

## E-Waste And Its Management: A Review

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### ABSTRACT

E-Waste is an abbreviation of electronic waste which refers to the hazardous waste created when electronic products or components like mobile phones, electronic circuits, pc, electronic gadgets, batteries etc are discarded. In day today life we rely completely on electronic products. Increase in the growth of information and technology, various sectors has increased the usage of the electronic equipment. E-waste is created everyday all over the world. These products usually have a limited life span, thereafter creating huge hazardous waste having detrimental effect on both man and environment. E-waste contain several different substances and chemicals, majority of which are toxic and are likely to create hazardous impact on health and surrounding. Management of E-waste is quite risky involves significant risk to health hazards of workers and other people involved in this process. As these contain toxic chemical and substances, precautionary measures must be taken to avoid exposure in the whole management process. Incineration and land filling are two widely used techniques for disposal of these wastes. There is a risk associated with a leakage of heavy metals from incineration and land filling. To overcome from this burning environmental issue, we must use best environmental practices which include reuse, recycling etc. policy like "buy back policy" plays an important role to reduce the generation of E-waste in various sectors. This paper provides the basic information about the electronic waste, its component, some sound environmental practices to overcome from this problem and potential of generation of E-waste in India. Keywords: E-waste, land filling, incineration, hazards etc

### INTRODUCTION

Electronic waste or E-waste is term used for electronic products that have became unwanted, non working and have reached the limit of their use. Due to increase in recent trends in science and technology, many electronic devices became a waste after a few years of use. E-waste or electronic waste is created when an electronic product, gadgets etc are discarded after the end of its useful life. Electronic waste may also be defined as discarded electronic circuits, offline electronic equipment, electronics, mobile phones, television sets and refrigerators. By 2017, the total global volume of discarded refrigerators, cell phones, batteries, electronic circuits, computers, monitors, and other electronic waste will weigh almost as much as 200 empire state buildings, as per new report. The forecast, based on data gathered by united nation organization, government , non-government and science organization in partnership known as "solving the E-waste problem" initiate, predicts e-waste generation will swell by third in the next five years, led by the united states and china.



## SOURCES OF E-WASTE

E-waste are generated from

1. formal sector
2. informal sector

Formal sector includes

- importers
- producers
- retailers
- consumers
- traders
- scrap dealers.

Informal sector includes

- Dismantlers
- Smelters
- Recyclers

All these sectors are involved in the generation of E-waste

## MATERIAL FOUND IN E-WASTE

There are various hazardous and non hazardous material are present in e waste, however their concentration is variable. These materials are categorized into following six categories.

1. Iron and steel.
2. Non ferrous metals.
3. Aluminium
4. Glass.
5. Plastics.
6. Electronic components.
7. Others (rubber, wood, ceramic)

## COMPOSITION

- Ferrous metal=53.3%
- Non-ferrous metal=8.4%



- Glass=15%
- Plastic=23.3%
- Electronic components=0.7%
- Others=17.3%

### HAZARDOUS CONSITUENT OF E- WASTE

E-waste contains various hazardous substances. These substances have the capacity to cause serious damage to living and non living components of the environment. Because of its components, it is complex to handle. It is comprises of number of components some of which contain toxic substances that have dreadful impact on human and environment. Basel convention characterizes E-waste as hazardous when they contain and contaminated with mercury, lead, cadmium, polychlorinated biphenyls (PCB) etc and precious metal ash from cathode ray tubes, LCD screens and other activated glasses are classified as hazardous wastes.

Effect of some hazardous waste components in E-waste are:

S.No.	Hazardous components	Effects
1.	Arsenic	Arsenic can affect the skin and can decrease nerve conduction velocity .long exposure to arsenic ultimately cause lung cancer and sometime proved to be fatal
2.	Lead	It is a natural occurring metal widely used in everything from construction materials to batteries. It has the ability to cause serious health problems, especially in young kids. Can affect kidneys, reproductive systems, nervous connections.
3	Barium	Usually affects cardiac muscles
4	Chromium	Can damage to vital organs like liver, kidneys and may cause asthmatic bronchitis and lung cancer.
5	Beryllium	May cause lung diseases
6	Mercury	Potential to affects the central nervous systems, kidney, immune system, may cause liver or brain damage.
8	Cadmium	Degrades the bones and can cause pain to joint muscles
9	Brominated flame retardants (BFR)	Cause hormonal disorder in humans and have the capacity to affect reproductive system
10	CFCs	These are one of the ozone layer depleting substances and can cause skin cancer in animals.
11	Polychlorinated	can affect human immune system and can cause cancer. They have



	biphenyls( PCB)	potential to pollute environment.
12	Polyvinyl chloride (PVC)	Can damage respiratory organ.
13	Dioxin	These are highly toxic to animals and can lead to malfunction of foetus, decreased reproduction and affect immune system

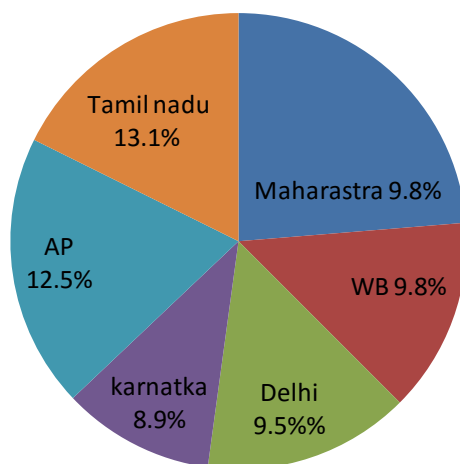
## E-WASTE GENERATION IN INDIA

India which has ranked the world's second largest mobile market, and also the fifth largest producer of E-waste, discarding roughly about 18.5 lakh tones of electronic waste every year, a study by ASSOCHAM –KPMG said. The rising levels of E-waste generation in India have been a matter of concern in recent years. There are about or more than 100 crore mobile phones in circulation, nearly 25% end up in e-waste annually, There are 10 states in India that contribute to 70% of the total E- waste generated in the country. 65 cities generate more than 60 -65% of the total E-waste in India. Among the top ten cities generating E-waste, Mumbai ranks first followed by Delhi, Bengaluru, Chennai, Kolkata, Ahmedabad, Hyderabad, Pune, Surat and Nagpur. A report of the United Nations predicted that by 2020, E-waste from old computers would jump by 400% on 2007 levels in China and 500% in India. Also E-waste from discarded mobile phones would be about seven times higher than 2007 levels in China and in India 18 times higher by 2020.

## STATE AND CITY WISE ELECTRONIC WASTE GENERATION IN INDIA



### state wise generation of E-waste



### City wise generation of E waste in India

S.NO.	Cities	%
1	Mumbai	24.8%
2	Kolkatta	8.8%
3	Chennai	9.0%
4	Bengaluru	10%
5	Nagpur	3.9%
6	Surat	4.0%
7	Pune	5.6%
8	Hyderabad	6.2%

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## MANAGEMENT OF E-WASTE

### Existing regulations:

1. Ministry of environment and forests' E-waste management and handling rule 2011(notified on 12<sup>th</sup> may 2011 and effective from 01-05-2012,)

The E-waste (Management and handling) rules 2011 by MoEF was notified with a primary objective to channelize the e- waste generated in the country for environmentally sound recycling. For implementation of the provisions of the rules, a guidance document was framed to help producers, consumers, collection centres , dismantlers , recyclers, and regulatory agencies for effective compliance.

2. Guidelines on implementation of E-waste rules 2011 issued by central pollution control board, Delhi ministry of environment and forest government of India central pollution control board.
3. Department of telecommunication notification date 25<sup>th</sup> January 2012, to the manufacturers of mobile phones instrument to follow e- waste management and handling rule 2011 notified by ministry of environment and forests on 12<sup>th</sup> may 2011 while manufacturing / distributing phones as per TRAI recommendation.
4. Environment /climate change -2012 (January to December 2012) human rights documentation India social institute, lodhi road, new Delhi, India as a collection of previously published news and views from the print as well as the electronic media, whose reference marked at the end of each news item.
5. Ministry of environment and forests, govt. of India implementation of national clean energy fund project on remediation of hazardous waste contaminated sites in the country: The project has been envisaged for remediation of 12 priority contaminated sites across the country and has been designed to provide a detailed site investigated, design of appropriate engineering solution for remediation and also to implement actual remediation of those contaminated sites. To realize the objective, the project has been envisaged in two phase i.e. preparation of detailed project report (DPR) for remediation and also to implement actual remediation of those contaminated sites.

### E-WASTE (MANAGEMENT) RULES, 2016

1. Manufacturer, dealer, refurbisher and producer responsibility organization have been introduced as additional stakeholders in the rules.



2. CFL and other mercury containing lamp brought under the purview.
3. Provision for plan India EPR authorization by CPCB has been introduced.
4. Option has been given for setting up of PRO, e-waste exchanger, e- retailer, deposit refund scheme as additional channel for implementation of EPR by producers to ensure efficient channelization of e-waste.

### **E-WASTE (MANAGEMENT) AMENDMENT rules, 2018**

The E-waste management collection targets under EPR have been revised and will be applicable from 1 October 2017

The quantity of E waste collected by producers from the 1 October 2016 to 30 September 2017 shall be accounted for in the revised EPR targets until March 2018.

Separate E waste collection targets have been drafted for new producers, i.e. those producers whose number of years of sales operation is less than the average lives of their products. The average lives of the products will be as per the guidelines issued by CPCB from time to time.

Producers responsibility organizations shall apply to the central pollution control board for registration to undertake activities prescribed in the rules.

Under the reduction of hazardous substances, cost for sampling and testing shall be borne by the government for conducting the (RoHS) test

### **Management techniques**

E-waste is very harmful for human as well as for environment. These wastes can cause mutation in genes and thus have the capacity to cause cancer and many genetic diseases. Therefore best environmental practices needs to be done for managing of these wastes and to cleanup of environment. Following techniques are currently used for decontamination of environment from E-waste.

**Land filing:** it is one of the most widely used methods for disposal of E-waste. In land filling trenches are made in the on the surfaces. Soil is dragged out from the trenches and waste material is buried in it, this is then covered by a thick layer of soil. The materials under it start degrading after some time. The degradation process in landfills is very complex and often runs over a wide time span.

**Incineration:** it is a controlled and complete combustion process, in which waste material is burned in specially designed incinerators at very high temperature. The main advantage of incineration of E-waste is that, it reduces the volume of the waste and utilize of energy content of combustible material.

### **BIOREMEDIATION APROACHES FOR E-WASTE**



Bioremediation is a general concept that includes all those processes and actions that take place in order to transform the environment which is altered by contaminants. In bioremediation process we use microorganisms to treat waste. Thermal methods are not successful alone however biological techniques can increase the removal efficiency. There are numerous examples of employing bioremediation against various pollutants.

Various microbial processes are applied to mobilize metals from electronic waste materials. Bacteria *Thiobacillus*, *Thiooxidants*, *J. ferrooxidants* and fungi *Aspergillus niger*, *Penicillium simplicissimum*, were grown in the presence of electronic scrap. The formation of inorganic and organic acids caused the mobilization of metals and hence helps in removing them from environment.

## CONCLUSION

The article summarizes that E-waste contains number of hazardous substance. These substances have capacity to harm both man and environment. There is a gradual increase of E-waste across the globe. In India, the amount of E-waste generated is rising rapidly. The management of the E-waste is major challenged faced by the country. There is no large scale organized E-waste recycling facility in India. Moreover, the management practices are not well designed and have a lot of health and environmental impacts. Due to lack of awareness regarding the disposal of E-waste, some people discard E-waste with regular municipal waste which is an extremely hazardous practice. A scientific approach is needed to address the challenges faced by India in E-waste management. Using biological techniques, the recovery efficiency is increased where as thermal and other methods are less successful. There is a need to focus on bioremediation method. These methods can improve scenario of current treatment practices available for E-waste. Besides these management practices, there is need of doing more research on eco friendly and sound environmental techniques which can be used for the treatment of E-waste.

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