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Commercial E- waste management: Role of industry and Government

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Abstract

Electronic waste or e-waste describes discarded electrical or electronic devices. Used electronics which are destined for reuse, resale, salvage, recycling or disposal are also considered e-waste. E-Waste is a popular, informal name for electronic products nearing the end of their useful life. E-wastes are considered dangerous, as certain components of some electronic products. E-waste is a newly born waste which came into existence in early 19th century with the invention of radio and telephones and increased exponentially in early 21st century. With the rapid growth of electronic and IT industries it has become the fastest growing waste of the modern and industrialized world. Today E-waste has become one of the most concerned and serious problem to the surrounding and mass health mostly because of unscientific disposal of these waste, or in other words "Informal recycling process". E-waste contains toxic and hazardous substance which may lead to severe health risk and environmental damage. Any electrical substance whose life time has ended and which cannot be repaired further can be termed as E-waste. This paper represents a review on E-Waste management measure to be taken by the government and people also for the proper management of disposal and for eco-friendly development.

Keywords: component; formatting; style; styling; insert

1. Introduction

Energy is one and important thing because the use of energy increasing day by day and from the very beginning of their civilization humans have paid very little attention towards the waste disposal and their recycling process. India is a developing county, from the last decades increase in population & change of lifestyle, the demand of using electronic products is increased. In India e-waste generation is growing at 15% & is expected to cross 8000000 tones per year in 2012. A Central pollution control board (cpcb) report said 65 cities in India generate more than 60-70% of the total e-waste, which comes from 10 states, that are followed by Maharashtra, Tamil Nadu, Andhra Pradesh, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab in the list of e-waste generating states in India Because of this negligence, human history has faced many hazardous problems and if things goes as it is the scenario may become more worsen. Due to the significant growth in investments, consumption and exports, the generation of e-waste from General consumption of the large household appliances represent the largest proportion of waste, followed by information and communications technology equipment and Consumer electronics has been drastically increased within the country ^[1-2]. As a result, the general consumption of electrical and electronic products such as computers, mobile phones, and televisions has been increased in the country. Human beings now dealt with the huge problem of e-waste both locally generated and internationally imported. Overall, these hazardous wastes are currently disposed hap hazard manner in roadsides, dump yards and sometimes in home gardens. However, trading of used electronic items has become a common practice and the number of sales centers had increased notably within past few years. The composition of e-waste is very diverse and differs across product lines and categories. The toxicity of many of the chemicals in e-waste is unknown. The release of toxic materials to the environment through emissions and effluents has a great potential to cause health impacts to the humans and environment. There is generally low public awareness of the hazardous nature of e-waste management techniques used in developing countries. At present some telecommunication companies and household appliances companies had moved on with successful collecting systems for used

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electrical and electronic while, considerable amount of e-waste continues to be recycled in the informal sector. The objectives of this study were to identify the (i) major types of e-waste, (ii) different waste components in each category, and (iii) management methods for different e-wastes [3-4].

2. E-Waste

The electronic industry is the world’s largest and fastest growing manufacturing industry. During the last decade, it has assumed that role of providing a forceful leverage of the socio-economic and technological growth of a developing society. The consequence of its consumer oriented growth combined with rapid product obsolescence and technological advices are a new environmental challenge - the growing menace of “Electronics Waste” or “E- Waste” that consists of obsolete electronic devices. Large dependent of humans on machines have changed our world into machines dependent world. Each year technology advances. We are mostly dependent on computers and other electronic devices. Each year millions of these devices are discarded or become useless. Industrial revolution followed by the advances in information technology during the last century has radically changed people's lifestyle. Although this development has helped the human race [5-6].

Mismanagement has led to new problems of contamination and pollution. The technical prowess acquired during the last Century has pocked a new challenge in the management of wastes. For example, personal computers (PCs) contain certain components, which are highly toxic, such as chlorinated and brominate substances, toxic gases, toxic metals, biologically active materials, acids, plastics and plastic additives. The hazardous content of these materials pose an environmental and health threat. Thus proper management is

Necessary while disposing or recycling e-wastes. These days computer has become most common and widely used

gadget in all kinds of activities ranging from schools, residences, offices to manufacturing industries. E-toxic components in Computers could be summarized as circuit boards containing heavy metals like lead & cadmium; batteries containing cadmium; cathode ray tubes with lead oxide & barium; brominates flame retardants used on printed circuit boards, cables and plastic casing; poly vinyl chloride (PVC) coated copper cables and plastic computer; casings that release highly toxic dioxins & furans when burnt to recover valuable metals; mercury switches; mercury in flat screens; poly chlorinated biphenyl's (PCB's) present in older capacitors; transformers; etc. Basel, Action Network (BAN) estimates that the 500 million computers in the world contain 2.87 billion kgs of plastics, 716.7 million kgs of lead and 286,700 kgs of mercury. The average 14-inch monitor uses a tube that contains an estimated 2.5 to 4 kgs of lead. The lead can seep into the ground water from landfills thereby contaminating it. If the tube is crushed and burned, it emits toxic fumes into the air. Hence E-wastes are increasing each year significantly which has many harmful effects. That’s why E-waste has become one of the most concerned problems of modern industrialized and machine based world. As said earlier, any electrical substance whose life time has ended and which cannot be repaired further can be termed as E-waste. These are discarded electronic substances. If not handled carefully they may prove to be harmful. E-waste contains various harmful and hazardous components such as Lead, Arsenic, Chromium, CFC, PVC, etc. and various chemical compounds which when exposed to surroundings are harmful and may cause deadly diseases such as cancer. So a proper recycling and disposal process are required to be adopted in direction to reduce the harmfulness of E-waste. Components and there effects are listed below [7-8].

Table 1: Hazardous Effect of E-Waste

Sources of E-Waste	Constituents	Health Effects
Solders in Printed Circuit boards, glass panels and gaskets in computer monitors	Lead (PB)	Damage to central and peripheral nervous systems, blood systems and kidney damage. Affects brain development of children
Chip Resistors and Semiconductors	Cadmium (CD)	Toxic irreversible effects on human effects Accumulates in Kidneys and liver Causes neural damage
Relays and Switches, Printed Circuit Boards	Mercury (Hg)	Chronic damage to the brain Respiratory and skin disorders
Cabling and Computer housing	Plastic including PVC	Burning produce dioxin. It causes Reproductive and development problems Immune system damage Interface with regulatory hormones
Front panel of CRTs	Barium(Ba)	Muscle weakness Damage to heart, liver and spleen
Motherboard	Beryllium (Be)	Lung Cancer Skin diseases such as warts

Solid Waste Management (SWM) is a major public health and environmental concern in the urban areas and many developing countries. Availability of limited information about the quantity of E-waste materials imported-exported between the countries and the presence of hazardous substances are the two broad divisions on which studies are made every year. No matter whether they are imported or processed domestically E-waste needs a special treatment. Matsudo studied the domestic attempts of recycling the used

home electric appliances, focusing on recent legislation (the Home Appliance Recycling Law) that state that it is the responsibility of producers to collect and recycle the dead appliance. He visited recycling plants to collect data such as content and recovery of metals. He concluded that the implementation of law reduces the waste generation and heavy metals emissions. Terazono studied the material flow between jaan and China. On the basis of the definition of recyclable resource as mentioned in Japan's Fundamental

Law for Establishing a Sound Material-Cycle Society he proposed that the value of product does not depends upon the fact that whether it is recyclable or not rather it depends upon the market i.e., price of the products are decided by the market. According to Ban and SVTC the main reason of improper functioning of the present E-waste management is that most of the E-waste collected are exported instead of being treated domestically. They suggested that producers should take responsibility for the removal of toxic substance from their products and collection of end-of-life products. Stevel examined the electronics products of Philips in Netherlands and their take-back & recycling process and their responsibility for the products. Macaulay studied the cost and benefits of disposal of the CRTs (Cathode Ray Tubes) as they contain large amount of lead. GTZ conducted a study in India in 2007 to determine the availability of E-waste in three levels. First of them was 'Potential annual waste' which include discarded products as well as the products which can be included n E-waste but are stored by the users and the statistics was found to be 3, 82,979 million tonnes. The second level was 'E-waste available for recycling' which was about 1, 44,143million tonnes. The third was 'E-waste recycled' and the data collected was 19,000 tonnes. Out of 19,000 tonnes it was estimated that 95% recycling was done by informal sector that doesn't care for environment [9-12].



Fig 1: Various Types of E-Waste

3. E-waste management

“Prevention is better than cure”

As we know now that there is no methods being implemented even in the first world to eliminate the problems of e-waste. E-waste is very dangerous to mass health. We need to manage E-waste. E-waste management means adopting various steps to reduce E-waste. The most effective way to manage E-waste is to adopt 3-Rs namely reduce, reuse and recycle. Also sustainable development should be adopted [13-15].

Reduce

The best way to manage waste is not produce it. This can be done by shopping carefully and being aware of a few guidelines. Our first preference should be to reduce the production E-waste. Many people use to buy a new

electronic set only to get a new model even if their previous set is working properly.

Buy products in bulk, larger, economy-size products or ones in concentrated form use less packaging and usually cost less per ounce.

Avoid over packaged goods, especially ones packed with several materials such as foil, paper and plastic. They are difficult to recycle, plus you pay more for the package.

So it is better to upgrade previous model with the version, if possible. Electronic items should be taken good care of so that they can be used for longer period of time. We should prefer to buy refurbished products.

Reuse

The best management method is direct reuse, where someone else can use the electronic without any change. It makes economic and environmental sense to reuse products. A very small percentage of residential electronic waste is likely to fall something which is waste for one may not necessarily be waste for other. This is the most desirable e-waste recycling process where with slight modifications the mobile phones, computers, laptops, printers can be reused or given as second hand products to the other persons. The old electronic equipments can be donated in the various charity programs and thus helping the person in need. Moreover, there is a better way also by selling the old mobile phones or laptops to some recycling companies. One should donate items which are not useful to him, to any charity so that they might be taken into use by others. This way can help to reduce E-waste.



Fig 2: Three R's

Recycle

Recycling is a series of steps that takes a used material and processes, remanufactures and sells it as a new product. One of the major challenges is recycling the printed circuit boards from the electronic wastes. The circuit boards contain such precious metals as copper, iron, aluminum etc. Dead devices cannot be used by anyone. Recycling of the raw materials from this waste is a way to get around this limitation. This process provides reuse facilities and prevents disposal of hazardous products. To make 3R's effective a combined effort is to be taken both by government and people to keep environment clean, green and fresh. They help in saving resource and energy. Each individual has to take their responsibility in order to make earth a “waste-less” place to live [16-20].

4. Responsibility of various bodies

A. Responsibility of Industries

1. All the workers and the persons at every level in any industries handling E-waste should be well qualified and trained.
2. Components should be made of bio-degradable materials if possible.
3. Proper disposal system should be established for disposing and recycling of the waste.
4. There should be a waste minimizing regulation for the reduction of E-waste.
5. They should have proper license for recycling and be renewed periodically.

B. Responsibility of Government

1. Government should set up a waste supervision department in each district for the supervision of waste disposal and their recycling process in different sectors.
2. Informal sectors should be changed into waste management planning together with improving the lifestyle of the workers involved, building on their practices and experience.
3. New formal waste recycling department should be set up.
4. Strict rules and regulations should be made to supervise the waste recycling industries and should be checks periodically.
5. Public awareness programmes should be conducted to aware public about harmful effect of E-waste
6. Government should encourage research and development activities related with E-waste for more advance and safer way of disposal of wastes.
7. Government should provide waste management
8. Services for the removal and disposal of hazardous E-waste
9. Government should promote 3 R's
10. Government should encourage Ngo's which plays a crucial role in promoting awareness among people
11. There should be a producer-public-government cooperation
12. Regulation on the import and export of E-waste

C. Responsibility of citizen

1. People should handle devices with care to prolong their lifetime in order to reduce the E-waste.
2. People should donate useless items to charity so that that can be used by someone else who needs it.
3. People should give dead electronic items to the recycling industries.
4. People should upgrade their devices instead of buying new one.
5. Certified products should be brought.
6. Children's should be educated about the use of electronic devices.

5. E-waste scenario in India

Main Sources of E-waste in India Government, public and Private sectors-70%

Contribution of households-15%

Rest being contributed by manufactures

While the world is advancing day by day, but the developing countries like India facing the problems of E-waste. Developed countries dispose their E-waste in India and other Asian countries because of availability of cheap

labour and resource where they are disposed of or recycled without taking the issue of health and environment into account. Problem developing countries are facing towards E-waste management are-

1. Most of the E-waste is recycled through informal recycling sectors involving uneducated and untrained workers;
2. Existing laws do not supervise informal recycling sector which covers most of the recycling process in India and doesn't take the rehabilitation of the workers involved into the account;
3. Rather than focusing on health and environmental issues, people focus on profit making process;
4. According to UN report India was 5 biggest generator of E-waste in 2014 with 1.7 million tonnes of discarded electronic and electrical equipments;
5. It is estimated that E-waste in India is going to rise with 500% in 2020.

While most of the govt. rules are still inactive, some groups like Toxic Link India are working on to collect data against this hazardous trade.

The existing e-waste recycling systems are purely business driven that have come about without any government intervention. Any development in these e-waste sectors will have to be built on the existing set-up as the waste collection and pre-processing can be handled efficiently by the informal sector, at the same time offer numerous job opportunities [21-25].

6. Conclusion

The following are the salient conclusions:

1. Modern Facilities are to be established for the collection of e-waste & for the disposal methods of e-waste.
2. E-Waste is increasing day by day more than the reuse & recycles.
3. Awareness Programmes about e-waste can be initiated nationwide, so that people may help in reducing it.
4. Electronic goods Manufacturing Companies must be legally ensured to mention the disposal methods of their Product in their user manual.
5. Some Refund schemes can be taken by the government for collection of solid waste, to encourage the consumers, while the consumers return the electronic devices.
7. The Export of e-waste must be minimized & instead more number of recycling plants must be set up in India.
8. Government has to arrange workshops, seminars for the people who live in villages.
9. Banners can be laid in large quantity everywhere.

Also Display Do's & Don'ts on the banners. While we are keen for becoming technically advanced and more developed, we often neglect their impact on health and environment. Among many, E-waste is one of the most deadly waste which has increased exponentially in very short span of time and if not regulated wisely may proved to be dangerous not only to human but entire species living on earth. Imports and domestic manufacturing are the two main reasons for increasing E waste in India. Each individual has to cooperate with the government in order to keep the environment clean and green. 3Rs (Reduce, Reuse &

Recycle) is the most effective way in this prospect by saving resource and energy. Reuse and recycle is better alternative compared to disposing as they helps in reducing the presence of toxic and hazardous substance in the environment. Strict rules and regulations should be implemented regarding E-waste. The concept of sustainable development should be adopted i.e. eco-friendly development. We should always kept in mind ^[26-30].

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