



The Effects Of Electronic Waste On Human Health And The Environment

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Abstract:-

Large amounts of e-waste produced by electrical and electronic gadgets are found all over the world nowadays and have turned into a global ecological concern. Because certain components of various electronic devices include compounds that are hazardous due to their density and conditions, e-waste is considered harmful. These materials' hazardous content poses a risk to both the environment and human health. Its deadly compounds combined with soil, water, and air have a dangerous direct or indirect influence on all biodiversity. The study's foundation is a survey of the literature on the effects of electronic waste on the environment and human health. It was determined that there was a massive production of e-waste and that there were insufficient and inappropriate measures in place to handle it. Additionally, it was shown that e-waste had a significant negative influence on both the environment and human health.

Keywords:- E-waste, electrical and electronic equipment, EEE, environment, human health.

1. Introduction :-

Discarded electrical or electronic equipment is referred to as electronic trash, or e-waste. It is also frequently referred to as end-of-life (EOL) electronics or waste electrical and electronic equipment (WEEE). E-waste also includes used electronics that are intended for disposal, salvage recycling through material recovery, rehabilitation, reuse, or resale. In underdeveloped nations, informal e-waste processing can have a negative impact on human health and pollute the environment. There is a global e-waste problem and danger as a result of the increased consumption of electronic goods brought about by the Digital Revolution and scientific and technological advancements like bitcoin. Frequent model releases, needless purchases of electrical and electronic equipment (EEE), short innovation cycles, low recycling rates, and a decline in the average lifespan of computers are all contributing factors to the exponentially fast growth of e-waste.

In the recent decades, EEE has been developing exponentially in the globe while the life expectancy of these items has become shorter and shorter. Certainly, the quantity of electrical gadgets will keep on expanding on the worldwide scale. Subsequently, the volume of WEEE increases rapidly annually and furthermore, it is considered to be among the most crucial issues in the disposal of waste in the twenty-first century. This upsurge has been enhanced by the expansive economic growth combined with urbanization that demands for more consumer goods. As a result, the consumption of EEE has

increased which has as well fostered the production of e-waste.

Electronic rubbish, or e-waste, is created when an electronic product is discarded after its useful life is done. The rapid advancement of technology and our consumption-driven society have led to the massive production of e-waste. The US Environmental Protection Agency (EPA) divides e-waste into ten distinct categories in the US:

- ❖ Large household appliances, including cooling and freezing appliances
- ❖ Small household appliances
- ❖ IT equipment, including monitors
- ❖ Consumer electronics, including televisions
- ❖ Lamps and luminaires
- ❖ Toys
- ❖ Tools
- ❖ Medical devices
- ❖ Monitoring and control instruments
- ❖ Automatic dispensers

These comprise secondary raw materials (copper, steel, plastic, or comparable materials), re-usables (functional and repairable electronics), and old electronics that are intended for reuse, resale, salvage, recycling, or disposal. Due to the frequent commingling of shipments of excess electronics (good, recyclable, and non-recyclable), the word "waste" is reserved for leftover or material that is discarded by the buyer rather than recycled, including residue from reuse and recycling activities. Many proponents of public policy use the terms "e-waste" and "e-scrap" interchangeably to refer to any excess electronics. One of the most difficult types to recycle is cathode ray tubes (CRTs).

In perspective on the negative impacts of risky wastes to the environment and human wellbeing, a few nations saw the need for a worldwide consent to address the issues and difficulties presented by the dangerous waste. Additionally, towards the end of 1980s, the stiffening of ecological guidelines in industrialized nations prompted a sensational increase in the cost of disposal of hazardous waste. Scanning for less expensive approaches to dispose of the wastes, the traders started transporting unsafe waste to developing nations. The international outcry following these ill-considered exercises prompted the drafting and selection of strategic plans and guidelines at the Basel Convention. This Convention had the secretariat in Geneva Switzerland that facilitated the execution of the convention and the associated agreements. The convention also offers help and regulations on lawful and technical concerns, collects statistical information, and organizes trainings on suitable management of dangerous waste.

2.E-WasteGeneration:-

With 44.7 million tons of e-scrap created worldwide in 2016, the business, public, and individual consumer sectors all contribute to the creation of e-waste. Only 20% (about 8.9 metric tons) of the 44.7 million tons of e-waste were registered as being collected and recycled properly, according to the Global E-Waste Monitor, with the remaining 80% (35.8 metric tons) going unrecorded. Of these 80%, 4% were disposed of as residual garbage in countries with better incomes, while the remaining 74% of electronic waste was unknown and was most likely recycled, swapped, or disposed of under subpar circumstances. Asia produced 18.2 million tons of e-waste in 2016, followed by Europe (12.3), America (2.2), and Oceania (0.7). In advanced nations like Oceania, including Australia and New Zealand, the public and private sectors of personal use generate more electronic trash per resident than in poor countries. With a collection rate of 6%, Oceania is the largest producer of e-waste per capita. Europe comes in second with 35%, America with 17%, Asia with 15%, and Africa with very limited information on collection rates [2]. It should be highlighted, nonetheless, that official data on electronic trash has only been given by 41

countries. This suggests that there is a significant paucity of information on the generation, handling, and trade of e-waste. Once more, contamination and waste generated during raw material extraction and/or transportation, as well as during the production, distribution, and sale of EEE, are not included in the definition of e-waste. With an expected yearly growth rate of 3% to 4%, it is predicted to rise to 52.2 million tons by 2021.

3.Impact Of E-Waste On Human Health:-

The environment and human health are seriously endangered by e-waste. Heavy metals, chemicals, and dangerous substances are present in this equipment. Workers that handle e-waste are also directly exposed to ergonomic and physical hazards, which can result in work-related accidents as well as poor health. They are impacted not only by the dangerous components of e-waste but also by the materials that are used to extract valuable components from it. For instance, high concentrations of copper, rare earth metals, and silver threaten Indian workers. Additionally, it was found that workers in the Philippines were exposed to hazardous fumes and corrosive solutions from smelting, which they breathed. These employees are not aware of the dangers associated with their line of work. According to a Nigerian study, just 12% of informal e-waste workers were well-informed on occupational safety and health hazards, and 88% of them were unable to identify a single chemical component in the garbage. Recycling of electronic garbage is done informally both outdoors and in cramped workshops. Typically, this setting is inadequate and unable to provide the required level of workplace safety. Nose and face masks and adequate lighting and ventilation are not provided for the workers here. Because they can infect neighboring residents in many ways, some e-waste is disposed of close to residential areas, endangering them. Lead, for example, is extremely toxic and can have negative effects on children's cognitive and behavioral development, including lowering IQ. In underdeveloped nations, proper e-waste recycling services are uncommon due to their high installation and operating costs. Aluminum, zinc, mercury, cadmium, nickel, lead, chromium, copper, arsenic, iron, manganese, and zinc are among the major hazardous compounds found in EEE. Mercury is present in fluorescent bulbs, flat-screen displays, and other devices. Its adverse effects include dermatitis, memory loss, sensory impairment, and muscular weakness. Sulfur, which is present in acid batteries, damages important bodily organs. Cadmium inhalation can cause serious harm to the kidneys and lungs, as well as deficiencies in children's neuromotor skills, learning behavior, and cognitive abilities. Lead-acid batteries and CRT displays contain lead. Its consequences are extensive and include reproductive system harm, central nervous system impairment, and cognitive impairment. Mercury poisoning damages the kidney and brain, among other organs. Workers are directly impacted by the recycling process, but individuals are indirectly impacted when they consume contaminated water or come into contact with a contaminated food chain. Most significantly, when e-waste is burned in the open, air is the primary carrier of dangerous contaminants. These methods produce emissions that are so thick that they influence a large area, making it difficult for those who live and work nearby to breathe. The situation in Ghana is worse since most of the workers are kids and teenagers who work 10 to 12 hours a day and burn PVC (polyvinyl chloride) cables all the time. Long-term, continuous e-waste burning has been linked to lung and cardiovascular disorders. Since water flows from contaminated fields, the accumulation of hazardous wastes in the environment has an impact on nearby lands and rivers. Over time, this causes contamination in the food chain, which has a significant impact on the general public and causes food-borne illnesses. The ecological elements of soil, water, and air support agricultural practices including growing crops, fruits, and vegetables as well as producing animal feed. Furthermore, because the toxins slow down the animals' metabolic processes, they accumulate in tissues and may eventually be eliminated in meat, milk, and eggs.

Residents situated along polluted rivers draw water that they directly use for washing, cooking and drinking. This water is also used in major activities like intensive farming. A research carried out in India on local residents living in and around the e-waste processing facilities found shocking levels of toxic heavy metals (Ni, Cu, Zn & Cr) in their blood samples. As a consequence, the study established the significant predominance of cardiovascular disease i.e. hypertension among the local residents which was

associated with the constant exposure to electronic waste. It was also concluded that some of these metals had been spread in the atmosphere hence causing air contamination.

4. Impact Of E-Waste On Environment:-

According to Rahib and Ali (2014), e-waste is thought to be very infectious for the ecosystem and its constituent parts. Toxic emissions are released by processing processes such as smelting, cutting, crushing, incineration, and burning (Lee et al., 2007). According to Awasthi et al. (2016), traditional e-waste processing in India through unsuitable networks has released a huge amount of heavy metals and other toxins into the environment, harming plants, soil, water, and dust. The primary environmental issues are hazardous materials found in garbage and resource depletion brought on by the production of new electrical and electronic devices. A million tons of resources that could be salvaged and utilized to create new items are wasted when electrical and electronic products are disposed of in landfills. The physical and chemical makeup of e-waste differs from that of industrial or municipal garbage. Because electronic devices contain thousands of components made from deadly chemicals and metals like lead, cadmium, polyvinyl chlorides (PVCs), brominated flame retardants, beryllium, antimony, phthalates, chromium, and mercury, e-waste poses a far greater risk to human health than many other municipal wastes (Saoji, 2012). The environment and human health may suffer as a result of these wastes (Gaidajis et al., 2010; Alabi et al., 2020). Despite typically only being present in trace levels, these hazardous compounds seriously harm the ecosystem. Through leachates from disposal sites, wastewater from dismantling and shredding facilities, fly and bottom ash from burning activities, and particle matter from dismantling activities, improper treatment of e-waste contributes harmful materials to environmental cycles. Greenhouse gases that contribute to global warming can be produced by burning e-waste. Researchers from all around the world have thoroughly examined the effects of recycling e-waste on human health, particularly in nations where the informal sector handles this task (Herat, 2020). Long-term exposure to e-waste components can harm the kidney, bones, reproductive and endocrine systems, the neurological system, etc. (Islam et al., 2019). The people who live near the unofficial e-waste markets may be impacted by these dangerous substances once they are discharged into the body and accumulate in adipose tissues (Zeng et al., 2017; Zhang et al., 2017; Liu et al., 2018). A number of substances found in e-waste are harmful to human health. The most significant ones are that long-term exposure to arsenic can induce lung cancer, reduce nerve conduction velocity, and cause a variety of skin conditions. Chronic Beryllium Disease (berylliosis), which mostly affects the lungs, is brought on by beryllium. Chronic cadmium exposure results in Itaiitai illness. Lead is a neurotoxic that damages the reproductive system and kidneys. Mercury has an impact on the central nervous system and cardiovascular system. Serious hormonal problems can result from using brominated flame retardant (BFR). Any garbage that is disposed of always ends up in the environment. The soil, air, and water have been found to have high concentrations of organic and metallic pollutants. Other hazardous materials found in e-waste that contribute to toxic landfills are hydrochlorofluorocarbons (HCFCs) and polychlorinated biphenyls (PCBs). Plastics make up a significant amount of e-waste, and if not disposed of appropriately, retardant plastics may be harmful to the environment. Computer garbage is disposed of in landfills, where it creates contaminated leachates that eventually poison subterranean water. Computer chip smelting produces acids and sludge that, if left on the ground, acidify the soil. Toxins pose a threat to human health and vital environmental components if these electronic devices are disposed of with other household waste.

When sulfur from lead-acid batteries is released into the environment, it results in acid rain. The sale of nickel-cadmium batteries containing at least 6-8% cadmium was prohibited by the European Union. This is because, if not properly recycled, cadmium may infiltrate into the soil and harm microorganisms while also upsetting the soil's biological balance. The environmental bioaccumulation of some toxins, such as persistent organic pollutants, indicates a long-term health danger because they are not biodegradable. Long-term exposure of water and soil to pollutants subsequently encourages chemical loadings, which ultimately lead to significant levels of harmful substance absorption in crops. Open air burning is one of the unofficial recycling methods used for component separation, such as copper and solder recovery from electrical wires. Direct ecological effects of open air burning include the discharge of various toxic compounds into the

atmosphere and the buildup of pollutants on soil and water supplies. Water contamination results from the residual ash being transported by surface waterways. For example, a study conducted in Vietnam on surface soils and river sediments near and in WEEE locations discovered elevated amounts of dioxin-like chemical poisons from open burning. Burning PVC cables and e-waste continuously has an immediate negative impact on the environment, filling the air with dense black smoke that takes a long time to remove.

5.Conclusion:-

High use of electronic products is a result of changes in people's lives, technical developments, and the accessibility of electronic gadgets. Due to the huge volume of e-waste produced and the lack of appropriate disposal systems, it is predicted that this type of trash will have detrimental effects on both the environment and human health. In order to reduce the pollution levels caused by the chemicals included in e-waste, it is imperative that the appropriate mitigation techniques be implemented. It is possible to adopt standardized e-waste rules and legislation from a number of different nations. From material extraction to disposal, effective tracking and collection will be made possible by proper e-waste management, guaranteeing that these massive e-waste mounds are converted into valuable products and business prospects. In addition to harmful materials, e-waste also contains valuable materials. Although the government is very worried about e-waste, consumers should also be concerned since it contains a number of dangerous substances. In India, the majority of e-waste reuse, remanufacturing, and recycling is done informally that is, without government approval. While some e-waste is recycled in the unorganized sector, the majority of e-waste is disposed of in landfills once the valuable materials have been recovered. It causes a variety of environmental and health risks. To fully use the resource value of e-waste and create a sustainable management pattern, it is crucial to bridge the gap between the formal and informal e-waste sectors. It is imperative and highly recommended to formalize the unorganized sector through a continuous recycling program. Effective procurement, collection, extraction, and disposal of materials are all made possible by proper e-waste management, which guarantees that this substantial amount of e-waste will be converted into profitable products. For India's waste management system to remain viable, the negative impacts of e-waste on the environment and human health must be reduced by effective recycling, e-waste disposal, and strict enforcement of e-waste management laws.

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