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A Critical Review of E-waste Regulations in India

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Abstract: **The biggest challenge in resolving any social problem is the non-compliance of rules & regulations in the society. A lot of scientific legislation has come up in India as well in recent times. With effect from May, 2012 E-Waste (Management & Handling) Rules, 2011 came into effect and these rules entail environmentally sound management of e-Waste. E-waste management implies that all the required steps have been taken to ensure the management and disposal in such a manner that it does not affect the health of human beings and the environment adversely due to undesirable effects of hazardous substance contained in such e-wastes. These rules also necessitate the manner of collection, transportation, storage, dismantling and recycling of such e-waste. But all good said and done on paper still requires to be put into practice. Being the fastest growing refuse problem in the world, the e-waste junk stream is growing at a rate of 20% per year. By 2010 India had about 75 million computers and the base is expected to grow to 140 million computers by 2013 end. Computer equipment accounts for almost 68% of e-waste material, followed by telecommunication (12%), electrical (8%) and medical equipment (7%) and household e-crap (5%). All these are no more accessories of the society but necessity. It is a gigantic task to convince the society to follow strict rules in usage, management & disposal of e-products. An e-Waste Inventory Management system needs to be put into place. The process should be a combination of manual and mechanical dismantling, size reduction, segregation, dust collection as well as sending hazardous waste for final disposal and precious metal bearing components for refining or recycling. Entire system should be based on the principles of clean environment and zero landfill. Hazardous substances recovered during the process of recycling of e-waste should be disposed off through the CHWTSDF, authorized by the Pollution Control Board in the prescribed manner. This paper is intended to offer a practical, scientific, safe and environmentally apt model system for implementation of E-waste Regulations in India. Common but differential roles have been proposed at all levels of e-waste management.**

Keywords--legislation, recycling, CHWTSDF, e-inventory, Human health.

1. INTRODUCTION

E-waste or electronic waste is defined as Computers, Televisions, VCRs, Stereos, Copiers, Fax Machines, Mobiles and other Electronic Equipment, which have been discarded, have become obsolete, have ceased to function or are no longer wanted. Unfortunately, electronic discards is one of the fastest growing segments of our nation's waste stream. Certain components of some electronic products contain materials that render them hazardous, depending on their condition and density. For instance, CRTs (cathode ray tubes) from televisions and monitor are extremely hazardous, especially since most of them are coated with a radioactive substance Zirconium (Zr).

CED's are common Consumer Electronic Devices that are used in the home or office, such as telephones, cellular phones, answering machines, radios, stereo equipment, tape players/recorders, phonographs, video cassette players/recorders, compact disc players/recorders, calculators, copiers and fax machines. The DTSC has determined that CED's contain toxic substances and should not be disposed of in landfills.
Electronic waste is growing at three times the rate of other wastes.

Industrial revolution followed by the advances in information technology during the last century has radically changed people's lifestyle. E-toxic components in computers could be summarized as circuit boards containing heavy metals like lead & cadmium; batteries containing cadmium; cathode ray tubes with lead oxide & barium; brominated flameretardants used on printed circuit boards, cables and plastic casing; poly vinyl chloride (PVC) coated copper cables and plastic computer casings that release highly toxic dioxins & furans when burnt to recover valuable metals; mercury switches; mercury in flat screens; poly chlorinated biphenyl's (PCB's) present in older capacitors; transformers; etc. Basel Action Network (BAN) estimates that the 500 million computers in the world contain 2.87 billion kgs of plastics, 716.7 million kgs of lead and 286,700 kgs of mercury. The average 14-inch monitor uses a tube that contains an estimated 2.5 to 4 kgs of lead. The lead can seep into the ground water from landfills thereby contaminating it. If the tube is crushed and burned, it emits toxic fumes into the air. The technical prowess acquired during the last century has posed a new challenge in the management of wastes. Thus proper management is necessary while disposing or recycling e-wastes.

2. METHODS:

Interesting Statistics:

1) The total e-waste in India has been estimated to be 1,46,180 metric tons per year.
2) The e-waste refuse stream is growing at a rate of 3-5% per year, making it the fastest growing refuse problem in the world.
3) The average life expectancy of a new PC is now less than two years.
4) Mumbai tops the list at present with 11,017 tons followed by Delhi with 9,730 tons and Bangalore with 4,648 tons.
5) An estimated 30,000 computers become obsolete every year from the IT industry in Bangalore alone. . By 2010 India had about 75 million computers and the base is expected to grow to 140 million computers by 2013 end.

*TABLE I
AVERAGE COMPOSITION OF ELECTRONIC WASTES

Metals	60.2 %
Plastics	15.2%
Screens	12%
Pollutions	2.7%
Cables	2%
Printed circuit board	3.1%
Meta plastic mixture	5%

*SOURCE: VSRD-IJCSIT, VOL. 2 (3), 2012

3. RECOMMENDATIONS FOR MANAGEMENT OF E-WASTES:

A. INVENTORY MANAGEMENT

Proper control over the materials used in the manufacturing process is an important way to reduce waste generation (Freeman, 1989). By reducing both the quantity of hazardous materials used in the process and the amount of excess raw materials in stock, the quantity of waste generated can be reduced. This can be done in two ways i.e. establishing material-purchase review and control procedures and inventory tracking system. Another inventory management procedure for waste reduction is to ensure that only the needed quantity of a material is ordered.

B. VOLUME REDUCTION

Volume reduction includes those techniques that remove the hazardous portion of a waste from a non-hazardous portion. These techniques are usually to reduce the volume, and thus the cost of disposing of a waste material. Methods include gravity and vacuum filtration, ultra filtration, reverse osmosis, freeze vaporization etc. For example, an electronic component manufacturer can use compaction equipments to reduce volume of waste cathode ray-tube.

C. RECOVERY AND REUSE

Waste can be recovered on-site, or at an off-site recovery facility, or through inter industry exchange. A number of physical and chemical techniques are available to reclaim a waste material such as reverse osmosis, electrolysis, condensation, electrolytic recovery, filtration, centrifugation etc. For example, a printed-circuit board manufacturer can use electrolytic recovery to reclaim metals from copper and tin-lead plating bath.

1) *Sustainable Product Design*: Efforts should be made to design a product with fewer amounts of hazardous materials.
2) *Renewable materials and energy*: Bio-plastics, Bio-based toners, glues and inks etc., should be encouraged.
3) *An Ideal Model Recycling Procedure* :

Recycling activities should commence with the receipt of e-waste material from various locations. The material must be initially weighed, and separated product-wise (monitors, CPUs, printers, keyboards, etc.) for easy retrieval. The material must be then checked by qualified technicians to ascertain whether the equipments are working or non-working. If the equipment is in working/ near-working condition, then the technicians should attempt to repair/ upgrade the equipments to ensure that they become re-marketable and can be resold. If the equipments are not in working condition, attempts should be made to salvage components. Accordingly, the technicians must dismantle the equipment into components and try to retrieve any working parts thereof. The residual components should then pass on for shredding into the twin-shaft shredder which helps to “open up” sealed components, separating metals from plastic. The shredder accepts manually dismantled components through a hopper at one end, passes the feed through the shredding chamber where two counter rotating hexagonal shafts fitted with circular blades shred the components, and the shredded items are dropped onto a moving conveyor belt. Certain components of the computer such as printed circuit boards (PCBs) contain precious metals such as gold, silver, etc. These PCBs should not be sent for shredding, instead be accumulated and used for precious metal extraction. That portion of e-waste which contains hazardous elements and cannot be recycled must be sent to authorized hazardous waste treatment and disposal facilities for final disposal as per the norms of the Pollution Board. Chips and various integrated circuits

including monitor LCD TFT and its Peripheral from computers, mobiles, televisions, etc. which are no more in usage include should be recycled to be reused in small electronic industry that help in increasing the life of this small electronic hence decreasing the e-waste.

Recycling of e-waste is not required merely because it is mandatory or environmental requirement, but is also essential to avoid bad publicity when computers and other office automation systems are found in landfill or third world countries, consequently, the industries should move towards a paradigm shift with respect to cost avoidance v/s risk avoidance.

Hazardous substances recovered during the process of recycling of e-waste are being disposed off through the Common Hazardous Waste Treatment, Storage & Disposal Facility, commonly known as CHWTSDF, authorized by the Pollution Control Board in the prescribed manner. Extraction of precious metals out of e-waste material is an integral and a very important part of the entire e-waste recycling chain.

D. ADVANTAGES OF RECYCLING:

Recycling can be defined as the assembling, developing promoting or buying of new products, which are prepared from waste materials. This exercise also reduces litter and the costs of solid waste disposal.

4. THE INDIAN SCENARIO:

Developed countries dispose their wastes to India and other developing countries. A recent investigation revealed that much of the electronics turned over for recycling in the United States ends up in Asia, where they are either disposed of or recycled with little or no regard for environmental or worker health and safety. Major reasons for exports are cheap labour and lack of environmental and occupational standards in Asia and in this way the toxic effluent of the developed nations flood the world's poorest nations. It is imperative that developing countries and India in particular wake up to the monopoly of the developed countries and set up appropriate management measures to prevent the hazards and mishaps due to mismanagement of e-wastes. In India there is excellent technology and machineries for recycling of electrical & electronic waste to suit the environmental objective and best recovery practices. The process is a combination of manual and mechanical dismantling, size reduction, segregation, dust collection as well as sending hazardous waste for final disposal and precious metal bearing components for refining. Entire system is based on the principles of clean environment and zero landfill.

5. MANAGEMENT OPTIONS:

A. Responsibilities of the Government

Governments should set up regulatory agencies in each district, which are vested with the responsibility of coordinating and consolidating the regulatory functions of the various government authorities regarding hazardous substances with provision of severe punishments. Encouragement of research into the development and standard of hazardous waste management, environmental monitoring and the regulation of hazardous e-waste disposal has to be done.

B. Responsibility and Role of industries

Generators of wastes should take responsibility to determine the output characteristics of wastes and if hazardous, should provide management options. Manufacturers, distributors, and retailers should undertake the responsibility of recycling/disposal of their own products by educating and rewarding the consumers financially.

C. Responsibilities of the Citizen

Waste prevention is perhaps more preferred to any other waste management option including recycling. Donating electronics for reuse extends the lives of valuable products and keeps them out of the waste management system for a longer time. But care should be taken while donating such items i.e. the items should be in working condition. Reuse, in addition to being an environmentally preferable alternative, also benefits society. By donating used electronics, schools, non-profit organizations, and lower-income families can afford to use equipment that they otherwise could not afford. E-wastes should never be disposed with garbage and other household wastes. This should be segregated at the site and sold or donated to various organizations. NGOs should adopt a participatory approach in management of e-wastes.

6. CONCLUSION:

It is concluded that e-waste in a serious and dangerous problem which is continuing to grow exponentially in epic proportions. The need of the hour is to address the issue technically, politically and socially. A concerted effort taking all stakeholders together working in sync would be the ideal scenario of e-waste management.

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