

A Study on E-Waste Management Practices in India

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Abstract

E-waste, or electronic waste, refers to discarded or unwanted electronic goods. Each year, more than 50 million tons of e-waste are generated. The risks associated with e-waste depend on its condition. Discarded computers, batteries, and other electronic waste can lead to harmful effects. Therefore, it is important to be aware of e-waste along with other types of waste. The situation is critical; India produces about 150,000 tons of e-waste each year, and nearly all of it ends up in the informal sector since there is currently no organized system in place. This paper discusses the current state of e-waste management, sources of e-waste, future projections, and potential strategies for managing e-waste in India.

Keywords: E-waste, Environment, Hazardous, E-waste Management.

Introduction

E-waste consists of waste generated from used electronic devices and household appliances that can no longer be used for their original purpose and are meant for recovery, recycling, or disposal. This waste includes a wide range of electrical and electronic devices, such as computers, mobile phones, personal stereos, and large appliances like refrigerators, air conditioners, and televisions. E-waste contains over 1,000 different substances, many of which are toxic and potentially harmful to the environment.

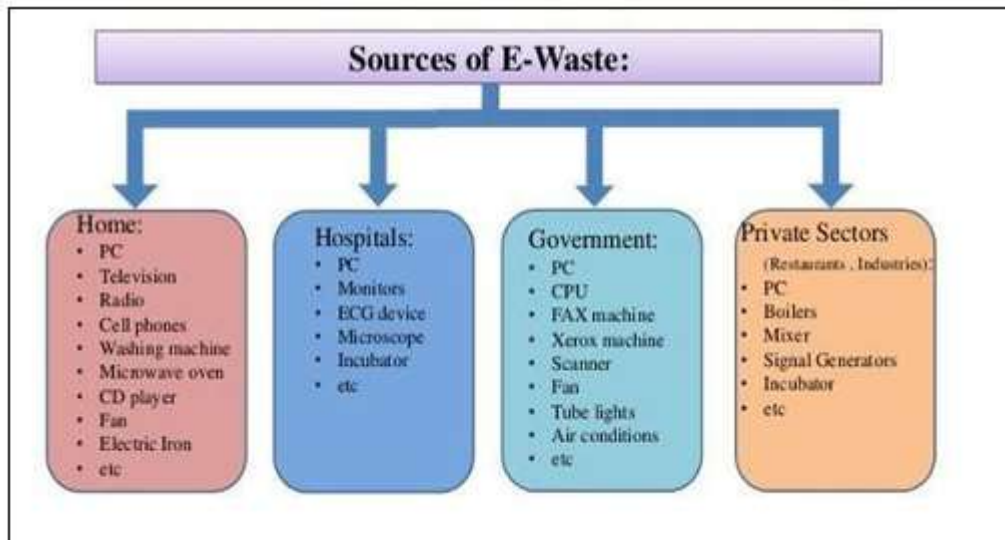
In the last decade, there has been significant growth in the manufacturing and use of electronic and electrical equipment worldwide. This increase, along with rapid product obsolescence and lower costs, has led to discarded electronic and electrical equipment, or 'E-waste,' becoming the fastest-growing waste problem globally. Many companies today design their products with planned obsolescence in mind. Marketing and retail strategies reinforce this trend, prioritizing affordability and convenience over product durability (Jennifer, 2005).

E-waste is becoming a bigger problem and a growing business opportunity, due to the large volumes generated and the presence of both toxic and valuable materials within it. The portion of E-waste that includes iron, copper, aluminum, gold, and other metals exceeds 60%, while pollutants make up only 2.70% (Widmer et al., 2005). Therefore, recycling E-waste is an important issue, not just for waste management but also for recovering valuable materials. However, the process for collecting and disposing of E-waste is quite challenging. It involves various types of products, many people and businesses, extensive areas, and a long timeframe, making it a vast and complex system.

Electronic waste, especially from computers, is increasing rapidly due to the rising demand for information technology and its role in national growth. Different government departments, as well as public and private sectors, are quickly adding old electronic devices like computers and mobile phones to the waste stream.

SOURCE OF E-WASTE IN INDIA

E-waste comes from various sources in the country, including government sectors, educational institutions, research and development, households, and manufacturing sectors.



Source: (UNEP, DTIE, 2007)

Individual households and small businesses face challenges in determining the exact number of personal computers they represent. In India, these households are not significant contributors. They account for about 22% of the total computers in the country. The remaining 78% comes from the business sector.

Large businesses, institutions, government offices, and foreign embassies were the first users of electronic products; today, they represent 78% of all installed PCs. Therefore, they produce most of the outdated technology in India. It is estimated that the total number of obsolete PCs from both businesses and individual households will be around 1.38 million.

PC manufacturers and retailers contribute next to the e-waste problem in India. Their waste includes defective IC chips, PCBs, motherboards, and other parts generated during manufacturing. It also consists of faulty PCs returned by consumers for replacement under warranty. This sector is expected to generate about 1,050 tons of waste each year.

E-waste from imports is a major source of PC scrap. Large quantities of e-waste, such as monitors, printers, keyboards, CPUs, mice, projectors, mobile phones, and PVC wires, are imported. These imported computers vary in range, models, and sizes, including both functional equipment and useless materials.

Waste from the secondary market includes TVs, computers, refrigerators, mixers, mobile phones, and electric boards.

E-WASTE MANAGEMENT IN INDIA

According to the Economic Times, India is the fifth largest producer of e-waste globally; having discarded 1.7 million tonnes of both electronics and electrical equipment in 2014. In India, the collection, transportation, sorting, disassembly, recycling and disposal of electronic waste takes place on an unregulated manner and is done manually by unskilled labourers in the informal economy. Unskilled labourers who work in the informal economy do not have any real understanding of the recycling process and little to no awareness of the value of the materials contained within e-waste.

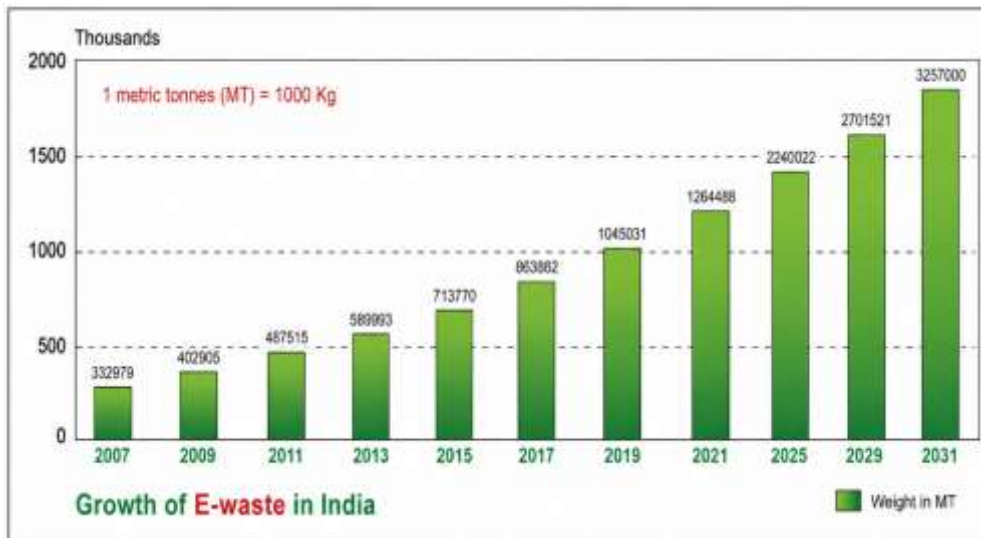
This increases the amount of e-waste being collected as rubbish, which are collected and separated from other rubbish by rag pickers, who also sell the e-waste they collect to scrap dealers who are responsible for selling it to recycling companies. Scrap dealers sell their electronic waste to recycling companies. Recycling companies often use outdated and potentially hazardous recycling processes and equipment to recycle or treat e-waste. India generates an estimated 12.5 lakh tonnes of electronic waste annually (ASSOCHAM 2014).

According to the EPI, India ranks 155th out of 178 countries on the Environmental Performance Index. India has also fared poorly in a number of health hazard sub-indices, ranking 127th overall; and in air quality where it ranks 174th overall; and in the water and sanitation sub-indices, where it ranks 124th overall. Properly managing e-waste (through

environmentally sound management) will improve India's position with respect to these environmental performance indices. Many developed countries consider India to be a dumping ground for discarded e-waste.

FUTURE ESTIMATE OF E WASTE IN INDIA

India is seeing a big increase in electronic waste because people are buying more electronic devices and technology is getting better. The amount of waste is going to go up from 332,979 metric tonnes in 2007 to about 3.26 million metric tonnes by 2031. That is a jump. People keep buying computers, laptops, smartphones and televisions and they get rid of the old ones after a short time. This is making a lot of waste. People like to get gadgets so they throw away the old ones and that makes even more waste.



The United Nations Environment Programme says that old computers and mobile devices are going to make a lot of waste in the future. The waste from devices is going to go up a lot because more people are using smartphones in India.

A group called the Manufacturers Association for Information Technology did some research. Found that a lot of electronic waste is not being recycled. People and companies are keeping electronic devices in homes and warehouses instead of recycling them. This is a problem because it is bad for the environment and peoples health.

We need to do a job of managing electronic waste. We need to collect it recycle it and get rid of it in a way. We also need to tell people about the importance of taking care of waste. If we do this we can help the environment. Make sure we have resources for a long time, in India. Electronic waste management is very important. We need to take care of electronic waste.

EFFECTS ON ENVIRONMENT

Disposing of electronic waste is a messy issue affecting multiple parts of the world. When computers are disposed of in landfills, they can produce contaminated liquids called leachates that could eventually contaminate the local groundwater. When acid and sludge (materials formed from the melting of computer chips) are placed on the ground, they have the capability of acidifying the soil. As seen in Guiyu, Hong Kong, a large illegal e-waste recycling site, the area is suffering from a lack of potable water as a result of contamination of local water supplies due to the indiscriminate dumping of e-waste recycling materials (acids, sludge, etc.) into rivers. To meet the demands of the local population, water is now being transported in from other cities. In addition, incinerating e-waste can create very toxic gases and fumes that pollute the ambient air. Unregulated landfills can produce environmental hazards.

When certain electronic devices, including circuit breakers, are damaged, they may release mercury into the surrounding soil. Leaching mercury has specific health-related dangers; however, the vaporisation of dissolved mercury and dimethylmercury (both components of waste electric and electronic equipment (WEEE)) is another concern. The most

dangerous way to burn electronic waste is by the practice of recovering copper and other metals from plastics by means of open-air burning. Toxic fallouts created by the open-air burning of plastic adversely affect both the immediate area and global atmospheric circulation. This results in toxic byproducts being deposited in many remote locations all over the world.

MANAGEMENT OF E-WASTE

According to estimates, 75% of all electronic items are not being used because people don't know how to dispose of them properly. Most of these electronic waste end up in households, offices, warehouses, laboratories, etc., and are often thrown away with regular household waste that ends up in the landfill. This calls for practical management measures to be put into place. In industry, e-waste management should start at the point of generation of the e-waste. Waste minimisation techniques and sustainable product design can be used for this purpose. Waste minimisation in industry involves the adoption of:

- Inventory Management
- Production-process Modification
- Volume Reduction
- Recovery and Reuse.

INVENTORY MANAGEMENT

Proper control over the raw materials used in the production process is an essential means to cut back on the amount of waste generated (Freeman, 1989). The amount of material wasted in both productions can be decreased by minimizing the amount of hazardous materials used in supply and by limiting the amount of excess raw material warehoused. This can be accomplished in 2 ways: (1) establishing review and approval processes for materials before they are purchased and (2) tracking raw material inventories. The first step in establishing an inventory management system is the development of review processes for all materials purchased. The procedures should require that a permit be issued for the purchase of all materials. In the review process all materials used in production will be reviewed and assessed for the presence of hazardous materials and for the availability of alternative non-hazardous materials.

PRODUCTION-PROCESS MODIFICATION

Waste generation can be reduced through modifications to the creation process. To cut waste generation by modifying the type of raw supplies being utilized in making the item (this measure can reduce waste generation). For example, waste can also be reduced through careful organisation and use of inputs during the manufacturing operation. The methods for minimising waste through changing production procedures can be generally grouped into three categories:

- i) Improved operating and maintenance measures
- ii) Material modify
- iii) Process-equipment alteration.

VOLUME REDUCTION

Volume reduction is a technique that separates out any hazardous material from the waste and eliminates it, so only the non-hazardous portion remains. Techniques used to reduce volume also reduce the cost associated with disposal of the waste; therefore, volume reduction has an economic value as well. The techniques that can be employed to reduce waste volume can be classified into two categories: (1) source separation and (2) waste concentration. Source separation of waste often represents a low-cost and simple way to reduce tons of waste. For example, if you were to have a waste

stream made up primarily of metal and glass, separating the metals from the glass will allow you to recover potentially valuable metals from that waste sludge. Concentrating a waste stream may increase its probability of being recycled or reused. Methods such as gravity and vapour filtration, ultrafiltration, reverse osmosis, and vacuum filtration, can all be used to concentrate the waste stream. For example, if you are an electronic component manufacturer, you can use compactors to reduce the volume of waste generated by your cathode-ray tubes.

RECOVERY AND REUSE

This technique has the potential to reduce costs associated with waste disposal, lower the cost of raw materials and produce revenue from wastes that can be sold. Waste can be reclaimed either at the site of generation or through off-site reclaimers or by exchanging waste between industries. There are several physical and chemical methods available to recover/reclaim waste material including; reverse osmosis, electrolysis, electrolytic recovery, condensation, filtration, centrifugation etc. An example of this would be that a manufacturer of Printed Circuit Boards (PCBs) would be able to reclaim metals from the copper and tin-lead plating solution through the use of electrolytic recovery.

SUSTAINABLE PRODUCT DESIGN

It is imperative that reducing hazards starts at product design. The following are two considerations:

1. Improving product design, with particular emphasis on reducing the amount of hazardous materials used in the making and use of the product. Some recent computer designs have achieved considerable reductions in both material usage and the use of hazardous materials through the design of flatter, lighter, more integrated products. One of the proposals made for improving both cost efficiency and environmental benefits is the use of a centralized computer network similar to that of the telephone system.
2. The use of biodegradable or renewable materials and energy will also reduce hazardous waste. Plastics made from bio-based materials (plants) instead of fossil fuels are a good source of renewable materials. Some renewables are also used to make toners, glues and inks. For example, there are currently solar-powered computers, but they are still very expensive.
3. Since most materials used today are non-renewable, it is also important for designers to ensure that products are designed for the potential of reuse, reclamation and/or enhancement. Some computer manufacturers such as Dell and Gateway offer their computers on a lease basis so that they will be refurbished, reused and then leased again, which also reduces the need for using their own resources for new computer production.

CONCLUSION

The generation of e-waste has been increasing rapidly due to the obsolescence of electrical and electronic equipment (EEE) as well as the increased use of these products around the globe; millions of tons of e-waste are created every year. Many people will keep obsolete EEE products in their homes, while others may sell them to local recyclers for reuse and/or profit.

Currently, there is no legally mandated framework for the collection and management of e-waste. Consequently, there is no systematic collection of e-waste within jurisdictions. Illegal workers (unskilled and untrained) are responsible for the collection, transport, sorting, disassembly, recycling and disposal of e-waste informally. Workers are typically low-wage employees with little regard for their own occupational safety, environmental safety or e-waste management processes.

There has been a massive increase in EEE globally to help bridge the digital divide and, therefore, to help address the fundamental issue of the environmental impact of ICT waste. E-waste management legislative efforts have been slow to develop; the current state of EEE management legislation is ineffective. So as to raise awareness among the general

public, more must be done to educate consumers about e-waste, as well as strengthen the laws that can help impede any future increases in e-waste production. There must also be an immediate creation of proper educational programs that can assist with the ability to implement standardized processes and procedures, along with developing an understanding of government regulations and best practices to properly manage e-waste in accordance with global best practices.

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