

# Review on Current Practices for E-Waste Management and Need for Environment Friendly Technologies

Dipal Parsania

Lecturer, Department of Environmental Engineering, Shree K. J. Polytechnic, Bharuch, Gujarat, India

**ABSTRACT:** India is emerging as one of the world's major electronic waste generators, posing grave concerns to public health and environment. As per recent study conducted by ASSOCHAM-KPMG; India has emerged as world's fifth largest electronic waste producer. Nearly 95 per cent of e-waste generated is managed by the unorganised sector and scrap dealers in this market. E-waste recycling is a concept barely existent in India. As a result, the waste generated is often dumped in water bodies or dump yards without proper recycling or treatment. E-waste contains hazardous substances that, if treated inappropriately at the end of life can affect adversely human health and environment. This is hazardous on various levels for both the environment and personal health. Much of the e-waste generated is recyclable. E-wastes such as computer monitors and printed circuit boards have number of base metals and precious metals which can be recovered for further beneficial use. Unfortunately only 1.5 per cent of e-waste generated in India gets recycled. This can be attributed to nearly zero awareness about e-waste and its recycling, as well as the fragmented nature of the unorganised sector and its apathy to waste collection and recycling. This study focuses on the concern of raising level of e-waste and its harmful effects on human health and environment along with the possible ways of recovery of useful ingredients from e-waste in environmentally safe manner.

**KEYWORDS:** WEEE, Bio-leaching, Precious metals, Recovery

## I. INTRODUCTION

The term E-waste is an abbreviation of "Electronic Waste". It can be interchangeably used with the word WEEE (Waste Electronic and Electrical Equipments). E-Waste is the term used to cover items of all types of unwanted, not working and obsolete Electrical and Electronic Equipments and its parts with circuitry or electrical components with power supply that have been discarded by the owner as waste without the intension of reuse. Most electronics that are improperly thrown away contain some form of harmful materials such as beryllium, cadmium, mercury & lead. It also contains complex valuable materials such as precious metals which need to be treated properly to effectively recover them with minimal environmental effect. The demand and use of these electronic products has been grown up with rapid rated in last few decades and creates piles of E-waste at the end of useful life. Due to irresistible demand of electronic items; we need to look forward for its eco friendly disposal methods. Electrical and Electronic equipment contains Printed circuit boards (PCBs) that have metallic and non-metallic elements, alloys and compounds such as Copper, Aluminium, Gold, Silver, Palladium, Platinum, Nickel, Tin, Lead, Iron, Sulphur, Phosphorous, Arsenic etc. If discarded in the open, these metals can cause a severe environmental and health hazard. PCBs contain high amounts of precious metals; about 20wt% copper, 0.04 wt% gold, 0.15 wt% silver, and 0.01 wt % palladium.[2] The extraction of these metals from PCBs is both profitable and environmentally worthwhile. Recycling of waste electric and electronic equipment is important not only to reduce the amount of waste requiring treatment, but also to promote the recovery of valuable materials. India discards roughly 18.5 lack Metric tonnes annually and According to this study, computers contributed towards 70 per cent of the total e-waste generated in India, while telecommunication equipments alone accounts for 12 % of total e-waste produced.

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor & UGC Approved Journal)

Website: [www.ijirset.com](http://www.ijirset.com)

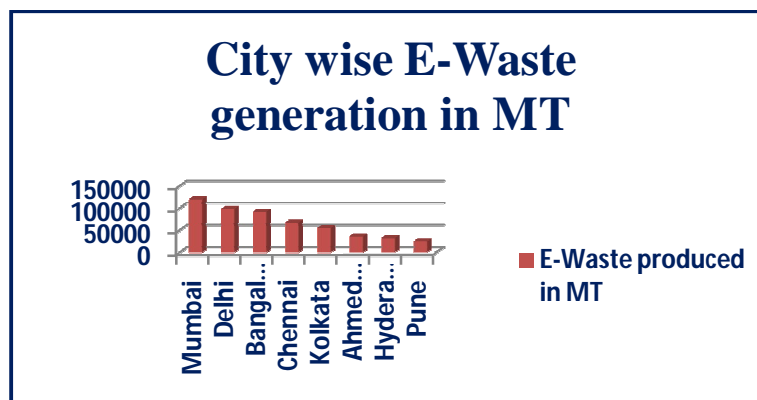
Vol. 6, Issue 8, August 2017

## II. WASTE GENERATION:

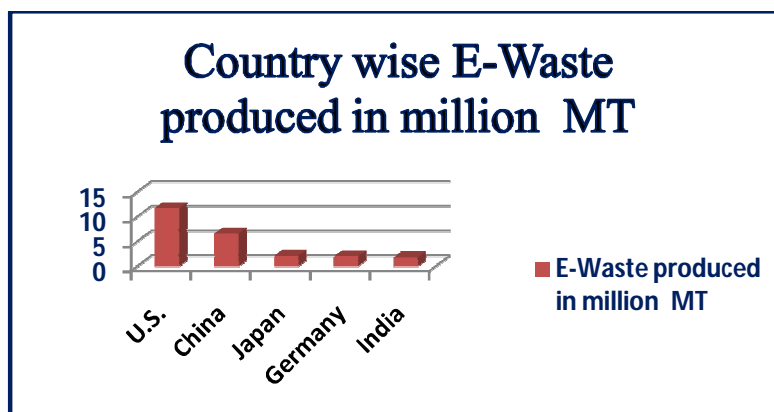
One recent study conducted by the ASSOCHAM has highlighted the top e-waste producing cities in India based on annual e-waste generation in which Mumbai is on the first rank with 1,20,000 MT annual e-waste production followed by Delhi and Bangalore with the contribution of 98,000 MT and 92,000 MT of e-waste per year respectively. Apart from the top three e-waste producers, the study also highlighted the five more cities among the top producers of e-waste which is listed as follows:

**Table:1 Top waste generating cities of India**

Sr. No.	Name of City	Annual waste generation in MT
1	Mumbai	1,20,000
2	Delhi	98,000
3	Kolkata	92,000
4	Chennai	67,000
5	Kolkata	55,000
6	Ahmedabad	36,000
7	Hyderabad	32,000
8	Pune	25,000



**Fig:1 city wise waste generation in MT**



**Fig:2 Top five E-waste generating countries**

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor & UGC Approved Journal)

Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 8, August 2017

### III. COMPOSITION OF E-WASTE IN INDIA:

Computer equipment accounts for almost 70% of e-waste material followed by telecommunication equipment (12%), electrical equipment (8%) and medical equipment (7%). Other equipment, including household e-crap account for the remaining 3%, it said.

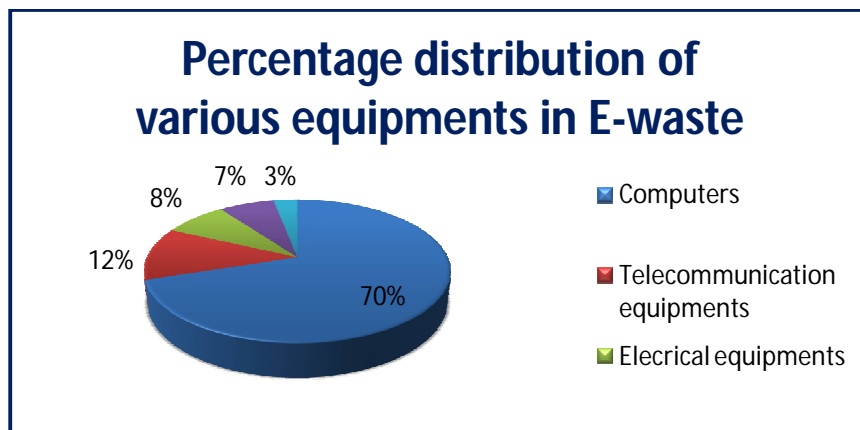


Fig:3 Percentage distribution of various electric equipments in E-waste

### IV. MANAGEMENT OF E-WASTES- CURRENT PRACTICES

As per the general waste management hierarchy the e-waste materials are also collected, transported, disposed or possibly processed and recycled with the view to reducing their negative impacts on health, the environment or aesthetics.

Table:2 Various methods of e-waste management [1]

Sr. No.	E-waste management practices	Description
1	<b>Disposal to Landfill</b>	This is one of the most widely used methods for e-waste disposal, in which e-waste is buried. Mining voids or borrow pits can be used in land filling. However, this has the disadvantages of uncontrolled fires which can release toxic fumes and also that toxic components of e-waste may contaminate ground water and pollute the environment.
2	<b>Incineration</b>	In this process waste materials are incinerated at high temperatures to reduce the waste volume and to utilise the energy content of combustible materials. This method is not reliable as this method results in pollution.
3	<b>Re-use</b>	The entire equipment or its working part is put into second hand use or use after modifications. By this way also we can reduce the volume of e-waste generation.
4	<b>Avoid and Reduce</b>	It is the first step in integrated waste management hierarchy where the waste is prevented from being created. That is why it can reduce the cost associated waste management and helps in resources conservation.
5	<b>Export to Developing Countries</b>	This has been a routine that developed countries export their e-waste to developing countries like China, India and

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor & UGC Approved Journal)

Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 8, August 2017

		Nigeria and these countries have gradually become their e-waste dump sites due to lack of legislative framework regarding E-waste. The exporting countries carry out their illegal business because they find it as less expensive option.
6	<b>Export to Developing Countries</b>	Recycling is the process of extracting valuable resources from e-waste. Here the equipment is dismantled and the valuable components are recovered and are used for manufacturing new products. At present recycling of e-waste is carried out by both formal and informal sectors. Informal recycling is found more in developing countries and usually involves large workforce requiring manual operation and intensive labour. Though it is a profitable method, is not advisable as it is lack of skills and technologies to manage e-waste in an environmentally friendly manner for optimum resource recovery.

## V. VARIOUS METHODS OF PRECIOUS METAL RECOVERY

There are three main processes for recovery of precious metals from electronic waste as given below:

1. Pyrometallurgical processing
2. Hydrometallurgical processing
3. Bio-Metallurgical processing.

**Pyrometallurgical** processing as a traditional technology for recovery of precious metals from waste electronic equipment

**Hydrometallurgical** processing techniques including cyanide leaching, halide leaching, thiourea leaching, and thiosulfate leaching of precious metals. Based on a critical comparison of various leaching methods from the points of view economic feasibility and environmental impact, it is concluded that leaching of gold by thiourea may be the most realistic substitute. Biotechnology is the most promising environment friendly. Process is techno-economically feasible for amount of gold exceeding the limit value of 500ppm. In addition; presented hydrometallurgical technology will allow the production of material with purity suitable for commercial use. The recovery of the metals varies with the leaching conditions such as leaching period, temperature, stirring rate, etc. [6,5]

**Bio Leaching** is cheaper and easier in comparison to pyro and hydrometallurgical processes. Bioleaching technology is the most promising environment friendly. Its advantage is flexibility of microorganisms to easily adapt to changing and extreme living conditions. Microbiological leaching process uses a natural ability of microorganisms to transform metals present in the waste in a solid form to a dissolved form. Besides the possibility of bioleaching of metals in alkaline environment involving cyanogenic bacteria, acidophilus microorganisms and conducting biological process of leaching in an acidic environment are equally important techniques. [3,5]

It requires 1 ton of rock to obtain 3 grams of gold from mines. E- Waste is scrap is an “urban mine” that is significantly richer in gold than the sources of the primary ores. According to the EPA, “Experts estimate that recycling 1 million cell phones can recover about 24 kg (50 lb) of gold, 250 kg (550 lb) of silver, 9 kg (20 lb) of palladium, and more than 9,000 kg (20,000 lb) of copper.”

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor & UGC Approved Journal)

Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 8, August 2017

## VI. LEGISLATIVE FRAMEWORK FOR E-WASTE IN INDIA

India, have brought out guidelines for environmentally sound management of E-waste, and Mercury Management in Fluorescent Lamp Sector. Ministry of Environment Forest and Climate change has notified E-waste management rules 2016, in which the producers are for the first time covered under extended producer's responsibility (EPR). The rules prescribe a waste collection target of 30 percent waste generated under EPR for the first two years, progressively going up to 70 percent in the seventh year of the rule.

## VII. CONCLUSION

One of the best ways to reduce the e-waste generation and its adverse environmental and human health impact is to raise the public awareness towards management of scrap electric and electronic equipment in eco-friendly manner while optimum recovery of useful materials from e-waste. This will create the win-win situation as the environment can be protected from unfavourable impacts of informal sectors handling e-waste and the precious metals along with other base metals can be recovered at its optimum level with environment friendly technology. There are many ways to involve users of electronic equipments in this innovative approach like by providing sufficient knowledge and make them aware to through media, newspapers, provide incentive offers etc.

## REFERENCES

- [1] I.N. Onyeje, P.I. Okwu "Extraction of Valuable Substances from E-Waste", American Journal of Engineering Research (AJER), p- ISSN : 2320-0936, 2014
- [2] Amil Memon, Dr. Jayeshkumar pitoda, Prof. Reshma L. Patel "The Recovery of Precious and Base Metals from E-Waste: A Review", International Journal of Constructive Research in Civil Engineering (IJCRCE), ISSN 2454-8693, 2016
- [3] A. V. Kavitha , "Extraction of precious metals from e-waste", Journal of Chemical and Pharmaceutical Sciences, ISSN: 0974-2115, 2014
- [4] Jennifer Namias "The future of electronic waste recycling in the united states: obstacles and domestic solutions" July 2013
- [5] Jaising Gadekar "Extraction of gold and other precious metals from E-waste", IJPPR ISSN 2349-7203
- [6] Zaid Ahamd "Extraction of Precious Metal "GOLD" from Electronic Waste by Chemical Leaching Method", Research Gate, 283147759