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E-Waste: A New Environmental Challenge for India

Ms. Richa Mishra
Research Scholar
Bundelkhand University, Jhansi

Abstract

Electronic waste may be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets and refrigerators. This definition includes used electronics which are destined for reuse, resale, salvage, recycling, or disposal. Because loads of surplus electronics are frequently commingled (good, recyclable, and non-recyclable), several public policy advocates apply the term "e-waste" broadly to all surplus electronics. Over the past decades, the global market of electrical and electronic equipment (EEE) continues to grow exponentially, while the lifespan of those products becomes shorter and shorter. Therefore, business and waste management officials are facing a new challenge, and e-Waste or waste electrical and electronic equipment (WEEE) is receiving considerable amount of attention from policy makers. In this paper an approach is made towards assessing the present situation of e-waste management globally as well as in India, considering the present regulations and guidelines. It is also a fact that major part of recycling of e-waste is being handled by informal sector who have little/no knowledge about the consequences of exposure to hazardous substances.

Keyword- electrical and electronic equipment (EEE), waste electrical and electronic equipment (WEEE), recyclable, Electronic waste

Introduction

Globalization and information technology are being widely recognized as main drivers of the human civilization in the later part of twentieth century and the 21st century. The Information Technology (IT) has been the power house of the global economy particularly since early 1990s. Software and hardware part of IT has touched most of the parts of social, technical, economic and natural environment. Exponentially increasing production of computer hardware has posed major challenges of proper disposal of the waste (e-waste) produced by this industry. Current study focuses on the effect of usage, dumping and recycling of the electronic waste on the natural environment. E-

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waste is a highly complex waste stream, as it contains both very scarce and valuable as well as highly toxic components. Mobile phones, for instance, consist of up to 1000 different components, many of which contain toxic elements such as lead, cadmium or brominated flame retardants. When burned, these elements release toxic emissions. Many detrimental health effects are connected to the recycling and disposal of e-waste when performed without the necessary safety precautions. For instance, lead affects the nervous and blood system. Its effects on children are particularly negative, damaging their brain development. In addition, landfilled WEEE seriously affects the environment, causing contamination problems such as the pollution of groundwater through the leakage of toxins.

Definition of E- Waste

As a popular and informal term, electronic waste (e-Waste) is loosely referred to any white goods, consumer and business electronics, and information technology hardware that is in the end of its useful life. Specifically, Puckett defines e-waste as "a broad and growing range of electronic devices ranging from large household devices such as refrigerators, air conditions, cell phones, personal stereos, and consumer electronics to computers which have been discarded by their users". According to Sinha-Khetriwal, "e-Waste can be classified as any electrical powered appliance that has reached its end-of-life". Meanwhile, a list of prevalent definitions has been provided by Widmer.

E-Waste in India

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 in exchange from retailers when purchasing a new item. The business sector is estimated to account for 78% of all installed computers in India (Toxics Link, 2003). Obsolete computers from the business sector are sold by auctions. Sometimes 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 1.38 million. According to a report of Confederation of Indian Industries (CII), the total waste generated by obsolete or broken down electronic and electrical equipment in India has been estimated to be 1,46,000 tons per year (CII,

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2006). Although the per-capita waste production in India is still relatively small, the total absolute volume of wastes generated will be huge. Further, it is growing at a faster rate.

The results of a field survey conducted in the Chennai, a metroplolitan 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 0.39 to 1.70 depending on the income class (Shobbana Ramesh and Kurian Joseph, 2006). In the case of TV it varied from 1.07 to 1.78 and for mobile phones it varied from 0.88 to 1.70. The low-income households use the PC for 5.94 years, TV for 8.16 years and the mobile phones for 2.34 years while, the upper income class uses the PC for 3.21 years, TV for 5.13 years and mobile phones for 1.63 years. Although the per-capita waste production in India is still relatively small, the total absolute volume of wastes generated will be huge. Further, it is growing at a faster rate. The growth rate of the mobile phones (80%) is very high compared to that of PC (20%) and TV (18%). The public awareness on e-wastes and the willingness of the public to pay for e-waste management as assessed during the study based on an organized questionnaire revealed that about 50% 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 3.57% to 5.92% of the product cost for PC, 3.94 % to 5.95 % for TV and 3.4 % to 5 % for the mobile phones.

Additionally considerable quantities of e-waste are reported to be imported (Agarwal, 1998; Toxics Link, 2004). However, no confirmed figures available on how substantial are these transboundary 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 data 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 used electronic goods.

Ministry of Environmental and Forest (MoEF) is the national authority responsible for legislation regarding waste management and environmental production. The guidelines for environmentally sound management of e-waste with an objective to provide guidance for

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identification of various sources of WEEE and prescribed producers for handling e-waste in an environmentally sound manner.

The Ministry of Environment and Forests (MoEF) has issued the following notifications related to hazardous wastes:

1. Hazardous Wastes (Management and Handling) Rules, 1989/2000/2002
2. MoEF Guidelines for Management and Handling of Hazardous Wastes,1991
3. Guidelines for Safe Road Transport of Hazardous Chemicals,1995
4. The Public Liability Act, 1991
5. Batteries (Management and Handling) Rules, 2001
6. The National Environmental Tribunal Act, 1995
7. Bio-Medical Wastes (Management and Handling) Rules, 1998
8. Municipal Solid Wastes (Management and Handling) Rules, 2000 and 2002

Total Amount of E-Waste in India[1]:

- Around 1,050 tonnes of electronic scrap is being produced by manufacturers and assemblers in a single calendar year.
- In a single month, there is a reported case of import of 30 metric tonnes (MT) of e- waste at Ahmedabad port.
- The minimum number of computers procured by an average scale scrap dealer is 20-25 per month.
- The approximate number of scrap dealers specializing in electronics, in and around Delhi, is more than 40. This figure also includes large scale dealers who handle thousands of PCs per month.
- Approximately 1.38 million personal computers become obsolete every year.
- The IT and IT enable services are expanding at a faster rate in and around the national capital region like: Delhi, Gurgoan and Noida. Over the last five years, the Indian IT industry has

[1] Vijay N. Bhoi and Trupti Shah:' E-Waste: A New Environmental Challenge', International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 2, February 2014, ISSN: 2277 128X

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recovered a compound annual growth rate of more than 42.4 %, which is almost double the growth rate of IT industry in many of the developing countries. Indian configuration of PC per 500 people is going to change to 1 for 50 by 2008.

- The total WEEE generation in India has been estimated to be 1, 46,180 tonnes per year based on selected EEE tracer items. Almost 50% of the PCs sold in India are products from the secondary market and are re-assembled on old components. The remaining market share is covered by multinational manufacturers (30%) and Indian (22%) brands.
- Mumbai currently tops the list of major cities with e-waste.
- Foreign companies helping Indian importers bypass government regulations to bring in the goods for recycling.
- Bangalore may be generating 10,000 to 15,000 tonnes of e-waste every month, according to industry sources. The Karnataka State Pollution Control Board has put it at 10,000 tonnes a month. Along with discarded obsolete hardware, many western countries are selling off their e-waste as scrap and some of this reach scraps dealers in this city. Metal components and some of the outer casings are resold, while the rest of the computers are dumped haphazardly.

Forms of E-Waste

Electronic Waste (e-waste) is the term used to describe old, end-of-life electronic appliances such as computers, laptops, TVs, DVD players, mobile phones, mp3 players etc. which have been disposed of by their original users. Technically, electronic waste is only a subset of WEEE (Waste Electrical and Electronic Equipment). According to the OECD any appliance using an electric power supply that has reached its end-o f-life would come under WEEE. Acknowledging the benefits of IT revolution this section presents darker reality of information technology. Very speed of innovation that lies at the heart of computer manufacturer leads to the product obsolescence. The reality of computer life cycle reveals a hazardous life cycle. The dark side of high technological development of electronic industry, especially computer technology, is revealed in the form of polluted drinking water, waste discharges that cause harm to fish, birth defects, high rate of miscarriage and cancer among cluster workers. Rapid changes in computer technology and the emergence of new electronic

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goods, the growing dependence on information technology, increasing rates of consumption of electronic products have led to disastrous environmental consequences.

Effects of e-waste on human health and environment

E-waste is highly complex to handle because of its composition. It is made up of multiple components some of which contain toxic substances that have an adverse impact on human health and environment if not handled properly that is if improper recycling and disposal methods are deployed. So there is a need for appropriate technology for handling and disposal of these chemicals. Basel Convention characterizes e-waste as hazardous when they contain and are contaminated with mercury, lead, cadmium, polychlorinated biphenyl etc. Wastes containing insulation or metal cables coated with plastics contaminated with or containing lead, coal tar, cadmium, Polychlorinated Biphenyl (PCB) etc are also characterized as hazardous wastes. Also precious metal ash from printed circuit boards, glass waste from cathode-ray tubes, LCD screens and other activated glasses are classified as hazardous wastes.

Effects of some of the prime hazardous components in of e- waste are mentioned below[2]:

1. **Arsenic-**Can affects skin and can decrease nerve conduction velocity. Chronic exposure to arsenic may cause lung cancer and sometimes be fatal.
2. **Lead-** May affect kidneys, reproductive systems, nervous connections. May cause blood and brain disorders, sometimes may be fatal.
3. **Barium-** Can affects heart muscle.
4. **Chromium** Candamage liver, kidneys and may cause asthmatic bronchitis and lung cancer.
5. **Beryllium** May cause lung diseases.
6. **Mercury** Affects the central nervous system, kidneys and immune system, it impairs foetus growth. May cause brain or liver damage.
7. **Cadmium** May cause severe pain in the joints and spine. It affects the kidneys and softens bones.
8. **BFR (Brominates flame retardants)-**Can harm reproductive and immune systems, may cause hormonal disorder.
9. **Chlorofluorocarbon (CFC)-**May affect the ozone layer. It may cause skin cancer in human and genetic damage in organisms.
10. **Polychlorinated Biphenyl (PCB)-**May cause cancer in animals; can affect the immune system, reproductive system, nervous system, endocrine system. PCBs persistently contaminate in the environment and cause severe damage.

[2] Study Paper On e-waste management By Ram Krishna, DDG(FA), TEC , New Delhi & Ms.SampaSaha, Director (ER), RTEC, Kolkata
tec.gov.in/pdf/Studypaper/e%20waste%20management_11.08.pdf

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11. **Polyvinyl Chloride (PVC)**-PVC contains upto 56% chlorine and when burnt, produces Hydrogen chloride gas which in turn produces hydrochloric acid that is dangerous to respiratory system.
12. **Dioxin** These are highly toxic to animals and can lead to malfunction of foetus, decreased reproduction and growth rates, affect immune system.

Conclusion

Most waste is inherently dangerous. It can degrade to produce leachate, which may contaminate ground water, and create landfill gas, which is explosive. In addition, because of the dangers associated with landfill sites, there are now very strict requirements on the construction, operation and aftercare of such sites. Solid waste management in India is becoming more complicated with the addition of e-waste, particularly computer and waste. There exists an urgent need for a detailed assessment of the current and future scenario including quantification, characteristics, existing disposal practices, environmental impacts etc. Institutional infrastructures, including e-waste collection, transportation, treatment, storage, recovery and disposal, need to be established, at national and/or regional levels for the environmentally sound management of e-waste. Based on the literature survey, following are the salient conclusions:

• The e-waste increase every day is much higher than the recycle, recovery and disposal. E-waste is produced by both formal and informal sectors.

• More pollution are produced while recycle, recovery and disposal of e-waste by formal and informal sectors if it is not handled properly.

• Finally, to creating awareness among formal, informal and public for disposal of waste.

• The discarded material collect, separate and transport by the informal sector and recycling, recovery and disposal by the formal and informal sectors is the way of reduction of pollution.

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