

INVENTORY OF E-WASTES GENERATED FROM THE USE OF AIR-CONDITIONERS AND CEILING FANS (A CASE STUDY OF UNIVERSITY OF IBADAN)

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Abstract

The purpose of this research work is to obtain an indication of volume of e-waste generation in university of Ibadan, Ibadan. Nigeria. The study focused on two (2) selected types of electrical and electronic equipments (EEE) only i.e. air-conditioner and ceiling fan. The research instruments used were a set of questionnaires to target stakeholders followed by one –on-one interviews. A total of 400 questionnaire were distributed to respondents from various segments of the university i.e. households, business institutions and repair centers, a total of 252 of the administered questionnaires were returned, which represents 65% recovery rate. Based on the findings from the field data collection, the tones of e-waste generated from the use of air-conditioner and ceiling fan are 11.07 tones and 6.2 tons respectively. It is desirable for the University of Ibadan to have a database on e-products consumption and e-waste generation towards developing a policy for the environmentally sound management of e-waste on campus and ensuring protection of the environment and human health.

The management of the wastes from electrical and equipment (WEEE) is a global environmental problem that has caused significant environment damage in some parts of the world. Given the high value of the recoverable control in WEEE and the high volume of used equipment that are being discarded, the recycling and recovery of material from WEEE has become a business opportunity of increasing significance The WEEE are frequently moved from the developed countries to the developing countries for processing. In the case of countries such as China, India and Nigeria, there is ample evidence that WEEE has been imported into these countries and processed in an unregulated manner for recycling and recovery purposes (Babajide, 2009).

The high turnover in the production of information and communication technology equipment that has contributed immensely to rapid socio-economic development (e-economic, e-governance, etc) has caused rapid computer, mobile phone product obsolescence which in turn has generated rapid and uncontrollable high volume of e-waste driving a global e-waste trade between development in all regions and countries. This provides national and regional governance challenge in e-waste management in all regions and countries (Osihanjo, 2009).

In recent years, information technology and electronic industry is regarded as the world's largest and fastest growing manufacturing industry. As a result remarkable electronic, growth combined with the phenomenon of rapid product obsolescence, discarded electronic equipment or e-

waste is now recognized as the growing waste stream. Given the high toxicity of the component materials in waste electrical electronic Equipment (WEEE) especially when burned or recycled in uncontrolled manner, the Basel convention has therefore identified WEEE as a hazardous substance and has developed a framework for control on trans-boundary movements, such as waste Nigeria which ratified the Basel convention and has in accordance, put in place several machines to control the handling and disposal of WEEE which is also referred to as e-waste. However the rate of e-waste generation in Nigeria generally with particular reference to university of Ibadan (which incidentally is the Basel convention regional coordinating centre for Africa) is not well understood and an inventory would be helpful in obtaining a perspective to determine further measures that may be necessary to ensure environmentally sound management of e-waste.

Classification of Waste Electrical Electronic Equipment (WEEE)

Categories of electronic equipment covered by EU Directive are:

1. Large household appliance.
2. Small household appliance.
3. IT and telecommunications equipment.
4. Consumer equipment.
5. Lighting equipment.
6. Electrical and electronic tools (with the exception of large scale stationary industry tools).
7. Toys, leisure and sports equipment.
8. Medical devices with the exception of all implanted and infected products)
9. Monitoring and control instruments.
10. Automatic dispensers.

Statement of Problem

- i. There is little or no data on information Communication Technology equipment penetration into the Nigeria market.
- ii. The penetration of disused equipment relative to acquisition is not known but crucial for effective e-waste management.

Rationale for the Study

There is no database for the total amount or volume of e-waste generated in University of Ibadan. At the same time, no scientific evidence exists regarding the application of a standard approach and methodology to estimate e-waste generated in University of Ibadan. Therefore, an attempt has been made to establish an approach and a methodology to quantify e-waste generated in University of Ibadan.

Objective of the Research

Broad Objective of the Research

The main objective of this research work is to prospect the feasibility of an e-waste management system within University of Ibadan by carrying out the inventory of e-waste generated within the university.

Specific Objectives the Research

The specific objectives which the research work seeks to determine in actualizing the broad objective are to:

- i. determine the volume and types of e-waste generated, stored and disposed by the stakeholders within the university.
- ii. identify measures that are currently in place to reduce the generation of e-waste by stakeholders within the university.
- iii. identify measures that are in place to safely dispose off e-waste generated by stakeholders within the university.

Research Design of Data Collection

The research work is questionnaire-based survey followed by well structured interviews where the target respondents groups and e-waste categories were predetermined by the researcher himself. Consultations were made with relevant stakeholders on the survey method and the data analysis method to determine the e-waste flow, the purchasing pattern, disposal practices and measures for e-waste management in university of Ibadan, Nigeria.

Population Distribution

In terms of population university of Ibadan had approximately 97,667 (Ninety seven thousand, six hundred and sixty seven), consisting of both staff and students. But of this number, only 8,222 students were accommodated while only 1,009 senior and junior were accommodated in the staff quarters.

(Source: Academic planning unit university of Ibadan, Nigeria. 2011).

Research Population

There are three main target respondents in the survey study. They are:

- i. Nuclear family members and students within the university.
- ii. Heads of units, departmental secretaries, office assistants, and operators of business centres.
- iii. Artisans, technicians, technologists and engineers.

Research Instrument

Units/Sections	Households	Business Entities/Department	Repair Centres
Faculties		60	
Administration and other units		55	
ICT centre within and outside SUB		55	
Halls of Residence	70		
Staff Quarters	140		
Repair Centres			20
Total	210	170	20

Table 1: Summary of distribution of questionnaire into various units, staff quarters and halls of residence as well as repair shops within the university community.

A total of 400 sets of questionnaires were distributed to all target respondents as highlighted on the table 1 above; out of these, 210 sets of questionnaires were distributed to household respondents which include nuclear families at the staff quarters and students in various halls of residence within the university; 170 sets of questionnaires were distributed to respondents in different faculties, departments, administrative units, respondents at various ICT centres both within and outside the students union building (SUB) while the remaining 20 sets of questionnaires were distributed to respondents at various repair centres attached to the laboratories, departments/units and technical workshops in the faculty of technology as well as those found around the students union building and other areas within the campus.

Target Electrical and Electronic Equipment

The EEE targets in this survey are:

1. Air-conditioner
2. Ceiling fan.

Results and Discussion

For the purpose of this research work university of Ibadan was divided into three different categories namely:

1. Household respondents which comprise of the students, academic staff, non academic staff, senior staff, and junior staff members residing within the campus.
2. Heads of various faculties, departments, units, secretaries, office assistants attached to various units, ICT centres within the university and.
3. Respondents from various repair centres within the university

Category	Sent Out	Returned	Percentage Retuned
Household respondents	210	131	62.38
ICT Centres, Faculties, Department Respondents	170	109	64.12
Repair Centre Respondents	20	12	60
Total	400	252	

Source: This Study, 2011

Table 2: Distribution of questionnaires sent out and returned for different stakeholder categories.

Out of 201 sets of questionnaire distributed to respondents in household category, 131 sets of questionnaires which represent 62.38% were returned; 170 sets of questionnaires were distributed to heads of different faculties, departments / units, secretaries and office assistants, and the operators of ICT centres, 109 sets of questionnaires which represents 64.12% were returned. A total of 12 sets of questionnaires which represent 60% were returned out of 20 sets of questionnaires that were distributed to respondents from different repair centres within the university. In all a total of 252 questionnaires out of 400 distributed which represents 65% recovery rate were returned by all the categories of respondents.

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Consumption and Generation of E-Waste

The consumption level of electrical electronic equipment was established from the responses obtained from the respondents through the distribution questionnaires which shows the purchases pattern. Below is the description of the E-waste generation from electrical electronic equipment from the point of purchase to final point of disposal.

User		High Income	Medium Income
Item			
Status Of Purchase	Brand New	17(89.47%)	2(10.53%)
	Second hand	6(30%)	14(70%)
Way to Obtain Air-conditioner	Bought	28(66.67%)	14(33.33%)
	Given	.....	.....
	Others	.....	.....
Ratio of Brand New To Second Hand	Brand New	19(48.7%)	
	Second Hand	20(51.3%)	
Disposal Method	municipal waste collection	1(4.2%)	
	Sold to second hand dealers	.....
	Stored within premises	13(54.2%)	
	Abandoned at repair shops	8.(33.3%)	
	Give away	2.(8.3%)	

Table 3: Distribution of Purchase and Disposal of Air-Conditioner among the three Levels of Users.

Air Conditioners

The average number of Air Conditioner currently possessed by the respondent is 89.47% (high income), 10.53% (medium income). The table indicates that the respondents (high income 66.67% and medium income 33.37% obtained the AC by direct purchase from shops). The percentages of brand new AC and second hand AC is 48.7% to 51.3% respectively. Panasonic which accounted for 46.15% of the total brands of AC purchased is the most preferred. From the total unwanted AC, about 54.2% as still in the possession of the owners because they are kept at home, while only 4.2% are discarded as municipal wastes. (Table 3).

Ceiling Fan

User		High Income	Medium Income
Item			
Status Of Purchase	Brand New	84(86.60%)	13(13.40%)
	Second hand	1(50%)	1(50%)
Way to Obtain Ceiling Fan	Bought	61(63.5%)	35(36.5%)
	Given	1(25%)	3(75%)
	Others	.....	.....
Ratio of Brand New To Second Hand	Brand New	97(98%)	
	Second Hand	2(2%)	

Disposal Method	municipal waste collection	62(61.4%)
	Sold to second hand dealers	39(38.6%)
	Stored within premises	.....
	Abandoned at repair shops	.....
	Give away	.....

Table 4: Distribution of Purchase and Disposal of Ceiling Fan among the three Levels of Users.

Ceiling Fan

From the data on table 4, the average number of ceiling fans currently possessed by the high income category 84 sets which represents 86.6%, while the medium category possessed 13 sets which represents 13.4%. The results indicate that 63.5% and 36.5% of the ceiling fans are currently possessed by the high income respondents and medium income, respondents respectively are bought from shops, followed by 25% and 75% that were given to high income respondents and medium income respondent respectively. The percentage for brand new and second-hand fans possessed by the respondents is 98% and 2% respectively. Approximately 61.4% of the unwanted fans are discarded, while 38.6% are sold to recycler and second hand shops.

Estimation of Overall Waste Produced from-2006-2010

EEE	Total number of units	Weight per unit (kg)	Total weight
Air-Conditioner	177	59.53	10.54 tonnes
Ceiling Fan	542	11.0	5.96 tonnes

Table 5: Total Wastes Generated from the use of air-conditioner and ceiling fan from 2006-2010

The table above indicates the total waste produced from 2006-2010 for all the 2 target Electrical Electronic Equipment.

Conclusion and Recommendation

Waste Electrical Electronic Equipment. (WEEE) has surfaced as a major concern in most countries in the world especially in those countries where WEEE is imported and processed in an unregulated fashion (such as what is obtainable in Nigeria) creating significant adverse environmental impacts. The indications are that the volume of WEEE will continue to rise year by year and University of Ibadan is no exception.

To reduce the increasing rate of generation of this waste electrical electronic equipment, the following are recommended:

- i. Waste reduction through promotion of less material use and greater longevity of products, these are targeted at products that create large volume of waste stream at the end of their life.
- ii. Re-use of components and material recycling. These targets,
 - (a) Products whose parts and materials can be reused or recycled.
 - (b) Industries whose products contain components that can be reused in new product.
- iii. There should be proper dissemination of waste disposal and other environmental information, rules and guidelines to all staff, students and others who transact in one business or the other within the campus.

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- iv. The household residents of the university and operators of various business centres within and outside the Students' Union Building should be properly educated on the need for them to always segregate the e-waste generated by them from other wastes before discarding them.
- v. The estate department of the university is charged with the responsibility of discarding e-waste and the residues generated from the repairs of electrical electronic equipment and so should be mandated to keep up-to-date records of waste electrical electronic equipment before being discarded through the auctioneers and approved waste collection outfits.
- vi. The various heads of units, faculties, departments should be properly educated on the need to keep proper records of electrical electronic equipment procured by them and also those EEE that are no longer useful.
- vii. The repair centres should be encouraged to keep records of those EEE they are able to repair and those they are unable to repair as well as the residues generated from the repairs of such EEE.

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