
Environment and E-Waste: The Waste of the 21st Century

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ABSTRACT

To address the digital divide, it is essential to provide an accessible, fair and reliable access to ICT. It is estimated that two-thirds of the global population remains disconnected.

Thus, it is essential to ensure that everyone has affordable access to the internet. In nations with developing economies, it has emerged as a key focus to reduce poverty by enhancing access to ICT. Simultaneously, remarkable expansion in the utilization of ICT devices and services, quicker transformation of technology and constant advancements in the ICT field have presented the world with a risk of decline in environmental quality and human well-being due to the disposal of electronic and electrical devices, which include dangerous elements, are still managed in an in a way that is harmful to the environment, primarily in developing countries. It represents a significant challenge for the countries to manage e-waste responsibly and safeguard the environment. Global management alongside Indian practices, taking into account the current regulations and rules. A significant portion of e-waste recycling is managed by informal sector lacking awareness regarding the effects of exposure to dangerous materials. To tackle the challenge of e-waste management in an environmentally friendly manner, the idea of EPR (extended producer responsibility) will be beneficial provided the regulations include supervision and sanction provisions. The repurposing of EEE has significant environmental and social benefits. Advantages compared to recycling since it extends the lifespan of the ICT devices and allows increased resource efficiency and energy effectiveness. In emerging countries, it can assist in enhancing the position of the informal sector through education and job opportunities. Alongside the technical, social, and organizational elements of EEE waste management system; it is also important to take into account the financial factors, if the system must be financially feasible and sustainable while also being socially acceptable.

INTRODUCTION

Electronic waste, commonly known as e-Waste, encompasses discarded electronic devices including computers, Information and Communication Technology (ICT) equipment, home appliances, and their accessories. The rapid growth of the IT sector has resulted in an increase in the use of electronic devices. These devices quickly become outdated and are often discarded, leading to significant amounts of hazardous e-waste. According to the Global e-Waste Monitor 2024, published by the United Nations Institute for Training and Research (UNITAR), the global production of electronic waste is increasing at a rate five times higher than the documented recycling of e-waste. Since 2010, there has been a notable rise in global e-waste output, increasing from 34 billion kilograms in 2010 to 62 billion kilograms in 2022. This trend is projected to continue, reaching 82 bn kg by 2030.

It is an undeniable reality that with the significant rise in the adoption of ICT devices to connect the digital gap, there is also a concerning increase of electronic waste globally. e-waste is characterized as “discarded electrical and electronic devices, complete or in fragments, or by products from their manufacturing and repair procedures, which are meant to be thrown away” while electrical and electronic devices are defined as ‘devices that rely on electrical currents or electromagnetic fields to operate effectively. E-waste management is essential because components from e-waste can lead to serious health hazards and ecological harm occurs when raw, unproven techniques are utilized for retrieval of valuable elements. It is essential to promote the recycling of all valuable and important resources from electronic waste to conserve natural resources. Many developing nations are

grappling with the swiftly escalating issues of electronic waste and must implement effective e-waste management systems for the disposal of obsolete ICT items to prevent danger to the planet and humanity.

LITERATURE REVIEW

Shubham Gupta and colleagues (2014) examined that in emerging nations such as India and China, Indonesia, Brazil, and commercial entities generally prioritize economic factors over than the environmental rules governing e-waste recycling. Therefore, for the successful retrieval of recyclable materials and eco-friendly surroundings, the effective processing of this refuse has been rendered essential, and is viewed as a challenge for contemporary society.

Sikdar & Vaniya (2014) in their study indicated that the government ought to implement certain subjects concerning the disposal of electronic waste and its recycling as well as the negative impacts of e-waste on the well-being of the human body in Environmental Education as a mandatory topic from primary to elevated scores. The investigator discovered recently that the educational system by itself is a strong means to guarantee ecological preservation. It ought to cover the majority of the populace in an early age, and increased e-waste conscious habits should be adopted every day.

Sukeshini Jadhav (2013) noted that effective e-waste management will aid in efficient sourcing and gathering all the way to extraction and disposal of materials, ensuring that electronic waste will transform into profitable products and business prospects. The producers must consider accountability for implementing the standard for producing environmentally friendly products sustainability management should begin at the product manufacturing phase, specifically with raw materials. Choosing materials, along with product and process design, can significantly influence the design outcomes for sustainable practices, which can promote recycling and repurposing. The producer ought to also attempt to launch a retrieval initiative to manage the waste effectively and ensure proper handling and E-waste can be disposed of. Since 60% of e-waste originates from the industry, it can play a significant role in the collection and establishment of Electronic waste management purify e-waste pathways.

The UNEP (2010) report forecasts that by 2020, electronic waste from obsolete computers in India will rise to 500%; the amount from discarded mobile phones will be approximately 18 times greater; from televisions will be 1.5 to 2 times greater; from abandoned refrigerators will increase two to threefold; compare to its corresponding levels of 2007. Given the growth rate, research indicates that the E-waste volume is expected to attain almost 2 million MT by 2025.

Sources of e-Waste

There are a number of different sources of e-Waste such as

- Waste produced by data processing items, including computers and computer accessories like printers, speakers, keyboards, and monitors.
- Electronic devices used for entertainment like TV, DVDs and CD players. Equipments or devices used for communication like phones, landlines, etc.
- Household equipments like vacuum cleaners, washing machines, air conditioners that have become old and people want to get rid of from them.
- Outdated electronic items like big monitors, stereo, VCR, etc.

Effects of e-Waste

e-Wastes have many harmful effects on humans, animals and our environment. Some of the effects of e-Waste are given below

- Electronic devices use potentially harmful metals such as lead, mercury, arsenic cadmium, beryllium, etc. When dumped into the landfills, these metals are environment and cause health issues into the animals and humans alike
- There are chances that the chemicals released from e-Wastes may percolate into the ground resulting in land and water pollution.
- Polychlorinated biphenyls and polybrominated diphenyl ethers are the important components of e-Waste and have dangerous side effects. These toxins and chemicals cause birth-defects, kidney, liver, heart and skeletal system damage.

Besides, they are known to have a deteriorating effect on the nervous and reproductive systems of the human body.

- The hydrochlorofluorocarbons (HCFCs) and chlorofluorocarbons (CFCs) are causative agents of ozone depletion. These toxins also bio-accumulate through the food chains and cause a serious threat to all species on the planet.

E-Waste Control

Recycling is the best method to control e-Waste. Recycling of e-Waste takes place in 3 major steps. These steps are

(i) **Detoxication** To ensure safe disposal or recycling of e-Waste, detoxication process takes place for the electronic materials. Detoxication is the process of removing critical components from the e-Waste in order to avoid contamination with toxic substances during the downstream processes. Critical components include lead glass from CRT (Cathode Ray Tube) screens, CFC (Chlorofluorocarbon) gases from refrigerators, light bulbs and batteries.

(ii) **Shredding** In this method, electronic materials are broken into pieces to obtain concentrates of recyclable materials in a dedicated fraction and also to further separate hazardous material.

The mechanical processing plants where shredding takes place include shredders, crushing units, magnetic and eddy current and air separators. The emitted gases are filtered and residues are treated to minimise environmental impact.

(iii) **Refining** The next step of e-Waste recycling is refining of the shredded materials to obtain reusable components. Refining of resources in e-Waste is possible and the technical solutions exist to get back raw material with minimum environmental impacts.

Other Ways of e-Waste Management

The rampantly growing environmental footprint due to e-Waste is indeed a cause of concern. It is the responsibility of both the consumers and producers to manage the growing e-Waste. Some of the suggested ways of e-Waste management are

- Most of the electronic material has a certain amount of reusable component associated with it. This reusable component includes metals such as copper, aluminium, lead, gold, silver iron, etc. Special environment-friendly techniques need to be devised in order to extract this material safely from the waste material.
- Instead of throwing away, the electronic devices can be donated to needy people. Used gadget can also be sold at cheaper rates. These electronic products should be repaired and reused if possible.

- Instead of throwing away the e-Wastes, they should be sold as scrap material for this, the initiatives of producers are needed. The producers can enter the recycling chain by providing a collection service and a repurchase offer better than that of the unorganised sector.
- The consumers can be provided with financial incentives in order to make them enter the formal recycle chain. They need to be encouraged to get the defunct gadgets and electronic items out of their house. The concept of three R's i.e. Reduce, Reuse and Recycle can play a significant role in e-Waste management.
- The formal and informal sector can be clubbed together in order to provide better e-Waste management. Besides, the producers must try to incorporate environment friendly raw material in the manufacturing of the final products
- Proper training should be given to the workers engaged in e-Waste recycling so that e-Waste management is done on scientific lines.
- The Government, NGOs and create awareness among the people about the harmful effect of e-Waste and about ways to reduce it.

Government's Initiatives

The Government of India has taken some important initiatives in order to reduce e-Waste in the country. Some of these are

- The Ministry of Electronics and Information Technology (MeitY) has initiated an e-Waste awareness programme under Digital India, along with industry associations from 2015. The objective of this programme is to create awareness among the public about the hazards of e-Waste recycling by the unorganised sector and to educate them about the alternative methods of disposing their e-Waste.
- Ministry of Environment, Forest and Climate Change under the Government of India has notified e-Waste Management Rules, 2016 in order to keep a check and enable proper management of the e-Waste. As per this rule, the manufacturer is also now responsible to collect e-Waste generated during manufacture of any electrical equipment and channelise it for recycling or disposal and seek authorisation from State Pollution Control Board (SPCB).
- Besides this, E-Parisaraa is an excellent initiative for the management of e-Waste in the country. E-Parisaraa, an eco-friendly recycling unit on the outskirts of the city, it is India's first e-Waste recycling unit. It aims to reduce pollution and landfill waste along with recovering valuable metals, plastics and glass in an eco-friendly way.
- Given that India is the 5th largest producer of e-Waste, there is always a need for amending past rules and implementing new ones. The draft of e-Waste (Management) Amendment Rules, 2022, require of all goods companies and producers of electronics to ensure that at least 60% of their produced e-Waste in collected and recycled by the year 2023 with targets to further increase the percentage to 70% and 80% by 2024 and 2025 respectively.
- A Deposit Refund Scheme has also been introduced as an additional economic instrument wherein the producer charges an additional amount as a deposit at the time of sale of the electrical and electronic equipment and returns it to the consumer along with interest when the end-of-life electrical and electronic equipment is returned.

CONCLUSION

It is suffice to say that that e-Waste is emerging as a serious public health and environmental issue in the world. Thus, it is the need of the hour to check and formulate such strategies and measures which can control the e-waste generation and dispose them safely. We should use effective e-Waste recycling methods instead of

switching the dangerous incineration method. More than any laws and rules, it requires a collective effort from the consumer, the producer and the government to handle manage and dispose the e-Waste efficiently. Electronic waste has turned into a significant issue globally as we persist in expanding the technology and be subservient to them. If immediate action is not performed promptly, it will keep increasing and turn into a significantly larger issue for the earth. It possesses a significant impact on the environment and human existence if not managed in an ecologically responsible way. Citizens must have adequate rights to pursue legal action for damages resulting in effects on their health, surroundings, and belongings. Consequently, it has become essential to handle electronic waste in a systematic and secure way using sustainable recycling methods.

There is a lack of awareness and education among both individuals and officials. The public and authorities need to be made aware of the significance of the environment and its effects, the impact of e-waste on the environment. We must cultivate a dedication to service and harmony with nature to avoid repeating past mistakes. Insufficient workplace safety exacerbates e-waste management issues. Pollution control boards at both the central and state levels must be enhanced regarding authority over all environmental issues. Developing skilled personnel and knowledge is essential.

Additionally, it is necessary to implement an effective strategy to promote re-use, refurbishment, or recycling of electronic waste in dedicated facilities to avoid environmental pollution and protect human health dangers.

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