



# A REVIEW PAPER ON E-WASTE MANAGEMENT SYSTEMS

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**Abstract :** As India has been a global leader in information technology and has been utilizing electronic devices more often over the past 60 years, the amount of discarded electronic waste has increased significantly. Yet, our nation lacks an appropriate disposal system, which has resulted in a tremendous volume of e-waste (determine proper disposal and recycling techniques so that pollution and health risks may be eliminated). The amount produced and disposed of annually, as well as the level of environmental danger that results, are not separately collected. Despite utilizing electrical items for the past 60 years, there is no adequate mechanism in place for their disposal. In order to prevent environmental pollution and health risks, effective methods of disposal and recycling must be found. In India, e-waste is not collected separately, thus it is unclear how much is produced, how it is disposed of, and how much of an environmental problem it poses.

**Keywords - Electrical items, E-waste, Disposal, Global, Ewaste recycle, Environmental, Danger.**

## I. INTRODUCTION

Electronic garbage, sometimes known as e-waste, refers to obsolete electronics or electrical equipment. E-waste includes used electronics that are intended for recycling, reuse, resale, salvage, or disposal. In underdeveloped nations, the informal processing of e-waste can have a negative impact on human health and cause environmental damage. Lead, cadmium, beryllium, or flame retardants are among the potentially dangerous materials found in electronic trash components like CPUs. In industrialized nations, recycling and disposal of e-waste may pose a serious risk to communities and employees. As a result, considerable care must be taken to prevent both harmful exposure during recycling operations and the leakage of materials like heavy metal from landfills and incinerator ashes.

## II. METHODS OF E-WASTE MANAGEMENT

### 1. Landfills

Because of its damaging effects on the environment, particularly when it is disposed of in landfills, electronic garbage, or e-waste, is a problem that is becoming more and more widespread. The most popular form of e-waste disposal, landfilling, has a number of detrimental environmental implications. The purpose of this essay is to explore the implications of e-waste on landfilling and any potential environmental risks. The toxic leachate Lead, cadmium, mercury, and brominated flame retardants are just a few of the dangerous materials found in electronics that can eventually seep into the groundwater and soil. This unfavourable leachate can affect the environment and taint nearby water sources. E-waste may also pollute the soil at landfills, rendering it unfit for plant development. The environment in the area and the wellbeing of adjacent populations may suffer as a result. Air Pollution: Landfills release a variety of harmful substances, such as carbon dioxide and methane, which contribute to air pollution and global warming. Dioxins and furans, which are harmful to the environment and human health, might be released as a result of the disposal of e-waste at landfills. Restricted Space: Landfilling electronic waste uses up valuable space that may be used for other purposes. As e-waste grows in volume, it becomes more difficult to manage. E-waste disposal in landfills has a number of harmful effects on the environment, including toxic leachate, soil contamination, air pollution, space limitations, and health risks. To lessen these harmful consequences and safeguard the environment and general well-being, it is crucial to implement sustainable e-waste management strategies, such as recycling and device reuse.

### 2. Acid Bath

Before it is discarded or repurposed, valuable metals are frequently removed from electronic waste (e-waste) using acid baths. E-waste is dissolved in an acidic solution throughout the procedure, which separates the valuable metals from the non-metallic components. Although though this technique has the potential to recover important metals, it also has a number of detrimental environmental effects.

producing hazardous garbage Acid baths produce a lot of hazardous waste, including acid solutions that have heavy metals, organic solvents, and other contaminants in them that are harmful. If this garbage is not properly disposed of, it can pollute the environment and endanger human health.

**Water pollution:** Moreover, neighbouring water sources may become contaminated by the acid solutions employed in the process. When acidic waste is not properly handled or disposed of, it can seep into the groundwater and soil, contaminating neighbouring rivers, lakes, and other bodies of water.

**Air pollution** Emissions of poisonous gases, such as chlorine gas, which are harmful to the environment and to people's health, can also result from the breakdown of e-waste in acid baths. Emissions from this procedure or from the transportation and disposal of the trash are also possible.

Acid baths consume a lot of energy to heat the acid solutions to their high temperatures. Climate change is a result of greenhouse gas emissions, which are a result of this energy use.

Acid baths are a typical technique for removing precious metals from e-waste. Even though this technique has the potential to recover valuable materials, it also has a number of detrimental effects on the environment, including the production of hazardous waste, the pollution of water and air, and the use of energy. Prioritising sustainable e-waste management techniques that prioritise recycling and reusing electronic equipment is crucial to reducing these adverse effects

### 3.Incineration

A fairly primitive technique for getting rid of electronic garbage that entails burning the trash at very high temperatures. This offers the dual advantages of dramatically lowering the volume of waste and producing energy that may be used for other purposes. Unfortunately, the process of burning the electronic waste's component parts also results in enormous amounts of harmful gases, including mercury and cadmium, that are released into the atmosphere. E-waste incineration, or burning of electronic trash, is a contentious form of disposal. Lead, mercury, and cadmium are just a few of the dangerous substances and heavy metals found in e-waste that may be released into the air during combustion. In addition to environmental issues, incineration can also put workers' health at risk because they might be exposed to these pollutants while working. As a result, burning of electronic waste is prohibited or subject to strict regulations in many nations. It is advised to recycle electronic garbage through a specialised facility. Recycling helps to recover precious metals and materials, lessen garbage sent to landfills, and reduces the risks to the environment and human health posed by incorrect disposal. If you have electronic waste that you need to dispose of, it is important to find a reputable e-waste recycling facility or program in your area to ensure that it is properly and safely handled

### 4.Recycle

Many e-waste items may be broken down into their component parts, which can then be utilised to create new goods. Circuit board precious metals may be recovered and melted down using e-waste recycling techniques to make new electronics or other items like jewellery. Recycling entails disassembling, or removing, various components of electronic trash that contain hazardous materials including PCBs and mercury, separating plastics, removing CRTs, and sorting ferrous and non-ferrous metals as well as printed circuit boards. Among the recyclable items are monitors and CRTs, keyboards, laptops, modems, telephone boards, hard drives, floppy drives, Compact discs, mobile phones, fax machines, printers, CPUs, memory chips, connecting wires, and cables. Computers, cell phones, and other electronic equipment are examples of electronic garbage, sometimes known as e-waste. Recycling e-waste is essential because it reduces the discharge of toxic substances like lead, mercury, and cadmium into the environment. Here are some of the procedures needed to recycle e-waste. **Collection:** Gathering outdated electronic equipment is the initial stage in the recycling of e-waste. There are collection points established up where people can deliver their outdated electronics for recycling. **Sorting:** The gadgets are classified based on type, brand, and condition after being gathered. This categorization aids in determining whether gadgets can be recycled, reconditioned, or both. **Disassembly:** The various components are subsequently separated during the disassembly of the devices. Batteries, capacitors, and CRTs are among the hazardous materials that are taken out and given special handling. **Shredding:** The plastic and metal parts are separated, while the leftover materials are shredded. **Refining:** Metals like copper, gold, and silver are removed from the separated components after they have been processed. **Reuse:** Finally, the extracted materials are used to create new products or sold as raw materials. Recycling e-waste lessens the amount of waste transported to landfills, protects the environment from hazardous materials release, and conserves natural resources. It's crucial to properly dispose of electronic waste and recycle whenever possible.

### 5.Reuse

The most ecologically friendly way to dispose of electronic trash is by far to reuse the equipment. Used devices that may be fixed and donated to those living in less fortunate areas are gladly accepted by many charities. Reuse of e-waste refers to the process of refurbishing and repurposing electronic devices that are still functional or can be repaired. Here are some ways that e-waste can be reused. **Donations:** You can donate working electronics to charitable organisations, libraries, and educational institutions. This gives those who cannot afford technology access and helps to close the digital divide. **Refurbishment:** Refurbished electronics are ones that have been damaged but can still be fixed. This entails fixing the broken parts and replacing the ones that can't be fixed. Then, refurbished items might be sold or given away. **Upcycling:** Electronic devices can be repurposed into new products. For example, old computer parts can be used to create artistic sculptures or functional items such as clocks, lamps, or shelves. **Repurposing:** Electronic devices can be used for purposes other than what they were originally intended for. For example, old smartphones can be used as security cameras or media players. **Trade-in:** Many electronic retailers offer trade-in programs where customers can trade in their old devices for a discount on a new one. The old devices are then refurbished or recycled.

### III. ADVANTAGES

1. Many valuable resources can be found in e-waste in the form of parts and materials. These are recovered and put to service once more. Copper, gold, silver, and palladium are among them.
2. The e-waste will be sorted to produce the above-mentioned valuable commodities, which represent a significant economic incentive.
3. Due to the existence of other metals and minerals including lead, nickel, and other polymers, recycling of electronic trash is particularly crucial.

### IV. DISADVANTAGES

1. Human health risks from improper disposal of e-waste.
2. Environmental effects from recycling e-waste result in human health problems.
3. The e-waste contains compounds that are extremely dangerous.
4. The disposal of electronic waste on landfills carries a certain amount of risk. Hazardous compounds have caused this through evaporation and leaching.

### IV. EFFECTS OF E-WASTE ON ENVIRONMENT, HUMAN HEALTH AND LAND

Since e-waste is a complex mixture of several kinds of harmful substances, its handling has the potential to have an irreparable effect on the environment and human health. The following list covers hazardous elements' health risks. Because of its composition, handling e-waste is quite difficult. It is made up of a number of different components, some of which contain poisonous materials that are bad for people. If recycling and disposal techniques are used improperly, the environment and public health could suffer. Therefore, proper technology is required for the treatment and disposal of hazardous compounds. As a result, local residents may be exposed to these dangerous substances in many ways. Since the recycling process is carried out close to a residential area, population groups who are particularly susceptible to harmful chemicals, such as newborns and children, are likely to have negative health effects. This section examines PCDD/Fa, a by-product of recycling e-waste. The effects of relatively low-level exposure on children's cognitive and behavioural development, particularly the reduction of IQ, are of special concern because lead is a highly poisonous metal with no known beneficial functions in the human body. Formal electronic trash recycling facilities use technology that is specially designed to properly retrieve salvageable components from outdated devices while safeguarding workers' health. These facilities are rare in less developed nations since they are expensive to establish and maintain. Workers at formal or semi-formal recycling centres may still be at risk of exposure due to varying national safety requirements. E-waste disposal is a problem that is prevalent in many parts of the world. Landfilling of computer waste results in contaminated leachates that eventually affect groundwater. When computer chip muck and acids are dumped on the ground, the soil becomes more acidic.

As an illustration, Guiyu, Hong Kong, a major centre of illegal e-waste recycling, is experiencing severe water shortages as a result of the tainted water sources. If these electronic devices are thrown out with ordinary household trash, the toxics represent a risk to both human health and important ecological components. A number of nations urged the need for a worldwide accord to address the issues and difficulties presented by hazardous waste in light of the negative effects these wastes have on the environment and human health. Additionally, in industrialised nations, tighter environmental restrictions in the late 1980s resulted in a sharp increase in the price of hazardous waste disposal. Hazardous waste started to be shipped to underdeveloped nations by "toxic traders" looking for more affordable ways to dispose of the wastes. Following these reckless actions, there was widespread indignation, which prompted the Basel Convention to develop and adopt strategic plans and restrictions. The execution of the convention and associated agreements is facilitated by the secretariat of the convention, located in Geneva, Switzerland. It also gathers statistical information, conducts training on the proper handling of hazardous waste, and offers support and guidelines on legal and technical difficulties.

### V. MINIMIZATION OF E-WASTE

To lessen the quantity of electronic trash that ends up in landfills and to preserve natural resources, e-waste must be minimised. Here are some suggestions for reducing e-waste:

**lowering consumption** Buying only the necessary electronic gadgets is one of the best strategies to reduce the amount of e-waste produced. **Upgrade and repair:** A smart technique to reduce e-waste is to upgrade or repair damaged electrical gadgets to increase their lifespan. Electronics that are still in working order but are no longer required can be given or sold. This can give those who cannot afford technology access and help lessen the quantity of e-waste. **Recycle:** To reduce the negative effects on the environment, proper e-waste recycling is essential. E-waste recycling programmes are provided by many manufacturers and merchants, which can aid in the recovery of valuable materials and waste reduction. **Purchasing ecologically friendly goods:** Try to find electronics that use less energy, contain recyclable parts, and last a long time. Electronics should be appropriately disposed of in order to prevent environmental contamination. This includes preventing the disposal of waste in landfills and making sure that hazardous products are handled correctly. We can lessen the environmental impact of electronic gadgets and preserve natural resources by reducing e-waste. To reduce e-waste, it is crucial to be aware of our purchasing habits and make responsible decisions.

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