminated. For purposes of determining whether any such debris is contaminated, the generator shall conduct representative sampling and analysis of such debris, the results of which shall be submitted to the affected local government for record keeping purposes only, unless not required by the affected local government. Any such debris that has been determined to be contaminated shall be disposed of in a landfill that meets, at a minimum, the requirements of this subtitle. “Electronic Waste” is defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets and refrigerators.

E-wastes are considered dangerous, as certain components of some electronic products contain materials that are hazardous, depending on their condition and density. The hazardous content of these materials pose a threat to human health and environment.

#### **10.4 Magnitude of the Electronic Waste:**

In the present times, advances in information technology have radically changed the life of Indian people especially urbanites. But, it's a really a matter of concern because due to its mismanagement, it has led to new problems of contamination and pollution. For instance, we all know that personal computers are generally a combination of various components which include highly toxic elements like chlorinated and brominated substances, toxic gases, metals, acid, plastic additives etc. An alarming issue for environment as well it has a hazardous effect on health of the individual in the existing society. Rapid economic growth, urbanisation, and increasing consumerism have increased both the production and consumption of electronic gadgets and electrical equipments. It has been found that in India in spite having world's most advanced high tech software and hardware developing facilities but as far as the recycling of these facilities is still underdeveloped in its nature. Majority of the population is unaware of the potential negative impact of the rapidly increasing use of computers, monitors and televisions. When such types of electronic gadgets are dumped in landfills, they pose health risks because of the hazardous material they contain. Improper segregation of electronic products leads to the possibility of damaging the environment as well. The information technology industry has been one of the prominent agent of change in the economy since the last decade and has significant contribution to digital revolution in every aspect of our daily lives, providing our society with more comfort and easy information acquisition and exchange. The Global E-Waste Monitor, 2017 published by United Nations University, estimated that India generates about 20 lakh ton of e-waste annually, nearly 82 percent of which is basically personal devices. Similarly another study highlighted that 70 percent of the e-waste followed by telecommunication equipments like phones 12 percent, electrical equipment 8 percent and medical equipment 7 percent with remaining from the household e-waste.

#### **10.5 Indian Scenario:**

In Indian context, there are generally two main leading industries i.e.IT and telecom. India, by 2011, has achieved a PC penetration of 95 per 1000 from the 14 per 1000 in 2008. At present, India has 95 million one of the most threatening substances is lead, of which only 5 percent is recycled in India. Indians will not trash their e-waste gadgets, but pass them on to a new low-end user who will, in turn, junk them in the flea market from where the instruments make their way to the Kabadiwallas. Major issues related to Indian scenario are: India's hospitals to see patients with 10 times the expected level of lead in their blood. In India, a water sample revealed levels of lead 190 times as high as the drinking water standard set by the World Health Organization. • Thousands of children throughout the India are attending schools that were built on or near toxic waste sites, with increased risk of developing asthma, cancer, learning disorders and other diseases linked to environmental pollutants. • 1-20 kg per person/p.a and growing at 3 times faster than the municipal waste • Over 200 million current mobile users • Preliminary estimates suggest that total WEEE generation in India is approximately 1, 46,000 tonnes per year. • 20 million electronic household appliances including TV, washing machines, PCs etc.) and 70 million cell phones reach end-of-life every year. Memory devices, MP3 players, iPods, ipads etc. are the newer additions. • About 70% of the heavy metals (mercury and cadmium) and 40% lead, in landfills in India come from e-waste

- 22% of the yearly world consumption of mercury is used in electronics manufacture
- More of acid content flow into the land contaminating the soil and land value.
- About 70 percent, of heavy metals in India landfills comes from E-Waste.
- World's 80% population live in areas of cell phone reception
- Indians upgrade or exchange their cell phones every 18 months, meaning there are approximately 16 million unused mobile phones stashed away at home or in the office
- Average working life of a mobile phone is 7 years but worldwide the average consumer changes their mobile every 11 months. Recently, Ministry of Electronics and Information Technology has developed a guideline on uniform inventorisation of e-waste in the country. As per the information available with CPCB, 69,414 MT of e-waste was collected, dismantled and recycled during 2017-18. On 15 July, 2019, the question has been raised in Rajya Sabha on Pollution due to e-waste. It has been found that only 1.5 percent of e-waste generated in India gets recycled.

## **10.6 Impact on Environment and Health:**

### **a. On Health:**

Electronic products actually are a complex mixture of several hundred tiny components, many of which contain deadly chemicals thereby threatening human health and the environment. Most of the components in e-devices contain lead, cadmium, mercury, Polyvinyl Chloride, chromium etc. TVs and video and computer monitors use CRTs which have significant amount of lead and long-term exposure to these substances can damage the nervous system, Kidney and bones, and even the reproductive and endocrine systems. Some of them are highly carcinogenic. These e-wastes, when improperly disposed (incinerated/land filled instead of recycling) with domestic waste, without any controls, can contaminate the soil, water and air. In general the electronic goods/ gadgets are classified three major heads:

- White goods: Household appliances
- Brown goods: TVs, cam recorders
- Grey goods: Computers, Printers, fax machines, Scanners

In general waste from the white and brown goods is less toxic when compared to grey goods.

### **b. On Environment:**

One of the most common effects of e-waste on air is through air pollution. Scavengers going through numerous landfills, looking for improperly disposed electronics to make some income from the recycling of these wastes, are exposed to such hazardous elements. When electronic items containing heavy metals such as lead, barium, mercury, are improperly disposed, these heavy metals leach through the soil to reach ground water channels which eventually run to the surface as streams or small ponds of water.

Consequently, the local communities often depending on these water bodies and the groundwater suffer multiple diseases. Not only this chemicals resulting in death of aquatic plants and animals, has intake of the contaminated water by humans and other animals resulted in lead poisoning.

Burning of e-waste in open landfills for obtaining gold and other precious metals produces fine particulate matter and cause cardiovascular and pulmonary ailments in children. The wind carries toxic particles and they enter the soil crop food pathway affecting both humans and animals as they enter the food chain. The motherboards have high level of mercury and their improper disposal may cause skin and respiratory diseases. Drinking water contaminated with lead affects the central and nervous system and causes poor brain growth, hearing disability, and impaired formation and function of blood cells. Since, these chemicals are not biodegradable; they persist in the environment for long time, increasing the risk of exposure.

### **c. Preventive Measures to Solve the Issue:**

- K.** The Product designers must ensure the longevity of the products through their re-use, repair, and or upgradeability features.
- L.** More emphasis should be laid on use of less toxic, easily recoverable, and recyclable materials which can be refurbished, disassembled and remanufactured.
- M.** Recycling and reuse of material which ultimately reduce generation of e-waste.
- N.** Policy makers need to focus on such issues related with production, and trade to final disposal including technology transfers for the recycling of electronic waste.
- O.** Adoption of regulatory instruments adequate to control both exports and imports of e-wastes and ensuring their environmentally sound management should be in place.
- P.** Legal framework should be initiated to resolve this issue to a large extent. In other words, manufacturers of products must be financially, physically and legally responsible for their products.
- Q.** All vendors of electronic devices shall provide take up backup and management services for their products at the end of the life of those products.
- R.** The old electronic product should sent back and carefully dismantled for its parts to be either recycled or re-used, either in a separate recycling division at the manufacturing unit or in a common facility.
- S.** Hybrid methodology should be adopted to overcome the problem. This strategy can provide new and emerging area of metallurgy which may facilitate the extraction of metals present in the trace quantity from their ores.

### **10.7 Conclusion:**

The word ‘waste’ and the act of ‘wasting’ are human inventions. Waste doesn’t exist in nature. In nature, everything has a purpose. Wasting results in long-term harmful consequences for humans, nature and the economy. There has been significant increase in the generation of electronic waste in the last few decades. E-waste management is a great challenge for governments of many developing countries such as India. This is becoming a huge public health issue and is exponentially increasing by the day. In order to take healthy initiative to tackle this problem, it is important to integrate the formal and informal sector. The competent authorities need to establish certain mechanisms for handling and treatment of e-waste in as safe and sustainable manner. In the end, technical and policy level based interventions; proper implementation, capacity building, and increasing the public awareness are the need of the time. They on convert this challenge into an opportunity and set global credible standards concerning environmental and occupational health.

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