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IMPACT OF E-WASTE ON HUMAN HEALTH & ENVIRONMENT: THE INTERNATIONAL AND NATIONAL LEGAL FRAMEWORK

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ABSTRACT

The electronic industry is the world's largest and fastest growing manufacturing industry. It has become leverage to the socioeconomic and technological growth of developed as well as developing Nations. Environmental deterioration and health risk due to improper e-waste management has become a serious issue at global as well as international level. The major portion of e-waste reaches an unorganized e-waste recycling sector and is then treated by using crude methods. Electronic waste (E - waste) is one of the fastest wastes splurging around the world. E - waste consists of all waste from electronic and electrical appliances which have reached their end - of - life period or are no longer fit for their original intended use and are destined for recovery, recycling, or disposal. The main sources of electronic waste are the government, public and private (industrial) sectors. Electronic waste (e-waste) is one of the fastest-growing pollution problems worldwide given the presence a variety of toxic substances contaminate the environment and threaten human health, if disposal protocols are not meticulously managed. The current practices of e-waste management suffers a number of disadvantages like inadequate legislation , difficulty in inventorization, health hazards due to informal recycling, poor awareness and reluctance on part of the corporate to address the critical issues This paper presents an overview of toxic substances present in e-waste, their potential environmental and human health impacts together with management strategies currently being used and also focuses on various conventions and rules at International and National level.

Key words: *Electronic, environment, e-waste, health, industry, issues, impact, Management,*

"Sooner or later, we will have to recognise that the Earth has rights, too, to live without pollution. What mankind must know is that human beings cannot live without Mother Earth, but the planet can live without humans."

– Evo Morales

1.INTRODUCTION

The term environment is described as the unique set of external conditions which can influence the life of human beings or any other organisms.[1] "Environment" is a difficult word to define. Its normal meaning relates to surroundings, but obviously that is a concept which is relatable to whatever object it is which is surrounded. Einstein has once observed, "the environment is everything that is not me". Environment is a polycentric and multifaceted problem affecting the human existence. Man is nature's best promise and worst enemy.[2] However, in general sense, environment means surroundings. This involves three questions (i) What is surrounded? (ii) by what surrounded? (iii) where surrounded? The first inquiry is concerned with living object in general and man in particular: if man is taken to be surrounded, physical attributes become relevant to the second inquiry which becomes environment and where surrounded is the space or habitat.[3]

Thus Environment has been defined as :- The complete range of external conditions under which an organism lives, including physical, chemical, and biological factors, such as temperature, light and availability of food and water. So, we can say that environment includes all those external conditions which effects the life of an organism.[4] Notably environment affects all the living creatures including the vegetables, plants, and trees. A number of necessities of life are fulfilled rather derived from the environment. Thus, it can be said that the environment is the life support system.[5]

Present era is an electronic era, electronic industry has emerged as one of the fastest and largest growing manufacturing industry in last the decade. It has been boon in providing society much needed impetus at all levels of economic, cultural, and technological advancements. Various kinds of EEE are being used by people in everyday lives from workplaces to household routines. In such scenario with the intention to transform lives of every civilian with a touch of technology, the then Hon'ble Prime Minister brought the "Digital India Programme." Digital India is a movement or regime where technology and connectivity aims to work together to improvise the different aspects of governance and activities that every citizen come across in daily walks of life.[6] Today unfortunately on account of human activities the composition and nature of environment has changed. Such activities include industrialisation, digitalisation, constructions, transportation etc. Although these activities are desirable for human welfare and development but at the same time these lead to release of objectionable toxic

[1] Gareth Jones, *People, and the Environment: A Global Approach*, 4-5 (Routledge New York, 2004).

[2] Paramjit and Nishtha Jaswal, *Environmental law*, 1 (Allahabad Law Agency, Faridabad, 4th edn., 2015).

[3] Dr. Uopadhyaya, *Environmental law*, 13 (Central Law Agency, Allahabad, 4th edn., 2015).

[4] Dr. S.K. Dhawan, Dr. S.K Sharma and M.L. Sharma, *Environmental Studies*, 1 (Bansal Book Depot, Shimla 2012).

[5] Dr. Sanjeev Kumar Chadha, *Lectures on Environmental Law*, 1 (Central law Publication, Allahabad, 1st edn., 2015).

[6] Jyoti Sharma "Digital India and its Impact on the Society" 4(4), *International Journal of Research in Humanities & Soc. Sciences*, 64-70 (May-June 2016)

materials into environment thereby causing environmental pollution.[7] Unfavourable patterns of alteration resulting from the effects of changes in radiation levels and energy patterns, physical or chemical constitution or the abundance of organisms emerged in the environment is called pollution. These pollutants may be generated by human activity as well as by natural resources.[8] Environmental pollution can affect human life, plants, animals as well as vegetation etc. Industrialisation, population growth, globalisation, production, consumption, power generation, agricultural practices, commercial gains etc. are some of the factors responsible for causing environmental pollution.[9]The check on pollution and tackling of wastes have emerged as two major challenges confronted by almost every country of the modern world.[10]The environmental pollution is major factor that is responsible for climate change or climate degradation. Impacts of environmental pollution includes changes like global warming, ozone layer depletion, acid rains and its consequent impacts on human health, animal health and on ecology of plants. Further different kinds of environmental pollution include water, air, noise, soil pollution, and pollution caused by solid wastes (including toxic wastes). One such waste which is growing at a rapid pace now a days is electronic waste (e-waste).

2.CONCEPT OF E-WASTE

E-waste in its common parlance means electronic products near to or after the end of their "usable lives."[11] Public perception of e-waste is not broad enough and covers primarily end-of-life Information and Communication Technology (ICT) devices along with other consumer electronics. However, e-waste itself is category of WEEE. [12]Therefore, e-waste covers waste electrical/electronic goods that become unfit for the intended use or life span of the same has ended.

According to BAN, E-waste means "discarded appliances using electricity, which include a wide range of e-products from large household devices such as refrigerators, air conditioners, cell phones, personal stereos, and consumer electronics to computers which have been discarded by their users.[13]

According to Global E-Waste Monitor 2014, "e-waste is a wide term used to cover all items of EEE and its components/parts that have been discarded by its owners as waste without their intention to reuse."[14]

[7] Khopkar. S.M, *Environmental Pollution: Monitoring and Control*, 4-5 (New Age International Publishers, New Delhi, 2004)

[8] ibid

[9] Dr. Mashhood Ahmed Khan and Arsalan Mujahid., "Environmental Pollution: Its Effect on Life and Remedies" 2(11), *Journal of Arts, Science & Commerce*, 276-285 (April 2011).

[10] Dejo Olowu., "Menace of E-wastes in Developing Countries: An Agenda for Legal and Policy Responses" 8(1), *Law Environment and Development Journal*, 59-75 (2012).

[11] Pooja Singh & Shanu Thomas, "E-waste Management and Environment Protection: A Critical Legal Analysis" *Bharti Law Review*, 27-35 (Jan-March 2016).

[12]M.N Rao and Razia Sultana, *Solid and Hazardous Waste Management*, 186-213 (B.S Publications, Hyderabad, 2012)

[13] G. Gaidaji, K. Angela Koglou et.al., "E-waste: Environmental Problems and Current Management" 3(1) *Journal of Engineering Science and Technology Review*, 193-199 (2010).

[14] Balde C.P, Wang. F., et.al., *The Global E-Waste Monitor-2014*, 10 (United Nations University, IAS – SCYCLE, Bonn, Germany).

3.CAUSES OF SWIFT GENERATION OF E-WASTE

In todays' world every individual endeavour to have access to use latest technology and due to easy and inexpensive availability manages to own these as well. But when it comes to dispose electrical or electronic equipment masses are unaware or ignorant about the issue of disposal of e-waste. The causes of rapid generation of e-waste are as follows:

3.1. Development &Technology[15]: Last two decades known as "golden period" witnessed swift growth in EEE industry. Since the times of liberalization, Indian economy has grown well from restrictive approach to the wider global approach. Information technology sector has contributed massively to economic growth. Each day there comes a new development in technology. Electronic equipment specifically computers are easily discarded by small offices and households not because they get damaged or broken but because innovation in technology renders deficiency in functioning, thereby making them undesirable and obsolete. Many times, new software's are incompatible with old hardware electronic devices compelling users of EEE with no other option except to buy a new one. Data collected from a recycling collection event of EEE reveals that nearly 50 percent of discarded computers are in working order, but they are discarded and thrown away just to make a way for latest technology.

3.2. Change in Consumption Pattern[16]: In era of urbanisation, there is variation in pace of lives and growth in economic status has enhanced the purchasing power of middle class to afford different variety of electrical and electronic good. Increase in affordability and availability of these products have totally changed the mind sets of consumers and they are never seen reluctant in spending on EEE. Change is visible when consumers outgrow old EEE with the moment new EEE arrive in the market. Therefore, due to extreme rate of obsolescence consumers are generating much higher amount of e-waste.

3.3. Population Growth[17] One reason for growth of e-waste is population. As the population is growing each day with a development in earning capacity everyone buys a computer or other electrical or electronic device which simply means more generation of e-waste. Common observation shows that individual belonging to any strata of society is carrying cell phone with himself. Therefore, more the population growth more the use of electrical and electronic goods and therefore increase in e-waste generation.

A study by Toxic Links, an environmental NGO working in toxic wastes has revealed in its report dated September 7, 2016, that Indians lack awareness regarding the issue of e-waste.[18]

[15] Rajya Sabha Secretariat, *Report on E-Waste in India*, (June 2011).

[16] Satish Sinha, *Dark shadows of Digitization on Indian Horizons* in Rakesh Johri (ed.), *E-Waste: Implications, Regulations and Management in India and Current Global Best Practices*, 23-44 (TERI Press, 2009).

[17]Omole. D.O, Tenebe I.T, et.al., "Causes, Impact and Management: Case Study of Some Nigerian Communities" 10(18) *ARPN Journal of Engineering and Applied Sciences* 7876-7884 (October 2015)

[18]Editorial, "Majority of Indian Unaware About E-Waste: A Study" Available at http://toxicslink.org/? q=article/majority-indians-unaware-e-waste-study. (Visited on June 5. 2016).

4.IMPACT OF E-WASTE ON ENVIRONMENT

Illegally imported or dumped e-waste by its nature is generally processed in the informal recycling sector. The intensive informal and uncontrolled recycling of e-waste has resulted in the release of huge amounts of pollutants in the local environment. Fields and Laboratories results in China has clearly shown that e-waste is significantly degrading soil, air, water quality and range of biotas and environment through other informal e-waste recycling centres.[19]

Contamination of Ecological Sources by E-Waste- Living beings require a healthy ecology to survive. The toxic substances of e-waste are contaminating the ecological resources of environment in following manner: Air and Dust- Maximum times human body is exposed to atmospheric air which is must for their survival. Atmospheric air which once was considered as the life giver has now a days turned into a source of all health-related problems. When e-waste is burnt large amounts of toxicants enter the environment. Workers in e-waste industry are exposed to even more toxic substances leading to chronic illness like asthma, skin diseases and stomach disorders.[20]

Water- Liquid wastes associated with electronics industry comprises of used electroplating solution, contaminated rinse water, spent solvents and alkaline effluents. No matter how well-regulated processes are, the treatment of liquid and gaseous effluents usually results in further liquid wastes. Heavy metals present in e-waste which is dumped in landfills gets absorbed by the groundwater especially when in acidic conditions. Dioxins and furans once get into the water cause the phenomenon of bio concentration thereby affecting the quality of environment.[21]

Soil and Sediments- Soil and sediments have the tendency to absorb and accumulate pollutants which has long lasting impact of contamination. Open dumping and landfilling are the most common ways to dispose e-wastes. It is considered as the most dangerous method to discard e-waste because through the process of leaching toxic elements make their way to soil and sediments and pollute it. Once these elements enter into plants from soil, they get bio magnified to the highest tropical level.[22]

Use of informal e-waste recycling methods have direct impact on plants due to presence of heavy metals in them. E-waste contaminants can easily affect aquatic systems with the process of leaching from dumpsites where unprocessed or processed e-wastes are kept. Similarly, the disposal of acid wastes following hydrometallurgical processes enter water and soil thereby leading to contamination of aquatic systems.[23]

5.IMPACT OF E-WASTE ON HUMAN HEALTH

E-waste consist of varied combination of poisonous elements which can have irreparable impacts on environment and human health. The physiological and health impacts of e-waste on humans are numerous but children and women are more

[19] Walters, A. and Santillo D, *Evidence of Environmental and Health Impacts of Electronics Recycling in China: An Update*, 7 (Greenpeace International, Amsterdam, 2008).

[20] Theakston, F., 2001. Air Quality Guidelines for Europe. World Health Organization.

[21] Ashwani Kumar, Satyendra Choudhry, et.al., "Challenges and Way to the Solution of E-Waste 3(2), *International Journal of Advances in Electronics and Computer Science*, 29-33 (Feb-2016).

[22] *ibid*

[23] Brett H. Robinson, "E-Waste: An Assessment of Global Production and Environmental Impacts", *Science of Total Environment*, 183-191 (2009).

vulnerable to its effects. There exists number of routes through which hazardous substances of e-waste make its way to enter in human body.

E-waste is highly complex to handle because of its composition. It is made up of multiple components some of which contain toxic substances that have an adverse impact on human health and environment if not handled properly that is if improper recycling and disposal methods are deployed. Effects of some of the prime hazardous components in of e- waste are mentioned below:[24]

1. Arsenic, can affect skin and can decrease nerve conduction velocity. Chronic exposure to arsenic may cause lung cancer and sometimes be fatal.

2. Lead, may affect kidneys, reproductive systems, nervous connections. May cause blood and brain disorders, sometimes may be fatal.

3. Barium, can affect heart muscle.

4. Chromium, can damage liver, kidneys and may cause asthmatic bronchitis and lung cancer.
5. Beryllium, may cause lung diseases.

6. Mercury, affects the central nervous system, kidneys, and immune system, it impairs foetus growth. May cause brain or liver damage

7. Cadmium, may cause severe pain in the joints and spine. It affects the kidneys and softens bones.
8. BFR (Brominates flame retardants), can harm reproductive and immune systems, may cause hormonal disorder.
9. Chlorofluorocarbon (CFC), may affect the ozone layer. It may cause skin cancer in human and genetic damage in organisms.

10. Polychlorinated Biphenyl (PCB), May cause cancer in animals, can affect the immune system, reproductive system, nervous system, endocrine system. PCBs persistently contaminate in the environment and cause severe damage.

11. Polyvinyl Chloride (PVC) PVC, contains up to 56% chlorine and when burnt, produces Hydrogen chloride gas which in turn produces hydrochloric acid that is dangerous to respiratory system.
12. Dioxin, these are highly toxic to animals and can lead to malfunction of foetus, decreased reproduction and growth rates, affect immune system.

6.DEVELOPMENT OF INTERNATIONAL LAW ON E-WASTE MANAGEMENT

The massive industrial commercial growth in last few decades have caused lot of disturbances in ecosystem. These days entire environment is polluted and toxic substances through various channels are polluting air, ground water resources, drinking water, oceans, soil, crops and vegetables. This situation has brought the attention of environmentalists, policy makers and public worldwide regarding risks associated with inappropriate disposal of

[24] Available at, https://www.tec.gov.in/pdf/studypaper/e%20waste%management . Visited on 23/02/2023.

hazardous wastes. The alarming situation has come where quantum and complexity both together form subject of attention.[25]

6.1. Stockholm Declaration, 1972- Stockholm Declaration is considered as a landmark, where various nation states showed their concern on the issue of economic development and deterioration of environment. It further stressed upon the need to ensure that development remains well matched with need to protect environment for the benefit of inhabitants of the planet earth.[26]

Following principles of the Declaration can be associated with waste management[27]

Principle 1 guarantees fundamental right to quality environment.

Principle 2 emphasises on need to safeguard natural resources like land, water, air, flora, fauna.

Principle 7 directs nation states to take all the possible steps to avoid pollution in seas by contamination of substances that can cause risks to human health, damage living resources and marine life.

Principle 18 that incorporates that application of science and technology in social and economic development must be applied to the identification, avoidance, and control of environmental dangers.

Principle 24 advocates that international matters concerning protection and improvement of environment should be handled by small and big nations in cooperative spirit and stresses on measures of multilateral and bilateral agreements to effectively deal with detrimental environmental impacts.

6.2. International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL)-The International Convention for the Prevention of Pollution from Ships (MARPOL) is the major international Convention dealing with prevention of pollution of the marine environment because of operational or accidental causes of ships. This Convention was adopted on November 2, 1973, at International Maritime Organisation. Then was the adoption of Protocol in the year 1978 in response to a sequence of tanker accidents that took place in the years1976-1977.[28]

6.3.Brundtland Commission, 1980- In the year 1980, United Nations set up the Commission on Environment and Development (Brundtland Commission), the outcome of which was a comprehensive document titled as "Our Common Future" The Commission has given due importance to needs of future generations by not setting limitations for technological developments rather by coining the idea of taking technology and social organisation together to create a new era of economic growth in environmentally sound manner. E-waste is a toxic waste and

[25] Annamalai Murugan, *International Regime of Environmental Law*, 213 (Regal Publications, New Delhi, 2016).

[26] Donald K. Anton and Dinah L. Shelton, *Environmental Protection and Human Rights*, 535 (Cambridge University Press, New York, 2011).

[27] United Nations: Report United Nation Conference on Human Environment Stockholm 5-16 June ,1972 Available at http://www.un-documents.net/aconf48-14r1.pdf. (Visited January 19, 2022).

[28] The International Convention for the Prevention of Pollution from Ships (MARPOL), Available at http://www.imo.org/en/about/conventions/listofconventions/pages/international-convention-for-theprevention-of-pollution-from-ships-(marpol).aspx. (Visited on December 12, 2018).

has potential to spoil human health and environment if not managed properly in an organised manner. There is need to formulate tight control mechanisms under the authority of Governments of the concerned nations.[29]

6.4. Rio Declaration on Environment and Development 1992- United Nations Conference on Environment and Development (Rio Declaration) was held with the intent to protect the integrity of global environmental and developmental system. 142 countries are parties to this Declaration and India has also ratified this Declaration. The Declaration proclaimed 27 principles along with Agenda 21 which were a kind of guiding principles to be followed by nations for achieving sustainable development. The concept on sustainable development analyses the relationship between economic development, quality of environment and social equity. The definition given by Brundtland Commission Report emphasised on balancing economic and social needs of people keeping intact the regenerating capacity of natural environment.[30]

6.5. Basel Protocol on Liability and Compensation for Damage resulting from Transboundary Movements of Hazardous Wastes and their Disposal, (Basel Protocol on Liability), December 1999-In pursuance of Article 12 of Basel Convention, 1989 parties adopted Basel Protocol on Liability in COP 5 in the year 1999. The Protocol aims to establish a comprehensive regime for liability for the damages resulting from the trans-boundary movement of hazardous wastes and from any other illegal shipping of wastes. It covered each phase of transboundary movement from the point of loading, areas falling in transit and covers the place of unloading.[31]

6.6. The Nairobi Declaration, 2006- Initially Basel Convention, 1989 did not take up e-waste specifically although it did contain provisions for regulating recycling and exports of hazardous wastes from developed to third world countries. However, on 8th meeting of COP to the Basel Convention e-waste was the key agenda. Acknowledging the increase in use of EEE, rapid transnational movements of e-waste, underlying the ecologically sound management of e-waste, conscious of the fact of environmental and health repercussions likely to arise from illegal movement of e-waste, mindful about the fact that reuse and recycling can promote environmentally sound management of e-wastes and encouraging manufacture of green designs took the matter of e-waste use, manufacture, reuse, recycling, illegal traffic and disposal of e-waste in COP-8 is also knows as Nairobi Declaration.[32] The parties declared inter alia to promote clean technology and green design for electronic products and aims to phase out hazardous substances used in components of e-products along with advocating about EPR in the life cycle of management of e-products. Parties also declared to prevent and combat illegal traffic of e-waste.[33]

[29] United Nations Treaty Series, Vol 1522, I-26369, Available at https://treaties.un.org/doc/ publication/unts/volume%201522/volume-1522-i-26369-english.pdf. (Visited on May 17, 2022).

[30] Peter P. Rogers, Kazi F. Zalal, et.al., An Introduction to Sustainable Development 41-42 (Glen Educational Foundation Inc, 2008).

[31] Katharina Kummer Peiry, "Basel Convention Control Transboundary on the of Movements Hazardous Wastes Disposal of and Their Disposal" United Nations Audio Visual Library of International Law, Available at, http://legal.un.org/avl/ha/bcctmhwd/bcctmhwd.html. (Visited on May 7, 2018).

[32] Nairobi Declaration on Environmentally Sound Management of Electrical and Electronic Waste, December 2006, Available at http://www.basel.int/portals/4/basel%20convention/ docs/meetings/cop/ cop8/nairobide-claration.pdf (Visited on July 3, 2018).

[33] Tzvi Levinson, Christina Folman, et.al., "E-Waste Legislation in European Union and the Basel Convention" in Rakesh Johri (ed.), *E-Waste: Implications, Regulations and Management in India and Current Global Best Practices*, 165-166 (TERI Press, 2009).

7. E-WASTE REGULATORY MEASURES AT NATIONAL LEVEL

7.1. EU Directive on Waste Electrical and Electronic Equipment (WEEE), 2003- EU Directive on WEEE is an exhaustive Directive containing scheme of effective management and regulation of e-waste.[34] Today also the Directive is well recognised worldwide for providing both exhaustive and illustrative definition of e-waste. E-Waste rules of India are majorly influenced by EU Directive. The E-waste Directives and Regulations legislated by EU aim to uphold the principle of 'reduce, reuse and recycle' by incorporating take back schemes, recycling systems, and regulating the content and quantum of toxics. The Directive was made with key objectives.[35]

1.To protect, preserve and improve the quality of environment with a prudent and wise use of natural resources.

2.To minimise waste generation and reuse, recycle and recover materials or energy from waste.

3.Encourage consumers to initially segregate and collect e-waste separately.

4.To set up collection points where private households can return their waste free of any charge.

5.To make available best available recycling, recovery, and treatment techniques to ensure safety in human health and high environmental protection.

6.To provide information as to components and material identification to facilitate the management of e-waste.

7.2. EU Directive on Waste Electrical and Electronic Equipment (WEEE), July 2012, majorly affected the roles played by various stakeholders in e-waste management regime. The key changes are as follows [36]

The 2012 Directive expanded the scope and mandates application of directive on all EEE which requires every producer to comply with regulations.

1.The ten categories are replaced by six and fourth category now includes photovoltaic panels. 2.The new six categories are more like the WEEE that are collected and treated separately. 3.The collection and recovery targets are increased and based on equipment placed in the market or WEEE generated and applies to both household and professional EEE which shall make collection players improvise their collection systems and develop new collection mechanisms.

7.3. Restriction of Hazardous Substances Directive, 2003, was adopted in the year 2003 by the EU and applies on the EEE placed in the market after July 1, 2006 provided all of them fall under the WEEE Directive (except Medical equipment and Monitoring and Control Instruments) and to electric light bulbs in household.[37] The Directive puts restriction on the use of six hazardous constituents in the manufacture of different kinds of EEE. The Directive puts complete ban on all EEE containing higher than permitted levels in parts per million (ppm) by

[34] WEEE Directive 2002/96/EC Official Journal of the European Union, L 37/24 dated 13.2.2003.

[35] Ibid

[36] Available at, Study on the Transposition of the 2012 WEEE Directive in Europe Final Report – Part 1 Transversal Analysis. (solarwaste.eu), (Visited on January 20, 2023).

[37] RoHS Directive 2002/95/EC. Available at, https://environment.ec.europpa.eu/topics/waste-and recycling/rohs-directives_en., (Visited on January 20, 2023).

weight of homogenous material of hazardous compounds namely "mercury, cadmium, lead, hexavalent chromium, polybrominated diphenyl and polybrominated biphenyl ether flame retardants.[38]The Directive intends to eliminate the use of these hazardous components by substituting these with lesser hazardous compounds".[39]

7.4. Regulation on Registration, Evaluation, Authorisation and Restriction of Chemical, 2007, (REACH)-EU enforced REACH on June 1, 2007, which was to be implemented in phases till 2017.REACH aims to improve the protection of environment and human health through the earlier and better identification of the latent properties of chemical substances. This is done by employing four processes of REACH, i.e., the registration, evaluation, authorisation, and restriction of chemicals. It has another objective to enhance innovation and competitiveness of the EU chemicals industry. These Regulation places accountability on the industry to manage the risks arising from chemicals and provides safety related information on the substances. Manufacturers and importers are required to collect and disseminate every information regarding properties of their chemical substances, which will also enable their safe handling. Further importers and manufacturers are required to register the information gathered in a central database in the European Chemicals Agency (ECHA) in Helsinki.[40]

7.5. The Bamako Convention, 1991-The Bamako Convention was adopted by 12 nations of the Organisation of African Unity at Bamako, Mali in January, 1991and came into effect in March 1999.[41] The Convention also bans incineration of hazardous waste at sea and their disposal in the seabed and sub seabed. The Convention adopts precautionary principle in relation to waste generation and promote for cleaner production. It also prohibits trans-boundary transfer of polluting technologies.[42]

7.6. E- Waste Management Rules, 2016

The Ministry of Environment, Forest and Climate Change has notified the E-Waste Management Rules, 2016 in supersession of the e-waste (Management & Handling) Rules, 2011.[43]

i. Over 21 products (Schedule-I) were included under the purview of the rule. It included Compact Fluorescent Lamp (CFL) and other mercury-containing lamps, as well as other such equipment.

[38] S.P Singh, *Electronic Waste Management*, 82-88 (Sahitya Bhandar Publications, 2006)

[39] Supra note 37.

[40] Regulation (Ec) No 1907/2006 of The European Parliament and of The Council of 18 December 2006 available at http://www.cirs-reach.com/REACH/. (Visited on January 20, 2023).

[41] Bamako Convention, available at https://www.jus.uio.no/lm/hazardous.waste.ban.afrian.import. bamako. convention.1991/portrait.pdf (Visited on January 20, 2023).

[42] Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, (1991) available at, https://www.jus.uio.no/lm/hazardous.waste.ban.afrian.import.bamako.convention.1991/portrait.pdf (Visited on January 22, 2023).

[43] E-Waste (Management) Rules, 2016 - India Environment Portal | News, reports, documents, blogs, data, analysis on environment & development | India, South Asia. (Visited on January 22, 2023).

ii. For the first time, the rules brought the producers under Extended Producer Responsibility (EPR), along with targets. Producers have been made responsible for the collection of E-waste and its exchange.

iii.Various producers can have a separate Producer Responsibility Organisation (PRO) and ensure collection of E-waste, as well as its disposal in an environmentally sound manner.

iv. The Deposit Refund Scheme has been introduced as an additional economic instrument wherein the producer charges an additional amount as a deposit at the time of sale of the electrical and electronic equipment and returns it to the consumer along with interest when the end-of-life electrical and electronic equipment is returned.

v. The role of State Governments has been also introduced to ensure the safety, health, and skill development of the workers involved in dismantling and recycling operations.

vi. A provision of penalty for violation of rules has also been introduced.

vii. Urban Local Bodies(Municipal Committee/Council/Corporation) has been assigned the duty to collect and channelize the orphan products to authorized dismantlers or recyclers.

viii. Allocation of proper space to existing and upcoming industrial units for e-waste dismantling and recycling.

7.7. E-waste (Management) Amendment Rules, 2018

Union Minister for Environment, Forest, and Climate Change has said that the Government has amended the E-waste (Management) Rules, 2018 in a move to facilitate and effectively implement the environmentally sound management of e-waste in India. The amendment in rules has been done with the objective of channelizing the E-waste generated in the country towards authorized dismantlers and recyclers to formalize the e-waste recycling sector. The collection targets under the provision of Extended Producer Responsibility (EPR) in the Rules have been revised and targets have been introduced for new producers who have started their sales operations recently.[44]

The Ministry of Environment, forest and climate change on 2nd November 2022, has published the E-Waste (Management) Rules, 2022 which shall come into force from the 1st day of April 2023. These rules shall apply to every manufacturer, producer refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, refurbishing, dismantling, recycling, and processing of e-waste or electrical and electronic equipment including their components, consumables, parts and spares which make the product operational. However, this rule shall not be applicable to waste batteries as covered under the Battery Waste Management Rules, 2022, packaging plastics as covered under the Plastic Waste Management Rules, 2016, micro enterprise as defined in

[44] Available at, E- Waste (Management) Amendment Rules, 2018 - India Environment Portal | News, reports, documents, blogs, data, analysis on environment & development | India, South Asia, Visited on 2 February 2023.

the Micro, Small and Medium Enterprises Development Act, 2006 and radio-active wastes as covered under the provisions of the Atomic Energy Act, 1962.[45]

8. CONCLUSION

E waste is a relatively new segment in the global problem of waste removal. It is also the fastest growing segment worldwide in discarded waste. This growing problem in the world is largely ignored or misunderstood. Many people do not understand what it is or how it affects them, the world, or the environment. So, the question "What is e-waste" needs to be addressed before any solutions can be effective. E waste comes from the improper disposal of any number of electronic devices. These devices include computers, televisions, cell phones, or most other electronic equipment. Consumers in developed nations are quick to replace their devices because of continuous technological advances. This upgrading leads to an excess of unused electronic devices. What is done with old computers and phones is what is contributing to the e waste problem. Some people understand the importance of properly disposing of these old units, but many more still throw them in the garbage or incinerators.

Most developed nations in the world have laws and regulations requiring that e waste not be disposed of in landfills or be incinerated. Cities and states have set up programs across the United States where consumers can drop off used electronic devices to be properly disposed of. The best method of disposal is to recycle this equipment. Many people do not understand that the parts in old devices can be reused in new products. There is a popular mantra used by many recycling advocates, "Reduce, Reuse, and Recycle." This slogan has widely been promoted with plastics and glass, but its message is also applicable to the disposal of e waste. Many electronic stores offer services to help customers bring in old electronics or parts to dispose of them safely and properly. E-waste is an emerging issue, driven by the rapidly increasing quantities of complex end-of-life electronic equipment. The global level of production, consumption and recycling induces large flows of both toxic and valuable substances. The international regulations mainly developed under the Basel Convention, focusing on a global ban for transboundary movements of e-waste, seem to face difficulties in being implemented effectively; however, a conclusive account of the situation and trends is not yet possible. On a global as well as national level some attempts have been made to identify past, present, and future e-waste streams. The focus has been laid on quantities and in some cases on routes and spatial distribution, but a global/national perspective is still lacking.

[45] Available at, The E-Waste (Management) Rules, 2022 - India Environment Portal | News, reports, documents, blogs, data, analysis on environment & development | India, South Asia, Visited on Visited on 2 February 2023.