

E-Waste Management Practices in India

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Abstract

*Many environmental epidemiological studies are required to assess the present status of **E-waste management** system in India, to assess the e-waste quantities and exact amplitude of the problem in Indian cities, and to establish relationships with the informal recycling sectors. The valuable data will be generated by these studies that would help in drafting an action plan for e-waste management. India should improve the current surveillance system to monitor the consequences of prevailing diseases and health hazards through e-waste. The sustainability of e-waste management systems has to be ensured by improving the collection and recycling systems. It would be desirable to establish public, private partnerships in setting up buy-back or drop-off centers. Levying advance recycling fees is another approach to ensure waste management sustainability. To identify best e-waste management technologies across the globe and adopt them successfully can be key to a sustainable futuristic growth. The reduction of the hazardous substances in the electronic and electrical equipments and the promotion of use of their safer substitutes have been adopted in many countries.*

Keywords: - E-waste – E-waste Management – Recycling sectors – health hazards – Public-private partnership – Buy-back – Drop-off – Sustainable waste management.

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Introduction

Electronic waste (E-waste) is one of the fastest growing waste streams in emerging as well as developed regions. The reduced life spans of electrical, electronic and consumer electronic devices are generating large quantities of E-Waste, which is growing rapidly every year.

E-waste management is also called urban mining¹. It is the process of extracting the parts out of the e-waste to either sell or reuse.

Until recently, strong-acid bases have been the dominant technology and chemistry for extracting precious metals and other metals of our electronic waste.

E-waste recycling will play a significant role in the coming decade and impact industries globally, thereby boosting economy through e-waste management. Currently, only a small portion of products is collected and directed into state-of-the art recycling chains. Significant improvements are needed here to fully utilize this secondary metal resource.

E-Waste hazardous to the environment and human health

The effects of E-waste on human health reveal serious negative outcomes for those dismantling and handling components of discarded electronics. The study, published by the Royal Institute of Technology in Stockholm, Sweden, details that workers, some as young as six years of age, are routinely exposed to hazardous materials and inhalation of toxic gases through direct handling of discarded electronics. In addition to its damaging effect on the environment and its illegal smuggling into developing countries, researchers have now linked e-waste to adverse effects on human health, such as inflammation and oxidative stress – precursors to cardiovascular disease, DNA damage and possibly cancer. People affected by this health crisis are mostly in areas where there is little knowledge about the health risks and in many cases no basic health care or social protections.

- **Computers and most electronics contain toxic materials such as lead, zinc, nickel, flame retardants, barium, and chromium.** Specifically with lead, if released into the environment can cause damage to human blood, kidneys, as well as central and peripheral nervous systems.
- **When e-waste is warmed up, toxic chemicals are released into the air damaging the atmosphere.** The damage to the atmosphere is one of the biggest environmental impacts from e-waste.
- **When electronic waste is thrown away in landfills their toxic materials seep into groundwater, affecting both land and sea animals.** This can also affect the health of the people in the developing countries where most of the electronic waste is dumped.

- **Only 10 percent of cell phones are recycled in the United States and most Americans get new cell phones every 12 to 18 months.** This is creating more and more electronic waste and with the lack of responsible recycling, the environmental issues of e-waste are continually increasing.
- **In Guiyu, China, many of the resident's exhibit substantial digestive, neurological, respiratory and bone problems.** This is the largest e-waste disposal site in China and quite possible the world, Guiyu receives shipments of toxic e-waste from all over the world.

Importance of E-Waste Management

- Keep e-waste out of landfills. Computers, mobile devices, televisions, sound systems, chargers and even household appliances are all recyclable, yet they can also be the most dangerous materials dumped inside a landfill, according to the Environmental Protection Agency. When improperly disposed of, the heavy metals, plastics and glass in e-waste can pollute the air or seep into waterways. Recycling e-waste can significantly decrease the demand for mining heavy metals and reduce the greenhouse gas emissions from manufacturing virgin materials.
- The electronic devices contain valuable metals like gold and silver, and only 10% of those metals are recycled from the devices and rest go of the amount goes to the garbage bin. By recovering precious metals, we can make the world relatively richer, and that is not our hypothesis, it is a reality.
- The short product lifespan has led to the solid waste generation that goes to landfill thus making environment hazardous.
- By adhering to electronic waste recycling, you will be eliminating hazardous materials like mercury, chromium, and cadmium that are found in the electronic devices, these substances are highly dangerous to human life. It also contains heavy metals too.
- The poisonous effects not only harm the atmosphere but also it affects the plants, trees, and animals, it can also cause natural disastrous resulting in human tragedy and loses



Reasons for e- waste

- Advancement in Technology
- Changes in style fashion and status
- Nearing the end of their useful life
- Not taking precautions while handling them

Particles and their origins

The European Waste Electrical and Electronic Equipment (WEEE) Directive classifies waste in ten categories: Large household appliances (including cooling and freezing appliances), Small household appliances, IT equipment (including monitors), Consumer electronics (including TVs), Lamps and Luminaries, Toys, Tools, Medical devices, Monitoring and control instruments and Automatic dispensers. These include used electronics which are destined for reuse, resale, salvage, recycling, or disposal as well as re-usable (working and repairable electronics) and secondary raw materials (copper, steel, plastic, etc.). The term "waste" is reserved for residue or material which is dumped by the buyer rather than recycled, including residue from reuse and recycling operations, because loads of surplus electronics are frequently commingled (good, recyclable, and non-recyclable). Several public policy advocates apply the term "e-waste" and "e-scrap" broadly to all surplus electronics. Cathode ray tubes (CRTs) are considered one of the hardest types to recycle.

CRTs have a relatively high concentration of lead and phosphors (not to be confused with phosphorus), both of which are necessary for the display. The United States Environmental Protection Agency (EPA) includes discarded CRT monitors in its category of "hazardous household waste" but considers CRTs that have been set aside for testing to be commodities if they are not discarded, speculatively accumulated, or left unprotected from weather and other damage. These CRT devices are often confused between the DLP Rear Projection TV, both of which have a different recycling process due to the materials of which they are composed.

The high value of the computer recycling subset of electronic waste (working and reusable laptops, desktops, and components like RAM) can help pay the cost of transportation for a larger number of worthless pieces than what can be achieved with display devices, which have less (or negative) scrap value. Discarded equipment, such as phones, laptops, fridges, sensors, and TVs contain substances that pose considerable environmental and health risks, especially if treated inadequately. Most e-waste is not properly documented and not treated through appropriate recycling chains and methods. At the same time, e-waste streams challenge the efforts towards a circular economy as valuable and scarce resources are wasted. This report represents an important step to identify current challenges and solutions.

To address these challenges, United Nations University (UNU), International Telecommunication Union (ITU), and the International Solid Waste Association (ISWA) joined forces, and in January 2017 launched the Global Partnership for E-waste Statistics. Its objective is to help countries produce e-waste statistics and to build a global e-waste database to track developments over time. Better data is an important step towards addressing the e-waste challenge. Statistics help to evaluate developments over time, set and assess targets, and identify best practices of policies. Better e-waste data will eventually contribute to minimizing e-waste generation, prevent illegal dumping and improper treatment of e-waste, promote recycling, and create jobs in the refurbishment and recycling sector.

E-waste management in sub continents

Agbogbloshie is the world's biggest e-waste dumpsite and is located close to Accra, Ghana. Electronic waste - TVs, PCs, HiFi systems, refrigerators - defines the landscape of this former wetland and recreation area.

Here in Agbogbloshie 7- to 25-year-old boys smash stones and simple tools against TVs and PCs to get to the metals, especially copper. They will earn approximately \$2.50 per day. Most of them, hoping for a better future, left their families from the poor northern and upper west regions of Ghana for this kind of work.

Injuries like burns, untreated wounds, lung problems, eye damage, and back problems go hand in hand with chronic nausea, anorexia, debilitating headaches and respiratory problems. Almost everyone suffers from insomnia. Smoke and invisible toxins (especially cadmium) harm the careless workers because they often don't know about the risks and walk around in flimsy footwear like flip-flops. Most of them die from cancer while in their 20s. Nevertheless Agbogbloshie is a socio-economic and environmental disaster. It is estimated that e-waste dumping in Agbogbloshie will double in 2020. The 40,000 settlers nicknamed this area "Sodom and Gomorrah".

China to release plan for tackling e-waste by end of year 2017 new reforms will target manufacturers of cars, lead batteries and drinks packaging. Take mobile phones as an example of the e-waste challenge. Data from the China Academy of Information and Communications Technology shows that China shipped in 560 million mobile devices in 2016. Industry insiders estimate that between 400 to 500 million mobiles could be discarded in favor of new handsets annually in China in coming years. And this is on top of the one billion mobiles already dumped in the country.

China's E-waste industry is in for an upgrade though. In January, the State Council released a document calling for an Extended Producer Responsibility (EPR) system. By the end of 2017, the Ministry of Environmental Protection and other government bodies must put forward a proposal for recycling of electric (devices that use electricity, such as fridges,

hairdryers and microwaves) and electronic products (devices that alter electric currents internally using switches, such as computers or mobile phones).

And this is just the start. By 2025, the State Council wants to see an EPR system in place for key product types, “major advances” in environmental product design, and for at least half of discarded products to be reclaimed and recycled.

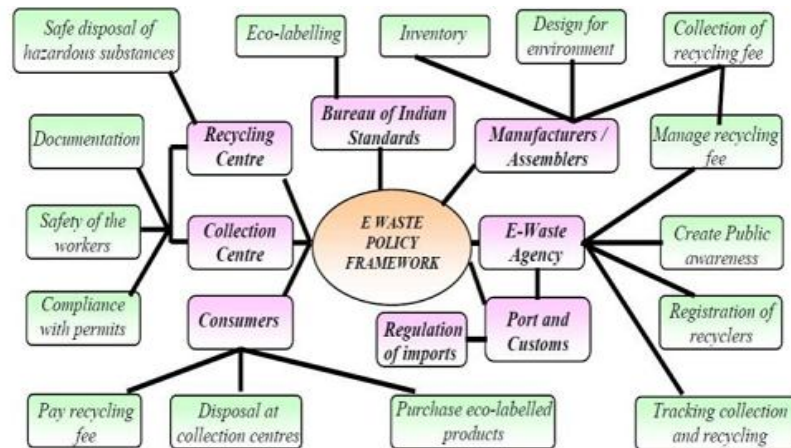
Particles of E-waste in India

The world produces 50 million tons of electronic and electrical waste per year, according to a recent UN report, but only 20% is formally recycled. Much of the rest ends up in landfill, or is recycled informally in developing nations.

India generates more than two million tons of e-waste annually, and also imports undisclosed amounts of e-waste from other countries from around the world—including Australia. More than 95% of India’s e-waste is processed by a widely distributed network of informal workers of waste pickers. They are often referred to as “kabadiwalas” or “raddiwalas” who collect, dismantle and recycle it and operate illegally outside of any regulated or formal organizational system. Little has changed since India introduced e-waste management legislation in 2016.

Union Minister for Environment, Forest and Climate Change, Dr. Harsh Vardhan has said that the Government has amended the E-waste (Management) amendment Rules, 2018 in a move to facilitate and effectively implement the environmentally sound management of e-waste in India. Dr. Vardhan highlighted that the amendment in rules has been done with the objective of channelizing the E-waste generated in the country towards authorized dismantlers and recyclers in order to formalize the e-waste recycling sector. He pointed out that the collection targets under the provision of Extended Producer Responsibility (EPR) in the Rules have been revised and targets have been introduced for new producers who have started their sales operations recently.

E-waste dismantlers on Delhi’s outskirts. Along the narrow and congested alley ways in Seelampur encountered hundreds of people, including children, handling different types of electronic waste including discarded televisions, air-conditioners, computers, phones and batteries. Squatting outside shop units they were busy dismantling these products and sorting circuit boards, capacitors, metals and other components (without proper tools, gloves, face masks or suitable footwear) to be sold on to other traders for further recycling.



Elements of e-waste management system for India

Current disposal methods of e-wastes

According to Environmental Protection Agency of United States (UNEP) almost 2-3% of the municipal waste comprises of e-waste and out of which only 15-20% is recycled. Whereas most of the e-waste goes to the incinerators and landfills thus polluting the nature or some of the E-waste was shipped to the developing countries like India, China, Pakistan and Malaysia.

Land filling

This is the most common methodology of e-waste disposal. Soil is excavated and trenches are made for burying the e-waste in it. An impervious liner is made of clay or plastic with a leach ate basin for collection and transferring the e-waste to the treatment plant. However, landfill is not an environmentally sound process for disposing off the e-waste as toxic substances like cadmium; lead and mercury are released inside the soil and ground water.

Acid baths

Acid bath involves soaking of the electronic circuits in the powerful sulphuric, hydrochloric or nitric acid solutions that free the metals from the electronic pathways. The recovered metal is used in the manufacturing of other products while the hazardous acid waste finds its ways in the local water sources.

Incineration

This is a controlled way of disposing off the e-waste and it involves combustion of electronic waste at high temperature in specially designed incinerators. This e-waste disposal method is quite advantageous as the waste volume is reduced extremely much and the energy

obtained is also utilized separately. However, it is also not free from disadvantages with the emission of the harmful gases mercury and cadmium in the environment.

Recycling of E-waste

Mobile phones, monitors, CPUs, floppy drives, laptops, keyboards, cables and connecting wires can be re-utilized with the help of the recycling process. It involves dismantling of the electronic device, separation of the parts having hazardous substances like CRT, printed circuit boards etc. and then recovery of the precious metals like copper, gold or lead can be done with the help of the efficient a powerful e-waste recycler. The most crucial thing here is choosing the right kind of recycler that does not break laws and handle the e-waste in the eco-friendly manner.

Reuse of electronic devices

This is the most desirable e-waste recycling process where with slight modifications the mobile phones, computers, laptops, printers can be reused or given as second hand product to the other person. The old electronic equipment can also be donated in the various charity programs and thus helping the persons in need. Moreover, there is a better way also by selling the old mobile phones or laptops to the some recycling and refurbishing companies. Several websites are acting as the middleman between recyclers and electronic users. It is a win-win situation for the users as they not only get rid off the old mobile phones but also get paid after reselling it.

Safe methods for disposal of E-waste and managing authorities

If e-waste is simply stored it doesn't pose any hazard, however, when it is improperly handled and disposed of the chemicals it contains pose a serious hazard. Not only does improper handling of e-waste allow dangerous chemicals to seep into the soil and groundwater, but it also leads to wastage of base metals which can be reused. Thankfully, there are steps people can take to dispose of e-waste in an environmentally friendly manner.

- Sell Your Electronics
- Give Electronics to Certified E-Waste Recycler
- Donate to NGOs
- Donate to a Small College or Rural School
- Sell Back to Manufacturers

Conclusion

It is confirmed that the public awareness and cooperation of manufactures are essential for the advancement of E-waste management system. And also it is the responsibility of governments to allocate sufficient grants and protecting the internationally

agreed environmental legislations within their borders. Licensing of certification like stewardship may ensure the security to prevent illegal smugglers and handlers of e-waste. Basel Action Network is now working at their best to stop or control trans boundary e-waste movements, they also involved in conducting public awareness programs to enlighten the world community and opening research areas to find better methods or alternatives. As e-wastes are the known major source of heavy metals, hazardous chemicals and carcinogens, certainly diseases related to skin, respiratory, intestinal, immune, and endocrine and nervous systems including cancers can be prevented by proper management and disposal of e-waste.

Model facilities employing environmentally sound technologies and methods for recycling and recovery are to be established. Criteria are to be developed for recovery and disposal of E Wastes. Policy level interventions should include development of e-waste regulation, control of import and export of e-wastes and facilitation in development of infrastructure. An effective take-back program providing incentives for producers to design products that are less wasteful, contain fewer toxic components, and are easier to disassemble, reuse, and recycle may help in reducing the wastes. It should set targets for collection and reuse/recycling, impose reporting requirements and include enforcement mechanisms and deposit/refund schemes to encourage consumers to return electronic devices for collection and reuse/recycling. End-of life management should be made a priority in the design of new electronic products.

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