ELECTRONIC WASTE POLLUTION IN NIGERIA: IMPACT ON CHILD HEALTH

Badamasi, Khadijat Murtala
Department of Early Childhood Care Education, Federal College of Education Zaria
Mobile: *+234-806-750-6281*, Email: *kubrabadamasi@gmail.com*

Abstract
The study explored the impact of e-waste pollution in Africa, especially on child health. Concepts of electrical and electronic waste, contamination by e-waste, e-waste and health risks, sources of child exposure at home and surroundings routes to e-wastes pollution, dangers attached to e-waste pollution and the challenges of tackling e-waste were discussed. The paper advocated the critical need for the intervention of government and non-governmental organizations.
***Keywords**: E-waste management, Environmental pollution, Child health, Environmental health.*

Introduction
The love towards children is natural. Yet, they are threatened in the immediate surrounding and community. Electronic waste pollution is one of the challenges facing the 21st century society. Electrical and electrical wastes pose dangers to child health through contamination-related health risks.

Concept of e-waste
E-waste is any refuse created by discarded electronic devices and components as well as substances involved in their manufacture or use. The disposal of electronics is a growing problem because electronic equipment frequently contain hazardous substances. In a personal computer, for example, there may be lead in the cathode ray tube (CRT) and soldering compound, mercury in switches and housing, and cobalt in steel components, among other equally toxic substances (Eugster, Hischier *et al.*, 2007). Examples of electrical and electronic wastes are monitors/computers/motherboards, telephones/mobile phones, chips, wireless devices/other peripheral items, printers, fax/photocopy machines, televisions, cathode ray tubes, transformers, audio-stereo equipment/video cameras, cables, lamps, large household appliances (e.g. refrigerators and electric ovens and cookers).

Typical contamination scenarios
Contamination scenarios include dumping sites at or near riverbanks, villages situated along rivers that receive e-waste, manually disassembling and repairing, e-waste open burning to extract valuable metals, final disposal sites or landfills.

E-waste and health risks
Table 8.1.5.1 presents a summary of e-waste-associated health risks.

Table 8.1.5.1: E-waste-associated health risks

E-waste component	Processed used	Adverse health effects
Lead	Solder, CRT monitor glass, lead-acid batteries, some formulations of PVC. A typical 15-inch cathode ray tube may contain 1.5 pounds of lead, but other CRTs have been estimated as having up to 8 pounds of lead	Adverse effects of lead exposure include impaired cognitive function, behavioral disturbances, attention deficits, and hyperactivity, conduct problems, and lower IQ. These effects are most damaging to children whose developing nervous systems are very susceptible to damage caused by lead, cadmium, and mercury
Mercury	Found in fluorescent tubes (numerous applications), tilt switches (mechanical doorbells, thermostats) and flat screen monitors.	Health effects include sensory impairment, dermatitis, memory loss, and muscle weakness. Exposure in-utero causes fetal deficits in motor function, attention, and verbal domains.[85] Environmental effects in animals include death, reduced fertility, and slower growth and development.
Cadmium	Found in light-sensitive resistors, corrosion-resistant alloys for marine and aviation environments, and nickel-cadmium batteries. The most common form of cadmium is found in Nickel-cadmium rechargeable batteries. These batteries tend to contain between 6 and 18% cadmium. The sale of Nickel-Cadmium batteries has been banned in the European Union except for medical use. When not properly recycled it can leach into the soil, harming microorganisms and disrupting the soil ecosystem. Exposure is caused by proximity to hazardous waste sites and factories and workers in the metal refining industry.	The inhalation of cadmium can cause severe damage to the lungs and is also known to cause kidney damage. Cadmium is also associated with deficits in cognition, learning, behavior, and neuromotor skills in children
Hexavalent chromium	Used in metal coatings to protect from corrosion	A known carcinogen after occupational inhalation exposure. There is also evidence of cytotoxic and genotoxic effects of some chemicals, which have been shown to inhibit cell proliferation, cause cell membrane lesion, cause DNA single-strand breaks, and elevate Reactive Oxygen Species (ROS) levels.
Sulphur	Found in lead-acid batteries	Health effects include liver damage, kidney damage, heart damage, eye and throat irritation. When released into the environment, it can create sulphuric acid through sulphur dioxide.
Brominated Flame Retardants (BFRs)	Used as flame retardants in plastics in most electronics. Includes PBBs, PBDE, DecaBDE, OctaBDE, PentaBDE.	Health effects include impaired development of the nervous system, thyroid problems, liver problemsEnvironmental effects: similar effects as in animals as humans. PBBs were banned from 1973 to 1977 on. PCBs were banned during the 1980s
Perfluorooctanoic acid (PFOA)	Used as an antistatic additive in industrial applications and found in electronics, also found in non-stick cookware (PTFE). PFOAs are formed synthetically through environmental degradation	Studies in mice have found the following health effects: Hepatotoxicity, developmental toxicity, immunotoxicity, hormonal effects and carcinogenic effects. Studies have found increased maternal PFOA levels to be associated with an increased risk of spontaneous abortion (miscarriage) and stillbirth. Increased maternal levels of PFOA are also associated with decreases in mean gestational age (preterm birth), mean birth weight (low birth weight), mean birth length (small for gestational age), and mean APGAR score
Beryllium oxide	Filler in some thermal interface materials such as thermal grease used on heatsinks for CPUs and power transistors, magnetrons, X-ray-transparent ceramic windows, heat transfer fins in vacuum tubes, and gas lasers.	Occupational exposures associated with lung cancer, other common adverse health effects are beryllium sensitization, chronic beryllium disease, and acute beryllium disease

Settings of child exposure

Child exposure to e-waste-related health risks could involve burning activities and manual dismantling; living in or close to houses with recycling activity; involvement of children in manual sorting and picking of recyclable, reusable materials from mixed e-wastes, take-home exposure from parents working with e-waste (e.g. contaminated dust).

Routes of child exposure

Child exposure routes to e-waste involvement include contamination of the surrounding areas, soil, home surfaces (e.g. windowsills), and water; atmospheric pollution due to burning and dismantling activities; inhalation of indoor or outdoor fumes; and ingestion of contaminated dust and soil, drinking water, and food.

Challenges to tackling e-waste issues

The practical examples of challenges to tackling e-waste issues are include information on exposure is limited, children are the most vulnerable, long-lasting low dose exposure may cause diseases after many years, effects occur through a mixture of chemicals and different mechanisms, there is high evidence of the toxicity of chemicals involved in e-waste contamination, and social vulnerability in the genesis and persistence of the exposure.

Conclusion/Recommendations

To address the issues related to e-waste pollution and its impact on child health, the study recommends as follows:

At global level

International agreements and tools for action

Non-governmental organizations (NGOs) such as Electronic Waste Initiative, Solving the E-Waste Problem, Partnership for Action on Computing Equipment and E-waste and child health initiative should:

(1) control trans boundary movements of hazardous wastes and their disposal
(2) Prior informed consent procedures for certain hazardous chemicals and pesticides in international trade
(3) Protecting human health and the environment from persistent organic pollutants (POPs)

At National Level

At national level Nigerian government should:

(a) engage in Risk management of E-waste resources
(b) response to international agreements
(c) Implement standards, actions and programmes one-waste toxicant exposures
(d) Improvedownstream monitoringof e-waste
(e) Reuse andminimization waste policies
(f) "Take back" programs
(g) Maximize design for repair ability, reuse and durable use
(h) Reduce the use and release of e-waste
(i) Reduce toxicity: phase-outcertain chemicals
(j) Eradicate child labour within e-waste

At Local Level

- Promote good practices in the process of recovery and recycling
- Invest in better solutions for recyclability and ease of disassembly
- Educate the community and workers
- Educatehealth care providers
- Surveillance and epidemiological vigilance for acute and chronic related illness.

Reference

ADI (2010). African Development Indicators, Open Data by Country. Available at (31.01.2011): http://data.worldbank.org/data-catalog/africa-development-indicators

CIA (2005). Central Intelligence Agency, The World Fact book. Available at :(22.9.2010): https://www.cia.gov/library/publications/the-world-factbook/geos/gh.html

Eugster M., R. Hischier, et al. (2007). Key environmental impacts of the Chinese EEE industry – a life cycle assessment study. State Secretariat for Economic Affairs (SECO). St.Gallen /

Switzerland; Beijing / China, Swiss Federal Laboratories for Materials Testing and Research (Empa); Tsinghua University China: 90. Furniture re-use network (2009). Set of average weights for furniture, appliances and other items.

GHS (2005). Ghana Health Service: The Health Sector in Ghana, Facts and Figures 2005. Accra.

GIS (2008). Ghana Immigration Service: Aikins, L.F.; Gyasi, A.A.; Hlorgbey, D.E.K.: Annual Report for 2008, Analysis of Immigration Data. Accra.

GSS (1998). Ghana Statistical Service: Apphia, Rebecca; et al.: Ghana Living Standard Survey 4, Report of the fourth Round (GLSS 4). Accra.

GSS (2008). Ghana Statistical Service: Apphia, Rebecca; et al.: Ghana Living Standard Survey, Report of the fifth Round (GLSS 5). Accra.

GSS (2009). Ghana Statistical Service: Ghana in Figures 2008. Accra. HPMP (2010). United Nation Development Program: Hydrochlorofluorocarbon Management Plan (HPMP). Accra. Not published yet.

Huisman, J. Magalini, F. et al. (2008). 2008 Review of Directive 2002/96 on Waste Electrical and Electronic Equipment (WEEE). Final Report. United Nations University. ITU (2008). Information Technology Union, World TelecommunicationIICT Indicators Database, Chronological Time Series 1960-2007, 12th Edition 2008, Geneva 2008. Parts also available at:http://www.itu.int/

Laffely, J. (2007). Assessing cost implications of applying best e-waste recovery practices in a manual disassembly material recovery facility in Cape Town, South Africa, using process-based cost modelling. Lausanne / St.Gallen, EPF Lausanne / Empa.

Mereku, D.K. (2000). *Demand and Supply of Basic School Teachers in Ghana*. Winneba: National Teacher Education Forum.

Mo C. (2003). Ministry of Communication: The Ghana ICT for Accelerated Development (ICT4AD) Policy. Accra.

Mueller, E. and Widmer, R.(2009). Material flüsse der elektrischen und elektronischen Geräte in der Schweiz, BAFU, Bern.

NAB (2009). National Accreditation Board: Accredited Tertiary Institutions, as at December 2009.Accra,2009.Availableat(30.06.2010):http://nab.gov.gh/nabsite/downloads/2010%20PUBLICATION%20FINAL.pdf

Prakash S., Manhart, A., Amoyaw-Osei, Y., Agyekum, O.(2010). Socio-economic assessment and feasibility study on sustainable e-waste management in Ghana. Accra.

Schluep, M. Hagelueken, C. et al. (2009). Sustainable Innovation and Technology

Transfer Industrial Sector Studies: Recycling – From E-Waste to Resources. Nairobi.

Sépulveda, A., M. Schluep et al. (2010). A review of the environmental fate and effects of hazardous substances released from electrical and electronic equipments during recycling: Examples from China and India. *Environmental Impact Assessment Review*. 30 (1): 28-41.

SHEP (2010). Self-help Electrification Program: Presentation by Vanderpuye, Henry, Energy Consultant, Ministry of Energy, Ghana, to the Climate Parliment, March 2010. Available at(30.06.2010):http://www.climateparl.net/cpcontent/pdfs/SHEP%20%20Ghana's%20Selfhelp%20Electrification%20Programme.pdf

SWICO Recycling Guarantee (2006). Activity Report 2005. Zurich: Switzerland, Swiss Association for Information, Communications and Organization Technology (SWICO).

Thompson, N. M. and Casely-Hayford, L. (2008). Associates for Change: RECOUP Working Paper 16, The Financing and Outcome of Education in Ghana. Cambridge.

UN Comtrade (2010). United Nations Commodity Trade Statistics Database, Country List, International Trade Center (ITC) Country Profile, Trade in goods statistics. Available at (22.09.2010): http://www.intracen.org/dbms/country/CA_CtryIndex.Asp?CT=288

WDI (2008). The World Bank, Development Indicators, Open Data by Country. Available at (22.09.2010): http://data.worldbank.org/country/ghana

Zumbuehl, D. (2006). *Mass flow assessment (MFA) and assessment of recycling strategies for cathode ray tubes (CRTs) for the Cape Metropolitan Area (CMA), South Africa*. Zurich: St.Gallen, ETH Zurich / Empa.