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Overview of Issues, Challenges and Strategies for Effective Management of E -Waste in India

Dr. Varsha Rayanade

Abstract

The rapid growth of the electronics industry has led to a significant increase in generation of electronic waste i.e. e-waste in India, which mostly comes from electronic devices and appliances. Managing E-waste is more complex and challenging compared to other traditional waste. E-waste management is becoming a major cause of concern to public health and environment due to its hazardous nature. This paper attempts to review the current issues, challenges and management practices of e-waste in India.

With the growing economy and rise in demand for electronic devices, India today has become one of the largest generators of e-waste. Approximately 2 million tons of e-waste is generated annually that keeps piling up, with a growth rate of almost 15-20% per annum. The present system of e-waste management in India is facing many issues and challenges such as difficulty in inventorization, ineffective regulations, unsafe and informal recycling practices, lack of awareness among consumers, etc. Failure in proper disposal of e-waste thus leads to significant environmental and health concerns, including soil and water pollution, air pollution and health problems. This paper presents an overview of various issues, challenges related to e-waste and the strategies for effective e-waste management in India. It also highlights the need for effective e-waste management strategies, including legislation, infrastructure development, public awareness and emphasizes the need for infrastructure development, including e-waste recycling and disposal facilities.

The paper concludes that e-waste management is a significant concern in India due to its hazardous impact on the environment and human health. Effective e-waste management strategies, including legislation, infrastructure development, and public awareness, are needed to address this issue.

Keywords: E-Waste, E-Waste Management, Environment, Pollution, Infrastructure Development, Public Health.

Background

India is one of the fastest growing economies in the world. During the past decade, there has been significant growth in Indian's IT and communication sector, as result of which use of electronic products such as computers, laptops, tablets, smartphones, Bluetooth devices, etc. have also increased rapidly. Further, technological advancements have shortened the useable life cycle of such electronic products as new models with better features are constantly being launched, which induce the consumers to exchange their existing gadgets and appliances for new models. Thus, it can be said that the electronic waste stream is one of the fastest-growing waste streams in India. E-waste is a popular, informal name for electronic products whose "useful life" period has ended and have become obsolete and un-useable. When any electrical or electronic equipment is no longer fit for use, it turns into electronic waste (e-waste).

Definition of Electronic Waste (E-Waste)

E-Waste (Management) Rules, 2016 defines e-waste as “any electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment and repair processes”

United Nations Environment Program (UNEP) defines ‘E-waste’ as “any electrically powered appliance that fails to satisfy the current owner for its originally intended purpose”

Organization for Economic Cooperation and Development (OECD) defines ‘E-waste’ as “any household appliance consuming electricity that has reached its end of life is E-waste.”

Introduction

The rapid growth of the electronics industry has led to a significant increase in electronic waste (e-waste) generation worldwide. Electronic waste refers to discarded electronic devices, including computers, mobile phones, televisions, and other electronic equipment. The growth of the electronics industry has been driven by the increasing demand for electronic devices, particularly in developing countries like India.

India has become one of the largest generators of e-waste due to its growing economy and increasing demand for electronic devices. India is the "Third largest electronic waste producer in the world"; approximately 2 million tons of e-waste are generated annually and an undisclosed amount of e-waste is imported from other countries around the world. According to United Nations Trade and Development (Unctad) report, India witnessed an

highest 163 per cent growth globally in generating electronic waste from screens, computers, and small IT and telecommunication equipment (SCSIT) between 2010 and 2022. As per the '2024 Digital Economy Report: Shaping an environmentally sustainable and inclusive digital future' India has doubled its share in SCSIT waste generation in the world from 3.1 per cent in 2010 to 6.4 per cent in 2022. Over the year, the E-waste garbage list is getting updated that includes gadgets like smartphones, tablets, laptops, video game consoles, cameras, e-bikes, and many more.

E-waste is a repository of numerous hazardous substances such as lead, mercury, cadmium, and chromium that pose significant risks to both human health and the environment. These materials can contaminate soil, water, and air, and can have serious health impacts, including cancer, neurological damage, and reproductive problems. E Waste is emerging as a serious public health and environmental issue in India. (Joon, Veenu, et.al, 2017).

Though, E-waste, is an emerging problem, it also a business opportunity of increasing significance, given the volumes of E-waste being generated and the content of both toxic and valuable materials in them. E- waste includes fractions of iron, copper, aluminum, gold and other metals in E-waste which constitute to over 60%, while the pollutants material comprise of only 2.70% (Widmer et al., 2005). Therefore, recycling of E-waste is an important subject not only from the point of waste treatment but also from the recovery aspect of valuable materials. However the process of take-back and disposal of E-waste is very complex, involving various kinds of products, many people and enterprises, extensive areas, and long time span.

The current e-waste disposal techniques in India have been operated mostly in an informal manner due to the lack of enforcement laws and regulations and unfortunately, it is frequently disposed of without adequate safety measures in place. This is largely because a substantial portion of e-waste is processed illegally by workers operating outside of formal, regulated systems. These informal laborers often employ unregulated and perilous recycling methods, leading to potentially severe health consequences. (Park, Miles 2019). Although it helps many make a living, those that are disposing of e-waste are usually not aware of the risks and health hazards that result from certain disposal techniques due to low literacy rate and limited awareness of the hazards associated with e-waste. These workers operate independently, outside of any formal organization which makes enforcing e-waste regulations difficult-to-impossible. Further, these recyclers often rely on rudimentary recycling techniques that can release toxic pollutants into the surrounding area. The release of toxic pollutants associated with crude e-waste recycling can have far reaching, irreversible consequences. (Pandit, Virendra, 2016).

E-waste management in India continues to follow similar pattern used for other waste products. An informal e-waste recycling sector employs thousands of workers in urban areas to collect, sort, repair, refurbish, and dismantle disused electrical and electronic products. However, there is a different situation in advanced countries, and there is no such concept in India of consumers voluntarily donating the useless electrical and electronic equipment at formal e-waste recycling centers. Also, there is no concept of consumers paying for disposal of the e-waste they generate. According to Toxic Link (2004), there is no large-scale organized e-waste management in India. The unorganized sector dominates and manages 95% of e-waste in India (Link, 2004). Also, the volume of e-waste generated is high in India with ineffective legislation, the involvement of child labor, lack of proper infrastructure, poor awareness, and the reluctance of authorities involved (Lundgren, 2012). Without proper disposal of e-waste in India, in the coming years these problems will get more serious and a matter of concern in India's handling of e-waste.

The management of e-waste is thus a complex issue that requires a multi-faceted approach. It involves the development of effective policies and regulations, the creation of infrastructure for e-waste collection and recycling, and the raising of public awareness about the importance of proper e-waste disposal. The management of e-waste in India is still in its infancy stage. The country lacks a comprehensive legislation to regulate e-waste management, and the existing infrastructure for e-waste collection and recycling is inadequate. There is also a lack of public awareness about the importance of proper e-waste disposal.

This paper reviews the current issues, challenges, and management practices of e-waste in India. It highlights the need for effective e-waste management strategies, including legislation, infrastructure development, and public awareness.

Research Methodology

This paper follows an exploratory methodology based on a qualitative review of the environmental and social aspects in the area of e-waste sector. An exploratory methodology was adopted due to non-availability of ample information on e-waste. Data were collected through comprehensive analysis of qualitative data related to the topics that have been published in various sources mainly from various Government and NGOs' published reports, news articles, websites etc. This paper focus to limelight the issues, challenges and strategies for effective management of e-waste in India

Issues and Challenges Related To E-Waste In India

Volume of E-waste Generated – As per Thomas Reuters, India stands fifth in e-waste generation producing around 1.7 lakhs metric tonnes per annum

Involvement of Child Labor – ASSOCHAM estimates that in India, around 4.5 lakh child laborers in the age group of 10-14 are engaged in various E-waste activities. These child laborers do not adequate protection and safeguards in various dumping yards or at recycling units. Today, the need of the hour is prevention of child labour entry in E waste activities - be it collection, segregation or recycling.

Ineffective Legislation- Most of the websites of State Pollution Control Board's do not provide adequate information related to E-waste. Even the basic E-waste Rules and guidelines have not been uploaded of their websites. Due to the absence of any such information the recyclers and collectors of E-waste, citizens and institutional generators of E- waste are totally at a loss to deal with their waste and do not know how to fulfill their responsibility. (Sinha & Rambha,2013). Hence, there is failure in successful implementation of E- waste management and handling rules, 2012.

Lack of Infrastructure – There is very limited infrastructure capacity for large-scale management of e-waste in India. Further, very few governments approved e-waste recycling centers exist in the country, which constitutes only about 1/5th of the total amount of e-waste generated each year. Therefore, there is a huge gap between present recycling and collection facilities and quantum of E-waste that is being generated and this gap is growing at an alarming speed of 15% per annum.

Health Hazards - E-waste contains various toxic materials, such as lead, mercury, cadmium, chromium that pose significant risks to both human health and the environment. These materials can contaminate soil, water, and air, and can have serious health impacts, including cancer, neurological damage, and reproductive problems. E Waste is emerging as a serious public health and environmental issue in India. Due to lack of awareness, many people are risking their health as well as contaminating the environment as well.

Lack of Incentive Schemes- Several cities have very few dedicated collection depots or formal recycling centers where consumers can voluntarily drop-off the e-waste. Due to lack of proper incentive schemes, the majority of people and urban household consumers are used to sell e-waste or get some discount in exchange when they purchase any new electrical or electronic products from small-scale retail shops. A few financial incentives could help consumers for responsibly disposing of their e-waste.

E-waste Imports – Along with the huge generation of E – Waste in the country, nearly 80% of E-waste generated in developed countries is sent to developing countries such as India, China, Ghana and Nigeria for recycling (Lundgren, 2012)

Mismanagement in Market for the End-of-Life Products - The inability to reliably source e-waste quantities create economies of scale and restricts the entry of private players to set up e-waste management systems in a formal sector. For instance, employing effective recycling technologies for e-waste management in India may require significant upfront capital expenditures. Further, absence of certainty about sourcing enough quantities of e-waste acts as a barrier to interested private entities.

Inadequate Regulations –At present the mandatory take-back system for producers has induced little improvements in e-waste management practices as there are no accompanying collection targets nor any incentives for taking responsibility. Certain amendments were proposed, which provided more regulatory certainty by specifying gradual and increasingly stricter collection targets. However, the regulatory design places a significant burden on the already ill-equipped regulatory agencies. The regulators therefore, need to review the Extended Producer Responsibility (EPR) plan submitted by the producers, grant authorization, and enforce the EPR plan's provisions.

Lack of research- Government needs to encourage research into the development and standardization of hazardous waste management, environmental monitoring and the regulation of hazardous waste-disposal. (Karishma & Vrat, 2015). As of now limited research is underway in E –Waste sector.

Strategies For Effective Management of E_Waste In India

There are various ways of improving e-waste management in India. However, there are certain key components mentioned below that can be linked together to form strategies for improving e-waste management in India.

- Providing Market Information About E-waste Prices - The prices for e-waste and its components are not widely known or publicized among urban consumers. A consolidated price list must be updated on a weekly

basis as it would be a powerful market signal for customers who sell the e-waste to local vendors. Such information must be displayed at websites of state Pollution Control Board, local Municipal Corporations as well as advertised in local newspapers similar to commodity price listings or foreign exchange rates. The price list must reflect the prevailing market demand for e-waste components and enable informal sector collectors to buy and sell e-waste at the fair market prices to private processors or government-approved recycling and dismantling centers.

- **Incentive Schemes for Formal E Waste Recycling** - The Indian Government has introduced a point-based reward system of E-waste Recycling Credits (ERCs) for formal organizations to incentivize them to channel their e-waste through government-approved recycling centers. Further, depending on the type of e-waste supplied, organizations should be given the requisite ERCs which they can use to offset their energy utility bills. Such an initiative will also provide a strong incentive for informal sector e-waste businesses to formalize the operations and establish supply chain links with approved recycling centers.
- **Training and Up-skilling Informal Sector Players** - The majority of an informal e-waste recycling workforce needs up-skilling, particularly for handling and dismantling hazardous materials. Short term courses and training programs can be specially designed for e-waste collectors, handlers, and dismantlers by the Electronics Sector Skill Council's combined expertise, the Green Jobs Sector Skill Council, and regulatory agencies like the Central and State Pollution Control Boards.
- **Developing Innovative Methods and Technologies for Processing of E-waste** - The composition of e-waste is changing rapidly due to the new electronic devices entering in the market. It therefore, requires significant investment in research and development for innovative recycling methods and technologies for future-proofing India's e-waste policies and management. For example, e-bikes and e-cars usage has expanded dramatically in India over the past five years, but any e-waste recycling rules do not yet cover the lithium-ion batteries that power the devices.
- **Develop and Strengthen the Informal Sector**- Addressing the problem of informal sector e-waste practices requires a greater understanding of the sector itself in terms of its incentives and challenges. Engagement with informal sector workers and the groups, in a manner that recognizes the right of their livelihoods, builds trust, and develops an understanding of the problems along with potential solutions, can be an initial step. The government must institute a platform that facilitates consultations among various stakeholders like informal sector workers, NGOs working with the informal sector, third parties, private entities, and registered recyclers, and manufacturers which will strengthen the informal sector.
- **Implementation of EPR Policy** - The government needs to rethink about the policy instruments under the EPR approach. A mandatory take back with collection targets cannot be the ideal instrument. Producer responsibility comes in many varieties other than mandatory take-back. The economic instruments like advanced recycling fee or advanced disposal fee on every unit of the product sold in the market will relieve the producers of the physical responsibility of collection, and the revenues generated can be used to develop markets for the end-of-the-life or useless products, such as Subsidize consumers to deposit their e-waste at designated centers, Directly fund recyclers, Assist informal sector workers in training or skill development or provide a greater social security net to the workers. Regulatory Enforcement
- **Ban on E-waste Imports** – as per the existing regulations, e-wastes are not allowed to be imported for final disposal but can be imported for reuse and recycling. However, in the absence of adequate infrastructure in the country for recycling, ban should be imposed on all kinds of e –waste imports.
- **Public Awareness about E-waste Management** – the producers are required to provide information about the impact of e-waste, appropriate disposal practices, etc. on their websites as per current e-waste regulations. However, it is observed that in spite of many producers providing such information on their websites, the overall awareness levels remain low among bulk consumers. Hence, the government must consider integrating e-waste awareness campaigns and the overall, public awareness generation initiatives should be based on partnerships and collaboration among various stakeholders. Stricter guidelines/regulations to the producers on these awareness campaigns' frequency and mode might also help in improving the present situation.
- **Implementation of Effective Reverse Supply Chain Management** – legislation or regulations need to be made for proper Implementation of Effective Reverse Supply Chain Management for E –Waste. In the Reverse Supply Chain Management, the E-waste would be collected from all kinds of resources and it would be delivered to a processor that can recycle valuable parts from E-waste and dispose the rest hazardous components in proper environmental friendly manner. The producer may also buy such recycled valuable parts as raw material from the processor; therefore a close loop supply chain would be formed. In the process, companies can become more environmentally efficient through reusing and reducing the amount of materials used,

Conclusion

Over the past ten years, e-waste has become a more prominent global issue. India, a significant participant in the electronics sector, has not been an exception to this trend. There are serious risks to the environment and public health as a result of improper e-waste disposal procedures and a lack of general knowledge. E-waste is becoming a huge public health issue and is exponentially increasing by the day. Hence, the competent authorities in developing countries like India need to establish mechanisms for handling and treating e-waste safely and sustainable manner. In India, there is dominance of informal sector in e-waste management. It is essential to integrate the informal sector with the formal sector by taking necessary steps to formalize the informal sector by strict implementation of rules and levy heavy penalties on defaulters. To conclude, it can be said that India's e-waste problem presents a range of challenges, from a lack of infrastructure and recycling capacity to limited public awareness. However, with comprehensive research, innovative recycling technologies, improved infrastructure, and increased public awareness, India can develop a more sustainable and effective approach to managing e-waste, protecting both the environment and public health while promoting responsible consumer behavior.

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