Used and end-of-life electrical and electronic equipment imported into Liberia

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Summary

Obsolete electrical and electronic equipment (EEE) produced worldwide and specifically in African countries, together with the absence of well-organized collection and management systems has manifold impacts on the environment, the health of local communities and the economic system. This report presents a qualitative and - to some extent - a quantitative assessment of the situation of the import of used and end-of-life electrical and electronic equipment imported into Liberia.

14 Years of conflict and mismanagement during the civil war period have resulted in a public services infrastructure that is greatly lacking in capacity, extending from physical infrastructure such as electricity and water supply, to political infrastructure such as legislation and enforcement thereof. The lack of a formal chemicals and waste management regime in Liberia has created and exacerbated many of the environmental problems that the country currently faces in reaching its goals for sustainable development. Overall, Liberia has limited financial resources and a lack of technical expertise at the national level necessary to develop and implement waste management (e.g. e-waste) programs that would support monitoring (law enforcement and human/environmental health), dissemination of and access to available information as well as opportunities for training and education in this area. As a result Liberia has no specific legal instruments relating to e-waste management. However, policies and legislation relating to waste management in general do exist, as well as a broad national legal and institutional framework for the development, adoption and enforcement of such measures. Examples are the act creating the Environmental Protection Agency (EPA), the National Environmental Policy and specifically Part IV of the Environmental Protection and Management Law, which provides for the establishment of standards by the EPA, including water and air quality, toxic chemicals and pesticides (including POPs), hazardous wastes and materials, as well as waste management.

New and used EEE is imported into Liberia from Europe (mainly from Italy, Belgium and Germany), North America (mainly USA) and some African countries (mainly used EEE from Nigeria, Egypt and Guinea). Some are whole and some are parts to be assembled. New EEE with original or faked brands is also imported from Asia (mainly Hong Kong, China, India, Japan, Korea) and from the Middle East (mainly from Dubai and Lebanon). From the limited statistical data, which was available, it was estimated that Liberia received around 3’500 tonnes of EEE imports in 2009. According to the interviews with customs and port authorities approx. 10% of this volume is used EEE. About 70% of used EEE imports arrive in a functioning state, but life span is often very short. Around 15% need to be serviced or repaired, while about 15% are not functioning and cannot be repaired. Approx. 90% of imports are new products, however often having a low life expectancy just like second-hand products. Observations point to the suspicion that many new imports are non or faked branded low cost Asian imports. The average household in Liberia possess around 25 kg of EEE, which is approximately 4.6 kg per capita. Extrapolating this numbers to the whole country results in an upper limit of around 170,000 tonnes of EEE installed in Liberian households.

The result of this study is a preliminary description of the national landscape related to the imports and usage of EEE in Liberia. It is suggested that Liberia proceeds with its effort to assess the e-waste situation in the country in some more details. In parallel and by including the key stakeholders, a national e-waste management strategy should be developed under the coordination of the EPA. In a first phase a focus should be set on policy and legislation issues as well as capacity and awareness building measures at all levels.

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1 Introduction

1.1 Background and objectives

Obsolete electrical and electronic equipment (EEE) produced worldwide and specifically in African countries together with the absence of well-organized collection and management systems has manifold impacts on the environment, the health of local communities and the economic system. In many African Countries waste electrical and electronic equipment (WEEE) or e-waste for short, is routinely disposed on uncontrolled dump sites, where waste volumes are periodically minimized by setting them on fire. Thereby a whole range of toxic substances is released from e-waste, heavily contaminating air, soil and water resources. Even unburned, in tropical climate, many e-waste fractions will soon release major pollutants, damaging human and environmental health.

Besides pollutants, electronic equipment also contains a whole range of valuable metals like palladium, indium and germanium that are inevitably lost if not recovered in an early stage of waste treatment. From a global perspective, this loss of scarce metals has to be compensated by intensified mining activities, which again lead to severe sustainability impacts in mining areas worldwide.

Giving the constantly rising demand for scarce resource, the present e-waste management in Africa does not only pollute natural resources and endanger people's health; it also misses out on substantial business opportunities in material recovery and recycling. Although the high-tech know-how for environmentally sound recovery of metals is not yet in sight in Africa, international business co-operations could link strategic advantages of recycling industries in Africa and industrialised economies.

In 2010 the e-waste Africa project was launched in the framework of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. It is a comprehensive programme of activities aiming at enhancing environmental governance of e-wastes and at creating favorable social and economic conditions for partnerships and small businesses in the recycling sector in Africa. The programme is executed in five different countries in Western Africa, including Benin, Côte d'Ivoire, Ghana, Liberia and Nigeria, focusing on the analysis of the three areas (a) transboundary movement of (waste) electrical and electronic equipment (W)EEE, (b) national baseline assessment and (c) socio economic assessment. The project in Liberia focuses mainly on transboundary movement issues and includes a survey among the main national consumers of electrical and electronic equipment (EEE)

Hence the main objective of this study is the qualitative and quantitative assessments of the situation of the import of used and end-of-life electrical and electronic equipment imported into Liberia.

The demand for EEE is large. IT and communication equipments are used on a large scale. The computer age is bearing in Liberia and the large UN presence also influence the large quantities of communication equipments imported into Liberia. Educational Institutions and government offices use lot of computers.

There is no specific policy on electrical and electronic waste in Liberia. Most of the electrical and electronic equipment used in the country are imported either by vendors or through donations.

1.2 General country characteristics

The Republic of Liberia has a land surface of 111,370 km2 and is situated in West Africa, bordered on the west by Sierra Leone, on the north by Guinea, on the east by Côte d'Ivoire and on the south by the Atlantic Ocean. Lying just north of the equator, the country has a tropical climate and is one of the wettest in the world, with an average annual rainfall of more than 5,000mm. Liberia's population is currently estimated at 3.5 million with an annual growth rate of 4.9 per cent. Average life expectancy is 39 years and an estimated 50 per cent of the population are below the age of 20.

Figure 1: Map of Liberia

Liberia is rich in natural resources, including iron ore, timber, diamonds, gold and potential for hydropower. The economy of Liberia reflects the toll of the civil war that ended in 2003; per capita GDP stands at US$ 165 , a dramatic drop from the pre-war 1980 level of US$ 1,269. Unemployment is estimated at 85 per cent, with nearly half the population existing on less than US$ 0.50 per day. Liberia is not currently rated on the Human Development Index (HDI) given the lack of data. However, its HDI rating in 1999 was 0.276 placing it second from the bottom on the list of countries.6 As per the DAC list of ODA recipients, Liberia is ranked as a Least Developed Country (LDC).

Years of civil war and conflict coupled with the flight of most businesses have disrupted formal economic activity and the domestic security situation has slowed down the process of rebuilding Liberia's social and economic structure. Liberia's economy is largely dependent on rubber, timber, gold, diamonds and agricultural crops. In 2005, agriculture activities accounted for 52 per cent of Liberia's GDP with only 12 per cent of GDP being generated from the industrial sector. Fishery and maritime ship licensing registry and services are also important. Most of the foreign earnings of the country rely on the maritime registry and the timber industry.

1.3 Conflict, peace and environmental impact

In August 2003, a comprehensive peace agreement ended 14 years of civil war, with current president Ellen Johnson Sirleaf democratically being elected in November 2005.

Liberia's infrastructure has greatly suffered from the civil war. The destruction caused by it, in combination for long period of time during which there was lacking government control over economic activities, caused much of the environmental degradation in the country.

Massive population displacement in the rural areas during the war led to artificially accelerated urbanization, resulting in severe overcrowding in towns and cities. Due to increasing insecurity in many parts of the country, exodus of people into Monrovia has swelled the population to more than one million. Combined with the absence of a coordinated strategy for waste management and water provision, this has led to high levels of pollution.

Table 1: Development indicators for Liberia (2006 - 2010)

Indicator	Value
Land area (km2)*	**96,000**
Total population (mln)*	**3.8**
Rural population (%)*	**40**
Urban population (%)*	**60**
Number of households (mln)	**0.67**
Household size (persons)	**5.5**
Population below international poverty line (Population below $1 per day / population below $2 per day) (%)*	**84 / 95**
Electrification rate (%)	**N/A**
Human development index (HDI) / Ranking out of 169	**0.300 / 162**
Gross domestic product (GDP) (USD, bln)*	**0.870**
GDP per capita (USD)*	**229**
GDP (PPP) per capita (USD)*	**388**
Internet users per 1000 people**	**5.5**

*(The World Bank 2010)

**(ITU 2008)

1.4 Major waste management concerns

14 Years of conflict and mismanagement during the civil war period have resulted in a public services infrastructure that is greatly lacking in capacity, extending from physical infrastructure such as electricity and water supply, to political infrastructure such as legislation and enforcement thereof.

The lack of a formal chemicals and waste management regime in Liberia has created and exacerbated many of the environmental problems that the country currently faces in reaching its goals for sustainable development. Overall, Liberia has limited financial resources and a lack of technical expertise at the national level necessary to develop and implement waste Management (e-waste) programs that would support monitoring (law enforcement and human/environmental health), dissemination of and access to available information as well as opportunities for training and education in this area.

There is thus a need for Liberia to increase its access to necessary financial resources for the sound management of e-waste and to further develop technical waste management capacity at the national level by making international bodies, specialized agencies and donors aware of the challenges that it faces.

Some of Liberia's major concerns relative to the management of chemicals that are highlighted in the NIP as well as the Liberia 2006 Common Country Assessment (CCA) are:

There is a general lack of operational and sufficient waste management and disposal infrastructure. Open burning of domestic and agricultural waste is by far one of the most abundant sources of POPs release into the air, while untreated domestic waste water is a significant source of POPs release to water. Presently, there exist no safe facilities for hazardous waste disposal.

2 Methods

The e-waste assessment was conducted in line with the method of EMPA as can be seen below:

2.1 Literature review and statistical data

During the survey, the poverty Reduction Strategy, Millennium Development Goal, state of the environment, National Implementation of the Stockholm Convention documents were consulted but no important information was available. Statistical data about EEE imports was obtained from the customs authority.

2.2 Meetings and workshops

To commence the whole survey process a workshop was held in Monrovia with stakeholder from various sectors in attendance.

Five follow-up/program meetings have also been held to serve as a monitoring and evaluation mechanism.

2.3 Surveys, questionnaire sampling

Survey and assessment have been done in the follow areas/categories. Major categories include households, major importers/dealers Institutions/companies. Questionnaires were prepared according to the partner project Nigeria[1].

Surveys were done in the following zone using the above named categories of questionnaires. The zones included central Monrovia, Bushrod Island, Sinkor, and Congo Town, all of the City of Monrovia and also some surveys were conducted in Paynesville city.

There is no research document on the importation of EEE into Liberia. At the Whein Town dump site, scavengers were seen operating with hammers, knives and shredders. In other dumps and on the sidewalks, scrap dealers dismantle all categories of EEEs and E-wastes.

2.4 Field studies

A joint team of the experts and the Liberian team visited the Customs offices at the Ministry of Finance from where we were escorted to the customs offices at the Port of Liberia. At this point, inspection, handling and storage methods were explained to us.

The group then travelled to Whein town in Paynesville, the final disposal site used by all waste collection entities in Monrovia. At this point, disposal methods were observed.

[1] Ogungbuyi Olakitan, Nnorom Innocent Chiddi, Osibanjo Oladele, and Schluep Mathias, "Nigeria e-Waste Country Assessment," SBC E-waste Africa Project. Basel Convention Coordinating Centre for Africa (BCCC-Nigeria) and Swiss Federal Laboratories for Materials Science and Technology (Empa), Ibadan/Nigeria and St.Gallen/Switzerland, 2012.

After Whein town, we came to central Monrovia to locate dealers and recyclers. This phase was done on Johnson street around the "the buy your own thing" market area, at dealers stores on Benson, Center and Randall streets and repair shops on Jonson Street.

Before going to Whein town, we checked some recyclers on the Barnersville road and the Somalia drive.

Problems observed during the field study:

- Dumpsites for e-waste are not available. Therefore no proper disposal
- No proper or systematic collection of e-waste
- Adequate data on EEE or even e-waste is difficult to get
- Advance recycling sites do practically not exist. If found, they are done manually and considered as "scrap dealers". No record of volume dealt within recorded.

2.5 Limitation of the methodology used

The main limitations include;

1. The informal nature/irregular sector makes document of the mass flow assessment in conclusive.
2. Because of the unharmonized manner of data dealing, a lot a assumption were made and this could create margin of error
3. The survey was conducted in two cities in Monsterrado county, so the survey results do not represent a national dimension
4. The absence of data of detailed studies and references led to the use of self-created methodologies.

3 Imports of (W)EEE

3.1 Policies and legislations related to imports

Liberia has no specific legal instruments relating to e-waste management. But policies and laws relating to waste management exist.

The EPA Act

The Act creating the Environmental Protection Agency (EPA) now requires environmental impact assessment (EIA) of all activities, decisions, programs, projects and policies, which may have significant impacts – beneficially and adversely – on human health and the environment.

The National Environmental Policy of Liberia

The National Environmental Policy of Liberia provides a broad framework for the proper and responsible management of natural resources and the protection of human health and the environment.

The Environmental Protection and Management Law

Part IV of the Environmental Protection and Management Law provides for the establishment of standards by the EPA, in consultation with relevant line administrative agencies, regarding water and air quality, toxic chemicals and pesticides (including POPs), hazardous wastes and materials, waste management, soil quality as well as noise pollution, noxious odors, ionization and radiation.

Regulations

The administrative agencies mentioned above promulgate from time to time appropriate regulations pursuant to the statutes for which they are responsible.

There is currently no domestic legislation specifically regulating the use of e-waste in Liberia, but a broad national legal and institutional framework exists for the issuance of such regulations and their enforcement. An opportunity for a domestic regulatory regime presently exists, because Liberia is a Party not only to the Basel Convention on Trans-boundary Movement of Hazardous Substances but also to a number of other similar international legal instruments, including the Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, and the Stockholm Convention on Persistent Organic Pollutants. Liberia has also ratified the Ban Amendment[2] to the Basel Convention

Table 2: Policies and legislations related to imports

Name of Policy/Legislation	Objective	Relevance for EEE import
National Environmental Management and Protection Law of EPA (2003)	To help regulate environment activities and actions	Raises awareness of waste issues
The National Environmental Policy	To Stand as a guide	
Draft Legislation on persistent Organic Pollutant (POPs) waste(2008)	To create awareness on POPs waste	Can be used as a model
The National Medical waste Policy (2010)	To highlight components of e-waste	
The Constitution of Liberia also includes a section on Human and Environmental Health.	To Serve as a generic policy document	Highlights waste issues
National Waste Management Strategy. (Draft)		

3.2 Overview of Stakeholders

EEE is imported into Liberia from Europe, the USA and other North American countries. Some are whole and some are parts to be assembled. New EEE is also imported from Asia, mainly Hong Kong, China, India, Japan, Korea and also from Africa, mainly Nigeria, Egypt, Guinea. From the Middle East mainly from Dubai, Lebanon. From Europe mainly from Italy, Belgium and Germany.

There are two types of importers, large scale – companies, large shops and institutions. Small scale Important are small shops and individuals. Large importers sometimes supply small scale importers who sell to individuals. Few of the main actors are listed below. A more comprehensive list of import businesses is given in Table 3.

- Beever – a business institution that is involved in the importation of both electronic equipment and others and also does wholesale & retail of goods. (They are international dealers).

[2] The Ban Amendment provides for the prohibition by each Party included in the proposed new Annex VII (Parties and other States which are members of the OECD, EC, Liechtenstein) of all transboundary movements to States not included in Annex VII of hazardous wastes covered by the Convention that are intended for final disposal, and of all transboundary movements to States not included in Annex VII of hazardous wastes covered by paragraph 1 (a) of Article 1 of the Convention that are destined for reuse, recycling or recovery operations.

- African Trading Company – they sell goods from a local warehouse. They are involved in the sale of kitchen wares.
- The GSM Companies (eg: Cellcome, Lonestarcell , Libercell, Libtel, etc.) these groups do wholesale and retail selling of phones and walking talking(radio handset).
- GOL – this government ministries, agencies, autonomous agencies and commissions.
- Religious Institutions _ this group sometime receive donation internationally and sometime purchase from abroad and from a local dealers
- Nongovernmental Organizations – (UNDP, WHO, Action Faim, UNICEF etc.) these group most use re-frigerator and computers. They get most of their equipment from abroad

Table 3: Major importers of new and used EEE

Dekoyah Business Center	A.T.C
Arun Brothers Branch # 1	L.R. & Sons
Semesk Business Center	Kaibeh & Kabah Corp. Inc.
Catco	Hass Business Center
Raj Enterprise	SMF
Cellcom	Sweet Success
Naresh Brothers	Chrisplay & Son Inc.
Smarth Cell- General Merchandise	Shehry Trading Inc.
Dozzy Enterprises	Peace Electronic Center
Beever Comms.	Randall Electornic
Ebadaleh Business Center	LORD's Time Ent.
Afit electronics service	Modern Refrigeration Corp
Hadid Electronics	Homeline Inc.
Tarcet Mobile	York Trading Inc.
Atlantic Mobile	Class
Dynamic International	Arkay Hardware Center
Ditco	Vishnu Trading Inc.s
Mega Cell	

3.3 Import procedures and statistics

Qualitative description

The import business in Liberia functions in different ways. For instance, the major importers such as Beever, sharp or Razzouk Brother Inc. and Sethi Brothers import goods in large quantity and store them in their various warehouses and other local dealers purchase them for retailing purposes while the major importers themselves sell wholesale and retail.

Another business group is one that receives commodities/goods from family members or relatives from abroad, these groups mainly retail their commodities/goods while some use them in their institution for vocational training purpose.

The third groups of importers are those who get their goods from neighboring countries such as Guinea and Nigeria. These ones mainly sell goods by retail and do not really use warehouse for storing purpose. Their goods are kept to places they sell them.

Finally, some other institutions such as governmental, nongovernmental, and charity institutions/organizations that are not in the profit making business also import goods/commodities while some get donation. Those goods are used for different purposes.

The large businesses buy new items directly from the manufacturers and from various services and countries such as the USA, in Europe, Belgium, Italy and Germany. In Africa, from Nigeria Guinea and Egypt and in Asia, China, Japan, India and Hong Kong some of the goods are new and don't undergo extensive testing but the second hand ones are critically looked at. Beever does the screening.

The major importers are organized under the Liberian business Association and the Chamber of Commerce supervises the business activities.

The small businesses are also under the supervision of the Petty Traders Association. The large businesses and small businesses register with the Ministries of Finance and Commerce. Apart from the large businesses most of the petit businesses are sole proprietorship.

Private Imports and donations

Some equipment, such as cell phones, new notebooks/computers and digital cameras are brought into the country by private importer. These are sometimes sent in barrels, cartoons and even sent in used cars. Most of these items are second handed and avoid paying taxes therefore are cheap.

Donations are done in large quantities to educational, religious and social Institutions. Sometimes government Institutions and NGO's receive EEE from Europe, Asia and the USA. Usually these items are secondhanded/used.

Quality of used EEE imports

The quality of goods is not too good, they can be ranked as average and some very poor. This is evident by the life span of the items. A system to grade the items is not too effective.

- About 70% of used EEE imports arrive in a functioning state but life span in sometimes very short.
- About 15% need to be serviced or repaired.
- About 15% are not functioning.
- The 15% that is not functioning can hardly be repaired, end-of-life. Even the 15% that can be repaired has a very short life span.

Import statistics

The main port in Liberia is Monrovia Free Port (85% of all imports). It is estimated that air imports account for approx. 95-98% of new goods (mobile phones and computers). From information retrieved through interviews with the customs authority it can be assumed that second-hand appliances are all imported through the ports. Though separate statistics to distinguish between second-hand and new EEE imports are not always available. Table 4 summarizes the statistics which could be obtained from the customs authority for the year 2009. Using an average weight per appliance as published in the partner project Ghana (see footnote 3 on page 10) it can be estimated that approx. 3'500 tonnes of EEE were imported in 2009. According to the interviews with customs and port authorities approx. 10% of this volume is used EEE (Table 4).

A field visit at the port and discussions with the port authority revealed the following information:

- There are no designated places for special imports of EEE
- EEE imports are suspected to come mainly from the USA
- Sometimes containers are inspected for quality and quantity

- The port recently introduced a new clearing system for freight, which includes a one-stop-shop, i.e. all clearing activities are done at one point (time effort for one ship approx 2 days)
- For inspections the port receives risk profile through an automated system, hence:
    - Containers with high risks are picked for inspections
    - Not declared goods get fined
    - If fines are not paid the goods get auctioned after three months

Table 4: Import statistics for specific EEE (year 2009)

Product	Import route	# of imported items	Thereof New	Thereof used	Exporting country
Stereos	Sea, Air & Land	5,293	5,000	293	China, Hong Kong, Guinea, Dubai, Japan Belgium
TV(CRT)	Air, Land & Sea	14,143	14,000	145	China, Dubai, Nigeria, Japan, Hong Kong, Guinea, Korea
Fridges/Freezer	Sea	18,869	18,000	869	India, Japan, China, Hong Kong, USA, Italy, Germany
Air conditioner	Sea	4,025	3,500	525	Japan, China Egypt Korea, Le-banon Dubai, USA
Hair Dryers	Sea	500	500	-	Japan, USA Hong Kong
Electric Heater	Sea	450	450	-	Japan, USA
Gas Store	Sea	1,623	1623	-	Japan, China, Hong Kong, Italy Dubai Belgium
Washing machine	Sea	1,417	1,417	-	Japan, China, USA
Radio	Air, Land & Sea	25,302	25,302	-	Dubai, Japan, China, Hong Kong, USA, Guinea, Belgium
Fan	Air, Land & Sea	4, 939	4, 939	-	India, Japan, Dubai Korea, China, Guinea, Nigeria, Hong Kong
Mixers	Sea	400	400	-	Japan, China, USA, Dubai
Phone	Air, Land & Sea	816,817	810,000	6,817	India, Japan Hong Kong, Guinea, Lebanon, Dubai, Nigeria
LCD Monitors	Air, Land & Sea	1,110	1,110	-	Dubai, Japan, Hong Kong
Cameras	Air & Sea	3, 552	3000	552	Dubai, Hong Kong, USA, Japan
DVD Player	Land & Sea	121,270	121,000		
MP3 Player	Land & Sea	4,848	4,848	-	China, Hong Kong, Guinea, Korea, USA, Japan Dubai
Projectors	Air & Sea	218	218	-	China, USA, Japan Hong Kong Holland
Iron	Air & Sea	2,155	2000	155	Japan, Hong Kong, Dubai, Korea
Microwave	Air & Sea	178	178	-	Japan, USA, Holland, Dubai
Printers	Air & Sea	13,327	13,327	-	China, Hong Kong, USA Dubai
TV Flat	Air & Sea	4,371	4,371	-	China, Hong Kong, Korea, Dubai
CRT Monitors	Air & Sea	14, 100	14,100	-	Hong Kong, USA, Dubai
Fax Machine	Air & Sea	2, 410	2,410	-	Dubai, USA, Japan
Scanners	Air & Sea	1,825	1,825	-	Dubai, Holland, Japan
Computers	Air & Sea	22,500	15,000	7,500	USA, Belgium, Dubai, Japan, Ko-rea, Holland
Photocopiers	Air & Sea	4,300	4,300	4,300	Dubai, USA Germany, Japan Hong Kong
Laptops	Air & Sea	12,378	10,000	2,378	Dubai, USA, Guinea, Holland, Ja-pan, Nigeria
Laundry Drier	Air & Sea	1,417	1,417	-	Japan, China, USA

4 Consumer Survey

4.1 Governmental Institutions

Most of the government institutions interviewed indicated to be aware about the environmental hazards caused by discarded electronic equipment such as computers and that some parts need special treatment in order to be disposed of in an environmentally friendly manner. However, despite being aware on the environmental hazards, most of them indicated to lack any procedures for handling e-waste although 50% of them indicated to have plans for introducing an internal policy for handling e-waste.

Table 5 and Table 6 summarize the results from the interviews made in 5 selected ministries and agencies of the government. The numbers provide indications on how much EEE could be installed and/or stored and not in use in such institutions. However the available data from this survey does not allow for extrapolation for all institutional and corporate consumers in Liberia.

The average life span of computers in most institutions interviewed was estimated between 2 to 5 for both desktops and laptops while some ministries indicated that they use desktops up to 10 years. The average lifespan for different ICT equipment as estimated based on the survey is listed below in Table 7. The current practice of end-of life management is storage. Most of the government Ministries and institutions store obsolete computers within their premises for unspecified time period and few institutions keep them temporarily in stores or offices for at least 2 years before disposing them of through auctioning or donation, depending on the decision of the top management.

Table 5: Type and quantities of EEE used in 5 selected Ministries and Agencies of Government

Description	Name of Institution/ No. of EEE in Possession					
	EPA	**Ministry of Agriculture**	**LISGIS**	**Ministry of Health**	**NEC**	**Total**
No. of employees	146	300	212	500	205	**1,363**
Desktops	25	43	147	105	100	**420**
Laptops	25	100	42	111	40	**318**
Printers	31	52	25	98	75	**281**
Mobile phones	146	275	206	409	100	**1,136**
Televisions	3	10	5	12	7	**37**
Fridges	5	12	2	79	15	**113**
Air conditioners	25	61	22	89	22	**219**

Table 6: Type and Quantities of EEE not in use in 5 selected Govt Ministries & Agencies

Description	Name of Institution/ No. of EEE Not in use					
	EPA	Ministry of Agriculture	LISGIS	Ministry of Health	NEC	Total
No. of employees	146	300	212	500	205	1,363
Desktops	15	8	34	11	16	84
Laptops	6	6	19	9	7	47
Printers	21	11	16	9	18	75
Mobile phones	12	18	6	13	22	71
Televisions	1	4	4	9	8	26
Fridges	0	4	7	7	6	24
Air conditioners	7	17	12	12	14	62
Traditional monitors (CRT)	10	12	20	12	19	73
Flat Screen monitors (LCD)	11	9	9	9	8	46
Others						

Table 7: Average lifespan of ICT equipment in the government sector

ICT equipment	Average lifespan (years)
Desktop computer	**3.8**
Laptop computer	**3**
CRT screens	**4.3**
LCD screens	**3**
Printers	**4**

4.2 Private Households

Based on the survey among 400 selected households in Monrovia, an average of installed EEE could be estimated for an urban settlement in Liberia (Table 8). The average weight per appliance to calculate from number of items to kg were taken from the Ghana survey[3]. Based on this numbers and by using the data related to Liberian household statistics from Table 1 it can be calculated that the average household in Liberia possess around 25 kg of EEE, which is approximately 4.6 kg per capita. Extrapolating this numbers to all Liberia a total of around 170,000 tonnes of EEE is installed in Liberian households. Since this extrapolation doesn't take into account that rural households usually have lower penetration rates, this number can be interpreted as the maximum volume of EEE installed in Liberia for the year 2011.

[3] Amoyaw-Osei, Yaw, Obed Opoku Agyekum, John A. Pwamang, Esther Mueller, Raphael Fasko, and Mathias Schluep. 2011. *Ghana e-Waste Country Assessment*. SBC E-waste Africa Project. Accra, Ghana: Green Advocacy, Ghana & Empa, Switzerland. http://www.ewasteguide.info/Amoyaw-Osei_2011_GreenAd-Empa.

Table 8: Types and quantities of EEE found in 400 selected households in Monrovia (2011)

Large Household Appliances	average per household		IT Equipment	average per household	
	(items)	(kg)	(items)	(items)	(kg)
Air conditioners	0.20	2.0	Fax machine	0.02	0.1
Dish Washers	0.05	2.1	Phones	0.00	0.0
Dryers	0.00	0.0	Mobile Phones	0.90	0.4
Electric Heaters	0.03	0.1	Laptops	0.10	0.5
Fridges	0.20	6.5	PCs	0.03	0.3
Grillers	0.01	0.2	LCD monitor	0.02	0.1
Hobs	0.00	0.0	CRTs monitor	0.00	0.0
Steam Ovens	0.00	0.0	Modems	0.02	0.1
Stove	0.06	3.2	Printers	0.03	0.2
Washing machine	0.01	0.7	Scanners	0.01	0.1
Small Household Appliances	average per household		Copy machines	0.03	1.3
	(items)	(kg)	**Consumer equipment**	average per household	
Blenders	0.01	0.1		(items)	(kg)
Coffee Machine	0.01	0.0	Alarm Clocks	0.09	0.1
Electric Lawn mowers	0.00	0.0	Cameras	0.09	0.1
Electric Tooth brushers	0.00	0.0	DVD Players	0.20	0.9
Fans	0.30	2.9	MP3 Players	0.05	0.1
Hair Dryers	0.10	0.1	Projectors	0.01	0.0
Flat irons	0.10	0.1	Radios	0.30	0.5
Kettles	0.03	0.1	Stereo	0.01	0.1
Microwaves	0.02	0.3	TVs (CRT)	0.05	1.7
Mixers	0.00	0.0	TV (Flat panel)	0.00	0.0
Pool cleaners	0.00	0.0	Batteries	0.04	Na
Popcorn Makers	0.00	0.0	Car Batteries	0.20	Na
Toasters	0.00	0.0			
Vacuum Cleaners	0.01	0.1			
Inverters	0.03	na			

5 Conclusions & Recommendations

5.1 Conclusion

Liberia lacks the capacity to adequately handle e-waste problems. Trained manpower is inadequate and even the political will is minimum.

E-waste recycling is gaining momentum illegally in Liberia because of the little attention paid to it by regulatory authorities and lack of awareness about adverse effects from unsound recycling practices. Recycling is ignorantly run consciously encouraging pollution and degradation of human health and the environment.

10% of all EEE imports are mostly low quality second-hand products with little value on the market. About 90% of all EEE imported are new, but mostly substandard and are liable to rapid loss of value. These products deteriorate and malfunction very fast performing almost like second hand products. This might be due to the suspicion that a relevant share of new products is non-branded or faked branded low costs appliances imported from Asia.

The problem now is that the waste stream is permeated with WEEE and because this is disposed of in the general municipal waste, sometimes burnt and produces harmful chemicals (PCDD/PCDF) and affects the health of the collectors, repairers and informal recyclers.

Presently there is no proper infrastructure for the sound management/disposal of WEEE. Also no policy or legislation on WEEE exists in Liberia.

5.2 Recommendation

1. Massive awareness on the dangers of WEEE
2. Awareness workshops on WEEE for decision makers and regulators.
3. Develop a e-waste management strategy
4. Develop policy and legislation for the sound management of WEEE
5. Facilitate the formation of a cooperation of WEEE recyclers
6. Conduct training workshops for enforcement agencies
7. Build the capacities of relevant institutions in terms of infrastructures and manpower
8. Create a database for WEEE
9. Establish a registration mechanism (Registry for WEEE and EEE).