ELECTRONIC WASTE MANAGEMENT– INDIAN CONTEXT

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Abstract

Electronic waste or e-waste is one of the rapidly growing problems of the world.

E-waste comprises of old, end-of-life electronic appliances such as computers, laptops, TVs, DVD players, refrigerators, freezers, mobile phones, MP3 players, etc., which have been disposed of by their original users. E-waste contains many hazardous constituents that may negatively impact the environment and affect human health if not properly managed.

In India, e-waste management assumes greater significance not only due to the generation of its own e-waste but also because of the dumping of e-waste from developed countries. This is coupled with India's lack of appropriate infrastructure and procedures for its disposal and recycling.

This paper introduces the terms and concepts of e-waste, components of e-waste management and analyses the major issues related to e-waste management in India.

Key Words: E-waste, Environment, Disposal and Recycling.

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1. Introduction

Electronics industry is the world's largest and fastest growing manufacturing industry. Rapid growth combined with rapid product obsolescence resulted in discarded electronics which is now the fastest growing waste stream in the industrialized world.

Electronic waste, "e-waste" or "Waste Electrical and Electronic Equipment" ("WEEE") is waste material consisting of any broken or unwanted electrical or electronic appliances. As per the CPCB (Central Pollution Control Board, India) Guidelines, 2008 e-waste is defined as waste generated from used electronic devices and household appliances which are not fit for their originally intended use and are destined for recovery, recycling and disposal. Generally, e-waste comprises of old, end-of-life electronic appliances such as computers, laptops, TVs, DVD players, refrigerators, freezers, mobile phones, MP3 players, etc., which have been disposed of by their original users. According to WEEE Directive, the components in WEEE are: IT & Telecom Equipments, Electrical & Electronic Tools, Large Household Appliances, Toys, Leisure & Sports Equipment, Small Household Appliances, Medical Devices, Consumer & Lighting, and Monitoring & Control Instruments. Despite its common classification as a waste, disposed electronics are a considerable category of secondary resource due to their significant suitability for direct reuse (for example, many fully functional computers and components are discarded during upgrades), refurbishing, and material recycling of its constituent raw materials. The unauthorized e-waste dismantling, recycling, resource recovery has become a global concern because many components of the above equipment are toxic and non-biodegradable and the processes employed for material recovery are hazardous. The phenomenal growth of IT and electronics industry, changing lifestyle of people, technological development, low cost availability of electronic gadgets and hunger race has lead to increased rates of consumption of electronic products. The high rates of obsolescence of the above mentioned items coupled with steady rise in the demand have also resulted in substantial growth in e-waste generation. There is no comprehensive and latest inventory of e-waste in the country, however, as per preliminary estimates, the annual e-waste generation in India has been estimated to be 0.8 million tonne by 2012. An UN report estimates that the world wide generation of e-waste is around 30 to 50 million tonne per annum. The present study has been undertaken to introduce the terms and concepts of e-waste, components of e-waste management and analyses the major issues related to e-waste management in India.

2. Components of E-Waste Management

The major components of e-waste management are:

I. E-waste collection, sorting and transportation.

II. E-waste recycling; it involves dismantling, recovery of valuable resource, sale of dismantled parts and export of processed waste for precious metal recovery.

The stakeholders, i.e., the people who can help in overcoming the challenges posed by e-waste, are;

I.   Manufacturers

II. Users

III. Recyclers

IV. Policy Makers

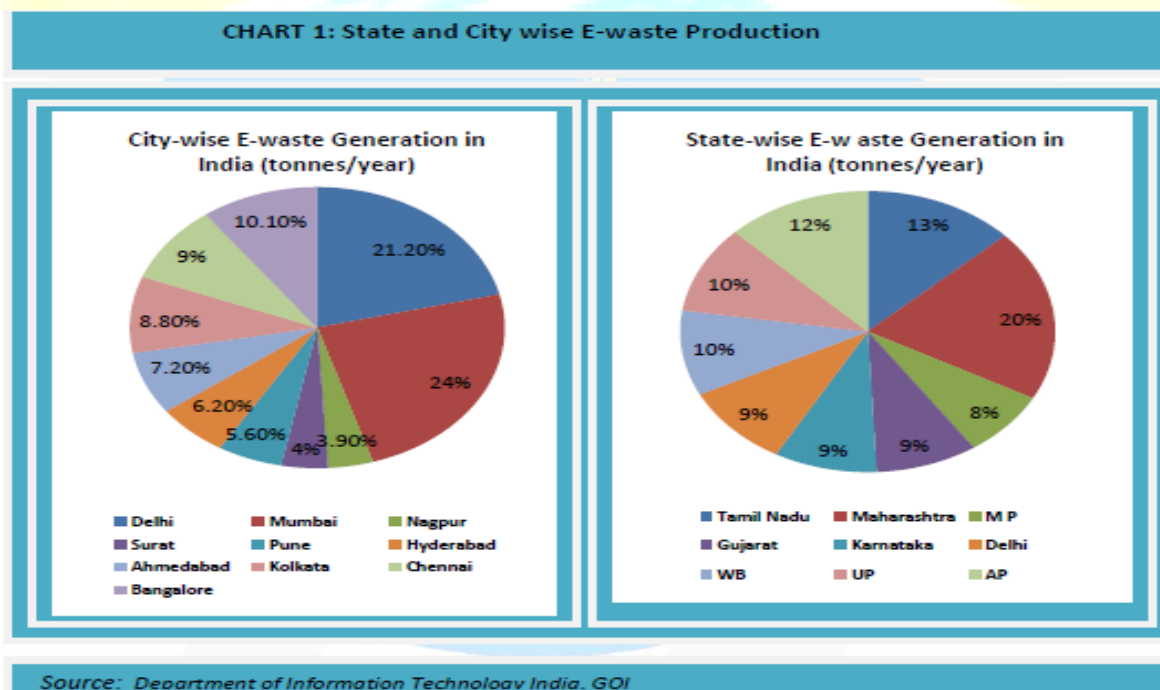## 3. Major issues related to E-Waste Management in India

While considering the problems related to e-waste in India, following major components should be focused upon:

3.1 Magnitude of the Problem with respect to Present E-Waste Scenario

The electronics industry has emerged as the fastest growing segment of Indian industry both in terms of production and exports. The share of software services in electronics and IT sector has gone up from 38.7 per cent in 1998-99 to 61.8 percent in 2003-04. A review of the industry statistics show that in 1990-91, hardware accounted for nearly 50% of total IT revenues while software's share was 22%. The scenario changed by 1994-95, with hardware share falling to 38% and software's share rising to 41%. This shift in the IT industry began with liberalization, and the opening up of Indian markets together with which there was a change in India's import policies vis-à-vis hardware leading to substitution of domestically produced hardware by imports. Since the early 1990s, the software industry has been growing at a compound annual growth rate of over 46% (supply chain management, 1999). Output of computers in value terms, for example, increased by 36.0, 19.7 and 57.6 per cent in 2000-01, 2002-03, and 2003-04, respectively. Within this segment, the IT industry is prime mover with an annual growth rate of 42.4% between 1995 and 2000. By the end of financial year 2005-06, India had an installed base of 4.64 million desktops, about 431 thousand notebooks and 89 thousand servers. According to

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the estimates made by the Manufacturers Association of Information Technology (MAIT) the Indian PC industry is growing at a 25% compounded annual growth rate.

The e-waste inventory based on this obsolescence rate and installed base in India for the year 2005 had been estimated to be 146180.00 tonnes. This is expected to exceed 8,00,000 tonnes by 2012. 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 ranks first 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 (Chart-1).

CHART 1: State and City wise E-waste Production

Source: Department of Information Technology India. GOI

3.2 Management of E-Waste

Management of e-waste in India is carried out both by informal and formal sector. These are discussed below:

3.2.1 Informal Cycling

The informal sector has a historic role in waste management and recycling in India and it is well known that e-waste recycling is no exception to this with an estimated 95 percent of e-waste being recycled through the informal sector (GTZ-MAIT study, 2007). The informal e-

waste recycling units provide job to thousands of people in urban and pre-urban areas, and supports the formal waste management agencies like municipalities.

The e-waste recycling in the informal sector essentially involves collection, segregation, dismantling. Additionally, various investigations have shown that there are extensive repair and refurbishment activities resulting in an extended life of the products and a large second hand market, in particular for IT products. To a large extend the informal sector in India is also involved in extraction of precious metals. These generally small units exercise little or no control over their activities and use highly-polluting process - in many cases without being aware of the risks of these environmental concerns regarding the operations in the informal sector occur at different stages of the e-waste recycling chain. Most severely the illegal extraction of precious metals is causing highly dangerous and toxic emissions such as dioxins, heavy metals, lead, cadmium, mercury etc. Additionally, the discharges and the smudges from e-waste processing leads to contamination of water bodies and soil due to residues e.g. acids, spent fluids/chemicals, traces of polychlorinated biphenyl (PCB), brominated flame retardants (BFRs), etc. This leads to considerable occupational health and safety concerns and environmental hazards. The contact with the chemicals used during the operations, improper ventilation and working without use of personal protection equipments lead to direct exposure to hazardous chemicals. Apart from this, workers are also exposed to other hazards leading to physical injuries and chronic ailments such as asthma, malnutrition, skin diseases, eye irritations etc. and in some cases even to long term and incurable diseases.

3.2.2 Formal E-Waste Re-Cyclers

The recycling/recovery of valuables substances by units in formal sector is carried out in protected environment and with due care to minimize any damage to the environment or society. The use of advanced processes and technologies leads to efficient recovery of metals. Recovery technology by units in formal sector will be economically viable as the high cost of capital equipments and needed techniques could be shared by the volume of products. Efficiency of recovery in the formal recycling is high and metals at the trace level can also be recovered. Some technology works with zero-landfill approach. However, it is not clear whether the advent of formal recycling would come at the expense of informal sector recyclers or would complement their activities. In this juncture, some notable initiatives regarding e-waste management are:

- **E-Parisaraa:** It is the first government-authorized eco-friendly recycling unit which makes full use of e-waste. The plant, which is India's first scientific e-waste recycling unit, aims to reduce pollution, landfill waste and recover valuable metals, plastics and glass from waste in an eco-friendly manner. What makes EParisaraa different is that unlike the backyard handling of e-waste, there is no melting involved in the sorting. Notably, it protects data from discarded PCs and guarantees customers' confidentiality.

- **Earth Sense Recycle Private Limited:** Earth Sense Recycle Private Limited is the joint venture between the E-Parisaraa Private Limited and M/S. GJ Multiclave India Private Limited, which is a bio-medical waste handling and management company. This company came into existence in the year 2000 and they recycle all types of e-wastes including de-bound assets and other electrical and electronic equipment.

- **Trishyiraya Recycling India Pvt. Ltd (TPL):** Trishyiraya Recycling India Pvt. Ltd (TPL) offers safe and reliable disposal of e-waste. The Govt. of India as well as the Pollution Control Board has certified the company. It has constant surveillance mechanisms like CCTV Monitors etc.TPL feels proud of its innovative technology that helps recycle e-waste. Adding feather to its cap is the 'Total Termination Process' that is completely pollution free. There is no contamination of water or air and, no sound pollution either.

- **Plug-in to E-Cycling:** It is a partnership of Environmental Protection Agency (EPA) and consumer electronics manufacturers, retailers, and service providers that offers more opportunities to donate or recycle - to "E-Cycle" used electronics. E-Cycling includes recycling and recovers valuable materials from old electronics which can be used to make new products. It also includes reducing greenhouse gas emission, reducing pollution, saving energy and resources by extracting fewer raw materials from the earth. Safe recycling of outdated electronic items promotes sound management of toxic chemicals such as lead and mercury and helps others.

3.3 Policy Level Initiatives

The policy level initiatives regarding e-waste in India are quite rudimentary and needs immediate attention. Following are some of the policy level initiatives in India regarding e-waste:

I. The Hazardous Wastes (Management and Handling) Amendment Rules, 2003: Under Schedule 3, e-waste is defined as "Waste Electrical and Electronic Equipment including all

components, sub-assemblies and their fractions except batteries falling under these rules". The definition provided here is similar to that of Basal Convention. E-waste is only briefly included in the rules with no detail description.

II. Guidelines for Environmentally Sound Management of E-waste, 2008: This guideline was a Government of India initiative and was approved by Ministry of Environment and Forest Central Pollution Control Board. It classified the e-waste according to its various components and compositions and mainly emphasizes on the management and treatment practices of e-waste. The guideline incorporated concepts such as "Extended Producer Responsibility".

III. The E-waste (Management and Handling) Rules, 2011: This is the very recent initiative and the only attempt in India meant solely for addressing the issues related to e-waste. According to this regulation, 'electrical and electronic equipment means equipment which is dependent on electric currents or electro-magnetic fields to be fully functional and 'e-waste' means waste electrical and electronic equipment, while or in part of rejects from their manufacturing and repair process, which are intended to be discarded. These rules are meant to be applied to every producer, consumer of bulk consumer involved in manufacturing, sale/purchase and processing of electrical and electronic equipment, collection centers, dismantlers and recyclers of e-waste. Responsibilities of producers, collections centres, consumers, dismantlers, recyclers etc. are defined and incorporated in these rules. The E-waste (Management & Handling) Rules, 2011 have been notified with primary objective to channelize the e-waste generated in the country for environmentally sound recycling which is largely controlled by the un-organized sector who are adopting crude practices that results into higher pollution and less recovery, thereby causing wastages of precious resources and damage to environment.

3.4 The Challenges

The challenges of managing e-waste in India are very different from those in other countries, both the developed and developing. No doubt, there can be several shared lessons; the complexity of the e-waste issue in India, given its vast geographical and cultural diversity and economic disparities, makes WEEE management challenges quite unique. A few of these are:

1. Rapidly increasing e-waste volumes, both domestically generated as well as through imports. Imports are often disguised as second-hand computer donations towards bridging the digital divide or dimply as metal scrap.

2. Low level of awareness among manufacturers and consumers of the hazards of incorrect e-waste disposal.

3. No accurate estimates of the quantity of e-waste generated and recycled available in India.

4. Major portion of e-waste is processed by informal (unorganized) sector using rudimentary techniques such as acid leaching and open-air burning, which results in severe environmental damage.

5. E-waste workers have little or no knowledge of toxins in e-waste and are exposed to health hazards.

6. High-risk backyard recycling operations impact vulnerable social groups like women, children and immigrant labourers.

7. Inefficient recycling processes results in substantial losses of material value and resources.

8. Cherry-picking by recyclers who recover precious metals (gold, platinum, silver, copper, etc) and improperly dispose of the rest, posing environmental hazards.

4. Conclusion

Most of the e-waste is recycled in India in unorganized units, which engage significant number of manpower. Recovery of metals from printed circuit boards (PCBs) by primitive means is a most hazardous act. Proper education, awareness and most importantly alternative cost effective technology need to be provided so that better means can be provided to those who earn the livelihood from this. A holistic approach is needed to address the challenges faced by India in e-waste management. The lack of public awareness regarding the disposal of electronic goods and inadequacy of policies to handle the issues related to e-waste enhance the problem in India. In most of the cases, the bulk of e-waste remains unattended in households and public offices. Rarely some sectors like some of the IT companies practice Extended Producer Responsibility or Take Back Policies. Another important factor in Indian context is that although the information technology revolution started in India way back in early 1990s, the first rule exclusively dealing with e-waste came up only recently after almost 20 years in the form of "E-waste (Management and Handling) Rules, 2011". Proper implementation of the "E-waste (Management and Handling) Rules, 2011" is exceedingly essential to address the ever-growing pile of e-waste in the country.

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