

E-Waste Management and its Concern in Today's Environment

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Abstract— Although many countries, including those in the European Union, have developed laws to address electronic waste (or e-waste) disposal and management, there is no law that addresses e-waste in India. The current estimation of the amount of E-waste generated in India is extremely hazy. E-waste management in India is a serious issue because of the informal recycling activities. In this paper an attempt has been made to quantify the amount of e-waste generated in Raipur. And results were obtained regarding awareness among people about e-waste, method of e-waste management and suggestions were obtained about e-waste management. Based on the survey conducted, it was recommended that role of government should be increased for controlling the informal method of e-waste management and for promoting the formal method and increasing the awareness among people about hazardous effect of e-waste and for its proper disposal.

Key words: Environment, E-Waste Management

I. INTRODUCTION

A. E-Waste

E-waste is one of the fastest growing waste streams globally. It comprises of wastes generated from used electronic devices and house hold appliances which are not fit for their original intended use and are destined for recovery, recycling or disposal. Such wastes encompasses wide range of electrical and electronic devises such as computers, hand held cellular phones, personal stereos, including large household appliances such as refrigerators, air conditioners etc. These wastes can cause widespread environmental damage due to the use of toxic materials in the manufacture of electronic goods. E-wastes contain over 1000 different substances many of which are toxic and potentially hazardous to environment and human health.

B. E-Waste in India

The story of current Indian e-waste management is different from the worldwide. As there is no separate collection of e-waste in India, there is no clear data on the quantity generated and disposed of each year and the resulting extent of environmental risk. The preferred practice to get rid of obsolete electronic items in India is to get them is exchange from retailers when purchasing a new item. Indians upgrade or exchange their cell phones every 18 months, meaning there are approximately 16 million unused mobile phones stashed away at home or in the office. According to a report of Confederation of Indian Industries, the total waste generated by obsolete or broken down electronic and electrical equipment in Indian has been estimated to be 1,46,000 tons per year. Sixty-five cities in India generate more than 60% of the total e-waste generated in India. Ten states generate 70% of the total e-waste generated in India.

Maharashtra followed by Tamil Nadu, Andhra Pradesh, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab in the list of e-waste generating states in India. Among top ten cities generating e-waste, Mumbai ranks first followed by Delhi, Bangalore, Chennai, Kolkata, Ahmedabad, Hyderabad, Pune, Surat and Nagpur. There is no large scale organized e-waste recycling facility in India and the entire recycling exists in unorganized sector. In India, probably the e waste is given to the rag pickers who pay some amount to the customer from whom they are collecting the waste. Most of the activities, like collection, transportation, segregation, dismantling, recycling, disposal, etc., are carried out by informal sector. The rag pickers collect all kind of waste like papers, books, newspapers, plastic, cardboard, polythene, metals, etc. including e-waste, and earn their livelihood by selling it to middlemen or scrap dealers. This is a very good source of income not only for rag pickers but also for middlemen and scrap dealers. E-waste is mostly handled by unskilled workers and they do not take proper safety measures. Recycling and disposal is not properly done due to lack of appropriate technology. Also, very few companies are there which have implemented "take back" system voluntarily. There is no clear data on the quantity generated and disposed of each year and the resulting extent of environmental risk. According to the literature review its revealed that about 50% of the public are aware of environmental and health impacts of the electronic items. Hence, there is an urgent need of implementation of proper e-waste management system in India.

C. Impacts of E-Wastes

Electronic wastes can cause widespread environmental damage due to the use of toxic materials in the manufacture of electronic goods. Hazardous materials such as lead, mercury and hexavalent chromium in one form or the other are present in such wastes primarily 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 know, e-waste contains 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 casing, cables and polyvinyl chloride (PVC) cable insulation that release highly toxic dioxins and furans when burned to retrieve Copper from the wires.

Sources of e-waste	Constituent	Health effects
Solder in printed circuit boards,		– Damage to central and peripheral nervous

CRT, glass panels and gaskets in computer monitors	Lead(PB)	systems, blood systems and kidney damage – Affects brain development of children
Chip resistors, Batteries and semiconductors	Cadmium(Cd)	– Toxic irreversible effects on human health – 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, hardner for steel housings	Hexavalent chromium (Cr)	– Asthmatic bronchitis – DNA damage
Cabling and computer housing	Plastics including PVC	– Reproductive and developmental problems – Immune system damage
Plastic housing of electronic equipments and circuit boards	Brominated flame retardants(BFR)	– Disrupts endocrine system functions
Front panel of CRTs	Barium(Ba)	– Muscle weakness – Damage to heart, liver and spleen
Motherboard	Beryllium (Be)	– Skin diseases such as warts

Table 1: Effects of E-Waste Constituent on Health

II. CURRENT E-WASTE SCENARIO IN INDIA

The electronic and electric waste in India is dismantled and sorted manually to fractions such as printed wiring boards, cathode ray tubes (CRTs), cables, plastics, metals, condensers and other, and now a day's invaluable materials like batteries. It is a livelihood for unorganized recyclers and due to lack of awareness; they are risking their health and the environments as well. The valuable fractions are processed to directly reusable components and to secondary raw materials in a variety of refining and conditioning processes. No sophisticated machinery or personal protective equipment is used for the extraction of different materials. All the work is done by bare hands and only with the help of hammers and screwdrivers. Children and women are routinely involved in the operations. Waste components which does not have any resale or reuse value are openly burnt or disposed off in open dumps. Pollution problems associated with such backyard smelting using crude processes are resulting in fugitive emissions and slag containing heavy metals of health concern. CRT breaking operations result in injuries from cuts and acids used for removal of heavy metals and respiratory problems due to shredding, burning etc. The use strong acids to retrieve precious metals such as gold. Working in poorly ventilated enclosed areas without masks and technical expertise results in exposure to dangerous and slow poisoning chemicals. Polychlorinated biphenyls(PCBs) in older capacitors and transformers; and brominated flame retardants on printed circuits boards, plastic casings, cables and polyvinyl chloride (PVC) cable insulation can release highly toxic dioxins and furans when burned to retrieve copper from the wires. On a broader scale, analysing the environmental and societal impacts of e-waste reveals a mosaic of benefits and costs. Proponents of e-waste recycling claim that greater employment, new access to raw materials and electronics, and improved infrastructure will result.

III. METHODOLOGY

A survey has been conducted in Raipur of Chhattisgarh state. The process of survey was done in two steps which are given below:

- Collection of secondary data
- Primary data collection & analysis

A. Collection of Secondary Data

In this step the status of electronic and communication products in Raipur could be estimated by measuring the percentage of household possessing Television, Computer/Laptop and Mobile phone which are the main constituents leading to e-waste generation. The percentage of household possessing these items in Raipur are shown below:

City	Total Household	Total percentage of household having		
		Television	Computer/laptop	Mobile phone
Raipur	5,15,029	55.4	11.4	43.7

Table 2: Percentage of household possessing different products

Source: Census of India 2011

From the above table it could be concluded that majority of household possesses television followed by computer/laptop and mobile phone. Therefore the percentage of e-waste generated from these households follow the same pattern.

B. Primary Data Collection

For primary data, a survey had been done by interviewing retailers, dealers, and showroom owners from different part of the city.

As it is observed from the survey that majority of the sellers of all the three categories are managing their e-waste by giving it to scrap dealer or vendor. Therefore some scrap dealer and vendor were approached during the survey to find out what these scrap dealers do with the e-waste collected from households, shops and offices. The finding obtained could be described as a process which includes following steps:

- Step 1: Sourcing by informal recyclers- In this step the e-waste is collected by informal scrap dealer from household and business. The household sell e-waste to second hand market or to showroom owner/retailers in exchange schemes. Sometimes scrap collector directly collect the e-waste from household. Informal scrap collector collects e-waste also from government organization or business firms by participating in auction or by directly approaching the offices or through exchange scheme.
- Step 2: Aggregation- After the e-waste collected by scrap dealer they checks the material receive and divide it into three part as material which can be resold in second hand market as first part, second part include items which could be repaired or refurbished and resold and third part consist of what is to be sent for recycling.
- Step 3: Segregation & dismantling- Those parts of e-waste which cannot be resold in original form are dismantled either by scrap collector himself or sell it to a dismantler. The dismantling of only electrical and electronic products mainly fridge, TV, and washing machine are performed at local level. Most of the computers and mobiles could not be dismantled here and are, therefore, taken by e-waste collector from Delhi where dismantling is done by experts of informal sector. After dismantling the product, the components are again checked to know if any part or components could be reused. The reusable components or parts are sold at higher price as compared to non-reusable part.
- Step 4: Recycling- After segregating and dismantling the waste electronic product the parts which could not be resold are recycled. Each stage workers are expertise in their job and perform the specific job. Most of the recycling job is performed by informal sectors.

IV. CONCLUSION AND RECOMMENDATIONS

During the course of the study, it has been observed that E-waste estimation is difficult in cities like Raipur because of the less awareness about the topic among the people. As about 90% of the e-Waste generated in Raipur is being consumed by the informal sector. The government should also make plans to increase the awareness among people regarding the hazardous effect of e-waste and emphasis them to give their e-waste to collector who recycle it in environment friendly manner. And proper infrastructure and environment friendly recycling facility must also be established in Raipur. The company should also promote buy back facility for proper disposal of e-waste by the end user. For this collection and dropping centre should be open by company for customer other than the already available dealer location.

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