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E - Waste Management: Initiatives of Government

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Abstract:- **Electrical and electronic gadgets reaching to the end of their use are E – waste. As on now even if 1 % of total Municipal Solid Waste (MSW) is E- waste, very soon it is going to attain major contribution because of lack of awareness and poor management practices, The generation and contribution is mainly due to non- compliance of rules and legislations for the governing country. In America, the attention has been paid since 1976 through Resource Conservation and Recovery Act (RCRA – 1976). The amendments have been taking place with multi billion dollars budgets. In contrast to this in India, small consideration was given while forming Municipal Solid Waste Management Rule (MSWM Rule) 2000. An international treaty, Basel Convention, was signed in 1989 and realized during 1992 but did not address scientific disposal of E – waste internationally; hence developed countries take the advantage and keep on disposing waste in poor and developing countries. To improve the situation, India has made provisions in Hazardous Waste Management Rule 2003 and gadget of India 2011. E – waste trade in developing countries has become another fraudulent practice and is mostly dominated by illiterate and informal sector. Even in India the waste trade sector is a part of the 'informal' sector. The practices being followed result in deterioration of environment as well as the occupational risks. A few of environmental concerns such as climate change, deterioration of water bodies, impacts on flora and fauna is yet to be explored. In spite of legal provisions, the handling and disposal practices in India are in very primitive stage and yet to percolate even the creamy layers of society. This paper essentially focuses on legal aspects and few mitigation measures to deal with E – waste management improvement for Indian conditions.**

Key words: E – waste, legislations, legislations, E – waste trade, informal sector, handling and disposal, mitigation measures

I. INTRODUCTION

India is world's second highest populated country and is one of the fastest urbanising countries. The rapid industrialisation and large populations have been leading to significant generation of solid waste. It is estimated that about 1, 00, 000
MT of solid waste (SW) is generated daily in the country (Manual on Municipal Solid Waste Management 1998). In spite of newly established proper legal provisions the local administrative boards fail to manage the waste due to lack of serious efforts, staff and basic infrastructure. Out of the entire MSW, the waste arising from electronics related agencies is usually 1% and is termed as E-waste (UNEP E – waste assessment and inventory manual vol. 1, 2007). Being composed of 1000's of different materials, the E – waste also becomes a part of hazardous waste due to its toxic nature. The factors responsible for the growing amounts of E – waste are majorly the dominancy of informal sectors in developing countries like India along with it growing industrialization from past decade, technological advancement, improvement in life style, ease of usage and availability, innovations has led to increase in the utilization of E- gadgets (Kumar et. al, 2011) and are the major reasons for the generation of E- waste (Ramesh and Joseph, 2006). Also the management of E- waste is not proper due to lack of awareness, poor practices and insufficient legislations and rules (Srivastava, 2009).

II. E- WASTE MANAGEMENT SCENARIO

A. International Scenario of E – waste Management

In developed countries the obsolete E- gadgets from household, industry and commercial establishments are taken back by manufacturer of respective items. Also types of E- waste, collection points are established at certain locations from where E- waste recyclers pick up the waste on chargeable basis. The manufacturers send their collected E- waste to authorized E- waste recyclers for necessary actions. The recyclers process the E- waste so as to cause minimal harm to environment. For such various E- gadgets, the conceptual life cycle from its manufacturing to it disposal as waste is as shown in Fig. 1.

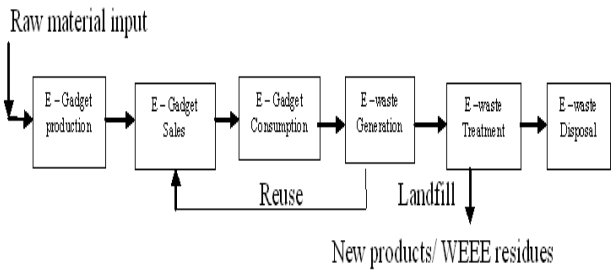

Fig 1: E- gadgets flow in a system

B. Indian Scenario of E – waste Management

In India, as there is no separate collection practices followed for E-waste, there is lack of availability of vibrant data on the generation rate, quantity generated and disposed of per year and this result into magnitude of environmental risk. Traditional E- waste flow model in India is shown in Fig. 2. The preferred management practices to get rid of obsolete E- gadgets in India are to change them in exchange from retailers with the purchase of a new item. The business sector is estimated to produce about 78% of all installed computers in India. Obsolete computers from the business sector are sold by auctions (Joseph, 2007). It is estimated

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that the total number of obsolete personal computers emanating each year from business and individual households in India will be around 1.38 million. The total E- waste generated in Indian industries by obsolete or broken down EEE has been estimated to be 1, 46,000 tons per year (CII, 2006). The general flow of E – waste in developing countries which includes involvement of different sectors is as in flowchart below.

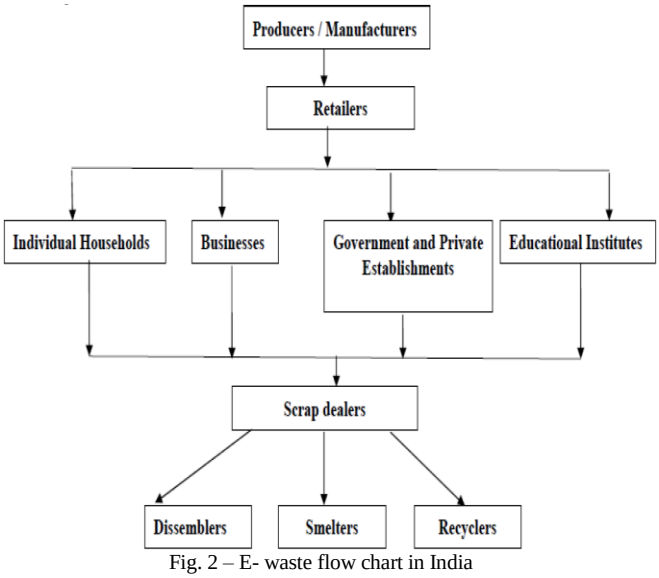

Fig. 2 – E- waste flow chart in India

III. LEGISLATIVE PROVISIONS FOR E – WASTE MANAGEMENT

A. International Scenario of E – waste Management

1. Global Scenario

The ever increasing E – waste in coming years is of due importance if the considerations are taken into account like the initiatives of governments towards the management practices adoption, system development with regards to legislations available. The legislative provisions are the major baselines for any country to have an E – waste management system. At international levels, the initiatives towards E – waste and the problems related to the rising generation rates were understood. Thus in developed nations, the initiatives were taken since 1976, with the special provisions of norms for handling, storage and disposal of hazardous waste. The 1st law giving consideration to E – waste was, Resource Conservation and Recovery Act (RCRA), 1976. The RCRA is a US law which has delivered, in wide terms, the general guiding principle for the waste management program envisioned by Congress. It has included a congressional mandate directing EPA to develop a complete set of regulations to implement the law. The hazardous waste program has established a system for monitoring hazardous waste from its time of generation till its final step of its ultimate disposal — in effect, from "cradle to grave", under RCRA Subtitle C (USEPA). EPA or the state hazardous waste regulatory agency has made it mandatory to follow hazardous waste laws by undertaking primary responsibility for implementation of a hazardous waste program through adoption, authorization, and implementation of the regulations. The RCRA hazardous waste program has been legalized for commercial businesses as well as federal, state, and local government facilities which generate, transport, treat, store, or dispose of hazardous waste. The law has been modified with the need for development of society for pollution control and sustainable life. Also with change of decade, increasing population and rising quantities of wastes made them to take into account the severity of the same problem.

In industrialized countries during the late 1980s due to a tightening of environmental policy, a dramatic increase was observed in the cost of disposal of hazardous waste. This in turn had been led to the export of toxic waste from industrialized developed countries to Eastern Europe and developing countries. The Basel negotiation process was then started by international treaty, Basel Convention in year 1987. The contract was signed in 1989 and established with its practical application from the year 1992 in response to the public outrage caused by the discovery of this practice (UN, 2011). This agreement considers the hazardous waste with components but it did not address scientific disposal of E – waste universally.

These provisions made showed that the due consideration was not given solely to E – waste but in some or other way a part of E – waste containing toxic content was treated as per the legislations available. But the major guidelines were set by United Nations Environment Program (UNEP) in year 2007. The increasing "market penetration" in developing countries, "replacement market" in developed countries and "high obsolescence rate" make E – waste one of the fastest waste streams. There is a serious need to address E – waste management particularly in developing countries. The presence of valuable recyclable components attracts informal and unorganised sector. The unsafe and environmentally risky practices adopted by them pose great risks to health and environment. These legislations are the majorly followed in most of the countries as they give detail information about need for effective E – waste management. These guidelines give the account of procedures to quantify and characterize this waste stream, identify major waste generators, and assess the risks involved with respect to the human health and environment. It also focuses on need of scientific, safe and environmentally sound management system based on policies and technologies, and its effective implementation.

2. Indian Scenario

On the other side being developed country, India is far behind for all these problems of E – waste management. The developing countries are also lacking in the strategic management system development and the effective implementation of rules and legislations. The awareness about management of E – waste till date is not wide spread and thus it is still considered in the municipal solid waste (MSW). It is a burden on treatment and disposal practices presently available as the characteristics of E – waste differ from characteristics of MSW. Due to the nature (i.e. Solid and biodegradable), toxicity of few of components has made the E – waste hazardous. Thus towards this problem of E – waste the guidelines were firstly included in

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Municipal Solid Waste Rule, in year 1998. The E – waste was considered as part of MSW which followed the same management as it is provided to MSW. The growing populations of India, industrialization, improved living standards etc are the major factors responsible for growing penetration rate of electronic gadgets. This worsen scenario has led to create awareness about the problem of E – waste management. E – waste trade in developing countries has become another fraudulent practice. It is found to be mostly dominated by illiterate part of society and informal sector. Even in India the waste trade sector is a part of the 'informal' sector and it is very active. To improve the situation, Indian government has made provisions in Hazardous Waste Management Rule 2003.

Now recently government of India has made provision of a separate rule in gadget of India in 2011 which is named as "E – waste (Management and Handling) Rule, 2011". This rule has been implemented from 1st May, 2012. This rule has been divided in to six different chapters and three schedules which are mandatory and applicable to every producer, consumer or bulk consumer involved in the manufacturing, sale, purchase and processing of e – gadgets or their components specified in schedule – I, collection centre, dismantler and recycler of E – waste. It also gives detailed account of responsibilities, procedures for authorization and registration for handling, storage and transportation of E – wastes and record maintenance of risks associated. It has mainly made provision of change in design for reduction of hazardous substances during manufacture of any e – gadgets.

IV. E – WASTE: HEALTH IMPACTS

The practices being followed currently have resulted in deterioration of environment as well as a major cause was found in the occupational risks to human health. A few of environmental concerns such as climate change, deterioration of water bodies, impacts on flora and fauna is yet to be explored. In spite of legal provisions, the handling and disposal practices in India are in very primitive stage and yet to percolate even the creamy layers of society. E - waste comprises hazardous chemicals including lead, mercury, cadmium, brominated flame retardants, poly vinyl chloride. Many of the elements are carcinogenic, cause problems of respiratory and reproductive systems. They can travel to long distances through air, water and accumulate in our bodies and environment. The penetration of E – waste from different sectors along with MSW has resulted in adverse effect on health and environment. Detailed health impacts categorized source wise are as in below Table No 1.

Table No 1: Health impacts of E – waste

Source of e-wastes	Constituent	Health effects
Solder in printed circuit boards, glass panels and gaskets in computer monitors	Lead (PB)	• Damage to central and peripheral nervous systems, blood systems and kidney damage. • Affects brain development of children.
Chip resistors and semiconductors	Cadmium (CD)	• Toxic irreversible effects on human health. • Accumulates in kidney and liver. • Causes neural damage. • Teratogenic.
Relays and switches, printed circuit boards	Mercury (Hg)	• Chronic damage to the brain. • Respiratory and skin disorders due to bioaccumulation in fishes.
Corrosion protection of untreated and galvanized steel plates, decorator or hardner for steel housings	Hexavalent chromium (Cr) VI	• Asthmatic bronchitis. • DNA(Deoxy ribonucleic acid) damage.
Cabling and computer housing	Plastics including PVC(poly vinyl chloride)	Burning produces dioxin. It causes • Reproductive and developmental problems; • Immune system damage; • Interfere with regulatory hormones
Plastic housing of electronic equipments and circuit boards.	Brominated flame retardants	• Disrupts endocrine system functions
Front panel of CRTs (Cathode ray tubes)	Barium (Ba)	Short term exposure causes: • Muscle weakness; • Damage to heart, liver and spleen.
Motherboard	Beryllium (Be)	• Carcinogenic (lung cancer) • Inhalation of fumes and dust. Causes chronic beryllium disease or beryllicosis. • Skin diseases such as warts.

(Source: Ghouse, 2011)

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CONCLUSION

E – waste due to its current growth rate will become a separate and major component of waste. The toxic nature of E – waste makes it of importance for its management. With current available system for management of E – waste, if the options like repair, reuse, recycle are adopted, that will act as a optimization at source. The implementation of E – waste Rules are required to be followed strictly which gives a partly solution to problem of MSW management as till today E – waste management is being practiced in combination with MSW. Government of India should widen the boundaries of categories to be included as E – waste as currently they do not cover the some categories related to electrical gadgets. Also it gives a scope to develop a separate management plan for different levels. This will lead to easy implementation of proper, scientific and sound management practices for E – waste with regards to collection, storage, transport, treatment and disposal.

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