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Management of E-Waste

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Abstract

Globally, electronics industry is the largest and fastest growing manufacturing industry. In the last couple of decades, it has played a crucial part in socio -economic and technological growth of societies. The Basel convention delineates wastes as substances or objects which are disposed of or are intended to be disposed of by the provisions of national laws. This paper garners information regarding the generation of E-waste and its proper management in a global level.

Keywords: - *E-waste, Basel convention, Generation, Management*

INTRODUCTION

There are so many types of wastes and e-waste is one of its types and it produced drastically. Electronic waste abbreviated as e-waste is a generic term embracing various forms of electric and electronic equipment that have ceased to be of any value to their owners (Mehra, 2004). The approach of consumer targeted growth policy in concoction with rapid product obsolescence and technological advances have produced a new environmental challenge; the threat of "Waste Electrical or Electronic Equipment (WEEE)" or "e-waste" that comprises of obsoletes electronic devices. E waste is one of the fastest and rapid growing waste streams in the world. In developing countries, WEEE accounts for 2% of total solid waste and is expected to grow to 3% by 2012.Two major problems that are associated with generation of WEEE including the large volume generated and safe environmental disposal of e-waste. Studies conducted have shown that about 3.4 hundred thousand tons of e waste is generated

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annually in India and the total generation of e-waste was almost about 4.9tons by 2011 as predicted. TRAI reports suggested about113.27 million new cellular customers in 2008, with an average 9.7 million customers added every month (Radha, 2002).

DEFINITION

Sporadic growth of technology, up gradation of technical innovations, and a high pace of obsolescence in the electronics industry have pave done of the fastest growing waste streams in the world which encompasses the end of life electrical and electronic equipment product such as: Refrigerator, Washing machines, Computers and Printers, Televisions, Mobiles, I pods etc. Many of which contain toxic materials. Toxinsine-wasteincludePolyvinylchloride(PVCplastics),copper,lead,mercury,arsenic(inoldermodels),cadmium,manganese,cobal t,gold,andiron.Between1994 and 2004,disposal of PCs resulted in 719,000tonsoflead, 288 tons of mercury, and 1,364 tons of cadmium being placed inland fills. Mercury, chromium, led, and brominated flame retardants are likely to cause the most severe heal th effects in humans. E-waste consists of both hazardous and non-hazardous substances in their components. While assessing the global scenario, the e-waste generation is estimated at 2 to 50 million tonnes annually. It represents 1 to 4% of the global municipal waste produced as 1637 million tonnes per year. The obsolete and EOL electrical and electronic equipment in large numbers made it a fast and rapid growing waste all over the world aggrandizing at the rate of 4 to 6% per annum with respect to the municipal waste. The presence of organic toxic and hazardous substances in e-waste separates it from the normal municipal waste. These toxic substances like plastic, lead, mercury, cadmium, arsenic etc. pose health hazards on the human being to the most when treated in uncontrolled condition via air, water and soil (Mehra, 2004).

TECHNOLOGICAL WASTE: ***A Major Component of E-Waste***

Cellular market grew from 168.12 million in 2003–2004 to 261.99 million in 2007–2008. In 2006, microwave ovens and air conditioners registered a growth of about 29%. Refrigerator sales hyped to4.4 million in 2006–2007 and its production went up by 18% as compared to the preceding year. Washing machines, which have always seen poor growth, have seen reasonable growth in 2006. The sale of color televisions (CTVs) is increased 4

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times by 2007.Of the total amount of e-waste that is generated only about 19,000 tons of the e-waste is recycled, 96 % in the informal sector (Envocare, 2001). E-waste comprises valuable constituents such as strategic metals like silver, gold and copper and hence is economically viable to recycle. The processes consist of disassembly of the e-waste and the extraction of valuable materials which have environmental and health hazards, if such recycling activities are carried out by the informal sector in an unregulated manner. This is an intriguing paradox as it merges an emerging problem with a business opportunity of aggrandizing importance, given the volumes of e-waste being and the content of both toxic and valuable materials in them.

E-WASTE IN INDIA

There is no separate collection of e-waste in India, till now there is no clear data on the quantity produced and disposed of each year and the resulting extent of environmental risk. The preferred procedure to get rid of obsolete electronic items in India is to get them in exchange from retailers when purchasing a new item. The business sector is estimated to account for 79% of all installed computers in India. Obsolete computers from the business sector are sold by auctions. In few cases educational institutes or charitable institutions receive old computers for reuse. It is estimated that the total number of obsolete personal computers emanating each year from business and individual households in India will be around 1.39 million (Devi et al.,2004). According to airport of Confederation of Indian Industries, the total waste produced by obsolete or broken-down electronic and electrical equipment in India has been estimated to be 1,47,000 tons per year . The results of a field survey conducted in the Mumbai, a metropolitan city of India to assess the average usage and life of the personal computers (PCs), television (TV) and mobile phone showed that the average household usage of the PC ranges from 0.40. to 1.72 depending on the income class. In the case of TV it varied from1.09 to 1.98 and for mobile phones it differed from 0.98 to 1.80. The low-income households use the PC for 5.95 years, TV for 8.19 years and the mobile phones for 2.36 years while, the upper income class uses the PC for 3.23 years, TV for 5.16years and mobile phones for 1.64 years. Although the per-capita waste synthesis in India is still relatively moderate, the total absolute volume of wastes generated will be huge. Further, it is growing at a faster pace (Ammons et al.,

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2003). The growth rates of the mobile phones (92%) are very high compared to that of PC (21%) and TV (19%). The public awareness on e-wastes and the willingness of the public to pay for e-waste management was analyzed during the study based on an organized questionnaire revealed that about 52% of the public are aware of environmental and health impacts of the electronic items. The willingness of public to pay for e-waste management ranges from 3.59% to 5.93% of the product cost for PC, 3.95 % to 5.96 % for TV and 3.7 % to 6 % for the mobile phones. Additionally considerable quantities of e-waste are reported to be imported. Currently, there is no confirmed figures available on how substantial are these trans boundary e-waste streams, as most of such trade in e-waste is camouflaged and conducted under the pretext of obtaining 'reusable' equipment or 'donations' from developed nations. The government trade information does not distinguish between imports of new and old computers and peripheral parts and so it is difficult to track what share of imports are availed electronic goods (Alastair, 2004).

IMPACTS OF E-WASTES

Electronic wastes can cause widespread environmental damage and hazards due to the use of lethal materials in the manufacture of electronic goods. Hazardous materials such as lead, mercury and hexavalent chromium in one form of toxic agent or the other are present in such wastes initially consisting of Cathode ray tubes (CRTs), Printed board assemblies, Capacitors, Mercury switches and relays, Batteries, Liquid crystal displays (LCDs), Cartridges from photocopying machines, Selenium drums (photocopier) and Electrolytes. Although it is hardly referred, e-waste encompassing toxic substances such as Lead and Cadmium in circuit boards; lead oxide and Cadmium in monitor Cathode Ray Tubes (CRTs); Mercury in switches and flat screen monitors; Cadmium in computer batteries; polychlorinated biphenyls (PCBs) in older capacitors and transformers; and brominated flame retardants on printed circuit boards, plastic casings, cables and polyvinylchloride (PVC) cable insulation that releases highly toxic dioxins and furans when burned to retrieve Copper from the wires(Agarwal,1998). All electronic equipments comprises printed circuit boards which are hazardous because of their content of lead (in solder), brominated flame retardants (about 5-12 % by weight) and antimony oxide, which is also present as a flame retardant (about 1-3% by weight) . Land filling of e wastes

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can pave to the leaching of lead into the ground water. If the CRT is crushed and burned, it emits hazardous lethal fumes into the air. These products contain multiple rechargeable battery types, all of which comprises toxic substances that can contaminate the environment when burned in incinerators or disposed of in landfills. The cadmium from one mobile phone battery is enough to pollute 620 m3 of water. The quantity of cadmium in landfill sites is crucial, and considerable toxic contamination is caused by the inevitable medium and long-term effects of cadmium leaking into the surrounding soil. Because plastics are highly flammable, the printed wiring board and housings of electronic products encompasses brominated flame retardants, a number of which are clearly damaging to human health and the environmental terrain (Zoeteman et al., 2009).

IMPACTS OF INFORMAL RECYCLING

The accrued electronic and electric waste in India is dismantled, sorted, arrayed manually to fractions such as printed wiring boards, cathode ray tubes (CRT), cables, plastics, metals, condensers and other, recent days invaluable materials like batteries. It is a livelihood for unarrayed recyclers and due to lack of awareness; they are risking their health and the environment as well. The valuable fractions are processed to directly reusable elements and to secondary raw materials in a variety of refining and conditioning processes. No sophisticated machinery or personal protective equipment is availed for the extraction of different materials. All the work is done by bare hands (rather there is lack of awareness regarding the need for precautionary measures) and only with the help of hammers and screwdrivers. Children and women are mostly involved in the operations (Young. 2010). Waste components which does not have any resale or reuse value are burnt or disposed off in open dumps. Pollution problems associated with such backyard smelting availing crude processes are resulting in fugitive emissions and slag comprising heavy metals of health concern. CRT breaking operations result in injuries from cuts and acids availed for removal of heavy metals and respiratory illness due to shredding, burning etc. They use strong acids to retrieve precious metals such as gold. Working in poorly ventilated enclosed areas without masks and technical expertise typically results in exposure to dangerous and slow poisoning chemicals. Polychlorinated biphenyls (PCBs) in older capacitors and transformers; and brominated flame

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retardants on printed circuit boards, plastic casings, cables and polyvinylchloride (PVC) cable insulation can ooze highly toxic dioxins and furans when burned to retrieve copper from the wires. On a wide scale, assessing the environmental and societal impacts of e-waste reveals mosaic of benefits and costs. Most e-waste "recycling" involve small enterprises that are numerous, widespread, and difficult to maintain. They take advantage of low labor costs due to high pace of unemployment rates, internal migration of poor peasants, and the lack of protest or political mobilization by affected villagers who believe that e-wastes cater the only viable source of income or entry into modern development pathways (Basu, 2010).

Integration of unorganized and organized sector in India, the process of integrating the informal sector with the formal sector poses key challenges. In practice, majority of recyclers in the informal sector dismantle and sell the elements to local recycling units whereas others are involved in recovering by e products. Likewise e-waste recycling units in India permitted by the government are involved in dismantling of the used equipment (Raghupathy et al., 2010). The plastics, steel, aluminum, glass etc. are recycled in India while the printed circuit boards are shredded and exported to other countries like Europe, Singapore, Australia, and even China for precious metal recovery .The path to formalization of the informal sector units would require several steps. This would involve in identification of clusters in the informal sector. This process should also raise the awareness level in the workers in informal fields regarding the harmful effects of e-waste and how to avoid them thereby also educating these workers on environmental friendly processes. They should also be educated on concepts and new approaches of recycling and reuse including financial benefits allied with them. Providing hands-on training and demonstration of process efficacy will be an important step in converting them from unorganized to organized sector. The integration would need trust, improved connections and strong bond between the two sectors for the effort to work. Further, the economical dynamics of the informal sector would change due to introduction of certain processes, which were not considered before. The government should cater financial aid, easy access to credit and provision of financial incentives such as subsidies and introduction of insurance schemes to ensure no loss of income for workers switching from the unorganized

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sector to organized sector (Widmer. et al., 2005). The organized sector could also help this integration process by building the capacity of informal sector associations as well as jointly developing the norms for trade of material between the two sectors.

E-WASTE LEGISLATION IN INDIA

The environmentally sound management of e-waste is an important challenge for India. The challenge links not only to imported e-waste, but also to the increasing amounts of domestically produced e-waste. Till today, no legislation dealing exclusively with e-waste exists. The following section examines and analyses the current regulatory framework for e-waste in India, examining existing legislation, voluntary e-waste guidelines released by the central government, and the novel draft rules dedicated to e-waste management. Although no e-waste laws currently exist, two regulations – the Hazardous Waste (Management and Handling) (HWM) Rules and the Batteries (Management and Handling) Rules – are mainly applicable to some extent. The HWM Rules require receiving, treating, transporting or storing hazardous waste to initially obtain permission from the relevant State Pollution Control Board (SPCB) by both a company and individual. In addition, the HWM Rules also stipulates banning of imported hazardous waste for disposal or dumping. The central government can revoke this by issuing an import authorization document for hazardous waste that is to be either processed or reused. Amendment to the HWM Rules in 2000profoundly expanded the scope of the Rules to include provisions on e-waste for the first time (Chaturvedi et al., 2007).

E-WASTE MANAGEMENT STRATEGIES IN INDIA

The e-waste management strategies in India should emphasize and address issues from production and trade to final disposal, including technology transfers for the recycling of electronic waste. This should mainly include proper training, legislations and guidelines for all involved. Considering the severity of the problem, it is absolutely necessary that certain management options have to be adopted to handle the bulk e-wastes. Following are some of the management options suggested for the government in developing countries, industries and the consumers to manage and handle e-waste effectively and in an environment friendly manner .Governments should set up regulatory agencies vested with the responsibility of coordinating, assessing and consolidating the regulatory functions

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of the various government authorities regarding hazardous substances. Governments should be responsible for providing a balanced system of laws, controls and administrative procedures for hazardous waste management. Existing laws concerning e-waste disposal needs to be overhauled. A revamped legislation with policies on e-waste regulation, management and proper disposal of hazardous wastes should be completely formulated. Moreover, the law should empower the agency to control, supervise and regulate the relevant activities of government departments (Chaturvedi et al.,2008).

The law should provide information on the materials from manufacturers, processors and importers and to maintain an inventory of these materials. Risk management policies should be clearly formulated for production, processing, distribution, use and disposal of electronic wastes. Beneficial reuse of "e-waste" and business activities that use e-waste must be encouraged. Educational programs should be conducted for both manufacturers and consumers on harmful effects of e-waste and to promote recycling among citizens and businesses, thereby creating a holistic awareness. The proposed draft e-waste (Management and Handling) Rules 2010 incorporates to a certain extent all of these proposals. The proposed draft e-waste (Management and Handling) Rules 2010 should cater incentives for conducting research into the development and standard of hazardous waste management, environmental monitoring and the regulation of hazardous waste-disposal along with examining and authenticating the use of environmental friendly products for manufacture of electronic goods (Joseph.,2007).

CONCLUSION

Regulations against dumping e-waste in the country by other nations have to be strictly followed. If the laws are not maintained, stringent penalties must be imposed. In sentences, custodial sentences should be preferred to paltry fines, which would deter foreign nations from dumping their quota of e-waste in India. Governments and NGO’s should explore opportunities to partner with manufacturers and retailers to provide recycling services.

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