Electronic Waste in India: A Silently Growing Threat to Human Health and Environment

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ABSTRACT ***A new waste stream of known electronic waste (e-waste) has been created in developed and developing countries around the world due to the rapid increase in technology, its frequent upgradation and a high rate of worthlessness in the electronics industry. E-waste contains a number of components, some of which include hazardous materials that if not appropriately handled, may have a negative effect on human health and the environment. This poses a new problem for the world called e-waste management. The management of e-waste in India has a greater effect not only on the development of its own e-waste, but also on the disposal of e-waste from developed countries. This is coupled with the lack of sufficient facilities and techniques for its disposal and reprocessing in India. A separate structure of assembly and an institutional framework should be in place to manage them adequately for sustainable development. The objectives of this study are to identify the major types of e-wastes, their different waste components, and current e-waste management practices in India.***
Keywords: e-waste, environment, challenge, management recycling

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I. INTRODUCTION

The transformation of information and communication has brought tremendous changes in the way we structure our lives, our societies, industries and institutions in the 20th century. At the same time, these have led to several issues, including the question of large amounts of hazardous waste and several other wastes produced by electrical devices. Electronic Waste (E-Waste) is India's rapidly rising waste source, with a 3-5 percent per year growth rate. Waste produced from used electronic devices such as computers, entertaining devices such as television sets, cell phones and refrigerators and other household appliances that are not suitable for their originally intended use and are intended for recovery, recycling and disposal. E-wastes are considered hazardous, since few sections of certain electronic goods, depending on their intensity and condition, contain materials that are harmful. The dangerous elements of these products are detrimental to the environment and human health. Unwanted computers, televisions, electric lamps, fax machines, mobile phones and batteries can enter and pollute soil and groundwater if improperly disposed of. Many of these materials are ecologically sustainable and can be recycled, repaired or reused so that they are less detrimental to the environment. E-waste recycling is a source of income for many people in India, but there are also numerous health and environmental risks. Informal waste pickers called kabadiwalas or raddiwalas illegally recycle more than 95 per cent of India's e-waste. It is estimated that an approximately 25,000 people including children, engage in the crude e-waste dismantling of the waste in Delhi alone – annually 10,000–20,000 tons of e-waste are dismantling with their bare hands. These staff operate individually, outside any formal agency, making it difficult-to-impossible to implement e-waste regulations. Recyclers also rely on primitive techniques of recycling that can release harmful contaminants into the environment around them. The material not recycled by waste gatherers is either left or burnt in waste yards. Both approaches will lead to the release of toxic chemicals from the air, water and soil. Staff at these facilities also lack sufficient safety equipment, and e-waste contamination can cause a lot of public health problems. There can be far-reaching, irreversible effects for the release of harmful contaminants associated with e-waste recycling. There are three categories of e-waste 'white goods', include household appliances such as air conditioners, dishwashers, refrigerators and washing machines. "brown goods" like cameras and TVs. And Grey goods,' such as computers, printers, scanners for fax machines, etc. Because of their multifaceted and higher toxic composition, the recycling of grey items is comparatively more complex than white and brown products. In the last decade, there has been substantial growth in the demand for grey products in India. Due to the substantial increase in investments, spending, use and exports, the generation of e-waste (42 percent) of e-waste, led by information and communications technology devices (34 percent) and consumer electronics devices (14%) The remaining 10% is accounted for by other devices, including household e-craps. The e-waste composition is varied and falls within the groups of "hazardous" and "non-hazardous." It consists mainly of metals, plastics, ferrous and non-ferrous, and Plywood, wood and glass and glass, circuit boards imprinted, concrete, ceramics, rubber, and other materials. Steel and Iron The waste contains roughly 50%, followed by plastics (21%), non-ferrous metals (13%) and other constituents. The metals of nonferrous are made of metals such as silver, gold, platinum and aluminum, and precious metals. and so on, palladium. Elements such as plum, mercury, arsenic, cadmium, selenium and hexavalent in nature, e-waste becomes dangerous with chromium and flame retardants above the threshold.

II.OBJECTIVES

This paper intended to discuss the following

- ➢ E-waste in India's present scenario.
- ➢ E-waste generation in India by state and city
- ➢ The flow in India of E-waste
- ➢ E-waste methods of treatment in India
- ➢ Effect on human health and the ecosystem of E-waste
- ➢ Scenario of recycling in India
- ➢ Legislation covering e-waste in India
- ➢ E waste recycling enterprises in India

III.METHODOLOGY

The current study is explanatory in nature. It is based on secondary data and information collected from the concerned sources as per the need of the research. The related books, articles and journal papers and published documents of various ministries/departments and organizations and websites are used in this study mentioned in the bibliography and Citations.

IV. LITERATURE REVIEW ON E WASTE MANAGEMENT

Till date-waste literature has been very restricted in developed countries. Its focus was on the magnitude and influence of e-waste (Joines, 2012; R. Heeks et al. Shin Kuma & Managi, 2010). It also focused on the international trade in e-waste (Joines, 2012.654) and e-waste laws (Akenji, Hotta, Bengtsson & Hayashi, 2011; Nnorom & Osinbajo, 2008).; Bandyopadhyay, 2008; Kahhat et al., 2008; Ongondo et al., 2011a; Ongondo et Al., 2011b; Wath et al., 2011), and on the role of regulation in its governance (Hicks et al 2005; Sinha, 2005; E-wash, 2005; Dwivedy et al., 2004; Liu, 2006; Dwivedy and Mittal, 2010). Research is also being conducted into e-waste resource extraction and related environmental benefits (White et al., 2003; Chancerel et al., 2009; Huang et al., 2009). However, both in developed and in developing countries the problems of e-waste management continue to exist.

V. CURRENT STATUS OF E-WASTE MANAGEMENT IN INDIA

Technology plays an increasingly greater role in our day-to-day lives, and many people constantly try to own the new and shiniest appliances and gadgets. Some are resold, some are routinely recycled, but under poor circumstances, the vast majority actually end up as undocumented e-waste that is likely to be discarded, exchanged or recycled. India produces approximately 1.70 million TPA (tonnes per year of e-waste, provides 12% of global e-waste and ranks fifth in the list of countries that are the largest producers of e-waste.The amount of e-waste generated in India between 2007 and 2017 with a projected 2019 to 2025 is shown in these statistics. In 2019, some 49.8 million tons of e-waste are expected to be generated in the world. Most e-waste from small electronic equipment will be produced all over the world. The Assocham estimates that the production of Indian e-waste is expected to cross 52,40,0000 tons, i.e., nearly three times the current 18 lakh metric tons per year at CAGR by 2020, an unbelievable, unregulated growth rate of approximately 30%. Despite the subsequent implementation of the E-Waste Management Law India has managed to recycle only about 36,000 tonnes. In recent years, the levels of the generation of e-waste have been anxious as e-waste causes toxic pollution and presents many health risks. By 2020, an unprecedented and unmanageable quantity of 32,40,0000 metric tons will be affected by e-waste production in India. Since the 2016 E-Waste Management Rules are in place, India was only able to recycle 36,000 metric tons of e-waste, demonstrating how inefficient the e-waste management scenario was. E-waste is India's quietly rising garbage problem. Every year, tons of e-waste are dumped and crises in India are continually rising. In recent years, rising e-waste output levels in India have been a matter of serious concern. The issue of e-waste has been discussed at some levels in India, but not on a huge enough level to have a crucial impact.

VI.STATE AND CITY WISE E-WASTE GENERATION IN INDIA

The global production of electronic waste amounts to about 40 million tonnes. The volume of global e-waste is projected to rise to 52.2 million tonnes in 2021 India is emerging as one of the world's leading manufacturers of electronic waste, causing significant public health and environmental issues as well. and with about 1.8 million tonnes a year, India is the fifth biggest producer of e-waste in the world after the United States, China Japan and Germany. Moreover, a number of e-waste quantities are also transported from international companies and agencies. In India, e-waste collection, transport, segregation, disassembly, recycling and disposal are carried out manually in the informal sector through untrained labour Maharashtra is one of the 10 most important e-waste produced countries, followed by Tamil Nadu, Andhra Pradesh, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, and Madhya Pradesh, Punjab. Five Member States account for 75% of the country's total e-waste, while 65 towns account for 25% of Indian total e-waste. Mumbai has been the front-runner, with about 120,000 tons of e-waste being produced each year. With 98,000 and 92,000 tons of e-waste, respectively, Delhi and Bengaluru ran second and third. Most Indian cities are committed to compliance with the minimum requirements for e-waste collection, treatment and disposal. Separation at source is non-existent, collection is performed manually, coverage is restricted, the methodology of discarding is irrational, capacity is limited at the local level, and the lack of a long-term strategy created many challenges for the management of waste in cities. Computers account for 70% of the total e-waste produced in India, compared to 12% for the telecommunications equipment. Each of them. E-waste accounts for nearly 70% of heavy metals in deposits.

VII.FLOW OF E-WASTE IN INDIA

The flow of e-waste tracks a route connecting the main, secondary and third stages. E-waste is obtained by the various participants from different sources but in the value, chain is interrelated. The state of the semi-formal stakeholder is reliant on their interface with the other stakeholders. The relationship is formed between the formal and informal sectors therefore the e-waste does not track one route at first. Primary workers are provided e-waste in the formally organized market of manufacturers, importers, offices, and so on. These stakeholders are primarily scrap traders who are able to bid and stock large quantities of e-waste. Since the stakeholders have little interest in separating the e-waste, secondary e-waste staff who have limited economic ability divide it and pull it into bits. Finally, tertiary e-waste employees not only separate and dismantle e-waste, but try also to extract the precious material.

VIII.E-WASTE TREATMENT METHODS IN INDIA

The essential elements of e-waste management are collection, treatment, and disposal systems. The majority of developed countries have framework conventions, directives and regulations aimed at encouraging proper processing, treatment and recycling and responsible disposal of non-recyclable components. However, in India the informal sector dominates e-waste generation, transport, processing and recycling. The industry is well connected and unregulated. The collection of e-waste is rational business driven by benefit. E-waste comprises a large amount of various engineering materials that can be re-used by current technology. Sometimes all the materials and values that can be retrieved are not recovered. Furthermore, there are significant problems of environmental leakage of toxins, protection and health of staff. The commonly used methods of treating e-waste's are

1. Landfilling: This is the most popular method of e-waste disposal in India. Soil is quarried and the e-waste is covered in dugouts. A solid liner is made of clay or plastic with a leachate sink to the treatment plant for the processing and disposal of e-waste. The landfill is not an environmentally safe method for the elimination of e-waste into soil and groundwater as hazardous substances. In electronic goods such as cadmium, plum and mercury toxic chemicals are transmitted to the earth over time or are released into the air, affecting the health of neighboring households and the ecosystem. Thus, it is highly serious if e-waste is disposed of improperly.
2. Acid Bath: This process requires the drenchment of the electronic circuits into acid bath overnight in vigorous solutions for hydrochloric, sulfuric or nitric acid. That separates the electro-circuit boards from the metals. In the manufacture of other items, the recycled metal is used while the toxic acid bath tubs are drained into the surrounding water supplies, drains and rivers after 4 to 5 usage, which later can be reached in the local water sources.

3. Incineration: Incineration and other high temperature waste disposal methods are labeled as "thermal treatment" Incineration offers a controlled means of disposing of e-wastes at high temperatures, including burning at high temperatures in specially built incinerators, of organic substances in e-waste substances. This method of removal is very useful, since the volume of waste is unbelievably minimized and the energy collected is then used separately. E-waste is treated in backyard operations using landfilling, cyanide leaching, open sky incineration, and simple smelters to recover precious metals, mainly copper, gold and silver, with comparatively low yields, and to dispose the remainder of urban solid waste in open dumps, surface water bodies, and unlined and unmonitored landfills. These practices are detrimental to individuals as well as to the environment. There is an immediate need to combine the informal with the formal sector so that e-waste collects separately, efficiently manages and disposes of it and distracts it from traditional sites and from open burning, so as to reduce public health and environmental impacts. It is a complex challenge to effectively and efficiently handle the rising quantity of e-waste in cost and environmental terms. Therefore, in India the competent authorities must take big steps in the management of e-waste items to follow best practice and to introduce mitigational measures establish systems for the handling and treatment of e-waste.

IX.THE IMPACT OF E-WASTE ON HUMAN HEALTH AND ENVIRONMENT

E-waste junkyards create a huge environmental issue for the workers working inside and the people living around these dumps. When electronic products that have been manually decomposed for precious or burnt or discarded in waste dumps, about 70% of thickened materials, including plum, Barium, mercury, Lithium, and other materials, and 40% of plumage contained in dumping sites, are decomposed manually. The heavy metals extend from the land to groundwater channels and contribute to soil degradation and soil pollution. High and continuing interactions with these chemicals cause harm to blood vessels, nervous systems, the growth of the brain, kidneys, bronchitis, respiratory diseases, skin, lung, heart and liver disorders, and spleen damage as the result of e-waste processing is unhealthy. Electronic waste is very complex and varies across product lines and categories. More than 1000 different ingredients are typically included in "hazardous" and "non-hazardous," while electronic goods are hand-broken down for precious metals, burned or dumped in waste dumps they contaminate soil and water. It includes 1000 different ingredients. The key sources of electronic waste in India are government, public and private (industrial sectors, which account for almost 75% of total waste generation collectively. Individual households make relatively small contributions at approximately 16 percent, while the remainder are made by producers. Even if individual households do not make substantial contributions to computer-generated waste, they consume significant amounts of consumer durability and are also potential waste producers. Computers, TVs and cell phones contain heavy metals such as lead, mercury and cadmium because they have limited lifetimes, so these electronic devices are discarded in tremendous quantities. E-waste reduction is now complicated and presents environmental risks in numerous forms as a result chronic and acute disease patient are rising exponentially.

X. RECYCLING SCENARIO IN INDIA

India is heavily dependent on the informal e-waste recycling market, as only a few organized waste recycling plants are available. More than 95 percent of the waste in urban slums of the country is treated and handled in bulk. More than 3000 e-waste recycling units are active in the non-formal sector in India's metropolitan cities. In the informal sector, small, labor-intensive and low technological manufacturing are mostly unchanged, unregistered. The information sectors. Thousands e-waste pickers are dependent on waste for survival in spite of the health problems involved. They collect household or commercial/industrial waste and derive potential value from electric waste, others operate in recycling systems operated by associations of recyclers. These units are used to obtain profitably-oriented components such as iron, gold, silver, copper and aluminum, etc. Many e-waste operations are done by hand, such as assembly, segregation, disassembly, reprocessing, and disposal. Such unscientific activities generate health risks. The broken garbage is often freely disposed, resulting in damage to the ecosystem. However, e-waste pickers also contribute much to maintain safe cities. In India there are also few structured recyclers of e-waste. In formal industries, the procedures typically restrict themselves to segregation and e-waste disintegration before the process of printed circuit boards (PCBs) is reduced in size. In the maintained area, valuable elements are recycled and recovered by units in the formal sector so as to reduce damage to human life and habitats. The application of modern and advanced technology leads to the efficient recovery of metals. The zero-landfill solution works with some technologies. The recovery technology would be cost efficient in formal sector units because the high cost of equipment could be separated by the amount of e-waste goods.

XI. LEGISLATION DEALING WITH E-WASTE IN INDIA

India enacted the first full environmental law, the Environmental Production Act, in 1986. (EPA). The EPA regulations provide full authority to the union administration to take all necessary or reasonable steps to protect and enhance the quality of the environment and to avoid, control and mitigate environmental pollution. The EPA goals were introduced in 1989, and regulations on hazardous waste and storage were enforced. Electronic waste management legislation was introduced around 2008 and was endorsed by the Central Pollution Control Board as well as by the Ministry of Environment and Forest in 2008, an Environmental Sound Management Guideline for E-Waste. The Guidelines for the identification of different sources of E-waste and for the treatment of e-waste were published in April 2008. The advice on manufacturing responsibility and hazardous material reduction was laid down in these Guidebooks. It also encouraged the incorporation of the informal sector in systematic collection and e-waste channeling. E-waste Regulations 2011 called for the approval of electronic waste collection only by authorized dismantlers and recyclers. The Guidelines also stipulate that electronic equipment manufacturers should reduce the use of toxic metals such as mercury, plumbing or cadmium. The duty was delegated in 2016 to electronica producers and distributors in compliance with the E-waste (Management) Regulations,2016 as well as to e-waste collection and cancellation of consumer e-waste from consumers to the certified reprocessing facility, and to expand the responsibility of manufacturers to collect 30 to 70 percent of their e-waste Today businesses need to set their production figures for annual collection goals. The rules also impose a penalty for failure to comply, particularly if the rules for recycling are not respected. Recent policy changes and proposed actions have led to more coordinated recycling activities in the region. while India still has limited technology.

XII.CONCLUSION

The problem of E-waste has been identified as a tremendously growing waste stream in the world. Inappropriate processing and management of e-waste during recycling may develop major risks to both human health and environment. Taking into consideration its adverse effect on health and eco-toxicological impacts, an urgent international multi-layered agreement is needed addressing e-waste handling, transportation, storage, recycling, and final disposal of any residual waste, whether by land filling or by burning.

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