



Local scale assessment of xenobiotic substances and heavy metals in some waste electronic and electric recycling sites in Ghana

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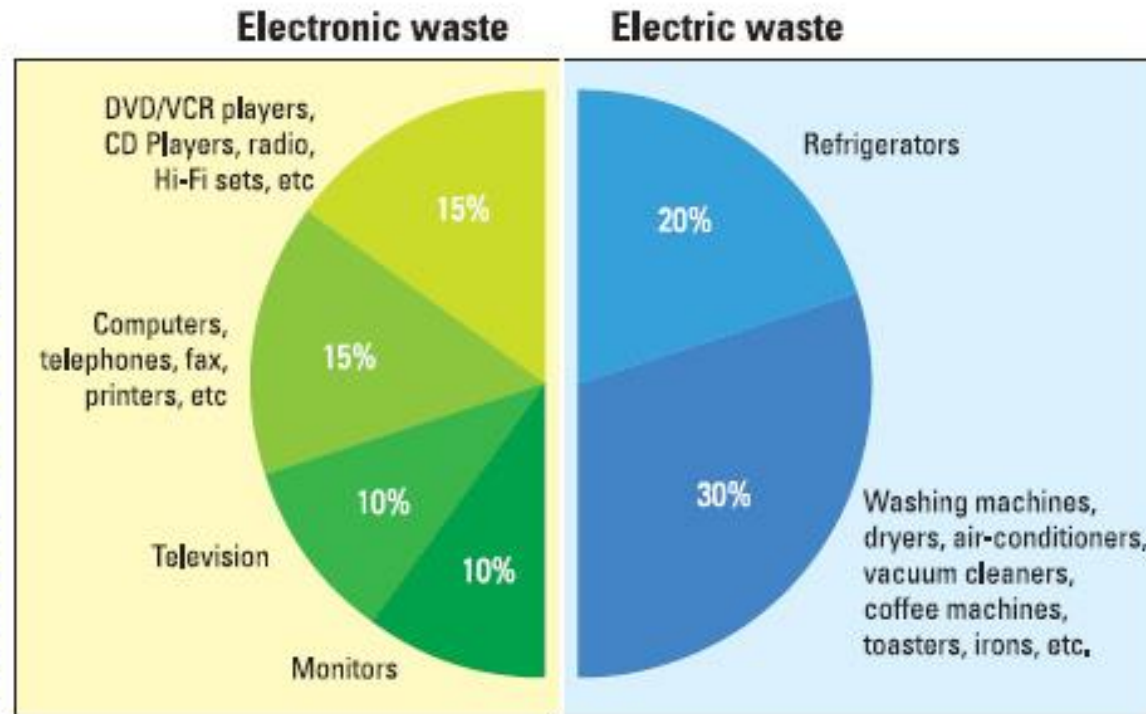
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Introduction



- 15% of second hand EEE are broken down or outdated (Nartey, 2016; Oteng-Ababio, 2010)

WHAT IS E-WASTE?



- 215,000 tonnes of EEE imported into Ghana yearly
- only 30% brand new (Amoyaw-Osei & Agyekum, 2011)



Introduction

Regulatory Frameworks

- ✓ International
 - Basel Convention (1989)
 - Rotterdam Convention (1998)
 - Stockholm Convention (2001)
- ✓ National
 - No e-waste specific legislation in Ghana (Nartey, 2016)



Introduction

✓ Basel Convention

- on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989).
- presents four main aims related to the **waste hierarchy** of prevention, reduction, recovery and final disposal.
- “Basel Action Network Amendment” or “Basel BAN”, the Decision to ban shipment of hazardous wastes from OECD to non-OECD countries for the purposes of final disposal.

✓ Limitations



Introduction

✓ Rotterdam Convention

- on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998).
- provides for the **exchange of information** about potentially hazardous chemicals that may be exported and imported.
- covers **pesticides** and **industrial chemicals** that have been banned or severely controlled by Parties (Rotterdam Convention, n.d.)



Introduction

- ✓ Stockholm Convention on Persistent Organic Pollutants (2001)
 - requires Parties to take measures to eliminate or reduce the release of POPs into the environment
 - three identified categories of POPs: **pesticides**, **industrial chemicals** and **unintentionally produced by-products**.
 - aims to protect human health and the environment from chemicals that remain **persistent** in the environment for long periods, are **distributed globally** and **accumulate** in the fatty tissue of humans and animals.

(Bell & McGillivray, 2006)



So what is happening?

Agbogbloshie, world's largest e-waste dumpsite?

<http://shanghaiscrap.com/2015/06/anatomy-of-a-myth-the-worlds-biggest-e-waste-dump-isnt/>



www.knust.edu.gh

Problem

- ✓ With increase in technology (double increase assuming a linear growth and by a factor of 7 assuming exponential growth) comes
 - Limited space
 - proper recycling system lacking (0.2% material flow into formal recycling sector)
 - Loss of recoverable resources

- ✓ Limited knowledge about e-waste frameworks and health effects.

- ✓ Health problems

(Amoyaw-Osei & Agyekum 2011)



Problem

- Heavy metals (Pb, Cd, Hg, Be, etc.)
- Hazardous chemicals (BFRs, PAHs, etc.)
- Combustion by-products (PCDD/Fs, PCBs)
- Mixture toxicity



Health Effects

- Respiratory, reproductive, carcinogenic
- CNS
- Brain function...

Sanitation and environment

Ecological risk



Specific Objectives

- Identify **relevant heavy metals and xenobiotic substances on (WEEE) recycling sites (Agbogloshie, Koforidua and Suame Magazine)** analytical methods and sampling procedures to be used.
- Measure **levels** of heavy metals and xenobiotics in WEEE areas.
- Model the fate and effects of organics and other metals of concern and assess their health, environmental and ecological risks (using e.g. QSAR as a predictive tool).



Environmental matrix	Analytes	Analytical method
Soil	<u>Heavy metals</u> Hg, Sb, As, Cd, Cr, Cu, Pb, Mg, Ni, Sn, and Zn.	<u>Heavy metals</u> Graphite Furnace Atomic Absorption Spectroscopy (GFAAS), X-ray Fluorescence (XRF). <u>Organics</u> Gas Chromatography (GC) - Mass Spectrometry (MS)
Air	<u>Organics</u> PCBs, PCDDs/Fs, chlorobenzenes, phthalates, brominated and organophosphorous flame retardants, polycyclic aromatic hydrocarbons (PAHs), monocyclic aromatic hydrocarbons, halogenated aliphatic hydrocarbons and phenols.	
Sediment		
Surface and ground waters		
Ash	PCDDs/Fs and heavy metals	



Specific Objectives

- Quantify actual risks associated with human exposure to xenobiotic substances in WEEE dumpsites based on already attained concentration values (using @Risk).
- Set up a human exposure assessment model and based on methods developed for WEEE, support with a human exposure assessment for artisanal mining sites.





Thank you! 😊



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