



ELECTRONIC WASTE MANAGEMENT

Nursing

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ABSTRACT

The electronic industry, like information technology and telecommunication, is the world's largest and fastest growing manufacturing industry. As a consequence of this growth, combined with rapid product obsolescence, discarded electronics or e – waste is now the fastest growing waste stream in the industrialized world. Although the fast development in information technology has radically changed people's life-style and helped human race, the mis-management of e-waste has led to new problems of contamination and pollution, thus posing a threat to environment and health.

KEYWORDS

E-waste, Toxins, Landfill, Incineration, Recycling, Occupational health etc.

DEFINITION

Electronic waste, e-waste, e-scrap or waste electrical and electronic equipment (WEEE) describes loosely discarded, surplus, obsolete or broken electrical or electronic equipments. This includes used electronics which are destined for reuse, resale, salvage, recycling, or disposal like mobile phones, computers, television sets, and refrigerators, washing machine, dryers etc.

Solid waste management which is already a man moth task in India, is becoming more complicated by the invasion of e-waste, particularly computer waste.

E-waste has become a problem of crisis proportion because of the reasons:

- The toxic ingredient of e – waste posing a threat to occupational health of rag pickers as well as the environment.
- Generation of e-waste at an alarming rate.

GLOBAL BURDEN OF E – WASTE

- It is estimated that about 50 million tons of e-waste is produced each year and it is escalating rapidly at a rate of 3-5% every year, which is three times faster than the municipal waste.
- E-waste comprises of more than 5% of all municipal solid waste.
- 23,000 tonnes of e-waste is shipped to developing nations. US discards 30 million computers annually.
- It is estimated that about 15 – 20% is recycled and rest goes to landfill and incineration.

BURDEN IN INDIA

- 1,46,000 tonnes of e-waste was generated during 2005 and 3,80,000 tonnes during 2007.
- 8,00,000 tonnes estimated by the year 2012.
- India and other developing countries are the dumping grounds for the developed countries.

SOURCES OF E-WASTE

E-waste is generated from 3 major sectors:

- Individual and small businesses.
- Large businesses, institutions and governments.
- Original equipment manufacturers (OEMs).

Individual and small businesses

Electronic equipments, particularly computers are often discarded by household and small businesses not because they are broken but because of up gradation of new technologies. So the customers are forced to buy new ones. Thus the life span of computer has shrunk from five years to almost two – three years. The old ones are just dumped.

Large businesses, institutions and establishments

From the large establishments, the e-waste goes to the lease companies, who take back the old ones and end it for re-use/recycling/export markets.

Original equipment manufacturers

In OEMs, when the production line does not meet quality standards, it is disposed off either by recycling or by export to developing countries

in the name of free trade.

IMPACTS/HAZARDS OF E-WASTE

Effects on environment

- Computer wastes that are land filled produce contaminated leachates which eventually pollute the ground water. For e.g. The Cadmium from one mobile phone battery is enough to pollute 600 m³ of water. Similarly mercury from circuit breakers, polychlorinated biphenyls (PCB) from condensers, lead from cone glass of cathode ray tube (CRT's) etc also leach and pollute ground water.
- Incineration of e-waste can emit toxic fumes and gasses polluting air.
- The plastic casings, cables and polyvinyl chloride cable insulation when burnt to recover copper from the wires release toxic dioxins and furans (toxic fumes), polluting air.
- Acids and sludge obtained from melting computer chips, is disposed on the ground causes acidification of soil and if disposed in the rivers results in water contamination and acute water shortage.
- Thus, ultimately there will be disturbance of eco system.
- Thus, the hazardous effects on environment are contamination of ground water, pollution of air, acidification of soil, disturbance of aquatic ecosystem.

Effects on Health

S. No.	Source	Constituent	Health effect
1	Solders in printed circuit boards, glass panels & gasket in monitor	Lead (Pb)	<ul style="list-style-type: none"> • Damage to nervous system, vascular system and kidneys • Affects brain development in children
2	Chips, resistor and semiconductors	Cadmium (Cd)	<ul style="list-style-type: none"> • Accumulation in Liver and Kidneys • Neural damage • Teratogenic
3	Relays & switches, printed circuit boards	Mercury (Hg)	<ul style="list-style-type: none"> • Chronic damage to brain • Respiratory and skin disorders
4	Data tapes, floppy disc	Hexavalent chromium	<ul style="list-style-type: none"> • Asthmatic bronchitis • DNA damage
5	Cabling & computer housing	Plastic including PVC	<ul style="list-style-type: none"> • Reproductive & developmental problems • Immune system damage • Interference with regulatory hormones
6	Front panel of cathode ray tubes	Barium	<ul style="list-style-type: none"> • Muscle weakness • Damage to heart, liver & spleen
7	Plastic housing of electronic equipments & circuit boards	Brominated flame retardants (BFR)	<ul style="list-style-type: none"> • Disrupts endocrine functions

8	Mother board	Beryllium (Be)	<ul style="list-style-type: none"> • Lung cancer • Berylicosis • Skin disease like warts
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To combat the ill effects of E-waste on environment and health, several countries exhorted the need for a global agreement to address the problems and challenges posed by hazardous waste. Due to the rise in the cost of disposal of hazardous waste the toxic traders began to ship this waste to developing countries including India, where they are either disposed off or recycled with little or no regard to environmental or workers health and safety, because of cheap labor and lack of environmental and occupational standards.

Due to all these irresponsible activities Basel Convention was drafted with secretariat in Geneva and Switzerland to facilitate the implementation of convention and related agreements. It brought about a respite to the transboundary movement of hazardous waste. India and other countries have ratified the convention. These countries should enforce the strict legislation in their own country for the prevention of this horrifying act. The European parliament recently passed legislation that will require manufacturers to take back their electronic products when consumers discard them. This is called "Extended producer responsibility". It also mandates a time table for phasing out most toxic substances in electronic products.

WASTE MINIMIZATION TECHNIQUES

About 75% of the electronic items are stored in the houses, offices and warehouses etc. due to uncertainty of how to manage it. They are often mixed with house hold waste and disposed off in landfills, which in turn is harmful to environment and health. This necessitates the minimization of e-waste at the point of generation in the industries itself. It involves the adoption of following measures:

- a) **Inventory Management:** This consist of proper control over the materials used in manufacturing process, to reduce waste generation. This can only be done not only by the purchase of only the required materials but also by restrict inventory tracking system.
- b) **Volume Reduction:** the volume of the waste can be reduced by removing or segregation of hazardous portion from nonhazardous portion and also any concentration methods such as vacuum filtration, ultra filtration, reverse osmosis, freeze vaporization etc.
- c) **Recovery and Reuse:** a number of physical and chemical techniques are available to reclaim waste material such as electrolysis, condensation, centrifugation, filtration, reverse osmosis etc.

MANAGEMENT OF OPTIONS:

The following options/responsibilities are suggested for the Govt., industries and public.

For Government:

- Govt. should set up regulatory agencies in each District.
- Legislation should be strictly enforced.
- Research in E-waste management should be encouraged.

For Industries:

- Industries should identify the hazardous waste and should provide management options. E-waste handlers should be properly qualified and trained.
- They should adopt waste minimization technique.
- There must be 'reverse production system'. It means there should be infrastructure to recover and reuse the materials present in e-waste such as lead, copper, aluminium, gold, plastics, glass, wire etc.
- The manufacturers, distributor and retailer should undertake the responsibility of recycling/disposal of their own products.

For Citizens:

- Reusing the donated, working electronics, keep them out of waste management system.
- E-waste should never be disposed with garbage and other household waste. NGO's should adopt a participatory approach in the management of e-waste.

E-WASTE DISPOSAL

E-waste disposal can be done through the various methods:

- a) **Recycling:** It is defined as assembling, developing, promoting or

buying of new products which are prepared from waste products.

Steps in Recycling: first E-wastes are dismantled. Then hazardous material such as PCB, mercury and plastics are removed. Then the valuable metals such as lead, gold, copper etc. are removed, retrieved and new equipments are developed. Thus the environmental pollution is avoided. Only a small percentage of e-waste is actually recycled. While recycling helps ensure that raw materials are reused, workers often end up handling hazardous chemicals, causing harm to the workers, the local community, and the local environment.

- b) **Landfilling:** It consist of dumping/burial of e-waste. Unfortunately, much of the e-waste ends up in landfills today. The toxic chemicals found in e-waste often leach into the ground or may be released into the air, impacting the environment and local communities. The disadvantages are that the material like mercury, cadmium, lead etc. leaches into the soil, polluting the ground water. So it is not a safe method.
- c) **Incineration:** In this method the e-waste is burnt in specially designed incinerators at a high temperature of about 1000^oC. It is a complete combustion process. This method not only helps in the reduction of the volume of the waste, but also the hazardous substances are converted into less hazardous substances. Some e-waste is incinerated, but this is problematic because it results in the release of heavy metals into the air.
- d) **Reusing:** This consists of direct use of equipments or using it after slight modification, e.g. computers, cell phones etc. this method reduces the volume of generation of e-waste and there is no wastage of time and money. In some cases, old electronics are reused, whether they are re-certified and resold or sent to developing countries for reuse. However, in some cases, electronics sent to developing countries for reuse are only used a short time and then dumped in areas that don't have proper hazardous waste facilities.
- e) **Export** – It's common for e-waste to be exported to other countries, such as India and China, where e-waste scrap yards take care of the electronic waste.

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