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Electronic Waste Management: National and International Perspectives

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Abstract

Advancement in technology including information technology work as a catalyst in the development of new and efficient products and appliances. Older and unserviceable products end up as waste once discarded by the users. Constituents of these products are hazardous and non-hazardous in nature; proportion of them varies from product to product. This paper will address the problem of e-waste management including both national and international initiatives. The objective of this paper is to analyze the prevailing law, policy and institutional mechanism to highlight the gaps and suggest ways to reduce the existing gap to secure our environment and ecosystems from the threat of electronic waste by proposing necessary changes in the regime.

Key words: Informal Sector, E-Waste, Hazardous Waste, Recycling, Developing Countries

1.1 Introduction

Advances in the field of science and technology brought about industrial revolution in the 18th century, which marked a new era in human civilization. In the 20th century, the information and communication revolution brought enormous changes. ,. Modern means of luxury and comfort became available to all. Electronic appliances made deep inroads in almost every household with the beginning of the 21st century. These developments caused manifold problems including the problem of massive amount of hazardous waste and other wastes generated from electrical and electronic appliances and products. These wastes pose a great threat to the human health and the environment. It is a serious challenge before all the countries and requires coordinated efforts to address it for achieving sustainable development as agreed at the "United Nations sustainable development Summit 2015"[1] held in New York on 25 - 27 September.

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E-waste is the world's fastest growing waste stream and is fueled mainly by higher consumption rates of electric and electronics equipment, short life cycles, and few option for repair. According to Global E-waste Monitor Report 2020[2], 53.6 million metric tonnes (MT) of electronic waste generated worldwide in 2019 an increase of 21% in just five years. According to Global E-waste Monitor Report 2020, India generated 3.2 million tonnes of e-waste in 2019 and 'ranked third among e-waste producing countries

2.1 What is E-waste?

E-waste consists of all waste from electrical and electronic appliances, which have reached their end of life period and are no longer fit for their original intended use, and are destined for recovery, recycling or disposal. It includes computers and its accessories like monitors, printers, keyboards, Central processing units; typewriters, mobile phones and chargers, remotes, compact discs, headphones, batteries, TVs, air conditioners, refrigerators and other household appliances.

The presence of elements like lead, mercury, arsenic, hexavalent chromium and flame-retardants beyond threshold quantities make e-waste hazardous in nature. It contains over 1000 different substances many of which are toxic and creates serious pollution upon disposal. Obsolete computers pose the most significant environmental health hazard among e-wastes. 'The EU defines the new waste stream as Waste Electrical and Electronic Equipment (WEEE)[3]. The E-Waste (Management) Rules 2016 define electronic waste as "any electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment and repair processes"[4]

3.1 Environment concerns and health hazards

The high rates of resource consumption patterns of electronic products has had an unintended and negative impact on the environment through the generation of wastes far beyond the handling capacity of concerned agencies. The management of huge and growing quantities of electronic waste emerged as one of the most important environmental problems of developing countries, especially India. E-waste is highly complex to handle due to its composition, includes both toxic and non-toxic, which is harmful for human health and the environment.

3.1.1 Pollutants in e-waste and its impact on health and environment

Pollutants or toxins in e-waste are typically concentrated in circuit boards, batteries, plastics and LCDs (liquid crystal displays). Major pollutants in waste electrical and electronic equipment include arsenic, barium, cadmium, chrome cobalt, copper, lead, PCBs, selenium, silver, zinc etc. Many of the substances are toxic, carcinogenic, and harmful for health and environment[5]. Most of these elements cause serious ailments in humans and are harmful to the environment.

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4.1 Extended Producer Responsibility (EPR) and E-waste

The EPR places the responsibility of the end-of-life management of products on the manufacturers or the producers. "Conceptually, EPR is designed to make the manufacturers internalize the external costs associated with the end of life disposal of their products."[6]

The OECD recommended two broad objectives of EPR approach[7]. Firstly it shifts burden on producers and secondly by forcing to internalize external costs for disposal, the EPR provides incentives to the producers to take into account environmental needs. Thus, the producers would encourage designing their products using recyclable or less toxic materials if EPR makes the producers internalize the social costs of disposal. Under the EPR approach, the producers can be made responsible paying cost for processing of e-waste and mandatory take back of the discarded products from the consumers.

The product take-back requirements may also enforce collection rate targets. Information responsibility might mandate providing information on the attributes of the products by labeling about toxicity, recyclability etc. EPR regulations may include anyone or a combination of these four types of producer responsibilities[8].

India's first law on e-waste came in 2011 and then after successive changes incorporated EPR concept with renewed interest. This led to Indian e-waste sector witnessing many changes like producers started making serious efforts in collection, increase in formal management sector, emergence of Producers Responsibility Organization(PROs) and attempts to develop indigenous technologies to process and recover different components of e-waste etc.

5.1. Legal Regulations on E-waste in India

In India, as per schedule XII of constitution, Municipalities are responsible for solid waste management. Article 243W empowers the State Legislatures to frame legislations in respect of waste management. The Municipal Solid Wastes (Management & Handling) Rules, 2000 were enacted by the Central Government, which came into force from 25 September 2000. Some of the guidelines for handling municipal solid wastes provided in the Schedules can be used as a model in the e-waste recycling and disposal scheme. The guidelines include organizing house to house collection of waste, proper collection of waste from slums and squatters, hotels, restaurants and offices etc. It also emphasized on segregation of wastes, adopting suitable technologies for processing and awareness.[9]

5.1.1 The Hazardous Waste (Management and Handling) Rules, 2003

In furtherance to the implementation of the objectives of the Environment (Protection) Act 1986, the Hazardous Waste (Management and Handling) Rules were enacted in 1989. It classified hazardous waste into eighteen categories based on constituents present in it and the quantum of

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generation. These Rules were amended in the year 2000 primarily to bring them in line with the Basel Convention 1989, which classified the waste by process of waste generation (Schedule-1) and as per their characteristics (Schedule-2).

Thus, 44 categories were identified comprising 148 waste streams in Schedule-1 and 79 types of wastes in Schedule-2. The amendment made in the Rules in the year 2003 streamlined the list of processes/ waste streams in Schedule-1, whereby the number of industrial processes generating hazardous waste was reduced from 44 to 36 and the number of waste streams from 148 to 123. The Schedule-2 remained unchanged.[10] As per the Rules, "hazardous waste" is defined as any waste which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or substances.

5.1.2 The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules 2008

These rules make the registration with the Central Pollution Control Board (CPCB) mandatory for those who desires of recycling or reprocessing hazardous waste including electronic and electrical waste. . The satisfaction of CPCB about environmentally sound technologies and processes, adequate technical capabilities, requisite facilities and equipment to recycle, reprocess or reuse hazardous waste will be the deciding factor for granting registration to applicants. The waste generated is required to be sent or sold to a registered or authorized recycler. The Ministry of Environment and Forest is the nodal ministry for granting permission for transit of the hazardous waste.

5.1.3 Guidelines for Environmentally Sound Management of E-waste, 2008

Considering the growing concern on the issue of e-waste, the Government of India has supported several initiatives, particularly the assessment conducted by the CPCB on the management and handling of e-waste which led to the preparation and the publication of the Guidelines for Environmentally Sound Management of E-waste in March 2008. The Guidelines have been formulated with the objective of providing broad guidance for identification of various sources of e-waste and the approach and methodology for handling and disposal of e-waste in an environmentally sound manner. The guidelines also emphasize the concept of (EPR).

5.1.4 E-waste Rules 2011

It addressed the issues related to e-waste management in environmentally sound manner and also to reduce the use of hazardous material in the manufacture of electrical and electronic equipment (EEE). In India, these are the first ever exclusive rules on e-waste. These guidelines also suggest treatment technologies to be adopted. The E-waste Rules, 2011also introduces the concept of

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(EPR). The producers are required to set up e-waste collection centers and establish take-back systems to assist consumers.

However, The E-waste Rules 2011 suffered from many shortcomings, absence of integration of informal sector, import of e-waste, no rule provided for e-waste accumulated before 2011 (historical waste), absence of a business model, lax penalty and lack of technology.[11]

5.1.5 Restriction of Hazardous Substances (RoHS)

The E-waste Rules, 2011 aims to restrict the use of hazardous substances such as lead, cadmium, mercury and brominates flame-retardants in EEE. The RoHS (in force since May 2014) restricts the six substances at the same maximum concentrations as in the European Union but the scope of products is different. Producers of EEE does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated diphenyls or ethers beyond a maximum concentration value of 0.1 percent by weight in homogeneous materials for lead, mercury, hexavalent chromium, and 0.01 percent weight in homogeneous materials for cadmium.

5.1.6 Hazardous Waste (Management and Transboundary Movement) Rules 2016

The Ministry of Environment, Forest and Climate Change amended the Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2016.

The amendment has been done keeping into consideration the “Ease of Doing Business” and boosting “Make in India” initiative by simplifying the procedures under the Rules, while at the same time upholding the principles of sustainable development and ensuring minimal impact on the environment.

Some of the salient features of the Hazardous Waste (Management and Transboundary Movement) Rules 2016 included prohibition on import of solid plastic, relaxation on export of silk waste, exemption of industries under the rules if they are exempted under the Air Act 1981 and Water Act 1974.

5.1.7 The E- Waste (Management) Amendment Rules, 2018

These amendments have been done with an objective of channelizing the E-waste generated in the country towards authorized dismantlers and recyclers in order to formalize the e-waste recycling sector. The collection targets under the provision of EPR in the Rules have been revised and targets have been introduced for new producers.

Some of the salient features of the Amendment Rules included[12] revision of e-waste collection targets under EPR w.e.f October 1, 2017 with 10 % increase every year until 2023 and after that

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the collection target will be 70 % e-waste generated as per EPR plan. Other features included Producer Responsibility Organizations (PROs) to apply to Central Board for registration etc.

6.1 E-Waste and Sustainable Development Goals (SDGs)

In September 2015 at the United Nations General Assembly adopted Sustainable Development Goals (SDGs). The 17 goals and 169 targets were set to be achieved within the targeted timeframe to end poverty, protect the planet, and ensure prosperity for all. Environment is embedded in each of the 17 integrated goals, with e-waste specifically linking to a number of these targets.

In particular, targets 3.9. 8.3, 8.8, 11.6, 12.4 and 12.5 relate to the issues associated with e-waste. This relationship involves the link between deaths and illnesses, and hazardous substances across their life cycle; decent work and labour rights; air quality and municipal waste management; and, the reduction of waste generation through use of the waste hierarchy.

By contrast, for e-waste, a more specific sub indicator has been recognized for monitoring growth in the waste stream, which is of particular concern due to both its potential hazardousness and its high residual value.[13] Increasing levels of e-waste globally pose challenges for the implementation of the 2030 Agenda for Sustainable Development requiring an efficient approach and coordinated action by the UN system to support countries in their efforts to manage their e-waste.[14]

7.1 Select International Processes and Agreements

7.1.1 International Convention for the Prevention of Pollution from Ships (MARPOL) (73/78/97)

Together with it six annexes, MARPOL addresses oil pollution from ships, from noxious liquid substances carried in bulk, from harmful substances carried by sea in packaged form, from sewage and garbage and the prevention of air pollution from ships. The MARPOL has greatly contributed to a significant decrease in pollution from international shipping and applies to 99% of the world's merchant tonnage.

7.1.2 Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal (1989)

The Basel Convention aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes. Among the key provisions of the Basel Convention, are environmentally sound management, transboundary movement, waste minimization and waste disposal practices.

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7.1.3 Montreal Protocol on Ozone Depleting Substances (1989)

The Montreal Protocol is an international treaty, which aims to protect the ozone layer by phasing out the production, and use of ozone depleting substances (ODS).ODS, chlorofluorocarbons (CFCs) and hydro chlorofluorocarbon (HCFCs) as refrigerants are still used in some refrigerators and air conditioners. Waste refrigerators and air conditioners will also likely contain CFCs or HCFCs.

7.1.4 Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998)

The Rotterdam Convention promotes shared responsibilities in relation to the international trade of certain hazardous chemicals to protect human health and the environment from potential harm. The convention promotes open exchange of information.

7.1.5 Stockholm Convention on Persistent Organic Pollutants (2001)

This treaty is designed to protect human health and the environment from chemicals that remain intact in the environment for long periods. They remain widely distributed geographically and accumulate in the fatty tissues of humans and wildlife. The chemicals are harmful to human health and the environment.

7.1.6 Minamata Convention on Mercury (2013)

This is a global treaty to protect human health and the environment from the adverse effects of mercury. Controlling the anthropogenic releases of mercury throughout its lifecycle has been a key factor in shaping the obligations under the Convention.[15]

8.1 E-waste Management- Issues and Challenges for policy

The biggest problem in managing e-waste in India is the prevalence of informal sector in processing e-waste using crude methods of extraction of recyclable materials and other precious metals present in the waste in trace quantities. Presence of formal sector in e-waste processing is limited and working below the installed capacity. Some of the issues in management of e-waste are the following:

8.1.1 Poor information on e-waste generation rates

The 2012 regulation on e-waste acknowledged lack of waste inventories as the limitation and placed the responsibility of developing state wise e-waste inventories on the respective State

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Pollution Control Boards (SPCBs). However, there is availability of data at the national level but states are lagging behind in making inventory of e-waste in their respective states.

8.1.2 Environmentally unsustainable informal sector practices

People in urban and rural areas are not aware about the harms of their processing and they are often ignorant of rules on e-waste. Therefore, they sell their end of life product to collectors in informal sector. The informal sector provides livelihoods to millions of people often belonging to poorer section of society. Kabadiwala play important role in collecting unusable home appliances and sell to their agents who in turn transport them to processing Centre in informal sectors. However, many waste processing units in formal sectors are operating below optimum level except at Attero e-waste processing unit near Roorkee. Reason being it has the necessary license from Government of India to import e-waste for recycling.

8.1.3 Friction in markets for the end-of-life products

Presently formal sector finding it difficult to compete with informal sector, which sources wastes at lower prices due to illegal imports in the country. Therefore, stringent and strong along with policy framework should be evolved to stop illegal import and optimal utilization of existing processing units.

8.1.4 Inadequate regulatory design and enforcement

Regulations on e-waste place great responsibility on regulatory agencies like CPCB and SPCB to monitor e-waste sector right from overseeing collection to their processing etc. They are also required to examine EPR plan of producers and grant authorization and enforce EPR plan and regulation. However, regulatory agencies having inadequate work force and lack of monitoring facilities. "They sometime are also weakened by regulatory captures."[16]

9.1 Conclusions

E-waste in India is increasing with alarming rate. As per Global E-Waste Report 2020 India generated 3.2 million tons of e-waste and ranked third among e-waste producing countries after the China, United States. Since 2011, India initiated concrete policy measures to institutionalize e-waste management in line with international treaties and agreements. However, the data substantiate that existing laws and policies are inadequate. According to Global E-Waste Monitor, currently India has the capacity only to recycle one fourth of its waste. It means that three fourth of e-waste is in stock along with addition of new e-waste into the stream.

In order to manage e-waste in a sustainable and effective manner, domestic measures will not suffice unless and until countries around the world join their hands to combat the health and environmental challenges from e-waste. Globally illegal import and export is a major challenge

to stop and at domestic level, integration of informal sector in formal sector is a challenge. To combat these challenges requires efficient enforcement of regulation and huge invention with trained workforce for institutionalization of e-waste.

All these efforts/measures will be in the curative nature, which is need of the hour. However, efficient management of e-waste requires systematic and multilevel approach. Integration of advance technology at production level of e-products could prove as preventive measure to stop further contribution of e-waste.

Therefore, in order to combat the challenges of human health and environmental concern arising from uncontrolled accumulation of e-waste requires awareness among all the stakeholders, capital investment and technical training. In addition, alternatives should be available to the respective stakeholders in cost effective manner, which requires smart and corruption free management by the government agencies.

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