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E-Waste Management Practices: Policies Strategies and Regulations, In Selected National Institutions, Nairobi, Kenya.

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Abstract: *The disposal of e-waste in Kenya remains a challenge. The aim of this study was to evaluate current e-waste management policies strategies and practices and provides recommendations that may be used to improve the management of the e-wastes in Kenya. This study was conducted in Nairobi city the national capital of Kenya and a regional commercial hub in eastern Africa. The study employed literature review; including institutional record. Key informants interviews and observations. The respondents were drawn from the major potential e-waste generators in the city including: computer and mobile phone importers and assemblers, end users: institutions, formal e-waste recyclers and key ICT and e-waste management institutions including cck and NEMA. The results showed that only a fraction of electronic waste (10%) finds its way to recycling facilities and there is no efficient take back scheme for consumers. Most of the institutions involved in the study do not have an outright policy on disposal of electronic waste. Consequently, they resort to disposing electronic waste together with other solid wastes. The study shows that the major approaches employed for disposing e-waste included: the municipal solid waste disposal system, extended storage within the institutional premises for a long period of time, passing them to secondary users and take back schemes through extended producer responsibility. Although the national government has recognized the challenges posed by e-waste, the level of preparedness and implementation of policies and regulations is still limited. There is need to develop a national e-waste collection system, targeting the process of collection, disposal, licensing of key actors and consumer awareness creation. The national government should introduce strategies geared towards enhancing collaboration among stakeholders in order to enhance extended producer responsibility and public awareness on electronic waste.*

Key Words: *E-Waste, Management, Institutions, Policy, Strategies, Regulations, Recycling.*

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I. Introduction

Globally ICT is at the epicenter of socioeconomic development, notably through rapid technological progression, facilitating speedy access of ideas and experiences, and prompt exchange of information. in fact access, usage and ownership of ict are fundamental in facilitating businesses, enhancing higher efficiency and outputs in productions and in linking and empowering communities. but the management of emanating electronic waste (waste electrical and electronic equipment (WEEE) or e-waste) has become an environmental concern in many developing countries. e-waste has raised concern although; it ranges from 0.01% to 1% of the total municipal solid waste generation in Nairobi city, more so because many components of such equipment are considered as toxic and are not biodegradable. The toxicity is due in part to lead, mercury, cadmium and a number of other inorganic but toxic substances (UNEP, 2007). the increase in the end of life of electrical and electronic products (e-waste) depends on the economic growth of a country, population growth, market penetration, technology upgrade, and obsolescence rates (Kalana, 2010).

Much of the growth in the information technology sector in developing countries has been intensified by the importation of "hand me-down" used equipment's from developed countries. as a result many agencies and businesses have organized to channel used equipment from north to south. Some of the trade is "illegal" under international rules governing trade in toxic waste such as the Basel convention (ban, 2005; Kojima, 2005; Osibanjo and Nnorom, 2007). The challenge lies in the management of increased volumes of e-waste, without an explicit policy and standards to undertake the process.

Kenya has experienced a remarkable growth in the ICT sector in the last decade. a growing number of Kenyans today have access to computer facilities at home, school, business centers and internet cafes. a greater number also have access to mobile phones and this is now playing a huge role in the development of the Kenyan

economy (Shivoga, 2010). the influx of cheap imported refurbished or otherwise known as second hand computers, cell phones, printers and solar panels among other electronic gadgets is slowly contributing to what can be termed "a silent epidemic" that will have tremendous adverse effect on the well-being of many Kenyans and environmental degradation (Mbalo, 2008). if this trend continues unchecked, Kenya is likely to be burdened with the e-waste dumped from developed nations.

Nairobi is reputed to be the fastest growing city in the world after Guadalupe, Mexico city (Mexico) and Maputo (Mozambique) (GOK, 2003). a quarterly report by the computer society of Kenya (CSK, 2003) shows mobile phone subscription rose from a mere 5,345 in 1997 to 250 thousand in 2001, with over 11 million subscribers at the end of 2007 (CCK, 2007) and currently, 32 million (over 90 percent) of adult Kenyans are mobile uses (WB, 2012), the International Telecommunications union (ITU) ranks Kenya as the sixth among the nations with the highest number of mobile phones in Africa (African, 2008). According to the national ICT survey report 0f 2011 about 78% and 37% of the households in Nairobi have at least one mobile phone and computers respectively. the total amount of computers monitors and printers, mobile phones disposed yearly as per 2007 are approximately 2, 984.35 tons. the rate at which these mountains of obsolete electronic products are growing will reach crisis proportions unless measures are taken to manage the menace in Nairobi which is already saddled with the problem of poor solid waste management.

Table 1 Percentage of ICT equipment ownership/access among the population in Nairobi

	Radio	Television	Pay TV	Fixed Telephone	Mobile Phone	Computer	Internet	Total
Nairobi	**0.4%**	**78.2 %**	**13.2 %**	**11.9 %**	**86.2 %**	**32.7 %**	**48.3 %**	**3,024,059**

II. Statement of The Problem

The ICT boom in developing countries such as Kenya has brought with it a new category of waste: e-waste that barely existed 20 years ago. Today it represents one of the fastest growing waste types. This has been associated with increasing "market penetration" in the urban areas, "replacement market" in developed countries and "high obsolescence rate". Therefore there is a pressing need to address e-waste management in developing countries such as Kenya. Mainly because of public health concerns and environmental pollution resulting from inappropriate management of e-waste is potentially immense. For example, studies show that about 40% of lead found in the soil originates from the electronic waste. While, 70% of heavy metals found in the soil are of electronic origin (Milinkovic, 2005). The disposal of electronic equipment (computers and mobile phone handsets) thus needs to be managed in an environmentally sound way, to minimize their toxic releases into the environment and threats to human health (Basel/MPPI, 2004; Basiye, 2008). The uniqueness of e-waste problem in kenya is that e-waste is relatively new and its quantities are rapidly growing as the technology becomes more common (MPPI, 2006). The presence of valuable recyclable components has already attracts informal and unorganized sector (Osibanjo and Nnorom, 2008). This might lead into unsafe human and environmentally risky practices. Therefore there is urgency in Kenya to created sound policy and legal framework to establish environmentally safe management of e-waste. Thus the aim of this study was to evaluate current e-waste management policies strategies and practices in Kenya with the intension of providing recommendations that may be used to improve the management of the e-wastes in the country.

III. Methodology

The study was conducted in Nairobi, which is the capital and largest city of Kenya and the heaviest consumer of ICT products and services. This is because of the many commercial activities and institutions that are located in Nairobi.

The study involved collection of both quantitative and qualitative data so as to establish the flow of e-waste and subsequent disposal. This involved the use of semi–structured questionnaires and open -ended interview guides with flexible probing, ideal for such studies.

Secondary data was collected through institutional documents and relevant national policy and regulation documents such as local government act (cap 265), EMCA (1999), waste management regulations 2006, Kenya communications act of 1998 and national ICT policy (2006). The study adopted Swedish Federal Laboratory for Materials Testing and Research (EMPA) methodological framework from which research tools was developed for data collection. The study population was divided into four categories: importer/ assembler/ distributor/ supplier category, the consumer category (institutions), recycler category and final disposer category.

Descriptive statistics was used to summarize the collected data. Mean and mode as measures of central tendency were used to summarize the waste stream flow of various stakeholders. Further analysis of sample characteristics was done using frequencies and percentages. Presentation of data was done in Tables and Graphs.

Extended Producer Responsibility (EPR) was one of the e-waste management strategies that were analyzed using Sinha (2004) methodology. The methodology involved comparative analysis of five major comparison indicators – actor involvement, material flows and controls, externalities, financial metrics and market metrics comprising of 19 sub-indicators. The indicators were chosen on their ability to illustrate the most important characteristics of an e-waste management system. The indicators were scored using a 3 point scale on a subjective basis, and are relative in value (1= low, 2 = medium, 3 = high). 'high', 'medium' and 'low' values are not absolute.

IV. Results and Discussions

4.1 Policy, Regulations and Legislative Considerations.

The results show that Kenya has no specific policy on e-waste in place. However, there is recognition of international conventions regulating hazardous waste, among them the Basel convention on the control of transboundary movements of hazardous wastes and their disposal, and the Bamako convention, which aim at introducing preventive measures and guaranteeing appropriate disposal of hazardous waste in Africa (derby and Obara, 2006; EU, 2009).

Basel convention however, does not cover discarded electronic equipment, in working condition, which might be sent to other countries as second hand products. An amendment to the convention, commonly known as the Basel ban, calls for prohibiting the export of hazardous waste, which includes e-waste, from OECD countries to non-OECD countries, for any purpose. However, the ban amendment is still to come into force, as it has not been ratified by a majority of the signatories to the convention. However, there are several grey areas in the convention which are open to interpretation, making the implementation less effective than expected.

The Bamako convention aims to criminalize the import of hazardous waste into Africa from outside the region and from non-contracting parties and also prohibits dumping hazardous waste at sea as well as incinerating it. However, its implementation is still a challenge as Kenya continues to receive second hand ICT equipment which contains hazardous components from developed countries in form of donations (WAEMA, 2007).

The study also established that there are provisions found in other legislations governing the environment, air, water, public health, waste and hazardous substances. Before enactment of environmental management and coordination act (1999), local authorities (las) had monopoly control over sanitation and solid waste management services in Kenya, largely under the local government act (cap 265) and public health act (cap 242).the former empowers las to establish and maintain Municipal Solid Waste (MSW) management services while the latter requires them to provide the services. The acts, however, neither set standards for the service nor emphasizes waste reduction or recycling. In addition, the acts do not classify waste into municipal, industrial and hazardous types or allocate responsibility over each type. The main shortcoming with these statutes is the fact that they are silent on sound environmental management of waste especially e-waste.

Environmental Management and Coordination Act (EMCA) 1999 addresses waste management in Kenya. Specific provisions in the act outline how one should handle e-waste. "…n*o person shall discharge or dispose of any wastes in a manner that would cause pollution, to the environment or ill health to any person; no person shall transport wastes except to a licensed wastes disposal site established and in accordance with a valid license issued under the act*"(EMCA 1999).

EMCA, 1999 also has a general definition of hazardous waste in the fifth schedule which describes e-wastes as having five distinct characteristics i.e. explosivity, flammability, oxidizivity, toxicity and corrositivity. The waste contains compounds of metals classified as hazardous wastes by virtue of its constituents. Section 5 of the waste management guidelines requires the waste generator to minimize waste and eliminate waste altogether as well as identifying and eliminating potential negative impacts of the product, enabling the recovery and reuse of the product, reclamation and recycling and incorporating environmental concerns in the design and disposal of a product. Sections 17-23 require the generators of hazardous waste to conduct an EIA and label clearly the "hazardous waste". The designated national authority, uses Basel convention guidelines, and NEMA over sees the entire transport of such materials.

This act mandated the national environmental Management Authority (NEMA) to develop regulation on waste management including hazardous waste management. In line with the mandate NEMA developed waste management regulation in 2006. part iv of this regulation deals with hazardous waste in totality that is the hazardous waste specifications, requirement for Environmental Impact Assessment (EIA), handling, storing and transporting, export permit and its validity, transit of hazardous waste and insurance amongst other issues. the waste management regulation 2006 is not explicit on addressing e-waste; the components of e-waste are covered under various facets of the regulation such as hazardous waste management and chemical waste management. The lack of explicit and detailed mention on e-waste has created loopholes in the regulation as the e-waste handlers and actors do not comply with the regulation's requirements on waste handling as they state that the regulation does not cover e-waste. in addition an average Kenyan reading the regulation would not link hazardous waste to EEE and especially to the ICT goods.

From the study, it was established that the main issues with e-waste management in Kenya are: low level of awareness, the amount of secondary e-waste imported into the country and lack of waste segregation. The main challenge facing mobile phone e-waste management is disposal of batteries. The second hand and refurbished phones often have batteries with a shortly life span. These batteries are dumped alongside other MSW due to lack of awareness on the contents and the danger they pose to the environment. Therefore, there is need for well-organized collection points with protection against theft and existing take back schemes could be used by NEMA field offices as collection points.

ICT issues are regulated under various statutes including but not limited to: the science and technology act, cap. 250 of 1977, the Kenya broadcasting corporation act of 1988 and the Kenya communications act of 1998. These statutes are inadequate in dealing with end of life management of the ICT equipment. They basically cover the licensing and frequency distribution. The national ICT policy (2006) is cognizant of e-waste and states that "as a prerequisite for grant or renewal of licenses, applicants must demonstrate their readiness to minimize the effects of their infrastructure on the environment. This should include provision of appropriate recycling, disposal facilities for waste that may contain toxic substances." But the intention is not clearly captured in ICT regulations to make it binding, the universal licensing framework implemented by the CCK from 2008 makes step towards enforcing this statement of intent. The environmental considerations mentioned in the policy are in line with the government promoting environmentally-friendly: it products that address the cost issues and the environment issues. In line with this is the development of regulations for recycling and disposal facilities. However, these are mentioned in the policy but in reality none of these good intensions has been implemented. For example, CCK regulations in ICT sector tend to favor service providers given that so far, no license has been cancelled, for having emitted e-waste. The mobile phone telephony is regulated under this sector, but the mobile phone as a good is not regulated in this sector although it is associated with the services under this sector. Therefore there seems to be a gap, where the state encourages ICT development yet, does not have in place measures to manage e-waste generated in the process.

The Kenya Bureau of Standards (KEBS) established in July 1974 by an act of parliament to act as a trade facilitator and the objectives of the KEBS relevant to this study include preparation of standards relating to ICT products, testing and quality management and the pre-export verification of conformity to standards. Kenya has standards on some electrical and electronic equipment but not on mobile phones.

However, where there are no national standards, KEBS uses international standards to regulate the goods entering into the country. The Pre-export Verification of Conformity program (PVOC) was formed with the objective of verifying the quality of certain regulated goods coming into Kenya. The inspections are carried out at the country of export by appointed contractors to minimize the risk of unsafe and substandard goods entering the Kenyan market and to protect Kenyans 'health, safety and environment. The PVOC programme covers most of the high risk goods including electronic goods which require a certificate of conformity before being accepted into Kenya. The inspections are based on Kenyan standards, and where Kenyan standards are not sufficient or there are no standards they can be based on equivalent international standards or manufacturer/ company standards. With the influx of second hand electronic equipment and refurbished equipment the PVOC comes in to ensure that the products entering the Kenyan market are not waste or EOL products.

The PVOC team has rejected some EEE, including mobile phones which were old and refurbished. But it is an onerous task regulating the ICT products, especially mobile phones; as they can be brought into the country undetected in some ports of entry. Most communication equipment is high value goods and they are flown into the country as opposed to importation via the port.

The main challenge facing the KEBS is the safe disposal of the rejected hazardous goods as the country lacks the necessary infrastructure to destroy these goods although it is stipulated in the law that the importer of the rejected good is to meet the disposal cost. The other challenge lies in the regulation of donations which in most cases entail computers and laptops. The donations of computers and laptops that have less than one year life left should not be allowed into the country. The organizations and communities that receive these donations view KEBS as an obstacle in bridging the digital divide.

Kenya Ports Authority (KPA) established in 1978 through an act of parliament as a statutory body under the ministry of transport (KPA 2008). Then KPA covers the following ports: Kilindini, Malindi, Mtwapa, Kilifi, Kiunga, Shimoni, Funzu and Vanga all along the Indian Ocean. Kilindini habour in Mombasa is the only fully equipped port. It is the second biggest port in the region after Durban in terms if tonnage and containers handled (KPA 2008). It has 17 shipping lines and is directly connected to 80 ports worldwide. It also handles 14 million tons of cargo annually (KPA 2008). The interest in KPA lies in its role in the verification of imports with special reference to the EEE imports. The data on the total imports is computerized but there is no specific data on the number of EEE that enter the country: the only data that can be retrieved would be on the number of containers received at the port. The EOL computers for the KPA are sold to the members of staff at low prices so as to motivate the employees to buy the computers in an auction based on first come first served (Basiye, 2008). The KPA transferred the computers from their custody into individual employees' hands. The concern is what happens to these computers when they reach the end-of-life (EOL)?

Kenya Revenue Authority (KRA) established in 1995 by an act of parliament with the sole mandate of collecting revenue on behalf of the government of Kenya. The role of KRA for this study is the custom services and KRA's role as the watch dog function for the government agencies by controlling exit and entry points to the country to ensure that prohibited and illegal goods do not pass through Kenyan borders. Hazardous wastes and their disposal as provided for under the Basel convention are listed as part of the restricted goods that are controlled by KRAs' commissioner of customs (KRA 2008). Over and above the fiscal responsibilities of the custom services department, kra is also responsible for the facilitation of legitimate trade and protection of society from illegal entry and exit of prohibited goods. But there is importation of second hand computers which are cheaper and have a short life span. This poses a threat to the environment.

The Kenya National Cleaner Production Centre (KNCPC) was established in July 2000 through the Kenya Industrial Research and Development Institute (KIRDI), the United Nations Development Programme (UNDP) and the government of Kenya. The Centre's core function is to build national capacity to implement cleaner production (pollution prevention) Programmes in industry and businesses (KNCPC 2008). The center has been instrumental in coordinating waste minimization and resource efficiency projects through continuous awareness and training activities, demonstration projects and policy dialogues .therefore, KNCPC could be used as one of the avenues to regulate the tonnage of e-waste generated by stakeholders through sensitization of stakeholders of waste minimization strategies.

4.2 Recycling as an E-Waste Management Strategy

The study results showed that the great obstacle to proper recycling as lack of infrastructure and policy to regulate the actors. Fifty-four percent of the key informants felt that lack of legislation was an obstacle, while the absence of recycling possibilities was rated third by 50% of the respondents. Cost was given the least ranking with 45% of the respondents finding it an obstacle. The obstacles were ranked as below:

Table 2: Obstacles to Recycling

Obstacles To Recycling	Ranking
Infrastructure	1
Policy And Legislation	2
Absence Of Recycling Possibilities	3
Cost	4

It was further established that lack of awareness and designated dumping sites, limited support for local initiatives, absence of any framework for End-of-Life (EoL) product take-back or implementation of Extended Producer Responsibility (EPR) and lack of separation of waste at source, have made the situation more complex.

The study established that the volumes of e-waste handled by the formal recycling companies were low as compared to the anticipated volumes of e-waste. Therefore, the informal recycling companies that lack proper infrastructure and mechanisms to handle e-waste have been left to handle More E-Waste. While A Significant e-

waste ends up in the municipal dumping sites thus polluting the environment. In addition, policies and legislation in place do not have recycling provisions nor do they address the issues of long storage of the absolute equipment in work places. This means that much e-waste remains in storage and also puts both recycler and local population at risk. The study established that residents near dump sites report waste fumes, chemical inhalation, and air and water pollution. This scenario was also observed by WAEMA (2008) in his study on e-waste management in Nairobi.

The study identified that EMCA, 1999 requires the waste generator to minimize waste and eliminate waste altogether as well as identifying and eliminating potential negative impacts of the product, enabling the recovery and reuse of the product, reclamation and recycling and incorporating environmental concerns in the design and disposal of a product. However, this policy is deficient as the component of recycling should commence from collection of advance recycling fee at the point-of-sale of electrical equipment components, disposal of electronic waste at dedicated collection points at their end of life and the final recycling/ safe disposal of e-waste by recyclers. The study further established that small volumes of e-waste are collected by the sampled institutions at limited collection points. The most commonly recycling method employed is dismantling and cable stripping. The process is largely manually operated. This practice exposes the workers and communities involved in dismantling e-waste to serious, health and environmental problems.

4.3 Extended Producer Responsibility as an E-Waste Management Strategy

The study established that EPR is one good component of managing e-waste which should be emulated by most institutions. EPR analysis was done using Sinha (2004) methodology that involved comparative analysis of five major comparison indicators – actor involvement, material flows and controls, externalities, financial metrics and market metrics comprising of 19 sub-indicators. The indicators were chosen on their ability to illustrate the most important characteristics of an e-waste management system.

4.3.1 Stakeholder (actor) involvement

The study showed that the level of involvement by all actors is still low. The national government has not developed clear policies and legal frameworks for management of e-waste. Producers in this case the importers/suppliers are importing equipment with short life span and the take back schemes are still underdeveloped. The highest involvement is that of collectors and recyclers who bear the physical and economic burden of the end-of-life management of the appliances. The retailers and end users deserve the 'medium' score because of their involvement in the second hand market and their role in extending the product life through reuse and repair. This is illustrated in figure 1.

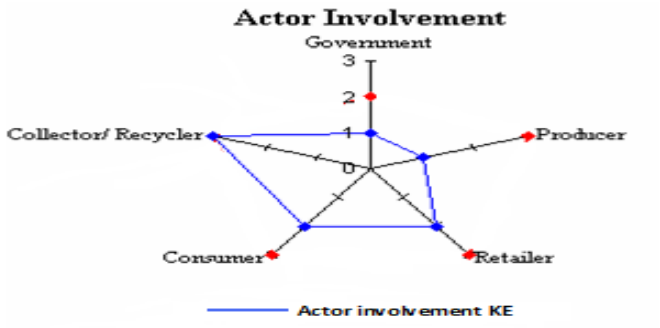

Figure 1: Actor Involvement in Nairobi

Similar studies done by Sinha (2004) showed that the Swiss system entails a high degree of involvement for all actors, who share the responsibility of the product equitably as compared to Nairobi. The consumer pays the Advanced Recycling Fees (ARFs) and must bring back the product, the retailer is obligated to take it back and the recycler must ensure that the e-waste is properly recycled. Through the producer responsibility organizations (pros), producers bear their share of the responsibility by ensuring that the environmental impacts of their products are minimal through its entire life cycle. The government is given only a 'medium' involvement score because the government does not participate in the system on a day-to-day. See table 3.

Table 3: Comparison Indicator - Actor Involvement In Kenya And Switzerland

Indicator	Kenya	Switzerland
Actor Involvement		
Producer Involvement	Low	High
Consumer Involvement	Medium	High
Retailer Involvement	Low	High
Collector/ Recycler Involvement	Medium	High
Government Involvement	Low	Medium

4.3.2 Material Flows & Controls

From the study, the per capita generation of e-waste was substantially lower as compared to a country like Switzerland. This study result is similar to EMPA (2009) which showed that the per capita generation of e-waste was substantially lower. There is still low market penetration of electronic and electrical equipment. But the variety of e-waste processed by selected institutions in Nairobi is similar in characteristics to that of Switzerland and India. Both systems encompass all (or most) types of discarded electronic and electrical appliances. However in Nairobi, no formal demarcation of responsibilities exists. Majority of collectors and recyclers process any kind of equipment that has electronic or electrical components only few recycling companies are specific on brands that they recycle. The study also established that the recycling companies in Nairobi get a low score due to complete lack of control over the flow of material. See figure 2.

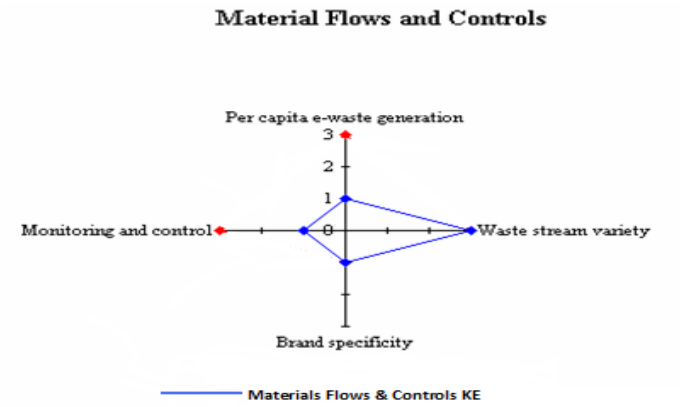

Figure 2: Comparison Indicator - Material Flow In Nairobi

Similar studies conducted by Sinha (2004) in Switzerland show that the country has a high score on e-waste generation per capita. Generally, the Swiss Association for Information, Communication and Organizational Technology (SWICO) and Stiftungfür Entsorgung Schweiz (hereafter S.EN.S) systems used in Sweden do not discriminate on the basis of product brand, accepting any equipment from all manufacturers, irrespective of when or where the product was sold. The main difference between Kenya and Switzerland systems is in terms of the controls and monitoring mechanism, whereas in Switzerland gets a high score because of the multiple levels of controls through the entire system, Nairobi gets a low score due to the complete lack of control over the flow of material. See table 4.

Table 4: Comparison Indicator – Material Flow in Kenya And Switzerland

Indicator	Kenya	Switzerland
Material Flows & Controls		
Per Capita E-Waste Generation	Low	High
Waste Stream Variety	High	High
Brand Specificity	Low	Low
Control & Monitoring	Low	High

4.3.3 Externalities

Externalities exist in both systems, both positive as well as negative. The study established the most positive aspect about the Kenyan system is the large number of jobs it generates. However, the low emission and occupational health standards are the negative aspects of the Kenyan system and need to be improved. See figure 3

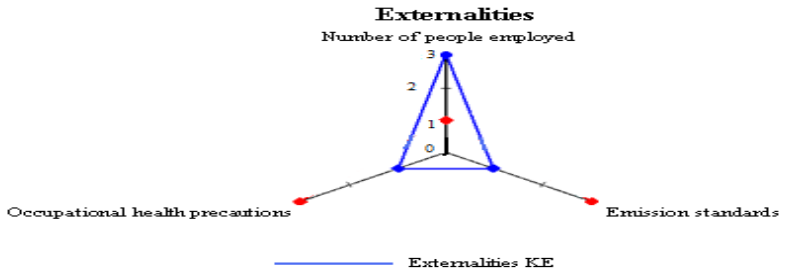

Figure 3: Comparison Indicator - Externalities In Nairobi

Similar studies conducted by Sinha (2004) showed that on the positive side, the Swiss system has high emission standards thus is able to have lesser soil, water and air pollution. Not only are the standards higher, the actors also comply with the requirements. The Swiss system also enforces high occupational health standards for people involved in the handling and treatment of e-waste. However, number of jobs it generates is low. See table 5.

Table 5: Comparison Indicator - Externalities In Kenya And Switzerland

Indicator	Kenya	Switzerland
Externalities		
Emission Standards	Low	High
Health & Safety Standards	Low	High
Employment Generation	High	Low

4.3.4 Financial Metrics

From the study, the labour cost involved in managing the e-waste system is low as compared to other countries. In addition, there is value addition to the waste at each step, as it passes from collector to dealer to recycler. The low cost of labour and the minimal investment required make it viable to finance the entire system through a wholly market mechanism, without requiring additional external financing. See figure 4.

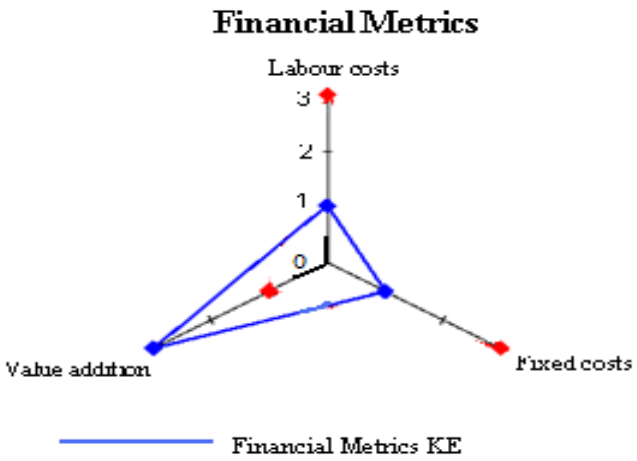

Figure 4: Comparison Indicator - Financial Metrics In Nairobi

Similar studies show that the financial metrics of Switzerland is a mirror image of that of Kenya. In Switzerland the labour cost involved in managing the e-waste system is substantially higher than that of Kenya. In addition, investment in specialized machinery and logistics infrastructure entails high fixed costs as well. However, the value added to the waste as it goes through the process is minimal, therefore necessitating external financing to cover the difference between the end value of the recyclables and the costs incurred. See table 6.

Table 6: Comparison Indicator – Financial Metrics In Kenya And Switzerland

Indicator	Kenya	Switzerland
Financial Metrics		
Labour Costs	Low	High
Fixed Costs	Low	High
Value Addition	High	Low

4.3.5 Market Metrics

The research established that the market saturation is such that ownership of electrical and electronic appliances is sparse. Appliances in Kenya are used for much longer than other countries; in part because it is cheaper to get the appliance repaired than purchase a new one, as well as reuse in the form of second hand appliances. The income disparity in Kenya ensures that there are takers for appliances at different price points, resulting in robust demand for most second hand consumer durables. The demand for secondary raw materials depends on several factors such as the quality of the material, the price differential between primary and secondary, and the sophistication of the manufacturing industry. The main reasons for a high demand for secondary raw materials in Kenya are the diverse manufacturing industry, as well as the price differential. The biggest factor which affects this indicator is the recycling of plastics. In Kenya the use of secondary plastic is widespread. See figure 5 below.

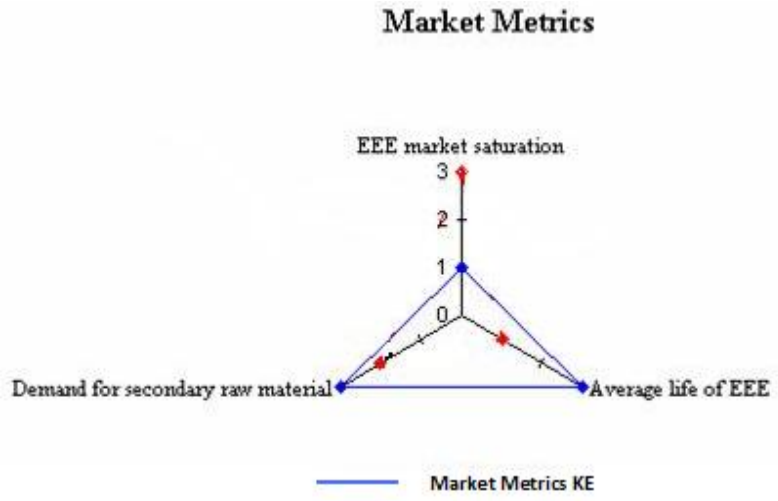

Figure 5: Comparison Indicator- Market Metrics In Nairobi

Similar studies conducted by Sinha (2004) show that the market metrics indicators between Switzerland and Kenya are almost opposites of each other. The high market saturation in Switzerland is on account of widespread ownership and high per capita spending on electronics and electrical appliances. The market saturation in Kenya is quite the opposite, with ownership of electrical and electronic appliances being sparse. In Switzerland; the electrical equipment are used for a shorter duration than Kenya. Switzerland also has reasonable demand for secondary raw materials given the large scale recycling sector and the high quality of the secondary material achieved. The biggest factor which affects this indicator is the recycling of plastics. Switzerland has negligible plastic recycling from e-waste and chooses to incinerate plastics for energy recovery while in kenya the use of secondary plastic is widespread. See table 7.

Table 7: Comparison Indicator – Market Metrics In Kenya And Switzerland

Indicator	Kenya	Switzerland
Average Product Life	High	Low
Market Saturation	Low	High
Demand For Secondary Raw Material	High	Medium

4.4 Awareness Programmes As An E-Waste Management Strategy

The study established that capability, awareness and training of the people involved in the management of e-waste are an important factor. Most of the e-waste activities have not yet been regulated thus making it impossible to know the e-waste handlers and there level of awareness on the hazardous nature of e-waste. While conducting the interviews it was very clear that the waste handlers were not aware of the contents in the EEE

that they were handling. Most recyclers dismantled e-waste without appropriate protection. The lack of awareness applies to the end users too. Most of the end Users Interviewed Had No Information On How To dispose of their eol eee, thus necessitating creation of awareness on e-waste management and safe disposal channels.

End users perceive e-waste as a resource that can generate income thus the unwillingness of consumers to give out their EoL goods for free. This perception is further enhanced by the value attached to products by the consumers; there is a tendency to store EoL EEE especially mobile phones and computers in their offices even if these products are obsolete as opposed to disposing them. The end users' reluctance to pay for recycling and disposal services reinforces the notion that nothing goes to waste and that garbage is money. The above perceptions make end users reluctant to freely participate in EoL management of EEE that has not benefit to them.

The study also showed that end users are an important link in the production-consumption chain. End users have certain rights including the right to satisfaction of basic needs, right to safety, right to information, right to choose, right to be heard, right to redress, right to consumer education and right to a healthy environment. Unfortunately end users tend to be unaware of some of these rights, for example in Kenya we still have purchase receipts indicating that *'goods once sold cannot be returned'* while in developed countries the statement changed to read *'if you are not satisfied you get a refund'*.

From the study end users have responsibilities including critical awareness, action, solidarity, empathy and maintaining a healthy and sustainable environment. End users of electronic products have a responsibility to buy smart, use right, and manage well and at the end of useful life, to dispose well. Items that have not reached the end of their useful life can be donated or repaired for continued use.

V. Conclusion

The existing framework requires substantial updates, particularly with respect to the issues regarding importation, responsibility of the manufactures, importers and distributors as well as awareness creation among the end users. This should be addressed in order to properly equip Kenya for managing what will hopefully grow into a thriving ICT sector with consequences of high volumes of e-waste being generated and if not well managed, finding their way to the dumpsite. Best-practice standards that have been time-honored in successful e-waste management systems in developed countries definitely represent the international gold standard in e-waste management.

Recommendations:

Specific, policy-oriented recommendations to facilitate management of e- waste management in kenya include;

1. **Development of a comprehensive national strategy:** there is need to develop a comprehensive national strategy on e-waste that will extensively address the management of the various e-waste issues in the country, the importation of second hand e-products and the donations.
2. **Adoption and implementation of EPR:** e-waste is an emerging waste stream that is inadequately addressed in the existing regulations. In order to fill the gaps identified in the existing policies, institutional and regulatory mechanisms in addressing e-waste there is need to incorporate **extended producer responsibility (**EPR) in Kenya's environmental legislation and regulations.
3. There is need of inclusion of e-waste as a waste category in the EMCA and subsidiary regulations. This can also be done by developing a legislation/regulation specifically on e-waste handling the collection, storage, recycling and disposal of e-waste. The regulation can introduce EPR mandating the producers and importers to take responsibility of their products at the EoL, it can also introduce standards, specifications and mandatory labeling of second hand products, donations and refurbished products as a way of keeping track on these products and differentiating them from new products.
4. **Awareness and information disseminations:** from the interviews conducted it is apparent that the end users are not aware of the existence of the collection scheme by the manufacturer. There is a need for the manufacturer to create awareness on the schemes existence and purpose. The awareness can be created through various channels such as: media advertisement especially the radio as it has a wider coverage, and through the road shows at times conducted by the manufacturers in advertising new phones. There is a need for the manufacturer to dedicate funds to the promotion of the take-back scheme. The manufacturer could also promote the scheme through schools as a way of reaching a wider population.

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