
E-WASTE MANAGEMENT: CHALLENGES AND SOLUTIONS

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ABSTRACT

In present time, sustainable management of Electronic Waste is immerging as a huge problem and developing countries are the main target of this problem, as the Electronic Waste either dumped in the developing countries or their own management of the Electronic Waste is not developed as effective as in developed countries. The Electronic Waste contain hazardous substances which are dangerous for the human life and the environment as whole. In most developed countries legislations are formed for the effective management of the Electronic Waste produced. These legislations are also coupled with the proper infrastructure for the better treatment of Electronic Waste. However, in developing countries either legislations are not present and if present then the implementation is not strong. Apart from the legislation the infrastructure for the treatment of the Electronic Waste is not well funded and manged. Backyard recycle, open air warning of Electronic Waste and other practices damage the environment directly and in most dangerous manner. Apart from the environmental impact, these non-structural ways of treatment of Electronic Waste also create social problem such as child labour, dangerous working conditions for the workers etc. In the present work, we review the concept of Electronic Waste, its dangerous effect on environment and the responsibility of the producers under the concept of Extended Producers Lability (EPR) to manage the Electronic Waste which they have created in the market and earned profit from it. Further, we review the Electronic Waste management in the developed countries and role of Government of India in Electronic Waste management. Finally, we discuss better ways to deal with the Electronic Waste management for preservation of environment without the sacrificing technological advancements.

Introduction

India is an emerging market for electronics and electrical equipment and after the Govt efforts such as Modified Special Incentive Package Scheme as well as State wise Packaged Scheme for Incentives & Electronic Policy has created a platform for increasing the domestic producing of the same. It is assumed in many domestic studies that around 60% of the electronic goods are produced to target private individuals. With the growth in the production and import of electronic goods, problem of management of the waste of such electronic goods had also emerged. Further the problem of sustainable management of such waste get more circuitous due to lack of knowledge and sense of responsibility among the producers as well as individuals

According to an Article in Time of India on Jun 12,2007, *“Demand of electronic products in India is expected to grow at a CAGR (Compound annual growth rate) of 41% during 2017-2020 to reach by 2020, the domestic production which is currently growing at a CARC of 27% may touch \$104 billion....”*

The management of electronic waste is termed as “E-Waste management”. E-waste generally include¹:

1. Electronic devices such as computers, servers, main frames, monitors, TVs & display devices.
2. Telecommunication devices such as cellular phones & pagers, calculators, audio and video devices, printers, scanners, fax machines, refrigerators, air conditioners, washing machines, and microwave ovens.
3. Recording devices such as DVDs, CDs, floppies, tapes, printing cartridges, military electronic waste, automobile catalytic converters.
4. Electronic components such as chips, processors, mother boards, printed circuit boards, industrial electronics such as sensors, alarms, sirens, security devices, automobile electronic devices.

¹ International Journal of Engineering Inventions, Umesh Kumar, Dr. D. N. Singh, Volume 3, Issue 2 (September 2013) PP: 06-14

The household and consumer electronics contain many components, some of which are valuable (like gold) and some are toxic and hazardous. E-waste which has hazardous constituents have negative impact on the environment and over human health. Hence there is a basic and important requirement to manage such waste properly, timely and effectively.

Production of such waste and proper disposal is two faces of same coin. In the era of technological advancement, we cannot overlook either environment nor technological development. We have to go forward in hand to hand with both. Moreover, if we attempt to give more weightage to any of the two than the ultimate loss will not be caused only to economy but also to people of nation either in terms of employment or in terms of hazardous effect to natural environment.

In our day to day life we see, observe and feel many types of degradation caused to our environment and we simply either chat or debate over the same but won't choose to do something meaningful for the same. This may be about the pollution of water which we see in the rivers, ponds and reservoirs etc. or may be about the landfills of solid waste which we observe near borders of capital cities like Delhi and Mumbai.

Environmental Impact of E-Waste

E-waste have direct impacts on environment as the E-waste have potential to pollute soil, air and water and the indirectly but severely impact the human health and wildlife. Emission of such waste to the environment in the present time is making present environmental adverse and it became more worst to tackle. For example- Refrigerator and Air Conditioners discarded contains CFC's (Chlorofluoro-Carbon) that will eventually destroy Ozone layer, when CFC escape from the unauthorized waste dumping sites.

“To improve the environment management of WEEE (waste electrical and electronic equipment) and to contribute to a circular economy and enhanced resources efficiency the improvement of collection, treatment and recycling of electronics at the end of their life is essential”.²

It is estimated that around 130 million mobile phones and 3 million tons of other electronic gadgets like televisions, laptops and computers are retired annually. According to Environmental Protection Agency of United States (UNEP) almost 2-3% of the municipal

² Ec.europa.eu/environment/waste/well/index_en.html, visited on 21-12-2018

waste comprises of e-waste and out of which only 15-20% is recycled. Whereas most of the e-waste goes to the incinerators and landfills thus polluting the nature or some of the e-waste was shipped to the developing countries like India, China, Pakistan and Malaysia³.

As the production of electronic and electrical products increase, problem of management of E-waste also raised by the time. In the past, solid waste disposal was not a concern because of the free availability of degraded land. However, land scarcity is now a major problem faced by the municipality and therefore finding land for MSW disposal is becoming increasingly difficult.⁴ Due to increase quantity of E-waste and scarcity of land to dispose of any producers and manufactures dispose E-waste by one or combined ways as discussed below:

Landfilling

This is the most common methodology of e-waste disposal. Soil is excavated and trenches are made for burying the e-waste in it. An impervious liner is made of clay or plastic with a leachate basin for collection and transferring the e-waste to the treatment plant. However, landfill is not an environmentally sound process for disposing off the e-waste as toxic substances like cadmium, lead and mercury are released inside the soil and ground water⁵.

Acid Bath

Acid bath involves soaking of the electronic circuits in the powerful sulphuric, hydrochloric or nitric acid solutions that free the metals from the electronic pathways. The recovered metal is used in the manufacturing of other products while the hazardous acid waste finds its ways in the local water sources⁶.

Incineration

This is a controlled way of disposing off the e-waste and it involves combustion of electronic waste at high temperature in specially designed incinerators. This e-waste disposal method is quite advantageous as the waste volume is reduced extremely much and the energy obtained is

³ <http://www.pacebutler.com/blog/e-waste-disposal-methods-in-us/>, visited on 09-01-2018

⁴ (PDF) Environmental impacts with waste disposal practices in a suburban municipality in Sri Lanka. Available from: https://www.researchgate.net/publication/228501236_Environmental_impacts_with_waste_disposal_practices_in_a_suburban_municipality_in_Sri_Lanka [accessed Jan 11 2019].

⁵ Supra Note 3

⁶ Idbi

also utilized separately. However, it is also not free from disadvantages with the emission of the harmful gases mercury and cadmium in the environment⁷.

E-WASTE REGULATIONS EUROPEAN UNION⁸

The European Union of Countries (EU) have addressed to the e waste problems and from nineties decade have comprehensive and progressive e-waste legislations. The main approaches are:-

The Waste Shipment Regulation (WSR) :-

Passed in 1993 and amended in 2007 it was the first dedicated e waste regulation. It emphasizes that no EU member state is allowed to export e-waste classified as hazardous to non- OECD (Organisation for Economic Cooperation & Development) countries. As number of e waste components didn't fall under the WSR's definition of hazardous substance, these components continued to be exported to non-OECD countries under other provisions..

Directive 2002/96/EC of the European Parliament and of the Council

In 2003 the EU has passed e-waste Directive / legislation for changing product designs and increasing recycling rates of discarded WEEE and Restriction of the use of certain hazardous substances (RoHS). The RoHS Directive addresses the beginning of the EEE life cycle by attempting to eliminate hazardous substances such as mercury, lead and fire retardants in domestically produced or imported electrical and electronic products. The WEEE Directive concentrates on the end-of-life stages of EEE. The Directive intends to encourage product designs that facilitate the recycling, repair, disassembly and reuse of WEEE by introducing the concept of Extended Producer Responsibility (EPR). EPR deals with the financial responsibility for collecting and managing WEEE in line with the Directive to the producers. Individual Producer Responsibility (IPR) applies for the management of new products put on the market. For historical waste, i.e. products put on the market before 13 August 2005, the financial responsibility is divided among producers in proportion to their market share of a specific type of equipment (WEEE Directive, Article 8). The rationale behind producer

⁷ <http://www.pacebutler.com/blog/e-waste-disposal-methods-in-us/>, visited on 09-01-2018

⁸ International Journal of Engineering Inventions, Umesh Kumar, Dr. D.N. Singh, Voulme 3, Issue 2, (September2013), PP:06-14.

responsibility is the —polluter pays principle, which intends to include the costs of disposal and treatment in a product's price, thus reflecting the product's environmental effects.

To deal with the Directive's insufficient effectiveness and efficiency, the European Commission proposed a revision in 2008. Several modifications were affected and has helped to reduce illegal e-waste exports to non-OECD countries. The provision of higher mandatory collection target for e-waste, establishing minimum monitoring requirements for WEEE shipments and introduction of legally binding provision for the distinction between new, used or waste products to tackle the false labeling of WEEE as used EEE have been effected.

The important e waste dealing Packaging Directive was implemented into UK law through two pieces of legislation:

1. The Packaging (Essential Requirements) Regulations 2003 (as amended) requires that packaging is minimized, that it can be recycled and recovered and that dangerous substances (such as heavy metals) are restricted.
2. The Producer Responsibility Obligations (Packaging Waste) Regulations 2007 place an obligation to reduce packaging on all UK companies with £2 million plus turnover or handling more than 50 tones of packaging each year.

E-WASTE REGULATIONS IN THE US⁹

In US segment wise development and enactment of directives and legislations and regulations have can be observed as there is no federal legislation specifically targeting the national management or the export of WEEE. As on date there are only two federal regulations addressing e-waste and its export namely The Resource Conservation and Recovery Act of 1976 (RCRA) and The Environmental Protection Agency (EPA)'s CRT Rule.

RCRA proscribes a —cradle to grave tracking system for hazardous waste. The legislation requires both individuals and firms handling, disposing of or shipping hazardous waste to obtain permits / permission from the EPA and/or get permission from importing countries. The RCRA has mainly two loopholes. The loopholes are:

⁹ International Journal of Engineering Inventions, Umesh Kumar, Dr. D.N. Singh, Voulme 3, Issue 2, (September2013), PP:06-14

a. RCRA regulates WEEE disposal only when the substance falls under the act's definition of hazardous waste. When disposed of in landfills in the US, most e-waste does not meet this definition; when dismantled abroad exposure to toxins increases. The EPA has created exemptions for the export of certain hazardous items.

b. The households and businesses producing up to 220 pounds of hazardous waste per month may dispose of that waste in landfills. The RCRA is less effective in regulating disposal of municipal e-waste within the United States or its export.

The CRT rule currently in effect due to few loopholes makes it less effective. The rule regulates the export of unsorted CRT glass and CRTs destined for recycling. The EPA does not restrict the export of unused, intact CRTs intended for reuse or recycling. Since the federal government does not consider most e-waste hazardous, American recyclers are allowed to ship the electronics abroad without any restriction.

E WASTE REGULATIONS IN CHINA¹⁰

The Chinese government has issued a variety of environmental laws, regulations, standards, technical guidance and norms related to e-waste management over the past decade.

In order to deal with the problems arising from the illegal import of e-waste, the government has passed numerous regulations to restrict and ban the import of e-waste. China is signatory to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, a multilateral environmental agreement, as well as the Basel Ban Amendment. The first policy as per Figure, catalogue for managing the import of wastes, which was passed in 2000, included second-hand electronic equipment and e-waste in the "List of Prohibited Goods to be imported for Processing or Trade", which is being updated regularly.

The second key policy, Technical Policy on Pollution Prevention and Control of WEEE, was enacted in 2006 with aim to reduce the volume of e-waste, to increase the reutilization rate for discarded electrical and electronic equipment, to increase standards for e-waste recycling. The principle of 3R namely Reduce, Re-use and Recycle and Polluter Pays (i.e. shared responsibility of producers, retailers and consumers) was profounded with aim of

¹⁰ International Journal of Engineering Inventions, Umesh Kumar, Dr. D.N. Singh, Voulme 3, Issue 2, (September2013), PP:06-14

environmental measures to minimize environmental pollution during the storage, re-use, recycling and final disposal of e-waste for listed items.

The Ordinance on Management of Prevention and Control of Pollution from Electronic and Information Products, was implemented in 2007 for reduction of use of hazardous and toxic substances in electronic appliances reducing the pollution generated in the manufacture, recycling and disposal of these products.

Administrative Measures on Pollution Prevention of Waste Electrical and Electronic Equipment, was enacted in 2008 with aim of preventing pollution caused by the storage, transport, disassembly, recycling and disposal of e-waste. This policy aimed to e-waste recycling companies seeking treatment licenses. The local authorities were entrusted responsibility for checks and balances for standard maintenance. The Technical Specifications of Pollution Control for Processing Waste Electrical and Electronic Equipment provides the technical standards and specifications for various e-waste treatment processes and activities such as storage, transport, dismantling and waste handling, as well as for equipment and material fractions.

The latest —The Regulation on Management of the Recycling and Disposal of Waste Electrical and Electronic Equipment¹¹ was enacted in 2011. It is a pivotal piece of national legislation for e-waste management in China. The regulation stipulates that e-waste should be collected through multiple channels and recycled by licensed recycling enterprises. The regulations establish a —specialized fund to subsidize the formal collection and recycling of e-waste. Producers and importers of electronic products are required to contribute to this fund.

E-WASTE MANAGEMENT – AN OVERVIEW FROM PERSPECTIVE OF INDIA

As India is a progressive country, management of E-waste is also a problem to India. India is manufacturing also importing EEE. Apart from the manufacturing and importing of EEE, legal import of electronic waste and illegal dumping of electronic waste also a problem in existence for India.

In India before the enactment of E-Waste Management Rules, 2011 under the Environment Protection Act, 1986, disposal of E-waste is totally related to informal sector and there were no proper legislations to deal with the proper disposal of EEE after the end of their life. Generally,

“Kabadivala” collect the EEE from the households and then dismantle such EEE without any proper professional training or facilities. They take out the parts which are useful to them and from which they can make money and all the waste parts were further discarded in the open areas.

Major step was taken by the Government of India as aftermath of Bhopal Gas Disaster happened in the month of December of 1984. In the wake, of Bhopal Gas Disaster Central Government decided to have strong environmental policies. Following to this Central Government enacted the Air (Prevention and Control of Pollution) Act,1981 and followed by the Environment Protection Act,1986. The Environment Protection Act,1986 is an umbrella legislation which provide Central Government a framework to coordinate with the State Governments and different authorities at state level. With the help of Environment Protection Act,1986 Central Government not only cover the then existed law such as Air and Water Act but also enable the Central Government to reach out the legislation coming in the future such as Forest (Conservation) Act, 1988.

In December 1988 the Union Ministry of Environment and Forest constituted a Committee to recommend a framework and an Action plan for the conservation of resources. Based on the recommendations of the Committee, the Government of India adopted a National Conservation Strategy and Policy Statement on Environment and Development (NCS). The preamble to the NCS adopts the policy of ‘Sustainable development’ and declares the Government’s commitment to re-orient policies and Action ‘in unison with the environmental perspective’¹¹.

It is in the Environment Protect Act,1986 that hazardous substances was discussed for the first time. Section 2 (e) discussed "hazardous substance" means any substance or preparation which, by reason of its chemical or physico-chemical properties or handling, is liable to cause harm to human beings, other living creatures, plant, micro-organism, property or the environment.¹² After Environment Protect Act,1986, several other legislation were pass to regulate hazardous substances. These legislations are as mentioned below:

1. **Hazardous Waste (Management and Handling) Rules of 1989:** Objective is to control generation, collection, treatment, import, storage and handling of hazardous waste.

¹¹ <http://www.ecology.edu/environmental-legislation.html> , visited on 11-01-2019.

¹² Environment Protection Act,1984, Environment and Pollution Laws, Universal Publication,2018.

2. **The Manufacture, Storage and Import of Hazardous Chemical Rules of 1989:** Defines the terms used in this context, and sets up an Authority to inspect, once a year, the industrial activity competent with hazardous chemicals and storage facilities.
3. **The Manufacture, use, Import, Export and Storage of Hazardous Micro-Organisms/Genetically Engineered Organisms or Cells Rules of 1989:** These were introduced with a view to protect the environment, nature and health in connection with the application of gene technology and micro-organisms.
4. **Biomedical Waste (Management and Handling) Rules of 1998:** It is a legal binding on the healthcare institutions of streamline the process of proper handling of hospital waste such as its segregation, disposal, collection and treatment.
5. **Recycled Plastic Manufacture and Usage Rules of 1999 & Recycled Plastic Manufacture and Usage Amendment Rules Of 2002:** Rules were introduced to prohibit the usage of carry bags or containers made of recycled plastic for foodstuffs. Rules also lay down procedures for the manufacture of virgin and recycled plastic carry bags and recycled plastic containers.
6. **Municipal Solid Wastes (Management and Handling) Rules, 2000:** According to these rules any municipal solid waste generated in a city or a town, shall be managed and handled in accordance with the compliance criteria and the procedure laid down in Schedules of these rules. The waste processing and disposal facilities to be set up by the municipal authority on their own or through an operator of a facility shall meet the specifications and standards as specified in Schedules.

Apart from the internal legislation India is also active party in the international conventions/protocols and programmes related to the protection of environment and further prevention. As the problem of E-waste become the burning issues, India is always ready to play its role in sustainable management of E-waste by participating in international programmes and further implementing such policies in the country for betterment of the environment and sustainable development.

In reference, to the present time below mentioned international conventions/protocols to which India is party, have great importance in the field of sustainable management of E-waste:

1. **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal¹³:**

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22 March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland. The Convention entered into force on 5 May 1992. The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as “hazardous wastes” based on their origin and/or composition and their characteristics, as well as two types of wastes defined as “other wastes” (household waste and incinerator ash).

India deposited its instrument of ratification on June 1992. As on date there are 180 Parties to the Convention.

Environmental awareness and tightening of environmental regulations in the industrialised world during 1970s and 1980s had led to an increasing public resistance to the disposal of hazardous wastes – in accordance with what became known as the NIMBY (Not In My Back Yard) syndrome – and to an escalation of disposal costs. This in turn led some operators to seek cheap disposal options for hazardous wastes in the developing world, which was lagging in environmental awareness regulations and enforcement mechanisms. Against this background, the Basel Convention was negotiated in the late 1980s, and at the time of its adoption its thrust to combat the “toxic trade”. The Convention aims towards restricting transboundary movements of hazardous wastes and its disposal with environmentally sound management (ESM).¹⁴

2. **Rotterdam Convention on the prior informed consent procedure for certain Hazardous Chemicals and Pesticides in International Trade:**

The Rotterdam Convention on the prior informed consent procedure for certain Hazardous Chemicals and Pesticides in International Trade entered into force on 24th February 2004. India acceded to the convention on 24th May 2005 and it became operative on 23rd August 2005. During the interim period, over 170 countries identified 265 departments/institutes as

¹³ http://www.moef.nic.in/division/introduction-12?theme=moef_high, Official website of The Ministry of Environment, Forest and Climate Change (MoEFCC), visited on 12-01-2019.

¹⁴ <http://pib.nic.in/newsite/PrintRelease.aspx?relid=161203>, Report on Inter-Ministerial Delegation to Participate in Basel, Rotterdam, Stockholm Conventions in Geneva, Press Information Bureau, Government of India, Ministry of Environment, Forest and Climate Change, visited on 12-01-2019.

Designated National Authorities (DNAs) to act on their behalf in the performance of the administrative functions required by the Convention. The Designated National Authorities (DNAs) for India are in Ministry of Chemicals and Fertilizers, Ministry of Agriculture and Cooperation. The Official Contact Points (OCPs) are designated in Ministry of Environment, Forests and Climate Change. There are 47 chemicals listed in Annex III to this Convention, which include 33 pesticides and 14 industrial chemicals that have been banned or severely restricted for health or environmental reasons by two or more Parties and which the Conference of the Parties (COPs) has decided to subject to the Prior Informed consent (PIC) procedure¹⁵.

3. **Stockholm Convention on Persistent Organic Pollutants:**

The Stockholm Convention on Persistent Organic Pollutants (POPs) is a global treaty to protect human health and the environment from POPs. The Convention sought initially 12 chemicals, for restriction or elimination of the production and release. Now, the Convention covers 23 chemicals. The Convention was adopted in May, 2001 and came into force on 17th May, 2004. India ratified the Convention on 13th January, 2006 which came in to force on 12th April, 2006. As per Article 7 of the Convention, Parties to the Convention were required to develop a National Implementation Plan (NIP) to demonstrate how their obligations to the Convention would be implemented and NIP has been developed through Global Environment Facility (GEF) funding. Ministry of Environment, Forests and Climate Change serves as the focal point for GEF and Stockholm Convention in the country. Designated national authorities are in Ministry of Agriculture and Cooperation and Ministry of Chemicals and Petrochemicals. India has ratified 12 initially listed chemicals¹⁶.

4. **Minamata Convention on Mercury:**

In February 2009, the Governing Council of UNEP adopted Decision 25/5 on the development of a global legally binding instrument on mercury. At the Conference of Plenipotentiaries held from 9th-11th October 2013 in Minamata and Kumamoto, Japan, the “Minamata Convention on Mercury”, a global treaty to protect human health and the environment from the adverse effects of mercury, was formally adopted and opened for signature by States and regional

¹⁵ http://www.moef.nic.in/division/introduction-12?theme=moef_high, Official website of The Ministry of Environment, Forest and Climate Change (MoEFCC), visited on 12-01-2019.

¹⁶ Ibid

economic integration organizations. The Convention has till now received nine ratification and 128 signatures. India has signed the Convention on 30th September 2014¹⁷.

5. Strategic Approach to International Chemicals Management:

In February 2006, over 190 countries including India acceded to the Strategic Approach to International Chemicals Management (SAICM), an international policy framework to foster sound management of chemicals. Initial activities under SAICM included development or updating of national chemicals profiles, strengthening of institutions, and mainstreaming sound management of chemicals in national strategies. Towards this end, India initiated the preparation of the National Chemicals Management Profile to assess India's infrastructure and capacity for management of chemicals. Other actions taken by the Ministry were: (i) initiated studies of inventorisation of lead, cadmium, mercury and arsenic in paints, distemper and pigments in the country, (ii) initiated discussions with leading national laboratories, (iii) notified the E-Waste (Management and Handling) Rules, 2012 for the management of electronic waste, and (iv) finalized the draft Dangerous Goods (Classification, Packaging and Labelling) Rules, 2013 in the line of Globally Harmonized System¹⁸.

At recent Inter-Ministerial Delegation on Basel, Rotterdam, Stockholm Conventions was held in Geneva, Switzerland. Indian delegation headed by the Secretary, Ministry of Environment, Forest and Climate Change, Shri Ajay Narayan Jha, attended BRS Conventions. The theme of the meetings and the high-level segment will be - "*A future detoxified: sound management of chemicals and waste*". Conference of Parties (COPs) to the BRS Convention include - the 13th meeting of the Conference of Parties to "Basel Convention (BC COP 13); the 8th meeting of the Conference of Parties to "Rotterdam Convention (RC COP 8) and 8th meeting of the Conference of Parties to "Stockholm Convention (SC COP 8). While the Basel Convention will discuss the control of transboundary movements of hazardous wastes and their disposal, the Rotterdam Convention will deliberate on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade" and the Stockholm Convention is on persistent organic pollutants (POPs)"¹⁹.

¹⁷ http://www.moef.nic.in/division/introduction-12?theme=moef_high, Official website of The Ministry of Environment, Forest and Climate Change (MoEFCC), visited on 12-01-2019.

¹⁸ Ibid

¹⁹ <http://pib.nic.in/newsite/PrintRelease.aspx?relid=161203>, Report on Inter-Ministerial Delegation to Participate in Basel, Rotterdam, Stockholm Conventions in Geneva, Press Information Bureau, Government of India, Ministry of Environment, Forest and Climate Change, visited on 12-01-2019.

In furtherance to the Strategic Approach to International Chemicals Management, India notified the E-Waste (Management and Handling) Rules, 2012 for the management of electronic waste under Environment Protection Act, 1986.

E-Waste (Management) Rules, 2016

According to above discussion, India notified the E-Waste (Management and Handling) Rules, 2012, however the 2012 Rules was supersession by E-Waste (Management and Handling) Rules, 2011 has notified the E-Waste (Management) Rules, 2016 (hereinafter refer as the Rules, 2016), which was effective from 1.10.2016. These rules are applicable to every producer, consumer or bulk consumer, collection centre, dismantler and recycler of e-waste involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components specified in schedule – I of these Rules²⁰.

The basic idea behind the Rules is Polluter Pay Principle (PPP). As the Rules lay down the guidelines regarding the sustainable management of E-Waste by collecting, transporting, dismantling and then proper disposal of W-Waste. For this purpose, “Rules created two categories of electrical and electronic equipment namely (i) IT and Telecommunication Equipment and (ii.) Consumer Electricals and Electronics such as TVs, Washing Machines, Refrigerators Air Conditioners including fluorescent and other mercury containing lamps are covered under these Rules. The main feature, of these rules, is Extended Producer Responsibility (EPR)²¹.”

For the purpose of the proper disposal of W-Waste, Rules lead down average life of the EEP. The generation of e-waste from end of life products: E-waste generation (weight or number) in the financial year ‘x – y’ = Sales in the financial year ‘(x-z) - (y-z)’ where, ‘x – y’ = financial year in which generation is estimated, and z= average life span of EEE.²²

By setting targets Rules, 2016 lead down a duty on producers and manufactures to participate in the sustainable development of the environment. Under the Rule, 2016 it is duty of producers and manufactures to clean the waste which they have generated either directly or indirectly for the benefit making. For this purpose, Rules, 2016 included consumers, bulk consumers, dealers,

²⁰ Implementation Guideline for E-Waste(Management) Rules, 2016 by Central Pollution Control Board, p-1, available on http://cpcb.nic.in/cpcb/old/GUIDELINES_E%20WASTE_RULES_2016.pdf, visited on 12-01-2019.

²¹ Ibid

²² Ibid

manufacturer, producers and refurbisher for the collection, transportation, dismantling and then proper disposal. In chapter II under Section 4,5,6,7, and 8 duties of consumers, bulk consumers, dealers, manufacturer, producers and refurbisher are discussed. Further Rules,2016 also discussed in detail duties of dismantler, recycler and even the concern State Governments for environmentally sound E-Waste management. To meet the targets set by the Rules,2016 consumers, bulk consumers, dealers, manufacturer, producers, to seek and grand of authorisation of E-Waste Management as specify mentioned in Chapter III under Section 12. Further under Section 12 dismantler or recycler and refurbisher to seek and grand of authorisation for dismantle or recycle and process e-waste by utilising environmentally sound technologies and possess adequate technical capabilities. Rules,2016 cover every aspect related to management of E-Waste.

What better we can do?

Now the question arises what best we can do? Apart the legislature at the individual level also we all have a greater responsibility toward our environment. We all must work together to protect our environment and resources for the future generation. Apart from the legal obligation we all must understand that at individual level that it is our duty to dispose the electronic and electrical items to the authorised dismantlers so that whatever E-waste will be generated can to dispose of accordingly and such waste will not degrade the environment. Person who are not aware of concept of E-waste and proper disposal of waste electronic and electrical items, it is our duty as an educated and responsible citizen of the Country to educate such people about the proper channel established by the law for disposal of E-waste. These steps may seem small but they have huge impact not only on our environment but also socially. Disposing you waste electronic and electrical items to the *Kabadiwalas* not only create serious issues to the environment because they do not transport, dismantle and dispose of such waste in safe and technological advance environment but also create other social problem in a society such as Child Labour, Unsafe working environment for workers, Less and/or unequal wages and suppression of workers. Even non-governmental organizations can play an important part in this regard and can make initiatives to education each group of societies about concept of E-waste, proper disposal and the chain individuals have to follow in this regard.

Conclusion

In the technological progressive society, we cannot all together stop the production of EEE however, we must take up steps in this regard so that our environment will not be harmed further and the harm already done must be cure by the sustainable management. We can seek more eco-friendly options some of the examples are:

- a) The replacement of CRT screens with LCD screens (Pb elimination but Hg introduction)²³,
- b) The introduction of optical fibres (Cu elimination from the cablings, but F, Pb, Y and Zr introduction)²⁴,
- c) The introduction of rechargeable batteries (Ni, Cd reduction, but Li increase), etc²⁵.

Apart from the proper collection, transport, dismantle, recycle and disposal of EEE support of individuals and non-governmental organizations is as important as the legislative implementation. Without overall support, we cannot walk too far.

²³ Review Article, E-waste: Environmental Problems and Current Management, G. Gaidajis, K. Angelakoglou and D. Aktsoglou, Journal of Engineering Science and Technology Review, p-198

²⁴ Review Article, E-waste: Environmental Problems and Current Management, G. Gaidajis, K. Angelakoglou and D. Aktsoglou, Journal of Engineering Science and Technology Review, p-198

²⁵ Ibid