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E-Waste – Introducing Gen Z Pollution

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Abstract

E-waste in simple words is the waste that is generated from devices like mobile phones, computers, ACs, fridges etc. The different types of waste are the outcome of our daily or industrial activities. E-waste is generated when the devices we use in our daily lives are broken or worn out of use they are either thrown in the garbage or sold at the value of it, which ultimately results in the accumulation of unwanted electronic waste. The paper discusses the generation of mounting quantities of e-waste leading to increased threats to the environment due to multiple reasons such as industrialization, urbanization and changes in the pattern of life, which accompany the process of economic growth. In recent years, technologies have been developed that are triggering a substantial quantity of energy and waste from the devices posing a threat concerning e-waste for its safe disposal. The paper discusses in depth the methods of how western countries are responsible for the accumulation of E-waste in the South Asian region in the name of used goods. The authors explain in detail what steps can be procured to prevent such accretion, moreover emphasizing the methods inculcated by various countries to deal with such type of waste. The authors have attempted to suggest steps, with the help of which the recycling of the e-waste generated can be made sure along with the methods to control the generation of e-waste simultaneously.

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Introduction

E-waste is a popular, informal name for electronic products nearing the end of their "useful life."[1] Since the early 19th century, the dawn of electronic gadgets such as TVs, Computers and mobile phones; e-waste generation and management has become a bane across the world. The world is developing at a pace which is unsurmountable due to the digitization and urbanization in recent years. The development of the internet and the introduction of robots and devices has been a major factor in the enhancement of the standard of living of each individual. However, each coin has two sides, if on one hand there have been major developments with the devices being introduced subsequently, on the other hand, the human race forgot to manage those devices which needed to be disposed of if not in use.

1 What Is E-Waste? Available at https://calrecycle.ca.gov/electronics/whatise-waste/ (last visited at September 29, 2022)

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E-waste management has attracted attention due to the impact it is causing globally to such an extent,[2] which has compelled the developed nations to announce International E-Waste Day on October 13 to spread awareness amongst the masses to take note of this global challenge.

Recently a report was released by the United Nation's Global E-waste Monitor 2020 which estimated that in the last five years, the volume of E-waste generated has increased by 21 per cent globally which seems to have a doubling rate of 16 years. It is to be acknowledged that in the year 2019 it has already set a record with a massive 53.6 million tonnes (MT) generated.[3]

Several stakeholders have conducted several events for the public to educate them about the impact of e-waste on our lives. As this E-waste is no different from any other kind of waste, it is and will be a major cause of pollution by generation Z, if not managed in time. Smartphones, tablets, and computers are major contributors to the annual global e-waste generated across the globe. Whereas other household appliances like Refrigerators, ACs and other heating & cooling equipment contribute the rest.[4]

It is alarming that the huge quantity of e-waste will rise enormously in the next few years because merely 25 per cent of the total e-waste generated is getting recycled annually. Attention is drawn to the number and method that nearly 45 million tons of e-waste have been either filled in landfill (or burned) or added to the water channels such as rivers, ponds etc. resulting in polluting our environment triggering into irreversible damage to the ecosystem.

In addition to this, the situation tends to raise the alarm because only 66% of the World population is covered by e-waste legislation. Electronic waste in a developed country like Japan has become a serious environmental concern. Even though Japan implemented an effective electronic e-waste recycling model at first, still it is countering the growing e-waste challenge.

Intensity of E-waste generation

The entire world is producing a huge quantity of e-waste approximately 55 million tons annually which requires an immediate and urgent legislative intent to establish more recycling facilities to enhance the rate of recycling else this challenge will get much worse.[5] E-waste is one of the fastest contributors to the entire solid waste produced globally. Menace of e-waste has increased too much in the past 5 years, for instance, it was reported at 44 million tons in the year 2016 and the same has touched 55 million tons in 2021. Consequently, this sharp rise has resulted in the devastation of land, soil and water channels.

Scholars and scientists believe that the uncontrolled production of electronic devices for consumers has resulted in a rush amongst the masses to buy more and more electronic devices by replacing older devices. On the other side, Nations have shown apathy to increase the rate of e-waste recycling. Ultimately, in absence of recycling, valuable raw materials present within e-waste are going to landfills unnoticed, which in turn is a great loss for every country in terms of their natural resources and optimization of the available resources which can be used efficiently.

The fact that the intensity of the e-waste generated every year is on the rise is not debatable, moreover, it is also to be understood that this waste is very harmful as it contains all types of chemicals hazardous to life and the environment.

With covid 19 in the picture, the pandemic era also known as the digitization period has resulted in everything happening offline to online henceforth increasing the purchase of more devices during this period. This has further increased the threat of the management of the waste which will be generated from electronics purchased. The authors draw attention to the estimation of the e-waste to be produced from the devices purchased, when schools went online and work from home started this resulted in the scenario where there were on average two to three phones in the house increased to - per person a device.[6]

2 "Great Lakes Electronics Corporation" (6635). "Sterling Drive South, Sterling Heights" (MI 48312).

3 "International E-waste day: The tsunami is here", available at https://www.downtoearth.org.in/blog/waste/international-e-waste-day-the-tsunami-is-here-73774 (last visited on September 28, 2022).

4 Frost & Sullivan. "Report on e-waste by ASSOCHAM" (21 April 2016).

5 "United Nations. "Report by Dept. of International Communications" (01 August 2019).

6 Lina Vyas & Nantapong Butakhieo (2021), The

It has to be ascertained what different and effective methods can be used when these devices will be disposed of. Landfills of e-waste have raised a serious environmental concern, where toxic chemicals are contaminating the soil. Similarly, when these chemicals are disposed of in the water streams it not only causes problems to human life but also to the life of the water animals.

In India, agriculture is deemed to be the prominent and major contributor to its economy and depends on natural water streams for irrigation. Traces of harmful chemicals and metals present in the e-waste have been found in agricultural crops which are resulting in persistent health concerns.

Illegal Transboundary movement of e-waste

Despite Waste from Electrical and Electronic Equipment (WEEE)[7] directives and other domestic legislation across the globe, a huge amount of e-waste generated in developed countries like the USA has been constantly shipped to developing countries in the South Asian regions, especially on the pretext of the used goods. This adds up to the total quantity of the annual e-waste generated in a particular country. As per recent reports, more than 40% of e-waste has been imported to India every year from western countries by violating the WEEE directives. In China, this contributes up to 45% of the total e-waste generated there.[8]

The only Convention for the global treaty on hazardous waste and other wastes including E-waste is the Basel Convention which was adopted on March 22, 1989, and later came into force on May 5, 1992. Most of the e-waste generated in Saudi Arabia and Qatar is mainly exported to India and China. However, there are legislations to restrict the movement of hazardous wastes, but due to the absence or low availability of recycling facilities and centres in many countries, it becomes a task for the government to manage e-waste implying that the waste generated must be managed locally within the informal sector or exported. Therefore, these countries such as Saudi Arabia and Qatar recourse to the option of exporting e-waste for treatment in other countries mainly the under developed or developing countries.[9]

Harm caused to the Environment by E-waste

United Nations has launched several programs to educate various stakeholders about the environmental risks posed by e-waste. The apathy of the executive Government industry and other stakeholders are held responsible to make environmental consequences more severe. The problem of e-waste management is a global problem. It can't be resolved at the national level. There is an imminent need to establish an international legal regime to curb the menace of e-waste.

United Nations is committed to curbing the menace of e-waste and thereby conducting several activities throughout the year, it has also developed a model for the management of e-waste which poses to be a reference for adoption worldwide for e-waste management. Developed countries like USA, ironically are contributing to the problem, because people can afford to buy more and more mobile phones and other electronic gadgets.

With reference to a global study conducted in 2015, 65% of e-waste generated in western countries has been dumped in South Asian Countries under the pretext of used goods which have not reached their end of life. Since the enactment of WEEE directives, the practice of exporting e-waste to other countries has turned into a menace which paves the way to make stringent e-waste import laws by underdeveloped countries in the South Asian

impact of working from home during COVID-19 on work and life domains: an exploratory study on Hong Kong, Policy Design and Practice, https://www.tandfonline.com/doi/full/10.1080/25741292.2020.1863560 (last visited at November 22, 2022)

7 Waste from Electrical and Electronic Equipment, available at https://environment.ec.europa.eu/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en (last visited at September 29, 2022)

8 Research Unit (LARRDIS), Rajya Sabha Secretariat, New Delhi, "Report on E-waste in India" (June 2011).

9 "Regional E-waste Monitor for the Arab States, 2021" available at https://ewastemonitor.info/wp-content/uploads/2021/12/Transboundary-REM_2021_ARAB_web_final_nov_30-2.pdf (last visited on September 29, 2022)

region. In India, the e-waste Management Rules 2011 provides for an effective e-waste management regime in India but doesn't provide a check on international imports of e-waste.[10]

E-Waste Management Model in India

Effective Recycling begins with eco-labelling which establishes a method to identify hazardous and non-hazardous products. This task has been assigned to the Bureau of Indian Standards in India to establish an effective e-waste management model. The Board is empowered to prepare and implement E-waste Policy Framework and also assists the government. Agencies, Manufacturers, Recyclers & Port and Customs etc. to establish a channel in order to dispose of the e-waste properly. Several manufacturers have established Collection Centers and Recycling facilities in India to recycle e-waste. Since the quantity of e-waste produced every year stills exceeds their capacity to recycle. This has resulted in e-waste management concerns and a huge quantity of e-waste is left in landfills or water channels. After enacting the e-waste management rules in the year 2011, India still needs proper implementation of its e-waste management model like other developing countries.[11]

Suggestions and steps for management of E-waste

After analyzing the extent of the problem and elaborating on the findings of the research, the author prescribes the following steps to be taken in order to establish an effective e-waste management model.

Step 1: UIN (Unique Identification Number) to be given for each electronic device.

Every manufacturer of electrical and electronic items shall be directed by the Bureau of Indian Standards to write the Unique Identification Number (UIN) over the product with a scanable bar code. This mandate is the utmost necessary first step in the direction of establishing an effective e-waste management model. UIN shall provide the complete details of the manufacturers and details about the place of its origin. Registration of UIN with the Central Agencies in every country shall be made mandatory for the manufacturer.

Step 2: National agencies informed about the manufacturing and inventory.

Till today, Manufacturers of electronic products are not liable to disclose the inventory details to National Agencies.[12] This contributes in absence of data from the regulatory bodies in every country. We have no evidence to calculate the growing menace of e-waste across the world. Every time, we start research on assumptions and end with presumptions. The Researcher states to establish a mandate to the manufacturers to share the inventory records with the central agencies so that an effective policy can be made for different categories of hazardous and non-hazardous e-waste items.[13]

Step 3: The manufacturer's responsibility to be aware of the collection of E-waste from the consumers so that it can be recycled (Extended Producer Responsibility-EPR)

Generally, the Menace of e-waste starts with illegal transboundary exports to underdeveloped countries. Then, it reaches scrap markets for recycling which is to be done by unskilled labour. E-waste is a bundle of precious metals like Gold, Platinum, Copper etc. with hazardous elements like lead, mercury, silica etc. Scrap Dealers buy the e-waste for the purpose of extracting precious metals from the e-waste but they use highly improper methods in absence of safety measures.[14] Several harmful acids like Concentrated Sulphuric Acid, Hydrochloric Acid and Nitric Acid have been used for the extraction of precious metals by unskilled labourers.

Sometimes extraction process involves the burning of e-waste which results in the emission of poisonous gases in the air. In the end, the remaining

10 United Nations University-Institute for the Advanced Study of Sustainability, "The Global E-waste Monitor" (2014).

11 Down to Earth, "Recycling of e-waste in India and its potential" (April 2019).

12 Ministry of Corporate Affairs, *Classification And Registration Of Companies*, available at https://www.mca.gov.in/MinistryV2/classification+and+registration+of+companies.html (last visited on November 22, 2022)

13 United States Environment Protection Agency. "Criteria for the Definition of Solid waste, e-waste & hazardous waste" (2018)

14 Supra 4.

dust, plastic, and ashes of e-waste are thrown into either water channels like rivers, lakes and other water bodies and sometimes, it's dumped in landfills. Hence to stop this practice which is the utmost hazardous to the people employed in the scrap industry and to the environment as a whole, the researcher intends to establish a mechanism, so that onus of recycling shall be shifted from scrap dealers to the manufacturers of the electronic items. Manufacturers either shall contribute in the establishment of recycling units or shall be made responsible for the collection of e-waste for recycling on their own. Central Govt. agencies shall stipulate the directives for the manufacturers in this regard in order to control the growing menace of e-waste across the globe.[15]

Step 4: Providing Incentive or return back policy so that the consumer be actively participating in the e-waste management.

The collection of e-waste shall provide incentives to the consumers so that they stop selling their products to scrap dealers. If they get an incentive from the collection it shall be competitively higher as compared to what has been offered by the scrap dealers is the only way to establish an effective e-waste management model across the globe. The manufacturer must contribute to provide incentives to the consumers if they deposit their e-waste products after reaching their end-of-life through the collection Centers. This practice has been observed in a few Western Countries but it's almost absent in various Countries of the Asian region. Regulatory authorities of State shall establish a mandate for the manufacturers to ensure payment of incentives to consumers for 100% collection of e-waste generated in the Country.[16]

Step 5: Establishment of Collection and Recycling Centre

The researcher intends to put focus on establishing more Collection and Recycling Centers for e-waste across the Globe. For instance, In India, several collection centres have been established in India by various stakeholders but still, people are not aware of these facilities. There is an urgent need of the establishment of many Recycling Centres also across the globe. Till now, India is capable to recycle only 25% of its annual e-waste generated. If still we ignore the need of establishing more recycling centres, the situation will be worse by 2050 because the rise in annual e-waste generation in India is alarming.

Step 6: Keeping a check on the import of used devices from the developed countries to underdeveloped and developing countries in order to prevent illegal dumping of electronic waste.

E-waste Management Rules 2011 does not provide a mechanism to check the national imports of e-waste in the name of used items. It allows the import of used items. Western Countries have found a way to dump their e-waste in the name of Used items by importing it to South Asian Countries. Another reason behind the dumping of e-waste is the high cost of recycling in the West whereas it is booming in the Indian Scrap markets.[17] The researcher intends to introduce penal provisions in the e-waste Management Rules 2011 to control the transboundary movement of e-waste. This step will drastically reduce the quantity of annual e-waste generation in India

Step 7: Research and Development in Technology

Innovations in upgrading technology are the only cause of the increase in the annual e-waste generation. Developed Countries are under the onus of protecting the global environment and they are also a signatory to International agreements to share technology with underdeveloped and developing countries. But in practice, sharing technology with the World is nothing but just a possibility. Developed Countries shall share the latest technology with other countries for the sake of the protection of the environment.[18]

Step 8: Recycling: Generating awareness among the consumers and the manufacturers about the recycling of the E-waste procured.

Improper recycling has become a consistent phenomenon across the globe and nearly 20% of e-waste has been recycled properly as per the chart shown below. People are not also aware about the e-waste recycling facilities and are thereby compelled to sell the used electronic items to scrap dealers.[19] Even people have no information about

15 "Jianjie Fu, Haiyan Zhang. Aiqian Zhang, and Guibin Jiang. Environ. Sci. Technol. "E-waste Recycling in China: A Challenging Field (2018)52,12,6727-6728.

16 "The Energy and Resource Institute (TERI), "E-waste Management in India Challenges and Opportunities" (Nov. 2019)

17 "Santhanam N., Journal of Environment, Health, Science & Engineering. "Electronic Waste-an emerging threat to the environment of Urban India" (2014)

18 "www.greentumble.com (last accessed 10 July 2020).

19 Supra 4

the presence of precious metals like Gold, Copper, platinum etc. in the e-waste. Hence, a widespread circulation of e-waste management directives amongst the masses in order to educate them is the need of the hour.

In every recycling unit, the process to recycle commences with the Receipt of e-waste followed by the sorting process. This results in the separation of articles which can be repaired and used further after upgrading, followed by testing and refurbishing Items which can't be repaired are sent to dismantling with the use of proper machines which involves extraction of precious metals like Gold, Silver, Copper, Brass, Aluminum, Palladium etc. After extracting the precious metals, the leftover plastic, silica, and lead are separated so that the same can be further used as raw material for manufacturing new items. Finally, after extracting precious metals and raw material from the e-waste leftover is sent to landfills. A proper recycling model must be adopted globally to control environmental degradation.

Recommendations

The authors intend to propose the following recommendations to establish an effective global e-waste management model which can be categorized in the following steps:-

- The first and foremost task of every Nation shall be on sharing recent technology with developing and underdeveloped countries in order to facilitate people to buy the latest technology products. We have observed that developed nations are not willing to share their latest technology and are keen to introduce obsolete technology with them in order to sell their goods multiple times to the same consumer for the sake of profit.
- Ultimately this business strategy compels the consumers to replace their electronic items several times and thereby generate e-waste.
- The next essential focus shall be on the recycling of e-waste. But, due to lack of awareness, the absence of collection centers and zero incentives to consumers are some of the areas of serious concern in order establishing a proper recycling model is the need of the hour. WEEE Directives provide for stringent procedures and penalties to recycle e-waste in European Countries which makes recycling an expensive process and in order to reduce the cost of recycling, the industry starts exporting their e-waste to South Asian countries on the pretext of used items.[20]

E-Waste Management Model in India

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Conclusion

As they say, "prevention is better than cure" although we have surpassed the prevention stage still the cure is to established or else this issue of e-waste management will be unmanageable. The Author concludes that e-waste is a waste which is a threat to all living beings and if serious measures are not taken into account, then it will become a problem big enough to not be handled. The authors suggest multiple methods in which e-waste can be managed one of them being Extended Producer Responsibility (EPR) must be observed as a fundamental liability principle to the producer and it can be applied strictly under the concept of Corporate Social Responsibility (CSR). If the producer at his end realizes his duty to

20 Supra 4.

21 Down to Earth, "Recycling of e-waste in India and its potential" (April 2019).

collect and recycle the used electronic waste then will not only help the environment but also himself as multiple useful and precious metals are recovered from the e-waste, which can be used again by the producer for further manufacturing.

Also, it is suggested by the authors that WEEE directives must be adopted as the standards of Environmental, Health and Safety Management Systems in India and other developing countries. In India WEEE/RoHS directive became effective in the year 2012, widely inclusive of all electrical and electronic waste handling, elaborating responsibilities of producers and consumers, stipulating procedures of recycling, etc. WEEE/ RoHS directives also restrict the usage of certain hazardous substances in electrical and electronic equipment which ensures the further devastation caused by the usage of those substances.

It is emphasized by the authors that the Transboundary Shipments or dumping of e-waste from international routes must be curbed. Re-use and legal exports of E-waste must be controlled. Strict regulations by government bodies should be made to ensure that underdeveloped or developing countries should not be made as the dumping ground for the e-waste generated in the developed nations in the name of technological and research and development. It is suggested by the authors to spread awareness among the users and manufacturers about the increasing number so that the severity of the issue is analyzed by each individual. Today, one of the reasons for increased e-waste is the usage of the internet, which can be ideally used to unfurl the need of the hour in recognizing the harmful effects of e-waste generation and the methods which can be complied with to ensure safe disposal.

The authors suggest some key steps such as making a wise choice towards safer technologies, and using non-hazardous metal substitutes, as the authorities, it is required by them to monitor Compliance of rules and establish effective regulatory mechanisms strengthened by manpower and technical expertise reduction of waste at the source. It is also suggested that if the authorities tend to offer Investment Opportunities in e-waste recycling, then this could be proved as an effective and sufficient e-waste management model across the globe to curb the menace of e-waste.

The authors drive the importance of management of the e-waste along with their usage, as it is well said that excess of anything is disastrous therefore it is mandated to manage the safe disposal of electronic devices while curbing and recycling the e-waste at simultaneously.