



## APPRAISAL OF E-WASTE MANAGEMENT PROBLEMS IN NIGERIA (A CASE STUDY OF SAMARU IN ZARIA)

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### ABSTRACT

This work was carried out to ascertain the level of (e-waste) awareness on electronics waste and the accompanied health hazard when not properly disposed off. The study also aimed to verify the present method of storage and disposal after the electronics useful life span has been exceeded. The study was carried out through street by street site visit to identify disposal sites, storage facilities and workshop for repairs of electronics in the community and also simultaneously conducted a manual count of the quantities of e-waste found in each of the identified site. To facilitate means of data collection, questionnaires were administered and also oral interviews were conducted with the key informants. From the survey result obtained, 1,711 different e-waste items were found within the research area ranging from television set to hand set. The three sources of e-waste identified within the community were 41 repair workshops, individual households and at uncontrolled dumped site that is capable of ground water pollution. The findings from this research showed that there was 28 percent level of e-waste awareness with it associated health problems in the study area and no controlled dumped site and storage facilities were identified. It was revealed that 139 of items ranging from television set to mobile phone were kept at individual households. The repair workshops serve as temporary storage where the e-waste awaits spare parts that may never come. This work was able to establish that there is need to create e-waste awareness in the community and also highlight the dangers involved in keeping e-waste within human reach. Finally, recommendations were made on how to effectively manage e-waste in the study area.

**Keywords:** E-waste, dump site, pollution, awareness

### INTRODUCTION

E-waste is a popular, informal name for discarded and end-of-life electronic /electrical products. Such products include computers, equipment for Information and Communication Technology (ICT), Home Appliances (e.g., TV, washing machines, air conditioners, and refrigerators etc.), audio & video products and all of their peripherals. Given the escalating sales and rapid obsolescence of the products, new technologies replacing the old ones; e-waste is emerging as a risk to the society (Gaule, 2008). The proliferate use of these electronic devices have generated huge amounts of

e-waste in the recent decades as a result of frequent update in the functionalities, cheap and beautification of the products. The management of electronic waste (e-waste) at the end of its useful life has presented serious challenges to the existing solid waste and hazardous waste management structures, resulting in widespread contamination of the environment through uncontrolled burning, disassembly and disposal with negative impact on public health, including occupational safety and health effects amongst those involved directly due to the methods of mutilating the waste (Prakash, 2010). Most people are not aware of the potential negative impact of the

rapidly increasing use of computers, monitors, and televisions in Nigeria (Nnorum and Osibanjo, 2009).

The amount of electronic waste products generated in Samaru is increasing rapidly and many outdated electronics such as

**Table1:** Some dangers of uncontrolled handling of e-waste

Electronics	Composition	Associated effect
Computer Monitors	Made of cathode ray tubes (CRTs) a source of lead, barium, Phosphor, cadmium, mercury (Binns <i>et al</i> , 2006)	Lead can reduce intelligence, delay motor development, impair memory, and cause hearing problems and troubles in balance.
Rechargeable Lantern	Lead-acid batteries, mercury, poly-vinyl-chloride (PVC) and brominates (Nnorom, 2009)	Mercury poisoning is potentially fatal and can cause irreversible brain, liver, and kidney damage. It is acutely hazardous as a vapor and in the form of its water-soluble salts, which corrode membranes of the body.
Radio Sets	Lead, mercury, Cadmium, (Binns, 2006).	
Computers (CPU)	Lead, polystyrene, acrylonitrile-butadiene-styrene (ABS), polycarbonate (PC)/ ABS alloys, Brominated flame retardants (Gaule, 2008).	Cadmium and solutions of its compounds are highly toxic, with cumulative effects similar to those of mercury poisoning.
Mobile Phones	Mercury silicon and copper nickel and cadmium (Sahu, 2008)	
Television Sets	Lead, mercury, Cadmium aluminum, (Blake, 2010).	
Refrigerators & Air Conditioners	Chlorofluorocarbon (CFCs), (Binns, 2006).Ammonia and Chrome-VI, (Prakash, 2010)	CFCs damage the ozone layer when they escape from sources such as leaky car air conditioners, discarded plastic-foam egg cartons, and old home air conditioners crushed in a landfill. As they break down, they release chlorine, which depletes the protective ozone layer. Source(Microsoft ® Encarta ® 2009)
Printed Circuit Boards (PCBS)	Lead, silver, gold, platinum and mercury (Agarwal <i>et al</i> , 2003). antimony, gold, silver, chromium, zinc, lead, tin and Copper (Gaule, 2008)	

computer monitors, rechargeable lanterns, radio sets, computer components, pressing irons, mobile phones, television sets, refrigerators, air conditioners, fans, video cassette recorders, Compact Disc (CD) players, lap tops, camera e.tc. are currently in storage in houses. The worrisome aspect of the situation is that E-waste contains lead, mercury, cadmium and other toxins known to cause severe health problems in humans, particularly children due to frequent exposure, resulting in elevated risks of cancer as well as increased occurrences of developmental and neurological disorders, surface and ground water pollution due to the poor disposal method (Gaulon, *et al*, 2005). Table1 shows the danger of uncontrolled handling of e-waste with it associated health problems resulting from its components. This work therefore aimed at carrying out an appraisal of the current e-waste generation management and also to propose a suitable process of e-waste

disposal for the dwellers of Samaru Community. This would be achieved by identifying the nature and composition of e-waste generated in Samaru, with proper documentation of the varieties, quantities, method of disposal and storage.

## MATERIALS AND METHODS

**Study Area:** Samaru Community is located at 11<sup>0</sup>10'12" north of the equator and 7<sup>0</sup>37'48" east of the Greenwich Prime Meridian. It is a semi-urban village with its inhabitants drawn from all parts of Nigeria. It hosts the Ahmadu Bello University and most of its people work in the University. Samaru, though close to the university, has very few social amenities. The streets are not tarred and highly prone to water-logging during the rain because there are no proper drainage ditches. It has a dense estimated population of 238 people per sq Mile (Wikipedia, 2010).

**Table 2:** Quantity of E-Waste Generated in the Study Area

Source of E-waste	Television	Video recorder	Refrigerator	Radio	Blender	Standing fan	CD player	Pressing Iron	Rechargeable lamp	Monitor	CPU	Mobile phones	Decoder (Receiver)	Printer	Charger	Electric cooker	Stabilizer	Electric heaters	TOTAL
W/SHOP 1					2	22		18									41	4	87
W/SHOP 2			34																34
W/SHOP 3	22	38		18		4	19	3									6		110
W/SHOP 4			26		3	12													41
W/SHOP 5						19												8	27
W/SHOP 6						24						1							25
W/SHOP 7					1	7											5		13
W/SHOP 8			18																18
W/SHOP 9			8									3							11
W/SHOP 10	26	8		13			21												68
W/SHOP 11	12	9							7									15	43
W/SHOP 12										7	12	9							28
W/SHOP 13			18																18
W/SHOP 14	10			6		3		4			4	1							28
W/SHOP 15	2	4		8		1		7					3						20
W/SHOP 16										4	7			4					15
W/SHOP 17			13									1				8			22
W/SHOP 18			46													3			49
W/SHOP 19										3	4		5	2					14
W/SHOP 20										9	5	1		2					17
W/SHOP 21										5	7								12
W/SHOP 22			27																27
W/SHOP 23								18								30			48
W/SHOP 24			24																24
W/SHOP 25												20	3		31				54
W/SHOP 26						10		15									24		49
W/SHOP 27	8	14		11			21						2						56
W/SHOP 28	12	12		7			17												48
W/SHOP 29			4									31			46				77
W/SHOP 30	4	3		1		8	11												27
W/SHOP 31												16			28				44
W/SHOP 32	16	14				3	29	13									24		99
W/SHOP 33	11	8		7			16												42
W/SHOP 34												10			26				37
W/SHOP 35	6			9			12	4											31
W/SHOP 36			11																11
W/SHOP 37				10					18										28
W/SHOP 38	13	2		2			15		1										33
W/SHOP 39			2					9								5	7	9	30
W/SHOP 40										2	2	5			16				25
W/SHOP 41			19													3			22
House Hold	12		7	25	9	7	14	5	4	3	2	31	2		40	8	9	5	139
Dumped Site	2			1				2	3						6	7		3	24
TOTAL	156	112	257	118	15	120	175	96	30	32	43	131	18	8	187	57	116	41	171
																			1



**Plate1:** Samaru Community Layout as captured using Google earth

Questionnaires and secondary sources of information which includes textbooks, journals, unpublished materials, Microsoft word, Google Earth and other appropriate literature on e-waste management from the internet were the used in the study.

The study was carried out through street by street visit to Samaru Local Community to identify all the potential sources of e-waste within the community, the current disposal and storage practice and to ascertain the level of awareness among the populace on the potential danger posed by e-waste if kept within human reach. Physical counting of generated e-waste in each of the source was done according to their brand and quantity as reported in table 2 below.

Structured questionnaire was prepared for easy data collection and administered to the identified repair workshops, traders of second-hand electronics, and consumers of electronic equipment in the study area. Random Sampling technique was employed in the administration of the questionnaires. A total of 161 questionnaires were administered, 120 for consumers of electronic equipments, 32 for electronic equipment repairers, and 9 for second-hand electronics traders.

## RESULTS AND DISCUSSION

The data obtained from the finding are as presented in the Table 2, from where it was found that printer was the least e-waste

generated (8) while refrigerator was the most common e-waste generated (257) in the study area, out of which only 7 of this item was kept at home and use as box and none of it was found at dump site visited. Large number of e-waste items was found at the repair workshops rather than individual homes and dumped sites. This signifies that the repairers of electronics are more exposed to danger posed by e-waste as a result of radiation from such items.

The socio-economic characteristics of the surveyed population are shown in Table 3 while their level of information about e-waste is indicated in Table 4.

**Table 3:** Socio-economic characteristics of the surveyed population

Socio-demographics of the surveyed population (n=149)		Frequency	
Age group (years)	10-20	7	
	20-30	26	
	30-40	53	
	40-50	35	
	≥50	28	
Educational attainment	Single	43	
	Married	106	
	Informal	14	
	Primary/Arabic	48	
	Secondary	25	
Tertiary		62	
	Vocation	Student	28
		Trader	52
		Public servant	67
Others		2	

The survey was target at the productive age of 20years and above that may have the ability and the willingness to purchase and enjoy modern day electronics gadgets. This age may also likely to pick information from media which may include e-waste. The research showed that married couple bought more of electronic gadgets than single individual. They also kept more of it for reuse like using malfunctioning refrigerator as box for keeping

children shoes, toys and old books etc. Most of the repairers were found to have acquired Primary/Arabic that might have contributed to poor e-waste awareness and its possible health hazard.

**Table 4:** E-waste Awareness in Samaru

Level of information about e-waste	Awareness of e-waste		Health Effects Awareness	
	Yes	No	Yes	No
Consumers of electronics	37	102	51	98
Repairers of electronics	6	45	3	48
Traders of second-hand electronics	2	9	1	10
Total	45	156	55	156

From Table 4, it was observed that the consumers of electronic gadget were much aware of e-waste and it associated health risk when kept within human reach than others who were involved in the business. The Plates below showed how people get themselves exposed to the danger of e-waste without the knowledge of it consequences.



From the research it was discovered that there exist various types of e-waste in Samaru Community which include computer monitors, rechargeable lanterns, radio sets, computer components, pressing irons, mobile phones, television sets, refrigerators, fans, Compact Disc (CD) players, lap tops influenced by importation of cheap and varieties of second-hand electronic equipment. The majority of residence especially the repairers of electronic have no awareness of the dangers posed by e-waste, without even recognizing that any electronics that has surpassed its serviceability limits state has become a waste called e-waste.

**CONCLUSION**

The total quantities of e-waste generated in Samaru were found to be 1,711 obtained from 41 sources of e-waste identified in the community. Currently there exists no known e-waste management plan in Samaru as the results revealed that e-waste are either kept in storage at home, repairer workshop or may find their ways into uncontrolled open dumped site. The general awareness on e-waste and its health implications is abysmally low as indicated in Table 4.

The repairers of electronic should be targeted when creating e-waste awareness with its associated health risk since their workshop serve as storage for most of the gadgets that has exceeded their salvage value. There is need for urgent action to arrest the open dumping system of e-waste as it is capable of polluting the ground water which happened to be the major source of water supply in the community. There is need to sensitize the residence of the danger pose by e-waste through awareness campaigns by mass media, Samaru FM etc. Proper management plan for collection and disposing systems should be established.

## REFERENCES

- Agarwal, B (2003). A Report on Scrapping the Hi-Tech Myth: Computer Waste in India <http://www.toxiclinks.org>.
- Binns, S and Kretzmann, E (2006). Electronic waste recycling promotion and consumer protection act: Final report, Columbia University, August.
- Blake, A (2010). Electronic waste: A public health issue USA, January,
- Gaule, H (2008). Seminar report on Recovery of precious metals from electronic waste. Institute of Technology, Surat, India
- Gaulon, B., Rozema, L and Klomp, K (2005). *E-waste*. Frank Mohr Institute, [www.mohr-i.nl/mawiki/E\\_2dwaste\\_99](http://www.mohr-i.nl/mawiki/E_2dwaste_99).
- Microsoft ® Encarta ® 2009. © 1993-2008 Microsoft Corporation. All rights reserved
- Nnorum, I.C and Osibanjo, O (2009). Heavy metal characterization of waste portable rechargeable batteries used in mobile phones, Abia Nigeria,
- Prakash, S and Manhart, A (2010). Socio-economic assessment and feasibility study on sustainable e-waste management in Ghana, Freiburg.
- Sahu, S and Srinivasan, N (2008). Mobile phone waste, current initiative in Asia and the Pacific.



<http://www.osehnigeria.org>