

A review on E-Waste Management: It impacts on Human Health and Environment

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Abstract:

The reduced life span of electrical and electronic devices is termed as e-waste. electronic devices, which includes computers, cell phones , printers, scanners, laptops , TVs, CRT monitors, household electronic machinery and laboratory electronic equipments, after completion of their life span they are turned as e-waste, . Presently, the quantity of electronic waste is a burning problem in our country . This work is based on survey conducted on different people of society regarding e-waste management awareness. Electronic items consists of many toxic metals such as cadmium, led and brominated flame-retardants. In E-waste areas, the residents had a high occurrence of headaches, skin diseases, nausea, vertigo, ulcers and gastric problems. When landfills having e-waste are burned, heavy metals and hazards chemical substances like toxic furans and dioxins from condensers and halozinated flame retardant products can be evolved. To avoid dumping of E-waste in land filling, should implement the 3R (Reduce, Reuse and Recycle).

Key words : E-Waste, health hazards, landfills, management.

1. Introduction :

As electronic up gradation of country, increasing the usage of electronic devices, which includes computers, cell phones , printers, scanners, laptops , TVs, CRT monitors, household electronic machinery and laboratory electronic equipments, after completion of their life span they are turned as e- waste, which contains various hazards chemicals, heavy metals and non-decomposable plastics.

The reduced life span of electrical and electronic devices is termed as e-waste. Every year high quantity of electronic waste is produced in the country. Presently, the quantity of electronic waste is a burning problem in our country. Riddance of e-waste is an emerging world's human health and environmental issue (Monica and Jugal Krishna,2010). In India most of the people stored electronic waste at their household as they do not know how to dismantle or recycling the items. This ever increasing the e-waste in the country every year, this impacts the environment and public health.

Electronic waste is a complex matter and is also huge source of important metals such as copper, gold, mercury and silver, which can be required and get back into production line. So dismantling the items of electronic waste and recycling the elements properly. Recycling centres furnish employment to the people and trained them in handling, dismantling and recycling the electronic items. Unscientific dismantling and recycling of e-waste creates hazards to public health and environment. Hence, the proper e-waste management has been required (Pandve HT,2007). It is needed to review the human health peril and strategies to prevent this growing imminence.

2. Methodology:

This work is purely based on survey conducted by us on different people of society regarding e-waste management awareness, collected and gathered information from Sasi e-recycling solutions, Hyderabad and various research articles on e-waste regarding sources, methods of disposal, heavy metals, hazards chemicals and their effects on environment and public health.

3. Source of E-waste:

The electronic equipment that is at the end of its useable life period is termed as e-waste. All used and damaged electronic items are treated as e-waste such as Televisions, printers, scanners, cables, electronic circuit boards, calculators, mobilephones, cameras, radios, DVD players, mice, batteries, CRT tubes, computer monitors, key boards and home used electronic items such as washing machine, fridge, grinder, AC, microwave ovens , laboratory equipments etc.

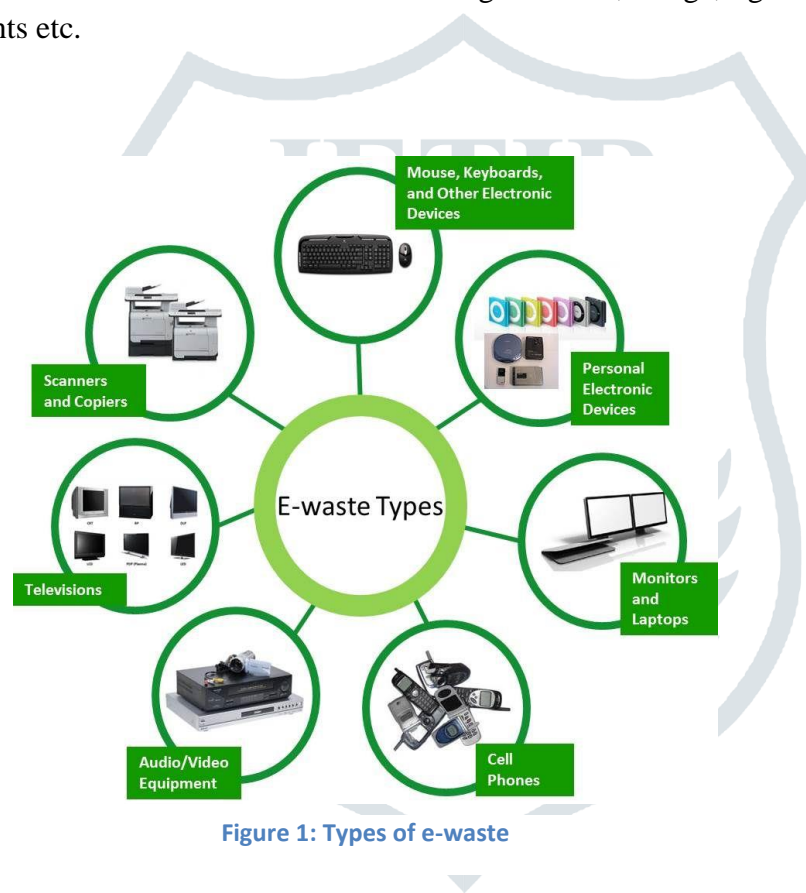


Figure 1: Types of e-waste

4. Impact of E-waste on human health:

Electronic items consists of many toxic metals such as cadmium, lead and brominated flame-retardants. The part including copper, gold, aluminum and other metals in e-waste is approximately 60 percentage while plastics about 30 percentage and the toxic pollutants comprise only 2.70 percentage (Widmer R. et al,2004), lead is the major component of many electronic devices, which causes different health hazards due to contamination of environment (Jang YC. and Townsend TG,2003). Lead enters biological systems through soil, water, air, and food. It causes nervous disorders in children (Bathurst PA, et al. 1992). In E-waste areas, the residents had a high occurrence of headaches, skin diseases, nausea, vertigo, ulcers and gastric problems (Qiu B. et al,2004).

Table 1: Showing sources of e-waste, constituents, and health impacts

Sources of e-waste	Constituents	Health impacts
Solder in printed circuit boards, and computer monitors	Lead	<ul style="list-style-type: none"> • Damage to nervous systems, blood systems, and kidney • Adverse effects on brain development
Semi-conductors	Cadmium	<ul style="list-style-type: none"> • Irreversible toxicity effects • Accumulates in liver and kidney
Switches and relays	Mercury	<ul style="list-style-type: none"> • Chronic brain damage
Copper wires	Copper	<ul style="list-style-type: none"> • Stomach cramps, nausea, liver dysfunction
CRT front panels	Barium & Phosphorus	<ul style="list-style-type: none"> • Cause muscle weakness and damage to liver
Rechargeable batteries	Nickel	<ul style="list-style-type: none"> • Skin allergy, lung allergy and asthma
Lithium batteries	Lithium	<ul style="list-style-type: none"> • Lithium can harm a nursing baby through breast milk

Sources of e-waste	Constituents	Health impacts
		<ul style="list-style-type: none"> • lung edema
Galvanized steel plates and decorator for steel housing	Chromium	<ul style="list-style-type: none"> • Causes bronchitis • DNA damage

Many of the above substances are carcinogenic and toxic. Cadmium which stored as toxicant in the tissues and may effect dysfunction of kidney, damage to bones and affects the respiratory organs in the form of oxide.(Elinder and Jarup 1996,WHO1992, ATSDR 2007b). Cadmium is also antecedent lung cancer (DHSS,2005). Mercury causes brain damage, skin, respiratory problems. and chronic damage to brain.

5. Impact of E-Waste on Environment:

If e-waste is improperly monitored landfills can cause environmental hazards, such as contaminating soil, water sources and polluting the air. When batteries emits acids and heavy metals, such as mercury, cadmium and nickel, then there is chance of leaching of e-waste. E-circuit boards contain lead, copper, zinc and cadmium may pass over land surface and get mixed with fresh water sources.

e-waste disposal is a big issue facing across the globe. E-Waste that is landfilled produces many heavy metals which can contaminate the soil and ground water. Melting of computer chips releases acids, which causes soil acidification. Destruction of e-waste by burning can emits harmful gases and fumes, thereby polluting the air. When the destruction of electronic devices, such as circuit boards and switches, mercury will leached out of the top soil into lower inaccessible subsoil. When landfilled plastics release cadmium, Poly brominated diphenyl ethers, which may enter into the soil and ground water. Significant amount of lead released from broken CRTs and gets assorted with acid water.

When landfills having e-waste are burned, heavy metals and hazards chemical substances like toxic furans and dioxins from condensers and halozinated flame retardant products can be evolved. PCBs are environmental toxicity and causes cancer in animals. Many waterbodies, buildings and other sites are contaminated with PCBs and there has been contamination of food supplies(Environmental Protection Agency).

6. Management of E-waste:

Maximum quantity of e-waste is dumped in the urban slums, where unskilled workers carryout the unscientific methods without any knowledge about proper use of equipment, that tending to cause hazards to their health and environment.

Central Pollution Control Board (CPCB) India is set up and issued guidelines for proper eco-friendly disposal and handling of the e-waste. Each manufacturer responsible personally for the final safe disposal of e-waste.

E-waste management should begin at the point of generation. This can be achieved by techniques of minimization and by long life product design. Regulation on e- materials used in the manufacturing of electronic items is a suitable way to minimize waste generation (Freeman, 1989). Reduction of toxic materials used in the manufacturing process, can reduce the health hazards.

Generation of waste can reduce by proper maintenance of processing. Effective training which includes proper handling of equipment and maintenance is needed for employees to reduce waste. Installing the updated equipment in the processing of materials can reduce e-waste efficiently (Ramachandra T.V., Saira Varghese K. 2004).

Waste should be recovered at on-site or off site. Many of the materials of electronic gadgets are nonrenewable, product manufacturers could ensure the product is design for repair, reuse and to be upgrade.



Figure 2. Electronic equipment in laboratory



Figure 3 E- waste stored in laboratory

7. RRR (Reduce, Reuse and Recycle):

To avoid dumping of E-waste in land filling, should implement the 3R (Reduce, Reuse and Recycle).

Reduction of e-waste can be achieved by modifying the components used to design the product. Reducing of E-Waste is not much possible, because of upgradation of technology, latest technical innovations and a huge competition in the electronic industry have led to one of the fastest growing waste streams in the globe.

Electric and electronic equipment end of usable life products can be reused by donating or selling it to someone who can still use it. Reusing the precious metals and plastics services world save much energy instead of making or mining earth more of them.

Recycle is the most safe method for disposal of E-waste. More than 50 million tons of e-waste is generated globally per year and it has all potentials to grow at faster rate than other waste streams. Recycle, which includes collection and scientific dismantle the E-waste, finding the hazards chemicals, carcinogen, prohibiting the electronic items with hazards materials and monitoring the e-waste transportation with in the permissible limits. (Shivakumaran,2013).

8. Conclusion:

Concluded that for the elevation of e-waste management system, awareness programs among the public and cooperation of manufacturers are required. Encourage manufacturers to produce long life and non hazards electronic products. Government should establish authorized e-waste recyclic canter with trained workers, which are easily accessible to public and industries. Government should establish an e-waste management

system to collect e-waste regularly like collection of municipal waste and enforce strict rules against dumping e-waste in the country by others. Government should encourage NGOs and other organizations to conduct the public awareness programs on e-waste management. Industries and companies should follow the minimization techniques on e-waste, which can reduce the amount of e-waste and thereby reducing the impact on human health and environment. Government should encourage research on the management of e-waste, environmental monitoring and regulation of hazardous waste disposal. E-waste should never be disposed with garbage and other household wastes. Collected e-waste should be stored properly until it is scientifically recycled.

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