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ELECTRONIC WASTE AND DEVELOPING ECONOMIES: WHAT OPTIONS FOR NIGERIA?*

Abstract

There is virtually no household or individual in Nigeria that has not in one way or the other purchased, acquired, made use of or discarded one electrical/ electronic device or another in the recent past. The developed economies, which incidentally produce these devices, now have increased regulation of these products as a result of the concern on their environmental harm. The devices: used computers; cell phones and other mobile devices; household air-conditioners; washing machines; refrigerators; etc, are often exported to developing countries that are ill-prepared to tackle the technologies involved and do not possess relevant capacities to manage them in an environmentally sound manner. In some cases, obsolete and discarded electrical/electronic equipment are sent to some developing countries, including Nigeria, as charity. These "gifts" are received without a deep knowledge of their environmental implications compounded by their high obsoleses. Often, the laws of these developing economies are ill-fitted to tackle appropriately the problems of e-waste. This paper explores the options for managing e-waste in Nigeria.

Key words: Electrical/Electronic waste (e-waste); e-waste and health hazard; trends in e-waste management; e-waste management options for Nigeria.

1.0. Introduction

Electronic waste is one of the emerging environmental problems that is of interest to international environmental law. With growth in the use of electrical and electronic gadgets in virtually every human endeavour in recent years, coupled with the speed with which they become obsolete and get discarded, electronic waste, has become a new wave of hazardous waste which is now of serious environmental concern to the international community, especially in the developing countries. This new wave of waste is generally referred to as 'e-waste'. The 'e-waste' has been noted as the most rapidly growing waste problem in the world today. It is

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estimated that, weight for weight, the average computer chip does more harm to the environment than a car. To make a 2-gram memory chip, over 1,400 grams of materials and fossil fuel are needed. Computers, which have a high rate of obsolescence, also contain cadmium, lead and mercury and when they are no longer required are dumped, recycled or disassembled to recover precious metals such as gold and copper, the rest are discarded as wastes.[1] Because this class of waste was not envisaged by the Basel Convention in 1989, the sixth Conference of Parties to the Convention met in Geneva, in December, 2002 to address a wide number of topics, including the growing issue of 'e- waste', among others. [2]

"Electronic waste", "e-waste", "e-scrap", or "Waste Electrical and Electronic Equipment" ("WEEE") is a loose category of surplus, obsolete, broken, or discarded electrical or electronic devices. It may be defined as all secondary computers, entertainment devices, electronics, mobile phones, and other items such as television sets and refrigerators, whether sold, donated, or discarded by their original owners.[3] This definition includes used electronics which are destined for reuse, resale, salvage, recycling, or disposal. It is also seen as the fastest growing component of municipal waste worldwide with 20-50 million tones generated annually.[4]

People like Morgan[5] defined the reusable (working and repairable electronics) and secondary scrap (copper, steel, plastic, etc.) to be "commodities", and reserve the term "waste" for residue or material which was represented as working or repairable but which is dumped or disposed or discarded by the buyer rather than recycled, including residue from reuse and recycling operations. Because loads of surplus electronics are frequently commingled (good, recyclable, and non-recyclable),

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[1] UNEP: Basel Basics (Website): http: //www.basel.int /Pub/basic, accessed 20/04/2010.

[2] During the conference technical guidelines were adopted on disposal and recycling of 'e-waste', lead-acid batteries, plastic wastes and obsolete ships.

[3] E. Waste Toxic- *Not in Our Backyard*; http://www/greenpeace.org, accessed 06/02/2010.

[4] United Nations Environment Programme (UNEP), www.unep.org, accessed 22/02/2010.

[5] Russell Morgan: "Tips and Tricks for Recycling Old Computers", http://www.smartbiz.com/article/articleprint/1525/-1/58/21/08/2006, accessed 17/03/2010

several public policy advocates apply the term "e-waste" broadly to all surplus electronics.[6] It should be noted that both types of e-waste have raised considerable concern considering that many component of such equipment are considered toxic and non-biodegradable. Some exporters may deliberately leave difficult-to-spot obsolete or non-working equipment mixed in loads of working equipment (through ignorance, or to avoid more costly treatment processes).[7]

There is increased regulation of electronic waste and concern over the environmental harm which can result from toxic electronic waste in the developed economies and this has raised disposal costs. The regulation creates an economic disincentive to remove residues prior to export. In extreme cases, brokers and others calling themselves recyclers export unscreened electronic waste to developing countries, avoiding the expense of removing items like bad cathode ray tubes (CRT), the processing of which is expensive and difficult. As a result, electronic waste is often exported to developing countries that are ill prepared to tackle technologies which they do not possess relevant capacities to manage. In June 2008, a container of electronic waste, destined from the Port of Oakland in the U.S. to Sanshui District in mainland China, was intercepted in Hong Kong by Greenpeace.[8] Concerns over exports of electronic waste were raised in press reports in India, Ghana, Ivory Coast and Nigeria. In addition countries such as Ghana, Nigeria, Pakistan, India and China have in recent past become hot spots for e-waste dumping, though recycling occurs, but this happens illegally.[9]

In the case of Nigeria this state of affairs has attracted comments from high quarters. In 2007, the Minister in charge of Federal Ministry of Environment and Urban Development acknowledged that:

> Large quantities of electronics and electrical that are obsolete are entering the market…. Nigeria in recent years has become

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[6] Russell Morgan, *ibid*. This Debate continues over the distinction between "commodity" and "waste" electronics definitions.

[7] All the same, obsolete household electronic and electrical gadgets, such as computers, are termed “hazardous household waste” by the United States Environmental Protection Agency (EPA).

[8] Greenpeace International: “Illegal e-waste exposed”, available at http://www.greenpeace.org/international/news/illegal-e-waste-exposed, last accessed 14/07/2010. In July 2009 containers from UK loaded with all sorts of wastes, including e-waste, found their way into Brazil.

[9] Junior Scholastic Magazine, April 13, 2009, Vol. 111, No. 16.

> the hotbed of high high-tech growth which prompted the burgeoning new trade and illegal importation of variety of electrical and electronic equipment. Consequently, many brokers and businesses have emerged to channel used equipment from developed countries to Nigeria.[10]

In addition, in 2007 Basel Action Network (BAN), in conjunction with Basel Convention Regional Coordinating Centre (BCRCC), released the result of the research it conducted in Nigeria. The result revealed that about 500 containers of used electrical/ electronic equipment enter Nigeria every month. Each container was said to container about 800,000 computers of which more than 50% were used computers. Of these 25-75 % of the used computers were completely junks and were eventually burnt or dumped carelessly.[11]

Defenders of the trade in used electronics argue that extraction of metals from virgin mining such as hard-rock mining of copper, silver, gold and other materials extracted from electronics is considered far more environmentally damaging than the recycling of electronic materials. They further argued that repair and reuse of computers and televisions has become a "lost art" in wealthier nations, and that refurbishing has traditionally been a path to development in developing countries. To this end, countries like South Korea, Taiwan, and southern China have excelled in finding "retained value" in used goods, and in some cases have set up billion-dollar industries in refurbishing used ink cartridges, single-use cameras, and working CRTs.[12] Refurbishing has traditionally been a threat to established manufacturing, and simple protectionism explains some criticism of the trade. To this end, proponents of the trade argue that thousands of men, women, and children are employed in reuse, refurbishing, repair, and remanufacturing, sustainable industries in decline in developed countries. Thus, denying developing nation's access to used electronics, they further argued, deny them not only affordable products and internet access but also means of employment and income.

Opponents of surplus electronics exports however argue

[10] Alex Emeje: "FG Raises Alarm Over Effects of Imported Appliance," Daily Independence Newspaper, Friday, 7th December, 2007, Vol. 3 No. 1371, C.2.

[11] *Ibid.*

[12] Guiyu in the Shantou region of China, and Delhi and Bangalore in India, have electronic waste processing areas.

that lower environmental and labour standards, cheap labour, and the relatively high value of recovered raw materials leads to a transfer of pollution-generating activities.[13] In China, Malaysia, India, Kenya, Nigeria, and various African countries, electronic waste is being sent to these countries for processing, sometimes illegally. Many surplus laptops are routed to developing nations as "dumping grounds for e-waste", especially from the United States of America. Because the United States has not ratified the Basel Convention or its Ban Amendment, and has no domestic laws forbidding the export of toxic waste, the Basel Action Network estimates that about 80% of the electronic waste directed to recycling in the United States does not get recycled there at all, but is put on container ships and sent to countries such as China.[14] The Institute for Scrap Recycling Industries, and the World Reuse, Repair and Recycling Association argued that whatever is the figure the truth of the matter is that large consignments of obsolete electronic equipment are shipped to developing countries under various guise by United States and other western countries. Infact, the 'e-waste' has become the most rapidly growing waste problem in the world today.[15]

2.0. Why is e-waste an environmental and health problem?

Electronic waste by its very nature causes serious health and pollution problems. This is because electronic equipment contains some very serious contaminants such as lead, cadmium, beryllium and brominated flame-retardants. If treated properly, electronic waste is a valuable source of secondary raw materials. For instance, "White box computers"[16] which are often assembled by small scale manufacturers utilizing refurbished components of electronic materials. However, if not treated properly, electronic waste is a major source of toxins and carcinogens. Rapid technology change, low initial cost and with planned obsolescence have resulted in a fast-growing surplus of electronic waste around the globe.

Technical solutions are available, but in most cases a legal framework, a collection system, logistics, and other services need to be implemented before a technical solution can be applied. In

[13] Such as burning of copper wire.

[14] This figure is however being disputed as an exaggeration by the EPA.

[15] It is estimated that, weight for weight, the average computer chip does more harm to the environment than a car. For instance, to make a 2-gram memory chip, over 1,400 grams of materials and fossil fuel are needed.

[16] Off-brand or no name computers.

the United States, an estimated 70% of heavy metals in landfills come from discarded electronics, while electronic waste represents only 2% of America's trash in landfills.[17] Discarded electronics represented 5 to 6 times as much weight as recycled electronics. The Consumer Electronics Association says that U.S. households spend an average of $1,400 annually on an average of 24 electronic items, leading to speculations of millions of tons of valuable metals sitting in desk drawers.[18] Surplus electronics have extremely high cost differentials. A single repairable laptop can be worth thousands of Naira, while an imploded cathode ray tube (CRT) is extremely difficult and expensive to recycle. This has created a difficult free-market economy. Large quantities of used electronics are typically sold to countries with very high repair capability and high raw material demand, which can result in high accumulations of residue in poor areas without strong environmental laws.

Trade in electronic waste is controlled by the Basel Convention.[19] However, the Basel Convention specifically exempts repair and refurbishment of used electronics in its Annex IX. But the Parties to the Convention had considered the question of whether exports of hazardous used electronic equipment for repair or refurbishment are considered as hazardous waste, subject to import and export controls under that Convention. In the Guidance document produced on that subject, that question was left up to the Parties to the Convention. However, in the working group all the Parties present believed that when material is untested, or contains hazardous parts that would need to be replaced as part of the repair process, then the Convention should apply.

Viewed from whichever way, electronic waste contains toxic substances such as lead element, mercury element, and cadmium. Carcinogenic substances in electronic waste may

[17] Silicon Valley Toxic Corporation: "Poison PCs/Toxic TVs Executive Summary", http://www.svtc.org/cleancc/pubs/pctvexecsum.htm, last accessed 29/07/2010.

[18] LaMonica, Martin: "Got a gadget gathering dust?" http://news.cnet.com, access date 29/07/2010. U.S. National Safety Council estimates that 75% of all personal computers ever sold are now gathering dust as surplus electronics. While some recycle, 7% of cell phone owners still throw away their old cell phones.

[19] The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 1989.

include polychlorinated biphenyls (PCBs). Capacitors, transformers, and wires insulated with or components coated with polyvinyl chloride (PVC), manufactured before 1977, often contain dangerous amounts of PCBs.[20] Up to 38 separate chemical elements are incorporated into electronic waste items. Substances found in large quantities include epoxy and electronics resins, fiberglass, PCBs, PVC, thermosetting plastics, lead, tin, copper, silicon, beryllium, carbon, iron and aluminum. While elements found in small amounts include cadmium, mercury and thallium. Elements found in trace amounts include americium, antimony, arsenic, barium, bismuth, boron, cobalt, europium, gallium, germanium, gold, indium, lithium, manganese, nickel, niobium, palladium, platinum, rhodium, ruthenium, selenium, silver, tantalum, terbium, thorium, titanium, vanadium, and yttrium.[21] Almost all electronics contain lead and tin (as solder) and copper (as wire and printed circuit board tracks), though the use of lead-free solder is now spreading rapidly. Again, many of the plastics used in electronic equipment contain flame retardants. These are generally halogens added to the plastic resin, making the plastics difficult to recycle. Due to the flame retardants being additives, they easily leach off the material in hot weather, which is a problem because when disposed of, electronic waste is generally left outside.[22]

Furthermore, uncontrolled burning, disassembly and disposal can cause a variety of environmental problems such as groundwater contamination, atmospheric pollution, or even water pollution either by immediate discharge or due to surface runoff (especially near coastal areas). Hazards also associated with electronic waste include health problems such as occupational safety and health effects among those directly involved due to the methods of processing the waste. Thousands of men, women, and children are employed in highly polluting, primitive recycling technologies, extracting the metals, toners, and plastics from computers and other electronic waste. Even in developed countries disposal of e-waste involves significant risk to workers

[20] Karlyn Black Kaley et al: "Health Concerns and Environmental Issues with PVC-Containing Building Materials in Green Buildings," http://www.ciwmb.ca.gov/publications/GreenBuilding/43106016.pdf, accessed 03/08/2010.

[21] Chemical fact sheet: Thallium (Spectrum Laboratories), available at http://www.speclab.com/elements/thallium.htm, last accessed 03/08/2010.

[22] The flame retardants leach into the soil and recorded levels were 93 times higher than soil with no contact with electronic waste.

and communities and great care is taken to avoid unsafe exposure in recycling operations and leaching of materials such as heavy metals from landfills and incinerator ashes. It is as a result of these and other hazards associated with hazardous substances that there is need to protect the environment from the adverse effects of e-waste.

In addition, developing countries utilize methods that are more harmful and more wasteful. In most developing countries, including Nigeria, electronic waste processing usually first involves dismantling the equipment into various parts- metal frames, power supplies, circuit boards and plastics, which are separated often by hand. Alternatively materials are shredded and sophisticated expensive equipment separates the various metal and plastic fractions, which then are sold to various smelters and plastic recyclers. However, an expedient and prevalent method is simply to toss equipment onto an open fire, in order to melt plastics and to burn away unvaluable metals. This releases carcinogens and neurotoxins into the air, contributing to an acrid, lingering smog. These noxious fumes include dioxins and furans. Bonfire refuse can be disposed of quickly into drainage ditches or waterways feeding the ocean or local water supplies. This has deleterious effect on the water bodies.

3.0. Trend options in e-waste management.

In the developed and some of the developing economies trend options in managing e-waste is through legislation.[23] In the 1990s some European countries banned the disposal of electronic waste in landfills. This created an electronic waste processing industry in Europe. In Switzerland, the first electronic waste recycling system was implemented in 1991, beginning with collection of old refrigerators. Over the years, all other electric and electronic devices were gradually added to the system. Legislation followed in 1998, and since January 2005 it has been possible to return all electronic waste to the sales points and other collection points free of charge. There are two established producer responsibility organizations: SWICO, mainly handling information, communication, and organization technology, and SENS, mainly

[23] The basis for this is that legislation is a legal framework which may recommend other options such as: recycling, reuse, recover, repair, reduce, donation, take back, exchange and consumer awareness. To his end, for purposes of this work relevant international and domestic instruments were reviewed.

responsible for electrical appliances. The total amount of recycled electronic waste exceeds 10kg per capita per year.[24]

The European Union implemented a similar system in February 2003, under the Waste Electrical and Electronic Equipment Directive (WEEE Directive, 2002/96/EC).[25] The WEEE Directive has now been transposed in national laws in all member countries of the European Union. It was designed to make equipment manufacturers financially or physically responsible for their equipment at the end of its life, under a policy known as extended producer responsibility (EPR) "Users of electrical and electronic equipment from private households should have the possibility of returning WEEE at least free of charge", and manufacturers must dispose of it in an environmentally friendly manner, by ecological disposal, reuse, or refurbishment. EPR was seen as a useful policy as it internalized the end-of-life costs and provided a competitive incentive for companies to design equipment with fewer costs and liabilities when it reached its end of life.[26] Under the directive, by the end of 2006 (with one or two years' delay for the new EU members), every country must recycle at least 4kg of electronic waste per capita per year. Furthermore, the Directive should "decrease e-waste and e-waste exports." In December 2008 a draft revision to the Directive proposed a market-based goal of 65%, which is 22 kg per capita in the case of the United Kingdom.[27] However, the application of the WEEE Directive has been criticized for implementing the EPR concept in a collective manner, and thereby losing the competitive incentive of individual manufacturers to be rewarded for their green design.[28]

Other efforts of the EU in curbing problems of e- waste include: The Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (2002/95/EC), Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment, commonly

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[24] See http://www.umwelt-schweiz.ch/buwal/eng/fachgebiete/fg_abfall/abfallwe gwe iser/eschrott/index.html, last accessed 15/08/2010.

[25] http://eur-lex.europa.eu/LexUriServ/LexUriServ, accessed 15/08/2010.

[26] Since August 13, 2005, electronics manufacturers became financially responsible for compliance to the WEEE Directive.

[27] A decision on the proposed revisions could result in a new WEEE Directive by 2010.

[28] Greenpeace International: "Lost In Transposition?" Greenpeace Report dated 27/09/2006 http://www.greenpeace.org/international/press/reports/lost-in-transposition, accessed 18/08/2010.

referred to as the Restriction of Hazardous Substances Directive (RoHS Directive), was also adopted in February 2003 by the European Union. The RoHS Directive took effect on July 1, 2006, and is required to be enforced and become law in each member state. This directive restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment.[29]

In the United States, the Congress considers a number of electronic waste bills, including the National Computer Recycling Act introduced by Congressman Mike Thompson (D-CA). The main federal law governing solid waste is the Resource Conservation and Recovery Act of 1976. It covers only CRTs, though state regulations may differ. There are also separate laws concerning battery disposal. Several trade organizations in the USA, including the Consumer Electronics Association, are lobbying for the implementation of comprehensive federal laws. On March 25, 2009, the House Science and Technology Committee approved funding for research on reducing electronic waste and mitigating environmental impact, regarded by sponsor Ralph Hall (R- TX).[30]

Again, during Earth Day, April 22, 2009, two bills were passed by the House of Representatives: H.R. 1580 Electronic Device Recycling Research and Development Act, introduced by Rep. Bart Gordon on March 18, 2009, and H.R. 957 Green Energy Education Act, introduced by Rep. Michael McCaul (R-TX.) H.R.1580. The H.R. 1580 bill require the Administration of Environmental Protection Agency (EPA) to give merit-based grants to consortia of universities, government labs and private industries to conduct research with the purpose of finding new approaches to recycling and reduction of hazardous materials in electronic devices and to "contribute to the professional development of scientists, engineers, and technicians in the field of electronic device manufacturing, design, refurnishing, and recycling." The bill will require the recipients of the grants to report every two years to Congress about the progress of their research, gaps in the advancement, risks and regulatory barriers that might hinder their progress. The Congressional Budget Office estimates that to put the bill in effect "would cost $10 million in 2010 and $80 million over the 2010-2014 period." The other bill

[29] "Legislating E-Waste Management: Progress From Various Countries", http://www.ewaste.cn/others/inter1-new.htm, last accessed 18/08/2010.
[30] This was the first federal bill to address electronic waste directly.

passed, H.R. 957, authorizes the Department of Energy in partnership with the National Science Foundation to provide grants to Institutions of higher education to promote education and training for Engineers and Architects "in high energy and high-performance building design." [31]

In addition to the Federal efforts, some states in the US in recent years have developed more stringent policies on e-waste. In 2001, State of Arkansas enacted the Arkansas Computer and Electronic Solid Waste Management Act, which requires that state agencies manage and sell surplus computer equipment, establishes a computer and electronics recycling fund, and authorizes the Department of Environmental Quality to regulate and/or ban the disposal of computer and electronic equipment in Arkansas landfills.[32]

California State implemented a broader waste ban, with advance recovery fee funding, two years later. Electronic waste in California may neither be disposed of in a landfill nor be exported overseas. The 2003 Electronic Waste Recycling Act in California introduced an Electronic Waste Recycling Fee on all new monitors and televisions sold to cover the cost of recycling. The fee ranges from six to ten dollars. California went from only a handful of recyclers to over 60 within the state and over 600 collection sites. The amount of the fee depends on the size of the monitor; it was adjusted on July 1, 2005 in order to match the real cost of recycling. Cell phones are "considered hazardous waste" in California; many chemicals in cell phones leach from landfills into the groundwater system.[33]

State of Colorado legislation requires education programmes that address its electronic waste problem. In 2004, Maine passed Maine Public Law 661, An Act to Protect Public Health and the Environment by providing for a System of Shared Responsibility for the Safe Collection and Recycling of Electronic Waste. It necessitated that after 2006; computer manufacturers take responsibility for handling and recycling computer monitors,

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[31] "H.R. 1580: Electronic Waste Research and Development Act." *Legislative Digest*. Retrieved on 28/08/2010.

[32] "Arkansas Computer and Electronic Solid Waste Management Act". http://www.arkleg.state.ar.us/ftproot/acts/2001/htm/act1410.pdf, accessed 28/08/2010.

[33] Nate Anderson: "California to electronics industry: No toxins for you!" http://arstechnica.com/news.ars/post/20060224-6254.html, last accessed 28/08 /2010.

CRT, and pay the handling costs as well.[34] Minnesota State enacted a law making vendors responsible for the disposal of their branded electronics. Minnesota legislation also outlaws the dumping of cathode ray tubes in landfills. A law in the state of Washington took effect on January 1, 2009, requiring manufacturers of electronic goods to pay for recycling, and establishing a state-wide network of collection points.[35]

In Canada, a number of Canadian provinces have implemented a broader waste ban with advance recovery fee funding on all new monitors and televisions sold to cover the cost of recycling. The fee ranges from six to ten Canadian dollars. The fee was added to the cost of purchasing new televisions, computers, and computer components in Alberta in February 2004, the first of its kind in Canada. Saskatchewan also implemented an electronics recycling fee in February 2007, followed by British Columbia in August 2007, Nova Scotia in February 2008, and Ontario in April 2009.[36]

A number of countries in the Asian continent have made some strides in the control of e-waste. South Korea, Japan and Taiwan require that sellers and manufacturers of electronics be responsible for recycling 75% of them.[37]

4.0. What options for Nigeria in e-waste management?

As a result of the insidious effects of e-waste and low technological knowledge of hazardous substances in e-waste we advocate that the best option for Nigeria in managing e-waste is through the instrumentality of the Law. This can be achieved through:

(1) adopting existing international environmental instruments on the subject alongside existing domestic Law/s, and, where necessary,

(2) enacting new law on the subject to beef up her position.

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[34] Massachusetts was the first of the United States to make it illegal to dispose of CRTs in landfills in April 2000, most similar to the European disposal bans of the 1990s.

[35] "E-waste laws in other states". http://www.cawrecycles.org. Last accessed on 28/08/2010.

[36] Katalin Feszty: "Canada moves to WEEE compliance". http://www.greensupplyline.com, last accessed, 25/08/2010.

[37] "Legislating e-waste management: progress from various countries". http://www.e- waste.cn/others/inter1- new.htm, last accessed 25/08/2010.

(1) Adopting existing international environmental instruments on the subject alongside domestic law. Two international instruments on hazardous wastes are of interest to us. They are:

a. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 1989, (hereinafter referred to as the Basel Convention) and
b. The Bamako Convention on the Ban of Imports into Africa and the Control of Trans-boundary Movement and Management of Hazardous Wastes 1991 (hereinafter referred to as the Bamako Convention).

We shall first and foremost review these laws and juxtapose them side-by-side domestic law on the subject.

With the tightening of environmental laws in developed nations in the 1970s, disposal costs for hazardous waste rose dramatically. At the same time, globalization of shipping made transboundary movement of waste more accessible, and many Less Developed Countries (LDCs) were desperate for foreign currency. Consequently, the trade in hazardous waste, particularly to LDCs, grew rapidly. One of the incidents which led to the creation of the Basel Convention was the *Khian Sea* waste disposal incident, in which a ship carrying incinerator ash from the city of Philadelphia in the United States after having dumped half of its load on a beach in Haiti, was forced away where it sailed for many months, changing its name several times. Unable to unload the cargo in any port, the crew was believed to have dumped much of it at sea.[38]

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, (the Basel Convention) is an international treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries (LDCs). The Convention is also intended to minimize the amount and toxicity of wastes generated, to ensure their environmentally sound management as closely as possible to the source of generation, and to assist LDCs in environmentally sound management of the hazardous and other wastes they generate. The Convention was opened for signature on 22 March 1989, and entered into force on 5 May 1992. Of the 172 parties to the Convention, Afghanistan, Haiti, and the United

[38] Greenpeace International, *ibid.*

States have signed the Convention but have not yet ratified it.[39]

The Convention imposes obligations on the Parties to the Convention for ensuring the environmentally sound management, in particular, the disposal of hazardous wastes. To this end, the Convention stipulates three main interdependent and mutually supportive goals that have to be fulfilled. They are:

(i) trans-boundary movements of wastes should be reduced to a minimum consistent with their environmentally sound management;
(ii) hazardous wastes should be treated and disposed of as close as possible to their source of generation; and
(iii) hazardous waste generation should be reduced and minimized at its source.[40]

The Convention contains general obligations requiring Parties, *inter alia*, to ensure that the trans-boundary movements of hazardous wastes are reduced to the minimum consistent with environmentally sound and efficient management. This, according to Birnie and Boyle,[41] places three important and far-reaching restrictions on international trade in hazardous wastes. First, the Convention confirms the sovereign right to ban imports; either on an individual, bilateral or regional basis provided the exercise of this right to prohibit trade in waste is notified to other parties through the secretariat.[42] Second, the Convention has adopted the principle of minimizing the generation of hazardous waste and promoting disposal at source. Indeed, the primary obligation is to manage the trans-boundary movement of waste in an environmentally sound manner. Thus, trans-boundary movement is permitted between parties to the Basel Convention but only in circumstances where the state of export does not have the capacity or facilities to dispose of the wastes in an environmentally sound manner itself, or unless the wastes are intended for re-cycling.[43] Furthermore, recognizing the importing states' responsibility under international law for the protection of their own environments, the Convention places on importing states' parties

[39] The Convention however, does not address the movement of radioactive waste.
[40] Preamble to the Basel Convention.
[41] P.W. Birne and A.E. Boyle: *International Law and the Environment*, 2nd edn. (Oxford: Oxford University Press, 2002) p. 383.
[42] Preamble to the Convention and Article 4 (1) (a).
[43] Art. 4 (9) (a) and (b), *supra.*

an obligation of environmentally sound management.[44] However, the exporting state may not under any circumstances discharge its obligation to manage the wastes in an environmentally sound manner and must permit re-import if necessary.[45]

To enhance the application of this concept (environmentally sound management of hazardous wastes) the Convention requires the establishment of technical guidelines.[46] The development and implementation of these guidelines create less hazardous waste and/or improve existing technologies with a view to eliminating the generation of hazardous wastes. In order to achieve this aim, a technical working group was established directly after the adoption of the Convention. What amounts to environmentally sound management was defined in general terms in Article 2(8). It means, "taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes." Prior to the coming into effect of the Basel Convention in 1992, the Cairo Guidelines and Principles of Environmentally Sound Management of Hazardous Wastes of 1985, and adopted by UNEP in 1987, provides a more detailed functional definition of the term. It means, "the use of best practicable means, approval of sites and facilities, disposal plans, monitoring, public access to information and contingency planning." [47]

Third, the Convention under Articles 4 and 6 requires prior, informed and written consent of both transit and import states, in the conduct of international trade in hazardous wastes. The basis for this provision, according to Maurice Sunkin et al,[48] is that a state's sovereignty over its territory places a duty upon other states using its territory not to cause damage or interfere with other uses of the territory. To this end, Birnie and Boyle[49] regard this prior consent provision as the crowning achievement of the Convention as really does international law require prior consent of other states before environmentally harmful activities may be undertaken.

In addition, under Article 4 (6), Parties to the Convention

[44] Arts. 4(8) and 9 (3), Basel Convention.
[45] Art. 4(10), *supra*.
[46] Art. 4 (8), *supra*.
[47] P.W. Birne and A.E. Boyle, *ibid*, p. 384.
[48] Maurice Sunkin, David M Ong and Robert Wight: *Source Book on Environmental Law* (London: Cavendish Publishing Limited, 1998) p. 296.
[49] P.W. Birnie and A.E. Boyle, *op cit*, p. 385.

agree not to allow the export of hazardous wastes or other wastes for disposal within the area south of Latitude 60 degrees whether or not such wastes are subject to trans-boundary movement. Another far- reaching general obligation imposed by the Convention are provided under Article 4(7).[50] Under the Article each Party shall:

(i) prohibit all persons under its national jurisdiction from transporting or disposing of hazardous wastes or other wastes unless such persons are authorized or allowed to perform such types of operations;

(ii) require that hazardous wastes and other wastes that are to be the subject matter of a trans-boundary movement be packaged, labelled, and transported in conformity with generally accepted and recognized international rules and standards in the field of packaging labelling and transport, and that due account is taken of relevant internationally recognized practices,

(iii) require that hazardous wastes or other wastes be accompanied by a movement document from the point at which a trans-boundary movement commences to the point of disposal.

For the purpose of the Convention, any trans-boundary movement of hazardous wastes or other wastes without notification to all states concerned (prior informed consent, PIC), or without consent of a state concerned, or consent obtained from states concerned through falsification, misrepresentation or fraud, or that does not conform in a material way with the documents, or that results in deliberate disposal of hazardous wastes or other wastes will be in contravention of the Convention and principles of international law, and be deemed to be illegal traffic.[51] Thus, illegal traffic in hazardous wastes or other wastes shall be considered by Parties as criminal.[52] However, a Protocol adopted in 1999[53] provides for a liability scheme compensation for damage resulting from trans-

[50] General overview of other obligations are provided in Arts 4 (8-13), Basel Convention.
[51] Art. 9, Basel Convention.
[52] Art. 4(3), *supra.*
[53] Liability and Compensation to the Basel Hazardous Wastes Convention, 1999 (also known as Basel Protocol, 1999).

boundary movements of hazardous wastes. For effective implementation of the Convention States Parties to the Convention should aim towards activities for the reduction and minimization of all risks of harm caused by hazardous wastes to health and environment. Such activities should include among other things:

i) steps to reduce or avoid the generation of hazardous wastes;
ii) steps to ensure proper recovery of wastes;
iii) steps to reduce to a minimum or eliminate the export/import of hazardous wastes. This entails the planning of environmentally sound disposal facilities, located as close as practicable to the source of generation, and identification of the generators.

The Basel Convention did not envisage e-waste as a hazardous substance in 1989. However, during the sixth Conference of Parties to the Convention (CoP) meeting in Geneva in December, 2002 it addressed a wide number of topics, including the growing issue of 'e-wastes', among others. During the conference technical guidelines were adopted on disposal and recycling of 'e-wastes', lead-acid batteries, plastic wastes and obsolete ships. This gave birth to the Basel Ban Amendment (BAN). The Amendment prohibits the export of hazardous waste from a list of developed, mostly Organisation for Economic Co-operation and Development (OECD) countries to developing countries. The Basel BAN applies to export for any reason, including recycling.[54]

Increased trade in recyclable materials has led to an increase in a market for used products such as computers. This market is valued in billions of dollars. At issue is the distinction when used computers stop being a "commodity" and become a "waste". During the CoP 6 the working group Parties to the Convention believed that when material is untested, or contains hazardous parts that would need to be replaced as part of the repair process, then the Convention will apply. Computers as noted earlier have a high rate of obsolescence, contain cadmium, lead and mercury and when they are no longer required are dumped, recycled or disassembled to recover precious metals such as gold and copper, the rest are discarded as waste.[55] Therefore, by analogy, if it can be proven that computer contains some

[54] http://en.wikipedia.org. Accessed 29/08/2010.

[55] United Nations Environment Programme: *Environmental Law Training Manual* (Nairobi: UNEP, 1997) p.46.

hazardous substances the texts of the Basel Convention should apply. This is in line with the precautionary principle.

The core of the principle is reflected in Principle 15 of the Rio Declaration 1992, which provides that: "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." An interpretation of this Principle 15 means that activities and substances which may be harmful to the environment should be regulated, and possibly prohibited, even if no conclusive or overwhelming evidence is available as to the harm or likely harm they may cause to the environment. This position is supported by the Bamako Convention in its Article 4(3) (f). It requires parties to the Convention to strive to adopt and implement "the preventive, precautionary approach to pollution without waiting for scientific proof …" Thus, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. We therefore hold that we must not wait for proof of harmful effects before taking action on e-waste, since its damage to the environment can be irreversible or remediable only at considerable expense and over a long period.

Although the Basel Convention by its various provisions laid down global standards for the control of trans-boundary movements of hazardous wastes and other wastes, this notwithstanding, in the words of Maurice Sunkin, et al,[56] the Convention nevertheless leaves open the possibility of national, bilateral or regional treaties incorporating stricter obligations, even amounting to total prohibitions against the imports of hazardous wastes. This assertion may be unconnected to the strong protestations made by developing countries Party to the Convention. Perhaps, this was the impetus needed by African countries that gave birth to the Bamako Convention on the Ban of Imports into Africa and the Control of Trans-boundary Movement and Management of Hazardous Wastes, Bamako Convention, to which we now turn.

Although, African countries are parties to the Basel Convention they remained conscious of their particularly vulnerable situation since the continent had become a dumpsite for developed countries where most of the hazardous wastes are produced. They were therefore conscious of the need for control

[56] Maurice Sunkin, *et al*, *op. cit*, p. 297.

measures, stricter than the Basel Convention, to protect the lives of Africans and their environment taking advantage of Article 11 of the Basel Convention, which provides as follows:

> Nothing in this Convention shall prevent a Party from imposing additional requirements that are consistent with the provisions of this Convention, and are in accordance with the rules of international law, in order better to protect human health and the environment.

The Bamako Convention is a treaty of African nations prohibiting the import of any hazardous (including radioactive) waste. The Convention was negotiated by twelve nations of the Organization of African Unity[57] at Bamako, Mali in January, 1991, and came into force on January 30, 1998. It uses a format and language similar to that of the Basel Convention, but is much stronger in prohibiting all imports of hazardous waste. Additionally, it does not make exceptions on certain hazardous wastes (like those for radioactive materials) made by the Basel Convention.

Impetus for the Bamako Convention arose from the failure of the Basel Convention to prohibit trade on hazardous waste to less developed countries. This was from the realization that many developed nations were exporting toxic wastes to Africa. This impression was strengthened by several prominent cases. One important case, which occurred in 1988, concerned the importation into Nigeria of 18,000 barrels of hazardous waste from the Italian companies Ecomar and Jelly Wax, which had agreed to pay local farmer Sunday Nana $100 per month for storage. The barrels, found in storage in the port of Lagos, contained toxic waste including polychlorinated biphenyls (PCB) and their eventual shipment back to Italy led to protests closing three Italian ports.

The objective of the Bamako Convention is to protect the human health of the African population and the environment against the adverse effects which may result from the generation of hazardous wastes to and within Africa.[58] Under the Convention the scope of hazardous wastes are as contained in Article 2. These include:

(i) wastes that belong to any category contained in Annex 1 of the Convention;
(ii) wastes not covered by the Annex but are defined as or considered to be hazardous waste by domestic legislation of

[57] As it was then called, now known as African Union.
[58] The Preamble to the Bamako Convention.

the party of import, export or transit;

(iii) wastes that posses any of the characteristics contained in Annex11 of the Convention; and

(iv) hazardous substances which have been banned, cancelled or refused registration by government regulatory action for health or environmental reasons or voluntarily withdrawn from registration in the country of manufacture for the same reason.

It should be noted that radioactive wastes that are subject to any international control system are covered by the Convention.[59] However, if wastes are derived from normal operation of a ship such wastes are not covered by the Convention.[60] Article 4 spells out general obligations to the Parties under the Convention. Parties shall:

(i) take appropriate legal, administrative and other measures within the area under their jurisdiction to prohibit the import of all hazardous wastes for any reason into Africa from non-contracting Parties. Such import shall be deemed illegal and a criminal act.

(ii) prohibit dumping or incineration of the wastes at seabed and sub-seabed and not even Contracting Parties shall engage in such, whether in internal waters, waterways, territorial seas, exclusive economic zone or high seas and where these happen, they shall be deemed illegal.

(iii) ensure that generators of wastes submit to the secretariat reports in respect of the generation and impose strict, unlimited, joint and several liability on the generators and as well ensure that the generation is reduced to a minimum taking into account social, economic and technological aspects.

(iv) ensure the availability of adequate treatment and disposal facilities for the Environmentally Sound Management of the wastes and that within their jurisdiction persons involved in the management of the wastes take necessary steps to prevent pollution arising from the wastes and where pollution occurs to ensure the minimization of the consequences thereof.

In addition to the above each Party shall strive to adopt and implement the preventive precautionary approach to pollution problems and to this end shall promote Clean Production Method.

[59] This was an improvement to the Basel Convention.
[60] Art 2(1-3), Bamako Convention.

This involves production or industrial systems that avoid or eliminate the generation of wastes.[61]

Arising from our discussions on Basel and Bamako Conventions, the following question arises: how can Nigeria apply the provisions of these international environmental instruments to prohibit or control incident of e-waste dumping in the country and in the process manage e-waste disposal? There are a number of options. The first is to fix a life span in terms of used electronic products (especially computers and cell phone) being imported into the country.[62] Second, any electronic product beyond the fixed life span should be classified as e-waste and therefore be regarded as hazardous. Both the Basel and Bamako Conventions are helpful in this respect. Under the Bamako Convention, the scope of a substance as waste, especially hazardous waste, is as provided under its Article 2. This constitutes no problem for implementation as its provisions are very clear.

Under the Basel Convention however, a substance will fall under its scope of control if it is within the category of wastes listed in Annex I, and it does exhibit one of the hazardous characteristics contained in Annex III.[63] However, even where the substance is not listed or classified under the Basel Convention, there is another way under which a substance may fall within the scope of a waste under the Convention, and therefore be subject to domestic legislative control. Where a substance is defined as or considered to be a hazardous waste under the laws of the exporting country, or the importing country, or that of the countries of transit, such a substance will be regulated under the Basel Convention. Here the Harmful Waste (Special Criminal Provision) Act[64] (HWSCPA) is helpful.[65] The Act defines hazardous waste as:

> Any injurious, poisonous, toxic or noxious substance...which can subject any person to the risk of death, fatal injury or

[61] Art 4(1), (2), (3) a-h, Bamako Convention

[62] This has been done in respect of used cars ("*Tokunbo*" cars). There is a ban in importation of used cars more than ten years old.

[63] Such as being explosive, flammable, toxic, or corrosive

[64] Cap H.1 Laws of the Federal Republic of Nigeria, 2004.

[65] See also the provisions of s. 27 of the National Environmental Standards and Regulations Enforcement Agency (Establishment) Act, (NESREA) 2007 that prohibits the discharging of harmful quantities of any hazardous substance into the air or upon land and the waters of Nigeria or the adjoining shorelines.

incurable impairment of physical and mental health…[66]

Again, the National Environmental (Sanitation and Wastes Control) Regulations, 2009 classified types of hazardous waste in its Schedule XIII as:

(a) Waste that exhibits any of the following hazardous properties: explosive; flammable liquids and solids; poisonous; toxic; ecotoxic; and infectious.[67]
(b) End-of-life waste of household electrical and electronic appliances or residues arising from the incineration of the same.[68]

What these mean is that not minding that neither the Basel nor the Bamako Conventions specifically classified e-waste as a hazardous substance once any substance exhibits any of the characteristics of being injurious, poisonous, toxic or noxious and can cause death, fatal injury or any form of impairment to persons,[69] or explosive, flammable, poisonous, toxic or ecotoxic,[70] such a substance should be classified as hazardous and a ban imposed on it adopting the provisions of both the Basel Convention and the Bamako Convention to control its trans-boundary movement. In addition, there are stringent requirements under both Conventions for notice, prior informed consent, labeling and tracking of movement of the wastes across international boundaries.

Furthermore, the Basel Convention in Article 4(3) states that illegal hazardous waste traffic is criminal but contains no enforcement provisions. According to Article 12 of the Basel Convention, "Parties are directed to adopt a protocol that establishes liability rules and procedures that are appropriate for damage that comes from the movement of hazardous waste across borders." The Bamako Convention is more explicit. Parties to the Convention should "take appropriate legal, administrative and other measures within the area under their jurisdiction to prohibit the import of all hazardous wastes for any reason into Africa from non- contracting Parties. Such import shall be deemed illegal and

[66] S. 15, HWSCP, Act.
[67] Item (a) Schedule XIII to the National Environmental (Sanitation and Wastes Control) Regulations, 2009.
[68] Item (c), *supra*.
[69] As per the provisions of s. 15 of the HWSCP Act.
[70] As per the provisions of item (a) Schedule XIII to the National Environmental (Sanitation and Wastes Control) Regulations, 2009.

a criminal act."[71]

Fortunately, in Nigeria, two of her domestic laws have criminalized dealing in hazardous substances. For instance, the Harmful Wastes (Special Criminal Provisions) Act (HWSCP Act), 1988[72] and the National Environmental Standards and Regulations Enforcement Agency (Establishment) Act, (NESREA) 2007.[73] Our discussions on the applicability of these laws are however dwelt on the provisions of the HWSCP Act.[74]

The HWSCP Act is an Act to prohibit the carrying, depositing and dumping of harmful waste on any land, territorial waters of Nigeria and matters relating thereto. Under this Act, it is an offence for any person, without lawful authority, to carry, deposit, dump or causes to be carried, deposited or dumped, transports or causes to be transported, imports or causes to import, negotiate for the purpose of importing any harmful waste, sells, offers for sale, buys or otherwise deals in any harmful waste.[75] A person shall be deemed to have committed the offence if he actually does the act, enables, aids, counsels or procures any person to commit the crime.[76] It is immaterial, in the case of counselling, that the act committed is the same as the one counselled or a different one, or is committed in the way counselled or in a different way, provided that in either case, the facts constituting probable consequence of carrying out the counsel.[77] Such a person shall, on conviction be liable to the same punishment prescribed in the Act.[78] The punishment prescribed under the Act is imprisonment for life, and in addition:

(a) any carrier, including aircraft, vehicle container and any other thing whatsoever used in the transportation or importation of the harmful waste, and

(b) any land on which harmful waste was deposited or dumped,

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[71] Article 4(1), Bamako Convention.

[72] S. 1.

[73] S. 27, NESREA Act and two of its Regulations (the National Environmental (Sanitation and Wastes Control) Regulations, 2009 and the National Environmental (Electrical/Electronic Sector) Regulations, 2010).

[74] The law is solely on harmful or hazardous substance and it is more encompassing in its provisions than the NESREA Act that has only one s. that deals with the subject matter.

[75] S. 1(2) HWSCP Act. This s. is more comprehensive and more strigent than the provisions of s. 27 of NESREA Act.

[76] S. 2 (1), HWSCP Act.

[77] S. 4, *supra.*

[78] S. 2(2), (3), *supra.*

> shall be forfeited and vest in the Federal Government without any further assurance.[79]

Where the offence is committed by a body corporate and it is proved that it was committed with the consent or connivance of or is attributable to any neglect on the part of a director, manager, secretary or other similar officer or by any person purporting to act in the same capacity, he, as well as the body corporate, shall be guilty of the crime and shall be liable to be proceeded against and punished accordingly.[80]

From the foregoing, electronic equipment, especially computer and mobile devices, by their very nature once not put to appropriate use or discarded inappropriately can constitute a hazardous substance. Nigeria can therefore apply her domestic law on the subject to control importation, dumping or disposal of such equipment into the country. Presently, the National Environmental Standards and Regulations Enforcement Agency (NESREA) been established. The Agency is to enforce compliance with provisions of international agreements, protocols, conventions and treaties on environment, including hazardous wastes, etc, and such other environmental agreements as may from time to time come into force.[81] It is also empowered to enforce compliance with regulations on importation, exportation, production, distribution, storage, sale, use, handling and disposal of hazardous chemicals and waste….[82] The Agency is therefore well positioned to handle issue of e-waste by enforcing both the international agreements and applying the domestic laws to rid the country of e-waste incidents.

It is therefore believed that where these laws, especially the HWSCP Act, are well positioned and if applied strictly,

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[79] S. 6, *supra*. This punishment is more stringent, and preferable, than punishment provided under s. 27 (2)–(3) of the NESREA Act. For an individual the punishment is a fine of =N=1,000,000 or imprisonment for 5 years. Where the offender is a body corporate every person who at the time the offence was committed or was in charge of the body corporate shall be deemed to be guilty of such offence and shall be liable to be proceeded against and punished accordingly as if he committed the offence in his personal capacity. However, where such a person can show that the offence was committed without his knowledge or that he exercised all due diligence to prevent the commission of the offence.

[80] S. 7, HWSCP Act

[81] S. 7 (d),HWSCP Act

[82] S. 7 (g), *supra*.

indiscriminate dumping of used electrical and electronic equipment in the country will be curtailed. However, one limitation of these laws is that it only adopts a react-and-cure approach and if and when applied, it is targeted towards just controlling the importation and dumping of e-waste in Nigeria, The Acts do not prescribe means and methods of e-waste management. This *lacuna* is addressed by the second option discussed below.

(2) Legislating against E-Waste.

The second option for Nigeria in managing e-waste is an outright legislation on e-waste management. There is currently no legislation in Nigeria that is targeted towards the management and control of e-waste. The nearest is the omnibus Harmful Waste (Special Criminal Provisions) Act, 1988 discussed above. This Act does not target e-waste *per se* but is applied generally to any substance that qualifies as a harmful or hazardous substance pursuant to the provisions of its section 15.[83] To this end we advocate that a legislation whose mischief is to manage and control e-waste be enacted. Such Law should adopt the anticipate-and-prevent approach and should contain provisions that should:

(a) Ban the disposal of electrical and electronic equipment in non-designated areas, especially landfills.
(b) Ban the importation of electrical and electronic equipment that are not above certain fixed life span.
(c) Create collection points for e-waste. This can be achieved by establishing Electronic Waste Collection Centres (EWCC). The centre shall handle information, communication and organisation technology as they affect electrical and electronic equipment.
(d) Make equipment manufacturers financially or physically responsible for their equipment at the end of its life, under a policy known as extended producer responsibility (EPR). The extended producer responsibility will internalized the end-of-life costs and provide a competitive incentive for companies to design equipment with fewer costs and liabilities when it reached its end of life, thus reducing the speed under which such equipment become obsolete and discarded.
(e) Make users of electrical and electronic equipment from private households have the possibility of returning waste electrical and electronic equipment free of charge to manufacturers. In this respect manufacturers of electrical and electronic equipment shall be mandated to dispose of e-waste in an environmentally friendly manner, by ecological disposal, reuse, or refurbishment. In addition,

[83] The position is not made better by the provisions of the NESREA Act.

sellers and manufacturers of electronics should be responsible for recycling 75% of them.

(f) Compel manufacturers of electronic goods to pay for recycling, and establish a nation-wide network of collection points, in collaboration with the Electronic Waste Collection Centres (EWCC).

(g) Mandate computer manufacturers to take responsibility for handling and recycling computer monitors, and pay the handling costs as well.

(h) Some have argued[84] that the reusables (working and repairable electronics) and secondary scrap (copper, steel, plastic, etc.) to be "commodities", these form loads of surplus electronic equipment that are frequently commingled. Because surplus electronic equipment have extremely high cost differentials, a single repairable laptop can be worth thousands of Naira. To this end, an e-waste processing industry should be created by the new Law.[85] This may have some multiplier effect:

i) Reduction in poor accumulation of residue electrical and electronic equipment,

ii) Reduction in unsafe disposal of discarded electrical and electronic equipment, and

iii) Creation of job opportunities.

5.0. Conclusion.

From all indications, electrical and electronic equipment are comparable to fire, "a good servant but a bad master." Despite the fact that we all need the various electrical and electronic equipment, in our homes and offices, it should be noted that because of rapid technology change, low initial cost, and with planned obsolescence there is a fast-growing surplus of electronic waste around the globe creating e-waste. As a result of increased regulation of electronic waste in developed economies, resulting in high disposal cost and concern over the environmental harm which can result from toxic electronic waste disposal, often exported to developing countries, there is need to control and manage e-waste in an environmentally friendly manner.

[84] People like Morgan *et al , ibid.*

[85] A number of countries such as Norway, Sweden, Denmark, Netherlands, Belgium, United Kingdom, Ireland, Luxembourg, France, Portugal, Spain, Switzerland, Austria, Slovenia, Malta, Finland, Germany, Czech Republic, Estonia, Latvia, Lithuania, Poland, Slovakia, Romania, Greece, Cyprus, Hungary, Italy, South Korea, Japan, Taiwan, and United States enforce e-waste recycling.

The processing of electronic waste in developing countries, especially if processed improperly, as is often the case, causes serious health and pollution problems due to lack of containment, as do unprotected land filling (due to leaching) and incineration. Uncontrolled burning, disassembly, and disposal can also cause environmental and health problems, including occupational safety and health effects among those directly involved, due to the methods of processing the waste. Thousands of men, women, and children are employed in highly polluting, primitive recycling technologies, extracting the metals, toners, and plastics from computers and other electronic waste, in many cases not knowing the health hazards they are exposed to.

It is in the light of the foregoing that we strongly advocate effective and efficient management and control system through far reaching legislation. Those who are manufacturers of electrical and electronic equipment, knowing the health hazards and environmental problems posed by the equipment, have taken steps to curtail and control their environmental impacts within their environment through legislation, leaving the developing countries, and often destinations of e-waste disposal, to face the environmental hazards from such disposal. To this end, Nigeria, and indeed all developing economies, must as a matter of urgency, take adequate legislative steps to control and manage electronic waste within its jurisdiction in order to avert the likely environmental disaster associated with it.