

E-Waste Handling on Green Computing

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Abstract

E-waste is an informal name for electronic products nearing the end of their useful life. Electronic appliances i.e. computers, laptops, TV's, DVD players, mobile phones, fax machines are the common electronic products. Many of these products can be re-used or recycled. Unfortunately these electronic products have become environmental problems of their own, which the users are unaware of beside playing an important role in our day to day activities such as internet surfing, data management, E-waste is not biodegradable, thus effects on plants, animals, human life and the surroundings, as a whole causing severe health hazards and disorders.

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Introduction

Any substance that is discarded is known as waste. Electronic waste or e-waste is the term used to describe old, end-of-life electronic appliances such as Computer, LED's, LCD's mobile players, laptops which has been disposed by their original users.

E-waste has been categorized into three main categories I.e. Large Household appliances, IT and Telecom and Consumer Equipment. Refrigerator and washing machine represent large household appliances, PC, Monitor and Laptop represent IT and Telecom, while TV represents Consumer Equipment.

E-waste items have been classified with respect to 26 common components found in them. These are “Building Blocks” of each item, therefore they are readily “identifiable” and “removable” these components are metal, motor/compressor, cooling, plastic, insulation, glass, LCD, rubber, wiring/electrical, concrete , transformer, magnetron, textile, circuit board, fluorescent lamp, incandescent lamp, heating element, thermostat, brominated flamed retardant (BFR)-containing plastic, batteries, CFC/HCFC/HFC/HC, external electric cables, refractory ceramic fibers, radioactive substances and electrolyte capacitors

The electronic and electrical goods are largely classified under three major heads, as: ‘white goods,’ comprising of household appliances like air conditioners, dishwashers, refrigerators and washing machines; ‘brown goods,’ comprising of TVs, camcorders, cameras, etc.; ‘grey goods,’ like computers, printers, fax machines, scanners, etc. The grey goods are comparatively more complex to recycle due to their toxic composition.

The computer equipment consists of a complicated assembly of various materials like chlorinated and brominated substances, plastic, toxic metals, gases and acids etc., which are highly toxic. Consumers are unaware of these toxic materials. All these products cause a hazardous effect on human health as well as the environment. The major perpetrator is computer monitor and CRT, which contains about 10-15 Kgs of lead that is non-biodegradable. The residues of computer disposals emit various types of toxic gases which

are highly carcinogenic, contaminate land, water and also air, effecting the environment. The waste comprises of about 40% of lead and 80% of other heavy metals like cadmium, etc that cause pollution.

Environmental and Health Impact of E-waste

Waste from the white and brown goods is less toxic as compared with grey goods. A computer contains highly toxic chemicals like lead, cadmium, mercury, beryllium, BFR, polyvinyl chloride and phosphor compounds

Lead

Exerts toxic effects on various systems in the body such as the central (organic affective syndrome) and peripheral nervous systems (motor neuropathy), the hemopoietic system (anemia), the genitourinary system (capable of causing damage to all parts of nephron) and the reproductive systems (male and female).

Mercury

Causes damage to the genitourinary system (tubular dysfunction), the central and peripheral nervous systems as well as the fetus. When inorganic mercury spreads out in the water, it is transformed into mentholated mercury, which bio-accumulates in living organisms and concentrates through the food chain, particularly by fish.

Cadmium

Is a potentially long-term cumulative poison. Toxic cadmium compounds accumulate in the human body, especially in the kidneys. There is evidence of the role of cadmium and beryllium in carcinogenicity.

One study of environmental effects in Guayule, China found the following:

- Airborne dioxins – one type found at 100 times levels previously measured
- Levels of carcinogens in duck ponds and rice paddies exceeded international standards for agricultural areas and cadmium, copper, nickel, and lead levels in rice paddies were above international standards
- Heavy metals found in road dust – lead over 300 times that of a control village’s road dust and copper over 100 times

The environmental impact of the processing of different electronic waste components

E-Waste Component	Process Used	Potential Environmental Hazard
Cathode ray tubes (used in TVs, computer monitors, ATM, video cameras, and more)	Breaking and removal of yoke, then dumping	Lead, barium and other heavy metals leaching into the ground water and release of toxic phosphor
Printed circuit board (image behind table - a thin plate on which chips and other electronic components are placed)	De-soldering and removal of computer chips; open burning and acid baths to remove final metals after chips are removed.	Air emissions as well as discharge into rivers of glass dust, tin, lead, brominates dioxin, beryllium cadmium, and mercury
Chips and other gold plated components	Chemical stripping using nitric and hydrochloric acid and burning of chips	Hydrocarbons, heavy metals, brominates substances discharged directly into rives acidifying fish and flora. Tin and lead contamination of surface and



		groundwater. Air emissions of brominates dioxins, heavy metals and hydrocarbons
Plastics from printers, keyboards, monitors, etc.	Shredding and low temp melting to be reused	Emissions of brominates dioxins, heavy metals and hydrocarbons
Computer wires	Open burning and stripping to remove copper	Hydrocarbon ashes released into air, water and soil.

Electromagnetic Pollution (EMF)

Some factors that is easily spreading into the environment, which leads to inevitable symptoms & hazards is basically caused by electronic devices such as TVs, computers, microwave, Mobile Phones etc. Light, Static Electric Field and Electromagnetic radiation emitted from the PC have been polluting the indoor air. Studies reveal that human subjects were exposed to air polluted by chemical emissions from PCs that had been in use for 2-3 months. The mobile phones are destroying the bird life.

Dangerous effects of EMF are:

Alzheimer's disease, Parkinson's disease, leukemia and above all brain tumor. Subtle effects include low visibility, anemia and minor headache. The picture tubes used in computers and

TV's, Waves received and send by mobile phones, emit lot of electromagnetic waves which are much harmful for the human body especially eyes, ears and nervous system and also destroying small birds. Mobile phone is the most prime factor for spreading EMF. The air also polluted by radio, TV and satellite broadcast. But spite of all this no action has being taken to curb this pollution.

EXISTING LEGISLATIONS AND POLICY RELATED TO E-WASTE

Draft Hazardous Materials (Management, Handling and Transboundary movement) Rules, 2007 (dated: September 28, 2007), part of the Environment Protection Act, 1986.

India is a signatory to the Basal Convention. (Basel Convention is the United Nations Environment Programme) on the control of Transboundary Movement of Hazardous wastes and their disposal.

There is no policy on e-waste, although some parts of computers could be considered as hazardous waste.

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