



## **ELECTRONIC WASTE CAUSING HAZARD TO HUMAN HEALTH AND ENVIRONMENT**

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### **ABSTRACT**

*E- waste comprises of a broad and growing range of electronic devices, ranging from large household devices such as refrigerators, air conditioners, cell phones, personal stereos, and consumer electronics to computers which have been discarded by their users. Electronic waste is one of the fastest growing problems worldwide and also in India. The presence of a variety of toxic substances from E- waste which can contaminate the environment and threaten human health, if disposal protocols are not meticulously managed. The rapid growth in ICT has led to an improvement in the capacity of computers but simultaneously to a decrease in the products lifetime as a result of which increasingly large quantities of waste electrical and electronic equipment (e-waste) are generated annually. This review article provides an overview of India's current e-waste scenario, magnitude of the problem, environmental and health hazards.*

**Key words:** E-waste, health hazard, recycling

### **1 INTRODUCTION**

Electronic waste or e-waste, according to the WEEE directive of the European Commission is defined as waste material consisting of any broken or unwanted electronic appliance. Electronic waste includes computers, entertainment electronics, mobile phones and other electronic items that have been discarded by their original users. 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.[1] Tones of electronic

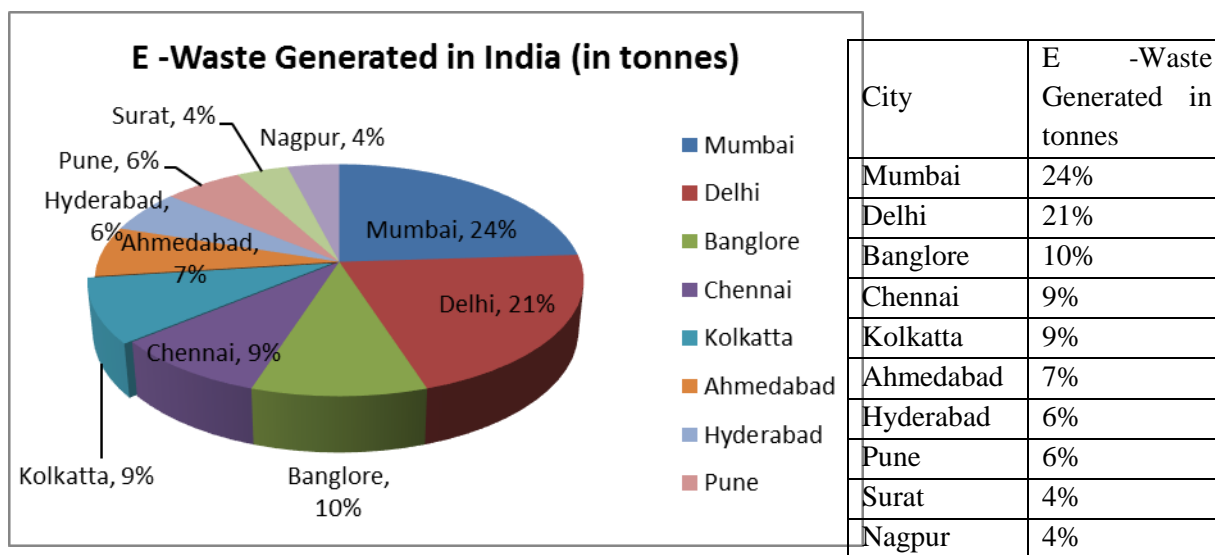
items are shipped over oceans every year. However, after their usage time they become a complex waste matter. It is found that the major contributions of E- waste in environmental pollution .With the presence of deadly chemicals and toxic substances in the electronic gadgets, disposal of E-Waste is becoming an environmental and health nightmare. Globally only 15-20 percent of E-Waste is recycled while the rest is dumped into developing countries such as India, China and Nigeria.

## 2. Classification of E-waste:

E-Waste can be classified as

- Temperature exchange equipments such as cooling and freezing equipment ( Refrigerators, freezers, air conditioners, heat pumps)
- Screens, monitors (television monitors, laptops, notebooks, and tablet)
- Lamps such as straight fluorescent lamp, compact fluorescent lamp and LED lamps etc.
- Large equipment such as washing machines, clothes dryers, dish washing machines, electric stoves, large printing machines, copying equipments and photovoltaic panels.
- Small equipment comprises of vacuum cleaners, microwaves, ventilation equipment, toasters, coffee machines, electric kettles and electric shavers, clocks, watches, hair dryer
- Small IT and telecommunication equipment. For example, mobile phones, GPS, pocket calculators, and routers etc.
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## 3. E-waste generation in India:



Source: Rajya Sabha 2011

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## 4. Environmental and health hazards:

Disposal of e - waste is particular problem faced in many regions across the globe. Computer wastes that are land filled produce contaminated leachates which eventually pollute the ground water. Acids and sludge obtained from melting computer chips if disposed on the ground causes acidification of soil. If these electronic items are discarded with other household garbage, the toxics pose a threat to both health and vital components of the ecosystem.

| Pollutant                  | Use/occurrence   | Danger  |
|----------------------------|--|---|
| Arsenic                    | Semiconductors, diodes, microwaves, LEDs (light emitting diodes), solar cells                              | Chronic exposure to arsenic can lead to various diseases of the skin and decrease nerve conduction velocity. Chronic exposure to arsenic can also cause lung cancer and can often be fatal  |
| Barium                     | Electron tubes, filler for plastic and rubber, lubricant additives   | Short term exposure to barium could lead to brain swelling, muscle weakness, damage to heart, liver and spleen. Animal studies reveal increased blood pressure and changes in the heart from ingesting barium over a long period of time. |
| Beryllium                  | Switch board and printed circuit board   | Carcinogenic, Chronic Beryllium Diseases (berylliosis), a disease which primarily affects the lungs. Exposure to beryllium also causes a form of skin disease that is characterized by poor wound healing and wart-like bumps             |
| Brominated flame retardant | Casing, circuit boards (plastic), cables, PVC cables,  | Combustion of halogenated case material and printed wiring boards at lower temperatures releases toxic emissions including dioxins which can lead to severe hormonal disorders  |
| Cadmium                    | Batteries, pigments, solder, alloys, circuit boards, computer batteries, monitor cathode ray tubes, (CRTs) | A carcinogen long term exposure causes Itai-itai disease, which causes severe pain in the joints and spine. It affects the kidneys and softens bones.   |
| Chromium                   | Dyes/pigments, switches, solar   | Inhaling hexavalent chromium or chromium 6 can damage liver and kidneys and cause bronchial maladies including asthmatic bronchitis and lung cancer.  |
| Cobalt                     | Insulator  | Accumulate to toxic levels in the liver, Kidney, pancreas, and heart, as well as the skeleton and skeletal muscle. Cobalt has been found to produce tumors in animals and is likely a human carcinogenic.                                 |
| Copper                     | Conducted in cables copper ribbons, coils, circuitry, pigments.  | Nausea, Vomiting, Diarrhea, Liver damage, Kidney damage, Death.   |

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|------|---|--|
| Lead | Lead rechargeable batteries, solar, transistors,<br>Lithium batteries, PVC(polyvinyl chloride)<br>Stabilizers, lasers, LEDs,<br>thermoelectric elements<br>Circuit boards | A neurotoxin that affects the kidneys and the Reproductive system. High quantities can be fatal . It affects mental development in children. |
|------|---|--|

Source: <http://ewasteguide.info/e-waste-composition> &

<http://www.lenntech.com/periodictable/elements/index.htm>

| Pollutant                       | Use/Occurrence  | Danger   |
|---------------------------------|---|--|
| Lithium                         | Mobile telephones, photographic equipment, video equipment (batteries)  | Corrosive to eyes, the skin and the respiratory tract. Corrosive on ingestion. Inhalation of the substance may cause lung oedema   |
| Mercury                         | Components in the copper machines and steam irons; batteries in clocks and pocket Calculators, switches, LCDs | Affects the central nervous system, kidneys and immune system .It impairs foetus growth and harms infants through mother's milk .  |
| Nickel                          | Alloys, batteries, relays, Semiconductors, pigments   | Lung cancer, nose cancer, larynx cancer and prostate cancer, asthma and carcinogenic, chronic bronchitis.  |
| PCBs(polychlorinated biphenyls) | Transformers, capacitors, softening agents for paint ,glue, plastic   | PCBs have also been shown to cause a number of serious non-cancer health effects in animals, including effects on the immune system, reproductive system, nervous system, endocrine system and other health effects                |
| Plastics                        | Circuit boards, cabinets and cables   | Carcinogenic. It can harm reproductive and immune systems. Burning PVC, a component of plastics, also produces dioxins.  |
| Selenium                        | Photoelectric cells, pigments, photocopiers, fax machines   | Exposure to high concentrations of selenium compounds cause selenosis. The major signs of selenosis are hair loss, nail brittleness, and neurological abnormalities (such as numbness and other odd sensations in the extremities) |
| Silver                          | Capacitors,   | Cardiac abnormalities, permanent brain   |

|                         |  |   |
|-------------------------|--|---|
|                         | switches(contacts),<br>batteries, resistors  | and nervous system damage   |
| Zinc                    | Steel, brass, alloy,<br>disposable and<br>rechargeable batteries,<br>luminous substances | Too much zinc can still cause eminent health problems, such as stomach cramps, skin irritations, vomiting, nausea and anemia                |
| Toner Dust              | Toner cartridges for laser<br>prints/ copies   | An irritant to people with respiratory conditions such as asthma or bronchitis  |
| Americium               | Medical equipment, fire<br>detectors, active sensing<br>element in smoke detectors       | Radioactivity   |
| Chlorofluorocarbon(CFC) | Cooling unit, Insulation<br>foam   | Deleterious effect on the ozone layer. This results in increased incidence of skin cancer in humans and in genetic damage in many organisms |

#### 5. Need to recycle:

- Land filling of E-waste can lead to leaching of lead into the ground water.
- If the CRT is crushed and burned, it emits toxic fumes into the air.
- The cadmium from one mobile phone battery is enough to pollute 600m<sup>3</sup> of water.
- Huge impact on health and environment because of e-waste around.

#### 6. Metal recovery:

- Ferrous components are separated either by a permanent magnet or electromagnet.
- Metals such as aluminum and copper from non-metallic materials are separated in eddy current separator.
- Removal of non-recyclable materials is done to enhance the value of recyclable material.
- Post separation provides higher metal concentration in lesser volume; thereafter the enriched metal content can then be sold and transported to an appropriate recycling facility for further processing.

#### 7. CONCLUSION:

To prevent any epidemic and to make each city a healthy city economically and environmentally, there is need for a well defined strategic waste management plan and strong implementation of it. E-Waste impact assessment on health and environment shall be carried to understand the current and future damage. Collection centers to be established for clearing the e-waste from the users. Government shall start the repair centers throughout the country. E waste issue shall be dealt seriously to avoid the future consequences.



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