

Electronic Waste; Sources, Impact and Recycling

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Abstract- Electronic waste (e-waste) is described as discarded electrical or electronic devices. Electronic waste may be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets, and refrigerators. Urban consumption and waste generation and the negative impacts associated with them in Nigeria vary dramatically from city to city. The poor collection, transportation and disposal of both municipal and industrial wastes in Nigeria pose a greater environmental threat facing the growing society. Electronic waste is generated from three major sources which includes individuals and small businesses; large businesses, institutions, and governments; and, original equipment manufacturers (OEMs), and it contains hazardous materials such as lead, mercury, beryllium, cadmium, and brominated flame-retardants that pose both human and environmental health threat. Properly disposal or reuse of electronics can help prevent health problems, reduce greenhouse gas emissions and create jobs, hence effective management and recycling of e-waste should be encouraged to prevent pollutions associated with e-waste.

I. INTRODUCTION

Waste generation has been a global environmental issue especially in developing countries. Electronic waste is discarded electrical or electronic devices, and used electronics which are destined for reuse, resale, salvage, recycling or disposal are also considered as e-waste. Informal processing of electronic waste in developing countries may cause serious health and pollution problems, as these countries have limited regulatory oversight of e-waste processing, and it may contain contaminants such as lead, cadmium, beryllium, or brominated flame retardants. Even in developed countries recycling and disposal of e-waste

may involve significant risk to workers and communities. Electronic waste may be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets, and refrigerators. Information, computer and telecommunications technology (ICT) has penetrated nearly every aspect of modern life and is positively affecting human life even in the most remote areas of developing countries (Osibanjo and Nnorom 2007) but the waste generated from such usage cannot be over emphasized. However, imports of used or rather end-of-life electronics to the developing countries, its positive potential also has its associated risk of becoming a dumping ground for e-waste from rich developed countries (Schmidt, 2006).

Nigeria is facing increasingly threat from the generation of e-waste, being the leading importer of electrical and electronic equipment in Africa. Globally, as one buys new electronic gadgets and discards their old ones, e-waste is growing in both developed and developing nations. According to studies by the United Nations, anywhere between 20 and 50 million tonnes of e-waste are generated globally, at a rate nearly three times faster than the overall municipal solid waste stream (Schluep *et al.* 2009). In Nigeria, the importation of used electronics assumed an alarming dimension, urban consumption and waste generation and the negative impacts associated with it in Nigeria varies dramatically from city to city. The poor collection, transportation and disposal of such wastes in Nigeria pose a greater environmental in society, which potentially causes environmental pollution and threat to human's health.

II. SOURCES OF ELECTRONIC WASTES

The constant availability of newer technology and design, and an increasingly early obsolescence, changes in technology and media (such as tapes,

software, MP3) and planned obsolescence have resulted in a fast-growing surplus of electronic waste around the globe. The average lifespan of a new model computer has decreased from 4.5 years in 1992 to an estimated 2 years in 2005 (Widmer *et al.*, 2005). Electronic waste is generated from three major sources which includes;

1. Individuals and small businesses
2. Large businesses, institutions, and governments
3. Original equipment manufacturers.

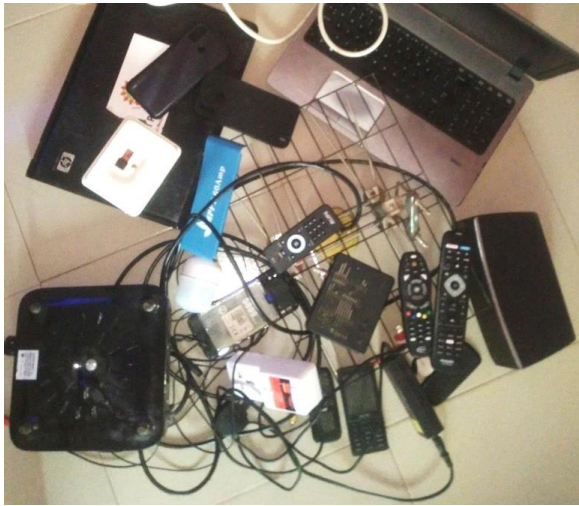


Figure 1: Electronic waste (Author, 2025)

The Environmental Protection Agency estimates that only 15-20% of e-waste generated is recycled, the rest of these electronics go directly into landfills and incinerators. The Basel Convention Regional Coordinating Centre for Africa and Technology transfer in collaboration with Basel Action Network (BAN) in 2005 reported that while some of the imported electronic into Nigeria are fully functional and are directly reused, while a significant quantity of imported computing equipment or parts are considered junk. As used electrical equipment were been imported into the country there remains a challenge to determine the official figures of e-waste internally generated from these importation or domestically assembled ones.

III. ENVIRONMENTAL IMPACT OF ELECTRONIC WASTES

E-waste components are non-biodegradable that contains toxics and harmful chemicals, it contains

hazardous materials such as lead, mercury, beryllium, cadmium, some metals such as iron, aluminum, nickel, copper, and brominated flame-retardants that pose both human and environmental health threat. It also contains some precious metals include gold, silver and the platinum-group metals. The processes of dismantling and disposing of electronic waste in the developing countries may result to contact of the e-waste components with surface water, groundwater, soil and the atmospheric posing great environmental threat. For instance, the arsenic found in computer chips and light emitting diodes is potentially known cancer-causing substance (carcinogen), causing skin and lung cancer. Lead and mercury components of e-waste potentially causes decreases in the overall performance of the nervous system, brain damage and death, and lung damage, nausea, vomiting, diarrhoea, blood pressure, skin rashes, brain and kidneys damage respectively. Thou, e-waste components should be prevented from coming in contact with the environment as most of them are carcinogen and harmful to man and his environment.

IV. RECYCLING AND E-WASTE MANAGEMENT

Among the challenges in e-waste management is recycling the printed circuit boards which contain such precious metals as gold, silver, platinum, etc. and such base metals as copper, iron, aluminum, to mention but a few, from the electronic wastes. The crude recovery techniques of e-waste component result in environmental contamination which has negative impacts on the human health (Sepúlveda *et al.*, 2010). This is usually done by melting the circuit boards, burning cable sheathing to recover copper wire and open-pit acid leaching for separating metals of value. Conventional method employed is mechanical shredding and separation, but its recycling efficiency is low. Properly disposal or reuse of electronics can help to prevent health and environmental threat associating with e-waste recycling and the gases emissions emitted during such process. The removal of plastics hard parts from the e-waste by shredding it in low temperature usually resulted to emissions of brominated dioxins, heavy metals and hydrocarbons into the environment, the best way to prevent such is by developing a more environmentally friendly recycling processes and machinery which combines

dismantling for component recovery with increased cost-effective processing of bulk electronic waste in an enclosed and employs a dust collection system, this would greatly limits the impact of e-waste usage and recycling.

V. CONCLUSION AND RECOMMENDATIONS

Electronic components may contain some contaminants such as lead, cadmium, beryllium, or brominated flame retardants, and in developed countries recycling and disposal of the used or unwanted electronics poses significant risk to the communities and great care must be taken to avoid unsafe exposure in recycling operations and leaking of materials such as heavy metals from landfills and incinerator ashes into the water bodies, air and soils. The causes of e-waste are as results of changes in technology, changes in media, falling prices, and planned obsolescence have resulted in a fast-growing surplus of electronic waste around the globe, if not properly managed can results to degradation and pollution of the environment.

Effective management of e-waste management which may include e-waste recycling, e-waste management should be encouraged and commissions should be established in government agency to handle the management of e-waste and put in place a well-defined e-waste recycling plants. Hence, there should be policy put in place to properly check and regulates the generation and disposal of e-waste and the community should be enlightened on the impact of such waste.

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