

E-WASTE MANAGEMENT: AN OVERVIEW

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ABSTRACT

The Electrical and Electronic waste (E-Waste) is one of the fastest growing waste streams in the world. Continuous Advancement and up-gradation in technology, both have contributed equally to the E-waste culture. E-waste from developed countries find an easy way into developing countries in the name of free trade is further complicating the problems associated with waste management. Short product life span coupled with exponential increase at an average 15% per year will result in doubling of the volume of e-waste over the next five to six years. Hence, the management of e-waste has become an important topic of concern especially in developing countries. In this paper, we have discussed various types of E-Waste, necessity of Waste Management and the possible practices for the same.

Keywords: *Electrical and Electronics Waste (E-Waste), E-Waste Management.*

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I. INTRODUCTION

'Waste' is something useless, unwanted, or defective and the word 'by-product' is something produced in an industrial or biological process in addition to the principal product. Electronic waste, E-waste comprises of wastes generated from used electronic devices and house hold appliances which are not fit for their original intended use and are destined for recovery, recycling or disposal. The electrical and electronic waste (e-waste) is one of the fastest growing waste streams in the world. So, management of E-Waste has become an important topic of concern especially in developing countries like India. Research and technology development will likely result in more cost-effective and efficient collection and recycling programs. It is the need of hour to have appreciation of problem due to lack of 'awareness and estimates' of actual amount of e-waste in India. In this paper, we have discussed various types of E-Waste, necessity of Waste Management and the possible practices for the same.

II. E-WASTE

E-waste includes used Electrical and electronic devices such as

- Computers
- Hand held cellular phones
- Large household appliances such as refrigerators, air conditioners etc.
- Cathode Ray Tubes
- Obsolete televisions
- Central processing units
- Videocassette recorders
- Copiers and printers
- Stereos and speakers
- Microwaves

III. SOURCES OF E-WASTE IN INDIA

A. Domestic Source

The consumption of more resources results in the generation of more waste. All types of waste, like solid, hazardous and biomedical waste, generations are included in domestic waste.

Generation of E-Waste is because of 1. Dismantling of obsolete E-products

2. Manufacturing process [1]

B. Imported Electronic Products

- Scrap dismantling/reprocessing
- Donations [5]

Reason that E-Waste is exported by recyclers to India

- High costs of processing the waste domestically
- Complex domestic recycling process
- Lower costs and higher demand for the material abroad

IV. WHY IS MANAGEMENT OF E – WASTE NECESSARY?

A. Economic Reason

Large amounts of money are spent hauling, transporting and disposing of waste, funds that could be used more efficiently in other activities; the generation of waste therefore involves a poor utilization of public funds.

B. Social Reason

In developing countries, waste is a health hazard. Industrial waste discharges pollutants that contaminate the air, soil and water.

C. Environmental Reason

Waste produces a series of unwanted effects such as the leakage of heavy metals into the groundwater from landfills and from industries, the misuse of valuable land as landfills near cities, the contamination of rivers, the disappearance of aquatic life, the raw materials, fuels and contamination produced by transporting waste.

Electronic products constitute approximately one percent of municipal solid waste. Electronic waste is growing at three times the rate of other municipal waste. Industry is shifting to new

technical advances like shifting from analog television to digital, high definition TV (HDTV). These technology advances and the replacement of obsolete software and equipment are leading to an increase in the amount of discarded consumer electronic products which contain hazardous or toxic substances including lead, mercury, antimony, silver, chromium, zinc, tin, copper, iron, aluminum, nickel, cobalt, and lithium. These toxic materials can cause kidney, cardiovascular and central nervous system damage. Precious and other metals, engineered plastics, glass and other materials has requirement of energy to source and manufacture which waste valuable resources [2].

V. FOUR IMPORTANT PROCESSES FOR WASTE MANAGEMENT [3]

A. Reduce

Reduce means manufacturing something, to reach the same or an improved final quality, while using less direct and indirect materials. For instance, laptops are much lighter now than years ago, because of the use of lighter components, more efficient and lighter batteries, etc.

B. Reuse

This means that something is used again for the purpose it was built, and without chemical changes to its structure. For instance, a refrigerant works in a closed cycle as its chemical structure is always the same, but it changes its physical properties since in one moment it is a gas and immediately after it becomes a liquid. As a result, its usefulness as the same substance is infinite. There are plenty of examples, such as any second-hand items, from cars to houses.

C. Recover

Recover means when something can be extracted from waste. For example, Sulphur can be recovered from a flue gas. Of course, combustion makes impossible to reuse the fuel burnt, but some materials and elements contained in it can be extracted. Out of a worn tire it is also impossible to get all the elements that entered its making, such as pure hydrocarbons and sulphur, although the energy content of the original hydrocarbons can be recovered.

D. Recycle

This occurs when the elements of something are broken to its elements yet they can be used again to manufacture the same items, or others. This is the case of aluminum, steel and metals in general; once the material is melted down, many different things can be produced with them. Some plastics, for instance, allow for obtaining their original components for any kind of use, yet this is not the case with other kinds of plastics, such as plastic supermarket bags, which can be recycled to render another product, but not a new plastic bag.

The list has been cast in decreasing order of importance, such that the most significant is Reduction, while the least is Recycling [3].

VI. MANAGEMENT OF E-WASTE

A. Manufacturer Take Back of Electronics

Manufacturer take-back of electronics would provide industry with an incentive to reduce the toxicity of products and to design products that are more easily recycled [2].

B. Mention the Hazardous Effects on the Product

Manufacturers and retailers also have a major role in educating the public by providing point-of-sale disposal information and product labels indicating which electronics will become hazardous waste.

C. Role of Local Govt.

The local government should ensure that the collection of E-Waste is properly passed to the landfill or transfer stations, recycling centers or solid waste haulers [4].

D. Ensuring Certificates of Recycling or Destruction

This documentation provides a check that traces e-waste from the collection site to the final processing facilities, including the dates of processing and the management methods utilized [4].

E. Third party inspection

Third-party independent auditors certify that recyclers are following agreed-upon standards throughout their management processes. An EMS (Environmental Management Systems) program to certify e-waste recyclers would augment regulatory compliance inspections [4].

F. Product Stewardship Initiatives

The National Electronics Product Stewardship Initiative (NEPSI) consists of a group of stakeholders seeking to reduce and manage waste from electronic products. NEPSI participants include federal, state and local governments, manufacturers, retailers, recyclers, and environmental groups to share responsibility for reducing the environmental impacts of products [2].

G. Extended Producer Responsibility

Extended producer responsibility (EPR) is an environmental policy approach in which a producer's responsibility for a product is extended to the post consumer stage of the product's life cycle, including its final disposal. Manufacturers should give incentives to their customers for product return through a "buy back approach" whereby old electronic goods are collected and a discount could be given on new products purchased by the consumer [3].

H. Pilot Market based Cooperation

Pilot market-based cooperation models between the informal recycling sector and formal industries should be implemented in various parts of countries as soon as possible, reorganizing the trading system in such a way that processes with the highest environmental and health impact and transferred from the informal to the formal sector [2].

I. Capacity Building, Training and Awareness Programs

Lack of civic sense and awareness among city residents will be a major hurdle to keep E-Waste out of municipal waste stream. Consumers to be educated to buy only necessary products that utilize some of the emerging technologies (i.e. lead-free, halogen-free, recycled plastics and from manufacturers or retailers that will 'take-back' their product) to be identified through eco-labelling [3].

J. Technical Interventions

- Restriction for use of toxic material
- Use of environment friendly material

- Development of criteria for recovery and disposal
- Design and engineering intervention
- Adoptability for upgradation [5]

For example-

1. Biodegradable cell phones

Mobile telephones are one of the most quickly discarded items of consumer electronics. Rapid changes in technology and taste means customers constantly upgrade their phones leaving behind more and more discarded phones. However there is increasing pressure on all manufacturers by policy makers to find ways of recycling discarded goods, and also pressure from some customers who want to feel they are making an environmentally sensitive purchase. This new research by engineers in the Warwick Manufacturing Group at the University of Warwick provides a novel way that a mobile telephone manufacturer can meet these demands [6]

VII. CONCLUSION

Electrical and Electronic waste or E-waste comprises of wastes generated from used electronic devices and house hold appliances which are not fit for their original intended use and are destined for recovery, recycling or disposal. Short product life span coupled with exponential increase will result in doubling of the volume of E-waste over the next five to six years. Hence, Management of E-Waste has become an important topic of concern especially in developing countries like India.

In this paper, we have discussed various types of E-Waste, necessity of Waste Management and the possible practices for the same.

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