

# Effect of Green Electronics on E-waste

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## Abstract

The majority of countries now own cell phones, among other devices, owing to the explosion of the tech industry over the past 20 years or so, and newer, better electronic devices seem to hit the market every few months. As a result, the quantity of unwanted electronic goods is growing quickly. E-waste or older electronics that are defective or undesirable, is quickly starting to overflow landfills. These electrical appliances frequently contain dangerous substances that could damage the surrounding community, the environment, or even the air. Although it cannot totally eradicate this e-waste, we can limit it by employing environmentally friendly electronic equipment throughout production. Electronic devices integrating green technology helps to provide harmless environment for future generations.

**Keywords:** E-waste, electronic devices, green technology, environmental hazards

## 1. Introduction

Therefore, expanding by 10% annually, e-waste is one among the quickest waste streams, and effectively managing it has emerged as a global problem. The categorization of e-waste is crucial for using suitable management strategies in the scope of pollution control and resource conservation because e-waste comprises both hazardous compounds and valuable resources. The objective of "greening" electrical products is to use less energy and have a less environmental impact than conventional electronics [1]. This could indicate that less energy is used throughout the process of mining the materials and producing the gadget and that could mean less energy is consumed over the period of using the products created from these resources.

Less toxicity is often correlated with less environmental impact, particularly after disposal. Reusing materials is crucial to achieve this [2-4]. E-waste is a problem that is getting worse, and it poses risks since poorly disposed of electronics allow elements like

chromium, lead, beryllium, cadmium, barium and copper to enter the environment. In this paper, by comparing different impacts of e-waste and the handling of e-wastes metals are analysed.

### 1.1 Green technology

In order to protect ecosystem and its resources, minimize the consequences of global warming and climate change, to establish new or alternative approaches and technologies to reconstruct an already harmed environment, green technology draws from a variety of science and technology domains [5].

### 1.2 Green electronics

Green electronics highlights the use of eco-friendly disposal methods for toxic materials included in electronic waste, or "e-waste." Electronic waste, or e-waste, is nothing more than the trash produced by products like computers, cell phones, televisions, batteries, wires, cables, etc. Hazardous substances such polymers, Chlorofluorocarbons, PVCs and other elements like arsenic, Cadmium, Lead, and Mercury are found in e-waste [6].

### 1.3 E-waste materials on electronics and its handling

Electronic items that are getting towards the end of their own "useful life" are sometimes referred to as "e-waste." Common electronic products include laptops, TV's, Video recorders, stereo systems, scanners, and fax machines and the electronic components used to rebuild it as some of the e-waste components. Numerous of these items can be recycled, repaired, or reused. The below figure 1 shows sources of e-waste.



**Figure 1.** Sources of e-waste

After the life time of these electronic goods it is been destroyed by burning. Open-air burning and chemical baths, which subject workers to dangerous compounds, are issues when attempting to restore valuable metals from electronic components. Additionally, there are issues with harmful substances leaking into the environment. It has a negative impact on both the environment and human health.

#### 1.4 Cleaning-up of E-waste

The implementation of triple R rule helps here “**Reduce, Reuse, Recycle**” as in figure 2.



**Figure 2.** E-waste Handling

- **Reduce** your quantity of electronic waste by smart purchasing and proper servicing.
- **Reuse** still working electronics to a client who can still benefit from them.
- **Recycle** goods that are beyond repair are recycled

## 2. Related Work

This article aims to cover current developments in the creation of the manufacturing techniques that serve as the foundation for the creation of green electronics [7]. The most promising applications for green technology are illustrated by using examples from light-emitting diodes, solar cell, organic field-effect transistors, and other electronic devices. The study provides an overview of recently created organic photovoltaic (OPVs) that use environmentally friendly solvents. Old cell devices, smartphones, and laptops, among many other sorts of electronic waste, were evaluated for their levels of heavy metals, precious metals, and rare earth elements [8]. The materials were subjected to several processing techniques before ICP-OES analysis. Results revealed that the major heavy elements in all

samples were Copper, Iron, Zinc, Nickel, Lead, and Al. U.S.EPA.3051A fared better for Au, Zn, Cu, Mo and Ni, and MMDM for La, whereas U.S.EPA.3050B is recommended for Pd, Pr Nd, , Ag, , Co, Al, Mn, Ce, Cd, Dy, Pt, Cr and Pb.

**Table 1.** Effect of E-wastes by electronic devices on health impacts

Components	Electronic devices	Elements	Health impacts
Mercury	LCD screens and monitors, Batteries	Elemental and methyl mercury	Effects on the nervous, digestive and immune systems, lungs and kidneys
Zinc	Nano-laser , air rechargeable batteries	Zn	damage the pancreas, anaemia
Cadmium	Computer connections, switches, and rechargeable batteries	Cd	Kidney disease, osteoporosis, cardiovascular diseases and cancer
Chromium	Electric switches, Plugs and terminators, spacers, antennae and accessories	Cr(VI)	lung cancer, nasal irritation, nasal ulcer asthma
Lead	Solders, batteries, photovoltaic, and metal alloys	Latin plumbum	Anaemia, weakness, and kidney and brain damage
Barium	Sparkplugs, fluorescent lamps, and getters in vacuum tubes	Ba	Increased blood pressures, kidney and heart damage, swelling of brains and liver
Nickel	Digital cameras rely on nickel-containing batteries	NiMH, NiCd	asthma, bronchitis cancer, allergy,

The article focuses on recycling methods employing eco-friendly technology to separate metallic from non-metallic PCB fractions and produce new materials from the various fractions acquired, limiting the generation of additional e-waste and so reducing pollution related with this waste [9]. Environmental pollution is prevented by using only air and water for flotation process rather than chemical reagents. Because the pH was the same before and after the test at 7.0 water may be reused with in flotation process or in another process, it is safe to say that this method of reusing printed circuit boards uses green technology. This article focuses on the advantages of recycling while also providing an overview of global e-waste data [10]. It emphasises the negative effects that e-waste has on both the environment and people, and how green devices could be one effective remedy. The enormous demand for electronic gadgets is causing an energy imbalance as well as a series of

negative effects: (i) the production of an enormous volume of e-waste (ii) a sharp increase in the extraction and depletion of scarce natural resources like indium and gallium. The hazardous substances found in e-waste are bad for both the ecosystem and us as people.

This paper-based on multilayer P-PCBs have been conceived and prototyped; they perform similarly to organic PCBs, which are now on the market, but the P-PCBs use a "green" manufacturing technique [11]. To gauge the environmental effects of P-PCBs, a life cycle analysis research was carried out. Recycling is only possible to a certain measure. Green electronics provide a more practical remedy for this issue and aid in sustainability. The materials made from wood are prepared for research into potential uses in emerging technological fields such electronics, bioelectronics, and energy [12]. This original study purpose is to analyse the basic chemicals and structures of woods and wood-derived compounds, which are crucial for a variety of both new and old enabling technologies. The overview of the consequences of e-waste on human health is shown in Table 1.

### **3. Few Green materials used in electronics and its benefits**

Green materials are available numerous forms. They can include organic electronics and biodegradable circuit boards, as well as continuously recyclable and reusable metals. Depending on the kind of material used and how it is used, both organic and inorganic substances may qualify as green [13-15]. Aluminium's has the capacity to be recycled and extraordinarily long lifespan is considered as a "green metal." In addition to being beneficial for the planet, renewable materials frequently outperform than less environment conscious, more hazardous replacements.

### **4. Challenges in Green Technology**

- It will take time for a bigger population to adopt the technology because most people are still unfamiliar with it.
- The green technology-based goods or systems cannot be installed or implemented due to a shortage of skilled human resources.
- The cost of implementation or the initial investment is quite expensive.
- Many of the goods are still in the R&D stage as technology is still developing. People are therefore ignorant of performance results.

## 5. Conclusion

E-waste management strategies like reducing, reusing, and recycling are now widely used. Metals that are present in the e-waste channel can be recovered and repurposed, which has positive effects on the economy and the environment. The purpose to create green electronics, investigate, and create low-cost, solvent-free, annealing-free and difficulties for green technology on electronics are discussed in the article. Thus the revolution of green technology reduces the impact of human health and environmental aspects.

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