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Inventory on e-waste management practices in Uganda.

Final report

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SUMMARY

E-waste management is a new area in Uganda and there is limited public awareness on the potential hazards posed by e-waste to human health and the environment. Like in most developing countries, infrastructure for e-waste recycling is limited and there is no appropriate solution for recycling, treatment and disposal of hazardous fractions. Unproblematic fractions from computer waste, such as plastic, can be recovered in existing recycling facilities, but hazardous fractions such as leaded cathode ray tubes (CRTs) and capacitors containing polychlorinated biphenyls (PCBs) and other toxic substances need new solutions. The entire country has only one incinerator at Nakasongola.

This report presents a national e-waste assessment for Uganda and investigates the situation with regard to electrical and electronic equipment (EEE) imports, use and e-waste generation. The study is part of the United Nations Industrial Development Organization (UNIDO) proposed plan of implementing a project to establish a pilot manual dismantling facility for e-waste in Uganda. The project will build on the achievements of the previous UNIDO project in cooperation with Microsoft in an e-waste assessment study in 2007/8 with emphasis on personal computers and monitors in Uganda within the framework of the computer refurbishment project in Uganda.

The assessment has established that there are several challenges towards management of electrical and electronic equipment (EEE) right from importation, distribution as well as e-waste management strategies within Uganda. The country has put in place specific regulations for the management of e-waste. These regulations are yet to be implemented but without a proper financing scheme, their enforcement will be a challenge. Furthermore the financing of the existing policies on waste management in general, should equally be considered for their proper enforcement. The key stakeholders of e-waste generation and management in Uganda all need to be involved in the enforcement of the policy in place. These include; the policy makers/regulators, importers, distributors and retailers, consumers, repair workshops/technicians (refurbishers), collectors, recyclers and disposal facilities.

Overall EEE import volumes have been on the increase over the period 2008 to 2012 with the IT and telecommunications equipment being the most imported category. Unfortunately customs

records do not distinguish between used and new EEE and it seems to be inconsistent over the years. Because Uganda is among the countries in Sub-Saharan Africa with the lowest electrification rates, with only about 2 % in rural areas, estimations on the EEE import volumes, use and e-waste generation have been based mainly on the middle and upper income urban households in addition to the Government and Corporate organizations sectors. The private sector and small businesses have been found to be the greatest contributors with a total of 163,301 tonnes of EEE compared with the 300 and 266 tonnes in Government and Corporate organizations sectors respectively

An indication of the actual life span of the appliances has been unclear from the survey due to the varying responses that were presented. However using values proposed by similar surveys in the African region, it is estimated that over a period of about 10 years, a total of 26,153 tonnes of WEEE will have been generated in Uganda. The major materials estimated to be recovered from the WEEE in the country over this period are ferrous metal, aluminium, copper and brominated plastics in quantities of 4,419; 1,519; 1,046 and 188 tonnes respectively. Facilities for the recycling of these materials are already available in the country. In addition, Informal collection of obsolete EEE exists where individuals survive on selling scrap from such equipment for cash. Downstream vending is also a common practice and vendors engage in resale of whole units, refurbishing for reuse, dismantling into parts, and selling copper components to local welding practitioners. Computer refurbishing business had taken root but some closed for unclear reasons. On the other hand, informal e-waste refurbishing appears to be gaining momentum. However, the recycling activities involving open burning need immediate attention as they are known to have adverse impacts on both human health and the environment.

1.0 INTRODUCTION

1.1 Problem identification

In Uganda, electrical and electronic products have widely been earmarked as a critical tool in the economic development of the country. As a result, infrastructure initiatives and development strategies incorporating electronic equipment and in particular ICT are being increasingly promoted and launched across the nation. While the potential advantages of electronic equipment specifically ICT for development are enormous, the management of e-waste has not been adequately and comprehensively integrated into strategies for harnessing and exploiting the safe use of electronic equipment. Much mention and effort has been made of an increasing investment in the ICTs but much less in terms of leveraging on these investments to support the Nation in meeting her strategic goals..

Electronic waste is generated by individuals, small businesses, large businesses, institutions and government organizations. Considering that e-waste poses diverse challenges, including environmental, economic and social aspects, all stakeholders need to participate in the development and even more in the implementation of solutions, It is important therefore to addresses these challenges by involving all stake holders from policymakers and government officials to medium sized companies (mostly recyclers, collectors and refurbishers).

1.2 Objective of the assessment

The overall objective of the assessment was to get a reliable overview of the e-waste generation and management in Uganda. The key tasks of the assessment included:

- Defining the sample at national level and in Kampala metropolitan areas to get a representative mix of Waste Electrical and Electronic Equipment (WEEE) occurring in Uganda;
- Categorising the sample according to the a list provided by the international experts and defining further scope of the inventory (which devices should be included);

- Updating the earlier study including all electronic and electrical equipment listed in the EU Directive under category II – IV, namely:
 - II. Small Household Appliances
 - III. IT and telecommunications equipment
 - IV. Consumer equipment
- Liaising with other institutions to establish information that may already exist and identifying gaps i.e. lack of information in order to obtain the needed information;
- Identifying potential recyclers for copper and plastic;
- Providing market prices of equipment that can be reused e.g. mobile phones, PCs, laptops, audio devices etc;
- Providing market prices of components (e.g.: ferrous and non-ferrous scrap commercialised within Uganda);
- Providing additional cost data in consultation with the respective responsible experts for the economic feasibility study and the establishment of a business plan (next step in the project), like labour costs for skilled and unskilled workers; and
- Providing inputs to design an effective take back system.

1.3 Basic Facts on E-Waste

Waste electrical and electronic equipment (WEEE) or e-waste for short is a generic term embracing various forms of electrical and electronic equipment that have ceased to be of any value to their owners. In this report and throughout the assignment, we shall use the terms WEEE and e-waste synonymously and in accordance with the EU WEEE Directive. The categories according to the EU WEEE Directive are listed in **Table 2**.

Table 2: WEEE categories according to the EU directive on WEEE (European Commission, 2010)

No.	Category	Label
I	Large household appliances	Large HH
II	Small household appliances	Small HH
III	IT and telecommunications equipment	ICT
IV	Consumer equipment	CE
V	Lighting equipment	Lighting
VI	Electrical and electronic tools (with the exception of large-scale stationary industrial tools)	E & E tools
VII	Toys, leisure and sports equipment	Toys
VIII	Medical devices (with the exception of all implanted and infected products)	Medical equipment
IX	Monitoring and control instruments	M & C
X	Automatic dispensers	Dispensers

When e-waste is disposed of or recycled without any controls, there are predictable negative impacts on the environment and human health. E-waste contains more than 1,000 different substances, many of which are toxic, such as lead, mercury, arsenic, cadmium, selenium, hexavalent chromium, and flame retardants that create dioxin emissions when burned. About 70 % of the heavy metals (mercury and cadmium) in US landfills come from electronic waste. Consumer electronics make up 40 % of the lead in landfills. These toxins can cause brain damage, allergic reactions and cancer. E-waste contains considerable quantities of valuable materials such as precious metals. Early generation PCs used to contain up to 4 g of gold each; however this has decreased to about 1 g today. The value of ordinary metals contained in e-waste is also very high: 1 ton of e-waste contains up to 0.2 tons of copper, which can be sold for about 1,000 US\$ at the current world price (as of 2007). Recycling e-waste has the potential therefore to be an attractive business (UNEP, 2009).

Given the diverse range of materials found in WEEE, it is difficult to give a generalized material composition for the entire waste stream. However, most studies examine five categories of materials: ferrous metals, non-ferrous metals, glass, plastics and others. According to the European Topic Centre on Resource and Waste Management (ETC/RWM), iron and steel are the most common materials found in electrical and electronic equipment and account for almost half of the total weight of WEEE. Plastics are the second largest component by weight representing approximately 21% of WEEE. Non-ferrous metals, including precious metals, represent

approximately 13% of the total weight of WEEE (with copper accounting for 7%) (Wägeret *al.*, 2012)

2.0 METHODS

2.1 General Methodology

The “**e-Waste Assessment Methodology Training & Reference Manual**” developed by EMPA (Schluep et al., 2012) has been used to conduct the assessment. The methodology involved four principal stages namely (a) Desk Review of Literature and Inception Report preparation (b) Document Acquisition and Literature Review (c) Data acquisition, Field visits and Stakeholder Consultations; and (d) Information Analysis and Report Writing. These four stages are described below.

2.2 Desk Review of Literature

An inception meeting was held between the client and the consultants. The objective of the meeting was to attain a common understanding of the scope of the assignment.

Consultants embarked on an extensive study of existing documentation as a prime activity for the performance of this assignment. General information on e-waste and management has been obtained from EMPA resource information and public international websites. Information on Electrical/electronic usage in Uganda has been obtained by reviewing current documents and study reports in the country including policies, legislations and other studies made in the country.

2.3 Stakeholder Consultations

This stage entailed more detailed consultations, with key stakeholders to generate more information. During this stage, a review literature on the e-waste lifecycle within the country with a view of identifying the major sources and characterizing individual e-waste generated by each source was made. The consultation itinerary was developed to ensure adequate information is gathered and broad participation is elicited from the targeted stakeholders. The key stakeholders consulted include the following.

Table 2.1: List of key stakeholders

Government ministries	Government Parastatals, Institutions and Companies	NGOs and Agencies
<ol style="list-style-type: none"> 1. Ministry of Health 2. Ministry of Public Service 3. Ministry of Education 4. Ministry of Trade, Industry and Cooperatives 5. Ministry of Finance, Planning and Economic Development 6. Ministry of Gender, Labour and Social Affairs 7. Ministry of Information and Communication Technology 8. Ministry of Lands, Housing and Urban Development 9. Ministry of Ethics and Integrity 10. Ministry of Water and Environment 11. Ministry of Tourism, Wildlife and Antiquities 12. Ministry of Justice and Constitutional Affairs 13. Ministry of Foreign Affairs 14. Ministry of Internal Affairs 15. Ministry of Works and Transport 16. Ministry of Agriculture, Animal Industry and Fisheries 	<ol style="list-style-type: none"> 1. Uganda Revenue Authority 2. National Information Technology Authority - NITA 3. National Environmental Authority 4. Uganda National Roads Authority 5. National Forestry Authority 6. National Water and Sewerage Corporation 7. Uganda Communications Commission 8. Uganda Wildlife Authority 9. Uganda Investment Authority 10. The New vision Group 11. Uganda Industrial Research Institute 12. Uganda National Bureau of Standards 13. Makerere University 14. Mbarara University of Science and Technology 15. Kyambogo University 16. Gulu University 17. Kampala City Council Authority 18. Uganda Broadcasting Cooperation 19. Dairy Development Authority 20. Government Aided schools 21. District headquarters 	<ol style="list-style-type: none"> 1. World Food Program 2. Red Cross Uganda 3. World Vision Uganda 4. UNHCR 5. UNIDO 6. Action Aid Uganda 7. Plan Uganda 8. Monitor publications 9. Red pepper publications 10. MTN 11. Airtel 12. UTL 13. Warid 14. Banks (Stanbic Bank, Centenary Bank, Standard Chartered Bank, Barclays Bank, DFCU Bank,) 15. Private Universities 16. Private Schools 17. Internet cafes 18. Second hand electronic traders/dealers

2.4 Data acquisition and Field Visits

Questionnaires

Questionnaires (Appendix 1) have been used to get an overview of the consumer behaviour of the various stakeholders. In addition they were designed to retrieve further information about the presence and nature of possible informal recyclers and the purpose for which e-waste is used.

Information obtained from literature review together with that extracted by use of questionnaires has been used to describe and quantify the flows and stocks of the products attributed to the generation of e-waste in Uganda.

Interviews

Personal interviews have been conducted with various experts in order to obtain or complement data and the associate information that will have been gathered.

2.5 Mass-flow Assessment

The mass-flow assessment was conducted in accordance with the methodology described in the e-waste assessment methodology manual of EMPA (Schluep et al., 2012). The life cycle stages for EEE start with importation, distribution, consumption, refurbishment, repairs, dismantle of scraps and disposal.

2.6 Limitations

The main limitation in the course of this inventory was the fact that most companies and households were not cooperative in divulging information on how exactly their electronic wastes are handled. In addition, there seems to be a problem of delay in remission of custom forms to various data capture centers from customs remote centre. This in turn leads to delays in data entry, editing and processing. The untimely availability of data leads to a vicious cycle of delays in analysis and production of statistical data on imports. There has also seemed to exist, erroneous classification of commodities done by importers for purposes of tax evasion.

3.0 SYSTEM DEFINITION

3.1 Geographical scope and Social indicators

Uganda has a total area of 241,550.7 square kilometres (sq. kms) with open water and swamps covering 41,743.2 sq. kms while land area is 199,807.4 sq. kms. Uganda's population has continued to grow rapidly over time. It increased from 9.5 million in 1969 to 24.2 million as at 13th September 2002. Between 1991 and 2002 the population increased at an average annual growth rate of 3.2 percent, and the population was projected at 34.1 million by mid 2012(UBOS, 2012). Urban population in Uganda has increased rapidly from less than 0.8 million persons in 1980 to 5.0 million persons in 2012, representing an increase of more than six times. This increase is mainly attributed to the creation of new urban administrative units, natural growth, demographic factors (excess of fertility over mortality) and Rural - Urban Migration. The country has recently inaugurated its 2040 vision "*A transformed Ugandan society from a peasant to a modern and prosperous country within 30 years*". It aims at transforming Uganda from a predominantly peasant and low income country to a competitive upper middle income country with per capita income of about USD9,500(Vision 2040).



Figure 3.1: Map of Uganda

3.2 Development indicators

By 2009/10 there was an overall literacy rate of 73 percent among persons aged 10 years and above; with men being more literate (79 percent) than women (66 percent). Literacy rates are reported to have increased by 4 percentage points from 69 percent in 2005/06 to 73 percent in 2009/10. The total labour force in Uganda increased from 10.9 million persons in 2005/06 to 13.4 million persons in 2009/10, an increase of 23.0 percent. The Labour Force Participation rate (LFPR) increased from 82 percent in 2005/06 to 91.5 percent in 2009/10. The overall unemployment rate was 3.6 percent in 2009/10 while the urban unemployment rate was about 8.7 percent in 2009/10. The time related underemployment rate was about 3.2 percent. By status in employment, 79.4 percent of the working population in 2009/10 was self-employed. The paid employees constituted 21.7 percent of the work force in 2009/10 compared to 16.3 percent in 2005/06. Only 6.8 percent of the work force have specialised training, that is, post primary (UBOS, 2012).

The majority of the working population is engaged in agriculture. The agriculture sector employed 66.0 percent of the working population while by occupation, 60.0 percent of the working population were agriculture and fishery workers. Despite the prominence of agriculture, it showed a decline between 2005/06 and 2009/10 by both industry and occupation. The size of the civil service (composed of those persons in the traditional civil service, teaching service (primary and secondary), police, prisons, public universities and the local governments' staff) in 2011 increased by 4.3 percent compared to 1.6 percent in 2010. However, it excludes employees of semi-autonomous institutions and parastatals. Overall, the number of employees was 18,687 in 2011, a decrease of 1.1 percent in relation to 2010. However the wage bill increased by 11.6 percent while the monthly average earnings increased by 12.8 percent.

The Labour Cost Index (is a measure of the rate of change in the total labour cost) in real terms dropped to 98.6 percent in 2009 but later increased during 2010, and finally fell to 99.3 percent during 2011 resulting into a decrease of 0.7 percent in 2011 in relation to its value during 2008. However, this does not include data on self-employment income or informal sector activities. The manufacture of chemicals, paint, soap and foam had the highest labour cost index increase of 28.7 percent in real terms during 2011 in relation to 2008. The lowest increase in the labour cost was registered for the hotels and restaurants (10 percent).

Uganda's average household monthly expenditure rose from Shs. 210,750 in 2005/06 to Shs. 232,700 in 2009/10, representing a real increase of 10.4 percent within this period. The increase was mainly driven by observed increases in the rural areas (of 11.8 percent) while the urban areas registered an increase of 3 percent between the same period. Based on the 2009/10 survey data, it was estimated that 24.5 percent (about 7.5 million persons) of Ugandans were poor. The incidence of poverty remains higher in rural areas (27.2 percent) compared to urban areas (9.1 percent).

3.3 Business

The information in this section is derived from the 2010/11 Census of Business Establishments (COBE) which gives an overall structure of businesses in the country (UBOS, 2011). For this census, a formal business was defined as one that had an annual turnover of more than 5 million shillings regardless of the number of employees. The informal economy of Uganda is typically

composed of very small businesses that are not registered in any way. They are often not run from business premises. Instead, they are run from homes, street pavements or other informal squatter-like arrangements. They are mainly a result of the massive rural-to-urban migration occurring throughout the country. On this basis COBE categorized an informal business as one with an average annual turnover of less or equal to 5 million shillings.

3.3.1 Employment

There are 458,106 businesses in the country. The distributions of businesses by industry showed that majority (61.1 percent) of the businesses were in the Trade sector, followed by accommodation & Food Services with 14.1 percent and Recreation and Personal Services with 9.1 percent. Businesses in the Agriculture sector (including Fishing and Forestry) accounted for only 1.8 percent. The businesses in Information & Community Services, Finance & Insurance, Transport and Storage, Mining & Quarrying, Construction and Utilities accounted for just 2.2 percent of the total number of businesses

The distribution of businesses by region showed that 30.0 percent of the businesses were in the Central region excluding Kampala while 29.2 percent were in Kampala region. Businesses in the Western region accounted for 18.0 percent while the North had the least proportion of businesses (8.2 percent).

The 458,106 establishments in the 2011 Business Register employed about 1,074,000 persons, giving an increase of 142 percent in the number of persons employed. Out of these, 44.3 percent were female employees. Businesses in the Trade Sector employed the majority (41.5 percent) implying that with 4 out of every 10 persons were employed in this sector. Out of the total number of females employed, 44.1 percent were in the Trade sector followed by 22.5 percent in the Accommodation and Food Services Sector.

The information obtained showed that on average 2 persons were employed per business. The highest average employment size was in the Construction sector where an average of 22 persons was employed per business. This was followed by the businesses in the Utility sector with an average employment size of 16 persons per business. The Food Processing sub sector employed

an average of 9 persons per business. The Education and Health sectors, on the other hand, employed an average of 8 persons per business just like in the Finance & Insurance sub-sectors.

Table 3.1 Average employment by sector

Industry Sector	Businesses	Employment	Average employment
Agriculture	4,985	31,317	6
Forestry	54	683	13
Fishing	3,146	13,873	4
Mining and Quarrying	713	3,192	4
Food processing	5,966	50,745	9
Other Manufacturing	25,791	88,352	3
Utilities	134	2,161	16
Construction	653	14,398	22
Trade	279,715	447,064	2
Transport & storage	1,594	13,483	8
Accommodation and Food services	64,602	154,167	2
Information & communication	4,109	14,401	4
Financial & Insurance services	3,340	27,135	8
Real estate & Business services	10,945	53,124	5
Education Health & social work	10,593	81,546	8
Recreation & personal services	41,766	80,893	2
Total	458,106	1,076, 534	2

Source (UBOS, 2012)

Legal ownership of businesses showed that 93.8 percent of the businesses were under Sole Proprietorship while 2.4 percent of the businesses were under Partnership and Private Limited Companies each.

3.3.2 Telephone usage

The Telecommunications sub-sector posted a substantial increase in the number of subscribers. The year 2011 was characterised by a 30.5 percent growth in the number of subscriptions. This was largely attributed to low tariffs on on-net call bundles that fostered multiple simcard ownership. The increase of multiple simcard hand sets and new services such as mobile money transfers and utility payment options also increased the number of subscribers. Subsequently, national telephone penetration rose to 52.1 lines per 100 population from 41.1 in 2010. Telephone connections rose to 17,161,84 with 16,696,992 cellular and 464,849 fixed lines at the end of 2011.

Table 3.2 Telephone subscribers

Service	2007	2008	2009	2010	2011
Subscribers	5,329,202	8,723,345	9,617,267	13,155,378	17,161,841
Fixed Telephone	165,788	168,481	233,533	327,144	464,849
Cellular Phone	5,163,414	8,554,864	9,383,734	12,828,264	16,696,992
Teledensity (lines per 100 population)	18.9	29.5	31.4	41.4	52.1

Source (UBOS, 2011)

3.3.3 Annual Turnover of Businesses

The Turnover was categorized as less than 5 million, between 5 & 10 million and greater than 10 million. The Analysis showed that 70 percent of the businesses had an annual turnover of less than 5 million shillings while only 10 percent had an annual turnover of more than 10 million.

3.3.3.1 Annual Turnover of Businesses by industry

Out of the businesses with an annual turnover of less than 5 million, 62 percent were in the Trade sector followed by Accommodation and Food Services with 16 percent and Personal & Business Services with 11 percent. None of the businesses in the Utility and Financial Services sectors had a turnover of less than 5 million shillings while for the Construction sector the number was negligible. Although the Trade, Accommodation and Food Services sectors dominated even for the subsequent categories of annual turnover, the Manufacturing sector followed.

3.3.3.2 Micro, Small, Medium and Large (MSML) Businesses

Micro businesses are those with an annual turnover of less than 5 million shillings irrespective of the number of employees, while small businesses are those with an annual turnover of between 5 and 10 million shillings irrespective of the number of employees. Medium businesses on the other hand are those with an annual turnover of more than 10 million shillings but employing less than 50 persons while the large businesses were those with an annual turnover of more than 10 million shillings and employing at least 50 persons. With this definition in mind, the distribution of businesses by MSML is such that Micro businesses accounted for 70 percent of the total number of businesses while Small businesses accounted for 20 percent. Large businesses on the other

hand accounted for less than 1 percent. The Micro businesses were also considered to constitute the informal sector.

3.3.4 Computer and Internet Facilities in Businesses

In the 2010/11 Census of Business Establishments, information was collected on the status of ownership and internet use by businesses. From the information obtained, 95 percent of the businesses did not own computers compared to only 5 percent that owned computers. Out of those businesses without computers, the businesses in the Trade sector dominated (with 53 percent) while the majority (26 percent) of those businesses that owned computers were in the Real Estate and Business Services sector. Further analysis on internet usage also showed that only 3percent of the businesses used internet for business operations.

3.3.5 Distribution of Manufacturing Businesses by activity

The census showed that there were slightly more than 30,000 businesses in the manufacturing sector, 81 percent in the Non Food Processing sub-sector and only 19percent in the Food Processing sub-sector. A comparison with the 2001/02 data showed that there was an overall growth of about 450 percent in the manufacturing businesses in2010/11.

The distribution of businesses by sub-sector revealed that the majority (43 percent) of the businesses were engaged in the Textile sub-sector followed by Furniture making with 17percent, Metal Products with 13 percent and Grain Milling with 8 percent.

3.3.6 Ownership & Usage of Computers in the Manufacturing sector

95 percent of the businesses did not own any computers compared to only 5 percent that owned computers. The sub-sector with the highest proportion of computers was the manufacture of Paper and Paper Products which accounted for 44percent of the businesses that had computers. This was followed by businesses in the other manufacturing sector accounting for 16 percent. Out of the businesses that owned computers, those engaged in the manufacture of metal products and saw milling were the least accounting for less than 1 percent.

Table 3.3 Ownership of Computers in the Manufacturing sector

Manufacturing activity	Own a computer			Percentage	Total
	Yes	%	No		
Food Manufacturing	278	19.0	5,688	18.8	5,966
Processing of Meat	35	2.4	134	0.4	169
Manufacture of Grain	35	2.4	2,604	8.6	2,639
Manufacture of Bakery Products	47	3.2	2,270	7.5	2,317
Coffee & Tea Processing	47	3.2	165	0.5	212
Manufacture of Animal Feeds	4	0.4	67	0.2	71
Manufacture of Other Foods	67	4.6	105	0.3	172
Manufacture of Beer & Spirits	23	1.6	310	1	333
Manufacture of Soft Drinks & Mineral Water	20	1.4	33	0.1	53
Non Food Manufacturing	1,188	81.0	24,603	81.2	25,791
Manufacture of Textiles & Wearing Apparel	58	4	13,443	44.4	13,501
Manufacture of Leather & Related Products	21	1.4	299	1	320
Saw milling	7	0.5	180	0.6	187
Manufacture of Paper Products & Printing	642	43.8	430	1.4	1,072
Manufacture of Bricks, Cement & Concrete	32	2.2	522	1.7	554
Manufacture of Metal Products	128	8.7	3,826	12.6	3,954
Repair of Machinery and Equipment	18	1.2	251	0.8	269
Manufacture of Furniture	48	3.3	5,422	17.9	5,470
Other Manufacturing	234	16	230	0.8	464
Total	1,466	100	30,290	100	31,757
Percent	4.6	0.3	95.4	0.3	100

Source (UBOS, 2011)

3.3.6.1 Computers and Internet usage in the construction sector businesses

Information on ownership and use of computers indicated that 79 percent of Construction businesses used and owned computers. Further analysis indicated that 68 percent of the establishments used internet services in their business.

3.3.6.2 Computers and Internet usage in the Trade sector businesses

Results showed that the only 2 percent of the business in the Trade sector owned and used computers. Furthermore, only one percent of businesses used internet in their businesses.

3.3.6.3 Computers and Internet usage in the Transport and Storage sector businesses

The Census results showed that only 39 percent of the businesses owned and used computers in their business operations. With respect to the use of internet services, results showed that 35 percent of the businesses used internet services with the highest proportion registered in businesses in the Other Transport and Support activities.

3.3.7 Distribution of businesses in the Information and communication sector by activity

The 2010/11 Census results showed that nearly 4,200 businesses were registered in the Information and Communication sector, accounting for 1 percent of the total businesses in COBE 2010/11. Further analysis showed that the highest proportion of businesses were those engaged in Television and Radio Programming activities accounting for 65 percent followed by businesses engaged in the Telecommunication activities accounting for 21 percent. However, the least proportion of businesses was of those engaged in Publishing Activities accounting for only 3 percent.

3.3.7.1 Employment in the Information and Communication sector

A total of about 11,000 persons were engaged in the Information and Communications sector accounting for 1.3 percent of the total COBE employment. The results showed that the highest proportion (47 percent) of employees was engaged in Television and Radio Programming Activities followed by businesses engaged in Telecommunication Activities accounting for 29 percent. However, the findings showed that Publishing Activities had the least employees, only 10 percent of the sector employment in this sector.

3.3.7.2 Average Employment in Information and Communication sector

On average, 4 persons were employed per business in the Information and Communication sector. Further analysis showed that the Publishing activities had a higher average of 14 persons per business, followed by Telecommunication activities with 5 persons. The activity with the least proportion of employees was Television and Radio Programme, Table 3.4.

Table 3.4 Average Employment in the Information and Communication sector

Activity	Businesses	Employment	Average Employment
Publishing	106	1,446	14
Television & Radio programme	2,677	6,821	3
Telecommunications	877	4,235	5
Computer programming & other computer activities	449	1,899	4
Total	4,109	14,401	4

3.3.7.3 Information and Communication sector Businesses by Employment Size

In this sector, the findings showed that majority (90 percent) of businesses were employing less than 5 persons. This was followed by those employing 5 to 9 persons accounting for 5percent. However, businesses employing more than 50 people accounted for one percent of the businesses.

3.3.7.4 Annual Turnover of businesses in the Information and communication sector

The distribution of the businesses by annual turnover showed that the highest proportion were those with an annual turnover of less than 5 million shillings, accounting for 66 percent. This was followed by businesses with an annual turnover of 5 to 10 million shillings accounting for 20 percent. However, only 14 percent of the businesses had an annual turnover of more than 10 million shillings. A majority of the businesses with an annual turnover of less than 10 million shillings were engaged in Television and Radio Programming, while those with an annual turnover of more than 10 million were engaged in the Telecommunication activities.

3.3.7.5 Computer & Internet usage in Information and communication sector businesses

The results showed that 27 percent of the total registered business owned and used computers while 73 percent neither owned nor used computers. Further analysis of the businesses that used computers indicated that Television and Radio Programming, and, Telecommunication Activities were the major users of computer services, representing 41percent and 30 percent respectively.

3.3.7.6 Computers & Internet usage in Health & Social Work Sector Businesses

The distribution of businesses by computer ownership and use showed that only 17 percent of the businesses owned and used computers. Furthermore, the analysis indicates that 44 percent of those who used and owned computer, were engaged in Social Works Services, followed by Medical and Dental Services with 36 percent. Residential care activities recorded the least ownership and use of computers.

Analysis was also done to determine the use of internet services. The results showed that only 12 percent of registered businesses did use internet services as opposed to 88 percent that did not use internet services in their businesses.

3.4 Education

The Education sector grew by 10.7 percent in FY 2010/11 and contributed 5.4 percent to GDP during the same period. Information from the COBE showed that Pre-primary Education was predominant, accounting for 48 percent of total businesses in the sector. Female employees dominated the Pre-primary activity and the majority of the businesses were in the Central region. Data on Primary and Secondary schools provided by the Ministry of Education and Sports showed that there were a total of 20,889 schools, 32 percent of them in the Western region. In addition, slightly over 300,000 persons were employed in Primary and Secondary schools and the majority of the employees, 59 percent were female. Furthermore, 95 percent of the Secondary schools had at least 10 employees and only 9 percent of the schools were less than 6 years of age. Finally, 69 percent of the secondary schools were privately owned (UBOS, 2012).

According to a report based on 2003 data (Eremu, 2005), Uganda had by 2005 only 0.7% of its primary and secondary schools connected to the Internet. Uconnect and School Net Uganda, two major NGOs involved in ICTs for schools, led these projects. Connectivity was much more prevalent in urban than rural schools, basically because access to ICT infrastructure for schools mirrors the national rural-urban divide. The more specific factors constraining connectivity in rural areas were the overall poor communications infrastructure, low electricity coverage, and high capital costs involved in setting up a computer laboratory.

No doubt this has changed since 2005, and will continue to change, as access to electricity and connectivity improves. The Communication Commission (UCC) in partnership with the

Ministry of Education and Sports (MoE&S) of the Uganda government conceived a program to increase ICT usage in Uganda, by establishing an ICT laboratory in all government secondary schools. The concept is that if all children leaving government secondary schools are aware and can use ICT by the time they get out of secondary school, a good foundation in ICT, for the country would have been laid (Mubaraka et al., 2013). The government through the Uganda Communications Commission (UCC) has established fully equipped modern computer laboratories in over 1,000 government-owned secondary schools across the country. There are about 1,050 government-owned secondary schools in Uganda. According to UCC, of the 1000 computer labs, 600 have already been connected to the internet while the rest will acquire internet within the next one year. Other than being used as a fountain of knowledge by the schools, the computer labs will also be used to impart Information and Communication Technology (ICT) skills in residents.

4.0 POLICY & LEGISLATION FRAMEWORK

The current status of e-waste management and generation in Uganda has been influenced by various Policies, Statutes, Laws, Acts and Regulations, passed and enacted in the last 10 years. These have, among other things, brought about liberalization in the various social/economic sectors that have led to impressive economic performance. The more relevant ones are briefly described below:

4.1 Regulatory framework related and influencing e-waste

The Constitution of the Republic of Uganda

The National Objective and Directive Principles of state policy part xxii (I) obliges the state to promote sustainable development in the management and utilization of natural resources in such a way as to meet the development and environmental needs of the present and future generations. The state is particularly enjoined to take all possible measures to prevent and minimize damage and destruction of Land, air, and water resulting from pollution and other sources.

The constitution further provides that every Ugandan has a right to a clean and healthy environment and mandates the Government or local government to protect natural lakes, rivers,

wetlands, forest reserves, game reserves, national parks and any land to be reserved for ecological touristic purposes for the common good of all citizens. The Constitution mandated Parliament to make laws regulating waste management and related matters thereto.

The National Environment Act CAP 53, Laws of Uganda

The Act provides for planning requirements, preventive measures, enforcement actions and control mechanisms during the execution of projects that are likely to impact on the environment. The Act establishes the National Environment Authority (NEMA) as a body corporate to co-ordinate the monitoring and enforcement of environment standards.

Among other things, the Act subjects projects to environmental audits. This is the systematic, documented, periodic and objective evaluation of how well environmental management is being adhered to in project development. NEMA does the audit in consultation with the relevant lead agency.

The Act provides for the concept of a lead agency which is any ministry, department, parastatals, local government or public officer in which or in whom any law vests the functions of control or management of any segment of the environment. The Act provides for the preparation of environmental impact assessments regarding certain types of projects that are listed in the third schedule of the Act. The said list includes pipelines, railway lines, major roads, all roads in scenic, wooded or mountainous areas, establishment of industrial estates, clearance of forest areas, oil refineries and petrochemical works, pumped-storage schemes, management of hydrocarbons including the storage of natural gas and combustible or explosive fuels. The environmental impact assessment must be approved before the project proceeds.

The Act defines pollution as any direct or indirect alteration of the physical, chemical, biological or radioactive properties of any part of the environment. The Authority is supposed to issue standards and guidelines by prescription as to the acceptable levels of pollution. To exceed such levels a licence is required.

The authority may bring legal action against any person whose activities are likely to have a significant impact on the environment or to prevent, stop or discontinue any act that is harmful to the environment and to require that such activity be subject to environment monitoring.

The Act also sets restrictions on the use of lakes, rivers and wetlands. Further, NEMA is required to maintain a register of mountainous and hilly areas at risk of environmental degradation.

The Act imposes an obligation on every person carrying out any activity to manage the waste generated by such activity. It also imposes a duty on every person to maintain and enhance the environment. Under the Act the Authority is mandated to take measures to reduce existing sources of pollution.

The Occupational Safety and Health Act, 2006

The Act generally provides for matters related to occupational safety and health. The Commissioner appointed under the Act is responsible for the administration of the Act. The Act also makes provision for the appointment of inspectors.

An inspector may prosecute or conduct, as the case may be, before a magistrate's court any charge, information, complaint or other proceeding arising under the Act, or in the discharge of his or her duty, and an objection to the competency of the inspector to give evidence as a witness in the prosecution shall not be sustained. The Act defines workplace to mean all places of work and all sites and areas where work is carried out including not only the permanent, indoor, stationary places of work, such as factories, offices and shops but also temporary places such as civil engineering sites, open-air places such as fields, forests, roads, oil refineries and mobile places of work such as cabs of trucks, seats of tractors and excavators, ships, galleys, freight decks of aircraft and without exception; places where workers are found as a consequence of their work (including canteens and living quarters onboard ships).

The Act provides for and makes it a duty of the employer to protect workers and to implement safety and health measures. The Act requires the employer to consult with workers' organizations. The Act also requires the employer to monitor and control the release of dangerous substances into the environment. Where the level of air pollution and chemical substances in a working environment exceed the exposure limits specified by an occupational hygienist, an employer has to provide adequate and suitable protective clothing and protective equipment to the workers of his or her undertaking.

The employer is required by the Act to display and provide guide safety precautions, and has a duty to provide safe premises. Workplaces are registered in a register by the Commissioner. Any

plan and any architectural drawings of a new workplace and of any alterations of an existing workplace have to be submitted to the Commissioner for approval, before the construction of buildings or alterations of existing buildings of workplaces begins.

The Act requires an occupier to notify the Commissioner in writing, of the full particulars of any mechanical power used at a workplace, not less than one month before the date upon which the mechanical power is first used in the workplace. The Act outlines provisions related to health and welfare; general safety requirements; fire preparedness; machinery, plant and equipment; hazardous materials; chemical safety; and matters relating to offences, penalties and legal proceedings under the Act.

The National Environment (standards for discharge of Effluent into water or land) Regulations, S.I no.5 of 1999

The regulations apply to all categories of hazardous and non hazardous waste. They cover movement of hazardous waste into and out of Uganda, its storage and disposal.

The regulations also provide for conditional licensing of transportation of waste from one district to another. The regulations prohibit the disposal of untreated waste into the environment. Any person intending to run a waste treatment facility may, after carrying out an EIA apply for a licence. In carrying out waste treatment, the operator of a waste treatment facility shall take all necessary measures to minimise or prevent pollution from site or plant.

The National Environmental (Audit) Regulations, 2009

These regulations prohibit the carrying out of environmental audits without due certification and regulation except if the person is an environmental inspector. The regulations also provide for the preparation of environmental audit reports, require owners or operators of facilities whose activities are likely to have a significant impact on the environment, to establish environment management systems; provide for enforcement of environmental audits and encourage voluntary environmental audits and compliance agreements to aid facility compliance to environmental requirements.

The National Environment (Minimum Standards for Management of Soil Quality) Regulations

The purpose of these regulations is to establish and prescribe minimum soil quality standards to maintain, restore and enhance the inherent productivity in the soil in the long term, to establish minimum standards for the management of the quality of soil for specified agricultural practices.

The regulations also establish criteria and procedures for the measurement and determination of soil quality and to issue measures and guidelines for soil management and conservation. The regulations also provide for recommended frequency for monitoring soil quality parameters for enforcement purpose.

The National Environment Impact Assessment Regulations, 1998

These Regulations deal with the Environment Impact Assessment Processes, including project briefs and Environment Impact studies. The regulations provide for EIA review processes, including invitation of general public comments and public hearings, and the decision of the Executive Director of the NEMA in respect of the grant, rejection or cancellation of an EIA certificate.

The National Environment Ozone Depletion and substances products Regulations, SI 63, 2001

These regulations aim to regulate the production, trade and use of controlled substances and products, provide for a system of data collection to facilitate compliance with relevant reporting requirements under the Montreal Protocol on Substances that deplete the ozone layer. The regulations also promote the use of Ozone friendly substances and products that do not deplete the ozone layer.

The various schedules provide for controlled products, controlled substances, and prohibition dates, application for licences to import controlled substances and export them, declaration by the end user of controlled substances or products and the need for records to be maintained for controlled substances.

The Water Act, Cap 152, Laws of Uganda

The Act provides for the use, protection and management of water use and supply. Important aspects in the Act include water rights landing for waste use, control on the use of water resources, water easements and control over water works and water use. It gives the government

rights to investigate, control, protect and manage water in Uganda. The Act lays down conditions under which waste may come into contact with any water. Under the Act, a person commits an offence who causes or allows waste to come into contact with any water; waste to be discharged directly or indirectly into water; water to be polluted.

National Bureau of Standards Act, Cap 327 Laws of Uganda

The Act establishes the Uganda National Bureau of Standards whose functions include the promotion of standardisation in industry, adopting any international standards or specifications, requiring certain products to comply with certain standards of manufacture, enforcing standards to protect the public against harmful components and providing testing for any materials or substances.

The governing body of the bureau is the National Standards Council.

The National Standards Council is empowered by the Act to declare specifications, certification marks and codes of practice. When such a standard is declared it is optional and any person complying is allowed to display the UNBS mark on their product(s).

However, the National Standards Council is also empowered to recommend compulsory standards to the Minister responsible for commerce and such minister may declare a compulsory standard by notice in the Uganda gazette. According to the Act no person shall import, distribute, manufacture, sell or have in his possession or control for sale or distribution any commodity for which a compulsory standard specification has been issued unless such commodity conforms to the standard. It is a criminal offence under the Act to violate this provision.

The Penal Code Act Cap 120, Laws of Uganda

The Penal Code Act has few provisions relating to environmental protection. The offences relate to nuisances, offences against health and convenience, offences endangering life or health, negligent acts likely to spread infection of diseases, adulteration of food or drink, fouling of air and water.

The Factories Act, Cap 220, Laws of Uganda

The Act provides that in every factory which is in connection with any process carried on there, is given off any dust or fume or other impurity of such a character to such extent as to be likely

to be injurious or offensive to the persons employed, all measures shall be taken to protect the persons employed against inhalation of the dust or fume to prevent its accumulation in the work room.

The Explosives Act, Cap 298, Laws of Uganda

The Act stipulates conditions for the manufacture of explosives in Uganda. Under the Act a person shall manufacture explosives solely for purposes of chemical experiment or for practical trials only. The manufacture of such explosives is restricted to explosives factories. A licence is required for any dealings in explosives.

The East African Community Act, 2002

The East African community Act gives force of law in Uganda to the treaty for the establishment of the East African Community. Member states signed the 1999 treaty with the main objective of developing policies and programs aimed at widening and deepening co-operation among the member states in political, economy, social and cultural fields, research and technology, defence security, legal and judicial affairs for their mutual benefit.

The Uganda Communications Act, 1997

The Telecommunications Policy was enacted in 1996. The main objective behind the policy was to increase the penetration and level of telecommunication services in the country through private sector investment rather than government intervention. The Communications Policy led to the enactment of the Uganda Communications Act in 1997 which resulted in the establishment of the Uganda Communications Commission as an independent Regulator to regulate the Communications Sector and ensure its orderly development. The Act further led to the licensing of a Second National Operator to compete with the incumbent, Uganda Telecom Limited, which was later divested by Government to a consortium of private companies through sell of 51% shares.

The Rural Communications Development Policy, 2001

The main objective of the policy is to provide access to basic communication services within reasonable distance to all people in Uganda.

4.2 International conventions

Uganda is also a signatory to a number international conventions and guidelines aimed at safe guarding its citizens and the environment (Table 4.1).

Table 4.1 International conventions and guidelines

Instrument	Objective
London Guidelines for the Exchange of Information on Chemicals in International Trade 1987 (as amended in 1989) (voluntary)	Intend to increase chemical safety through the exchange of information on chemicals in international trade. (All chemicals excluding pharmaceutical including narcotics, drugs and psychotropic substances.)
Convention on the Prohibition of the Development, production, stockpiling and use of Chemical Weapons and on their Destruction 1994.	Ban development, production and use of chemical warfare agents and precursors
World Charter for Nature 1982	To avoid discharge of pollutants into natural systems.
Convention concerning safety in the use of chemicals as at work.	To ensure the enhancement of the existing legal framework for occupational safety by regulating the management of chemicals in the work place with the broad purpose of protecting the environment and public with the specific objective of protecting workers from harmful effects of chemicals.
Convention on the Prior Informed Consent Procedure for certain hazardous chemicals And pesticides in international trade.	To promote shared responsibility and cooperative efforts among parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm.
Code of Ethics on the International trade in Chemicals (voluntary) 1994	Sets forth principles and guidance for private sector parties, governing standards of conduct in the production and management of chemicals in international trade with the purpose of reducing risks to human health and the environment.
Vienna Convention for the Protection of the Ozone Layer (1985)	To raise international cooperation in protecting the ozone layer from depletion.
Montreal Protocol on substances that deplete the ozone layer (1987)	To provide in detail for the technical issues relating to ozone depleting substances.
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their disposal.	To provide for proper management of hazardous wastes and other wastes including their transboundary movement and disposal.

Stockholm Convention	To protect human health and the environment from the effects of persistent organic pollutants (POPS)
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4.3 Specific e-waste management legislation

4.3.1 The National ICT Policy

In order for developments in the ICT sector to be addressed systematically, government has formulated an ICT Policy Framework so as to meet the challenges and harness the underlying potentials and opportunities.

The scope of the ICT Policy covers:

- (a) information as a resource for development
- (b) mechanisms for accessing information, and
- (c) ICT as an industry, including e-business, software development and manufacturing.

The policy looks at various categories of information from different sectors, essentially aimed at empowering people to improve their living conditions.

4.3.1 Electronic Waste Management Policy for Uganda

The Government realizes that the eagerness to transform the nation into an Information Society through initiatives like tele-medicine, e-government, e-education, tele-centers, and computer school labs will gradually lead to increased use of electronic equipment. The private sector, business and household communities have also adopted the use of electronic equipment in their daily operations. This equipment gradually reaches end of life and has to be replaced. Further, due to the prohibitive prices for acquisition of new electric and electronic equipment, there is high demand for used products.

To consolidate its efforts in protecting the health of its citizens and the environment against the hazards of e-waste, the Government of Uganda has come up with an Electronic Waste

Management Policy for Uganda. The Goal of the policy is to ensure the safe management of e-waste in Uganda (ICT, 2010).

The objective of this policy, alongside with the existing draft National IT policy, is designed to provide the stakeholders the necessary tools, information and knowledge to facilitate the formulation and adoption of appropriate e-waste management strategies.

The draft national IT policy for Uganda is to address the management of e-waste. The policy states that “An e-waste policy should be developed and implemented”. Prior to the draft policy on e-waste, there was no specific e-waste legislation in Uganda. Unlike solid waste management that has been addressed in the National Environmental Act, Cap.153 that provides for sustainable environment, e-waste management is not addressed. The Ratification of Treaties Act 5/1998 provides for the procedure for ratification of treaties in accordance with article 123 of the Constitution; which allows Uganda in ratifying international conventions related to e-waste. This treaty has allowed Uganda to be part of the international conventions concerning e-waste like the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, the Stockholm Convention on Persistent Organic Pollutants and the World Charter for Nature.

Human Resource

The policy stresses the fact that there is a significant deficit of qualified personnel to address the safe disposal of e-waste in Uganda. Matters are not any better considering the National curriculum as well as private training and certification centers do not address e-waste as a priority at the moment.

Infrastructure

Currently, Uganda as a country does not have any e-waste handling facility. Some private sector entities, though, have set up centers for refurbishment for computer equipment but they operate at a low capacity and the primary focus is to make profits by availing low cost computers to a section of society. Equipment that is beyond refurbishment is still disposed of at dumping sites.

E-waste awareness and education

There is limited e-waste awareness in the public and private sector. There have been initiatives in the private sector at a low rate geared towards e-waste awareness. In the public sector, the National Environmental Management Authority (NEMA) has carried out preliminary e-waste awareness initiatives.

ICT Equipment standards and regulations

The National Information Technology Authority – Uganda (NITA-U) was established in 2009 to address, among others, the issue of defining standards for ICT equipment imported into the country. The National Bureau of Standards does not have specific standards addressing e-waste.

Policy Guiding Principles

The e-waste policy alongside the existing draft National IT policy is designed to provide the stakeholders with the necessary information and knowledge to facilitate the formulation and adoption of appropriate e-waste management strategies that are in line with the National Development Plan for Uganda.

The policy principles include the following;

- (a) Human life and environment protection: The government shall ensure safety of citizens and the environment from hazardous materials embodied in electronic equipment.
- (b) Globalization: The policy implementation shall take into consideration best available recycling technologies on a global level.
- (c) Community participation: Government shall encourage citizen participation.
- (d) Public Private Partnership: The Government shall recognize the contribution of the private sector.

Policy Objectives

The national e-waste policy shall have the following objectives

- (a) To provide for establishment of e-waste management facilities in the country.
- (b) To mobilize and sensitize the Government, private sector and the communities on the proper management and handling of e-waste on a sustainable basis.
- (c) To provide specific e-waste regulation (legal and regulatory) from the acquisition, handling to the final disposal processes.
- (d) To develop a critical human resource base knowledgeable in handling e-waste.
- (e) To provide for resource mobilization for efficient management and disposal of e-waste.
- (f) To provide guidance on the standards of electronic equipment that is imported in the country.
- (g) To incentivize investments in e-waste refurbishment facilities.
- (h) To engage in regional and international efforts seeking for transnational and global solutions

Policy Strategies

The existent infrastructure for e-waste management is low and only available in the central part of the country. Other regions do not have any facility at all to manage e-waste. To this end, the Government of Uganda shall: Establish E-waste management Infrastructure as well as increase awareness and Education

E-waste Fund

In order to ensure sustainability of national collection facilities, a fund will be set up that will be collected from both the sellers and buyers of electronic equipment. To this end, the Government of Uganda shall develop a legal framework for applying the Advanced Recycling Fee (ARF) that requires consumers to pay a recycling fee when purchasing ICT equipment. The fee is collected

in a national fund to cover costs of collection and recycling of e-waste once the equipment reaches end of life.

Institutional Framework

E-waste policy shall be implemented through collaboration among stakeholder institutions not limited to MDAs, agencies, private sector, donors, by;

(a) Developing institutional e-waste policy guidelines and implementation plans.

(b) Mobilizing e-waste awareness campaigns.

Specifically, the key institutions that shall be involved in this policy implementation include; Ministry of Information and Communications Technology (ICT), Ministry of Trade, Tourism and Industry (MTTI), Ministry of Health (MOH), National Environment Management Authority (NEMA), Uganda Communications Commission (UCC), National Information Technology Authority – Uganda (NITA-U), Uganda National Bureau of Standards (UNBS), Uganda Revenue Authority (URA), Local Governments, Uganda Investment Authority, Public Procurement and Disposal Authority (PPDA), Uganda Research Institute (URI) and the Private Sector.

5.0 STAKEHOLDERS ASSESSMENT

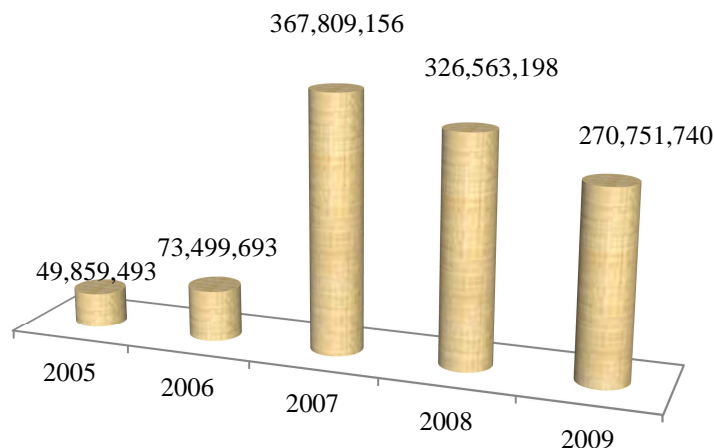
5.1 Stakeholder overview

The key stakeholders of e-waste generation and management in Uganda are the policy makers/regulators, importers, distributors and retailers, consumers, repair workshops/technicians (refurbishers), collectors, recyclers and disposal facilities. Producers, defined as organization involved in manufacturing, assembling and / or importing EEE have not yet taken root in Uganda. In the 1980's through the 90's, there was one electronic assembling company (Sembule Electronics Ltd) along Masaka Road, Nalukolongo Industrial which assembled TV sets. The company has since ceased the assembling and is now concentrating on importing electronics as well manufacturing of steel products. Nevertheless, according to the Uganda Investment Authority (UIA), Uganda's Information and Communication Technology (ICT) sector is one of

the most vibrant within the region, as good legal and regulatory frameworks exist. The newly developed and highly qualitative ICT infrastructure is also ready to accommodate more future investments.

Opportunities in ICT include establishment of information and communication infrastructure and broadband services, business process outsourcing services, computer and related equipment hardware assembly, high level ICT training facilities on international standards, ICT business services incubation, hardware repair training facilities, software development niches, setting up information technology virtual zones (ITVZ), and setting up Internet service provider facilities in other parts of Uganda. The sector has registered double digit growth over the last few years. Figure 5.1 shows the growth in industry investment expenditure over the last few years.

**Figure 5.1: ICT Industry Investment Expenditure,
2009 USD**



Source: Uganda Communication Commission

The majority of the international manufacturers like Perkin-Elimer, Unicam, Varian, Agilent, Sony, Philips, Motorola, HP, Compaq, Dell, Toshiba, Nokia, Samsung, LG, Sharp, Somotex and Thermocool are key players in the Uganda EEE market but do have neither manufacturing nor assembly within the country. Products from these international brands are imported readymade into the country by either government institutions or market distributors. There are few small scale local assemblers who assemble mainly unbranded computers. Most of the market dealers

have their main offices in Kampala, the central business district from where they are distributed to the other parts of the country.

Table 5.1: Overview of key players in EEE in Uganda

International Brand	Type of EEE
Perkin-Elmer, Unicam, Varian	Scientific equipment (especially the old equipment although their products are being phased)
Agilent	Scientific equipment (especially the new equipment)
Dell	Computers
Sony	Large and Small Household Appliance, Computers and mobile phones
HP	Computers and scientific equipment
LG	Large and Small house hold appliances
Nokia	Mobile Phones
Acer	Computers
Philips	Small Household Appliance and electrical lighting
Samsung	Large and Small Household Appliances, computers and mobile phones
Motorola	Mobile phones
Sharp	Computers
Toshiba	Computers
Thermocool	Air conditioners and Large Household Appliances

5.2 Importers

5.2.1 General Overview on Uganda’s Imports

Over 90 percent of the data was obtained from the Customs department of the URA. The information is collected using the Customs documents namely Single Bill of Entry and Direct Assessment Forms (F88 forms) filled in by Importers and Exporters or their clearing agents. For computerized customs centers, data capture is done using an Automated System for Customs Data (ASYCUDA), whereas non-computerized stations use Database software. 85 percent of all customs stations in Uganda have ASYCUDA. Two ASYCUDA versions are in use; 2.7 still being used in upcountry border stations and ASYCUDA++ used at Customs Business Centers under Direct Trader Input (DTI).

There are 39 Customs Offices in Uganda, the majority of which (about 25) are remote stations but with less than 10 percent of customs tax revenue. The remote stations are not automated, which made data from these stations difficult to collect. There is a big backlog of un-captured data from these stations that is not easily known. About 7000 electronic declarations are handled per month. The declarations are processed within a maximum of 48 days for those stations using ASYCUDA 2.7 and less than 4 hours using DTI (ASYCUDA++). Uganda uses 53 Customs Procedures (CPCs), but it is difficult to tell how many declarations are handled per customs procedure. Data from non Customs sources was collected the Uganda Bureau of Statistics (UBOS). The 1998 UBOS Act mandates UBOS as the principle data Collection, Analysis, Production and Disseminating Agency of the official statistics in Uganda. This legislative framework empowers UBOS to produce and publish any type of statistics in Uganda.

Overall, general imports into Uganda have been growing faster than exports, resulting into a wider trade imbalance. Between 2001 and 2005 for example, exports increased by 12.5%, 3.5%, 14.2%, 22.4% and 24.1% while imports increased by 5.0%, 6.7% and 28.1% before reducing to 25.5% and 19.0% for the respective years. By 2011 the major imports partners were; Kenya, United Arab Emirates, India, China, South Africa, Japan, Russia, Saudi Arabia and United States of America. The Asian continent remained the leading source of Uganda's imports throughout 2011. The higher increase in imports would be desirable and sustainable if most of the imports were used as inputs into the production process. However, most of the imports are consumables rather than industrial/production inputs.

There are two categories of imports into the country. The formal cross border trade through Customs Department of Uganda Revenue Authority (URA) and the informal cross border trade transactions between Uganda and her neighbours. The customs department collects data for formal trade transactions using the Single Bill of Entry (SBE) and F88 forms submitted by clearing agents on behalf of importers. However, all transactions involving inflow or outflow of goods under informal trade arrangement are largely unrecorded. Our findings therefore are based on URA records and do not include informal trade transactions.

Table 5.2 Summary of external trade statistics: 2007 – 2011 (million US \$)

Trade Flow	2007	2008	2009	2010	2011
Informal Exports	530.6	807.7	798.5	528.3	355.8
Formal/Official Exports	1,336.7	1,724.3	1,567.6	1,618.6	2,159.1
Total Exports	1,867.3	2,532.0	2,366.2	2,146.9	2,514.9
Informal Imports	57.2	78.1	82.0	66.5	53.9
Formal/Official Imports	3,495.4	4,525.9	4,257.6	4,664.3	5,630.9
Total Imports	3,552.6	4,604.0	4,339.6	4,730.8	5,684.8
Trade Balance	-1,685.3	-2,072.0	-1,973.5	-2,583.9	-3,169.9
% change (Exports)		35.6	-6.5	-9.3	17.1
% change (Imports)		29.6	-5.7	9.0	20.2

Source Uganda Revenue Authority

In 2011, the total imports bill stood at US \$ 5,684.8 million, of which, formal imports accounted for US \$5,630.9 million while informal imports were estimated at US \$ 53.9 million. The overall imports expenditure rose by 20.2 percent in 2011 compared to an increase of 9.0 percent in 2010. Although the formal imports bill increased over two consecutive years (2010 and 2011) informal imports maintained a stable decline of 18.9 percent in the same period. Petroleum and petroleum products take the highest import bill accounting for 22.9 percent of the expenditure on imports. This is followed by Road Vehicles with 8.9 percent, then Telecommunication instruments with 6.1 percent and Iron and steel at 4.8 percent (*See Appendix*).

5.2.2 Importation of EEE

According to records, most electrical and electronic equipment in Uganda are imported through the port of Mombasa, Kenya. Other entry ports are Entebbe International Airport and on rare occasions, the port of Dar es Salaam in Tanzania. In this survey, stakeholders interviews including customs officials at the Uganda Revenue Authority (URA), importers and traders, as well as a review of the available records was the main source of information on import volumes. A review of the customs records indicated that the imported EEE contain varying compositions ranging from cooking appliances, air conditioners, refrigerators and freezers, dryers, dish washing machines, smoothing irons, microwave ovens, oven and cookers, thermic toasters, cellular phones, television sets cameras, digital cameras and videos, computers, Tungsten halogen filament lamps, Radio receivers, electric kettles and cassette players among others.

According to the United Nations Commodity Trade Statistics Database, Transmission apparatus (inclusive of cellular phones) constituted the major electronic imports in Uganda in monetary terms, for the period 2005 -2010 (Appendix 5).

On the other hand, the 2011 data from customs indicates that electronic equipment imported into the country reflected a 12.3 percentage of all the imports in that year. These include: Power generating machinery and equipment; Office machines and automatic data-processing machines; Telecommunications and sound recording/reproducing apparatus; Electrical machinery, apparatus and appliances; Professional, scientific and controlling instruments and apparatus.

Uganda Revenue Authority (URA) records indicate that cellular phones as well as machines related to telephone services constituted the major electronic imports over the last two years (Table 5.3). The weights have been calculated by multiplying numbers of items from the customs records by the average weights of the corresponding items. (Appendices 6 and 7)

Table 5.3: Electrical/Electronic Imports 2008-2012 (Units Kg)

Item	Average weight	2008	2009	2010	2011	2012
Cooking appliances, plate warmers, for gas	46	0	44,344	1,000,224	802,562	2,574,022
Window or wall air conditioning machines,	32	43,040	41,152	0	407,648	667,904
Furnace burners for liquid fuel	28	42,896	22,680	363,244	548,352	279,580
Refrigerators and freezers	35	83,545	9,450	173,670	691,110	338,765
Centrifugal clothes-dryers	65	1,365	1,235	2,535	845	22,165
Dish washing machines, of the household type	50	42,100	4,650	12,100	27,750	220,200
Electric instantaneous or storage water	2	710	1,712	132	35,130	116,144
Electro-thermic hair dryers	1	328	442	8,314	6,642	9,563
Electrical smoothing irons	1	2,899	3,287	36,907	70,111	137,911
Microwave ovens	15	44,040	33,825	134,895	92,415	175,650
Oven and cookers	46	89,286	151,202	1,105,104	0	4,222,616
Electro-thermic toasters	1	134	289	3,115	5,865	6,775

Telephones for cellular networks	0	27,675	12,830	95,713	95,551	209,547
Other telephones	1	385	9,550	46,590	10,016	4,784,611
Machines for the reception & conversion	2	9,824	12,868	140,120	84,752	16,421,948
Television sets	32	76,851	285,759	379,927	584,316	197,089
Television cameras, digital cameras and video	4	4,464	1,636	0	30,732	74,964
Pocket-size radio cassette players	2	56,844	1,860	27,802	86,676	331,770
Tungsten halogen filament lamps	1	32	16,883	57,209	26,124	115,434
Discharge lamps, other than ultra-violet	0	98,552	2,989	188,998	281,510	1,636,566
Desk top Computers	10	673,200	925,076	786,209	1,007,929	965,280
Laptops	4	432	805,364	650,339	749,000	320,467

Although the HS Codes used do not capture whether the imported item is second hand or not, it should be noted in 2010, two trade groups – Dealers in Reconditioned Electronic Equipment (DIREE) and Uganda Electronics and Technicians Association (UETA) have since petitioned Parliament to withdraw the law. The controversy is far from over, as growing environmental concerns and the need for consumers to access low-cost IT equipment need to be balanced. Importers argue that consumers are deprived of low-cost equipment, especially those who can't afford high-end technology but the National Environmental Management Authority (NEMA) defends the law and plans to establish a recycling centre for electronic goods. The organization suggests that Uganda has been receiving discarded electronic items for years, known as the fastest growing form of waste in the world, rising at a rate of about 50 million tones a year. NEMA claims to have around Shs300 million (Approx.US \$ 120,000) from the environmental fund which they intend to use to set up the recycling centre, although experts believe the funds are not sufficient for such an undertaking.

Meanwhile, the government, through the Uganda National Bureau of Standards (UNBS) has put in place a program to have goods inspected in the country of origin. UNBS contends that the program is intended to substantially reduce substandard imported products onto the Ugandan market. The categories goods to be inspected in the country of origin before shipment is known as Pre-Export Verification of Conformity (PVoC) include the following:

- Group I Toys
- Group II Electrical and electronics including solar equipment
- Group III Automotive products and inputs
- Group IV Chemical products
- Group V Mechanical materials and gas appliances
- Group VI Textile, leather, plastic and rubber products
- Group VII Furniture (wood and metal articles)
- Group VIII Paper and stationery
- Group IX Protective safety equipment
- Group X Food and food products
- Group XI Used products including used motor vehicles.

In addition, the East African Community (EAC) member countries are moving towards harmonizing critical legislations on social, political and economic affairs. It is along that line that Uganda Communications Commission (UCC) intends to block all ‘cloned’ phones, a move that has already been implemented by the Communications Commission of Kenya’s (CCK’s). Further to that, although Uganda is the only country in the world to ban used computers, without enough muscle to enforce the ban, underground trade of these computers is booming. The records provided by URA therefore, do not reflect inflows of second hand computers. The ban may however be declared over as an environmental policy to handle electronic waste is being put in place. The National Information Technology Authority-Uganda (NITA-U), that promotes and monitors IT development in the country, will soon provide standards of used computers that can be imported into Uganda. All these steps, once implemented will inevitably have an impact on the volumes of electronic imports within the country.

Analysis of the customs data by use of the suitable international commodity codes to the corresponding WEEE category II-IV (see Table 1), shows a steady increase of import volumes can be observed from the year 2008 until 2012 with III being the most imported category. This is in line with Uganda’s increased aggressiveness in the Information and Communication Technology (ICT) sector. The data does not distinguish between used and new EEE and seem to be inconsistent over the years. For example, apart from category III, import numbers in 2011

seem to be lower than those of 2010 and 2012. The lower import activities in 2011 may be attributed to the political activities within this year. This is the year the presidential and parliamentary elections were held and traders might have hesitated to import waiting for the outcome of these elections.

Table 5.4: Uganda Import statistics 2008 – 2012 for WEEE categories II – IV (in tones)

	2008	2009	2010	2011	2012
II. Small household appliances	89	86	1,187	999	3,115
III. IT and telecommunications equipment	850	2,055	2,127	2,649	23,306
IV. Consumer equipment	274	184	1,536	1,041	6,461

5.3 Distributors

These are enterprises selling the equipment directly to the consumers. Most distributors are located in the business district of Kampala from where EEE is channeled to other parts of the country. The key distributors of electronic equipment in Uganda are listed in table 5.5 below as well as appendix 2.

Table 5.5: Key distributors of EEE in Uganda

DISTRIBUTOR	CATEGORY OF EEE (categories according to the EU directive on EEEE)
PK Electrical Suppliers	II and IV
Sebaggala & Sons Electrical Centre	II and IV
Ultratec (U) Ltd	II and IV
K.G.M. Group Of Companies	III
Smart Solutions Integrated	III
Terry Trading Cd Ltd.	III
World Wioe Importers	III
Game Store	II, III and IV
Nakumatt Uganda Ltd	II, III and IV
Uchumi Supermarkets	II, III and IV
The Tamales	II and IV
Midcom Uganda Limited	III

A total of 68 questionnaires were received from the distributors

- 62% of the respondents are not ISO 14001 certified.

- 59% of the respondents are aware that some electronic parts may be profitably recycled; they cite batteries, plastics, iron and aluminum parts as the major components recycled.
- 55% are aware that some hazardous fractions in e-waste need a special treatment in order to be safely disposed of.
- 68% of the companies/institutions that responded have a procedure for handling electronic waste. They claim that: plastic is compiled and later picked by informal collectors for free- (63%); Sell metallic components to informal collectors (57%); dumped in municipal tins (38). 58% of those who do not proper procedure requested to be educated.
- The majority (73%) do not plan to introduce a policy for management of e-waste urging that it is costly.
- 63% of the distributors purchase their equipment via retail shop of international brand while 40% purchase from second hand market.
- According to the distributors, the average life span of equipment is as follows:

Table 5.6 Distributor’s perception on end of life

Product	Number of years
Desk top computers	5
Laptop computers	4
Traditional monitors	7
Flat screen monitors	5
Printers	5
Mobile phones	3
Televisions	7

According to distributors, the estimation of the life span of the equipment is based on the turnover of their regular customers who report the breakdown of the items bought previously.

- 82% of the respondents are not aware of what happens to the discarded equipment
- Regarding end of Life Management, 64% sell the equipment which they don't use anymore while 38% donate them to schools, employees and friends.

5.4 Consumers

5.4.1 Government Sector

In July 2011, Government approved National E-government Policy Framework with the overall objective of improving public service delivery through a systematic transformation from manual to electronic based systems and practices. The policy framework broadly defines e-government to include all electronic transactions that facilitate service delivery among government organs, ministries, institutions, departments and agencies (G2G); between government and the private sector (G2P), and between government and the citizenry (G2C). The e-government policy framework is currently being implemented.

Before ensuring full deployment of e-government services, the government thought it necessary to establish the current status of the country one-government services based on a number of indicators for access, penetration, utilization and usage of ICT facilities and services. Thus the data from the current assessment has been supplemented by the results on the E-Government Readiness assessment conducted by National Information Technology Authority -NITA (NITA, 2012).

463 Government Institutions were targeted and it was established that 36 % of the employees in a central government institution have computer assigned to them; which is very low and not supportive of the government's agenda to enhance e-Government services, yet 56% of staff in central government institutions require computers to do their work, but do not have any assigned to them.

Thus on average, every central government institution would need to double the number of their computers to ensure effective e-Government service delivery. 52% of central government staff without assigned computers have access to computers. This percentage needs to be significantly increased. Introduction of shared computer lab facilities would help enhance e-Government readiness (*Access meant that they may not be assigned a computer, but are able to use a shared computer or a computer specifically assigned to someone else to perform work related tasks on an as-need basis*)

It was also established that 53% of computers in government institutions are between 0 and 3 years, with the average last major purchase of computers by the majority of government institutions having been made in 2010. This reflects that the majority of the current computers in central government should have the minimum technical specifications for implementing various e-Government initiatives

93 central government institutions indicate that of the total 21,907 computers within these institutions only 70% are working; and only 56% of the 21,907 have been assigned to staff. Consequently, 14% of working computers have not been assigned. For the institutions that responded; the 3,038 computers that are working, and that have not been issued, need to be issued; while an additional 9,251 computers need to be purchased to meet current needs.

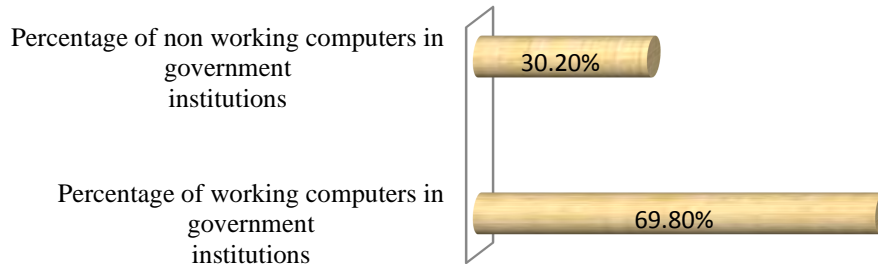
It was also established that within Government institutions, there are 6,622 computers that cannot be used, because they are either old, damaged and/or due for disposal. The fact that 30% of computers in central government are not working correlates favourably with the fact that 47% of computers in central government institutions are above 3 years old and intend to auction them to the public as a means of disposal.



Figure 5.2: Non-functioning computers in a government institution

98% of the 93 central government institutions that responded have desktop computers totalling to 13,212; while 97% of them have laptops totalling to 2,391. 18% of central government institutions have tablet computers totalling to 205 across the 12 institutions that have them.

Figure 5.3: Percentage of working computers in central government institutions



Source NITA, 2012

It was also established that 22% of central government institutions offer services or information to end users that can be accessed using a mobile phone. Considering that the mobile phone penetration rate in the country is at 51% according to the Uganda Communications Commission, it is vital for more government institutions to engage in developing e-government initiatives that can be implemented through mobile phone technology accessible platforms..

On average 40% of staff in central government institutions have access to the internet at the office. With 36.3% of staff in central government institutions having an assigned computer, with statistics the weights of computers in government institutions has been estimated as in table 5.7

Table 5.7 Weights of computers in Government Institutions

	Numbers	Average weight	Weight (Kg)	Weight of working computers (Kg)	Weight of Non-working computers (Kg)
Desk tops	21907	9.9	216,879	151,816	65,064
Laptops	3362	3.5	11,767	11,767	0
Tablets	713	1.4	998	998	0
Total	25982			164,581	65,064

Within Government institutions, 86% of the 93 respondents have single function desktop printers totalling to 3,575; with 83% having a total of 959 standalone scanners; and 74% having a total of 282 fax machines - compared to 81% of institutions with 543 multifunctional business printers. However the government does not have a policy or legal framework governing the management of e-records by Government Institutions. The policy and legal framework need to be developed and implemented

5.4.2 Private Sector

Corporate organizations

According to the 2010/11 census of business establishments by the Uganda Bureau of Statistics there are 124 corporate organizations within the country ranging from banks, hotels, tertiary institutions and hospitals among others. In a survey of 54 corporate organizations, it was established that 94 % of the respondents were aware about the environmental hazards caused by discarded electronic equipment and 83% are aware that some electronic parts may be profitably recycled.



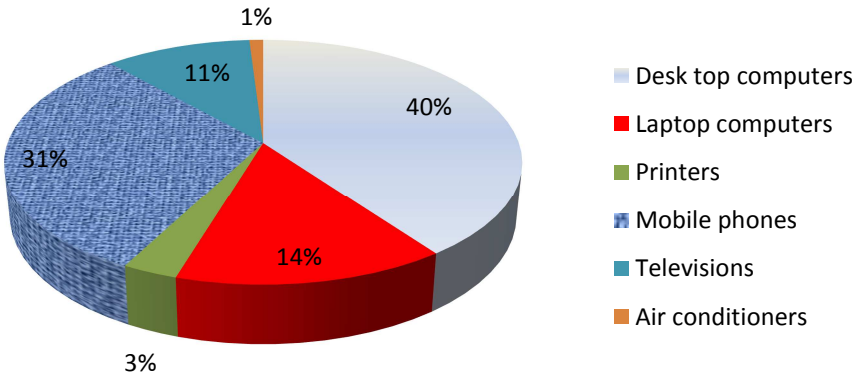
Figure 5.4: Obsolete equipment in a government institution

The procedure for 82% of these organizations of handling electronic waste was to hand them over the procurement and disposal department for action. According to the selected disposal departments interviewed, obsolete waste is compiled in the departmental store whereas the one

that “appears” to be functional is auctioned to the public. However, they do not make a follow up of what happens to the waste they dispose of to the public.

The number of laptops within an organization depends on the number of technical staff. 96% of the organization indicate that most of their technical staff owned a laptop either through the company or on individual basis even if one owned a desktop in his/her office. According to the Uganda Bureau of Statistics there are over 458,106 business and corporate establishments which register an employment of about 1,074,000 persons. Desktop computers, followed by mobile phones constitute the major electronic equipment in corporate organizations.

Figure 5.5: Distribution of electronic equipment in companies by number of appliances



92% of the corporate organizations purchase your equipment via retail shop of international brand with none indicating purchase on second-hand market. This is probably due to the stringent procurement rules as well as the ban on second hand computers. However, despite the fact that kept in the stores of the various organizations, only 11% of the respondents expressed willingness to pay for their equipment to be collected and recycled. The majority opt to have the auctioned to the public.



Figure 5.6: Auctioning of computers at Mbarara University of Science and Technology

Table 5.8: IT and Telecommunication Equipment in Corporate organizations

Item	Average items per corporation	Average Weight per (Kg)	Weight per organization	Estimated weight (Kg) in corporate organizations (124)
Desk top computers (including CRT, mouse, keyboard)	123	9.9	1217.7	150,995
Laptop computers	89	3.5	311.5	38,626
Printers	38	6.5	247	30,628
Mobile phones	163	0.1	16.3	2,021
CRT Televisions	6	31.6	189.6	23,510
LCD Televisions	12	4.7	56.4	6,994
Air conditioners	6	18.0	108	13,392
Total				266,166

5.4.3 Private households & small businesses

The sampling area for private households as well as small businesses was selected on the basis of the Uganda Bureau of Statistical Abstract (2012) demographic, socio-economic indicators and urban population projections. A total of 58 private middle and upper income households covering the areas of Kampala city, Kira town and Mbarara town responded to the questionnaires. According to the Uganda Bureau of Statistics (UBOS, 2012), there are 1.2 million households in urban areas of which 9.1 percent urban are categorized as poor. This means that there are close to 1,090,800 households in urban centers which may be categorized as

middle and upper income households. The sample size of 58 taken in this study is certainly small but this was mainly due to the limitations of the study as highlighted in section 2.6, as 250 questionnaires were administered but only 58 responded.

71% of the respondents knew the meaning of e-waste/waste of electrical and electronic equipment and 84% of these were aware that some hazardous fractions in e-waste need a special treatment in order to be safely disposed of. However 86% indicated that they did not have waste collectors in their area, and even those whose waste was occasionally picked, did not know what it was being used for. It was observed that most people do not throw away e-waste hoping that it might be of use in the future, although some sell it to people dealing in scrap. Whereas most respondents acknowledged that e-waste accumulation was a challenge, very few (7%) were willing to give it away for free. Analysis of data on large household appliances indicates that fridges are the most common appliances, followed by stoves and electric heaters. The fridge “user index” is 0.86 suggesting that in every 100 households of the surveyed area, 86 of them are likely to have a fridge.

Table 5.9: Average amount of Large Household Appliances in urban areas

Item	Average number of items per household	Average Weight (Kg) per item	Weight (Kg) per household	Estimated weight (Kg) in urban areas (1,090,800 households)
Air conditioners	0.10	18.0	1.86	2,031,145
Dish washers	0.14	48.7	6.72	7,327,167
Dryers	0.09	57.5	4.96	5,406,983
Electric heaters	0.34	5.0	1.72	1,880,690
Fridges	0.86	34.3	29.57	32,253,828
Grillers	0.14	13.3	1.83	2,001,054
Hobs	0.12	0.3	0.04	39,494
Steam ovens	0.09	55.7	4.80	5,237,721
Stoves	0.48	54.5	26.31	28,699,324
Washing Machines	0.09	3.7	0.32	347,928
Total				85,225,332

The most common small household appliances are flat irons, with almost all household surveyed being in possession of a flat iron. This is followed by fans and blenders. On the other hand,

mobile phones were the commonest IT equipment in the area surveyed with an average of over 3 phone sets per household. This is in line with the national records. According to the Uganda Bureau of Statistics, national telephone penetration rose from 41.1 in 2010 to 52.1 lines per 100 in 2011, representing a total of 4,006,463 new subscribers. However, the increased number of subscribers may not necessarily be pegged to the number of mobile phone sets since the use of multiple simcard hand sets is also reported to be on the increase.

Table 5.10: Small Household Appliances in urban areas

Item	Average number of items per household	Average Weight (Kg) per item	Weight (Kg) per household	Estimated weight (Kg) in urban areas (1,090,800 households)
Blenders	0.83	2	1.74	1,895,735
Coffee machines	0.07	na		
Toothbrush	0.03	na		
Electric Boilers	0.10	na		
Electric lawn mowers	0.03	14	0.48	526,593
Fans	0.91	10	9.14	9,967,655
Hair dryers	0.14	1	0.14	150,455
Flat Irons	0.97	1	0.97	1,053,186
Kettles	0.52	1	0.52	564,207
Microwaves	0.40	15	5.91	6,445,123
Mixers	0.03	1	0.03	37,614
Popcorn makers	0.02	1	0.02	18,807
Toasters	0.26	1	0.26	282,103
Vacuum cleaners	0.05	9	0.44	479,576
Total				21,421,055

Table 5.11: IT and Telecommunication Equipment in urban areas

Item	Average number of items per household	Average Weight (Kg) per item	Weight (Kg) per household	Estimated weight (Kg) in urban areas (1,090,800 households)
Fax machines	0.05	0.1	0.01	5,642
Phones	0.45	1.0	0.45	488,979

Mobile phones	3.53	0.5	1.80	1,966,261
Laptops	0.69	3.3	2.28	2,482,510
PCs	0.34	10.6	3.66	3,987,062
LCD monitors	0.24	4.5	1.09	1,184,834
CRT monitors	0.26	15.0	3.88	4,231,552
Modems	0.66	0.3	0.16	178,666
Printers	0.17	7.0	1.21	1,316,483
Scanners	0.07	7.5	0.52	564,207
Copy machines	0.00	59.0	0.00	0
Total				16,406,196

In the category of consumer equipment, radios followed by DVD players and cameras constitute the biggest percentage. The survey indicates that on average each household possess a radio set. Light bulbs constitute the highest number lighting equipment, and in the category of batteries no household indicated to be in possession of an accumulator.

Table 5.12: Consumer Equipment in urban areas

Item	Average number of items per household	Average Weight (Kg) per item	Weight (Kg) per household	Estimated weight (Kg) in urban areas (1,090,800 households)
Alarm clocks	0.62	0.33	0.20	223,426
Cameras	0.31	0.67	0.21	226,811
DVD players	0.81	4.90	3.97	4,331,228
MP3 Players	0.67	2.00	1.34	1,466,938
Radios	1.16	2.12	2.45	2,671,332
TVs (CRT)	0.79	32.30	25.62	27,943,287
TVs Flat Screen	0.21	15.00	3.10	3,385,241
Total				40,248,263

The estimations have been based on urban households as negligible volumes are expected in rural areas. Our assumption is based on the fact that Uganda is among the countries in Sub-Saharan Africa with the lowest electrification rates, with only about 6 % of the total population having access to electricity. In rural areas, the rate drops to an alarming 2. Therefore no significant volumes are expected in the rural areas.

5.4.4. E-Waste generation

It is unclear from the survey, what the life span of the appliances is, as varying responses were presented. What is certain however is that the life span of say large household appliances is slightly more than 10 years. In estimating the e-waste generated life span values as proposed by Ogungbuyi et al., 2012 in the Nigerian study, have been used.

Table 5.13: Overview of the WEE generation in Uganda

Item	Government sector (kg)	Corporate organizations (kg)	Private households & small businesses (kg)	Total (kg)	Life span	WEEE (kg)
Large Household Appliances			85,225,332	85,225,332	10	8,522,533
Small Household Appliances			21,421,055	21,421,055	4	5,355,264
Consumer Equipment			40,248,263	40,248,263	5	8,049,653
IT and Telecommunication Equipment	229,645	266,166	16,406,196	16,902,007	4	4,225,502
Total	229,645	266,166	163,300,846	163,796,657		26,152,951

Electrical and electronic equipment contain various fractions of valuable materials. Most of the valuable substances are found in printed circuit boards, which occur in relevant quantities mainly in the categories Office, Information and Communication Equipment as well as Entertainment and Consumer Electronics. Besides well known precious metals such as gold, silver, platinum and palladium also scarce materials like indium and gallium start to play an important role, due to their application in new technologies (e.g flat screens, photovoltaics). Table 5.13 summarizes

quantitative estimations of the material recovery that would be obtained from the four categories of EEE. The material composition has been estimated by multiplying values proposed by empa (Appendix 7) with the calculated WEEE (kg) in Table 5.13 above.

Table 5.14: Estimated Material recovery in WEEE generated in Uganda
(Based on values calculated in Table 5.13)

Material	Large household appliances		Small household appliances		ICT and consumer electronics	
	Material composition (%)	Estimated material recovery (kg)	Material composition (%)	Estimated material recovery (kg)	Material composition (%)	Estimated material recovery (kg)
Ferrous metal	43	3,664,689	29	1,553,026	36	4,419,056
Aluminium	14	749,737	9.3	748,618	5	1,518,923
Copper	12	965,958	17	718,335	4	1,046,118
Lead	1.6	67,608	0.57	149,072	0.29	0
Cadmium	0.0014	366	0.0068	0	0.018	0
Mercury	0.000038	0	0.000018	0	0.00007	0
Gold	0.00000067	0	0.00000061	0	0.00024	0
Silver	0.0000077	0	0.000007	0	0.0012	53.03
Palladium	0.0000003	0	0.00000024	0	0.00006	3.56
Indium	0	0	0	0	0.0005	12.83
Brominated plastics	0.29	12,815	0.75	11,392	18	188,301
Plastics	19	288,595	37	387,064	12	0
Lead glass	0	0	0	0	19	0
Glass	0.017	0	0.16	0	0.3	0
Other	10	0	6.9	0	5.7	3.0
Total	100		100	0	100	

On the basis of the estimations in table 5.13 above, it is evident that the amount of ferrous metal, aluminium, copper and brominated plastics that would be recovered from the potential WEEE in Uganda is 4,419; 1,519; 1,046 and 188 tonnes respectively. Iron and aluminium can easily be recycled within the country. In addition, plastic plants are extending their operations to include plastics from e-waste.

5.5 Collectors

According to the National Environment Management Authority (NEMA) there is no formal collection of e-waste in Uganda. Informal collection of obsolete computers exists where individuals survive on selling scrap from computers for cash to plastic plants, or metallic components to informal vendors. Downstream vending is a common practice and vendors engage in resale of whole units, refurbishing for reuse, dismantling into parts, and selling copper components to local welding practitioners. Kampala City Council and municipal councils in other urban towns are responsible for collection and disposal of solid non-hazardous waste at designated landfills. Even with such systems in place control measures to ensure separation of plastic waste are not sufficient.



Figure 5.7: Informal collectors

During the course of this assessment, we came across a company, Metalorg Recycling Ltd whose mission is to collect, process and develop waste mobile phones. Although the company has not yet established an office in Uganda, the address on its website (<http://www.metalorg.com/>) is given as;

Metalorg Recycling Ltd.

H-1052 Budapest, KarolyKrt. 24
Hungary, Europe
Office tel.: + 36 1 797 2309

Robert Garai

Sales Manager Electronic Scrap
robert.garai@metalorg.com
Phone : +36 70 433 6710

Gabor Pap

Sales Manager Electronic Scrap

gabor.pap@metalorg.com

Phone : +36 70 774 6710

Metalorg's approach is to encourage local technicians through their associations, Reconditioned Electronic Equipment (DIREE) and Uganda Electronics and Technicians Association (UETA) to collect the e-waste and later negotiate the prices to buy it.

5.6 Refurbishers and Recyclers

The refurbishers group comprises of all the repair units, service centres, etc., that extends the life time of equipment and feed the second hand market. A few formal e-waste refurbishers exist in Uganda. Examples are:

- Second Life Uganda and Interconnection Uganda dealing in second hand computers, are both major commercial refurbishment centers. However the services of Second Life Uganda seem to have been hampered by the death of its former director.
- Midcom Service Centre, a Nokia-authorized customer-care centre established in 2006, has set up mobile phone “take-back” collection points at all its centers and does refurbishment in-house.
- Uganda Green Computer Company (UGCCL) used to offer a full life-cycle model, which included the return of the refurbished PCs to the centre at the end of their useful life, disassembling the hardware and reuse of the working hardware components. This company closed for unclear reasons.

A few metal recycling plants exist, such as Steel Rolling Mill and Shumuk Aluminium Industries. There are no recycling options for hazardous e-waste fraction such as cathode ray tubes and lead glass. There are also no informal leaching activities that extract precious metals from e-waste (e.g. gold recovery). There are however recycling options for different waste streams generated by a PC (the plastics, ferrous metals, aluminium and copper). Plastic plants are extending their operations to include plastics from e-waste. They buy computer casings from

informal collectors and from Kampala City Council landfills. Examples of such plastic plants include Plastic Recycling Industries Uganda and Sunshine Plastics.



Figure 5.8: Recycling companies

On the other hand, informal e-waste refurbishing appears to be taking root. Some of the major informal refurbishing centres include Computer Facilities, Global Tech Computer Distributors Uganda Ltd and SMB General Suppliers. There is also a number of mushrooming electronic kiosks involved in refurbishing electronics especially mobile phones. Such technicians buy obsolete mobile phones cheaply (on average Ug. Shs. 5,000 or US \$ 5), refurbish their circuits and sell the product at approximately US \$ 40. During this assessment, we have established that 88% of the 32 informal e-waste recyclers interviewed were aware about the environmental hazards caused by discarded electronic equipments and a similar percentage were aware that some electronic parts may be profitably recycled. The commonest type of electric/electronic equipment processed by these recyclers was mobile phones with an average of 17 sets processed per week. This was followed by desktops and then laptops.

All respondents indicated that they manually dismantle the equipment to extract out the materials. The main material extracted is copper wire (68% of the respondents) and it is usually reused in circuit fittings. An extract of the responses is given tables 5.2 and 5.3.

5.7 E-waste cost model data requirements

Table 5.15 Employing Workers and renting business premises in Uganda

N°	Description	Average values	Comment
1	Official minimum salary	No minimum wage	The employer contributes 10% to the social security fund, while the employee contributes 5%. Most corporate organizations have health schemes for their employees although it is not by law.
	Salary and non-wage labour costs for a Reasonable worker's salary (dismantling)	100 \$/month	
	Administrator's salary	500 \$/month	
	Administrative Secretary's salary	700 \$/month	
	Driver	120	4 trye truck drivers are on average paid a monthly salary of \$120 plus a night allowance of \$ 10 whenever they travel out of station. 6 trye truck drivers are not paid monthly but instead a DSA of \$ 100
	Secretary/typist's salary	100 \$/month	
	Director's salary (CEO)	1000 \$/month	\$/month
2	Rent/Construction costs for an industrial hall	100\$/400m ²	Rough estimations for renting an industrial hall and/or for property purchase and hall construction (in \$/m ²)
4	Investment costs for pallets, 20ft-container, truck, lift truck	Hire of 20 ft -container \$ 500 per piece/month; Hire of truck lift \$ 200 per day	\$/piece
5	Specification (fotos) of locally used collection boxes and investing costs	\$ 90	Investment cost for the collection box (on the basis of the photographs sent

6	Working hours per day	Ten working hours per day is the maximum except where shifts are involved.	However the employer and the employee can agree to another limit, as long as it is under 10 hours per day/ In addition, there are special rules for shift workers that provide even more flexibility.) Secs.52 and 53, Employment Act.2006 common worker
7	Working days per week	6 days	When an employee works in excess of eight hours per day or forty eight hours per week without a written agreement, the employee should be remunerated at the minimum rate of one and a half times of the normal hourly rate if the overtime is on the normal working days, and at two times the hourly rate where the overtime is worked on gazetted public holidays.
8	Working days per year	294 days	

Table 5.16 E-waste prices from scavengers and tenders

	Description	Average price	Unit	Comment
1	Purchase price for e-waste, from scavengers		\$/kg or \$/unit	Approximate price that has to be paid to purchase e-waste collected by the scavengers (informal sector), if possible for each appliance mentioned above (otherwise just a general price)
		0.25	\$/kg	<i>Iron</i>
		0.70	\$/kg	<i>Aluminium</i>
		0.18	\$/kg	<i>Plastic</i>
		1.5	\$/Kg	<i>Copper</i>
2	Purchase price for e-waste, tender offers		\$/kg	Approximate price that has to be paid to purchase e-waste in tender offers by companies and/or authorities, if possible for each appliance mentioned above (otherwise just a general price)
		0.30	\$/kg	<i>Iron</i>

		0.80	\$/kg	<i>Aluminium</i>
		0.23	\$/kg	<i>Plastic</i>
		1.5	\$/Kg	<i>Copper</i>

Table 5.17 E-waste transport related costs

	Description	Average price	Unit	Comment
1	General transport prices for urban collection	7	\$(/km*t) or \$/day	Transport costs for the collection from collection points or directly from companies. It would be good to know for which type of vehicle the respective numbers are (Van with X tons of capacity, 12t-lorry, etc.)
2	General transport prices for intercity transport	12	\$(/km*t)	Transport costs between different cities (e.g. from dismantling facility to end-processor or landfill, etc.)
3	Road Transport prices from dismantling facility to port for international shipping	170	\$(/km*t)	To transport a 20-tonne container from Mombasa to Nairobi costs \$1,300 while a similar container from Mombasa to Kampala costs \$3,400. This is more than double the \$ 1,200 one would incur to ship the same goods from Japan to Mombasa. However, a 17-ton truck charges US \$ 5000 from Mombasa to Kampala or US \$ 294.1 per ton.
4	Railway transport	0.073	\$(/km*t)	Rift Valley Railways (RVR) has an internal costing program to estimate the cost of specific moves and determine its tariff rates, which they did have shared with our team. We have therefore estimated their operating costs per T/km on the basis of their financial ratios to be between US\$0.06 – US\$0.073 / Tkm.
5	Daily rent for a van/truck with a transport capacity of 5t (incl. gas, insurance, etc.)	200	\$/day	if readily available, please provide data for van/trucks with different transport capacities (i.e. 1t, 2t, 5t , 10t)
6	Cost of a re-conditioned 5t tuck	18,000	\$	

Table 5.18: Estimation of the expected share of each appliance type in the e-waste bulk

	Description	Average price	Unit	Comment
1	Appliance composition of considered e-waste bulk Mobile phones common e-waste appliances		% [weight]	
		25	\$/piece	PC
		20	\$/piece	Printer
		4	\$/piece	Mobile phone
		15 - 20	\$/piece	CRT Screens
		15	\$/piece	CRT TVs
2	LCD share in collected PC monitors	0%	% [weight]	We did not found any share of LCD in the e-waste.
3	Share of appliances collected by informal sector (for each appliance)	Kettles, 11%; irons,9%; sewing machines, 0%; PC/Server, 5%; Notebook, 0%; Printer, 4%; IT accessoires, 13%; mobile phones, 27%; audio appliances, 15%; video appliances, 6%; CRT screens, 6%; LCD screens, 0%; CRT TVs, 4% LCD TVs, 0% % [weight] .		
4	End-processing of each fraction : transport costs from dismantling facility to end-processor (\$/t) and costs/revenue for end-processing (\$/t)		\$/t	It was a challenge gathering this information as the informal dealers available fear that the information being collected will be used against them for purpose of taxation.

Table 5.19: Data for Refurbishment

	Data for Refurbishment	Amount	Unit	Comment
1		3	\$/piece	audio appliances
2		3	\$/piece	Flat iron
3		4	\$/piece	Mobile phone
4	Average price for a refurbished desktop PC (CRT/LCD)	170	\$/unit	including monitor
5	Average price for a refurbished laptop	320	\$/unit	
24	Average price for a refurbished printer	30 -45	\$/unit	Depending on the type of printer

25	Average price for a refurbished CRT	40	\$/unit	

Table 5.20: Prices for different fractions generated in an e-waste dismantling facility

Material	Price	Comment
Ferrous	0.38\$/Kg	According to dealers, competition from imported recovered scrap (informally) coming from neighboring countries like Burundi, DRC and Rwanda has forced the prices per kilo to a record low. In most cases, the prices quoted are negotiable
Aluminium	0.82\$/Kg	
Plastics	0.24\$/Kg	
Copper, Cables (with and without insulation),	0.25\$/Kg (without insulation)	
Waste (municipal waste) Waste (municipal waste)	Proposed fee \$ 10.91 per establishment per month	The Municipal Solid Waste Management services in the city are mainly divided into primary and secondary systems. Kampala City Council Authority (KCCA) mainly concentrates on the latter, where it only engages in transportation and disposal to the final disposal site. The primary system, which is normally at source-households, industries and institutions, are often neglected despite KCCA levying property and utility taxes. KCCA has placed several garbage skips that are emptied approximately once a week. A fee has been proposed but not clear whether it is pegged on amount of

		waste
common glass	No value	

Table 5.21: Estimation of the purchase price for Appliances that can still be used

Item	Scavengers	Tender offer by government institutions or companies
PCs	35\$	90\$
printers	22\$	25\$
Monitors	LCD 40\$	
	CRT 27\$	30 \$
TVs	LCD monitors 78 \$	
	CRT monitors 47\$	50
Notebooks	Not available	Not available
Mobile phones	4-5\$ (depending on the make)	

Note: Appliances from Government and companies are in much better condition and therefore are usually more expensive

Table 5.22: Estimation of the purchase price for obsolete appliance

Item	Scavengers	Tender offer by government institutions or companies
PCs	25\$	Negotiable
printers	5-20\$	Negotiable
Monitors		
	CRT 15\$	
TVs		
	CRT monitors 15\$	
Notebooks	Not available	Not available
Mobile phones	1-4\$ (depending on the make)	

Note 1: It is not clear why scavengers sell the obsolete appliances exorbitantly but there indications that the informal dismantlers buy it.

Note 2: Institutions are willing to negotiate with whoever wishes to help them dispose of the e-waste. Our assessment is that they can even donate it.

6.0 CONCLUSIONS

There are several challenges towards management of electrical and electronic equipment (EEE) right from importation, distribution as well as e-waste management strategies within Uganda. The country has put in place specific regulations for the management of e-waste. These regulations are yet to be implemented but without a proper financing scheme, their enforcement will be a challenge. Furthermore the financing of the existing policies on waste management in general ought to be equally considered for their proper enforcement. In addition, there is a significant deficit of qualified personnel to address the safe disposal of e-waste in Uganda. Matters are not any better considering that the National curriculum as well as private training and certification centers do not address e-waste as a priority at the moment. The key stakeholders of e-waste generation and management in Uganda all need to be involved in the enforcement of the policy in place. These include; the policy makers/regulators, importers, distributors and retailers, consumers, repair workshops/technicians (refurbishers), collectors, recyclers and disposal facilities.

Overall EEE import volumes have been on the increase over the period 2008 to 2012 with III being the most imported category. Unfortunately customs records do not distinguish between used and new EEE and it seems to be inconsistent over the years. In addition, the remission of custom forms to various data capture centers from customs remote centre was found wanting which leads to delays in data entry, editing and processing. Because Uganda is among the countries in Sub-Saharan Africa with the lowest electrification rates, with only about 2 % in rural areas, our estimations on the EEE import volumes, use and e-waste generation estimates have been based on the middle and upper income urban households. The private sector and small businesses have been found to be the greatest contributors with a total of 163,301 tonnes of EEE

compare with the 300 and 266 tonnes in Government and Corporate organizations sectors respectively

An indication of the actual life span of the appliances is unclear from the survey due to the varying responses that were presented. However using values proposed by similar surveys in the African region, it is estimated that over a period of about 10 years, a total of 26,153 tonnes of WEEE will have been generated in Uganda. The major materials estimated to be recovered from the WEEE in the country over this period are ferrous metal, aluminium, copper and brominated plastics in quantities of 4,419; 1,519; 1,046 and 188 tonnes respectively. Facilities for the recycling of these materials are already available in the country. In addition, Informal collection of obsolete EEE exists where individuals survive on selling scrap from such equipment for cash. Downstream vending is a common practice and vendors engage in resale of whole units, refurbishing for reuse, dismantling into parts, and selling copper components to local welding practitioners. Computer refurbishing business had taken root but some closed for unclear reasons. On the other hand, informal e-waste refurbishing appears to be gaining momentum. However, the recycling activities involving open burning need immediate attention as they are known to have adverse impacts on both human health and the environment.

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APPENDICES

Appendix 1 Questionnaires

QUESTIONNAIRES FOR CORPORATE ORGANISATIONS

E-WASTE ASSESSMENT IN UGANDA

Date: _____

Location: _____

Interviewer: _____

Introduction

United Nations Industrial Development Organisation (UNIDO) is implementing a project through Uganda Cleaner Production Centre on e-waste in Uganda with technical assistance from EMPA. The project involves collecting data on e-waste generation and management in Uganda in order to know the current e-waste generation and management in Uganda. The study will enable the Government of Uganda to determine the necessary steps required for handling e-waste.

Part 1: Information about the Company/Institution

Name of Company/Institution:			
Type of institution (Please tick applicable)	Company	Government	NGO
Postal Address:			
Physical Address:			
Tel: Fax:			
Fax: Website:			
Year of Establishment:			
Principal Activity of the Company/Institution:			
Number of Employees:			
Contact Person	Name & Designation:		Phone:
			Email:
Is your institution ISO 14001 certified?	Yes		
	No		

Part II : General Questions on Awareness

No.	Question	Answer		Remarks/Comments (<i>please enhance your replies with comments, suggestions, details, etc.</i>)
		YES	NO	
1	Are you aware about the environmental hazards caused			

	by discarded electronic equipments? (e.g. computers, mobile phones, etc)			
2	Are you aware that some electronic parts may be profitably recycled?			
3	Are you aware that some hazardous fractions in e-waste need a special treatment in order to be safely disposed of?			
4	Does your company/institution have a procedure for handling electronic waste?			
5	If not, does your company/institution plan to introduce a policy for management of e-waste?			

Part III: Stock and generation of e-waste

	Question	Answer	Remarks/Comments (<i>please enhance your replies with comments, suggestions, details, etc.</i>)
		Number	
6	How many electronic equipment does your institution/company possess?		
	Desk top computers (including CRT, mouse, keyboard)		
	Laptop computers		
	Printers		
	Mobile phones		
	Televisions		
	Air conditioners		
	Others		
7	How many of them are not in use and year of manufacturing		
	Desk top computers		
	Laptop computers		
	Printers		
	Mobile phones		
	Televisions		
	Others		
8	How many monitors are not in use?		
	Traditional monitors (CRT)		
	Flat screen monitors (LCD)		
9	How many of the computers were		

	purchased new?		
	Desk top computers		
	Laptop computers		
	Traditional monitors (CRT)		
	Flat screen monitors (LCD)		
10	How many of the Computers were purchased used?		
	Desk top computers		
	Laptop computers		
	Traditional monitors (CRT)		
	Flat screen monitors (LCD)		
11	How many new items does your company/institution purchase per year?		
	Desk top computers		
	Laptop computers		
	Traditional monitors		
	Flat screen monitors		
	Printers		
	Mobile phones		
	Televisions		
	Others		

Part IV: Origin of New Equipment

	Question	Answer	Remarks/Comments
12	Where do you purchase your equipment?		(Please indicate brand)
	Desk top computers ----- --	Directly from producer of international brand	
	Laptop computers ----- -	Via retail shop of international brand	
	Printers ----- -	Local assembler with own Brand	
	Mobile phones ----- --	Local assembler without own Brand	
	Televisions -----	Second-hand market	
	Fridges -----		
	Air conditioners -----		
	Others -----		

Part V: Life time

	Question	Answer (in Yrs)	Remarks/Comments
13	What is the average replacement period of new equipment?		
	Desk top computers		
	Laptop computers		
	Traditional monitors		
	Flat screen monitors		
	Printers		
	Mobile phones		
	Televisions		
	Fridges		
	Air conditioners		
	Others		
14	What is the average lifetime of used equipment?		
	Desk top computers		
	Laptop computers		
	Traditional monitors		
	Flat screen monitors		
	Printers		
	Mobile phones		
	Televisions		
	Fridges		
	Air conditioners		
	Others		

Part VI: End of Life Management

	Question	Answer	Remarks/Comments
15	What do you do with the equipments you don't use anymore?	Store	
	Desktop computers -----	Sell	
	Laptop computers -----	Throw them away with general waste	
	Traditional monitors (CRT) -----	Give them to a recycler	
	Flats screen monitors (LCD) -----	Donate them to schools, employees, friends, etc..	
	Printers -----	Give them back to the person who sold them	
	Mobile phones -----		

	<p>---</p> <p>Televisions -----</p> <p>Televisions -----</p> <p>Others -----</p>	Other..	
16	Do you keep inventories of the equipments you discard / store?	Yes No	
17	<p>If unused equipment is stored, please indicate for how long (on average)</p> <p>Desktop computers -----</p> <p>Laptop computers -----</p> <p>Traditional monitors (CRT) -----</p> <p>Flats screen monitors (LCD) -----</p> <p>Printers -----</p> <p>Mobile phones -----</p> <p>---</p> <p>Televisions -----</p> <p>Air conditioners -----</p> <p>Others -----</p>		
18	Are you aware of what happens to the equipments you have discarded?	Yes No	
19	Would you be ready to pay for your equipments to be collected and recycled?	Yes No	
20	If yes, at what conditions? (e.g. pick-up service, guarantee of proper disposal, etc.)	Please provide details	
21	In your opinion, what are the most	(Please tick applicable	

	important obstacles to proper recycling of electric and electronic equipments in the country?	answer to you) <input type="checkbox"/> Costs <input type="checkbox"/> Lacking infrastructure and/or policy within your company <input type="checkbox"/> Absence of recycling possibilities <input type="checkbox"/> Lack of legislation <input type="checkbox"/> other	
22	What should be done to foster proper e-waste recycling in Uganda?	Please suggest	

QUESTIONNAIRES FOR ELECTRICAL EQUIPMENT DISTRIBUTORS/RETAILERS

E-WASTE ASSESSMENT IN UGANDA

Date: _____

Location: _____

Interviewer: _____

Introduction

Uganda Cleaner Production Centre in collaboration with the United Nations Industrial Development (UNIDO), is collecting data on e-waste generation and management in Uganda in order to know the current e-waste generation and management in the country. The study will enable the authorities to determine the necessary steps required for handling e-waste. We would be grateful if you could spare some time to answer a few questions.

Part 1: Information about the Company/Institution

Name of Company/Institution:			
Type of institution (Please tick applicable)	Company	Government	NGO
Postal Address:			
Physical Address:			
Tel: Fax:			
Fax: Website:			
Year of Establishment:			
Principal Activity of the Company/Institution:			
Number of Employees:			
Contact Person	Name & Designation:		Phone:
			Email:
Is your institution ISO 14001 certified?	Yes		
	No		

Part II : General Questions on Awareness

No.	Question	Answer		Remarks/Comments (<i>please enhance your replies with comments, suggestions, details, etc.</i>)
		YES	NO	
1	Are you aware about the environmental hazards caused by discarded electronic equipments? (e.g. computers, mobile phones, etc)			
2	Are you aware that some electronic parts may be profitably recycled?			

3	Are you aware that some hazardous fractions in e-waste need a special treatment in order to be safely disposed of?			
4	Does your company/institution have a procedure for handling electronic waste?			
5	If not, does your company/institution plan to introduce a policy for management of e-waste?			

Part III: Stock and generation of e-waste

	Question	Answer	Remarks/Comments <i>(please enhance your replies with comments, suggestions, details, etc.)</i>
		Number	
6	What is the installed base of electric & electronic equipment at your company?		
	Desk top computers (including CRT, mouse, keyboard)		
	Laptop computers		
	Printers		
	Mobile phones		
	Televisions		
	Fridges		
	Air conditioners		
	Others		
7	How many of them are not in use/sellable?		
	Desk top computers		
	Laptop computers		
	Printers		
	Mobile phones		
	Televisions		
	Fridges		
	Air conditioners		
	Others		
8	How many monitors are not in use/sellable?		
	Traditional monitors (CRT)		
	Flat screen monitors (LCD)		
9	How many of the computers were purchased new?		
	Desk top computers		

	Laptop computers		
	Traditional monitors (CRT)		
	Flat screen monitors (LCD)		
10	How many of the Computers were purchased used?		
	Desk top computers		
	Laptop computers		
	Traditional monitors (CRT)		
	Flat screen monitors (LCD)		
11	How many new items does your company/institution purchase per year?		
	Desk top computers		
	Laptop computers		
	Traditional monitors		
	Flat screen monitors		
	Printers		
	Mobile phones		
	Televisions		
	Fridges		
	Air conditioners		
	Others		

Part IV: Origin of New Equipment

	Question	Answer	Remarks/Comments
12	Where do you purchase your equipment?		(Please indicate brand)
	Desk top computers ----- --	Directly from producer of international brand	
	Laptop computers ----- -	Via retail shop of international brand	
	Printers ----- -	Local assembler with own Brand	
	Mobile phones ----- --	Local assembler without own Brand	
	Televisions -----	Second-hand market	
	Fridges -----		
	Air conditioners -----		
	Others -----		

Part V: Life time

	Question	Answer (in Yrs)	Remarks/Comments
13	What is the average replacement period of new equipment?		
	Desk top computers		
	Laptop computers		
	Traditional monitors		
	Flat screen monitors		
	Printers		
	Mobile phones		
	Televisions		
	Fridges		
	Air conditioners		
	Others		
14	What is the average lifetime of used equipment?		
	Desk top computers		
	Laptop computers		
	Traditional monitors		
	Flat screen monitors		
	Printers		
	Mobile phones		
	Televisions		
	Fridges		
	Air conditioners		
	Others		

Part VI: End of Life Management

	Question	Answer	Remarks/Comments
15	What do you do with the equipments you don't use anymore?	Store	
	Desktop computers -----	Sell	
	Laptop computers -----	Throw them away with general waste	
	Traditional monitors (CRT) -----	Give them to a recycler	
	Flats screen monitors (LCD) -----	Donate them to schools, employees, friends, etc..	
	Printers -----	Give them back to the person who sold them	
	Mobile phones -----		

	<p>---</p> <p>Televisions -----</p> <p>Televisions -----</p> <p>Air conditioners -----</p> <p>Others -----</p>	Other..	
16	Do you keep inventories of the equipments you discard / store?	Yes No	
17	<p>If unused equipment is stored, please indicate for how long (on average)</p> <p>Desktop computers -----</p> <p>Laptop computers -----</p> <p>Traditional monitors (CRT) -----</p> <p>Flats screen monitors (LCD) -----</p> <p>Printers -----</p> <p>Mobile phones -----</p> <p>---</p> <p>Televisions -----</p> <p>Air conditioners -----</p> <p>Others -----</p>		
18	Are you aware of what happens to the equipments you have discarded?	Yes No	
19	Would you be ready to pay for your equipments to be collected and recycled?	Yes No	
20	If yes, at what conditions? (e.g. pick-up service, guarantee of proper disposal,	Please provide details	

	etc.)		
21	In your opinion, what are the most important obstacles to proper recycling of electric and electronic equipments in the country?	(Please tick applicable answer to you) <input type="checkbox"/> Costs <input type="checkbox"/> Lacking infrastructure and/or policy within your company <input type="checkbox"/> Absence of recycling possibilities <input type="checkbox"/> Lack of legislation <input type="checkbox"/> other	
22	What should be done to foster proper e-waste recycling in Uganda?	Please suggest	

Part VII: Distribution /Retail Profile

	Question	Answer	Remarks/Comments	
23	How many PCs were provided/ sold to clients in the last four years? 2008:	2008: Laptops ----- Desktops: ----- 2009: Laptops ----- Desktops: ----- 2010: Laptops ----- Desktops: ----- 2011: Laptops ----- Desktops: -----		
24	What is the distribution per sector?		Laptops	Desktops
		Government (including schools)		
		Private sector		
		Residential		
25	Are there request for, and does your company offer PC end-of-life take-back programmes?	YES NO		
26	If not, is your company considering such a programme?	YES		

		NO	

QUESTIONNAIRES FOR CONSUMERS E-WASTE ASSESSMENT IN UGANDA

Date: _____

Location: _____

Interviewer: _____

Interviewed person

Name	
Telephone	
E-mail	
Village	
Sub country/Division	
District	

Introduction

United Nations Industrial Development Organisation (UNIDO) is implementing a project through Uganda Cleaner Production Centre on e-waste in Uganda with technical assistance from EMPA. The project involves collecting data on e-waste generation and management in Uganda in order to know the current e-waste generation and management in Uganda. The study will enable the Government of Uganda to determine the necessary steps required for handling e-waste.

Questions about awareness and behavior

Questions 2.1	Responses	
	Yes	No
a) Do you know what e-waste or waste of electrical and electronic equipment is?		
b) Are you aware that some hazardous fractions in e-waste need a special treatment in order to be safely disposed of?		
c) Do you have waste collectors in		

your area?			
2.2	Yes, everything	Yes, but no E-Waste	No
Do waste collectors come and pick-up waste at your door?			
Do they take out e-waste too?			
2.3	Yes	No	I Don't know
Is the way e-waste is currently collected convenient to you?			
How could it be improved?			

Numbers of Electrical and Electronic Equipment in the Household (in use)

A. Large Household Appliances

Product	Number of Products
Air Conditioners	
Dish Washers	
Dryers	
Electric Heaters	
Fridges	
Grillers	
Hobs	
(Steam-) Ovens	
Stoves	
Washing Machines	

B. Small Household Appliances

Product	Number of Products
Blenders	
Coffee Machines	
Electric Lawn-mowers	
Electric Toothbrushes	
Fans	
Hair Dryers	
Flat rons	
Kettles	
Microwaves	
Mixers	

Pool Cleaners	
Popcorn Makers	
Toasters	
Vacuum Cleaners	

C. IT and Telecommunication Equipment

Product	Number of Products
Fax Machines	
Phones	
Mobile phones	
Laptops	
PCs	
LCD monitor	
CRT's (monitor)	
Modems	
Printers	
Scanners	
Copy machines	

D. Consumer Equipment

Product	Number of Products
Alarm Clocks	
Cameras	
DVD Players	
Electric Instruments	
Game Consoles	
MP3 Players	
Projectors	
Radios	
Stereos	
TVs (CRT)	
TV (Flat panel)	

E. Lightning Equipment

Product	Number of Products
Fluorescent Tubes	
Light Bulbs	
Long Life Light Bulbs (CFLs)	

F. Batteries

Product	Number of Products
Accumulators	
Car Batteries	
One-Way Batteries	
Others (specify)	

Detailed Information about tracing products

Product	Where was it bought? In what condition? (new/ used & working/ broken)	No. of years used	No. of years stored	In what condition was the product at the end of life? working -W broken - B broken but fixable - F
Fridge				
Washing Machine				
Toaster				
Microwave				
PC(Desktop)				
CRT monitor				
LCD Monitor				
Laptop				
Mobile				
TV (CRT)				
TV (Flat panel)				
Radio				

Disposal of Equipment (please mark with x)

	Donation	Sold to second hand dealers	Sold to scrap dealer	Disposed with household waste	Put on the street	Dumped somewhere else	Other
Fridge							
Washing Machine							
Toaster							
Microwave							

PC(Desktop)							
CRT monitor							
LCD Monitor							
Laptop							
Mobile							
TV (CRT)							
TV (Flat panel)							
Radio/Hi-fi							

Number of persons in the household (Please tick appropriate box)

1	2	3-4	5-8	More than 8

Salary per Month in the whole Household (Ug.Shs in ‘000) (Please tick appropriate box)

under 100	100 - 500	500 - 1000	1000 - 2000	2000 - 4000	over 4000

QUESTIONNAIRES FOR INFORMAL E-WASTE RECYCLERS

E-WASTE ASSESSMENT IN UGANDA

Date: _____

Location: _____

Interviewer: _____

Introduction

United Nations Industrial Development Organisation (UNIDO) in implementing a project through Uganda Cleaner Production Centre on e-waste in Uganda with technical assistance from EMPA. The project involves collecting data on e-waste generation and management in Uganda in order to know the current e-waste generation and management in Uganda. The study will enable the Government of Uganda to determine the necessary steps required for handling e-waste.

Part 1: General Information about the Enterprise

Name of Enterprise:	
Postal Address:	
Physical Address (Location):	
Tel:	Fax:
Website:	
Year of Establishment:	
Number of Employees:	
Name of Owner:	
Mob:	
Name of Manager:	
Mob:	

Part II: General Questions on Awareness

No.	Question	Answer		Remarks/Comments <i>(please enhance your replies with comments, suggestions, details, etc.)</i>
		YES	NO	
1	Are you aware about the environmental hazards caused by discarded electronic equipments? (e.g. computers, mobile phones, etc)			
2	Are you aware that some electronic parts may be profitably recycled?			
3	Are you aware that some hazardous fractions in e-waste need a special treatment in order to be safely disposed of?			

Part III: General Questions on Business

	Question	Answer	Remarks/Comments <i>(please enhance your replies with comments, suggestions, details, etc.)</i>
4	What volume of electric/electronic equipment do you process per week, month or year	Desktops Number: ----- Weight (tons): ----- Laptops: Number:----- Weight (tons): -----	
5	What kind of materials do you extract from the Computers?	Glass ----- YES/NO Battery ----- YES/NO Copper wires -----YES/NO Plastics ----- YES/NO	
6	What method do you use to dismantle the computers?		
7	Where do you sell the extracted materials?		
8	What do you do with the waste?		
9	How many similar dealers are present in this area?		
10. Type of Business Describe the main business activities.			
11. Workspace description Describe the area (room / hall / backyard) where the business operations are conducted. Include information on illumination/ lighting and aeration / ventilation. Indicate the ownership of the workspace (If rented, give figures on the monthly or annual rent). Work area: Illumination:			

Ventilation:

Ownership & Rent:

12. Production processes & technologies

Give a description of the applied technologies and processes used in the enterprise. Also describe the type of tools and machines used for these processes. Include information on implemented health protection measures.

Applied technologies & processes:

Types of tools and machines used:

13. Business inputs

Try to quantify the enterprises' monthly / annual business inputs needed to generate the described outputs. Focus on materials and running costs (no investments into machinery or others).

Type of input	Av. quantity per month	Average cost per month
---------------	------------------------	------------------------

14. Business Output: Try to quantify the enterprises' monthly / annual production in absolute and monetary terms.

Type of output Quantity per month Average revenue per month

Computers -----

Mobile phones -----

TVs -----

Radios -----

Other -----

15. Health and Safety issues: List and describe obvious health and safety risks from the carried out operations. See Annex I for a rough checklist to identify possible health and safety risks. In addition, check on other less specific risks (e.g. accident risks from heavy machinery, risks from poorly maintained electricity wiring). Try to elaborate on possible health problems that workers might blame on their professional activities.

Health and safety risks:

Implemented health protection measures:

Part III: Staff and Employment

Type of employment	Number of employees & Gender	Level of education	Age distribution
Oral agreement	F: M:		
Formal contract	F: M:		
Working hours:			
Social Security: Collect information on possible (official and unofficial) mechanisms in case of illness, pregnancy/ maternity leave, unemployment, retirement or any other case of social difficulty.			

Education and Apprenticeship: Describe possible apprenticeship- and training mechanisms. Include information on the financial and social conditions of apprentices and staff on training.

Part IV: Information on Business Sector

General information:

Collect information on the size, structure and functioning of the sector (*e.g. number of mobile phone or computer repair shops in the area*)

Information on upstream sectors:

Collect information on the size, structure and functioning of upstream activities (*e.g. where does the enterprise get the used equipment for repair or scrap?; Are there many dealers in the area?; Do they deal with other products as well?*) (Please indicate brand)

Information on downstream sector:

Collect information on the size, structure and functioning of downstream activities (*e.g. where are the repaired equipment or processed scrap sold?*).

Part V: Location and Neighboring Communities

Local setting:

Describe the location in which the enterprise is operating. Include information on the local social set-up, the population density and other types of businesses.

<p>Water supply Give information on the water supply and sanitation of the enterprise</p>
<p>Waste management Give information on the waste management practices. Especially address the waste stream that is generated by the assessed enterprise.</p>

Part VII: Complimentary information

<p>Add any other complementary information / impression collected during the assessment. Note any additional information that might be of interest (e.g. <i>relation between the manager and his staff</i>)</p>

Appendix 2: List of Selected distributors

<p>Balton Uganda Ltd Plot 47/51 Mulwana Rd. Industrial Area P.O. Box 852 Kampala Uganda Tel: 0312 502402 Fax: 0414 255853</p>	<p>Email:balton@balton.co.ug Website:www.baltoncp.com</p>
<p>Davis and Shirtliff Kampala , Jinja Road P. O. Box 22824, Contact: 4346337/8</p>	<p>Email:d&s@ug.dayliff.com</p>
<p>East African Distributors Ltd Plot 2-20 Jinja Rd. P.O. Box 22939 Kampala Tel: 0414 255432 Fax: 0414 255433</p>	
<p>Inter-Tech Enterprises Plot 1677, Muyenga P.O. Box 10076 Kampala Tel: 0414 510296 / 0752 292786</p>	
<p>Interbuild Limited P.O. Box 33313,</p>	<p>mfkatongole@yahoo.com, fkssali@yahoo.com</p>

Kampala - Uganda Tel: 256-41-344764 Fax: 256-41-231582	
Mantrac (U) Ltd. Plot 17/41, 7th Street Ind. Area P.O. Box 7126 Kampala Tel: 0312 260526 Fax: 0414 235425	
Refco Lighting Company Ltd Refco Lighting Company Ltd. Plot8-10 Kampala Road. 2nd Floor, Uganda House room 6.0 P.O.Box 23982 Kampala, Uganda Phone: 041235755 Mobile: 0712867910	Email: refco@ugandaconstruction.com Website: http://www.refco.ugandaconstruction.com
Refrigeration Components (U) Ltd Plot 83, 6th Street Industrial Area P.O. Box 25300 Kampala Tel: 0414 346625/6 Fax: 0414 346624	
Seven Hills Impex Ltd Head Office: Plot 13, 1st Street, Industrial Area, Kampala Branch: Shop No. M3-38, M3-54, Energy Centre Building, Market Street, Kampala Contact: 0414-233580	sevenhills@siticable.co.ug
Ssebagala& Sons Electro Centre Ltd Plot 9, Market Street, Tourist Hotel Building P.O. Box 9282 Kampala Tel: 0414 250247 / 0772 593350 Fax: 0414 344270	
Thermocool Plot 15-17 2nd Street Industrial Area P.O. Box 31542 Kampala Tel / Fax: 0414 252510	www.thermocool.co.ug
Uganda ElevatorCompanyLtd Tel: 256 41 343010 Fax: 256 41 235529 P.O Box 5518, Kampala - Uganda	ugelco@starcom.co.ug
Ugasung Electronics Plot 109 /111 6th Street Industrial Area. P. O. Box 7753 Kampala, Uganda Tel: +25641222333, +256312261890	ugasung-ug@hanmail.net
UltraTec (U) Ltd Plot 4520 KabalagalaClose P. O. Box 6832 Kampala Uganda	Email: ultratecug@usa.net Website: www.ultratecworld.com

<p>Tel: +256 (0)414 501620 Fax: +256 (0)414 501619 Mobile: +256 (0)772 200007, +256 (0)752 200007, +256 (0)712 200007</p>	
<p>Boomer Systems (U) Ltd. Plot 12 Wampewo Avenue, Kololo P.O. Box 7741 Kampala Tel: 041-233479, Fax: 041-235083</p>	<p>: ymug@starcom.co.ug</p>
<p>Energy Systems Ltd House 1st Floor Suite 109 Plot 3 William Street P. O Box 25928 Kampala Uganda. Tel: 256-41-250920 Fax.256-41-349055</p>	<p>Email:E-mail: info@energysystemsug.com Website:http://www.energysystemsug.com</p>
<p>Magric (U) Ltd P.O.Box 3218, Kampala, Uganda Plot 103 JinjaRd. Kampala, Uganda Tel: +256 (0)414-232100. Fax:+256 (0)414-344606</p>	
<p>J and J International - Uganda: P.o Box 10720, Kampala, Uganda 256-772-496474</p>	
<p>CWAMBEETA AND SONS COMPANY – Uganda Address : P.O.BOX 24734, KAMPALA, central, Uganda - 256 Phone(s) : 256-41-752428651 Mobile(s) : 256-2428651 Fax(s) : 256-41-345579</p>	
<p>Magazet Electronics co,ltd - Uganda Address : Market Street, Kampla, Africa, Uganda Phone(s) : 256-71-141341 Mobile(s) : 156712141341 Fax(s) : 156-41-545477</p>	
<p>Future Electronics Plot M806 Channel Lane Bugolobi Kampala</p>	

Appendix 3: Formal Imports by value ('000 US \$), SITC groupings, 2007 – 2011

SI TC	Description	2007	2008	2009	2010	2011
00	Live animals other than animals of division 03	0.0	0.0	0.0	0.1	0.0
01	Meat and meat preparations	0.0	0.0	0.0	0.0	0.1
02	Dairy products and bird's eggs	0.2	0.1	0.1	0.1	0.1
03	Fish, crustaceans and molluscs and preparations thereof	0.0	0.0	0.0	0.0	0.0
04	Cereals and cereal preparations	4.5	3.8	4.8	4.0	4.1
05	Vegetables and fruit	0.6	0.4	0.4	0.3	0.3
06	Sugars, sugar preparations and honey	2.0	1.6	1.8	1.9	2.4
07	Coffee, tea, cocoa, spices, and manufactures thereof	0.1	0.2	0.1	0.2	0.1
08	Feeding stuff for animals (not including unmilled cereals)	0.0	0.0	0.0	0.0	0.0
09	Miscellaneous edible products and preparations	0.4	0.5	0.5	0.5	0.7
11	Beverages	0.6	0.9	1.0	0.8	0.7
12	Tobacco and tobacco manufactures	0.3	0.2	0.3	0.3	0.2
21	Hides, skins and furskins, raw	0.0	0.0	0.0	0.0	0.0
22	Oil-seeds and oleaginous fruits	0.1	0.1	0.1	0.0	0.0
23	Crude rubber (including synthetic and reclaimed)	0.0	0.0	0.0	0.0	0.0
24	Cork and wood	0.1	0.2	0.1	0.0	0.0
25	Pulp and waste paper	0.0	0.0	0.0	0.0	0.0
26	Textile fibres (other than wool tops), wastes; not manufactured	0.8	0.8	0.8	0.9	0.9
27	Crude fertilizers and minerals (excl. coal, petrol, precious stones)	0.5	0.6	0.6	0.6	0.5
28	Metalliferous ores and metal scrap	0.0	0.0	0.1	0.2	0.1
29	Crude animal and vegetable materials, nes	0.1	0.1	0.1	0.1	0.1
32	Coal, coke and briquettes	0.1	0.1	0.1	0.0	0.1
33	Petroleum, petroleum products and related materials	18.5	18.5	17.1	19.7	22.9
34	Gas, natural and manufactured	0.2	0.1	0.2	0.2	0.2
35	Electric Current	0.4	0.3	0.1	0.1	0.2
41	Animal oils and fats	0.0	0.0	0.0	0.0	0.0
42	Fixed vegetable fats and oils, crude, refined or fractionated	3.0	4.3	3.0	3.9	4.1
43	Anim. or veget. fats and oils, processed; animal or vegetable waxes	0.6	0.7	0.3	0.3	0.5
51	Organic chemicals	0.9	1.1	1.2	1.1	1.2
52	Inorganic chemicals	0.5	0.7	0.7	0.6	0.5
53	Dyeing, tanning and colouring materials	0.3	0.4	0.3	0.3	0.3
54	Medical and pharmaceutical products	5.0	5.4	5.0	4.4	4.6
55	Essential oils, perfume materials; toilet cleaning preparations	1.5	1.6	1.4	1.4	1.5
56	Fertilizers , manufactured (other than those of group 272)	0.3	0.8	1.0	0.4	0.4
57	Plastics in primary forms	2.7	2.6	2.3	2.5	2.7
58	Plastics in non-primary forms	0.4	0.4	0.4	0.4	0.6

59	Chemical materials and products, nes	0.9	1.1	0.9	1.2	1.0
61	Leather, leather manufactures, nes, and dressed furskins	0.0	0.0	0.0	0.0	0.0
62	Rubber manufactures, nes	1.0	1.1	1.1	1.1	0.9
63	Cork and wood manufactures (excl. furniture)	0.1	0.1	0.1	0.1	0.1
64	Paper, paperboard, and articles of paper pulp, paper or paperboard	2.0	2.2	2.3	2.1	2.1
65	Textile yarn, fabrics, made-up articles, nes, and related products	2.1	1.6	1.6	2.2	1.3
66	Non-metallic mineral manufactures, nes	3.4	3.2	3.7	3.2	2.8
67	Iron and steel	5.0	6.8	5.2	4.9	4.8
68	Non-ferrous metals	0.7	0.6	0.5	0.5	0.5
69	Manufactures of metals, nes	2.1	2.3	3.4	2.4	1.8
71	Power generating machinery and equipment	1.5	2.6	2.2	2.1	1.1
72	Machinery specialized for particular industries	2.9	3.3	4.7	5.0	4.5
73	Metal working machinery	0.2	0.2	0.3	0.4	0.3
74	General industrial machinery and equipment, nes, machine parts, nes	2.0	2.3	2.7	2.7	2.4
75	Office machines and automatic data-processing machines	2.0	1.9	1.5	1.9	1.1
76	Telecommunications and sound recording/reproducing apparatus, etc	10.0	6.6	5.4	4.9	6.1
77	Electrical machinery, apparatus and appliances, nes	3.2	2.9	4.1	3.1	2.5
78	Road vehicles (including air-cushion vehicles)	8.4	7.5	8.7	9.0	8.9
79	Other transport equipment	0.2	0.3	0.3	1.1	1.0
81	Prefabricated buildings; sanitary, plumbing, etc, fixtures and fittings	0.4	0.3	0.4	0.4	0.4
82	Furniture & parts thereof; bedding, mattresses, mattress supports, etc	0.6	0.4	0.4	0.4	0.3
83	Travel goods, handbags and similar containers	0.2	0.2	0.2	0.2	0.2
84	Articles of apparel and clothing accessories	1.4	1.3	1.1	1.0	0.9
85	Footwear	1.1	1.0	0.9	0.9	0.7
87	Professional, scientific and controlling instruments and apparatus, nes	1.3	1.0	1.1	1.1	1.3
88	Photographic apparatus, equipment &supplies and optical goods; watches	0.2	0.2	0.1	0.3	0.1
89	Miscellaneous manufactured articles, nes	2.1	2.4	3.2	2.7	2.3
96	Coin (excl. gold coin), not being legal tender	0.0	0.0	0.0	0.0	0.0
97	Gold, non-monetary (excl. gold ores and concentrates)	0.1	0.0	0.2	0.0	0.0
	TOTAL	100.0	100.0	100.0	100.0	100.0

Source : URA, UBOS

Appendix 4: Uganda Imports by Product Sub-Chapter in US Dollars - Electrical machinery and equipment and parts thereof; sound recorders - Yearly

Sub-Chapter	2005	2006	2007	2008	2009	2010
Electric motors and generators	\$5,069,993	\$7,482,379	\$7,236,044	\$55,784,307	\$6,478,219	\$4,819,546
Electric generating sets and rotary converters.	\$6,056,846	\$25,931,351	\$15,940,168	\$33,930,359	\$24,075,479	\$22,449,489
Parts suitable for use principally with the machines of heading 85.01 or 85 ...	\$1,137,466	\$2,350,057	\$4,282,296	\$5,033,670	\$7,558,496	\$9,186,905
Electrical transformers, static converters (for example, rectifiers) and in ...	\$8,002,522	\$14,868,700	\$20,024,023	\$27,150,237	\$44,260,895	\$17,711,611
Electro-magnets; permanent magnets and articles intended to become permanen ...	\$58,600	\$46,364	\$44,669	\$87,361	\$90,600	\$98,391
Primary cells and primary batteries.	\$144,906	\$7,629	\$21,750	\$7,439	\$2,167	\$12,949
Electric accumulators, including separators	\$3,757,856	\$5,155,435	\$7,744,461	\$8,098,123	\$9,790,727	\$10,298,466
Electro-mechanical domestic appliances, with self-contained	\$306,555	\$405,621	\$552,455	\$706,104	\$598,400	\$776,331
Shavers, hair clippers and	\$37,483	\$55,193	\$90,635	\$115,992	\$101,940	\$134,640

hair-removing appliances, with self-contained						
Electrical ignition or starting equipment	\$466,383	\$374,490	\$434,653	\$866,538	\$1,005,445	\$860,536
Electrical lighting or signalling equipment	\$371,720	\$512,078	\$587,362	\$708,524	\$598,070	\$787,341
Portable electric lamps designed to function by their own source of energy	\$640,260	\$778,966	\$1,028,724	\$1,397,932	\$1,156,312	\$1,539,658
Industrial or laboratory electric furnaces and ovens	\$152,699	\$373,300	\$836,139	\$2,533,676	\$2,726,527	\$1,243,553
Electric (including electrically heated gas), laser or other light	\$289,449	\$298,121	\$594,442	\$2,285,166	\$649,044	\$995,820
Electric instantaneous or storage water heaters and immersion heaters	\$2,788,746	\$2,876,020	\$3,592,996	\$4,379,318	\$4,298,879	\$4,454,941
Electrical apparatus for line telephony or line telegraphy	\$3,320,394	\$5,183,993	\$12,134,180	\$92,641,870	\$66,142,501	\$48,035,490
Microphones and stands therefor; loudspeakers	\$1,118,831	\$1,368,297	\$2,149,699	\$2,581,006	\$2,371,699	\$4,005,700
Turntables (record-decks), record-players, cassette-players	\$747,973	\$958,305	\$1,004,646	\$1,390,859	\$484,451	\$726,491
Magnetic tape	\$119,202	\$78,900	\$100,418	\$7,110	\$3,552	\$519

recorders and other sound recording apparatus						
Video recording or reproducing apparatus,	\$1,811,423	\$1,499,058	\$3,738,782	\$2,774,608	\$2,274,592	\$2,529,912
Parts and accessories for use with the apparatus of heading 85.19 to 85.21	\$35,225	\$18,718	\$59,846	\$265,195	\$79,985	\$40,592
Prepared unrecorded media for sound recording or	\$1,064,970	\$1,252,878	\$1,216,779	\$3,240,721	\$1,576,523	\$2,367,418
Records, tapes and other recorded media for sound	\$3,341	\$1,261				
Transmission apparatus for radio-telephony, radio-broadcasting	\$53,491,968	\$106,341,735	\$188,820,995	\$118,306,333	\$96,156,367	\$125,086,398
Radar apparatus, radio navigational aid apparatus and radio remote control ...	\$98,652	\$270,755	\$6,136,760	\$627,877	\$326,153	\$253,754
Reception apparatus for radio-telephony, radio-telegraphy	\$6,523,617	\$4,112,396	\$4,897,508	\$6,085,625	\$3,563,515	\$3,970,999
Parts suitable for use with the apparatus of headings 85.25 to 85.28	\$2,589,268	\$3,089,677	\$6,501,425	\$6,935,585	\$5,457,558	\$7,235,861
Electrical signalling, safety or traffic control	\$46,605	\$1,222,486	\$543,218	\$251,766	\$118,145	\$68,106

equipment for railways						
Electric sound or visual signalling apparatus	\$401,501	\$318,672	\$1,856,790	\$1,239,191	\$2,088,954	\$1,943,152
Electrical capacitors, fixed, variable or adjustable (pre-set).	\$98,687	\$84,790	\$208,252	\$397,978	\$27,942	\$514,598
Electrical resistors (including rheostats and potentiometers)	\$79,687	\$52,314	\$33,172	\$250,024	\$36,304	\$78,055
Printed circuits.	\$43,732	\$29,852	\$89,486	\$56,385	\$126,596	\$264,162
Electrical apparatus for switching or protecting electrical circuits	\$1,749,766	\$3,880,844	\$5,661,282	\$3,489,715	\$10,352,462	\$2,930,245
Electrical apparatus for switching or protecting electrical circuits, or fo ...	\$3,710,384	\$4,760,938	\$6,910,060	\$6,552,950	\$9,215,848	\$7,109,187
Boards, panels, consoles, desks, cabinets and other bases	\$2,711,746	\$1,820,575	\$7,621,464	\$5,553,970	\$11,263,368	\$24,912,272
Parts suitable for use with the apparatus of heading 85.35, 85.36 or 85.37	\$658,987	\$447,247	\$1,611,373	\$1,363,494	\$3,202,675	\$2,453,538
Electric filament or discharge lamps, including sealed beam lamp units	\$1,330,574	\$975,585	\$2,925,852	\$3,329,537	\$3,345,540	\$4,346,859
Thermionic, cold cathode or	\$31,797	\$17,547	\$357,564	\$254,883	\$99,614	\$60,325

photo-cathode valves and tubes						
Diodes, transistors and similar semiconductor devices	\$2,555,028	\$4,294,993	\$5,813,636	\$8,955,639	\$9,836,984	\$9,656,869
Electronic integrated circuits and microassemblies		\$2,180	\$55,391	\$6,344	\$5,423	\$12,266
Electrical machines and apparatus, having individual functions	\$9,267	\$6,742	\$381,500	\$306,425	\$312,454	\$470,586
Insulated (including enamelled or anodised) wire, cable	\$3,562,293	\$6,078,904	\$10,849,475	\$19,023,103	\$31,930,222	\$24,695,329
Carbon electrodes, carbon brushes, lamp carbons, battery carbons	\$47,985	\$90,227	\$177,809	\$124,716	\$144,468	\$168,082
Electrical insulators of any material.	\$20,074	\$262,005	\$296,632	\$823,864	\$1,019,321	\$1,478,138
Insulating fittings for electrical machines, appliances or equipment	\$610,702	\$254,830	\$217,195	\$921,395	\$365,774	\$527,184
Total	\$117,875,163	\$210,292,408	\$335,382,006	\$430,842,914	\$365,320,190	\$351,312,264

Source: United Nations Commodity Trade Statistics Database

Appendix 5: Electrical/Electronic Imports 2008-2012 (Numbers)

Item	2008	2009	2010	2011	2012
Cooking appliances, plate warmers, for gas		964	21,744	17,447	55,957
Window or wall air conditioning machines,	1,345	1,286		12,739	20,872
Furnace burners for liquid fuel	1,532	810	12,973	19,584	9,985
Refrigerators and freezers	2,387	270	4,962	19,746	9,679
Centrifugal clothes-dryers	21	19	39	13	341
Dish washing machines, of the household type	842	93	242	555	4,404
Electric instantaneous or storage water	355	856	66	17,565	58,072
Electro-thermic hair dryers	328	442	8,314	6,642	9,563
Electrical smoothing irons	2,899	3,287	36,907	70,111	137,911
Microwave ovens	2,936	2,255	8,993	6,161	11,710
Oven and cookers	1,941	3,287	24,024		91,796
Electro-thermic toasters	134	289	3,115	5,865	6,775
Telephones for cellular networks	276,749	128,299	957,125	955,510	2,095,469
Other telephones	385	9,550	46,590	10,016	4,784,611
Machines for the reception & conversion	4,912	6,434	70,060	42,376	8,210,974
Television sets	2,432	9043	12,023	18,491	6,237
Television cameras, digital cameras and video	1,116	409		7,683	18,741
Pocket-size radio cassette players	28,422	930	13,901	43,338	165,885
Tungsten halogen filament lamps	53	28,138	95,348	43,540	192,390
Discharge lamps, other than ultra-violet	246,381	7,472	472,494	703,776	4,091,415
Desk top Computers	68,000	93,442	79,415	101,811	97,503
Laptops	123,432	230,104	185,811	214,000	91,562

Appendix 6: A collection of the average weight of selected electric and electronic appliances

Item	Average Weight (kg)	Source
Desktop Computer	9.9	Eugster et al. 2007
Laptop Computer	3.5	SWICO Recycling Guarantee 2006 / ecoinvent v2.0
CRT Screen	14.1	Laffely, J. 2007 / Zumbuehl, D. 2006
LCD Screen	4.7	SWICO Recycling Guarantee 2006 / ecoinvent v2.0
Mouse	0.05	Estimate / ecoinvent v2.0
Keyboard	1	Estimate / ecoinvent v2.0
Printer	6.5	Laffely, J. 2007
Television (CRT)	31.6	Zumbuehl, D. 2006
Mobile Phone	0.1	Estimate
Mobile Phone charger	0.1	Estimate
Video Recorder/DVD Player	5	Huisman et al. 2008
Hi-Fi system	10	Huisman et al. 2008
Radio	2	Huisman et al. 2008
Telephone	1	Huisman et al. 2008
Washing Machine	65	Huisman et al. 2008
Tumble Dryer	49	Künzler Bossert & Partner GmbH. 2001
Dish Washer	50	Huisman et al. 2008
Refrigerator	35	Huisman et al. 2008
Fridge/Freezer	35	Huisman et al. 2008
Freezer	65	Künzler Bossert & Partner GmbH. 2001
Microwave	15	Huisman et al. 2008
Electric cooker	46	Künzler Bossert & Partner GmbH. 2001
Vacuum Cleaner	8	Künzler Bossert & Partner GmbH. 2001
Iron	1	Huisman et al. 2008
Kettle	1	Huisman et al. 2008
Toaster	1	Huisman et al. 2008
Mixer	1	Huisman et al. 2008
Hair Dryer	1	Huisman et al. 2008
Electric Heater	5	Huisman et al. 2008
Electric Drill	2	Huisman et al. 2008
Power Saw	2	Huisman et al. 2008
Lawn Mower	15	Huisman et al. 2008

Appendix 7: Material composition of four e-waste categories in %.

Material	Large household appliances	Small household appliances	ICT and consumer electronics	Lamps
Ferrous metal	43	29	36	-
Aluminium	14	9.3	5	14
Copper	12	17	4	0.22
Lead	1.6	0.57	0.29	-
Cadmium	0.0014	0.0068	0.018	-
Mercury	0.000038	0.000018	0.00007	0.02
Gold	0.00000067	0.00000061	0.00024	-
Silver	0.0000077	0.000007	0.0012	-
Palladium	0.0000003	0.00000024	0.00006	-
Indium	0	0	0.0005	0.0005
Brominated plastics	0.29	0.75	18	3.7
Plastics	19	37	12	0
Lead glass	0	0	19	0
Glass	0.017	0.16	0.3	77
Other	10	6.9	5.7	5
Total	100	100	100	100

Source: Empa