E-Waste –A Digital Threat to Environment and Human Health in India

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Abstract: The present age is the age of electronics which has revolutionized human society and has impacted communication, business and connectivity across the globe and even beyond. On one side this digital revolution has made life easy but on the other side it has introduced significant threat to environment and human health. Being a fast-developing nation India, currently the third largest producer of e-waste globally faces escalating risks due to lack of awareness, paucity of funds, improper disposal of e-waste and inadequate infrastructure. This paper attempts to provide an overview of the types, sources and hazards of e-waste. It focuses on the current trends of handling e-waste in India and also examines the challenges in e-waste management and offers sustainable solutions involving public awareness, policy reforms and extended producer responsibility.

Key Words: e-waste, electronic waste recycling, Extended producer responsibility, Environmental impact, Digital pollution

INTRODUCTION

The global technological revolution has significantly altered communication, education and commerce in India. The digital revolution in India is evident through smartphone penetration, rising internet usage and growth in electronic consumption not only in the class A and class B cities and towns but also in the remotest, far flung and most underprivileged areas of the country. This digital pervasiveness has led to a parallel surge in e-waste making India the third largest generator of e-waste globally behind only China and US. E-waste includes end-of -life or obsolete electrical and electronic devices like televisions, refrigerators, air –conditioners, computers, cell phones, mobiles containing very toxic substances like mercury, lead or brominated flame retardants. Unscientific disposal practices, improper handling of e-waste by uneducated people with poor awareness of storage, disposal and recycling techniques further exacerbates the environmental and public health threats posed by e-waste.

Objectives of the Study and Methodology:

The primary objectives of the study are to

1. Analyse the trends of e-waste production in India and compare it with the global trends.
2. To examine India's current e-waste production and management practices.
3. To identify the challenges and propose solutions for sustainable e-waste disposal.

METHODOLOGY

The study is based on secondary data collected from various government publications, industry reports and academic literature particularly from the Ministry of Electronics and Information Technology (MeitY), Government of India, ASSOCHAM and other credible sources.

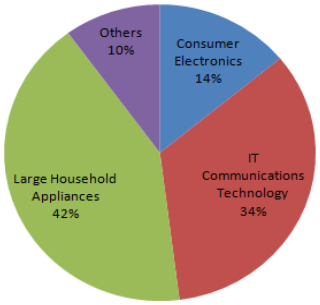
Composition of E Waste and its Classification:

E-Waste comprises of both electrical and electronic items that have been discarded. Electrical Waste typically includes large and small household appliances like washing machines, dryers, air conditioners, vacuum cleaners, coffee machines, toasters, irons, refrigerators, DVD players /VCR players, CD players, radios, wi-fi equipments, batteries, light bulbs, fluorescent tubes, etc. Electronic e-waste on the other hand primarily comprises of computers, printers, monitors, scanners, photocopiers, fax machines, television laptops, mobile phones, chargers, mouse, keyboards and other peripheral devices.

The disposal of electronic waste is complex and demands specialized expertise and technical knowhow as the e-waste contains highly toxic and hazardous substances. For example the cathode ray tube (CRT) in older computer monitors may contain significant

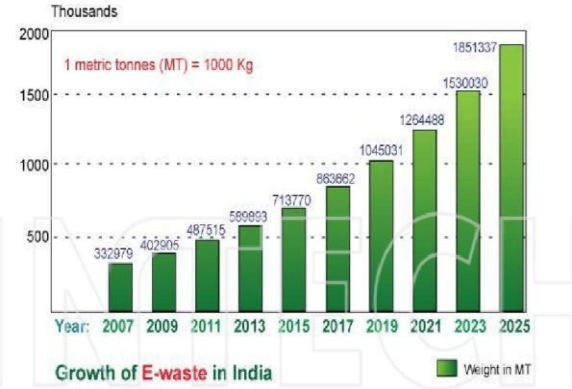
amount of lead. Other harmful substances commonly found in electronic waste may be arsenic, cadmium, selenium, chromium and flame retardants like polybrominated biphenyls, polyvinyl chloride, polychlorinated biphenyls, polybrominated diphenylethers, etc. Improper handling and disposal of these materials can result in severe irreversible environmental damage and pose serious health risks to humans, including neurological, respiratory and developmental disorders.

Composition of e-waste



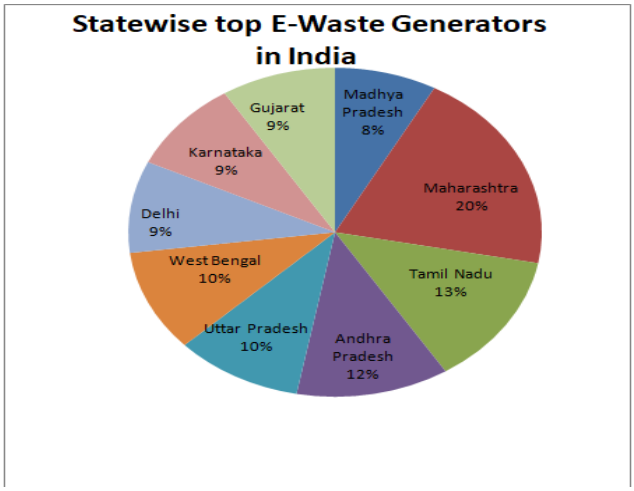
E Waste generation in India: A Growing Concern

The e-waste growth projection in India as given by the Department of Information Technology are shown below



Source: Department of Information Technology

The above graph shows that the volume has e-waste has increased from 0.8636 million metric tonnes in 2017 to 1.045 million metric tonnes in 2019-20 which marks a rise of 23% in e-waste production. Projections further show that the e-waste production is likely to rise to 1.751 million metric tonnes in 2023-24 jumping to a 73% rise in the production of e-waste! Estimates suggest that India will generate over 161 million tonnes of e-waste by 2050 (Sengupta et al. 2022). Studies also point out to the fact that computer devices account for nearly 70% of the e-waste, telecommunication equipments account for 12 percent of the e-waste, medical equipments being 8% and electric equipments contribute nearly 7% to the annual production of e-waste. A major factor contributing to the exponential growth of e-waste is the short life span of most electronic gadgets typically ranging from 2-3 years. As this waste contains toxic substances it can be detrimental to the environment and individuals if not handled properly. In a developing country like India dearth of knowledge and funds further exacerbates the problem. So what are the challenges and the way ahead ??



Source: NEC Technologies India Pvt Ltd and ASSOCHAM

Major Challenges of E-Waste Management in India:

One of the major challenges leading to the excessive production of e-waste is the intentional design of electronic gadgets with short life spans which coaxes the consumer to purchase new gadgets every 2-3 years discarding their old but still functional gadgets. Rapidly evolving technology and new innovations also serves as a motivation for the consumer to purchase new gadgets in order to remain aligned with latest technology. It is very shocking that this e-waste is just thrown away with the other wastes causing huge environmental damage. E-waste is generally not processed properly due to lack of proper facilities and technical knowhow. As per the data presented by the government in August 2024 in Rajya Sabha there is a significant increase in the processing of e-waste rising from 22 per cent in 2019-20 to 43 per cent in 2023-24. Despite this progress, approximately 57 per cent of e-waste— equivalent to 990,000 metric tonnes —

remains unprocessed in the country. The recycling rate of e-waste remains very low, a vast majority (over 90%) being collected and processed by the unorganized sector primarily unskilled ragpickers or kabadiwallahs who also face occupational hazards while collecting and disposing these electronic wastes because of lack of awareness, protective gear and dearth of knowledge.

Hazards of Improper Disposal of E-Waste:

Improper disposal of e-waste poses multi-dimensional threat to both human health and environment. E-waste contains a large number of hazardous chemicals like lead, mercury, chromium, cadmium and even the deadly plastics. When this waste is dumped into the landfills it leads to the leaching of these poisonous chemicals into the ground subsequently contaminating the soil and water bodies in the nearby areas. This leads to severe health hazards for the human beings, aquatic species and local flora and fauna. Various hazardous disposal techniques like dumping into the landfills, open burning of plastic shells and PCB boards, acid stripping of chips to recover precious metals, CRT cracking and dumping, all these methods cause severe environmental hazards. Prolonged exposure to these chemicals released by the e-waste causes serious damage to nervous system, liver dysfunction, blood circulatory system, skin disorders, bronchitis, respiratory disorders, kidney failure and various types of cancers. Studies have shown significantly elevated levels of heavy metals in the blood of workers handling these wastes.

The Way Forward:

- The most effective solution of the growing menace of E-Waste is the recycling of raw materials from the discarded electronic items. Most electronic items contain a variety of metals and minerals that can be recovered and reused for future purposes.
- In order to ensure extraction of raw materials from discarded electronic and electrical appliances the most important factor is the effective collection of these waste items. Hazardous substances should be restricted in new EEE in compliance with the RoHS provisions.
- Separate E-Waste collection centres should be set up and popularized through local media and internet and people should be motivated to sell their E-Waste to these authorized centres instead of giving them to the local unskilled kabadiwallahas. Public institutions and offices should be mandated to dispose e-waste through registered channels only.
- Awareness campaigns should be organized to educate the general masses about the importance of giving their E-Waste to the authorized vendors. Reuse and repair of electrical and electronic items should be promoted. “Right to repair” should be encouraged through proper availability of spare parts and repair services.
- Extended Producer Resposibility (EPR) should be made compulsory for the producers and they should be mandated for the proper disposal of these wastes through authorized recyclers. For this the producer should be incentivized to collect the old items before selling the new ones. EPR certificates will ensure accountability and encourage compliance.
- Sustainable recycling practices and tax incentives are needed to encourage manufacturers to design eco-friendly, recyclable products. The government should implement a tax credit system to incentivize electronics manufacturers for designing sustainable products.

CONCLUSION

Although electronic and electrical items are the need of the hour and in the present situation one cannot do without these, but by educating the masses about the harmful effects of unsystematic e-waste disposal and by creating awareness among the individuals about the importance and need to give the discarded e-waste only to authorized and registered agencies can greatly help in the management of e-waste. Companies should be encouraged to incentivize buy back policy. Every individual should consider it his personal responsibility to dispose or recycle the old devise before purchasing the new one. By fostering a circular economy approach and prioritizing soud practices, India can transform its e-waste menace into an opportunity for resource recovery and sustainable development.

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https://www.sciencedirect.com/science/article/abs/pii/S0892687522002710 AA01Volume: 2 | Issue: 4 | April 2013 • ISSN