

Overview of Ewaste Management Practices and their Legislations in India

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Abstract: term Ewaste is an informal name for electrical and electronic products nearing the end of their life. Computers, televisions, VCRs, stereos, copiers, and fax machines are common electronic products. Ewaste comprises of many useful as well as hazardous substances, these products can be reused, refurbished, or recycled. Electronic products discards is one of the fastest growing segments of our nation's waste stream due to the absence of clear framework for their management and handling. Rapid obsolescence of electronics goods, compounded by dumping from developed countries, has brought the e-waste problem in India to the brink of turning into an acute crisis. The communities that are affected by the toxics in e-waste need not necessarily be those that are creating the waste. The unethical export of e-waste by industrialised nations to developing countries is shifting the onus of development to communities ill-equipped to deal with such waste. A combination of education, legislation and scientific management is required in order to address the Ewaste situation.

Key words : Ewaste, legislations, management

Introduction

Over the last decades the electronics industry has revolutionized the world: electrical and electronic products have become ubiquitous of today's life around the planet. Without these products, modern life would not be possible in industrialized and industrializing countries. These products serve in such areas as medicine, mobility, education, health, food supply, communication, security, environmental protection and culture. To mention a few, devices such as refrigerators, washing machines, mobile phones, personal computers, printers, toys and TVs have made life more simple and comfortable. The amount and choice of appliances put on market every year is increasing

both in industrialized and industrializing countries are immense, giving easy and affordable access to people from all economic sections of society. Due to the ease of availability combined with the affordability the volume of Ewaste generated is very significant and calls for immediate attention from consumers, manufacturers and regulatory bodies. Currently, the available data on e-waste arising is poor and insufficient and estimation techniques are used for extension of known data. Good regulations and guidelines, enforced law are one side of successful tackling of the WEEE problem. On the other side there is the necessity of multi stakeholder cooperation. Treatment processes of e-waste aim at either removing the hazardous items or at separation of as much as possible of the main recyclable materials (e.g. metals, glass and plastics), but achieving both objectives would be most desired. Although very limited information on e-waste treatment capacity in India. Given the very limited data availability on amounts of e-waste collected and treated through "official" e-waste system channels, it is clear that the management of significant proportions of e-waste currently go unreported.

E-waste issues in India

The electronic waste management assumes greater significance in India not only due to the generation of our own waste but also dumping of e-waste particularly computer waste from the developed countries. The digital revolution, which commenced in 1980, continues to the present day and has transformed the way we live, work and communicate. There are a whole range of products, which have become affordable and infiltrated homes and offices. There is also a change also in the way these are utilized by consumers, as it is now easier and more convenient to replace than to repair these products.

The increasing affordability and availability of these products means a gradual penetration into smaller towns which are now recording impressive sales of consumer electronics. The desktop PC and laptop/notebook sales have shown impressive growth in the smaller cities and towns in the last five years, accounting to 68% and 75% of the total sales volume in 2008-09, compared to 45% and 25% in 2003-04. India, with around 500 million mobile users, is now the second largest market in the world after China, and in 2008-09 rural India outpaced urban India in mobile growth rate. According to data available with the Telecom Regulatory Authority of India, 48 million rural consumers took a new mobile connection in the first six months of calendar 2009 compared with just 32 million in the cities, thus taking the mobile penetration in rural India to around 17%. (TRAI)

It has been reported that the total e-waste generated in India amounts to 1,46,180 tons per year. With the major contributions being made by the sixty-five cities in India that generate more than 60% of the total e-waste generated. Speaking state wise ten states generate 70% of the total e-waste India which, includes Maharashtra, Tamil Nadu, Andhra Pradesh, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab. In terms of city wise generation of e-waste, Mumbai ranks first followed by Delhi, Bangalore, Chennai, Kolkata, followed by the rest. In India, increased demand for the key products like PC, TV, and Telephones in last 5-10 year has been responsible for the increasing amount of e-waste generation.

S.No	State	Ewaste generated (Tonnes)
1	Maharashtra	20271.24
2.	Tamil Nadu	13486.33
3.	Andhra Pradesh	12780.24
4	Uttar Pradesh	10381.11
5	West Bengal	10059.36
6	Delhi	9729.15
7	Karnataka	9118.74
8	Gujarat	8994.33
9	Madhya pradesh	7800.62
10	Punjab	7624.32

Table – 1 source Electronics for you, April 2009

India produces almost 400,000 tonnes of e-waste each year, according to an assessment conducted by the Manufacturers' Association of Information Technology (MAIT), an Indian hardware trade organisation. But the larger issue at hand is that only 5 per cent of the country's e-waste is recycled,

while at least 40 per cent of obsolete and unused computers and electronic products languish in homes and warehouses. With newer models of electronics entering the market faster than ever, e-waste is growing in India at an alarming rate. An as much as 1.46 lakh tonne of electrical and electronic waste is generated in the country annually, over 80% from households. Most of this waste is not recycled in an eco-friendly manner. It is often dumped or recycled on the roads. India generated 3,80,000 tonnes of e-waste in 2007. Only 3% of this made it to authorised recycling facilities. E-waste generation in the country is expected to cross the 8,00,000-tonne mark by 2012.

By 2015, two billion PCs are expected to invade our homes and India's mobile subscriber base is expected to touch 450 million. The electronic waste management assumes greater significance in India not only due to the generation of our own waste but also dumping of e-waste particularly computer waste from the developed countries. The growth rate of discarded electronic waste is high in India since it has emerged as an Information Technology giant and due to advances in technology and improved economic status.

We are using electronic products for last 60 years however, there is no proper disposal system followed in our country that has lead to enormous amount of e-waste. There is a need to find proper disposal and recycling technique so that environmental pollution and health hazards can be reduced. A report released by the UNEP predicts that by 2020, e-waste from computers would grow by up to 400% from 2007 levels in China and South Africa. By 2020, India's e-waste from old computers will jump 500% from 2007 levels, whereas South Africa and China will witness a 200-400% rise in computer-related waste, says the report. The rapidly growing mobile telephony in India will take its toll by 2020 when e-waste from discarded phones will grow 18 times from 2007 levels, a period during which China is estimated to see a seven-fold rise in the electronic waste from mobile phones.

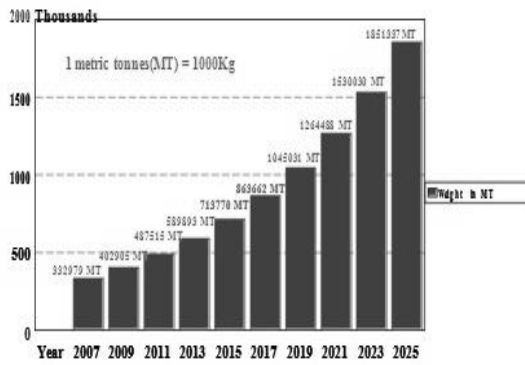


Fig.1: Growth of E-waste in India

India has a large consumer market and a high rate of illegal imports of electronic goods. Recently, India has released the guidelines on E waste management which are significant, but need to be implemented keeping in mind the informal sector that works on recycling. Large proportion of E Waste is generated when computers, televisions, digital cameras, cell phones and other electronic equipment are discarded. The rate of E Waste generation is increasing with rapidly declining costs, constant innovation and obsolescence of technology (leading to faster replacement of equipment), and greater penetration of electronic equipments in the market. A serious concern is the increase in penetration of goods like computers, printers, scanners and fax machines, which are difficult to recycle because of their toxic composition. Today, over 50% of computer sales take place in small town and rural areas, spreading the problem of E-Waste outside the borders of large urban centres. The main sources of electronic waste in India are the government, public and private (industrial) sector discards, which account for almost 70 % of the total waste generation. Households contribute about 15% and the rest is contributed by manufacturers.

It is observed in recent years that large volume of Ewaste is being exported from western countries to Asian countries like China, India, etc. for disposal. It seems the recycling business in western countries is becoming economically non-viable due to rising cost of manpower and availability of input materials for running the plant in full capacity. The western countries are, therefore, compelled to find out alternative destinations for disposal, where the labour cost is comparatively low and the environmental laws are not enforced so strictly. The imported materials are thus reaching through illegal routes in India, China for recycling at small-scale units in non-formal sector. These units use primitive, non-scientific, and non-environment-friendly methods. Ewaste is hazardous in nature due to presence of toxic substances like Pb, Cr6, Hg, Cd and flame retardants (polybrominated

biphenyls and polybrominated diphenylethers etc.). E-waste disposal mixed with solid municipal waste is posing a greater threat for environmental degradation countries like India, where formal recycling technology is not available and non-formal operators are extracting precious metals through crude means for easy money. These processes are harmful to the workers and to the environment, which are the major concern of e-waste management in India.

Appliance	Lifetime in years	Weight(kg)
PC + Monitor	5-8	25
Laptop	5-8	5
Printer	5	8
TV	8	30
Refrigerator	10	45

Table 2: Estimated Weight and Lifespan of EEE

Hazards and Concerns:

The problems associated with electronic waste are being recognized in recent years due to the increased awareness among the academics and the policy makers. E-waste is highly complex to handle due to its composition. A computer contains highly toxic chemicals like lead, cadmium, mercury, beryllium, Brominated Flame Retardants (BFRs), PVC and phosphorus compounds. Currently, less than 10 percent of e-waste produced is reused or recycled. This means that the majority of the e-waste is disposed of in landfills or incinerated, where it can eventually create health problems through human exposure. Some computer manufacturers intentionally design their products for short life cycles and employ materials and processes that hinder recycling efforts with the objective of requiring consumers to purchase new products. Furthermore, in addition to hazardous materials, e-waste contains valuable resources (such as gold, copper, and aluminum) which are lost if the waste is not recycled.

A television or a mobile phone is also loaded with many toxic chemicals. Most of these materials are known to have serious human health concerns and requires to be handled with extreme care in order to avoid any adverse impacts. This warrants the need for appropriate technology for handling and disposal of these chemicals. Though some of these materials are used in small quantities in each computer, the aggregate volumes being recycled are significant and will have serious impacts on environment and human health if not handled with

due safeguards. Many developed countries practice very stringent norms for recycling these products to avoid these adversities.

While India generates this huge volume of waste, almost 90% of the available E-waste continues to be recycled in the informal sector, in the by-lanes of cities and towns. Many of the processes are rudimentary in nature and can be classified as dangerous and toxic. Some of the processes involve burning or direct heating, use of acid baths, mercury amalgamation and other chemical processes to recover materials. These result in the release of toxic materials into the environment through emissions or effluents. The recycling centers are also slowly and gradually shifting as we witness growth of many such centers in smaller towns, thus raising concerns of dispersed contamination. Some of the more toxic and dangerous practices are gradually and increasingly moving to smaller towns to avoid scrutiny by the regulators.

Most workers engaged in these recycling operations are the urban poor and unaware of the hazards associated with it. Traditionally the urban poor have engaged with the trade of waste and recycling, one of the most polluting and unsafe livelihood opportunities for survival. While traders, who only engage in trading such wastes make around 10 to 15% profit, the worker earns a meager 150 to 200 rupees per day and is exposed to the hazards of the processes. E-waste also contains precious metals and many rare materials, which are highly valuable. The recycling operation especially the process of material recovery being rudimentary, results in very low recovery of materials and non-recovery of many rare elements. This loss is significant, making the whole process highly inefficient.

Release of toxins into environment, loss of natural resources due to low recovery of materials, health impact to workers, loss of revenue to state and disproportionate sharing of profits are some of the impacts of current recycling methods in the country. The Government of India has been slow in establishing the legal frame work governing the management of Ewaste in India. In recent years the Government in consultation with other stakeholders has developed the Ewaste management and handling rules which will come into effect from May 2012. The efficacies of these regulations have to be observed over the coming years in order to truly verify their effectiveness.

Legal frame work for Ewaste in India

Internationally the 160-State Basel Convention is the world's most comprehensive environmental agreement on hazardous and other wastes. Governments are expected to minimize the generation of hazardous wastes, treat and dispose of wastes as close as possible to their place of generation and reduce the quantities transported. The proper implementation of the Basel Convention ensures that hazardous e-waste be managed in an environmentally sound manner as it provides the tools for the transparency and traceability of e-wastes destined for recycling or recovery. The development of international resource recycling systems would have to be combined with a mechanism capable of monitoring such systems to ensure their accountability. That could not be achieved, however, without intensified international efforts to help developing countries strengthen their capacity to implement the Convention. Despite a wide range of environmental legislation in India there are no specific laws or guidelines for electronic waste or computer waste (Devi et al., 2004). As per the Hazardous Waste Rules (1989), e-waste is not treated as hazardous unless proved to have higher concentration of certain substances. The Ewaste legislation in India is at a stage of evolution combating the ever growing e-waste problem, India needs to have strong rules and regulations in place. Over the years, the government has instituted a number of regulations for better management of hazardous waste in the country. Some of these regulations are

(i) The Hazardous Wastes (Management and Handling) Rules, 1989/2000/2003: These define hazardous waste as "any waste which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or is likely to cause danger to health or environment, whether alone or when on contact with other wastes or substances." In Schedule 1, waste generated from the electronic industry is considered as hazardous waste. Schedule 3 lists waste of various kinds including electrical and electronic assemblies or scrap containing compounds such as accumulators and other batteries, mercury switches, glass from cathode ray tubes and other activated glass and PCB capacitors, or contaminated with constituents such as cadmium, mercury, lead, polychlorinated biphenyl or from which these have been removed, to an extent that they do not possess any of the constituents mentioned in Schedule 2.

(ii) DGFT (Exim policy 2002-07): Second hand personal computers (PCs)/laptops are not permitted for import under EPCG scheme under the provisions of para 5.1 of the Exim

Policy, even for service providers. Second-hand photocopier machines, air conditioners, diesel generating sets, etc, can also not be imported under EPCG Scheme under the provisions of Para 5.1 of EXIM Policy even if these are less than ten years old.

- (iii) MoEF Guidelines for Management and Handling of Hazardous Wastes, 1991
- (iv) Guidelines for Safe Road Transport of Hazardous Chemicals, 1995
- (v) The Public Liability Act, 1991
- (vi) Batteries (Management and Handling) Rules, 2001
- (vii) The National Environmental Tribunal Act, 1995
- (viii) Bio-Medical Wastes (Management and Handling) Rules, 1998
- (ix) Municipal Solid Wastes (Management and Handling) Rules, 2000 and 2002

Unfortunately, none of these regulations deal directly and specifically with e-waste. This situation requires the enactment of a special law dealing with the nuisance of e-waste. The Ministry of Environment and Forests has notified the Hazardous Wastes (Management, Handling and Trans boundary Movement) Rules, 2008 for proper management and handling of hazardous wastes including e-waste. As per these rules, e-waste generated is required to be sent or sold to authorized and registered recyclers or re-processors. The Guidelines for Environmentally Sound Management of e-waste published by CPCB provide the approach and methodology for environmentally sound management of e-waste. The Ministry of Environment and Forests has published E-waste (Management and Handling) Rules 2011 on 12th May, 2011.

The concept of Extended Producer Responsibility (EPR) has been enshrined in these rules to make EPR a mandatory activity. EPR is an environment protection strategy that makes the producer responsible for the entire life cycle of the product, especially for take back, recycling and final disposal of the product. The Government is implementing a Scheme to encourage setting up of integrated recycling facilities for E-waste on public private partnership mode. As per the Hazardous Wastes (Management, Handling and Trans boundary Movement) Rules, 2008, import of hazardous wastes including e-waste is not permitted from any country to India for disposal. Import of E-waste is permitted only for recycling with the permission of Directorate General of Foreign Trade and the Ministry of Environment and Forests. In case of violation of rules, Customs authorities are required to take legal action, including re-export of the consignment.

Future prospects for Ewaste

With increasing awareness and implementing the legal framework improvements are expected in the handling, recycling, treatment and disposal of Ewaste. There are a few major obstacles remain in managing the e wastes safely and effectively. To mention a few the lack of reliable data that poses a challenge to policy makers wishing to design an e-waste management strategy and to an industry wishing to make rational investment decisions. Only a fraction of the e waste (estimated 10%) finds its way to recyclers due to absence of an efficient take back scheme for consumers. The true potential of Ewaste in terms of recovery of raw materials and the environmental hazards are yet to be thoroughly studied and documented. The lack of a safe e waste recycling infrastructure in the formal sector and thus reliance on the capacities of the informal sector pose severe risks to the environment and human health. The existing e waste recycling systems are purely business-driven that have come about without any government intervention. Any development in these e waste sectors will have to be built on the existing set-up as the waste collection and pre-processing can be handled efficiently by the informal sector, at the same time offer numerous job opportunities.

Solution for Ewaste crisis can be obtained by cooperation from the manufacturers, consumers and the governments by companies removing hazardous substances to make reuse and recycling easier and safer. Stronger regulation and enforcement is required to prevent illegal, and sometimes legal, imports of Ewaste for dumping in India. Creating awareness among the consumers about the recycling and reuse as well as the health and environmental impacts of Ewaste. Producers have to take the initiative of replacing hazardous materials with less hazardous substitutes. Consumers must be educated so that the volume of waste generated can be reduced. Apart from the Government and other stake holders each individual must realise their responsibility towards Ewaste generation. India as a nation has a long way to go in addressing the Ewaste issue within the country.

List of abbreviations

CD	Compact disk
CFC	Chlorofluorocarbon
CRT	Cathode Ray Tube
CPCB	Central Pollution Control Board
EPR	Extended Producer Responsibility
EEE	Electrical and Electronic equipment
IT	Information Technology
LCD	Liquid Crystal Display

PAH polycyclic aromatic hydrocarbon
 PBB polybrominated biphenyl
 PBDE polybrominated diphenyl ether
 PCB polychlorinated biphenyl
 PCDD polychlorinated dibenzo-p-dioxin
 PCDF polychlorinated dibenzofuran
 PHAH polyhalogenated aromatic hydrocarbon
 PVC Poly vinyl chloride
 UNEP United Nations Environment Programme
 WEEE Waste Electrical and Electronic Equipment

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