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Study of Main components of E-waste and suggestions of Responsibilities for E-Waste management in India

Rakesh Choudhary[1], Harveer Laura[2]

1Research Scholar, Department of Civil Engineering (Enviornmental), Jagannath University
2Assistant Professor, Department of Civil Engineering (Enviornmental), Jagannath University

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Introduction : Electronic waste (e-waste) is one of the fastest-growing pollution problems worldwide given the presence if a variety of toxic substances which can contaminate the environment and threaten human health, if disposal protocols are not meticulously managed. This paper presents an overview of toxic substances present in e-waste, their potential environmental and human health impacts together with management strategies currently being used in certain countries. Several tools including Life Cycle Assessment (LCA), Material Flow Analysis (MFA), Multi Criteria Analysis (MCA) and Extended Producer Responsibility (EPR) have been developed to manage e-wastes especially in developed countries.

A variety of materials, including metals that can be reused constitute most electronic devices. Air and water pollution can be avoided and natural resources conserved if these electronics are dismantled and provided with reuse possibilities. A huge variety of products can come under the possibility of recycling, such as monitors, keyboards, laptops, hard drives, floppy drives, modems, telephone boards, compact disks, mobiles, fax machines, printers, CPUs, memory chips, connecting wires and cables.

Different parts comprising hazardous substances such as PCB, Hg, separation of plastic, removal of CRT, segregation of ferrous and non-ferrous metals and printed circuit boards are dismantled at the start of the recycling process. Toxic substances like cadmium, palladium, rhodium and lead solder are contained in electronic equipment, which, if thrown away without being recycled, can leak into the environment leading to contamination. It can also cause diseases such as nervous system damage, damage of the heart, kidneys, liver, as well as skin and bone diseases.

Major Constituents of E-Waste

The major constituents of Electronic Waste are as follows:

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1. Glass and Ceramics: - Glass is used in devices like the cover of Microwave oven, tray of Refrigerators, Glass panels for TVs & Monitors. Ceramic Component is used as an insulator in the devices.

2. Metals: - Different metals like Copper, Aluminum, Nickel, and Cobalt are used as electrical conductors and in manufacturing of electromagnetic components for the devices.

3. Plastic:-The bodies of the equipment are manufactured using plastic because its light, good insulator of heat and electricity is cheap and easy to recycle too.

Composition of E-Waste

The report by BAN also mentioned the following the composition of E- Waste, which are:

- Aluminum[2%]
- Lead[2%]
- Nickel[2%]
- Tin [4%]
- Iron [8%]
- Copper[20%]
- Refractory Oxides[30%]
- Plastic[30%]
- Others[2%]

It's clear from the figures that Refractory Oxides and Plastic cover the major portion. And they are also the trouble makers. Plastics & Refractory oxides are burnt in open air which not only causes air pollution but are also danger public health in large.

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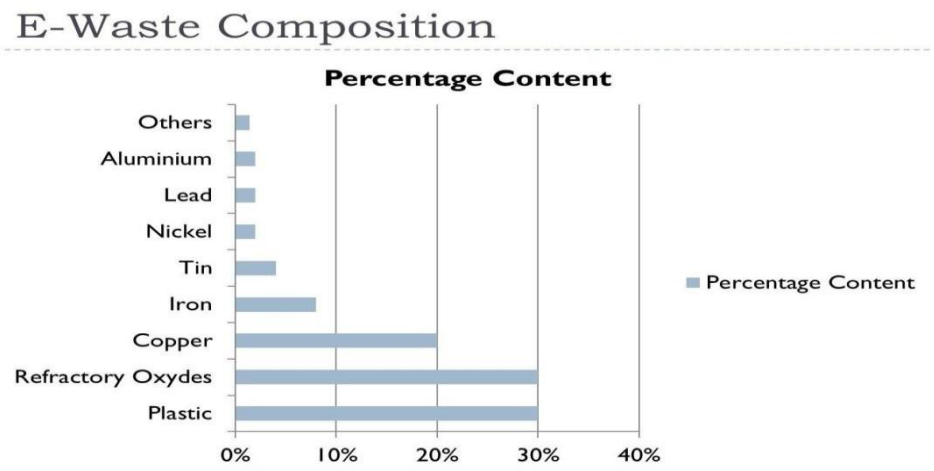
Figure 1 E-waste composition



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Responsibilities of the Government

(i) Governments should set up regulatory agencies in each district, which are vested with the responsibility of coordinating and consolidating the regulatory functions of the various government authorities regarding hazardous substances.

(ii) Governments should be responsible for providing an adequate system of laws, controls and administrative procedures for hazardous waste management (Third World Network. 1991). Existing laws concerning e-waste disposal be reviewed and revamped. A comprehensive law that provides e-waste regulation and management and proper disposal of hazardous wastes is required. Such a law should empower the agency to control, supervise and regulate the relevant activities of government departments.

Under this law, the agency concerned should

- Collect basic information on the materials from manufacturers, processors and importers and to maintain an inventory of these materials. The information should include toxicity and potential harmful effects.
- Identify potentially harmful substances and require the industry to test them for adverse health and environmental effects.
- Control risks from manufacture, processing, distribution, use and disposal of electronic wastes.
- Encourage beneficial reuse of "e-waste" and encouraging business activities that use waste". Set up programs so as to promote recycling among citizens and businesses.
- Educate e-waste generators on reuse/recycling options

(iii) Governments must encourage research into the development and standard of hazardous waste management, environmental monitoring and the regulation of hazardous waste-disposal.

(iv) Governments should enforce strict regulations against dumping e-waste in the country by outsiders. Where the laws are flouted, stringent penalties must be imposed. In particular,

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custodial sentences should be preferred to paltry fines, which these outsiders / foreign nationals can pay.

(v) Governments should enforce strict regulations and heavy fines levied on industries, which do not practice waste prevention and recovery in the production facilities.

(vi) Polluter pays principle and extended producer responsibility should be adopted.

(vii) Governments should encourage and support NGOs and other organizations to involve actively in solving the nation's e-waste problems.

(viii) Uncontrolled dumping is an unsatisfactory method for disposal of hazardous waste and should be phased out.

(viii) Governments should explore opportunities to partner with manufacturers and retailers to provide recycling services.

Responsibility and Role of industries

1. Generators of wastes should take responsibility to determine the output characteristics of
2. wastes and if hazardous, should provide management options.
3. All personnel involved in handling e-waste in industries including those at the policy, management, control and operational levels, should be properly qualified and trained. Companies can adopt their own policies while handling e-wastes. Some are given below:

    - Use label materials to assist in recycling (particularly plastics).
    - Standardize components for easy disassembly.
    - Re-evaluate 'cheap products' use, make product cycle 'cheap' and so that it has no inherent value that would encourage a recycling infrastructure.
    - Create computer components and peripherals of biodegradable materials.
    - Utilize technology sharing particularly for manufacturing and de manufacturing.
    - Encourage / promote / require green procurement for corporate buyers.
    - Look at green packaging options.

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4. Companies can and should adopt waste minimization techniques, which will make a significant reduction in the quantity of e-waste generated and thereby lessening the impact on the environment. It is a "reverse production" system that designs infrastructure to recover and reuse every material contained within e-wastes metals such as lead, copper, aluminum and gold, and various plastics, glass and wire. Such a "closed loop" manufacturing and recovery system offers a win-win situation for everyone, less of the Earth will be mined for raw materials, and groundwater will be protected, researchers explain.
5. Manufacturers, distributors, and retailers should undertake the responsibility of recycling/disposal of their own products.
6. Manufacturers of computer monitors, television sets and other electronic devices containing hazardous materials must be responsible for educating consumers and the general public regarding the potential threat to public health and the environment posed by their products. At minimum, all computer monitors, television sets and other electronic devices containing hazardous materials must be clearly labeled to identify environmental hazards and proper materials management.

Responsibilities of the Citizen

1. Waste prevention is perhaps more preferred to any other waste management option including recycling. Donating electronics for reuse extends the lives of valuable products and keeps them out of the waste management system for a longer time. But care should be taken while donating such items i.e. the items should be in working condition.
2. Reuse, in addition to being an environmentally preferable alternative, also benefits society. By donating used electronics, schools, non-profit organizations, and lower-income families can afford to use equipment that they otherwise could not afford.
3. E-wastes should never be disposed with garbage and other household wastes. This should be segregated at the site and sold or donated to various organizations.
4. While buying electronic products opt for those that:

    - Are made with fewer toxic constituents
    - Use recycled content
    - Are energy efficient
    - Are designed for easy upgrading or disassembly
    - Utilize minimal packaging

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- Offer leasing or take back options
- Have been certified by regulatory authorities. Customers should opt for upgrading their computers or other electronic items to the latest versions rather than buying new equipments.

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