e-waste



e-Waste Assessment Tanzania

UNIDO e-waste initiative for Tanzania

Presented by:
Anne Magashi (Cleaner Production Centre of Tanzania)
Mathias Schluep (EMPA - Switzerland)

FINAL Report

20 January 2011

UNIDO Microsoft Your potential. Our passion.

EMPA Materials Science & Technology

Table of Contents

Acronyms and Abbreviations

ARSCP	African Roundtable on Sustainable Consumption and Production
ATE	Association of Tanzania Employers
BRELA	Business Registrations and Licensing Agency
COSTECH	Tanzania Commission for Science and Technology
CPCT	Cleaner Production Centre of Tanzania
CTI	Confederation of Tanzania Industries
DOE	Division of Environment
EEE	Electrical and Electronic Equipment
FCC	Fair Competition Commission
GDP	Gross Domestic Product
GNI	Gross National Income
ICT	Information and Communication Technologies
INGOs	International Non-Governmental Organizations
IT	Information Technology
MITM	Ministry of Industry Trade and Marketing
MoWI	Ministry of Water and Irrigation
NBC	National Bank of Commerce
NIMR	National Institute for Medical Research
NMB	National Microfinance Bank
PCs	Personal Computers
TCCIA	Tanzania Chamber of Commerce Industry and Agriculture
TIRDO	Tanzania Industrial Research & Development Organization
TRA	Tanzania Revenue Authority
TTCL	Tanzania Telecommunications Company Ltd
TVs	Televisions
URT	United Republic of Tanzania
VPO	Vice President’s Office

Summary

The fast growing use of Information and Communication Technology (ICT) and rapid turn-over in technology is creating a growing e-waste stream not only in industrialized but also in developing countries like Tanzania. The challenge of e-waste is even of greater concern in developing countries because most of these countries lack the capacity for handling and recycling the hazardous materials contained in e-waste. This leads to disposal of both e-waste and municipal waste in dumpsites hence polluting the environment and creating health risks to the nearby community and the population at large.

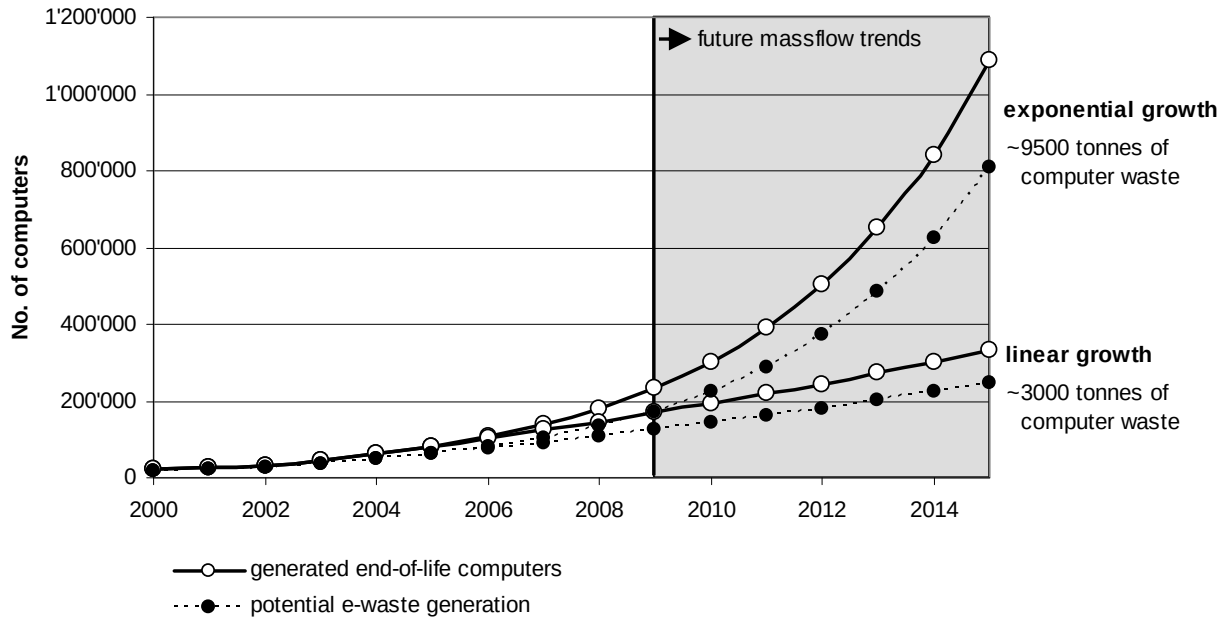
The magnitude and flow of e-waste generation is not well known in Tanzania. Only a few studies exist, which contain a rough estimate of the installed base of computers and e-waste generated (Kaunde 2009, VPO 2005) and analyzes the stakeholder set-up in Dar es Salaam (Mataheroe 2009). Moreover, there is inadequate information on the existing practices and strategies on e-waste management in the country.

This report provides the findings of an e-waste assessment study conducted by the Cleaner Production Centre of Tanzania in collaboration with EMPA of Switzerland within the framework of the "UNIDO e-waste initiative for Tanzania". The overall objective of the study was to get a reliable overview of the e-waste landscape in Tanzania, through a baseline study focusing mainly on computers and other IT equipment including mobile phones and TVs. The methodology used involved mainly data acquisition and analysis of the e-waste through literature review, consultations with stakeholders, field study questionnaires and observations by the expert team in the field. Field studies covered four urban centres (Dar es Salaam, Arusha, Moshi and Zanzibar) focusing mainly in Dar es Salaam for the in-depth field assessment

The study has shown that the use of ICT equipment is still low in Tanzania compared to other countries in the world but it is growing at a staggering pace. According to the World Bank data in the last decade for instance, the penetration rate of personal computers has increased by a factor of 10, while the number of mobile phone subscribers by a factor of 100! Extrapolations until the year 2009 suggests that the penetration rates of personal computers lies around 19.5 computers per 1000 people, which corresponds to an installed base of 850'000 units in 2009.

The results of this study have further shown that the average distribution sales of new computers are 50% to government; 40% to the private companies and 10% to private households & small businesses while the survey from second-hand dealers showed that second hand IT equipment are mainly sold to private households & small businesses. The average life of new computers was found to be 4 years in government and private sector and 8 years in private households and small businesses while the average life of second hand computers was found to be around 5 years. Based on the results of this survey and some key development statistics for Tanzania, it was estimated that about 200,000 computer units reached their end-of-life in 2009. Considering the fact that the current disposal practice of e-waste in Tanzania is mainly storage, this implies that there will soon be an increasing growth of e-waste stream in the country as more and more ICT equipment reaches their end-of life. Hence it is an opportune time for Tanzania to start addressing the problem of increasing e-waste volumes. Not addressing the fact of growing e-waste volumes bears the risk of a developing informal sector, with all its social and environmental drawbacks.

Future computer massflow trends based on linear and exponential growth indicate that the potential e-waste generation from computers could be between 250,000 and 800,000 computer units in 2015 respectively, which is equivalent to 3,000 – 9,500 tonnes.



The study report has also highlighted the strengths, weaknesses and opportunities of the current situation in the country in managing e-waste. Among the identified strengths include existence of relevant policies, legislation and institutional framework which support e-waste management; and initial developments towards environmental regulations and strategies which are specifically for e-waste management. There is also a strong downstream market for some of the e-waste fractions such as copper.

The weaknesses of the current situation include, among others, lack of specific policy on e-waste management; poor data records on imported products as new and second hand products are not distinguished; absence of reliable data on existing dealers of computers and IT equipment from the authorities; absence of reliable data on stocks and e-waste generation from the stakeholders; lack of disposal facilities for hazardous wastes; general lack of proper recycling activities for e-waste; weak enforcement of legislation; lack of public awareness on e-waste and its potential risks to the environment and human health; lack of infrastructure for formal collection and recycling of e-waste; and illegal dumping of e-waste such as burning and burying.

Some tentative general recommended actions for improving e-waste management in Tanzania and specific recommendations for the UNIDO e-waste initiative for Tanzania have also been given. As one of the main recommendations it is suggested to establish a manual dismantling facility in a joint effort by the main stakeholders. This will demand identifying possibilities for start-up funding, support a collection system and identify the appropriate downstream processes. Since the current potential e-waste generated in the country will not be sufficient to support a stable dismantling business, paid by the intrinsic value of the material fractions only, special attention needs to be given to appropriate financing mechanisms. In addition, the UNIDO e-waste initiative for Tanzania should support the on-going national stakeholder process, which is currently driving national policy and legislation as well as foster initiatives from the private (ICT) sector. Some activities will need regional approaches where UNIDO should play a broker role and integrate tasks in their ongoing coordination efforts for e-waste management in Eastern Africa.

1 Introduction

1.1 Problem identification

Information and Communication Technology services are a prerequisite for socio-economic development of any society in the today's world. ICTs provide easy access to information, knowledge and experience, and hence empower them to tackle the challenges of everyday life more easily. ICTs are also vital for good governance including gender balance, poverty reduction and improvement of health and education services. However, the fast growing use of Information and Communication Technology (ICT) and rapid turn-over in technology (particularly computers, mobile phones, etc) is creating a growing e-waste stream not only in industrialized but also in developing countries like Tanzania. The challenge of e-waste is even of greater concern in developing countries because most of these countries lack the capacity for handling and recycling the hazardous materials contained in the e-waste. This leads to disposal of both e-waste and municipal waste in dumpsites hence polluting the environment and creating health risks to the nearby community and the population at large.

The contribution of the micro, small and medium enterprises (MSMEs) to the socio-economic development of Tanzania is now acknowledged in Tanzania as they play a big role in terms of providing employment to the people hence reducing poverty and generating income to the government through taxes. The private sector is now the engine of the economy in Tanzania. In this respect the government has taken a number of initiatives to support the development of MSMEs including formulation of the Small and Medium Enterprises Policy of 2003. However, there are still a number of challenges facing the MSMEs such as limited access to information and inefficient technologies which lead to lower productivity and higher operational costs.

In an attempt to address these challenges, UNIDO plans to assist in the implementation of an environmentally sounds and sustainable computer refurbishment and recycling centre that offers affordable computers with responsible disposal and recycling solutions once the computers reach the end of their life. The initiative is part of the UNIDO – Microsoft partnership agreement that was signed in July 2006.

The magnitude and flow of e-waste generation is not well known in Tanzania. Only a few studies exist, which contain a rough estimate of the installed base of computers and e-waste generated (Kaunde 2009, VPO 2005) and analize the stakeholder set-up in Dar Es Salaam (Mataheroe 2009). Moreover, inadequate information on the existing practices and strategies on e-waste management is a concern to all interested parties in the country. Consequently, UNIDO has commissioned the EMPA in collaboration with the Cleaner Production Centre of Tanzania to undertake a rapid assessment on the existing e-waste landscape in Tanzania. The data to be obtained will define a solution for handling the e-waste associated with the UNIDO e-waste initiative for Tanzania.

1.2 Objective of the assessment

The overall objective of the study was to get a reliable overview of the e-waste landscape in Tanzania, through a baseline study (a rapid e-waste assessment). The focus was on computers and IT equipment including PCs, printers, TVs and mobile phones. The findings of the study will provided:

a) the necessary data to define a solution for handling the e-waste associated with the UNIDO e-waste initiative for Tanzania

b) a set of recommendations on the next steps for the development of a nation-wide e-waste strategy.

c) information for the development of policy and legislation that will address the management of e-waste

The specific objectives of the assessment were to:

a) Provide an overview of the current e-waste landscape, ascertain current and future flows of e-waste, estimate the current volume of e-waste in the country, determine the existing processing practices and identify local capacities to handle the recycling of different types of material.

b) Determine the support required for the development of sustainable e-waste management in Tanzania through a demonstration dismantling and/or recycling unit within the UNIDO e-waste initiative for Tanzania, considering locally existing informal and formal operations.

c) Provide options for a stakeholder network and form e.g. a local e-waste strategy group which will recommend a roadmap for further investigations.

2 Methods

The e-waste assessment was conducted in accordance with the e-waste assessment methodology developed by EMPA which was applied in Uganda and Trinidad & Tobago in 2008 and 2010 respectively. The methodology involved mainly data acquisition and analysis of the e-waste through literature review, consultations with stakeholders, field study questionnaires and observations by the expert team in the field.

2.1 Data acquisition

2.1.1 Literature review and statistical data

General information on e-waste and management has been obtained from EMPA (ewasteguide.info) and public websites of international organizations such as the Basel Action Network (www.ban.org) and the Basel Convention on Control of Trans-boundary Movements of Hazardous Wastes and their disposal (www.basel.int). Available information on the existing e-waste generation, characterization and management in Tanzania were obtained by reviewing current documents and study reports on e-waste undertaken in the country including policies, legislations and other studies made in the country.

Data on development indicators where drawn from international and national databases including the World Development Indicators (World Bank 2010), CIA World Factbook (CIA 2010) and the World Economic Forum (WEF 2010). Statistical data on imports of ICT products into the country were drawn from national and international statistical databases such as the Tanzania Revenue Authority (TRA 2010) and the UN-COMTRADE (Comtrade 2010). These databases record imports in accordance with the Universal Harmonised System for Commodities. The relevant code for IT material is no. 8471 ("automatic data processing machines (computers)"). Subcodes are devided into codes referring to entire computer units (desktops or laptops) and associated items (Table 1). Only the volumes recorded under the subcodes referring to computer units were considered for the massflow calculations.

Table 1: Subcodes for imported IT materials listed under code 8471 ("automatic data processing machines (computers)") according to the Universal Harmonised System for Commodities (Comtrade 2010).

Code	Description	Interpretation
847130	Portable automatic data processing machines, weighing not more than 10 kg, consisting of a least a central processing unit, a keyboard & a display	codes referring to entire computer units
847141	Other automatic data processing machines : Comprising in the same housing at least a central processing unit & an input & output unit, whether/not combined	
847149	Other automatic data processing machines , presented in the form of systems.	
847150	Processing units other than those of sub-heading 8471.41/8471.49, whether/not containing in the same housing one/two of the following types of unit : storage units, input units, output units	
847160	Input/output units, whether/not containing storage units in the same housing	associated items
847170	Storage units	
847180	Other units of automatic data processing machines, exclude. 8471.50, 8471.60, 8471.70.	
847190	Magnetic/optical readers, machines for transcribing data onto data media in coded form & machines for processing such data, n.e.s.	

2.1.2 Meetings and workshops

Consultative meetings were made with relevant stakeholders on the outset of the study for purposes of familiarization, soliciting support from the key stakeholders and training the local expert team on the e-waste as-

sessment methodology. Follow-ups and additional meetings and workshops with key stakeholders were organized as needed as part of the data acquisition as described in the following chapters.

2.1.3 Surveys, questionnaire sampling

Considering the fact that there are still a number of gaps in the available data to facilitate a country wide e-waste assessment and the limited time for the study, field study questionnaires have been developed for an in-depth surveys targeting mainly key consumers including the Government, Universities (e.g. University of Dar es Salaam through the University Computing Centre), households (e.g. through door-to-door questionnaires) and large enterprises (banks, telecom companies and one manufacturing company). The questionnaires for government, universities and large enterprises were complemented by face to face interviews. The structure of the questionnaires have been adapted/adopted from the e-waste assessment methodology manual of EMPA. The adapted/modified questionnaires aimed to obtain primary information/data on:

- General information on the existing policies of the institution/company with regard to e-waste management
- Stock and generation of e-waste
- End-of-life management of e-waste

2.1.4 Field studies

Field studies in four urban centres (Arusha, Dar es Salaam, Moshi & Zanzibar) were conducted through site visits and direct interviews held with the key stakeholders including consumers, distributors, retailers and recyclers. A list of stakeholders in visited and/or interviewed is shown in *Annex 1*.

2.2 Massflow assessment

The massflow assessment will be conducted in accordance with the methodology described in the e-waste assessment methodology manual of EMPA.

2.3 Limitations

The methodology used in massflow assessment of e-waste depends on primary data collected from the various stakeholders especially the quantities of products imported and their life-span. Thus getting reliable data from key stakeholders was very crucial and a big challenge in this study. In addition to taking a small sample size for the various stakeholders, most of them lack or do not have easily accessible information on their e-waste stocks and generation. As a result some of them failed to provide data or provided only estimated quantities for their stocks, purchases, sales or e-waste generation. Some of the retailers were also reluctant to provide information on their annual sales mainly due to fear of taxation.

Import and Export data from the Tanzania Revenue Authority was easily accessible and found to be more or less reliable. However, the data at TRA do not distinguish between new and second-hand products. Import of unassembled units could also lead to underestimation of imported products. It has been assumed that about 13% of imported computers are second-hand based on responses from three distributors/retailers of new and three retailers of second hand computers regarding their estimated annual sales between 2008 and 2009. Thus if the percentage of imported second-hand computers and other IT equipment is higher than 13%, then the estimated e-waste generation in the country could be understated, but all in all the study showed the general magnitude of e-waste generation in the country.

3 System definition

3.1 Geographical Scope

Tanzania is situated in East Africa, just south of the Equator bordering the Indian Ocean on the east; Kenya and Uganda on the north; Mozambique and Malawi on the south; and on the west it shares borders with Zambia, Zaire, Rwanda, and Burundi (see Figure 1). The United Republic of Tanzania, with a total land area of 883,749 sq km, constitutes Tanzania Mainland and islands of Pemba and Zanzibar.

Administratively, Tanzania is currently divided into 29 (26 old and 3 new) regions namely, Arusha, Dar es Salaam, Dodoma, Geita, Iringa, Kagera, Kigoma, Kilimanjaro, Lindi, Manyara, Mara, Mbeya, Morogoro, Mtwara, Mwanza, Njeruma, Pemba North, Pemba South, Pwani, Rukwa, Ruvuma, Shinyanga, Simiyu, Tabora, Tanga, Zanzibar Central/South, Zanzibar North and Zanzibar Urba/West. The new regions which were announced by the President in June 2010 are Geita, Njeruma and Simiyu. The major urban centres are in Arusha, Dar es Salaam, Kilimanjaro, Mwanza and Tanga regions in the Tanzania mainland as well as Zanzibar Central/South in the Isles whereby most of the commercial activities are concentrated mainly due to the available infrastructure for various services. This means that use of ICT is also concentrated in these urban centres. In this regard, the scope of this study will include all the major urban centres focusing mainly on Dar es Salaam for the in-depth assessment.

Figure 1: National Boundaries of Tanzania **Urban Centres covered during field work**

3.2 Product Scope

This assessment focuses mainly on computers and IT equipment, such as personal computers (desktop and laptop computers) and mobile phones. As far as synergies allowed for and in view of a more comprehensive picture of the e-waste situation in Tanzania other electrical and electronic equipment were included in some of the data analysis. This includes fridges and air conditioners, irons and kettles as well as radios and Hi-Fis as tracer materials for large and small household appliances as well as consumer equipment.

3.3 Development indicators

3.3.1 People

In 2008, Tanzania was estimated to have a population of about 42.5 million and an annual growth rate of 2.9% (World Bank 2010). Unemployment is at 4.3% with a labor force of approx. 21.2 Mio. Around 80% of the people are employed in the agricultural sector and 20% in industry and services. Around 700,000 people are employed in the private formal sector, not counting governmental services (number for 2005, NBS 2010). The governmental sector employs approx. 260,000 civil servants (number for 1999, ADB 2005),. The majority of the people in Tanzania mainland are Africans, representing 99% of the population of which 95% are Bantu consisting of more than 130 tribes. The other 1% of the population consists of Asians, Europeans and Arabs. The population of the Isles consists of Arabs, Africans and mixed race of Arab-Africans. More than 80% of the population in Tanzania lives in rural areas and the majority of them are farmers. The official language is Kiswahili although English language is used as a medium of instruction in secondary schools and institutions of higher learning. The table below shows some of the development indicators for the people in Tanzania.

Table 2: Development indicators for Tanzania with a bearing on e-waste, section "People"

Indicator	Year	Value	Reference
Population, total (in Mio)	2008	42.5	World Bank 2010
Population growth (annual %)	2008	2.8 %	World Bank 2010
Unemployment, total (% of total labor force)	2006	4.3 %	World Bank 2010
Labor force total	2009	21.2 Mio	CIA 2010
Labor force agriculture	2002	80 %	CIA 2010
Labor force industry and services	2002	20 %	CIA 2010
Labor force annual growth (%)	2002 - 2008	2.7 %	NBS 2010
GINI index	2000	34.6	CIA 2010

3.3.2 Environment

Tanzania has identified six major environmental problems which need urgent attention. These are land degradation; lack of accessible, good quality water for both urban and rural inhabitants; environmental pollution; loss of wildlife habitats and biodiversity; deterioration of aquatic systems; and deforestation.

Environmental pollution is particularly more in urban areas than in rural areas due to rapid growth of population in urban areas which has caused tremendous pressure on the existing services and amenities. Water pollution is the most widely spread form of environmental pollution in urban and rural areas mainly caused by agricultural, mining, industrial and transport activities. Indiscriminate solid and liquid waste disposal also contributes significantly to water, air and soil pollution.

Table 3: Development indicators for Tanzania with a bearing on e-waste, section "Environment

Indicator	Year	Value*	Reference
Land area (sq. km)	2002	883,749	World Bank 2010
Population in largest city (in Mio)	2005	2.7 Mio	World Bank 2010
Population in urban agglomerations > 1 million (% of total population)	2005	7.0 %	World Bank 2010
Rural population (% of total population)	2005	75.8%	World Bank 2010
Urban population (% of total)	2005	24.2%	World Bank 2010
Households (total)	2002	7.0 Mio	NBS 2010
Household size national (number of people)	2002	4.9	NBS 2010

3.3.3 Economy

The economy of Tanzania depends heavily on agriculture, which accounts for more than 40% of GDP, provides 85% of exports, and employs about 80% of the total work force (World Bank 2010). It is one of the least developed countries. In 2008 it had a per capita GDP of $ 1400 (CIA 2010). The country's sustained economic reforms being implemented in the country over the past several years has enabled the economy to grow by an average of 6% between 2000 and 2007 (CIA 2010). The country has remained politically stable since independence and the economy continues to show positive overall performance.

Tanzania has recently liberalised both local and international trade. This has resulted in an increasing flow of goods in and out of the country. For instance, in 2006 the contribution of internal trade to GDP was 17.5% with a growth rate of 8.4% while in 1995 the contribution of internal trade to GDP was 15.7% and growth rate was only 3.5% (MITM 2010). The communication services have also grown drastically from 10.4% in 2002 to 20.5 in 2008. The contribution of the communication sector to the GDP was 2.5% in 2008 compared to 1.2 % in 2002. The growth has mainly been due to an increasing number of mobile phone subscribers. Mobile phone subscribers have increased from 1,500 in 1993 to over 13 million in 2008 (see Table 5.

Table 4: Development indicators for Tanzania with a bearing on e-waste, section "Economy"

Indicator	Year	Value	Reference
GDP (Purchasing Power Parity in billion US$)	2008	57.7	CIA 2010
GDP per capita, PPP (Purchasing Power Parity , current international $)	2008	1400	CIA 2010
Agriculture, value added (% of GDP)	2006	45.3	World Bank 2010
Industry, value added (% of GDP)	2006	17.4	World Bank 2010
Services, etc., value added (% of GDP)	2006	37.3	World Bank 2010
Consumer price index (year 2000 = 100)	2005	119.4	World Bank 2010
Average annual growth - Agriculture	1998 - 2008	4.7	World Bank 2010
Average annual growth - Industry	1998 - 2008	8.8	World Bank 2010
Average annual growth - Services	1998 - 2008	6.1	World Bank 2010

3.3.4 States & Markets

Tanzania's teledensity is still low compared to other countries in the world but it is growing very fast. Studies have shown that the teledensity has increased tremendously over the last eight years from 1% in 2000 to 32% in 2008 (see Table 5). However, it is currently ranked 120th in networked readiness in the world and 17th within the low income group countries (WEF 2010). In 2003, the number of fixed and cellular lines was 7.2 lines per 100 people while the number of mobile phone subscribers stood at 6 – 7 lines per 100 inhabitants. The population covered by mobile cellular networks increase from 25% in 2000 to 65% in 2008.

Table 5: Trend of telephone subscribers in Tanzania: 2000 – 2008 (TCRA 2009)

Year	Fixed Lines	Mobile	Total Sub-scribers	Population	Teledensity (%)
2000	173,591	110,518	284,109	33,463,388	1
2001	177,802	275,560	453,362	33,756,093	1
2002	161,590	606,859	768,449	34,161,166	2
2003	147,006	1,298,000	1,445,006	34,876,231	4
2004	148,360	1,942,000	2,090,360	36,049,581	6
2005	154,420	2,963,737	3,118,157	37,267,530	8
2006	151,644	5,614,922	5,766,566	38,523,907	15
2007	163,269	8,322,857	8,486,126	39,816,363	21
2008	123,809	13,006,793	13,130,602	41,146,284	32

The government has fully liberalized the provision of internet services in order to encourage competition. However, most of the internet service providers are concentrated in urban areas due to the available infra-structure.

All ICT equipment is currently being imported since there are no local manufacturers and account for approx 6% of all imports (WEF 2010). Unfortunately there are also no standards which guide imports of both hard-ware and software (Verbal information from TBS). Table 6 shows ICT development indicators for Tanzania for the period 2000 to 2008.

Table 6: Development indicators for Tanzania with a bearing on e-waste, section "States & Markets" (World Bank 2010, WEF 2010)

Indicator	Year			
	2000	2004	2007	2008
Population (in millions)	34	36.5	40.45	42
Personal computers (per 1,000 people)	3	7.4	na	na
Internet users (per 1,000 people)	1	8.9	9.5	12
Telephone mainlines (per 1,000 people)	5	3.9	5.8	3
Mobile phone subscribers (per 1,000 people)	3	51.6	204	306
Households with television (%)	3			6

4 Policy & Legislation

4.1 e-Waste related policies & legislation

4.1.1 e-Waste related Policies

Tanzania has no specific policy on e-waste management but a number of policies are in place which aim at protecting the environment and human health. Among the existing policies relevant to e-waste management include the National Environment Policy (1997); Sustainable Industrial Devel-opment Policy (SIDP) 1996 – 2020; National Water Policy (2002); National Energy Policy (2003); National Trade Policy (2003); Small and Medium Enterprises (SMEs) Development Policy (2003); the National Health Policy (2003); Science and Technology Policy (1996); and the National Information and Communications Technologies (ICT) Poli-cy (2003). An overview of the e-waste related policies is given in Table 7.

Table 7: Overview of e-waste related Policies

Policy	Objectives	Relevancy to e-waste management
National Environmental Policy (1997)	To ensure sustainability, security, and equitable use of resources to meet the basic needs of the present population without compromising those of the future generations and without degrading the environment or risking health or safety.	Sets overall framework for environmental management issues in the country Promotes health related programmes including food hygiene, separation of toxic /hazardous wastes and pollution control at household level Proper e-waste management reduces pollution load to the environment and reduces risks to human health
National Energy Policy (2003)	To ensure availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national development goals	Promotes use of energy efficient equipment Promotes use of EEE and hence contributes to e-waste generation
The Sustainable Industrial Development Policy (1996-2020)	To achieve sustainable industrial development.	Promotes industrial development with less pollution Promotes efficient use of resources and recycling activities
The Small and Medium Enterprise (SMEs) Development Policy (2003)	To foster job creation and income generation through promoting the creation of new SMEs and improving the performance and competitiveness of the existing ones to increase their participation and contribution to the Tanzanian economy To facilitate and support programmes focusing on increased access of information pertinent to the development of SMEs	Encourages development of SMEs Encourages job creation Ensures that SME operators at all levels have access to information at affordable cost E-waste recycling activities could contribute to the development of SMEs, creation of employment and access to information at affordable cost.
National Trade Policy (2003)	To raise efficiency and widen linkages in domestic production and building of a diversified competitive export sector as the means of stimulating higher rates of growth and development	Promotes trade development Recovery of valuable fractions in e-waste could contribute to this policy
National Water Policy (2002)	To ensure that beneficiaries participate fully in planning, construction, operation, maintenance and management of community based domestic water supply schemes.	Promotes prevention of pollution of water sources Efficient e-waste management system prevents pollution of water bodies
National Health Policy (2007)	To improve the health of all Tanzanians, particularly those at high risk	Encourages safe disposal of hazardous wastes from health services including medical equipment & devices. E-waste contains hazardous substances
Human Settlement Development Policy (2000)	To ensure sustainable human settlement development	Encourages human settlements to be kept clean Ensures that pollution from solid and liquid wastes do not endanger the public health E-waste is one of the solid wastes which could endanger public health if not well managed
National ICT Policy (2003)	To provide a national framework that will enable ICT to contribute towards achieving the national development goals; and to transform Tanzania into a knowledge-based society through application of ICT	Promotes investments in ICT Promotes competitive development and production of ICT products and services Promotes establishment of direct relationships with manufacturers and designers of ICT resources E-waste recycling activities could lead to establishment of relationships with manufacturers and designers of ICT equipment.
National Science and Tech-	To promote science and technology	Promotes application of scientific knowledge,

Policy	Objectives	Relevancy to e-waste management
nology Policy (1996)	as tools for economic development, the improvement of human, physical and social well being, and for the protection of national sovereignty.	techniques and organizational methods in the production of goods and services. Promotes sharing of information on R & D R & D is still needed in the country in order to have sustainable e-waste management in the country. Capacity building and sharing of knowledge among the stakeholders is also needed.

4.1.2 e-Waste related Legislation

The Environmental Management Act (EMA) No. 20 of 2004 is the core legislation for all environmental issues in the country. EMA (2004) provides the legal and institutional framework for sustainable management of the environment. It also provides principles for environmental management, impact and risk assessments, prevention and control of pollution, waste management, environmental quality standards, public participation, compliance and enforcement. The Act provides a basis for the implementation of the National Environment Policy (1997) and the implementation of international instruments on environment including establishment of national offices and focal points for the implementation of international agreements on environment.

The Act stipulates the role of the local government in management and control of solid waste such as minimization, segregation, collection, transportation, storage, treatment and disposal of solid waste from various producers in both urban and rural area. The Act also includes provisions for handling hazardous waste.

The Environmental (Solid Waste Management) regulations of 2009 give further elaborations on the provisions of EMA (2004) pertaining to solid waste management while the Environmental Management (Hazardous Waste Control), 2009 elaborates on the provisions related to hazardous waste management. For instance, under solid waste management, the Environmental (Solid Waste Management) regulations of 2009 prohibits any person to deposit certain solid waste such as electrical and electronic waste unless the receptacle has been approved in accordance with the Environmental Management (Hazardous Waste Control) regulations, 2009.

Other related e-waste legislation include the Occupational Safety and Health Act (2003); Tanzania Bureau of Standards Act, 1975 (Act No. 3 of 1975); Fair Competition Act, 2003; Merchandise Marks Act (1963); Water Resources Management Act No.11 (2009); and the Local Government (Urban Authorities) Act No. 8 (1982) and Local Government (District Authorities) Act No. 7 (1982). An overview of some of the existing legislation including the responsible institutions and relevance to e-waste management is given in Table 8 below.

Table 8: Overview of Environmental Laws and Regulations related to e-waste Management

Legal Instrument	Major Content / Objective(s)	Influence on e-waste	Responsible Bodies
National Environmental Management Act (EMA) No 20 of 2004.	Provides principles for environmental management, impact and risk assessments, prevention and control of pollution, waste management, environmental quality standards, public participation, compliance and enforcement. Main objective is to protect the environment against pollution and promote sustainable management of the environment.	High	Vice President's Office National Environment Management Council (NEMC) Local Government Authorities
The Environmental (Solid Waste Management) Regulations of 2009	Provides principles for management and control of solid waste including administration and institutional arrangement, licences and permits	High	Vice President's Office National Environment Management Council (NEMC) Local Government Authorities
Environmental Management (Hazardous Waste Control), 2009	Provides principles for management and control of hazardous waste including e-waste.	High	Vice President's Office National Environment Management Council (NEMC) Local Government Authorities
Tanzania Food, Drugs and Cosmetics Act (2003)	To provide for the efficient and comprehensive control and regulation of manufacture, import, export, distribution and sell of food, drugs, medical devices, cosmetics, herbal drugs, poisons and medical devices for human consumption.	Low	Tanzania Food and Drugs Authority (TFDA Ministry of Health and Social Development
Occupational Safety and Health Act (2003)	To protect workers' safety, health and welfare in all workplaces. To protect other persons than those at work against hazards to health and safety who may be affected by the effects in connection with the activities of persons at work.	High	Ministry of Labour and Youth Development Occupational Safety and Health Authority
Tanzania Bureau of Standards Act, 1975 (Act No. 3 of 1975);	Provides for the establishment and functions of the Tanzania Bureau of Standards, a national standardization body. TBS develops products and environmental quality standards.	High	Ministry of Industry, Trade and Marketing Tanzania Bureau of Standards
Fair Competition Act, 2003 and Merchandise Marks Act (1963)	The Act establishes the Fair Competition Commission (FCC) with the aim of protecting and promoting effective competition in trade and commerce as well as protecting the consumers from unfair and misleading market conduct. The FCC is also charged with the responsibility of enforcing the Merchandise Marks Act of 1963, which is the legal instrument for fighting counterfeits. The Merchandise Marks Act (1963) prohibits supply of fake products, unsafe products and products which do not comply with the prescribed standards of the products.	High	Fair Competition Commission
Atomic Energy Act (2003)	Establishes the Tanzania Atomic Energy Commission and provides for its functions in relation to the control of the use of ionizing and non ionizing radiation sources, the promotion of safe and peaceful uses of atomic energy and nuclear technology.	Low	Tanzania Atomic Energy Commission
Water Resources Management Act No.11 (2009)	Controls management of water resources in the country. It covers institutional framework for the management of water resources, at national and local levels, water rights, pollution control, standard for various uses and effluent discharge limits.	Low	Ministry of Water and Irrigation Urban Water Utilities River Basins

Legal Instrument	Major Content / Objective(s)	Influence on e-waste	Responsible Bodies
Local Government (Urban Authorities) Act No. 8 (1982) and Local Government (District Authorities) Act No. 7 (1982).	The Acts provide for management of waste from human activities such as sewage, refuse, filth and human excreta. Other types of waste are not adequately addressed in the Acts.	Low	City /Municipal/District Authorities

4.2 Specific e-waste management legislation

Tanzania has no specific e-waste management legislation. E-waste is managed through the solid waste and hazardous regulations prescribed under the Environmental Management Act (2004). Part VIII of the Environmental Management (Hazardous Waste Control) regulations, 2009 of the Environmental Management Act (2004) addresses the issue of electrical and electronic waste.

Regulation 35 (1) requires every person who possesses or have control of electrical or electronic tools, accessories or equipment to segregate the e-waste from other types of waste and deposit separately into receptacles as prescribed by the National or Local Authorities. The obligation to segregate e-waste applies to collection, transportation and final disposal of e-waste from equipment and devices listed in the eighth schedule of the regulations. EEE categories listed in the 8th schedule of regulations include large household appliances; small household appliances; IT and Telecommunication equipment; consumer equipment; lighting equipment; electrical and electronic tools; Toys, sports and leisure equipment; medical products; monitoring and control instruments; and automatic dispensers. Regulation 37 (1) allows manufacturers or EEE to set-up and operate individually or collectively voluntary take-back systems for electrical and electronic waste from customers (households or institutions) provided that no fee is chargeable for that service while regulation 39 elaborates the role of the local government authorities in ensuring safe handling of electrical and electronic waste so as to minimize risks to human health and the environment.

The Vice President's Office – Division of Environment has developed a draft National Waste Management Strategy and Action Plan (2009 – 2013) which includes, among others, e-waste management. The goal of the e-waste management action plan is to minimize environmental and health risks associated with improper e-waste management through involvement of various stakeholders in the implementation. The specific objectives are to review related policies and legislation; promote environmentally sound disposal of e-waste; promote investments in management of e-waste; promote awareness on management of e-waste; and promote material recovery and recycling infrastructure. The draft strategy and action plan includes key targets for e-waste management in the country which are to ensure that:

a) By 2013, 80% of imported EEE conform to product standards;

b) By 2010, the quality of end-use of electrical and electronic equipment imported into the country is controlled; and

c) Two to four e-waste collection and recycling centres are established and operationalized by 2013.

The strategy is yet to be implemented.

4.2.1 International Instruments

Tanzania is a Party to a number of international and regional agreements related to environmental management including the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal; and the Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa. Most of the electrical and electronic products contain hazardous substances such as lead, cadmium and mercury.

Basel Convention

The Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal is a global environmental treaty that strictly regulates the trans-boundary movements of hazardous wastes.

Parties to the Convention are obliged to ensure environmentally sound management of hazardous wastes, particularly in their disposal. The Convention, adopted on 22 March 1989, came into force on 5 May 1992 and Tanzania ratified it in 1993.

The Basel Convention stipulates three main interdependent and mutually supportive goals, namely:

- Trans-boundary movements of hazardous wastes should be reduced to a minimum
- Hazardous wastes should be treated and disposed of as close as possible to their source of generation.
- Hazardous waste generation should be reduced and minimized at the source.

To achieve these goals, the Convention aims to control the trans-boundary movement of hazardous wastes, monitor and prevent illegal trafficking and to provide assistance for the environmentally sound management of hazardous wastes.

Bamako Convention

The Bamako Convention on the Ban of the Import into Africa and the Control of Trans-boundary Movement and Management of Hazardous Wastes within Africa was adopted in Bamako, Mali, on 30 January 1991 and came into force on 10 March 1999. The objective of the Bamako Convention is to protect human health and the environment from dangers posed by hazardous wastes by reducing their generation to a minimum in terms of quantity and/or hazard potential.

4.3 Institutional framework

The key institutions involved in waste management in Tanzania are the Vice President's Office-Division of Environment and Local Government Authorities. Others include the relevant regulatory bodies and sectoral ministries such as the National Environment Management Council (NEMC); Occupational Safety and Health Authority; and Ministry of Industry, Trade and Marketing.

The Environmental Management Act (2004) also provides for the establishment of the National Environmental Advisory Committee (NEAC) which advices the Minister responsible for environment and other sectoral ministries on matters related to environmental degradation including waste management.

Vice President's Office -Division of Environment

The Vice President's Office is the overall coordinator of all environmental issues in the country. The Division of Environment (DOE) in the Vice-President's Office is responsible, among other functions, for policy articulation; advocacy and implementation; monitoring and evaluation; environmental planning; environmental legislation; and international cooperation. The Division of Environment (DOE) in the Vice-President's Office is also a National Focal point for Multilateral Environmental Agreements including the Basel Convention and Bamako Convention.

Local Government Authorities

The Local Government Authorities have been granted powers under section 139 of EMA (2004) to ensure that various categories of wastes in either solid, liquid or gaseous forms are prevented or minimized in their areas of jurisdiction.

National Environnent Management Council (NEMC)

The National Environment Management Council (NEMC), under the Vice President's Office, is a regulatory body, which oversees the implementation of the Environmental Management Act, 2004. According to EMA (2004), the functions of NEMC include coordination, evaluation of government policies and activities on pollution control and enhancement of environmental quality, recommending measures to ensure government policies take adequate account of environmental effects. Other functions include advancement of scientific information, documentation and dissemination of information in promotion of general environmental education.

Occupational Safety and Health Authority (OSHA)

The Occupational Safety and Health Authority, established under the Occupational Safety and Health Act (2003) is responsible for controlling and monitoring the occupational safety and health at workplaces including safe use and handling of hazardous waste.

Ministry of Industry, Trade and Marketing (MIMT)

The MITM is responsible for issuing license for establishment of new factories and businesses. All traders including electrical and electronic equipment dealers need to be registered and issued licenses of their businesses through the BRELA, an authority under the MITM.

5 Stakeholders Assessment

5.1 Stakeholder overview

The key stakeholders of e-waste generation and management in Tanzania are the importers, distributors and retailers, consumers, repair workshops/technicians (refurbishers), collectors, recyclers and disposal facilities. The movement of computers among the various stakeholders is illustrated in Figure 2.

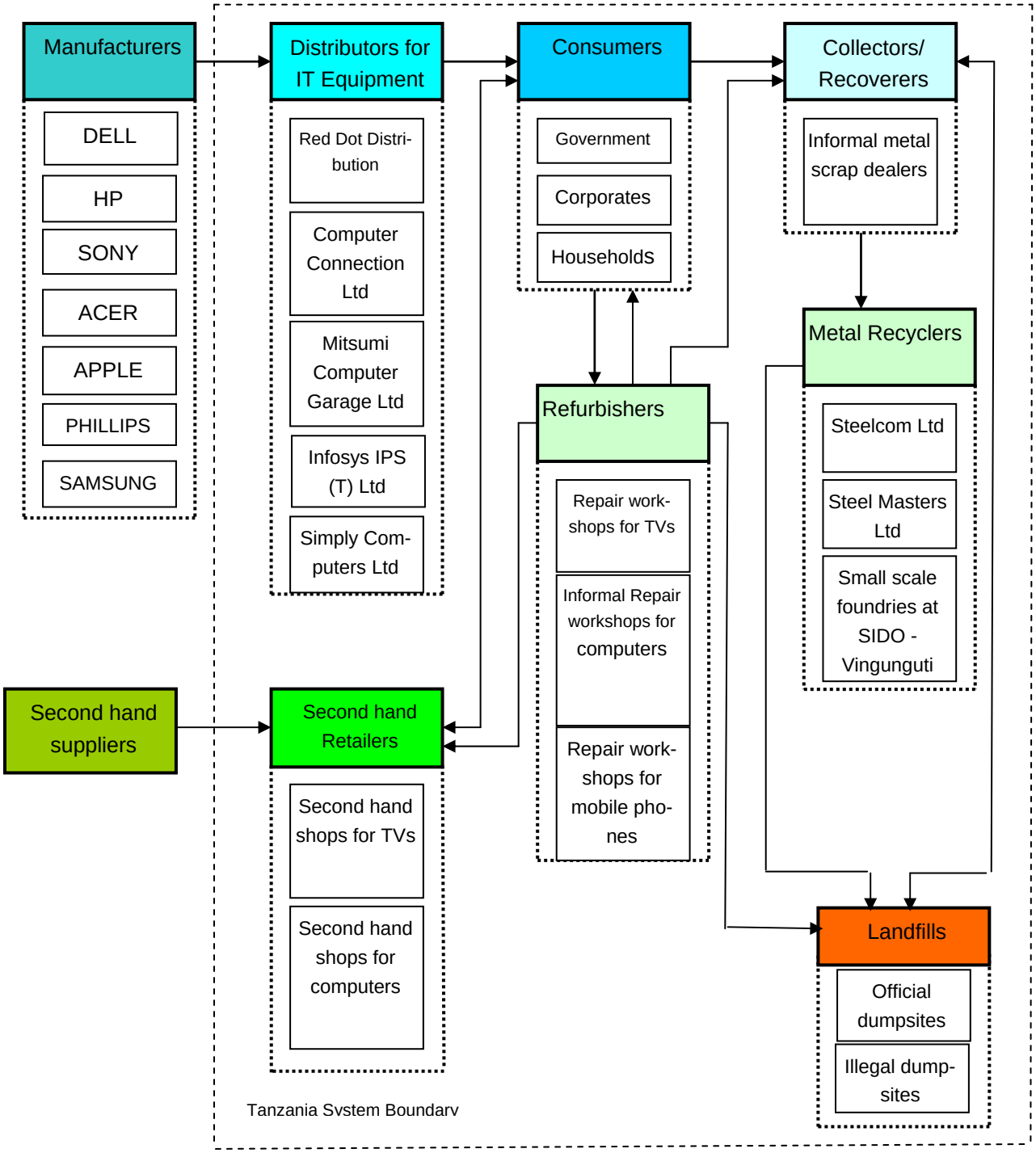


Figure 2: Overview of the Stakeholders of IT Equipment and their relationship in the mass flow of e-waste in Tanzania

5.2 Manufacturers and importers

There are currently no manufacturers of computers in the country. All computers and other IT equipment in Tanzania are imported either as new or second hand products. Table 9 shows the amount of specific appliances, i.e. computers (desktops and laptops), TVs and printers imported into Tanzania for the period 2000 to 2009 while Table 10 shows total imports of all computer items ("automatic data processing machines" – all items under code 8471) for the same period. According to the TRA data (TRA 2010), the average weight of a computer imported into Tanzania is 12.0 kg (see Table 9), which is a mixed value between imported desktops (incl. monitors) and laptops. The trend of total imported computer items into the country is shown in Figure 3. The curve indicates a consistency between the two data sources and indicates an almost linear increase in total weight of imported computers at an average growth rate of 135%.

Table 9: Imports of desktops & laptops, TVs and printers into Tanzania for the period 2000 – 2009 (TRA 2010)

Year	Equipment				
	Desktops & Laptops (codes 8471-30, -41, -49, -50)			TVs	Printers
	Net weight (kg)	No. of items	(kg/item)	(kg)	(kg)
2000	309970	24190	12.8	405,907	No data
2001	432495	33220	13.0	535,419	No data
2002	562022	40663	13.8	879,335	No data
2003	520063	47791	10.9	1,167,267	No data
2004	619088	43745	14.2	1,410,694	No data
2005	950171	130270	7.3	1,967,179	No data
2006	1148037	88311*	13.0	2,856,712	88
2007	1543527	103039	15.0	2,341,281	49,455
2008	1630640	152930	10.7	1,059,836	126,323
2009	1660667	117701	14.1	995,622	102,595
Average			**12.5**		

* quantities for 2006 were not available, hence they were calculated assuming an average weight of 13 kg.

Table 10: Imports of Computers items ("automatic data processing machines" – code 8471) into Tanzania: 1998 - 2009

Year	TRA 2010		UN Comtrade 2010
	Net Wt (kg)	No. of items	Net Wt (kg)
2000	798,964	51,722**	804,103
2001	983,364	112,995	982,942
2002	1,289,232	459,411	1,289,232
2003	1,382,202	163,656	1,410,258
2004	1,407,198	173,021	1,427,654
2005	2,392,925	821,334	2,408,862
2006	2,726,116	*219,845**	2,903,678
2007	3,360,105	448,012	3,331,183
2008	2,483,053	268,588	2,710,503
2009	2,425,870	355,187**	2,592,395

** Excludes Code 8471800: Huge quantities for Code 84718000 for years 2000 (2,261,785 units) and 2009 (1,037,823,600 units) could not be verified and justified, hence were excluded.

* Quantities for 2006 were not available, hence they were calculated assuming an average weight of 13 kg

According to Tanzania Revenue Authority (TRA), all computers entering the country, whether new or second hand are recorded in accordance with the Universal Harmonised System for Commodities (code 8471 for "automatic data processing machines (computers)"). Thus, data from both TRA and the UNCOMTRADE data bases do not distinguish between new and second hand products. It was therefore difficult to know the ratio of second hand computers and other IT equipment which were imported into the country between 1998

and 2009. About 13 percent allocation, similar to what was observed in Uganda for imported second hand products was applied in the calculations based on responses of annual sales from dealers of new and second hand computers..

According to TRA data, the major importers of new computers and other IT equipment during 2007 and 2009 include the following, among others: Red Dot Distribution Ltd; Sparnoon – Dynatech Tanzania Ltd; Computer Connections Ltd; Infosys IPS (T) Ltd; Ideal Computers Ltd; Mitsumi Computer Garage Ltd; Simply Computers Ltd; and Zanzibar Telecom Ltd.

Importers of second hand computers and other IT equipment which were contacted during this study include the following, among others: Digital Links Tanzania, Just Computers, Amani Electronics, Mopawo Used and Toronto Electronics all located in Dar es Salaam. Others are Best Buy Electronics of Zanzibar and Kwa Remtula of Arusha (buys locally).

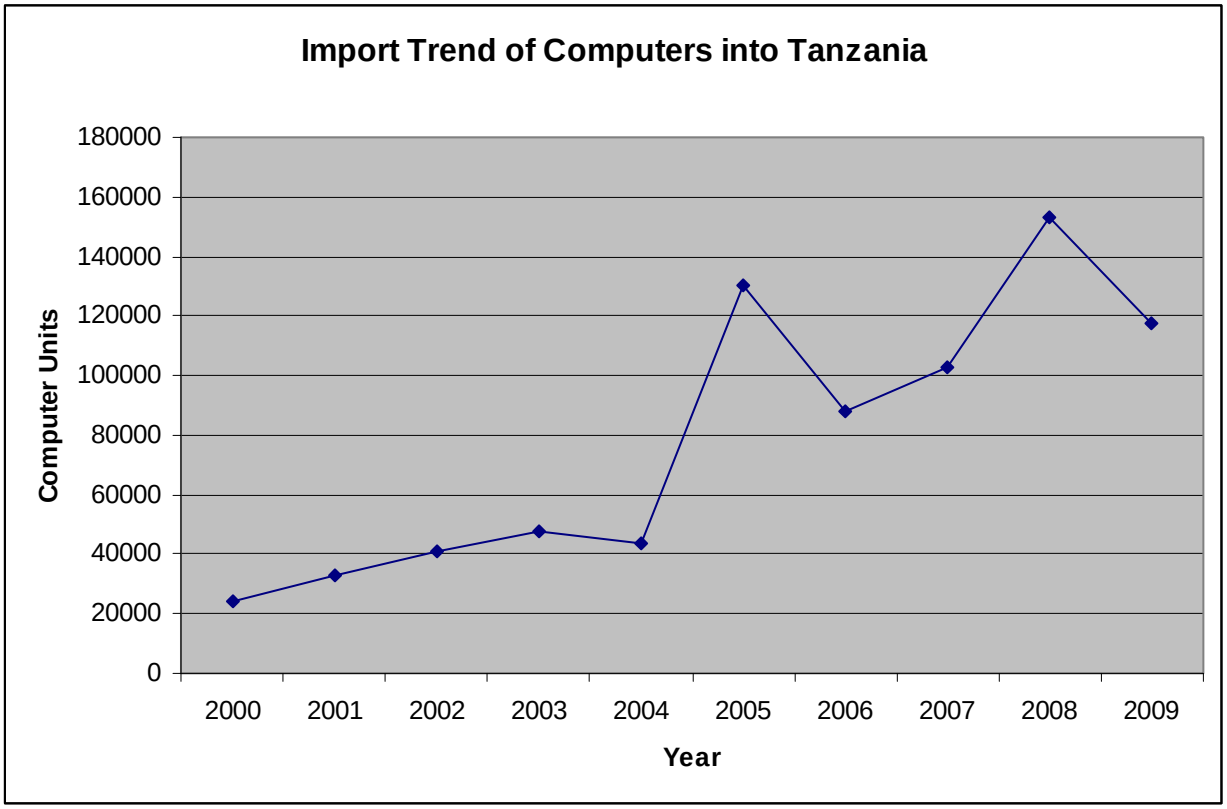


Figure 3: Trend of imported computers in Tanzania: 2000 – 2009 (in computer items), based on the data presented in 9.

5.3 Distributors

Responses from three major importers of new computers (Red Dot Distribution Ltd, Computer Connection Ltd and Infosys IPS (T) Ltd) indicated a share of their sales of 30-65% to government sector, 25-50% to private sector and 10-20% to households & small businesses. In Arusha, one distributor/retailer responded to sell about 30% to government and 70% to private sector including households. Red Dot Distribution Ltd, one of the leading importers of computers in the country and which accounted for about 4% of the total weights of imported computers in 2007 - 2009 sold about 1800 computers in 2008 and 1500 in 2009. In each year, fifty percent of the computers were laptops and the other half were desktops. Out of these, 65% were estimated to have been sold to government institutions, 25% to private companies and 10% to households & small businesses. Based on this survey it is assumed that the share distribution of new computers is 50% to government, 40% to private sector and 10% to households & small businesses. According to the survey with

second-hand dealers, almost 100% of second-hand products are sold to private households& small businesses.

Most of the distributors of new equipment purchase their products from the manufacturers of international brands while second hand retailers import from second hand suppliers abroad or buy from local markets (i.e. 1st hand consumers - individuals and corporate). The common brands being sold in Tanzania include Dell, Hewllet Packard, Apple, Sony and Samsung. The share distribution of the brands could not be established during this study.

Most of the dealers of second-hand equipment are not aware about the environmental hazards of e-waste.

5.4 Consumers

5.4.1 Government Sector

The government sector is the major consumer of electrical and electronic equipment. As mentioned above, the field survey conducted during this study showed that, most of the distributors sell over 50% of the computers and other IT equipment to public institutions while the rest is sold to private companies and individuals. In this study the government sector or public institutions respectively also embraces the educational sector.

Eight selected government ministries and institutions out of eleven responded to the questionnaires. Table 10 shows the type and total quantities of electrical and electronic equipment possessed in six selected government Ministries and Institutions while Tables 11 and 12 show the quantities possessed and not in use respectively in the same ministries and institutions. The selected government institutions which responded to the questionnaires of this study include three Ministries (Ministry of Lands, Housing and Human Settlement, Ministry of Health & Social Welfare, Ministry of Water and Irrigation); three R & D institutions (COSTECH, NIMR and TIRDO); two academic institutions (University of Dar es Salaam Computing Centre, Ardhi University); two regulatory agencies (National Environment Management Council, Tanzania Communication Regulatory Authority); and two local government authorities (Arusha Municipal Council and Moshi Municipal Council). All these institutions indicated to buy new equipment from retail shops of international brands. Only one institution (NIMR) admitted to possess second-hand computers which were donated to the institution for a specific project. Among the common brands being purchased include Dell, IBM, Sony and HP.

Table 11: Total Quantities of EEE available in 6 Selected Govt Ministries & Institutions

Description	Total No. of EEE in possession	Total Not in Use	% Not in use
Total Employees – about 1650			
Desktops	882	167	18.93
Laptops	423	29	6.86
Printers	450	103	22.89
Mobile phones	613	0	0.00
Televisions	31	2	6.45
Fridges	32	0	0.00
Air conditioners	581	15	2.58
Traditional monitors (CRT)		295	
Flat Screen monitors (LCD)		4	
Others		0	

Table 12: Type and Quantities of EEE Possessed in 6 Selected Govt Ministries & Institutions

Description	Name of Institution/ No. of EEE in Possession						
	TIRDO	NIMR	MoWI	Ministry of Health	NEMC	TCRA	Total
No. of employees	80	600	400	300	130	137	1647
Desktops	30	90	250	350	42	120	882
Laptops	5	25	100	200	23	70	423
Printers		15	200	200	20	15	450
Mobile phones	1			600	12		613
Televisions	1			25	2	3	31
Fridges	1			20	5	6	32
Air conditioners		50	100	400	30	1	581
Others							0

Table 13: Type and Quantities of EEE not in use in 6 Selected Govt Ministries & Institutions

Description	Name of Institution/ No. of EEE Not in use						
	TIRDO	NIMR	MoWI	Ministry of Health	NEMC	TCRA	Total
No. of employees	80	600	400	300	130	137	1647
Desktops	50	32	20	50		15	167
Laptops		4		20		5	29
Printers		11	17	70		5	103
Mobile phones							0
Televisions				2			2
Fridges							0
Air conditioners				15			15
Traditional monitors (CRT)	50	20	200	20		5	295
Flat Screen monitors (LCD)		4	0				4
Others							0

It can be seen from the above tables that the six ministries and institutions, with a total of about 1650 employees have about 1,110 computers in use which is about 0.7 computers per employee. The Tanzanian government employs approx. 264,000 civil servants (number for 1999, ADB 2005), which amount to about 184’800 installed computers. The percentage of computers not in use as compared to those in use (based on the responses of this study) ranged from 0 to 167%.

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.

The average life span of computers in most institutions interviewed was estimated between 2 to 5 for both desktops and laptops while the Ministry of Lands indicated to use desktops up to 10 years. The average lifespan for different ICT equipment as estimated based on the survey is listed in Table 14. 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 14: Average lifespan of ICT equipment in the government sector

ICT equipment	Average lifespan (years)
Desktop computer	4.8
Laptop computer	3.3
CRT screens	4.3
LCD screens	3.4
Printers	4.2

5.4.2 Private Sector

Table 15 shows the type and number of items possessed in five selected private companies (three banks and two telecommunication companies) while Table 16 shows the type and number of items not in use in the same companies. The estimated weight of the IT equipment available in the five selected companies is shown in Table 17and Table 18 shows the estimated weight of the IT equipment not in use.

Table 15: Type and Quantities of EEE Possessed in 5 Selected Private Companies

Description	Name of Company/No. of EEE Possessed					
	Stanbic Bank	CRDB Bank	NMB Bank	Zain	Zantel	Total
No. of employees	21	1300	700	800	700	
Desktops	21	1300	2010	100	180	3611
Laptops	0	300	60	80	150	590
Printers	21	100	400	40	40	601
Mobile phones	21	5	70			96
Televisions	1	100	20			121
Fridges	2	100	95			197
Air conditioners	6	500				506

Table 16: Type and Quantities of EEE not in use in 5 Selected Private Companies

Description	Name of Company/ No. of EEE Not in use					
	Stanbic Bank	CRDB Bank	NMB Bank	Zain	Zantel	Total
Desktops	2	170	200	0	30	402
Laptops	0	20	18	0	5	43
Printers	0	20	100	0	10	130
Mobile phones	1					1
Televisions						0
Fridges						0
Air conditioners						0
Traditional monitors (CRT)		20	80		20	120
Flat Screen monitors (LCD)	2	0	15		5	22

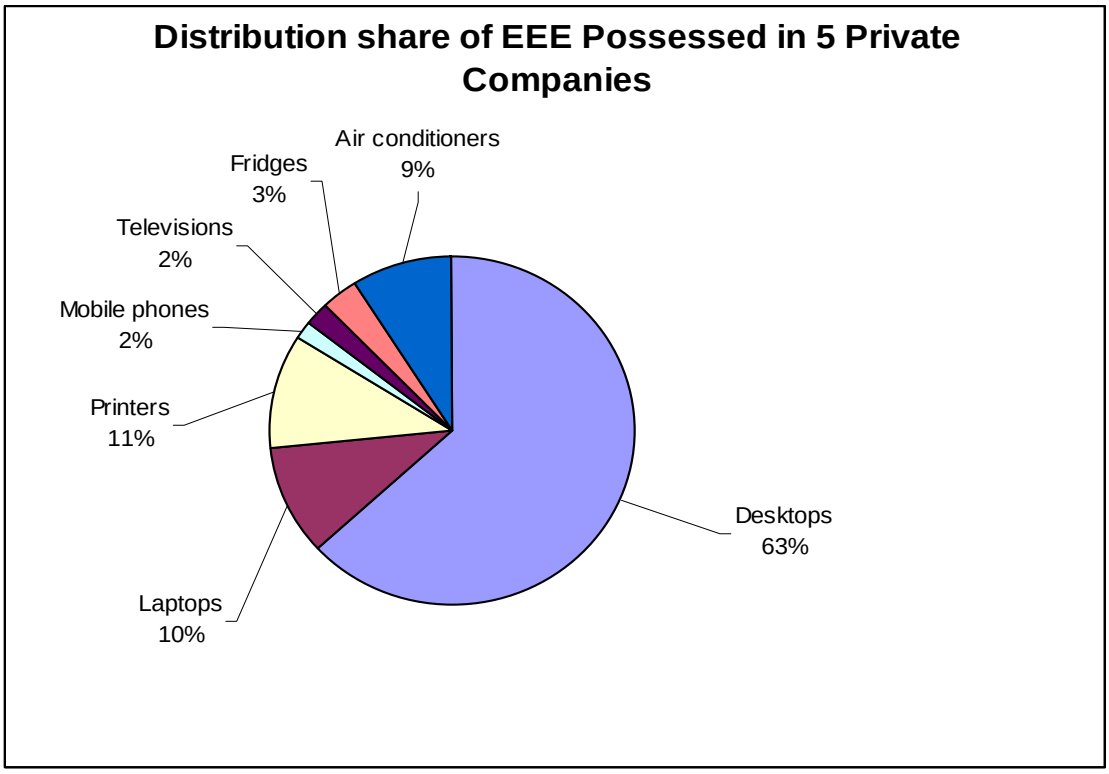


Figure 4: Distribution share of the number of EEE available in 5 selected private companies

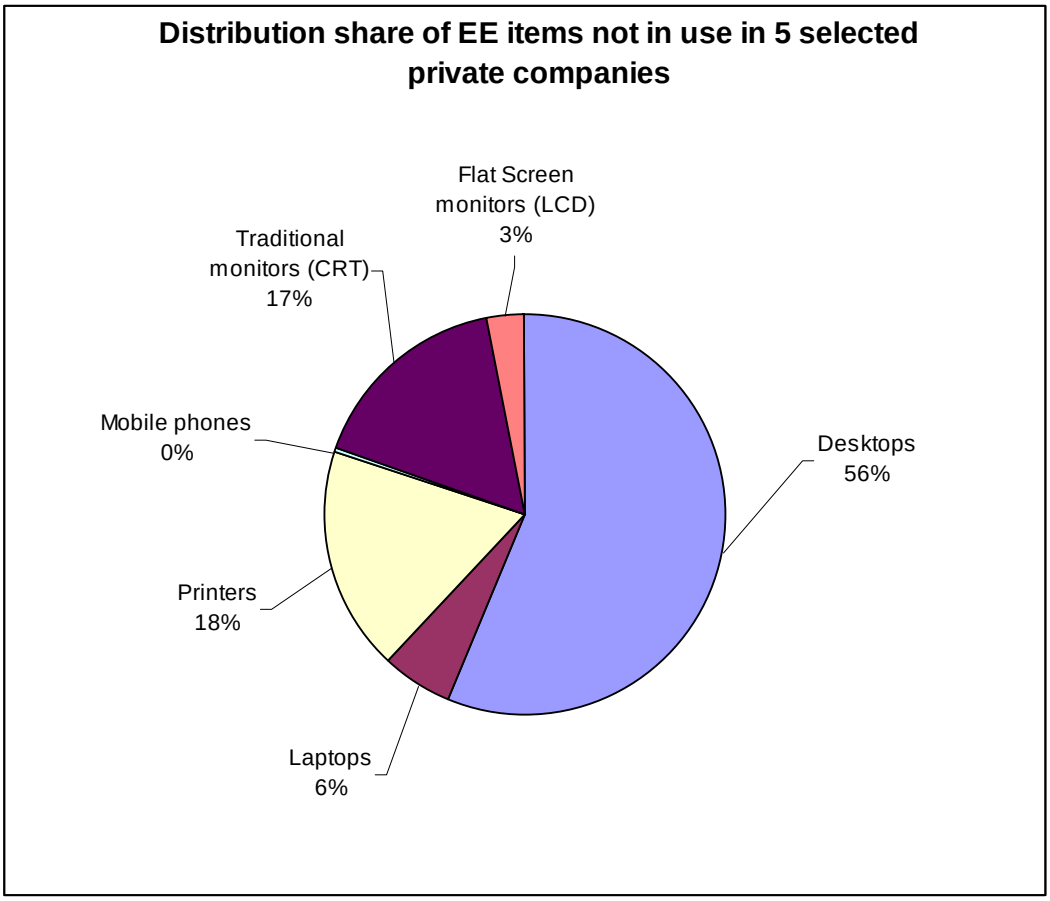


Figure 5: Distribution share of EE items not in use in 5 selected private companies

Table 17: Estimated weight of IT Equipment available in 5 Selected Private Companies

Item	Total items Possessed	Estimated Wt per item (kg)	Total Wt (kg)
Desktops	3611	9.9	35748.9
Laptops	590	3.5	2065
Printers	601	6.5	3906.5
Mobile phones	96	0.1	9.6
Televisions	121	31.6	3823.6
Total			45,553.60

Table 18: Estimated weight of IT Equipment not in use in 5 Selected Private Companies

Item	Total items not in use	Estimated Wt per item (kg)	Total Wt (kg)
Desktops	402	9.9	3979.8
Laptops	43	3.5	150.5
Printers	130	6.5	845
Mobile phones	1	0.1	0.1
Traditional monitors (CRT)	120	14.1	1692
Flat Screen monitors (LCD)	22	4.7	103.4
Total			6,770.80

The five companies indicated to possess a total of about 46,000 kg of IT equipment (i.e. desktops, laptops, printers, mobile phones and TVs. Out of these, about 7,000 kg are not in use, but stored somewhere in these companies which is about 7% of the total available weight of IT equipment in these companies.

The behaviour of the private sector in terms of awareness and purchase of equipment is similar to the government sector. Large, small and medium enterprises purchase new equipment and most of them are aware about the environmental hazards caused by discarded e-waste. The life span of new computers in these companies was estimated to be 3 to 5 years after which the old computers are sold to interested parties through auctioning. Some companies as well as international NGOs indicated to donate the old computers to schools or use them internally as sources of spare parts.

5.4.3 Private households & small businesses

In this study private households and small businesses are analyzed as one consumer group, since (a) it was difficult to distinguish between them in the time limited field survey and (b) both consumer types behave very similar regarding their preference of buying computers and disposing of end-of-life equipment. According to the results of a quick household survey conducted in twenty five randomly sampled private households located in Dar es Salaam, about 80% of the people interviewed indicated to be unaware of what e-waste is, and are also unaware about the environmental hazards caused by discarded e-waste.

About 50% of the households interviewed do not have waste collectors. Although some parts of Dar es Salaam have waste collectors for general wastes, most people do not throw away e-waste together with other waste because obsolete electrical and electronic equipment are not considered as waste by the owners, hence are normally stored inside the houses hoping that they might be of use in future. Few of the people interviewed indicated to sell e-waste to scrap dealers. Some people decide not to collect their faulty equipment from the repair workshops upon learning that it cannot be repaired. This is an indirect way of disposing of e-waste.

The types of electrical and electronic equipment found in the households surveyed are shown in Table 19. The leading quantities of IT equipment available in most of the households are mobile phones followed by lighting bulbs and fluorescent tubes. Others include fans and radios. Others were computers, televisions, cameras and refrigerators. About 60% of the households (14 households) surveyed indicated to have 5 to 8 people.

Table 19: Types and quantities of EEE found in 24 selected households in Dar es Salaam

Large Household Appliances	Total items		IT Equipment	Total items
Air conditioners	16		Fax machine	0
Dish Washers	1		Phones	8
Dryers	3		Mobile Phones	154
Electric Heaters	6		Laptops	17
Fridges	32		PCs	11
Grillers	0		LCD monitor	1
Hobs	4		CRTs monitor	2
Steam Ovens	15		Modems	7
Stove	23		Printers	8
Washing machine	1		Scanners	0
Small Household Appliances	Total items		Copy machines	0
Blenders	29		Consumer equipment	Total items
Coffee Machine	0		Alarm Clocks	22
Electric Lawn mowers	1		Cameras	21
Electric Tooth brushers	0		DVD Players	30
Fans	96		Electric Instruments	0
Hair Dryers	4		Game Consoles	5
Flat irons	1		MP3 Players	5
Kettles	20		Projectors	0
Microwaves	9		Radios	35
Mixers	0		Stereo	4
Pool cleaners	0		TVs (CRT)	29
Popcorn Makers	0		TV (Flat panel)	7
Toasters	5		Lighting Equipment	Total items
Vacuum Cleaners	5		Fluorescent Tubes	109
			Light Bulbs	141
			Long Life Light Bulbs	7
			Batteries	
			Accumulators	0
			Car Batteries	7
			One Way Batteris	0

5.5 Collectors

There are no formal collectors of e-waste in Tanzania. Only informal groups and individuals collect e-waste for purposes of extracting metal scraps. For instance in Zanzibar, there are over fifty informal groups and individuals dealing with collection of scrap metal. One of them is an informal group known as Manyalu comprising about 60 youths which collects and sells about 6 tons of scrap metals per month. Among the e-waste dismantled per month include 3000 TVs; 3000 Video recorders; 3000 microwaves; 3000 fridges and 1000 computers. The extracted metals include Aluminium, copper, iron and brass.

In Arusha, there is a company known as Maendeleo Used Plastics and Paper Enterprises (MUPPE) Ltd which collects waste plastics (not from computers or TVs) from the Municipal dumpsite and elsewhere within the Municipality. The collected wastes are sold to recyclers in Nairobi and Dar es Salaam. The names of the recyclers could not be revealed during the study. The same company collects waste kraft paper from flower farms in Arusha and sells them in Nairobi. MUPPE Ltd sells about 50 tons of waste (plastics & paper) per month.

In urban centres, the Cities/Municipalities have the responsibility of collecting and disposing of all types of waste. Collection of valuable types of waste is done informally and sold to recyclers. Collection and sale of used plastics, glass, aluminium and other precious materials is increasingly becoming a common business among the low-income community in Tanzania, particularly those living near the dumpsites.

Figure 6: Photo of a yard at MUPPE Ltd showing unsorted materials (left) and finished products ready for transportation (right)

5.6 Refurbishers

The refurbishment system of computers in Tanzania is mainly informal. Few refurbishment initiatives also exist in formal private companies, NGOs and vocational institutions. One of such initiative is the service offered by Digital Links Tanzania. Digital Links Tanzania (DLT), established in 2004, is a Tanzanian International NGO, affiliated to the UK based Digital Links International which offers a comprehensive and quality-assured IT disposal service for UK companies and is a leading provider of refurbished ICT equipment and training for educational purposes in more than ten African countries. DLT sources refurbished ICT equipment from Digital Links International, UK and donates to public secondary schools. Since its establishment in Tanzania in 2004, Digital Links (T) in conjuction with their long-term partner, Mkombozi Centre in Moshi, has imported over 2,500 refurbished desktops & laptops (an average of 370 per year) and donated the same to 45 schools in Tanzania mainland and 11 Teacher Resource Centres in Tanzania Isles (see list in Annex 10.5) Plans are also underway to start refurbishing locally donated computers for reuse and proper e-waste disposal from 2011.

With regard to the inform system, about 30 informal computer workshops exist in Dar es Salaam around Gerezani area in Ilala Municipality. The group calls themselves as Mwembeni Group. The quantities of computers received and repaired as provided by few selected people at this area are shown in Table 20. The workshops buy old computers which are auctioned by government and private companies as well as those sold by individuals. About 20 – 100 computers per month are collected at an average price of TZS 15,000 per computer, after which the repairable computers are repaired and sold again at TZS 100,000 – 250,000 each. About 40% of these computers are repaired and resold to consumers. The un-repairable ones are dismantled to recover valuable metals like copper, bronze, cast iron and aluminium and sold to scrap metal collector who ultimately sells to metal recyclers mainly Steelcom Ltd. Copper is sold for TZS 4000 – 6000 per kilo while iron fetches TZS 200 – 500 per kilo. Plastics and glass are thrown away with other wastes.

From the estimated 30 informal workshops with an average of around 50 computers being received per month for refurbishment in each workshop, it can be estimated that approx. 15,000 end-of-life computers (assuming 10 months of active business activities) are collected from the government sector and private companies in Dar Es Salaam or elsewhere. For whole of Tanzania it is estimated that approx. 60,000 computers get collected by informal collectors & refurbishers, having in mind that Dar Es Salaam represents approx. 25% of urban Tanzania.

Normal repair works of computers in various consumers is done at the site of consumers using technicians who are either employees of the distributors/retailers or freelance technicians. Some of the distributors/retailers provide technical support to their customers including repair works. Most of the consumers interviewed prefer to have their computers repaired at their own premises. Repair workshops of other EE equipment (e.g. TVs, radios, DVDs, etc) exist in most urban centres.

Table 20: Quantities of computers collected and repaired by selected refurbishers at Gerezani, Dar es Salaam

No.	Name	Quantity of computer bought per month	Quantity of computer re-paired & sold per month	Buying price (TZS)	Selling price (TZS)	Average life span of repaired computers
1.	Seba Komba	100 (3 laptops)	45	15000	100,000 to 200,000	3 years
2.	John Ernest	20 (4 laptops)	4	10,000 to 20,000	80,000 to 150,000	2 – 4 years
3.	Ally Mpalawa	60 (2 laptops)	25	10,000 to 15,000	70,000 to 200,000	3 years
4.	Dupa Kasungura	80 (5 laptops)	40	10,000 to 30,000	70,000 to 250,000	4 years
5.	Dotto Kimazi	90 (4 laptops)	40	10,000 to 25,000	150,000	5 years

5.7 Recyclers

5.7.1 E-Waste Recycling

There are no formal e-waste recycling activities in Tanzania. Few informal activities were noted including use of old computers as spare parts in repair workshops and recovery of copper wires done by scrap dealers when they get scrap computers, TVs, etc. The recovered copper is sold to metal recycling plants. Evidence of cable wires being burnt to recover copper was noticed in Zanzibar (see photo below). Sometimes they use sharp knives to recover copper from cable wires.

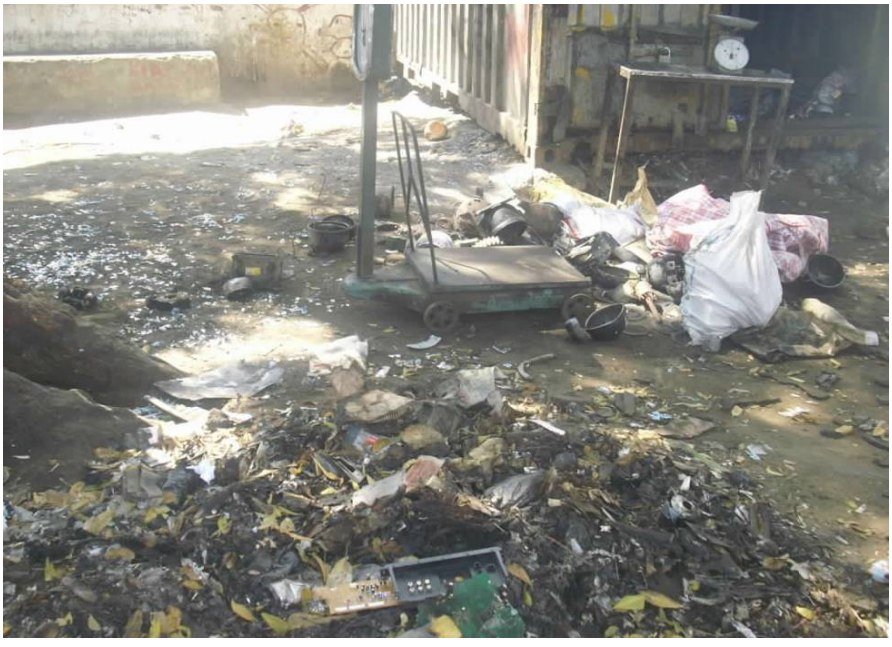


Figure 7: Working space area of Manyalu Group, Zanzibar

5.7.2 Other Recycling Activities

Other recycling activities include paper, glass, metal and plastic. The first three are well developed formal activities. A pilot plant for recycling plastics is currently operational at the Tanzania Industrial Development Organization (TIRDO). Among the existing recycling activities in Tanzania are shown in Table 19.

Table 21: Selected Recycling Businesses in Tanzania

Name of Business	Location	Items Recycled
M.M. Intergrated Steel Mills	Dar es Salaam	Metals
Metro Steel Mills Ltd	Dar es Salaam	Metals
Nyakato Steel Mills Ltd	Mwanza	Metals
Simba Steels Limited	Dar es Salaam	Metals
Sita Steel Rollings Ltd	Dar es Salaam	Metals
Steel Masters Ltd	Dar es Salaam	Metals
Steecom Ltd	Dar es Salaam	Metals
China Paper Corporation Co. Ltd	Moshi	Paper
Tanpack Tissues Ltd	Dar es Salaam	Paper
Kioo Ltd	Dar es Salaam	Glass
Ngosha Black Smith Group	Dar es Salaam	Metals
UNIDO-TIRDO Recycling Plant	Dar es Salaam	Plastics

5.8 Downstream processes

Generally, there is lack of awareness/knowledge on the existence of precious metals in computers, TVs, mobile phones and other IT equipment. As a result, there are no formal downstream processes in Tanzania which are specifically for e-waste. However, there is a downstream market for steel, copper, and aluminium. . Scrap metal dealers extract these metals from old IT equipment and sell them to various metal recyclers. The CRT tubes in computers are removed and sold to TV repair workshops as spare for TVs. Plastic and glass are currently thrown away together with Municipal wastes or disposed of in unofficial dumpsites through burning or burying. The existing plastic recycling plants do not recycle plastics from computers or TVs. However, a Chinese company located in Arusha is claimed to be interested in buying plastics from computers (Verbal information from Maendeleo Used Plastics and Paper Enterprises Ltd). Table 22 gives a summary of the existing downstream market infrastructure for e-waste fractions in Tanzania.

Table 22: Summary of existing downstream market infrastructure for different e-waste fractions generated by Personal Computers and TVs in Tanzania

Material fraction	Recycling / disposal in Tanzania	Possible downstream partners	Comments
Plastic	partially	Plastic recyclers	Currently thrown away in dumpsites or burnt. Burning creates health risks due to releases of furans and dioxins Needs investments for upgrading the local recyclers Chinese company in Arusha has shown interest (export to China?) – treatment standards in China need to be assessed Alternatively export to state of the art recycling facilities (e.g. MBA Polymers China[1])
Ferrous metals	Yes	Steel rolling mills and foundries e.g. Steelcom Ltd, Ngosha Blacksmith Group	Selling the fraction generates income
Aluminium	Yes	Aluminium smelters	Selling the fraction generates income
Copper	Yes	Metal smelters, e.g. Steelcom Ltd – a Palestine company which exports scrap metals and also produces various tools	Recovery of copper from cables is done in a crude way. Cables are burned or peeled off with sharp tool such as knives to recover copper Selling the fraction generates income Exporting bears the danger of stimulating copper robbery
Printed wiring boards (PWB containing precious metals)	No	Not available in Tanzania, export to Europe or Asia.	Sale of these fraction to a global refinery could generate income
CRT tubes (incl. glass, containing lead, beryllium, phosphor, etc.)	No	So far not identified in Tanzania Export to Europe	For local solutions further identification of possible downstream partners (e.g. industries who can use lead glass in their processes) in combination with investment into local treatment facility is needed
Hazardous fraction (PCB in capacitors, mercury in backlights, batteries)	No	Needs a hazardous waste treatment facility (special incineration or controlled landfill) which is not available, smaller capacitors and batteries can be left on the PWB when sold to international smelters. Export to Europe	Needs either investment into a local hazardous waste treatment facility or needs to be exported to specialized facilities abroad (e.g. to Europe)

5.9 Final disposers

There is no designated facility for disposing of hazardous waste in Tanzania. Principally, waste management in Tanzania is liable directly to the local authorities' responsibility. The local Government (Urban authorities) Act 1982 imposes under urban authorities the responsibility "to remove refuse and filth from any public

[1] Guangzhou GISE-MBA New Plastics Technology Co., Ltdhttp://www.mbapolymers.com/

or private place" (sect. 55 g) and to provide and maintain public refuse containers for the temporary deposit and collection of rubbish.

In Dar-es Salaam, the three Municipalities of Kinondoni, Ilala and Temeke are responsible for the collection of waste while the City of Dar es Salaam is responsible for receiving the wastes from the same Municipalities. However, the collection and disposal capacity of many Municipalities and Cities in Tanzania is low compared to the waste generated in the respective Municipalities/Cities. For instance, Kinondoni municipality is estimated to generate about 2026 tons of waste per day (JICA study 1997) but only 954 tons is collected per day which is about 50% of the waste generated. Zanzibar Municipal Council (ZMC) generates a total of about 800m^3 waste per day out of which about 510m^3 per day is collected and disposed of, which is about 65%. (ZMC, Assessment & Design Report, December 2009) The balance of the uncollected waste is normally disposed of at informal and/or illegal dumping areas.

Most of the City/Municipal dumpsites in Tanzania are crudely operated with no consideration for the environment. The Dumpsite of the Dar es Salaam City Council at Kinyamwezi was intended to be a sanitary landfill but it is not yet completed as a sanitary landfill. The current practice being used at the dumpsite is to cover the waste with imported soil in order to reduce foul smell and the generation of methane. Sometimes hazardous waste could be disposed of at the dumpsites without the knowledge of the authorities if it is mixed with municipal waste.

Some parts of the e-waste (e.g. plastics, glass) from repair workshops and informal recovery activities are eventually disposed of into the environment either through illegally dumping (e.g. through burning or burying) or mixed with other municipal wastes and thrown away in official dumpsites. Signs of e-waste being disposed of together with other Municipal wastes were observed at Jumbi dumpsite in Zanzibar (see photo below).

Figure 8: Photo of Murriet Dumpsite – Arusha. The right photo shows heaps of collected plastics by informal collectors ready for sale to MUPPE Ltd.

Figure 9: Photo of Jumbi Dumpsite – Zanzibar showing disposed e-waste.

5.10 Most affected communities

Since there are no formal or informal e-waste recycling activities in Tanzania, it is obvious that very few or no communities are significantly affected by e-waste. The only communities which could slightly be affected by e-waste are the collectors of waste in dumpsites (salvagers) and people living near dumpsites since some parts of e-waste end up in dumpsites in one way or the other. The current practice by the Fair Competition Commission of crushing and burning fake products at Kinyamwezi dumpsite, including computers and other IT equipment is a serious challenge which needs to be addressed urgently by the authorities. Since most electrical and electronic equipment contain hazardous materials such as lead, cadmium and mercury, this practice could lead to long-term health effects to both the environment and human health, especially the salvagers and the neighbouring community. The leaches from the dumpsite could also lead to pollution of the water bodies. Table 23 below shows the average annual counterfeit electrical and electronic equipment disposed of at Kinyamwezi dumpsite by the Fair Competition Commission.

Table 23: Average annual Counterfeit EE Equipment Disposed of at Kinyamwezi Dumpsite by the Fair Competition Commission

S/N	Type	Quantities	Unit
1	Computers	255	Cartons
2	Fridges	80	Cartons
3	Generators	180	Cartons
4	Fans switches	120	Cartons
5	Radios	300	Cartons
6	Sollateck AVS	250	Cartons
7	Television sets	350	Pcs
8	DVD Player	250	Pcs
9	Blenders	180	Pcs
10	Water Heater	99	Cartons
11	Electricity cables	150	Cartons
12	Bulb energy servers	250	Cartons
13	Fans	90	Cartons
	Total	53	Tons

Source: Dar es Salaam City Council, 2010

5.11 Other stakeholders

The following are among the stakeholders which could support or play a role in e-waste management in Tanzania:

Government Ministries:

- Division of Environment, Vice President's Office
- Ministry of Heath and Social Welfare
- Ministry of Industries, Trade and Marketing
- Ministry of Energy and Minerals
- Ministry of Education and Vocational Training
- Ministry of Water and Irrigation
- Ministry of Communication, Science and Technology

Regulatory and Local Authorities

- National Environment Management Council (NEMC)
- Tanzania Communication Regulatory Agency
- Radiation Commission
- Tanzania Revenue Authority
- Tanzania Communication Regulatory Agency
- BRELA
- City and Municipal Authorities

Others

- Cleaner Production Centre of Tanzania
- Small industries Development Organization
- Academic and Research Institutions (i.e.. Institutions of higher learning, R & D institutions)
- Financial Institutions and Banks (e.g. CRDB, NMB, NBC, Stanbic, Standard Chartered Bank, etc)
- Industry Associations (e.g. TCCIA, CTI, Private Sector Foundation, etc)
- Employers' Associations (e.g. ATE)
- Telecommunication companies (e.g. Vodacom, Tigo, Zantel, Zain, Sasatel, TTCL, etc).
- Fair competition Commission
- Government Asset Management & Procurement Agency

6 Massflow assessment

6.1 Massflow system chart

An overview of the computer life cycle stages in Tanzania is given in Figure 10. The main stages are import, distribution through retailers and consumption. Once the equipment reaches the end-of life as per the opinion of the first consumer (government sector, private companies and private households & small businesses) it is normally stored for unspecified time. After storage computers in the government sector and in private companies are auctioned, donated or sold directly to second hand consumers, which in most cases are private households & small businesses. Other options include the use on-site and/or off-site as spare parts by technicians (not shown in the diagram). Private households & small businesses also store the unused computers for unspecified time. A small portion eventually ends up in the waste stream and is disposed of either illegally or in official dumpsites together with other municipal wastes. The only route to material recovery seems to exist through informal collectors & refurbishers, who are selling the unusable computers and computer parts to informal dismantlers. Informal dismantlers either sell their fractions to mainly metal recyclers or dispose of the fractions which cannot be sold either illegally or in official dumpsites. In some cases private households & small businesses decide not to collect their faulty equipment from the repair workshops, which is an indirect way of disposing of e-waste.

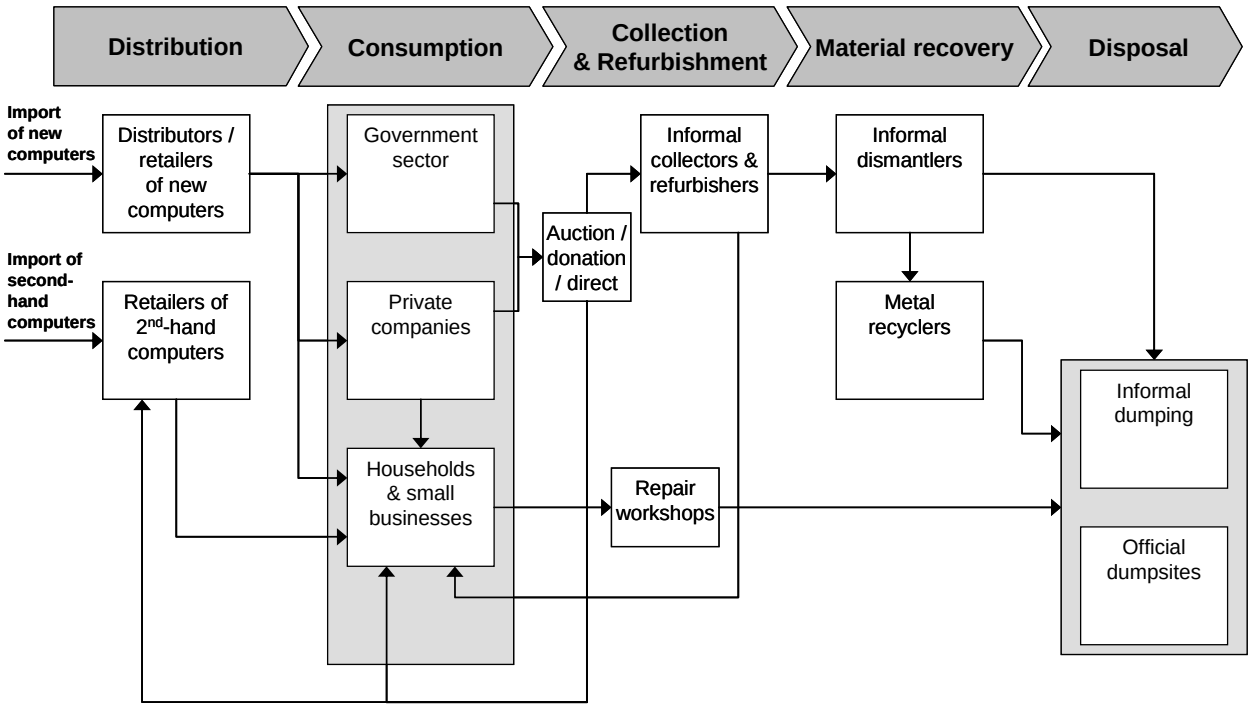


Figure 10: Massflow diagram of computers in Tanzania, current situation as of 2010

6.2 Current massflows

Current massflows for computers in Tanzania were calculated for the year 2009. Table 24 summarizes the key data for the assessment as elaborated earlier in this report. Results are presented in Figure 11 in number of items, representing the sum of desktops (incl. a monitor) and laptops.

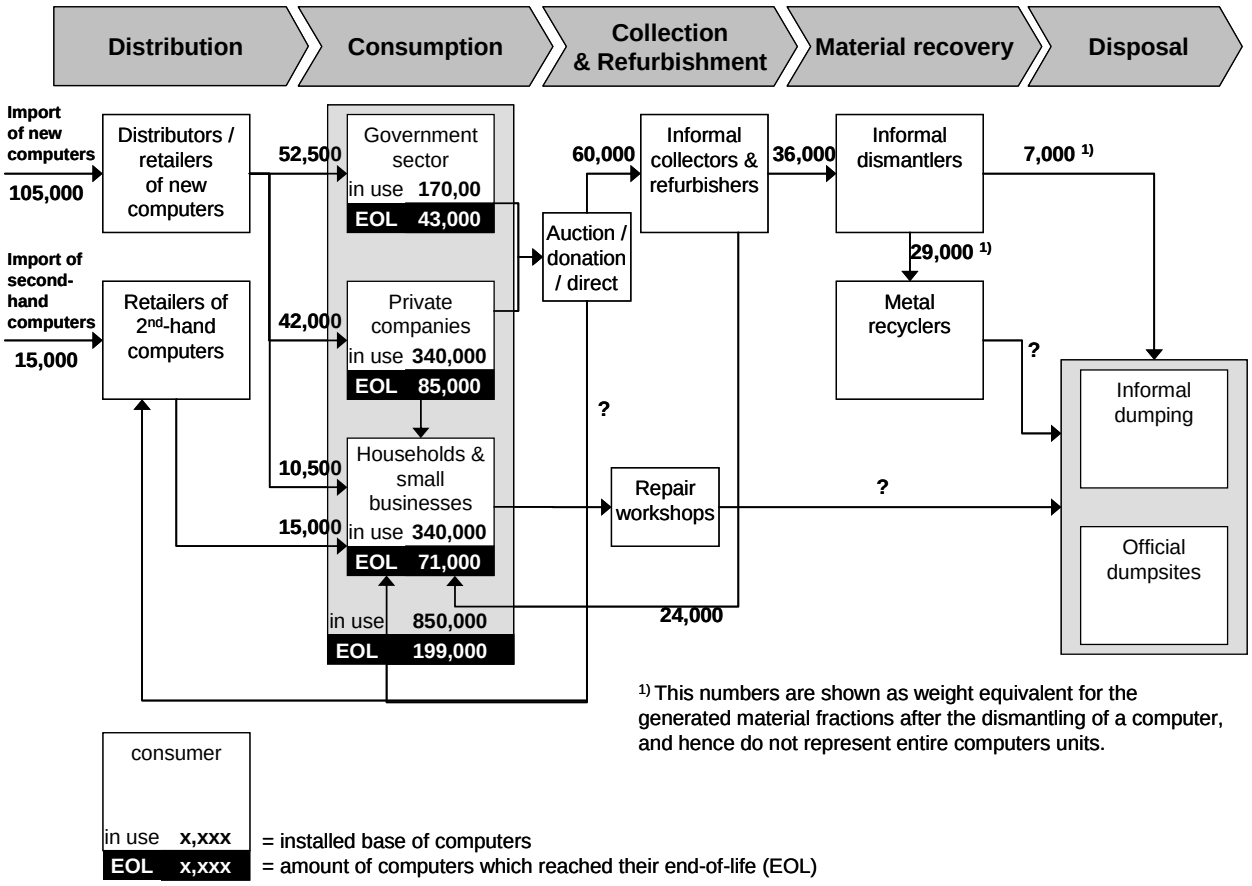


Figure 11: Estimated computer massflow in Tanzania for 2009 (in amount of computer units)

120,000 computers were imported in 2009 (TRA 2010). Based on the annual sales of three retailers of new computers and three retailers of second hand computers between 2008 and 2009, it is assumed that 13% account for second-hand computers, which corresponds to about 15,000 items. According to the World Bank data, the installed base of personal computers in Tanzania has increased from 3 per 1000 people in 2000 (corresponding to 100,000 installed base) to 9 per 1000 people in 2005 as shown in Figure 12. Extrapolations until the year 2009 suggests that the penetration rates increased somewhere between 16.6 in the case of linear growth and 22.3 in the case of exponential growth. We assume that it will be somewhere in the middle at approx. 19.5 computers per 1000 people, which corresponds to an installed base of 850'000 units. This number corresponds well with the 860'000 units, which were calculated starting with an installed base of 100,000 units in 2000 and consequently accumulating all imports from 2000 until 2009 (see Figure 12). This comparison however assumes that the number of computers thrown away in this period is not relevant. We think that this is a plausible assumption, keeping in mind that Tanzania experienced a relevant growth in computer penetration only in the last decade, hence went through a period of accumulating a computer stock.

According to the results of this study, the average distribution sales of new computers are 50% to government; 40% to the private companies and 10% to private households & small businesses. The survey from second-hand dealers also showed that second hand IT equipment are mainly sold to private households & small businesses. As of 2009 only a neglectable amount of second hand equipment were received by the government sector and private companies, such as donations to schools (data not shown). Based on the sur-

vey and some key statistics for the country as presented in the previous chapters (see summary in Table 25) the distribution of the installed base of computers is roughly estimated at 20% for the governmental sector (170,000 installed computers), 40% for private companies (340,000 installed computers) and 40% for private households & small businesses (340,000 installed computers). Based on an average life of computers in governments and private companies of 4 years, approx 43,000 computers reached their end-of-life in governmental institutions and 85,000 in private companies. Households & small businesses in contrast keep their second-hand computers for another 4 years and new computers for 8 years. Assuming that approx. 80% of the installed computers in households & small businesses were bought as second-hand computers and the average life span is around 4.8 years, this means that approx. 71,000 computers in private households & small businesses reached their end-of-life in 2009. Since end-of-life computers from the government sector and private companies receive a 2nd life after refurbishment the actual potential e-waste generated is the sum of the waste resulting from these refurbishment activities (60%) and the end-of-life computers from private households. This amounts to a total potential e-waste generation of 150,000 computer units or 1,800 tonnes.

Since the most common end-of-life management option is storage, only a small volume of computers enters the collection process. Based on the interviews among informal dismantler it is assumed that approx. 60,000 computers are bought for refurbishment, 60% of it being waste. There are indications that approx. 80 weight-% are recycled (~ 350 tonnes in 2009), while 20 weight-% is thrown away (~ 85 tonnes in 2009), either illegally or in official dumpsites. Further material flows, such as computers disposed of via repair workshops, donations, as well as direct sales to private households and retailers of 2nd-hand computers from the government sector and private companies could not be quantified.

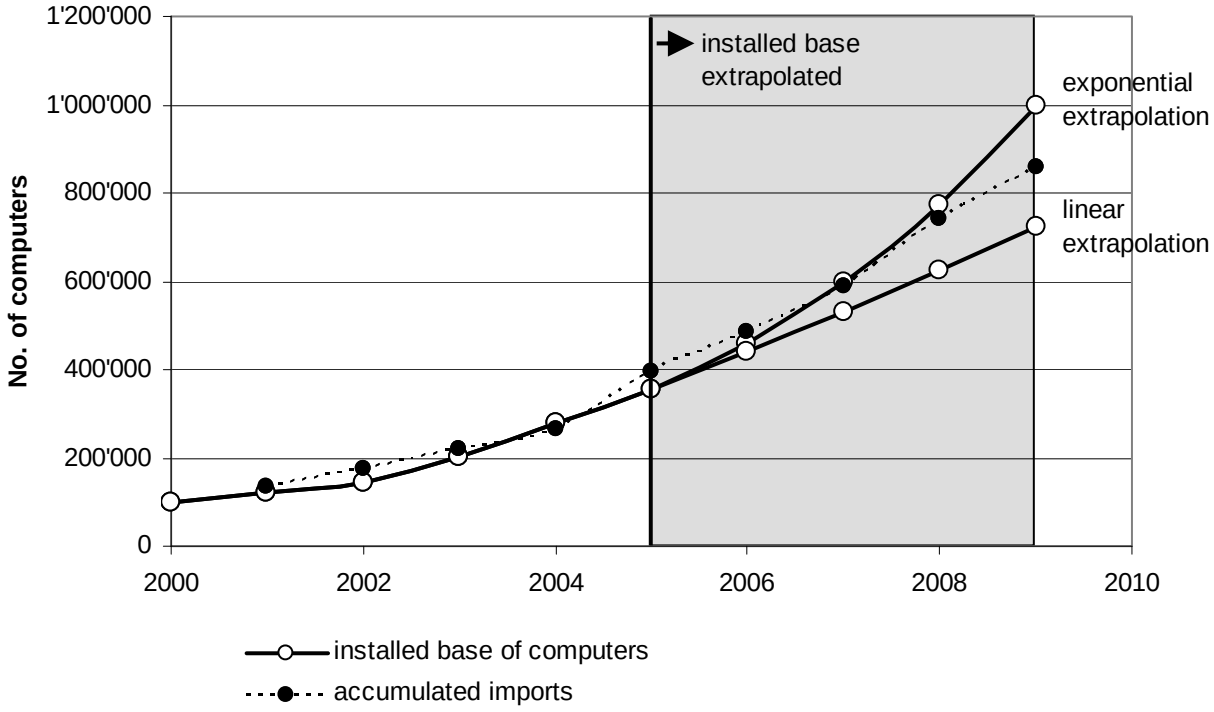


Figure 12: Installed base of computers (based on World Bank 2010 until 2005) and accumulated imports (based on TRA 2010 until 2009) in Tanzania 2000 – 2009.

Table 24: Key data and assumptions for the massflow assessment of computers in Tanzania in 2009

Indicator	Unit	Value	Comments
Imported computers	No. of items	120,000	See Table 9
- thereof 2nd-hand imports	%	13.0	
- Thereof new imports	%	87.0	
Annual national imports is equal to national sales (no export)	-	-	
Total installed base of personal computers	No. of items	850,000	See Figure 12
Government share of 2nd-hand imports	%	0	
Private companies share of 2nd-hand imports	%	0	
Private households share of 2nd-hand imports	%	100	
Government share of new imports	%	50	
Private companies share of new imports	%	40	
Private households share of new imports	%	10	
Life span of 2nd-hand computers	years	4	
Life span of new computers (4 years for 1st phase and 4 yrs for second phase)	years	8	
• Waste thrown away from each dismantled computer (estimates from Mwembeni group at Gerezani, DSM)	%	20	

Table 25: Key data used to calculate the distribution of the installed base of computers between the main consumer groups for the year 2009.

Consumer	Total no. of people	Penetration rate	Installed base of computers
Government sector	265,000 employees	0.7 computer / employee	170,000 units
Private companies (formal economy in the service sector)	700,000 employees	0.5 computer / employee	340'000 units
Households & small businesses	7 Mio households and unidentified number of small businesses (formal & informal)	Na.	340'000 units
Total Tanzania	42.5 Mio inhabitants	0.02 computer / capita	850'000 units

6.3 Future massflow trends

Future computer massflow trends for a potential e-waste generation are shown in Figure 13 for an exponential growth and a linear growth scenario. The extrapolations were done under the assumption that the distribution of the installed base and the average lifespan of computers stay the same as in 2009 (see Table 24 and Table 25). The potential e-waste generation was calculated according to the assumption used in the previous chapter for the current massflows, i.e. the potential e-waste generation is the sum of 60% of end-of-life computers occurring in the government sector and private companies and of 100% of end-of-life computers occurring in private households & small businesses. Since most of end-of-life equipment gets stored by the consumers for an indefinite time, the potential e-waste generation represents only a theoretical number and not the amount reaching recycling and disposal processes.

The extrapolations suggest that the potential e-waste generation from computers could be somewhere between 250,000 (linear growth) and 800,000 (exponential growth) computer units in 2015, which is equivalent to 3,000 – 9,500 tonnes.

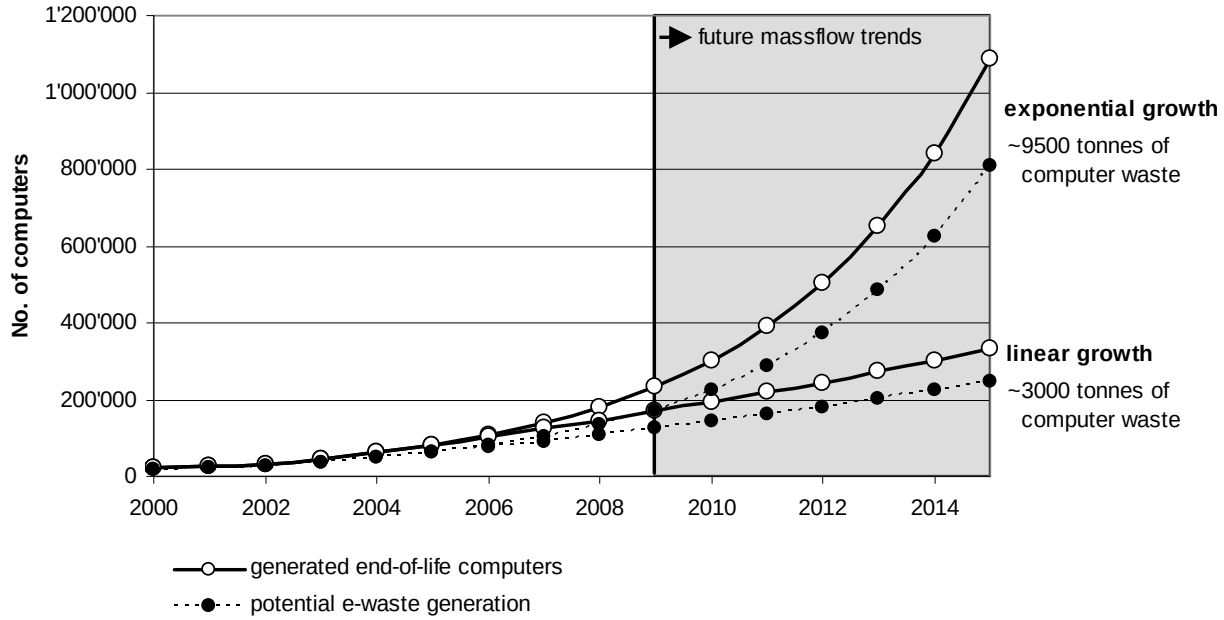


Figure 13: Future massflow trends for Tanzania until 2015.

7 Impacts

7.1 Overview

The impacts of e-waste management in Tanzania in terms of social, environmental and economic impacts were assessed based on five functional activities namely, collection, refurbishment, dismantling, material recovery and final disposal. Undesirable operations in the mass flow system of e-waste management in Tanzania were identified as shown in Figure 14 and described in the following sub-chapters. Significant impacts occur during collection, refurbishment/repair, recovery of materials and final disposal.

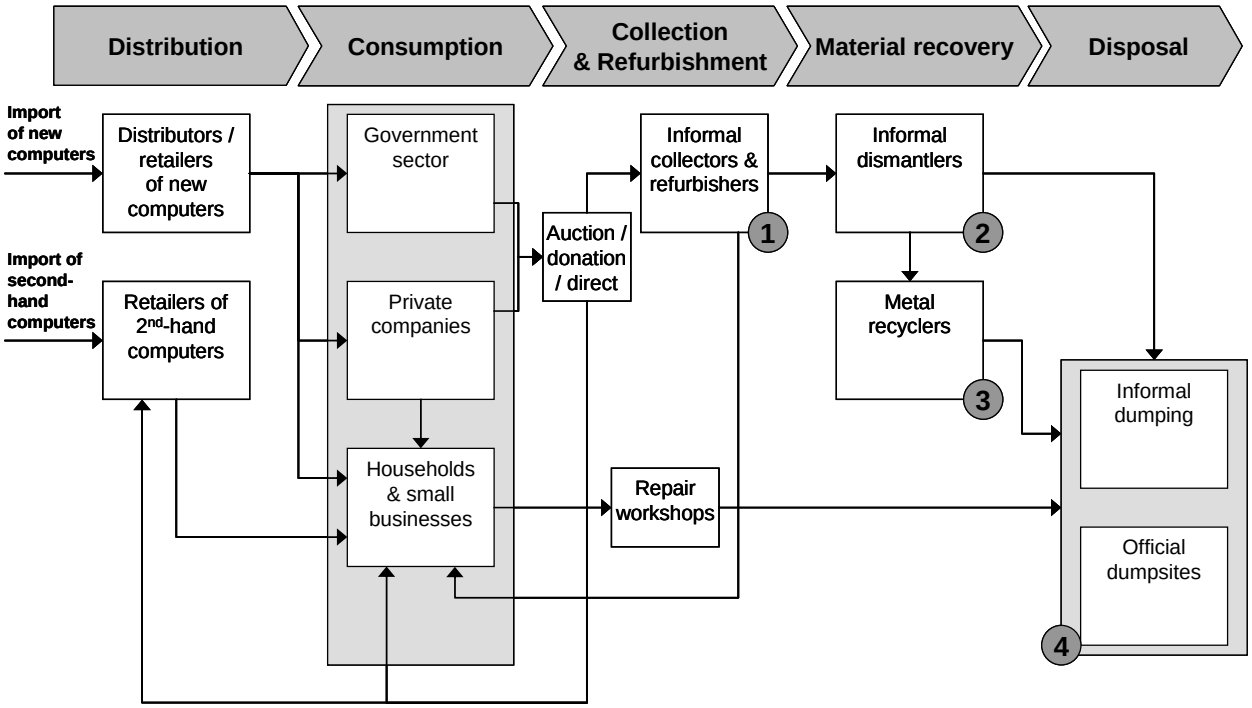
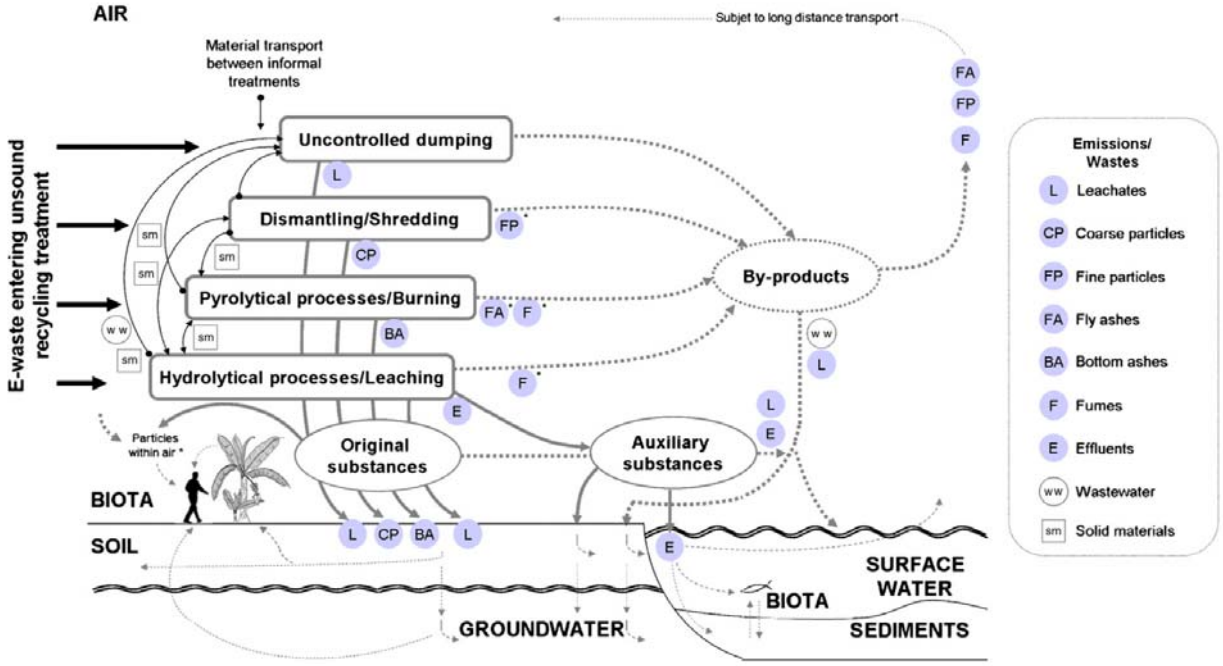


Figure 14: Mass Flow System Chart of e-waste in Tanzania showing "hot spots" for e-waste impacts.

7.2 Environmental impacts

Emissions from informal recycling activities have already been assessed in many studies (Sepúlveda et al. 2009). Figure 15 gives an overview on principal e-waste recycling activities, types of produced emissions and general environmental pathways. In Tanzania we observed uncontrolled dumping, dismantling and burning of e-waste. Processes such as leaching of gold from printed wiring boards were not observed in Tanzania. The associated main environmental impacts include the following:

- Soil pollution with hazardous substances through dismantling of IT equipment which contain hazardous materials such as lead, mercury and cadmium
- Hazardous substances disposed of in dumpsites and elsewhere could leach out and pollute water bodies.
- Air pollution during refurbishment and recovery of materials through soldering works and burning of cable wires to extract copper. Burning of plastics releases toxic substances such as dioxins.



Explanations: Ovals: types of substances contained within emissions. Continuous bold lines: fate of original and auxiliary substances. Dotted bold lines: fate of by-products such as dioxins and furans. Black arrows with a bold dot: material transport fluxes between treatments. Fine dashed arrows: general environmental pathways (Sepúlveda et al. 2009).

Figure 15: Principal e-waste recycling activities, types of produced emissions and general environmental pathways.

7.3 Socio-economic impacts

The most significant (positive) socio - economic impact is generation of income to the community involved in the collection, refurbishment and extraction of metals from e-waste. The sale of metal scraps is a growing business in Tanzania which feeds several formal and developed metal recycling industries mainly the steel rolling mills and small scale foundries. Awareness on recovery of other valuable metals such as gold from mobile phones is still lacking. Few scrap dealers are receiving obsolete TVs and computers and dismantling them to recover metals for sale to recyclers. For instance, responses from 5 people at Gerezani shops in Dar es Salaam showed that they purchase an average of 70 obsolete computers per month from businesses, government and individuals. This is equivalent to 4200 computers per year. Out of these, 40% are refurbished and sold back to the consumers. The computers are purchased at auction marts for an average price of TZS 15,000 each and then sold for a minimum of TZS 100,000 after being repaired. Assuming an average minimum profit of TZS 50,000 per repaired computer, this gives an average annual income of TZS 84 million for the five shops or 16.8 million per shop.

On the other hand, extracted materials such as copper fetch TZS 6,000 to 7,000 per kilo in the market. According to responses of the same 5 shops at Gerezani in Dar es Salaam, an average of 60% of computers received are dismantled to extract different metals; this means that about 2,500 computers are dismantled per year in the five shops. According to the literature on estimated weight composition of materials in ICT equipment, this is equivalent to annual weights of about 9 tons of iron, 1 ton of aluminium and 1 tons of copper, among others.

Thus e-waste recycling could generate income to the government through taxes if the business is formalized and regulated accordingly. At the moment the people involved do not pay any taxes to the government apart from minimal fees to the Municipality for waste collection. For the communities involved however the informal business generates income and hence reduces poverty. In addition refurbishment of used items raises the standard of living of low-income people by providing affordable equipment such as computers, TVs, mobile phones, etc

The activities above are associated with the following negative socio - economic impact:

- Collected items are sometimes stored haphazardly outside the business premises in close proximity to residential areas which increases the potential health risks to the workers and the surrounding community such as being injured by sharp objects. The objects stored outside could also become mosquito breeding areas during rain season and hence increase malaria disease within the community
- Most of the workers in the five sub-sectors do not wear protective gears such as boots, gloves and masks. This practice poses health and safety risks associated with air pollution and accidental injuries to the people involved
- Being an informal sector, most of the workers are not covered by any form of insurance or social security schemes
- Activities are normally carried out in urban centres in high densely populated areas which pose health risks to the surrounding community, especially children who could be easily injured by scattered metals while playing.

8 Conclusions & recommendations

This assessment of the situation regarding e-waste in Tanzania has shown that the use of ICT equipment is still low in Tanzania compared to other countries in the world but it is growing at a staggering pace. In the last decade for instance, the penetration rate of personal computers has increased by a factor of 10, while the number of mobile phone subscribers by a factor of 100! This implies that there will soon be an increasing growth of e-waste stream as more and more ICT equipment reaches their end-of life. Hence it is the right time for Tanzania to engage in addressing the problem of increasing e-waste volumes. Not addressing the fact of growing e-waste volumes bears the risk of a developing informal sector, with all its social and environmental drawbacks. The following are among the strengths, weaknesses as well as opportunities of the current situation in the country in managing e-waste. At the end of the chapter some tentative general conclusions and specific conclusions for the UNIDO e-waste initiative for Tanzania are given.

8.1 Strengths of the current situation

- Existence of relevant policies and legislation which support e-waste management
- Existence of environmental regulations and strategies which are specifically for e-waste management
- Existence of an institutional framework which can support e-waste management
- Existence of downstream market for some fractions of e-waste (see Table 26)
- The current practice of storing e-waste reduces the volumes being dumped illegally or in official dumpsites
- Long life span of new computers (about 8 yrs) due to two phases of use of EE (used as new for about 4yrs and then sold as second hand and used again for another 4yrs)
- Long life span of second-hand products (3-5yrs) which implies that the imported products are mostly of acceptable quality
- Existence of informal refurbishers/metal scrapers which extend the life of computers and other EEE, hence reduce volumes of illegal dumping
- Existence of informal collection system for metals and plastics which can be used to support e-waste management
- Existence of formal recycling industry for paper, metals and plastics which could absorb some of the e-waste fractions

8.2 Weaknesses of the current situation

- Poor data records on imported products as new and second hand products are not distinguished
- Absence of reliable data on existing dealers of computers and IT equipment from the authorities
- Absence of reliable data on stocks and e-waste generation from the stakeholders
- Lack of disposal facilities for hazardous wastes
- Lack of proper recycling activities for e-waste
- Lack of specific policy on e-waste management
- Weak enforcement of legislation
- Lack of public awareness on e-waste and its potential risks to the environment and human health
- Lack of infrastructure for formal collection and recycling of e-waste
- Illegal dumping of e-waste such as burning and burying could lead to environmental pollution as well as pose risks to human health
- Unsustainable destruction counterfeit products by the FCC in official dumpsites which could lead to pollution of water bodies through leaching
- Inadequate cooperation among the stakeholders
- Uncontrolled informal activities of e-waste management which pose health risks to the people involved and the nearby community
- Illegal disposal of e-waste in official municipal dumpsites by mixing e-waste with other municipal wastes

8.3 Opportunities for the different e-waste sectors

Opportunities for the different e-waste sectors in Tanzania include:

- Establishment of formal e-waste recycling activities
- Market stream for other valuable metals contained in e-waste such as gold in mobile phones
- Income generation through e-waste management process (i.e. collection, refurbishment, dismantling, recovery of materials and final disposal)

Table 26: Existing and possible downstream market infrastructure in Tanzania for different e-waste fractions generated by Personal Computers and TVs.

Material fraction	Recycling / disposal in Tanzania	Possible downstream partners	Comments
Plastic	partially	Plastic recyclers	Currently thrown away in dumpsites or burnt. Burning creates health risks due to releases of furans and dioxins Needs investments for upgrading the local recyclers Chinese company in Arusha has shown interest (export to China?) – treatment standards in China need to be assessed Alternatively export to state of the art recycling facilities (e.g. MBA Polymers China[2])
Ferrous metals	Yes	Steel rolling mills and foundries e.g. Steelcom Ltd, Ngosha Blacksmith Group	Selling the fraction generates income
Aluminium	Yes	Aluminium smelters	Selling the fraction generates income
Copper	Yes	Metal smelters, e.g. Steelcom Ltd – a Palestine company which exports scrap metals and also produces various tools	Recovery of copper from cables is done in a crude way. Cables are burned or peeled off with sharp tool such as knives to recover copper Selling the fraction generates income Exporting bears the danger of stimulating copper robbery
Printed wiring boards (PWB containing precious metals)	No	Not available in Tanzania, export to Europe or Asia.	Sale of these fraction to a global refinery could generate income
CRT tubes (incl. glass, containing lead, beryllium, phosphor, etc.)	No	So far not identified in Tanzania Export to Europe	For local solutions further identification of possible downstream partners (e.g. industries who can use lead glass in their processes) in combination with investment into local treatment facility is needed
Hazardous fraction (PCB in capacitors, mercury in backlights, batteries)	No	Needs a hazardous waste treatment facility (special incineration or controlled landfill) which is not available, smaller capacitors and batteries can be left on the PWB when sold to international smelters. Export to Europe	Needs either investment into a local hazardous waste treatment facility or needs to be exported to specialized facilities abroad (e.g. to Europe)

[2] Guangzhou GISE-MBA New Plastics Technology Co., Ltdhttp://www.mbapolymers.com/

8.4 General recommendations

The following are among the recommended actions for improving e-waste management in Tanzania taking into consideration the identified weaknesses as well as the key issues identified in the Durban Declaration on e-waste Management in Africa (WasteCon 2008):

Cooperation among stakeholders: - There is need for improving the cooperation among the stakeholders by involving them in the e-waste management. This could be done by operationalizing the current e-waste management strategy developed by the VPO- DOE. Cooperation among the stakeholders could also be improved by establishing a national e-waste forum in collaboration with relevant and well established international, regional or national bodies such as the European WEEE forum, ARSCP, CPCT, etc for purposes of sharing information and knowledge on e-waste management.

Development of a legal framework: - The existing Environmental Management Act (2004) and its regulations on hazardous waste of 2009 includes provisions for e-waste management but its enforcement is still a challenge. There is therefore a need for strengthening the relevant institutions in terms of both technical and financial capacities to enable them to effectively play their part in the implementation of EMA (2004). Some of the existing sectoral policies and legislations which hinder sustainable management of e-waste also need to be reviewed. For instance, the current practice by the FCC of disposing of counterfeit products in the country without considering the impacts to the environment and human health should be reviewed.

Establishment of an institutional framework: -The existing institutional framework can support e-waste management. However, there is need for strengthening the existing institutional framework in terms of technical, human and financial capacities to enable them to handle e-waste management effectively and efficiently.

Awareness creation: - Awareness on the effects of discarded e-waste to the environment and human health should be created at all levels of governance and the general public by making information available through appropriate means (e.g. websites, workshops/seminars, campaigns, etc.); and by identifying target groups (e.g. schools, universities, vocational institutions, informal sector, government, retailers, etc.) with tailor made solutions towards sustainable e-waste management.

Support markets: - The existing downstream markets and alternative material flows for e-waste fractions in Tanzania should be identified, quantified and evaluated. The informal sector should be formalized or at least connected to formal operations, to enable the government to properly control e-waste management as well as to promote fair local e-waste markets.

Collection and management of data: - Collection and management of data system need to be improved by, among others, establishing a data acquisition system which allows for design, monitoring and control of e-waste; setting up a mechanism for continuous update of these data; and by using data for transparent decision making and system improvement. The current import/export data collected by TRA does not distinguish between new and second hand products. Therefore there is need to improve this system to enable one to distinguish between new and second hand products. Manufacturers/importers of new equipment and suppliers of second-hand equipment should be required to disclose information on expected duration of use and disposal practices. Refurbishers and repair workshops should also be required to provide information on the volumes they process and return to consumers; waste generated; and disposal practices.

Development of a formal and efficient e-waste recycling sector: - There is need for developing a formal e-waste recycling sector by documenting tested and best available processes and practices. This includes developing and improving skills and competencies of entrepreneurs and other stakeholders through training, Business models for prep-processing technologies, such as manual dismantling operations, should be established on a local level. Business models for mechanical processes, such as proper treatment of CRT screens, should be coordinated on regional level, including solutions in cooperation with neighbouring countries. A focus should be put on connecting existing and new processes in the e-waste stream (see Table 26). Finally emphasis should also be put on the continuous improvement of the infrastructure through the establishment of standards and auditing procedures.

8.5 Specific recommendations for the UNIDO e-waste initiative for Tanzania

Results of this study underline that the idea to address the e-waste problem within the UNIDO e-waste initiative for Tanzania was well anticipated, i.e. it supports the current national discussion and activities with some useful insights into the current e-waste situation in the country. As a way forward recommendations for the following three areas are suggested:

Support in developing pilot projects:

- The initiative could play a pioneer role in Tanzania in the responsible treatment of end-of-life computers. A focus could be set to on supporting the establishment of a **manual dismantling facility** and the proactively encourage the coordination of further treatment options on regional level. Such a facility should be coordinated with other similar initiatives in the region (e.g. Close the Gap in Uganda, Camara in Kenya)
- A **collection system** beyond e-waste arising from the refurbishment operations should be supported in order to make a dismantling pilot feasible. It is suggested to start with integrating waste streams from governmental organizations, followed by private companies. For this purpose large OEMs should be integrated in the planning from the beginning. Collection from private households will need separate attention and needs a more in depth analysis for specific recommendations. For any collection system the role of the informal sector needs to be considered.
- **Downstream processes** should include models with international partners for the treatment of fractions, which cannot be processed on a national or regional level (see Table 26).

Support in elaborating on appropriate financing mechanisms:

- As has been document in earlier studies (e.g. Wasswa 2008) manual disassembly of computer waste and further sales of the resulting material fractions can generate income for some of the fractions. However the correct treatment of the problematic fractions (especially CRT screens, flame retardant plastics and batteries) will cost money. It is expected that the sustainable recycling of computer waste in Tanzania can only be paid by the intrinsic value of the computer unit's material content, once a critical volume throughput has been achieved (typically around 500 tonnes per year), and only under the conditions that commodity prices stay at a high level and the waste received is not cannibalized before entering a dismantling facility. Given the currently rather low potential volumes of e-waste generated (~2000 tonnes), critical volumes cannot be achieved realistically within a few years. Hence any engagement by UNIDO would demand for **a start-up funding and appropriate financing mechanisms**, which ensures high collection rates and avoids cherry picking of valuable fractions.

Support of stakeholder processes:

- It is recommended that the UNIDO e-waste initiative for Tanzania supports the **ongoing national stakeholder process**, which is currently driving national policy and legislation.
- In addition the project should also foster **initiatives from the private (ICT) sector** (corporate social responsibility programmes, take back programmes by large global manufacturers, etc.)
- Some activities will need **regional approaches** where UNIDO should play a broker role and integrate tasks in their on-going coordination efforts for e-waste management in Eastern Africa.

9 References

ADB 2005: United Republic of Tanzania - country governance profile. African Development Bank, Country Operations Department, ONCF, north, east and, south region, Tunis-Belvedère, Tunisia. http://www.afdb.org/en/countries/east-africa/tanzania/ (last accessed 27 September 2010)

CIA 2010: The World Factbook 2010. Central Intelligence Agency, Washington, DC. https://www.cia.gov/library/publications/the-world-factbook/index.html (last accessed 20 September 2010)

Kaunde Osmund and Nyenga Nancy R 2009: E-waste management in Tanzania; case study: Dae Es Salaam. University of Dar es salaam, National Environmental Management Council.

Mataheroe Pieter 2009: E-waste management in Tanzania? Identifying obstacles and opportunities. Eindhoven University of Technology, master thesis, Eindhoven / The Netherlands.

MITM 2010: Trade Statistics, Performance indicators in Trade sector (1995-2006). Ministry Of Industry, Trade and Marketing, The United Republic of Tanzania, http://www.mitm.go.tz/index.php (last accessed 20 September 2010)

NBS 2010: United Republic of Tanzania in Key Statistics. National Bureau of Statistics, Dar es Salaam, Tanzania. http://www.nbs.go.tz/ (last accessed 20 September 2010)

Sepúlveda, A, Schluep M, Renaud FG, Streicher M, Kuehr R, Hagelüken C, Gerecke AC, 2010: A review of the environmental fate and effects of hazardous substances released from electrical and electronic equipments during recycling: Examples from China and India. Environmental Impact Assessment Review 30, 28–41.

TRA 2010: Imports of Computers, TVs and Printers into Tanzania. Statistics Department, Tanzania Revenue Authority, Dar es Salaam, Tanzania.

TCRA 2009: Status of telecom market; March 2009 report Tanzania Communications Regulatory Authority. http://www.tcra.go.tz/ (last accessed 20 September 2010)

UN Comtrade 2010: International Merchandise Trade Statistics (IMTS). United Nations Statistics Division, http://comtrade.un.org/ (last accessed 20 September 2010)

VPO 2005: Assessment of electronic waste in Dar Es Salaam City, Vice President Office Divion of Environment, The United Republich of Tanzania.

Wasswa J and Schluep M., 2008: e-Waste assessment in Uganda: A situational analysis of e-waste management and generation with special emphasis on personal computers. Uganda Cleaner Production Center and Empa, UNIDO/Microsoft refurbishment centre project, Kampala/Uganda.

WasteCon 2008: The Durban Declaration on e-Waste Management in Africa. Waste Management Conference and Exhibition, The Institute of Waste Management of Southern Africa. Durban, South Africa.

World Bank 2010: World Development Indicators. International Bank for Reconstruction and Development, Washington DC. http://data.worldbank.org/ (last accessed 20 September 2010)

WEF 2010: The global information technology report 2009-2010. World Economic Forum, Geneva, Switzerland, http://www.networkedreadiness.com/gitr/main/about.cfm (last accessed 20 September 2010).

10 Annexes

10.1 List of Stakeholders Visited/Interviewed/Submitted Filled in Questionnaires

S/N	Name	Address	Contact Person (Name, Designation & Phone/Email)
	Government Consumers		
1	National Environment Management Council (NEMC)	Regent Estate, Plot No 29/30 P.O. Box 63154, DSM Website: www.nemctan.org	Eng. Bonaventura Baya, Director General Mob: 255 713 315 040 Email: bbaya@hotmail.com or nemctz@yahoo.com
2	Tanzania Communications Regulatory Authority	Mawasiliano Towers, Plot No. 2005/5/1, Block C, Sam Nujoma Rd P.O. Box 474, DSM Tel: 255 22 2199 760-9 Fax: 255 22241 2010 Website: www.tcra.go.tz	Director General Tel: 25522 2199 760-9 Email: dg@tcra.go.tz
3	University Computing Centre (UCC) - University of Dar es Salaam	P.O. Box 35062, DSM Tel: 255 22 2410 645 Fax: 255 22 241 0690 Website: www.ucc.co.tz	Respickius Casmir Isack Cambira Denis Mkwati – 255 22 2410 645 Email: dmkwati@udsm.ac.tz
4	University of Dar es Salaam – College of Eng. & Technology (CoET)		Osmund Kaunde
5	Ardhi University	P.O. Box 35176, DSM Website: www.aru.ac.tz	Erasto Mushi Mob: 255 756 538 082 Email: erasto@aru.ac.tz
6	Vice President Office – Division of Environment		Issania Mangalili Geofrey Bakanga Rogathe D. Kisanga
7	Ministry of Health and Social Welfare	P.O. Box 9083, DSM Tel: 255 22 2120261/7 Website: www.moh.go.tz	Sosthenes Bagomhe – System Analyst Mob: 255 714 143 590 Email: sosthenes.bagomhe@gmail.com
8	Ministry of Water & Irrigation	P.O. Box 9153, DSM Website: www.mowi.go.tz	Desmond Mayo Mob: 255 718 164 360 Email: desmond@mowi.go.tz
9	Ministry of Industries, Trade and Marketing (MITM)		Patrick B. Marwa
10	Ministry of Lands, Housing and Human Settlement	P.O. Box 3192, DSM Tel: 255 22 212 1241 Website: www.ardhi.go.tz	Pia Joseph Mob: 255 714 168 162 Email: mankajoe@yahoo.com
11	Tanzania Revenue Authority – Statistics Dept		Mrs. Lyimo – Stastician, TRA
12	Arusha Municipal Council	P.O. Box 3013, Arusha Tel: 255 27 250 8073 Fax: 255 27 250 5013 Website: www.arushamunicipal.go.tz	Mr Ekwabi Goodluck – Health Officer Mr Marko C. Bayai – Health Officer Mrisho Gambo - Computer Systems Analyst; Mob: 255 784 337 639

S/N	Name	Address	Contact Person (Name, Designation & Phone/Email)
			Email: mrishogambo@yahoo.co.uk
13	Moshi Municipal Council	Florida Road P.O. Box 318, Moshi Te/Faxl: 255 27 275 2906	Ms. Bernadetta Kinabo – Municipal Director Mrs. Vianne Kombe – Ag. Sustainable Moshi Programme Cordinator Mob: 255 756 334 607 Email: vianek@hotmail.com smpmoshi@gmail.com
14	Department of Environment, Zanzibar		Ms. Asha Ali Khatib – Ag. Director Mr Makame Machano Haji – Planning Officer
15	Department of Trade, Ministry of Tourism, Trade and Investment		Mr. Rashid Ali Salim – Director
16	Tanzania Revenue Authority, Zanzibar	P.O. Box 161, Zanzibar Tel: 255 24 2232 837- 8 Fax: 255 24 2232 633	Mr. Ali B. Ame – Manager, Customs Operations, Zanzibar - Mob: 255 777 411 526 Email: aame@tra.go.tz
17	International Criminal Tribunal for Rwanda (ICTR)		Mr. James Ndungu – IT Manager
18	National Institute for Medical Research (NIMR)	Luthuli Street, P.O. Box 9653, DSM Tel: 255 22 2121400 Fax: 255 22 2121 360 Website: www.nimr.or.tz	Irene Mremi – Systems Analyst Email: imremi@nimr.or.tz
19	Tanzania Industrial Research & Development Organization (TIRDO)	P.O. Box 23235, DSM Tel: 255 22 266 6034 Website: www.tirdo.org	Elizabeth Mtegwa – Research Asistant (IT) Mob: 255 784 320 240 Email: mtegwa@tirdo.org
20	COSTECH	P.O. Box 4302, DSM Tel: 255 22 2700 745 Fax: 255 22 2775 313 Website: www.costech.or.tz	Alfred Nyoni Mob: 277 754 643 275 Email: anyoni@costech.or.tz
	Private Consumers		
21	Zain	P.O. Box 9623, DSM Website : www.zain.com	Ajit Mistry – IT Support Engineer Tel: 255 786 670 792 Email: ajit.mistry@tz.zain.com
22	Zantel	P.O. Box 77052, DSM Fax: 255 22 266 7300	Yusuph Thuwen Mob: 255 777 415 511 Email: thuwen@zantel.com
23	Bonite Bottlers Ltd	Shiri Matunda, P.O.Box 1352, Moshi Tel: 255 27 2754422/7 Fax: 255 27 2753311	Mr. G. Srikrishna – Manager, IT and Projects Email: srikrishna@bbl.co.tz
24	Stanbic Bank	Sukari House, Ohio Street P.O. Box 72647 Tel: 255 211 2195, DSM	Laurencia Ngonyani – Customer Consultant Mob: 255 717 371 414 Email: ngonyanil@stanbic.com
	National Microfinance Bank (NMB)	P.O. Box 9213, DSM Tel: 255 22 2161 000 Website: www.nmbtz.com	Terry Exaud – Hardware & Communication Engineer Mob: 255 767 400 031 Email: terry.exaud@nmbtz.com
25	CRDB Bank	P.O. Box 268, DSM Tel: 255 22 212 9141	Idd Rwegoshora – Information Systems Officer

S/N	Name	Address	Contact Person (Name, Designation & Phone/Email)
		Website: www.crdbbank.com	Mob: 255 713 382 727 Email: irwegoshora@crdbbank.com
26	Silvertouch Internet Cafe	Azimio Street	Mr. James George – Technician Mob: 255 767 690 101 Email: gjamestz@gmail.com
	NGO Consumers		
27	Care	P.O. Box 10242, DSM Tel: 255 22 2666 775 Fax: 255 22 2666 944 Website: www.care.org	Mohamed Hamisi Mob: 255 717 041250 Email: Mohamed.hamisi@care.org
S/N	Name	Address	Contact Person (Name, Designation & Phone/Email)
28	Envirocare	Makongo Juu, P.O. Box 9824, DSM Tel/Fax : 255 22 270 1407 www.envirocare.co.tz	Loyce Lema – Executive Director Mob : 255 754 272 285/ 718 699 754 Email : eushayo@yahoo.com
29	Agenda Participation 2000	P.O. box 55756, DSM Tel : 255 22 246 0036 Fax: 255 22 246 0040 www.agendaparticipation2000.org	Seche Jackob Mob: 255 755 899 09
	Distributors/Retailers		
30	Digital Links Tanzania		John Townshend
31	Stone Town Trader Ltd, Zanzibar	P.O. Box 3466, Gizenga Street, Zanzibar Tel/Fax: 255 24 223 3089 Mob: 255 773 454 443 Email: sales@stt-znz.com Website: www.stt-znz.com	Mr. Zulfikar M. Bhaloo – Managing Director Mob: 255 777 420 111
32	One2One Ltd, Zanzibar	Mlandege, Salmin Amour Road, P.O. Box 4225, Zanzibar Tel: 255 24 2235 928/9 Fax: 255 24 2230 343	Mr. Manish P. Govindji – Managing Director Mob: 255 777 431 973 Email: manish@mcc.co.tz
33	JR Electronics, Arusha	P.O. Box 7170, Sokoine Road, Arusha Tel: 255 27 250 8902 Fax: 255 27 250 7565 www.jrelectronics.com	Mr. Mirjean Pirbhai – Director Tel: 255 27 250 7565 Email: jradmin@jrelectronics.com
34	Infosys IPS (T) Ltd	P.O. Box 7518, DSM Tel/Fax: 255 22 266 4219 Website: www.infosys.co.tz	Milton Mogha Mob: 255 712 579 062 Email: miltonm@infosys.co.tz
35	Computer Connection	P.O. Box 656, DSM Tel: 255 22 212 7751 Fax: 255 22 213 2601 www.computertz.com	M. Srinivasu Mob: 255 717 756 255 Email: msrinivasu@computertz.com
36	Red Dot Distribution Ltd	P.O. Box 80008, DSM Tel: 255 22 212 9222 Fax: 255 22 211 7743 www.reddot-ea.com	Mshad Mau – General Manager Tel : 255 22 212 9222 Email: mshad@reddot.co.tz

S/N	Name	Address	Contact Person (Name, Designation & Phone/Email)
	2nd Hand Retailers		
37	Kwa Remtula, Arusha	P.O. Box 2637, Arusha, Plot 2A, Unga Ltd Tel: 255 27 254 8149	Montazir Remtula – Sole Proprietor Mob: 255 717 37 37 37 Email: kwar08@yahoo.com
38	Murshid Mbarouk, Zanzibar		Mr. Murshid Mbarouk – Director
39	Best Buy Electronics, Zanzibar	Mlandege, P.O. Box 1396, Zanzibar	Mr. Seif Ali Seif – Managing Director Mob: 255 773 422 668
40	Toronto Electronics, DSM	Magomeni Mapipa	Mr. Faraji Hamisi / Mob: 255 715 102 616
41	Just Computers Ltd, DSM	Millenium Business Park, Morogoro Road Tel: 255 22 2400 762 Fax: 255 22 2400 764	Fahib Daudi / Mob: 255 715 844 771
42	Amani Electronics	Kariakoo - Msimbazi	Omary Hassan / Mob: 255 716 021 900
43	Modawo Used	Magomeni Mapipa	Hashim Abubakar / Mob: 255 717 778 801
44	Computer Store	Kariakoo - Msimbazi	Marunda Elikarim / Mob: 255 788 376 837
45	Bahau	Magomeni Mapipa	Omary Suleiman / Mob: 255 776 201 523
	Collectors		
42	Manyalu Group	Kariakoo, Zanzibar	Mr. Omari Khamis Bai (Mob: 0777 458900)
43	Mwembeni Group	Gerezani, DSM	Mr. Dotto Kimazi - Chairman
44	Maendeleo Used Plastics and Paper Enterprises Ltd.	P.O. Box 12789, Arusha	Mr. Maendeleo Paulo Midimi – Director Mob: 255 787 380229 Mrs Ainess John – Finance Manager Mob: 255 754 206103
Recyclers			
45	Ngosha Black Smith Group	Vingunguti, DSM	
	Final Disposers		
46	Dar es Salaam City Council Sanitary Landfill	P.O. Box 9084, DSM	Mr. Thomas A. Lyimo – Landfill Manager Mob: 0715 273423/0754 273423 Email: thomaslyimo@hotmail.com or thomasanaseli@yahoo.com
47	Zanzibar Municipal Council,		Mr. Rashid Ali Juma – Director, Zanzibar Municipal Council Mr. Mzee Khamis Juma – Sanitary Engineer, Zanzibar Municipal Council Email: mkju61@yahoo.com Mob: 255 777 413043
48	Arusha Municipal Council	P.O. Box 3013, Arusha Tel: 255 27 250 8073 Fax: 255 27 250 5013 Website: www.arushamunicipal.go.tz	Mr Ekwabi Goodluck – Health Officer Mr Marko C. Bayai – Health Officer Mrisho Gambo - Computer Systems Analyst; Mob: 255 784 337 639 Email: mrishogambo@yahoo.co.uk
49	Moshi Municipal Council	Florida Road P.O. Box 318, Moshi	Ms. Bernadetta Kinabo – Municipal Director Mrs. Vianne Kombe – Ag. Sustainable

S/N	Name	Address	Contact Person (Name, Designation & Phone/Email)
		Te/Faxl: 255 27 275 2906	Moshi Programme Cordinator Mob: 255 756 334 607 Email: vianek@hotmail.com smpmoshi@gmail.com

10.2 Questionnaires for Corporate

e-Waste Assessment in Tanzania

Questionnaire for Corporates

Date: _____

Location: _____

Interviewer: _____

Introduction

The Cleaner Production Centre of Tanzania (CPCT), a not-for-profit organization based in Dar es Salaam, in collaboration with the United Nations Industrial Development (UNIDO), is collecting data on e-waste generation and management in Tanzania 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

S/N	Question	Answer		Remarks/Comments *(please enhance your replies with comments, suggestions, details, etc.)*
		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 *(please enhance your replies with comments, suggestions, details, etc.)*
		Number	
6	**How many electronic equipment does your institution/company possess?**		
	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?**		
	Desk top computers		
	Laptop computers		
	Printers		
	Mobile phones		
	Televisions		
	Fridges		
	Air conditioners		
	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		
	Fridges		
	Air conditioners		
	Others		

Part IV: Origin of New Equipment

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

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?** Desktop computers ---------- Laptop computers ---------- Traditional monitors (CRT) ---------- Flats screen monitors (LCD) -------- Printers ---------- Mobile phones ---------- Televisions ---------- Televisions ---------- Air conditioners ---------- Others ----------	Store Sell Throw them away with general waste Give them to a recycler Donate them to schools, employees, friends, etc.. Give them back to the person who sold them Other..	
16	**Do you keep inventories of the equipments you discard / store?**	**Yes** No	
17	**If unused equipment is stored, please indicate for how long (on average)** Desktop computers ---------- Laptop computers ---------- Traditional monitors (CRT) ---------- Flats screen monitors (LCD) -------- Printers ---------- Mobile phones ----------		

	Televisions ---------- Televisions ---------- Air conditioners ---------- Others ----------		
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 important obstacles to proper recycling of electric and electronic equipments in the country?**	(Please tick applicable answer to you) • Costs • Lacking infrastructure and/or policy within your company • Absence of recycling possibilities • Lack of legislation • other	
22	**What should be done to foster proper e-waste recycling in Tanzania?**	**Please suggest**	

10.3 Questionnaires for Distributors/Retailers

e-Waste Assessment in Tanzania

Questionnaire for Distributor/Retailer

Date: _____

Location: _____

Interviewer: _____

Introduction

The Cleaner Production Centre of Tanzania (CPCT), a not-for-profit organization based in Dar es Salaam, in collaboration with the United Nations Industrial Development (UNIDO), is collecting data on e-waste generation and management in Tanzania 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

S/N	Question	Answer		Remarks/Comments *(please enhance your replies with comments, suggestions, details, etc.)*
		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 *(please enhance your replies with comments, suggestions, details, etc.)*
		Number	
6	**What is the installed base of electric & electronic equipment at your company?**		
	Desk top computers (including CRT, mouse, keyboard)		
	Laptop computers		
	Printers		
	Telephones		
	Televisions		
	Refrigerators		
	Air conditioners		
	Others		
7	**How many of them are not in use/sellable?**		
	Desk top computers		
	Laptop computers		
	Printers		
	Telephones		
	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		
	Telephones		
	Televisions		
	Fridges		
	Air conditioners		
	Others		

Part IV: Origin of New Equipment

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

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		
	Telephones		
	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		
	Telephones		
	Televisions		
	Refrigerators		
	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/can't sell anymore?** Desktop computers ---------- Laptop computers ---------- Traditional monitors (CRT) ---------- Flats screen monitors (LCD) -------- Printers ---------- Telephones ---------- Televisions ---------- Refrigerators ---------- Others ----------	Store Sell Throw them away with general waste Give them to a recycler Donate them to schools, employees, friends, etc.. Give them back to the person who sold them Other..	
16	**Do you keep inventories of the equipments you discard / store?**	**Yes** No	
17	**If unused equipment is stored, please indicate for how long (on average)** Desktop computers ---------- Laptop computers ---------- Traditional monitors (CRT) ---------- Flats screen monitors (LCD) -------- Printers ---------- Telephones ---------- Televisions ----------		

	Refrigerators ---------- Others ----------		
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 important obstacles to proper recycling of electric and electronic equipments in the country?**	(Please tick applicable answer to you) • Costs • Lacking infrastructure and/or policy within your company • Absence of recycling possibilities • Lack of legislation • other	
22	**What should be done to foster proper e-waste recycling in Tanzania?**	**Please suggest**	

Part VII: Distribution /Retail Profile

	Question	Answer	Remarks/Comments
23	**How many PCs were provided/ sold to clients in the last three years?** **2007:**	**2007: Laptops ----------** **Desktops: ----------** **2008: Laptops ----------** **Desktops: ----------** **2009: 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		

10.4 Questionnaires for Private Households

Cleaner Production Centre of Tanzania (CPCT)

e-Waste Assessment in Tanzania

Questionnaire for Private Households

Date: _____

Location: _____

Interviewer: _____

Interviewed person

Name	
Telephone	
E-mail	
Ward/Suburb	
Town	
Municipality/City	

Introduction

The Cleaner Production Centre of Tanzania (CPCT), a not-for-profit organization based in Dar es Salaam, in collaboration with the United Nations Industrial Development (UNIDO), is collecting data on e-waste generation and management in Tanzania 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

Questions about awareness and behaviour

Questions	**Responses**		
2.1	**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)

Large Household Appliances

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

Small Household Appliances

Product	# Products
Blenders	
Coffee Machines	
Electric Lawn-mowers	
Electric Toothbrushes	
Fans	
Hair Dryers	
Flat rons	
Kettles	
Microwaves	
Mixers	
Pool Cleaners	
Popcorn Makers	
Toasters	
Vacuum Cleaners	

IT and Telecommunication Equipment

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

Consumer Equipment

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

Lightning Equipment

Product	# Products
Fluorescent Tubes	
Light Bulbs	
Long Life Light Bulbs (CFLs)	

Batteries

Product	# Batteries
Accumulators	
Car Batteries	
One-Way Batteries	

Detailed Information about tracing products

Product	Where was it bought? In what condition? (new/ used & working/ broken)	# years used	# 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 (TZS in '000) (Please tick appropriate box)

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

10.5 Questionnaires for Informal e-Waste Recyclers

e-Waste Assessment in Tanzania

Questionnaire for Informal e-Waste Recyclers

Date: _____

Location: _____

Interviewer: _____

Introduction

The Cleaner Production Centre of Tanzania (CPCT), a not-for-profit organization based in Dar es Salaam, in collaboration with the United Nations Industrial Development (UNIDO), is collecting data on e-waste generation and management in Tanzania 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. Your enterprise has been identified as one of the key stakeholders for this study. We would be grateful if you could spare some time to answer a few questions.

Part 1: General Information about the Enterprise

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

Part II: General Questions on Awareness

S/N	Question	Answer		Remarks/Comments *(please enhance your replies with comments, suggestions, details, etc.)*
		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 *(please enhance your replies with comments, suggestions, details, etc.)*
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?)*

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 Neighbouring 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.

Water supply
Give information on the water supply and sanitation of the enterprise

Waste management
Give information on the waste management practices. Especially address the waste stream that is generated by the assessed enterprise.

Part VII: Complimentary information

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

10.6 List of Schools and Teachers' Resource Centres in Tanzania Supported by Digital Links Tanzania Since 2004

Beneficiaries in Tanzania Mainland

S/N	Name of School	Type	Location
1	Kibasila Sec School	Co-ed public	Dar es Salaam
2	Boko Sec School	Co-ed public	Dar es Salaam
3	Kiluvya Sec School	Co-ed public	Dar es Salaam
4	Juhudi Sec School	Co-ed public	Dar es Salaam
5	Kambangwa Sec School	Co-ed public	Dar es Salaam
6	Heritage Sec School	Co-ed private	Dar es Salaam
7	Laureate Prim + Sec Sch	Co-ed private	Dar es Salaam
8	Kisutu Secondary School	Public - Girls	Dar es Salaam
9	Kilombero Sec School	Co-ed public	Morogoro
10	Ifakara Girls Sec Sch	Girls public	Morogoro
11	Kilakala Sec Sch	Co-ed public	Morogoro
12	Mnini secondary school	Co-ed public	Kilimanjaro
13	Langasani secondary	Co-ed public	Kilimanjaro
14	Vunjo secondary	Co-ed public	Kilimanjaro
15	Shauritanga secondary	Co-ed public	Kilimanjaro
16	Kilomeni girls secondary	Girls public	Kilimanjaro
17	Mtakuja Sec Sch	Co-ed public	Kilimanjaro
18	Mnini Sec Sch	Co-ed public	Kilimanjaro
19	Anwarite Sec School	Girls private	Kilimanjaro
20	Enyorata Girls Secondary	Girls semi-private	Arusha
21	St Mary's Girls Sec	Girls private	Lushoto
22	Korogwe Sec School	Girls public	Tanga
23	Kilwa Sec School	Co-ed public	Kilwa
24	Mangula Sec School	Co-ed public	Morogoro
25	Mazinyungu Sec Sch	Co-ed public	Morogoro
26	Sumaye Sec Sch	Co-ed public	Morogoro
27	Kidatu Sec Sch	Co-ed public	Morogoro
28	Chalinze Sec Sch	Co-ed public	Bagomoyo
29	Nelson Mandela Sec Sch	Co-ed public	Bagamoyo
30	Heritage Sec Sch	Co-ed private	Dar es Salaam
31	Alpha High Sch	Co-ed private	Dar es Salaam
32	Kishengweni Sec	Co-ed public	Kilimanjaro
33	Somsom Sec	Co-ed public	Kilimanjaro
34	Weruweru Sec	Girls public	Kilimanjaro
35	Lyamungo	Co-ed public	Kilimanjaro
36	Lomwe Sec	Co-ed public	Kilimanjaro
37	Pasua Sec	Co-ed public	Kilimanjaro
38	Ebenezer Prim & Sec	Co-ed private	Kilimanjaro
39	Reginald Mengi Sec	Co-ed public	Kilimanjaro
40	KCMC College	Semi private	Kilimanjaro
41	Scolastica Prim & Sec	Co-ed public	Kilimanjaro

42	Arusha Sec	Co-ed	Arusha
43	Longido Sec	Co-ed public	Arusha
44	Funguni Sec School	Co-ed public	Pangani,Tanga
45	Bassoutu Sec	Co-ed public	Manyara

Source: Digital Links Tanzania, 2011

Beneficiaries in Zanzibar and Pemba

1	TC Kiembe Samaki
2	TC Bububu
3	TC Kitogani
4	National Teachers Resource Centre, Unguja
5	TC Mkwajuni
6	TC Dunga
7	TC Miti-Ulaya
8	TC Michakaini
9	TC Wingwi
10	TC Mizingani
11	Benjamin Mpaka Teachers Training Centre, Wete, Pemba

Source: Digital Links Tanzania, 2011

10.6 Waste Generation and Collection Data in Kinondoni Municipality

Solid Waste Generation

Type of Waste	Quantity per day (tons/day)
Household waste	1618.8
Commercial waste	30.4
Institutional waste	12.1
Market waste	40.5
Streets waste	2
Informal sector waste	322.2
TOTAL	**2026**

Source: Kinondoni Municipal Council, 2010

Solid Waste Collection in Kinondoni Municipality (2000 – 2007)

Average SW collection	954 tons/dy
• Municipality	553 tons/dy
• Contractors	401 tons/dy
Number of Franchisees	26
• Companies	18
• Groups	8

Source: Kinondoni Municipal Council, 2010