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E-WASTE- THE TOXIC LEGACY OF OUR DIGITAL AGE

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ABSTRACT

The rapid growth in Information and Telecommunications Technology (ICT) has led to an improvement in the capacity of electronic products but simultaneously to a decrease in the product's life time as a result of which increasingly large quantities of E-waste are generated annually. This ever increasing waste is very complex in nature and is also a rich source of metals such as gold, silver and copper which can be recovered and brought back into the production cycle. Improper dismantling and processing of e-waste render it perilous to human health and our ecosystem. Therefore, the need of proper e-waste management has been realized. It is necessary to review the public health risks and strategies to combat this growing menace. The article tries to study the environmental and health impact of E-waste. The article also analyses various e-waste management methods.

Keywords: E-Waste, E-Waste Management, Environmental hazard

INTRODUCTION

Information and Telecommunications Technology (ICT) and computer internet networking has penetrated nearly every aspect of our modern life, and is positively affecting human life even in the most remote areas of the developing countries. As the production and consumption of electronic goods are on the rise, the quantum of electronic waste generated is likely to increase in near future. Electronic waste or E-waste, is a term for electronic products that have become unwanted, non-working or obsolete, and have essentially reached the end of their useful life. It contains toxic substances such as lead, cadmium, beryllium, that causes hazard to both humans and environment. Society today revolves around technology and by the constant need for the new and most high tech products we are contributing to mass amount of E-waste. Our waste electronics are polluting drinking water and harming ecosystem around the world. So it's time to fix the problem.

OBJECTIVES

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- To study the environmental and health impact of e-waste.
- To analyes various e-waste management methods.

METHODOLOGY

The study is descriptive in nature, which is based on secondary data. The data have been collected from various published sources like journals, books, research articles and websites.

Amount of Electronic Waste World Wide

Rapid change in technology, changes in media (tapes, software, MP3), falling prices and planned obsolescence have resulted in a fast-growing surplus of electronic waste around the globe. Technical solutions are available, but in most cases a legal framework, a collection, logistics and other services need to be implemented before a technical solution can be applied.

Display units (CRT, LCD, LED monitors), processors (CPU, GPU, or APU chips), memory (DRAM or SRAM), and audio components have different useful lives. Processors are most frequently out-dated and more likely to become "e-waste", while display units are most often replaced while working without repair attempts, due to changes in wealthy nations appetites for new display technology. This problem could potentially be solved with Modular smartphones or phonebloks. These types of phones are more durable and have the technology to change certain parts of the phone making them more environmentally friendly. Being able to simply replace the part of the phone that is broken will reduce e-waste. An estimated 50 million tonnes of e-waste are produced each year. The USA discards 30 million computers each year and 100 million phones are disposed of in Europe each year. The United States is the world leader in producing electronic waste, tossing away about 3 million tonnes each year. China already produces about 2.3 million tonnes domestically, second only to the United States. And despite having banned e-waste imports, China remains a major e-waste dumping ground for developed countries. In the United States, an estimated 70% of heavy metals in landfills comes from discarded electronics.

The electronic waste problem is huge. Morethan 20 million tonnes of e-waste are produced every year. Americans alone generate 3.4 million tonnes of e-waste per year. If we put every blue whale alive today on one side of a scale and one year of US waste on the other, the e-waste would be heavier.

E-WASTE GENERATION -Indian Scenario:

E-waste is growing rapidly, mainly due to rapid development of technology relating to electronic device and decrease in the useful lifespan. In 2004, more than 180 million Personal Compters (PCs) were sold worldwide. In the same year, an estimated 100 million obsolete PCs entered

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waste streams. Further it was estimated that 130 million mobile phones were disposed in 2005. Worldwide e-waste growth had been estimated to be in the range of 20 to 50 million tons per year. At present developing countries is generating e-waste in large quantities. India ranks 4th position in the growth of PC.

Some facts about E-waste

In 2009, discarded TVs, computers, peripherals (including printers, scanners, fax machines) mice, keyboard and cell phones totaled about 2.37 million short tonnes.

- E-waste represents 2% of America's trash in landfills, but it equals 70% of overall toxic waste.
- 20 to 50 million metric tonnes of e-waste are disposed worldwide every year.
- Cell phones and other electronic items contain high amounts of precious metals like gold or silver. Americans dump phones containing over $60 million in gold or silver every year.
- A large number of what is labeled as "e-waste" is actually not waste at all, but rather whole electronic equipment or parts that are rapidly marketable for reuse or can be recycled for materials recovery.
- Only 12.5% of e-waste is currently recycled.
- For every 1 million cell phones that are recycled 35,274 lbs of copper, 772 lbs of silver, 75 lbs of gold and 33 lbs of palladium can be recovered.
- Recycling 1 million laptops saves the every equivalent to the electricity used by 3,657 US homes in a year.
- E-waste is still the fastest growing municipal waste stream in America, according to the Environmental Protection Agency.
- It takes 530 lbs of fossil fuel, 48 lbs of chemicals, and 1.5 tonnes of water to manufacture one computer and monitor.

The Environmental Impact of Processing of Different Electronic Waste Components

E-Waste Component	Process Used	Potential Environmental Hazard
Cathode ray tubes (used in TVs, Computer monitors, ATM, Video Cameras etc.)	Breaking and removal of yoke then dumping	Lead, barium and other heavy metals leaching into the ground water and release of toxic phosphor

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Printed circuit board	De-soldering and removal of computer chips, open burning and acid baths to remove final metals after chips are removed	Air emissions as well as discharge into rivers of glass dust, tin, lead brominated dioxin, beryllium, cadmin and mercury.
Chips and other gold plated components	Chemical Stripping using nitric and hydrochloric acid and buring of chips	Hydrocarbons. Heavy metals, brominated substances discharged directly into rivers acidiflying fish and flora. Tin and lead contamination of surface and ground water.
Plastic from printers, keyboards, monitors etc	Shredding and low temp melting to be reused.	Emissions of brominated dioxins, heavy metals and hyrocarbons
Computer wires	Open burning and stripping to remove copper	Hydrocarbon ashes released into air, water and soil

Effects of E-Waste on Human Health and Environment

E-waste is highly complex to handle because of its composition. It is made up of multiple components some of which contain toxic substances that have an adverse impact on human health and environment if not handled properly that is if improper recycling and disposal methods are deployed. So there is a need for appropriate technology for handling and disposal of these chemicals.

Basel Convention characterizes e-waste as hazardous when they contain and are contaminated with mercury, lead, cadmium, polychlorinated biphenyl (PCB) etc are also characterized as hazardous wastes. Also precious metal ash from printed circuit boards, glass waste from cathode- ray tubes, LCD screens and other activated glasses are classified as hazardous wastes.

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Effects of Some of the Hazardous Components of E-Waste

Sl.No	Hazardous Components	Effect of Hazardous components of e-waste
1	Arsenic	Can affect skin and can decrease nerve conduction velocity. Chronic exposure to arsenic may cause lung cancer and sometimes be fatal.
2	Lead	May affect kidneys, reproductive systems, nervous connections. May cause blood and brain disorders, sometimes may be fatal.
3	Barium	Can affect heart muscle.
4	Chromium	Can damage liver, kidneys and may cause asthmatic bronchitis and lung cancer.
5	Beryllium	May cause lung diseases.
6	Mercury	Affects the central nervous system, kidneys and immune system, it impairs foetus growth. May cause brain or liver damage.
7	Cadmium	May cause severe pain in the joints and spine. It affects the kidneys and softens bones.
8	BFR (Brominates flame retardants)	Can harm reproductive and immune systems, may cause hormonal disorder.
9	Chlorofluorocarbon (CFC)	May affect the ozone layer. It may cause skin cancer in human and genetic damage in organisms.
10	Polychlorinated Biphenyl (PCB)	May cause cancer in animals, can affect the immune system, reproductive system, nervous system, endocrine system, PCBs persistenly contaminate in the environment and cause servere damage.
11	Polyvinyl Chloride (PVC)	PVC contains up to 56% chlorine and when burnt, produces Hydrogen chloride gas which in turn produces hydrochloric acid that is dangerous to respiratory system.
12	Dioxin	These are highly toxic to animals and can lead to malfunction of foetus, deceased reproduction and growth rates, affect immune system.

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SUGGESTIONS

- Encourage recycling of all useful and valuable material from e-waste to preserve the natural resources.
- Promote sustainable recycling of e-waste
- To develop products with minimum use of hazardous substances.
- To handle e-waste in an environment friendly manner.
- Reuse Electrical and Electronics Equipment (EEE).
- Provide awareness about health and environment impact of e-waste among the people.
- Should start a surveillance system for disease and health consequences of e-waste.
- To establish public- private partnerships in setting up buy back or drop off centres.
- To identify best e-waste management technologies across the globe and adopt them successfully.
- Promote the use of safer substitutes of electronic and electrical equipments.
- Adopt the Restriction of Hazardous substances (RoHS) Regulations in the manufacture of electronic goods and identify less hazardous substitutes.
- Government should make stringent laws on the propoer disposal and management of e-waste by both private and public institutions. The existing laws if any on electronic waste must be revamped and reviewed periodically.
- Public awareness programmes should be conducted at regular intervals in order to create a positive attitude among the public on ex-waste management.
- Government should encourage Research and Development activities related with e-waste management and release funds if necessary for conducting R & D activities by private and public research institutes.
- Heavy fines should be imposed on those industries or individuals who does not follow the e-waste management principle or dump the e-waste causing environmental hazardous.
- When buying any electronic product consumers should opt for those products that have fewer toxic parts in them.
- Consumers should buy energy efficient products only.

CONCLUSION

Society today revolves around technology and by the constant need for the newest and most high tech products we are contributing to mass amount of e-waste. Since the invention of the iphone, cell phones have become the top source of e-waste products, because they are not made to last more than two years. Many electronic products contain hazardous element. When they are not properly disposed off as hazardous waste and end up in regular garbage dumps they not only leak into the surrounding environment, but will ultimately be consumed by communities, causing

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diseases such as cancer. Solving the e-waste problem starts with education and habit change as a result of knowledge.

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