Transpiring E-Waste Management Towards Sustainable Environment: Global Concern And Indian Legal Framework

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Introduction

"The responsible management of e-waste is critical for sustainable development and the protection of our environment."

-Achim Steiner

The acronym *'e-waste,'* which sometimes as well appears as the extended form *'electronic waste,'* refers to any excess, malfunctioning, or outdated electronic gadgets that have been completely used by its initial holder. The UN estimates that approx. 50 million tonnes of e-waste are produced globally every year.[1] The issue has only gotten worse due to declining cost of electronics. In reality, the major part of e-waste is made up of computers, televisions, mobile phones, and electronic gaming consoles because these are the items that individuals most likely swap out quickly when they want to get the newest technology. In this way, the issue of electronic waste is related to what manufacturers refer to as planned obsolescence—the deliberate condition in which the item loses its usefulness after a set amount of time, compelling the consumer to replace it. E-waste matters reason being, that getting rid of electronic devices can leave behind toxic waste and the items like lead, cadmium, and mercury, which can contaminate the air and water when disposed of. Governments all throughout the world have enacted regulations forbidding the disposal of e-waste in landfills and issued guidelines about remanufacturing due to concerns about the environmental problems surrounding it. A few responsibilities have been shifted back to the manufacturer in the European Union in the form of regulations that make them answerable for the demise of their tool, either financially or physically. This has created a competitive inducement for businesses to plan *'greener'* goods.

With an estimated yearly production of two million tonnes, India ranks among top five nations world as the producer of e-waste. In India, as in some other developing nations, the unofficial sector handles the bulk of e-waste management; over 90% of waste products are processed there, according to estimates. Numerous substances such as rare earth metals, both ferrous and non-ferrous, plastic, wood, and glass are all found in e-waste. Unscientific e-waste processing methods have a number of negative externalities upon human health and the environment.[2]

In current scenario the emergence of e-waste management mechanism to be able to promote the making of sustainable environment has paved its way. The developed countries are trying different mechanism to reduce and recycle the e-waste.

Meaning and key concept of e-waste

E-waste, is a highly common yet informal identify inclined to some electrical and the electronic devices either discarded or of further use. Numerous researchers have incorporated their perspectives upon e-waste and linked subjects since the issue being studied begins to itch society and becomes more intense over time.

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[1] C. P. Balde, V.Forti, et.al., Global E-waste monitor 2017: Quantities, flows, and resources. Bonn/Geneva/Vienna: United Nations University (UNU), International Telecommunication Union (ITU) & International Solid Waste Association (ISWA) (2017). Availabale at: https://collections.unu.edu/eserv/UNU:6341/Global-E-waste_Monitor_2017__electronic_single_pages_.pdf. (accessed on 12th May, 2024).

[2] Toxics Links. (2014). *On the edge: Potential hotspots in Delhi*. New Delhi. Available at: http://toxicslink.org/docs/Report-On-the-Edge.pdf. (accessed on 12th May, 2024).

As per California Integrated Waste Management Board:
"Discarded mobile phones, computers, televisions, VCRs, music systems, photo copier, wax and other printers fall under this category."

According to Wang:
"Electronic and electrical trash is a family with numerous branches that encompass all goods used for individual or public use, business, education, transportation, and other purposes that primarily require electricity and some level of automation to operate."[3]

As per Solving the e-waste problem (StEP) initiative:
"E-Waste is a term used to cover items of all types of electrical and electronic equipment (EEE) and its parts that have been discarded by the owner as waste without the intention of reuse."
One of the most rapidly expanding categories of waste in the world is made up of end-of-life electronic and electrical goods because of the quick advancement of technology, increased rate of becoming obsolete within the electronics industries, and other factors. It includes a broad variety of electronic devices, many of which include hazardous elements, including refrigerators, washing machines, laptops, printers, televisions, mobile phones, iPods, and so on. Numerous production and consumption patterns are unsustainable, endangering both environment and the human health. Developing cleaner products, minimising waste, recycling and disposing of waste in an environmentally sustainable manner, and making the best use of natural resources are some issues that must be addressed by all parties involved in reference to ensuring economic growth and improving quality of life.
The European Union (hereinafter referred as EU) along with other industrialised nations have taken steps to address the problem of e-waste, including implementing new laws and implementing scientific techniques for disposing of and recycling of concerned type of garbage. As according to EU definition this new waste stream is known as "Waste Electrical and Electronic Equipment" (hereinafter referred as WEEE).

Global Initiatives for E-waste Management:
The following are the initiatives taken by the global institutions to manage e-waste:
1. The Basel Convention: The most extensive international environmental agreement relating to the hazardous and other types of wastes is the *"Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal"*. On March 22, 1989, 173 countries signed it, and on May 5, 1992, it came into effect. It was primarily established to stop the economically driven transfer of potentially hazardous materials from wealthy to developing nations, which had happened as a result of stricter environmental laws and a sharp increase in the price of disposing waste in the developed nations.[4] One of the main tenets of Convention is that hazardous wastes have to be managed as close to the production point; and feasible to lessen the potential damage to human health and the environment. Thus, according to the Convention, transboundary transfers of hazardous or other wastes are permitted only after the exporting State has given prior written notice to the import and transiting state's appropriate authorities. A movement document must be sent with every shipment of trash, including hazardous waste, from the place of origin of the transboundary movement to the disposal site. Shipments of hazardous material made without these documentation are consequently prohibited.[5]
2. Waste Electrical and Electronic Equipment (WEEE) Directive: Among all the waste legislation now in place, the EU has signalling a new direction. The *"Basel Convention"* is implemented by European legislation through its directives, which forbids the export of any hazardous waste from EU members to developing nations.[6] The European Community's *"Waste Electrical and Electronic Equipment"* (hereinafter referred as WEEE) Directive, along with the *'Restriction of Hazardous Substances'* (hereinafter referred as RoHS) Directive, established collection, recycling, and recovery objectives for all kinds of electronic goods. These directives became European law in February 2003. The WEEE Directive imposes almost all duties on the developer of any *'electrical and electronic equipments'* (hereinafter referred as EEE). As per art.4[7], manufacturers must create items that are easy to disassemble and retrieve. Furthermore, the manufacturer must refrain from preventing the reuse of e-waste via special design features or manufacturing techniques, unless doing so jeopardises the environment or safety regulations. At the verge of end of its useful life, producers are required under art.5(3)[8] to gather trash of electronic & electrical equipment. A database of

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[3] Wang, Y., Luo, C., Li, J., Yin, H., Li, X., Zhang, G., (2011). "Characterization of PBDEs in soils and vegetations near an e-waste recycling site in South China". Environmental Pollution, p1-6.
[4] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal', Available at: http://www.basel.int/convention/basics.html (accessed on 13th May, 2024).
[5] *Ibid.*
[6] 'UNEP Responds to Abidjan Hazardous Wastes Crisis', Geneva, 8 September, 2006.
[7] Waste Electrical and Electronic Equipment Directive.
[8] *Ibid.*

producers must be created by the member states, according to art.12(1)[9] the makers of EEE must enrol in the nation where they are headquartered and to disclose in such registers the quantity of sales in addition to the quantity of items that are recovered and collected.[10]

3. Restriction of Hazardous Substances (RoHS) Directive: The European Union adopted the *"Restriction of Hazardous Substances Directive"*, also known as the RoHS Directive, in February 2003 as a legislative measure in order to tackle the matter of large quantities of toxic e-waste. This directive limits the usage of specific toxic substances in electronic & electrical devices. The RoHS Directive became operative on July 1, 2006, and each member state is called for to implement and enact the directive. Six hazardous compounds are prohibited under the directive from being used in making of different kinds of electrical and electronic equipment.

4. National Electronics Action Plan: US Environment Protection Agency with the objective to handle environmental issues resulting from the entire lifespan of electronics, encompassing equipment design, use, recycling, and disposal. The NEAP primarily addresses computers, televisions, and mobile phones, in contrast to the European Directives. Rather of stressing the *'Extended Producer Responsibility'* (hereinafter referred as EPA) concept, the EPA assigns accountability for products to a larger range of parties, including as producers, distributors, consumers, and disposers.[11] To reduce e-waste, the US is engaging in several programmes.

5. The Bamako Convention: The twelve countries that comprise the organisation of African Unity adopted Bamako Convention in January 1991 at Bamako, Mali, and it went into effect in March 1999.[12] It is also known as *"Bamako Convention on the Prohibition against the Import in Africa and the Control of Transboundary Movement of Harmful Wastes"*. The Convention seeks to minimise the quantity and/or dangerous potential of harmful/ hazardous waste generation so as to safeguard human health & environment in reference to the risks presented by these materials. It is everyone's responsibility to forbid the introduction of the hazardous wastes into the African region from non-Contracting Parties, irrespective of the intention.

6. UN E-Waste Management Initiatives: Forming alliances and realising Agenda 2030: The UN has launched a lot of programmes at both regional and international levels in exchange for the recognition of e-waste as a tsunami, particularly the cooperative efforts. In exchange to improve e-waste data and address e-waste concerns, several international agencies founded the *'Global E-waste Statistics Partnership'* (GESP) in 2017. The UN's e-waste management strategy includes a lot of noteworthy actions, including the incorporation of a group or agency and the launch of a programme or intervention. Like coordinating with the *'Environment Management Group'*[13] (EMG), the Sustainable Cycles (SCYCLE) programme, UNU-ViE SCYCLE, the *'Solving the E-waste Problem'* (StEP) initiative, and so on are a few examples.

India's Regulatory Framework for E- Waste

India ranks fifth globally in reference to e-waste production, having disposed of 1.7 million metric tonnes (Mt) of electrical and electronic devices in 2014.[14] The nation's e-waste stream is expanding more quickly than that of municipal waste stream, with government institutions, both the private and public sectors, and individual households accounting for roughly 70% of the total.[15] Although precise numbers and amounts of these contributors are difficult to ascertain, producers of components and installers as well as individual households are other significant sources of e-waste generation.

1. The Hazardous Waste Management and Handling) Rules, 2003: The said rule was passed in 1989 to aid in the accomplishment of EPA's goals. There was a consensus that a boundary between the garbage and by-product streams was necessary. Therefore, so as to aid in classification, rules requires to provide the definition of *'waste'* or a comprehensive list. It divided hazardous waste into 18 groups, pursuant to composition of the trash and the rate of production. The main goal of the 2000 amendments to these rules was to align them with the terms of Basel Convention. The 2000 rule change categorised garbage according to its properties in schedule 2 and the process of waste formation in schedule 1. On may 20, 2003, the proposed amendment rules, 2002 which included further modifications to the *"Hazardous Wastes*

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[9] *Ibid.*

[10] Tzvi Levinson, Christina Folman, and Julia Lietzmann, 'E-waste legislation in the European Union and the Basel Convention' in Rakesh Johri, E-waste: Implications, regulations and management in India and current global best practices, TERI, New Delhi, 2008, pp. 153-58.

[11] It is a Resource Conservation Challenge (RCC) 2005 Action Plan and one of the National Priority Areas (Green Initiatives-Electronics) identified by the Environment Protection Agency for the RCC. For further reading go to available at: http://www.epa.gov/osw/rcc/index.htm (accessed on 13th May, 2024).

[12] Bamako Convention, International Maritime Organisation, 09 December, 2005, available at: http://www.imo.org (accessed on 13th may, 2024).

[13] The EMG is a UN System-wide coordination body on environment and human settlements. It was established in 2001 pursuant to the General Assembly resolution 53/242 in July 1999.

[14] UN report, 2015.

[15] Agrawal A and Vivek , 2009. Is municipal solid waste recycling economically efficient: Environmental Management 40: 926-943.

(Management and Handling) Rules, 1989" were notified as *"Hazardous Wastes (Management and Handling) Rules, 2003."* Since e-waste and their components are classified as *'hazardous'* and *'non-hazardous waste,'* they are masked under its jurisdiction.

2. The Hazardous Waste Management, Handling and Trans-boundary Movement) Rules, 2008: The *"Hazardous Material (Management, Handling and Transboundary Movement) Rules, 2007"* were drafted by the Central Government in an attempt to create suitable e-waste legislation. These rules forbid the cross border flow of dangerous waste, as stipulated by Basel Convention, of which India is a party.[16] The "Ministry of Environment and Forests" (hereinafter referred as MoEF) notified the public on September 24, 2008, that the *"Hazardous Wastes (Management and Handling and Transboundary Movement) Rules, 2008"* superseded the *"Hazardous Wastes (Management and Handling) Rules, 1989"*, apart from whatsoever measures done or not taken prior to such supersession.[17] The MoEF is the assigned ministry in charge of overseeing the cross-border transportation of dangerous waste and granting permission for their shipment through any region of India, as per the *"Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008."* For the imports near about three categories have been entrenched for the importation of hazardous waste items; materials that are forbidden from entering the nation, materials that may be imported free of charge under an open general licence, and materials that require prior authorisation. In addition, the coordination committee was founded by MoEF to supervise the execution of the above mentioned rule of 2008. Representatives from the revenue department in the Finance Ministry, the Department of Commerce and Industries, the Ministry of Shipping, the CPCB, a few State Pollution Control Boards, and experts make up the Committee.[18]

3. The E-waste Management and Handling Rules, 2011: As per this rule, the manufacturers will need to inform customers about any potentially dangerous ingredients in the product. Additionally, *do's and don'ts* for handling the devices after usage should be provided to customers. Information pamphlets will also must be dispersed with a view to stop e-waste from being catapult in trash. Nonetheless, mass consumers like businesses and the government will be in charge of recycling the e-waste which they produce, under the regulations. It will be mandatory for manufacturers of mobile phones, personal computers, white goods, and mass users to make certain that whatever the e-waste they produce is either returned to the producers or directed to designated collection sites. Additionally, they must keep track of electronic trash that they produce and share those information with bodies such as Pollution Control Committees or SPCP.

Key Elements of Sustainable E-Waste management
There are many essential elements for sustainable e-waste management:

i. **Reuse:** Reusing electronic devices to extend their lifespan is a sustainable strategy. Businesses can set up programmes to repurpose and refurbish gadgets, then make them available to people or organisations that need them. Reusing or donating old electronics, while making sure they work properly and that all data is deleted, helps reduce waste and gives underprivileged populations access to technology.

ii. **Reduce:** Minimising the production of e-waste is the most effective method for dealing it. E-waste can be considerably decreased by supporting long-lasting and repairable electronics and urging customers to embrace a *'buy less, use longer'* philosophy. Additionally, producers ought to concentrate on eco-design, creating goods that are simpler to dismantle, fix, and update, thereby increasing their longevity.

iii.**Recycle:** An essential part of managing e-waste sustainably is recycling. Putting in place effective recycling systems reduces the environmental effect of extracting raw materials while recovering valuable materials from abandoned devices. By working with accredited recyclers of electronic waste, you can be guaranteed that gadgets are processed responsibly and safely while upholding stringent data security and environmental regulations.

Challenges in Management of e-waste in India
In India, recycling is primarily done by the unofficial sector. Thousands of low-income households rely on foraging for supplies from landfills to make ends meet. Middle-class urban households typically recycle their waste paper, plastic, metal, and clothing by selling it to small-scale, unofficial buyers called *'kabadiwalas'* These buyers then sort the materials and sell them as raw materials to handmade or industrial processors. They then pose those waste to the high factory. India manages e-waste in the manner akin to this. Thousands of urban households are employed in the unofficial e-waste recycling industry, which collects, sorts, repairs, refurbishes, and dismantles outdated electronic and electrical goods. But in developed nations, things operate differently, and in India, there is nothing voluntary as such consumer donation of outdated electronic and

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[16] M.P. Ram Mohan, Iti Garg and Gayatri Kumar, 'Regulating e-waste: a review of the international and national legal framework on e-waste, ' in Rakesh Johri,E-waste: Implications, Regulations and Management in India and Current Global Best Practices, TERI, The Energy and Resources Institute, 2008, p.170-71.

[17] Available at: http://www.indiaenvironmentportal.org.in/files/HAZMAT_2265_eng.pdf (accessed on 14th May, 2024).

[18] 'Trade of Hazardous waste', Rajya Sabha Starred Question No. 119, dated 2.8.2010.

electrical gadgets to official e-waste recycling facilities. Furthermore, the idea of customers paying for the disposal of electronic trash they produce does not exist.

i.   **Inadequate infrastructure for Recycling e-waste:** India's infrastructure is not equipped to handle e-waste on a huge scale. Only over $1/5^{th}$ of the nation's annual e-waste generation is processed at the very few government-approved recycling facilities. The co-funded grant scheme, made available by the Indian government, pays for e-waste management facility construction and capacity creation up to fifty percent of project expenses. Furthermore, lack of officially authorised e-waste recycling facilities because the majority of e-waste collectors in India work in unorganised supply chains, which causes the centres to run much below capacity.

ii. **Unsustainable Practices in the Informal Sector:** Even with expansion of formal breakdown and recycling industry, very little garbage is actually processed in this area. Due to their failure to obtain adequate trash, a lot of such formal facilities are running below their authorised limits. Household and institutional customers desire to send back their waste to the official sector is declining due to information lacking about e-waste and the expenses associated with returning the ended devices to formal collection sites.

iii. **Mismanagement of the End-of-Life Product Market:** Private companies ability to establish e-waste management processes in the formal sector is limited by their failure to consistently procure large enough amounts of e-waste to achieve the desired scale of economics. *For example*, utilising efficient recycling methods for managing e-waste in India might necessitate high capital investments, that private companies cannot justify in the lack of assurance on obtaining sufficient amounts of e-waste. Information limitations are another issue facing these markets.

iv. **Insufficient implementation and Design of Regulations:** The compulsory producer take-back programme, in the absence of corresponding collection goals, created no motivation for manufacturers to accept accountability and, as a result, did not significantly advance e-waste management techniques. A few changes were put forth that, by outlining progressively tougher collection targets, increased regulatory clarity. On the other hand, the regulatory agencies are already understaffed and burdened greatly by the regulatory design. The producers EPR strategy must be reviewed by the authorities, who must also authorise and implement the plan's requirements.

Conclusion

The quantity of waste generated in the last few years had become a greater and greater menace to environment as well as human health. The CPCP has identified over eighty-eight critically contaminated industrial zones. Such zones discharge pollutants into rivers, bodies of water, and in many cases, even the ground water. Regarding e-waste, it has been witnessed as one of waste streams with the fastest global growth to date. One major difficulty is the vast volume of electronic equipment that is approaching its end of life.

The simplicity of recycling as well as downstream effects have not been proved enough consideration during the design of computers and other electrical equipment. At the end, their dismantling requires a lot of effort. When electronic items reach their end, they will continue to endanger environment as well as human health because they are manufactured without recycling considerations and contain a variety of hazardous compounds. The existing composition of electronic items means that any nation's e-waste recycling programmes will produce emissions and residues that are harmful to the environment.

The safe management of trash must be carried out in an orderly manner with proper funding and sustainable recycling techniques at one end and efficient laws and monitoring systems on the other, considering the fact about their future implications.