

# **E-WASTE ENVIRONMENTAL POLLUTION AND HEALTH RISK IMPLICATIONS FOR EARLY CHILD CARE, GROWTH AND DEVELOPMENT IN NIGERIA**

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## ***Abstract***

*Nigeria is one of the dumping grounds for electrical and electronic waste materials and appliances that are outdated or close to end-of-life cycle (e-waste). E-waste contains potentially harmful substances. Inappropriate and unsafe management practices of these wastes can cause environmental pollution and health hazard and impact early child care, growth and development. The study examines the issues of disposal, recycling and proper management of e-waste materials in order to tackle the menace of health risk exposure to early life. Some recommendations were made as; All stakeholders (government, industry, environmental groups, and citizens) must work in cooperative collaboration with NESREA to effectively manage and mitigate the problems of e-waste in Nigeria. Nigeria should immediately ratify the Bamako Convention and entrench stringent enforcement regime of the National Environmental (Electrical/Electronic Sector) Regulations 2011 and the Nigerian Decree of 1988 prohibiting all imports of hazardous wastes.*

**Keywords:** *E-waste generation and management, Environmental pollution, Health hazard, Early child care.*

## **Introduction**

Electronic and electrical waste (e-waste), also referred to as waste electrical and electronic equipment (WEEE), is defined as any end-of-life equipment which is dependent on electrical currents or electromagnetic fields in order to work properly (UNEP, 2007). Included in this definition are small and large household appliances; information technology and telecommunications equipment; lighting equipment; electrical and electronic tools, toys, and leisure and sports equipment; medical devices; monitoring and control instruments; and automatic dispensers. Components of electrical and electronic equipment such as batteries, circuit boards, plastic casings, cathode-ray tubes, activated glass, and lead capacitors are also classified as e-waste (UNEP, 2013). Although e-waste is informally processed in many regions, high-volume informal recycling has been reported in China, Ghana, Nigeria, India, Thailand, Philippines, and Vietnam.

## **E-waste pollution**

Pollutants are released as a mixture, and the effects of exposure to a specific compound or element cannot be considered in isolation. However, a more complex understanding of the interactions between the chemical components of e-waste is needed. Exposure to e-waste is a complex process in which many routes and sources of exposure, different lengths of exposure time, and possible inhibitory, synergistic, or additive effects of many chemical exposures are all important variables. Exposure to e-waste is a unique variable in itself and the exposures implicated should be considered as a whole. Sources of exposure to e-waste can be classified into three sectors: informal recycling, formal recycling, and exposure to hazardous e-waste compounds remaining in the environment (ie, environmental exposure). Informal electronic waste recycling includes the dismantling of end-of-life electronics to retrieve valuable elements with

primitive techniques, without or with very little technology to minimise exposure or protective equipment, allowing the emission of dangerous chemicals (Wong *et al.*, 2007). Formal electronic waste recycling facilities use specifically designed equipment to safely remove salvageable materials from obsolete electronics while protecting workers from adverse health effects. However, these centres are very expensive to build and run and are rare in less developed countries. Varying national safety standards can mean that workers at formal or semiformal recycling centres still risk exposure at low doses (Schluep *et al.*, 2009). Because of the high levels of environmental, food, and water contamination, residents living within a specific distance of e-waste recycling areas are also at risk of environmental exposure, although at lower levels than through occupational exposure (Yu *et al.*, 2006; Fu, *et al.*, 2008). Exposure routes can vary dependent on the substance and recycling process. Generally, exposure to the hazardous components of e-waste is most likely to arise through inhalation, ingestion, and dermal contact. In addition to direct occupational (formal or informal) exposure, people can come into contact with e-waste materials, and associated pollutants, through contact with contaminated soil, dust, air, water, and through food sources, including meat (Robinson, 2009; ATSDR, 2007).

### **Concept of early years of child care**

Early years in life are the most important to the formation of intelligence, personality and social behaviour of a child. The year before a child reaches Kindergarten are among the most critical in his or her life to influence learning. That is why modern societies show serious concern for the education of their young ones by providing needed support to prepare them to succeed later in school (Ejeh, 2006). It is common practice in most societies to make provision for early childhood education programmes of various sorts for children below the official school-going age (usually 6years) mainly to prepare them for education in primary

schools (Obidike, 2012). The Federal Government of Nigeria recognizes the importance of early childhood education in Nigeria and as a result it was given prominence in the National Policy of Education (FRN, 2004) as one of the programmes in the Nigerian educational system. Bagudo (2008), posited that reports across the globe revealed that an estimated figure of one hundred million children, struggle daily for survival in villages and cities, and are exposed to the risks of hunger, poverty, disease, illiteracy and abuses. In support of this view, Mahuta (2007) stresses that the need to address the problems and salvage these children and the next generation of children from these menace, has necessitated the programme of Early Childhood Care Development and Education (ECCDE). Mahuta (2007) also stated that the aim of ECCDE is to foster the proper development of the children, identify and address their problems, harness their potentials, mould their character, enhance their learning, equipped them for life, so that their actions are channeled towards positive personal, communal and global development in all ramifications of life.

#### **Dangers and Implication of e-waste to early years**

Children, foetuses, pregnant women, elderly people, people with disabilities, workers in the informal e-waste recycling sector, and other vulnerable populations face additional exposure risks. Children are a particularly sensitive group because of additional routes of exposure (e.g., breastfeeding and placental exposures), high-risk behaviours (e.g., hand-to-mouth activities in early years and high risk-taking behaviours in adolescence), and their changing physiology (eg, high intakes of air, water, and food, and low rates of toxin elimination) (Pronzuk, 2004). The children of e-waste recycling workers also face take-home contamination from their parents' clothes and skin and direct high-level exposure if recycling is taking place in their homes. The effects of some of the most hazardous e-waste components, viz. mercury, lead, chromium, brominated

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flame retardants and cadmium. effects of e-waste on humans (UNEP,2007b; Moef, 2008; Envis, 2008; Pinto and Patil, 2008; Osuagwu and Ikerionwu, 2010; Chen *et al.*; 2011).

**Table 9.2.3.1: Effects of e-waste on humans**

<b>Toxin</b>	<b>Typical sources</b>	<b>Effects on humans</b>
Mercury	Fluorescent lamps, LCD monitor, switches, flat panel screens	Impairment of neurological development in fetuses and small children, tremours, emotional changes, cognition, motor function, insomnia, headaches, changes in nervous response, kidney effects, respiratory failures, death
Lead	CRT of TV, computer monitor, circuit boards	Probable human carcinogen, damage to brain and nervous systems, slow growth in children, hearing problems, blindness, diarrhoea, cognition, behavioural changes (e.g. delinquent), physical disorder.
Chromium	Untreated and galvanized steel plates, decorator or hardener for steel housings	Asthmatic bronchitis, skin irritation, ulceration, respiratory irritation, perforated eardrums, kidney damage, liver damage, pulmonary congestion, oedema, epigastric pain, erosion and discolouration of the teeth, motor function
BFR	Plastic casings, circuit boards	May increase cancer risk to digestive and lymph systems, endocrine disorder
Cadmium	Light-sensitive resistors, as corrosion retardant, Ni-Cd battery	Inhalation due to proximity to hazardous dump can cause severe damage to the lungs, kidney damage, cognition

Source: UNEP,2007b; Moef, 2008; Envis, 2008; Pinto and Patil, 2008; Osuagwu and Ikerionwu, 2010; Chen *et al.*; 2011

Apart from the hazardous effects on humans, it is discovered that e-waste leaches into the soil to pollute farmland and underground water. E-waste can also cause uncontrolled fire risk, leading to toxic fumes. In addition, uncontrolled burning, disassembly and disposal of e-waste can cause a variety of environmental problems such as groundwater contamination, atmospheric pollution, and occupational and safety effects among those directly or indirectly involved in the processing of e-waste (Ban *et al.*, 2005).

### **E-waste and the Nigeria situation**

The problem of e-waste and its management is not only global but has its own environmental implications. A major driver of the growing e-waste problem is the short life span of most electronic products – less than two years for computers and cell phones (Macauley *et al.*, 2003; Denga *et al.*, 2006; Bhutta *et al.*, 2011). In tackling the problem of e-waste the European Union (EU), Japan, Taiwan, South Korea and several states of the United States have introduced legislation making producers take responsibility of products reaching the end of their lives, with 65% of the United States being currently covered by some sort of state e-waste recycling law (ETC, 2012; Terada, 2012). The problem of e-waste in relation to human rights has been copiously discussed by Terada (2012). Apart from Rotterdam convention and the Stockholm conventions, the Basel convention (for the control of transboundary movements of hazardous wastes and their disposal) and the Bamako convention (on the ban on the import into Africa and the control of transboundary movement and management of hazardous wastes within Africa) have been put in place by the United Nations all in a bid to deal with the problems of e-waste. Even though the Basel Convention banned the export of hazardous waste to poorer countries since 1992, the practice continues (Woodell, 2008a, b).

### **Management of e-waste generation**

Three-year undercover investigation by Greenpeace (2009) indicated that unfixable WEEE in United Kingdom always end up shipped to Africa, especially Nigeria as “second-hand electronic goods”. While the local expertise capacity in Nigeria enables the utilization of thousands of the unfixable WEEE as spare parts, however, majority of these WEEE are usually dumped as e-waste without any proper recycling and thereby posing environmental health threat. Most of the e-waste comes from developed countries (Harder, 2005). According to ABC News (2006),

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Americans bought an estimated US\$125 billion worth of consumer electronics (computers, monitors, cell phones, televisions, etc.) in 2005. Hundreds of millions of them become obsolete every year and become source of e-waste which are loaded with hazardous contaminants. According to Terada (2012), the developed countries aware of the risks and health hazards to humans and environmental health coupled with the higher cost of safer recycling and the stringent regulations in their home countries find it easier to ship their e-waste to developing countries where there are negligent of regulations and cheap labour. To prevent this environmental injustice, the Basel Convention came into existence. The Basel Convention placed ban on import and control of transboundary movement and management of hazardous e-waste. The Basel Convention was adopted in 1989 and entered into force on May 5, 1992 and amended in 1995 (Terada, 2012; Ogunbuyi *et al.*, 2012; Puckett *et al.*, 2005). The Basel Convention does not contain any explicit enforcement provisions because it is assumed that the national laws of the parties should complement it. In September 2010, 178 nations, including industrialized countries such as Japan, European Union and the United Kingdom, were parties to the Basel Convention. However, USA, the world's highest producer of e-waste, has not ratified the Basel Convention and by such action or inaction has indirectly promoted the dumping of toxic e-waste on developing countries (Terada, 2012; Puckett *et al.*, 2005). For instance, under the Basel Convention used electrical and electronic equipment (UEEE) that is functioning and intended for re-use is not considered to be an e-waste, regardless of whether it is hazardous or not (Puckett *et al.*, 2005). That can give leverage to unscrupulous exporter, who can capitalize on such provision to dump near end-of-life UEEE on developing countries, except where proper testing to ascertain the functional state of the UEEE, certification and labelling have been carried out.

Another Convention called the Bamako Convention was adopted on January 29, 1991 and entered into force on April 22, 1998. The

Bamako Convention placed ban on the import and the control of transboundary movement and management of hazardous e-waste within Africa and unlike the Basel Convention, it articulated more specific and active guidelines for both sides of the e-waste trade. In March 2010, 33 African countries signed the Bamako Convention, while 24 of them ratified it (Terada, 2012). Nigeria signed the Bamako Convention in February 2008, but has not yet ratified it; while it not only signed but has also ratified the Basel Convention since May 24, 2004 (Terada, 2012; Puckett *et al.*, 2005). It is strongly believed that one of the major components of the solution to the control of transboundary movement of e-waste from USA, European Union, Asia, etc. to Nigeria requires Nigeria's immediate ratification of the Bamako Convention alongside an effective and efficient enforcement regime of the regulations.

The National Environmental Standards and Regulations Enforcement Agency (NESREA), an Agency of the Federal Ministry of Environment, is responsible for the enforcement of all environmental laws in Nigeria (Amachree, 2013). While NESREA's work is commendable, there is still much room for more work towards the effective solution to the e-waste scenario in Nigeria today. NESREA working with certain stakeholders have put efforts toward creating awareness about the e-waste issue but it is grossly insufficient. In 2009, NESREA sponsored an international conference on e-waste control titled "The Abuja Platform on E-Waste". In February 24-25, 2011, the 1<sup>st</sup> Eko international summit on e-waste was held in Lagos, Nigeria. The communique of the Summit drew the attention of the Federal Government to not only encourage but also enforce collection, recovery, re-use and recycling (3R's) of e-waste management (Eko Declaration, 2011). In November 2010, the Environment Division of the Nigerian Society of Engineers organized a conference in Abuja, Nigeria, titled "Environmental Impact of Telecommunication Projects in Nigeria". The conference called on government in all levels to legislate on e-waste management. In May

2011, “The National Environmental (Electrical/Electronic Sector) Regulations 2011” was gazette in Federal Government Gazette No. 5, Vol. 98. In the gazette, the 3R’s of waste management was expanded to 5R’s, namely: Reduce, Repair, Reuse, Recycle and Recover. Among other issues such as “Extended Producer Responsibility Programme” to buy-back WEEE is well captured in Schedule VIII of the Regulations. While the fines and punishment for offenders (individuals and corporate) are well articulated and the Regulations very laudable, however, much is required for the full effective implementation and enforcement regime.

### **Conclusion**

The NESREA Regulations 2011 is a laudable legislative document which is line with and complements the Basel Convention. Nigeria is presently a major destination for e-waste from USA, European Union, Asia, etc. Nigeria must, as a matter of urgency, ratifies the Bamako Convention so that the nation can have more stringent enforcement regime. While the efforts of NESREA is commendable, countrywide survey research for this paper revealed gross lack of awareness on the e-waste menace both within the literate and illiterate members of the Nigeria’s population.

### **Recommendations**

- All stakeholders (government, industry, environmental groups, and citizens) must work in cooperative collaboration with NESREA to effectively manage and mitigate the problems of e-waste in Nigeria.
- Nigeria should immediately ratify the Bamako Convention and entrench stringent enforcement regime of the National Environmental (Electrical/Electronic Sector) Regulations 2011 and the Nigerian Decree of 1988 prohibiting all imports of hazardous wastes.
- The “Extended Producer Responsibility Programme” to buy-back WEEE should be fully enforced internationally.

- Producer companies should use non-toxic raw materials in the manufacture of EEE to reduce the production of e-waste.
- Develop national database infrastructure on e-waste management in Nigeria.
- Full enforcement of the proof of testing and categorization with respect to the Basel Convention on transboundary movement and management of e-waste.
- All members of the Organization for Economic Cooperation and Development (OECD) and the European Union countries should implement in full the Basel Convention.
- The USA should be made to comply with OECD Council Decision regarding export of hazardous e-waste.

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