
E-waste Management: Increasing Concern in India

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ABSTRACT

E-waste is going to be the worst ever problem that the whole world be facing in the following decades. With the rapid growth of industries and telecommunication services, countries are facing a huge volume of e-waste generated due to discarded, obsolete and disposed electronic and electrical equipments. Besides, developing countries such as India, China, and countries in Africa are confronting the heat of e-waste being illegally dumped in these countries from the developed countries such as US and UK, although awareness is increasing. Several organizations are working for and bringing in very innovative ideas to address the issue of e-waste in India.

The paper attempts to present the key issues discussed in ASSOCHAM-KPMG report on e-waste in India. E-waste management and recycling can turn up into an profitable opportunity for many as was discussed in the opportunities, suggestions and industry facts section. Further, some social initiatives, showing increasing concerns towards the problem of e-waste, have also been discussed.

New words: e-waste, awareness, social initiatives, innovative ideas, recycling

INTRODUCTION

Electronic and electrical industry is the world's fastest growing and largest manufacturing industry. India does have what is called E-Waste Management and Handling Rules since May 2012, which laid the onus of recycling on companies along with an extended producer responsibility to ensure their efficient and appropriate collection. But the role of consumers is unclear. Such waste includes discarded computer monitors, motherboards, cathode ray tubes, printed circuit boards, mobile phones and chargers, compact discs, headphones, white goods such as liquid crystal displays, plasma televisions, air conditioners and refrigerators. This is because e-waste can contain toxic substances such as lead, mercury, cadmium, gases and heavy metals, as also non-bio-degradable like plastics, which are threats to both humans and the environment, if not handled properly. Studies show that millions of people in India are involved in scavenging e-waste or in waste management, and because of the exposure to toxic material, 30 percent of their income goes towards medicines with a life expectancy of just 45 years.

The principle of out of sight, out of mind has for a long time been useful in keeping the lid on the negative side-effects of industrialization (Loon, 2002). The global volume of e-waste generated is expected to reach 93.5 million tons in 2016 from 41.5 million tons in 2011 at a compound annual growth rate of 17.6 percent from 2011 to 2016, according to a new report from Markets and markets. According to a new market research report, *Global E-Waste Management Market (2011-2016)*, the total e-waste management market the revenue generated from the e-waste management market is expected to grow from \$9.15 billion in 2011 to \$20.25 billion in 2016 at a rate of 17.22 percent.

Proper disposal of e-waste is important because of hazards posed to health by the materials used in electronics, but almost a third of the disused electronic items are not reaching the authorised e-waste collectors in the capital. With extensive use of electronic equipments, and rapidly dumping them for upgraded ones, e-waste is fast becoming a cause on concern for the environment. Some important e-waste disposal/ processing methods are:

- **Landfilling**- burying into pits-- Is unsafe and poses the threat of chemicals leaching into soil and groundwater and contaminating them
- **Incineration**- mostly open-air burning -- If used unscientifically, the process may release toxic fumes
- **Recycling & reuse** -- Is an eco-friendly method and can help recover valuable metals etc
- **Bio-remediation** -- Productively uses indigenous micro-organisms to detoxify the pollutants -- Includes sub-processes such as 'Bio-sorption', 'Bio-Leaching' etc
- **Phyto-remediation** -- Uses indigenous plants to absorb and degrade pollutants

Given its vast volume, the e-waste processing mostly involves collection from scrap-dealers and then recycling/ dumping in unorganized manner. However, by involving all the shareholders, producers, relevant NGOs, municipal corporations, research institutes- it can be formalized.

Radiation Accident at Mayapuri

This article reports the accidental public radiation exposure in a scrap market in Delhi, India, on March 2010. The source, a gamma unit containing Cobalt-60 pencils, was improperly disposed of by a research institution in violation of national regulations for radiation protection and safety of radioactive sources. The unit was sold off to unsuspecting scrap dealers who dismantled the equipment. This event subsequently caused the most severe radiation accident reported in India to date, resulting in seven radiation injuries and one death. All five patients suffered from the hematological form of the acute radiation syndrome and local cutaneous radiation injury as well. While four patients exposed to doses between 0.6 and 2.8 Gy survived with intensive or supportive treatment, the patient with the highest exposure of 3.1 Gy died due to acute respiratory distress syndrome and multi-organ failure on Day 16 after hospitalization. The incident highlights the current gaps in the knowledge, infrastructure and legislation in handling radioactive materials.

These incidents pose a question mark on existing legal environment with regard to e-waste disposal. Various governmental, non-governmental bodies, considering e-waste a serious threat, are doing research on e-waste generation and its management techniques. One of the key studies is by Associated Chamber of Commerce and Industry in India (ASSOCHAM) and KPMG, one of the largest professional services companies in the world and one of the Big Four auditors, the report of which was released on 25th May, 2016. The key issues discussed in their report have been discussed in section 2.

Summary of Study by ASSOCHAM-KPMG

2.1 Contributors to e-waste generation

India, which has emerged as world's second largest mobile market, is also the fifth largest producer of e-waste, discarding roughly 18.5 lakh metric tonnes of [electronic waste](#) each year and is likely to grow to 5.2 million tonnes by 2020 at the predicted annual compounded growth of 30 percent, says one of its reports with cKinetics, a consultancy on sustainable business based here and in [Palo Alto](#). Mumbai (1,20,000) tops the list in generating e-waste followed by Delhi-NCR (98,000) and Bangalore (92,000). Chennai, Kolkata, Ahmedabad, Hyderabad and Pune find a place in the ladder, at 67,000, 55,000, 36,000, 32,000 and 26,000 metric tonnes per year respectively. But the sad part is a mere 2.5 percent of India's total e-waste gets recycled, attributing it mainly to poor laws and lack of adequate infrastructure. According to a joint study by ASSOCHAM-KPMG, the telecom equipment alone accounts for 12 per cent of the e-waste. The rising level of e-waste generation in India has been a matter of extreme concern in recent years. With more than 100 crore mobile phones in circulation, nearly 25 per cent end up in e-waste annually. Indians become richer and spend more on electronic items and appliances, computer equipment accounts for almost 70% of e-waste material followed by telecommunication equipment (12%), electrical equipment (8%) and medical equipment (7%). Other equipments including household e-scrap, account for the remaining 4%.

According to the report, government, public and private industries contribute more than 70 per cent of e-waste while 15% comes from households. Televisions, refrigerators and washing machines make up the majority of e-waste generated, while computers make up to 20 per cent

and mobile phones 2 per cent.

2.2 Impact on health and environment

E-waste typically includes discarded computer monitors, motherboards, Cathode Ray Tubes (CRT), Printed Circuit Board (PCB), mobile phones and chargers, compact discs, headphones, white goods such as Liquid Crystal Displays (LCD)/ Plasma televisions, air conditioners, refrigerators and so on. Domestic e-waste including computer, TV, mobiles and refrigerators contain over 1,000 toxic material, which contaminate soil and ground water. Exposure can cause headache, irritability, nausea, vomiting and eyes pain. Recyclers may suffer liver, kidney and neurological disorders. E-waste workers in India suffer from breathing problems, such as asthma and bronchitis. Many workers are children, who are unaware of the hazards and by the time they reach 35 to 40 years of age, they are incapable of working. About 2/3s of e-waste workers in India suffer from respiratory ailments like breathing difficulties, irritation, coughing, choking, and tremors problems due to improper safeguards and dismantling workshops. The recovery of metals like gold, platinum, copper and lead uses caustic soda and concentrated acids. Computers, televisions and mobile phones are most dangerous because they have high levels of lead, mercury and cadmium and they have short life-spans, so are discarded more.

2.3 Engagement of child labour in recycling process

In India, about 5 lakhs child labours between the age group of 10-14 are observed to be engaged in various e-waste (electronic waste) activities, without adequate protection and safeguards in various yards and recycling workshops. Informal recycling industry often employs children to dismantle electronic waste. ASSOCHAM's report strongly advocates legislation to prevent a child's entry into this labour market. The chamber has also strongly advocated the need to bring out effective legislation to prevent entry of child labour into its collection, segregation and distribution, reveals the study.

2.4 Problem of informal recycling

The ASSOCHAM-KPMG study said that the unorganised sector in India is estimated to handle around 95 per cent of the e-waste produced in the country, which consists of Kabadiwalas, scrap collectors and rag pickers. It is a matter of concern that most of our e-waste is handled in the most unscientific way by scrap dealers, who may be inadvertently handling radioactive material, as was brought to light in the past in a Mayapuri (west Delhi) case. Informal recyclers use primitive and hazardous methods like acid stripping and open air incineration for processing e-waste. These methods are highly unsafe and cause pollution by releasing toxins from e-waste into the environment. Most of the e-waste ends up with the informal sector because of the lack of regulations and improper collection centers, due to which scrap dealers have doubled in the city. One kilogram of copper scrap is priced at INR 350-INR 400, and one kilogram of aluminum scrap at INR 110-INR 130. Unsafe and crude methods are employed by the informal sector for e-waste recycling.

However, most of these products can be recycled, refurbished and redeployed, going down the value chain and reused by a bit of reconstruction process, reducing overall impact on the environment. The biggest e-waste recycling market in India is Delhi and approximately 30-40 percent of the e-waste in India lands here. Bangalore and Chennai are the next big e-waste

markets. Chennai is the fourth largest e-waste generating city and approximately 5.0 MT of e-waste is generated every day in the Chennai Metropolitan area. Almost 60.0 percent of the e-waste generated in Chennai is desktop computers. Though Chennai has fully functional e-waste recycling units, it is not in proportion to the e-waste generated in the city. Though the e-waste generated in each of the cities might vary, the fact is that approximately 90.0 percent of the waste ends up with the informal sector.

2.5 The CRT problem

Among the heaviest materials showing up at recycling centers are CRT monitors and TVs, which can represent a significant share of the e-waste stream. These dinosaurs from the pre-digital age pose a particular burden, not just because they contain lead, but also because the market for recovered CRT glass has virtually disappeared with the advent of flat-screen technology. Today, there is only one company in India that recycles CRT glass, and the cost of CRT management has doubled as a result.

Manufacturers initially thought the CRT problem would pass through the system in a year or two, but studies have found that people are hanging on to CRT monitors and TVs, using them as coffee tables or giving them to their kids. It is estimated that it will be six or seven years before manufacturers see a drop-off in CRTs. Based on the minimal decline in CRT recycling that ERI has seen over the past 11 years, it will be a minimum of 15 years before the CRT problem eases significantly.

2.6 Extended producers' responsibility (EPR)

The Ministry of environment, forest and climate Change has notified e-waste management rules, 2016 in which producers are for the first time covered under extended producers' responsibility (EPR). EPR means responsibility of any producer of electrical or electronic equipment, for channelization of e-waste to ensure environmentally sound management of such waste. The rules prescribe a waste collection target of 30 per cent waste generated under EPR for the first two years, progressively going up to 70 per cent in the seventh year of the rule. The rules prescribe stringent financial penalties for non-compliance.

Waste Management Industry Facts

The following are some interesting facts regarding waste management industry in India:

- The waste management market in India is expected to reach US\$ 13.62 billion by 2025
- The Government of India has approved a funding of over US\$ 4 billion for rural sanitation
- India's municipal solid waste (MSW) management market is expected to grow at a CAGR of 7.14% by 2025 while e-waste management market is expected to grow at a CAGR of 10.03% during the same period
- India has planned to achieve a capacity of 2.9 million hospital beds by 2025 which will lead to biomedical waste to grow at a CAGR of 8.41%.
- The E-Waste Market in India is forecasted to grow at a CAGR of 26.22 percent over the period 2014-2019

- Over 8 million tons/year of hazardous waste is generated in India; about 60% of these wastes, i.e., 4.8 million tons/year is estimated to be recyclable
- The Indian industrial sector generates an estimated 100 million tons/year of non-hazardous solid wastes
- The total waste quantity generated by the year 2047 is estimated to be about 260 million tons per year. It is estimated that if the waste is not disposed off in a more systematic manner, more than 1,400 km² of land, which is equivalent to the size of the city of Delhi, would be required in the country by the year 2047 for its disposal
- Over 160,000 Metric Tons (MT) of municipal solid waste is generated daily in the country. Per capita waste generation in cities varies from 0.2 kg to 0.6 kg per day depending upon the size of the population. This is estimated to increase at 1.33% annually.
- Recycling each PET bottle conserves energy to light a 60W bulb up to 6 hours & Recycling 1 ton of PET containers saves 6 cubic meters of landfill space

Opportunities

Following are the developmental steps which can turn into opportunities for e-waste managers and collectors:

- The Government of India has approved funding of US\$ 4 billion for rural sanitation
- The Government of India and the World Bank have signed a \$500 million credit agreement to improve piped water supply and sanitation services through decentralized delivery systems in the states of Assam, Bihar, Jharkhand and Uttar Pradesh.
- The Government of India allocated INR 70.6 billion (US\$ 1.2 billion) for Smart Cities in Budget 2014–15 & according to Smart Governance: Investments of about US\$ 1.2 trillion will be required over the next 20 years
- The Indian Ministry of Water Resources plans to invest US\$ 50 billion in the water sector in the coming years
- The Yamuna Action Plan Phase III project in Delhi is approved at an estimated cost of US \$276 million
- The MoUD added that under the Swachh Bharat Mission, about INR 37,000 Cr. (\$5.6 billion) of the project cost of INR 62,009 Cr. (\$9.4 billion) is to be incurred in solid waste management.

Suggestions

There are two reasons for the e-waste problem -- people are not aware about e-waste, and they do not have solutions to this issue. Worse, the waste that is segregated by the informal sector is either dumped or burnt, which is not the right thing to do. It is dumped in dustbins or sold, which is wrong. We should make sure e-waste goes to the right channels -- this is what needs to change. Given the huge user base and vast reach of telecom in India, it is practically difficult and

expensive for the handset manufacturers to achieve the targets prescribed in the rules from first year. Following are a few suggestions for efficiently managing the problem of e-waste:

- Strict implementation of Rules
- More easy to reach E-waste collection centers
- Approval of informal recyclers thereby securing their livelihood
- Training of informal recyclers regarding proper recycling techniques
- Regulations to stop child labor
- Organizing and providing structure to the established informal recycling sector
- Until it is legally bound, e-waste collection will be at low pace and volume. So collection targets should be assigned
- A system of feasible checks is needed and e-waste collection targets must be implemented in a phased manner with lower and practically achievable target limits
- Specific or incentivised targets should be set to encourage e-waste collection from rural sectors
- Recycling should not discourage reuse of electronic and electrical equipments
- Strict ban on e-waste from landfills will drastically raise e-waste collection
- Import of e-waste should be strictly prohibited
- Better awareness and proper implementation of e-waste norms can effectively address the issue
- **Initiatives taken by Governmental, Social and Business Organizations**

With the growing concern towards hazardous effects of e-waste on health and environment, several initiatives have been taken in India by organizations from government, social, business and other sectors. Some important projects are as follows:

6.1 "Take deposit at the time of sale": Initiative by Odisha State Pollution Control Board

Odisha produces about around 8,000 tonnes of electronic waste. But, there is hardly any robust system in place to dismantle and recycle these products. Odisha State Pollution Control Board (OSPCB) has directed producers of electrical and electronic equipments to collect 'end-to-life' electronic items and channelize those to authorized dismantlers or recyclers under Extended Producer Responsibility (EPR).

"The producers of electronic goods have to obtain authorisation from Central Pollution Control Board. The producers will collect e-waste by implementing take back system, e-waste exchange or through Producer Responsibility Organisation engaged by them," OSPCB directed quoting E-waste Management Rules, 2016.

The pollution watchdog said the producers would have to implement Deposit Refund Scheme – charging of additional amount as a deposit at the time of sale of the electrical and electronic

equipment and returns it to the consumer along with interest when the end-of-life electrical and electronic equipment is returned - for effective collection of e-waste through their dealers.

The bulk consumers of electronic equipment such as central government, State government departments, public sector undertakings, banks, educational institutions, multinational organizations, international agencies, partnership and public or private companies and healthcare facilities, which have turnover of more than Rs. 1 crore or have more than 20 employees, will ensure that the e-waste generated by them is channelized through authorised dealer. Bulk consumers would maintain records of e-waste generation and submit annual return to the OSPCB before June 30.

E-waste collection turns a noble mission

E-waste, considered a menace to the nature and society alike, may soon assume life-saving qualities if a novel project introduced by Piravom municipality gets adopted across the Kerala State. The project, which aims at utilising the proceeds from the sale of e-waste for charity, has impressed the Clean Kerala Company (CKC) that it is all set to place a proposal before the Local Self-Government Department recommending it as a model project worth implementing across the state.

The CKC, a government-promoted company engaged in the collection and disposal of e-waste, has been buying e-waste from educational institutions at a special rate of Rs.25 per kilogram, the proceeds from which are being used by individual institutions for purposes of their choice. The company decided to bring together 22 schools within their limits and club together their revenue for the larger good of the humanity. Jose K. Mani, MP, inaugurated the project on 4th July, 2016 and Kabeer B. Haroon, managing director of CKC, received e-waste as token from the leader of St. Joseph's School. The immediate proceeds would go to a ninth standard student who needs kidney transplantation, a 32-year-old mother of three who needs liver transplantation, a cancer patient and a 30-year-old woman casual labourer in need for a major surgery after suffering a fall; all of whom are from very poor families.

If it is assumed that every household had at least an unused television, which weighs about 40 kilogram, a school with 500 students would account for 2,000 kilogram of e-waste not to mention the many useless mobile phones, refrigerators, CFLs and much more.

'E-waste Mukh Bharat: Swachh Bharat' Movement

Eco Recycling Limited or Ecoreco, an e-waste management company, launched a social drive named 'E-waste Mukh Bharat: Swachh Bharat' on October 2, 2015. As a part of the initiative, Ecoreco plans to set up 100,000 e-waste collection bins or Eco-Bins in schools, colleges and religious places such as temples, churches, masjids and gurudwaras. It also proposes to establish 5,000 take-back points or collection centers across India to collect the waste from these bins. Some of the public sector units such as ONGC, BPCL and HPCL have joined the movement to free India from e-waste.

As the next step, Ecoreco has announced a programme named 'Ecoreco-Enviro-Education' to train about 3,00,000 Kabadiwalas within 10 years to equip them with the knowledge of systematic handling of e-waste to safeguard their health and environment. It proposes to utilize the value recovered from recycling of the e-waste collected through the bins for this purpose,

and eventually integrate them with the organized sector.

The E-Waste: From Toxic to Green initiative

[Chintan](#), an Indian NGO, in cooperation with Delhi's Pollution Control Committee and the city's Department of Environment, created a partnership with Safai Sena, a registered association of waste pickers to improve collection, segregation and storage of e-waste. They then joined forces with companies in India that safely recover metals and plastics from e-waste.



1: Training

Generation Collection

Segregation Recycling

The initiative trains waste pickers to collect e-waste using safe e-waste handling practices to reduce their exposure to dangerous toxins. After it is collected, the e-waste is safely stored at Chintan's authorized collection center and sent to recyclers for safe disposal/recycling. By diverting about 17 tonnes of e-waste to recycling centers each year, this project is reducing greenhouse gas emissions. In addition, the waste pickers collect e-waste in non-motorized vehicles. This means collection and transportation of e-waste is emission-free. This Delhi-based NGO, Chintan Environmental Research and Action Group, recently received the 2015 United Nations Momentum for Change Award, in the Urban Poor category. The award was for its initiative to train waste pickers to safely collect and dispose of electronic waste.

In Delhi alone, more than 25,000 people earn a living from e-waste handling, collection, dismantling and metal extraction. The initiative also negotiates for the best rates from recycling companies for e-waste, so that waste pickers can earn more money. This has increased their incomes by 10-30%. Many countries, such as Nepal, Bangladesh, Thailand and Ghana, also produce a considerable amount of e-waste and are also served by waste pickers for waste handling. Therefore, there is a huge potential not only to give these waste pickers sustainable livelihood but also work towards generating more awareness on better e-waste practices.

The E-Waste: From Toxic to Green initiative can serve as a model to help other countries recycle e-waste and fight poverty. As Chintan's model of handling e-waste is highly replicable due to its low cost, it can be adopted by other cities and countries where e-waste involves significant risk to workers, communities and the environment.

Stricter rules

The Union Ministry of Environment has announced stricter rules on the management of e-waste that encumbers producers of electronic goods to collect a percentage of their annual sales as e-waste. The main sources of e-waste are the government, public and private sectors. The new rules, which are expected to come into effect later this year i.e. 2016, will require companies to ensure that in the next two years they recover at least 30% of their electronic produce. By 2022 they will be expected to recover 70% of their e-produce.

Advanced recycling fund

Recyclers are hoping that a scheme called Advanced Recycling Fund can solve the problem of improving e-waste collection. Under this initiative, consumers pay a surcharge for buying electronic goods and are reimbursed when they return the product to a licenced seller. This is

the practice in the US and Europe and has proven to work well, so it should work well here too.

Independent organisations say that producers must do more to address the problem of e-waste. Rather than hoping that informal recyclers become formal, it would be more feasible for companies to design programmes that can establish tie-ups and ensure that e-waste only makes its way to formal recyclers.

Conclusion

E waste management provides benefits such as job creation, improved technological knowledge, and environmental benefits. In developing countries, job creation also helps in alleviation of poverty and improved health conditions. Without safe recycling facilities widely available, developing countries such as India, China, and countries in Africa are facing the heat of the e-waste being illegally dumped in these countries from the developed countries such as US and UK, although [awareness is increasing](#). Several organizations are working for and bringing in very innovative ideas to address the issue of e-waste in India.