Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Faculty of Natural Resources and Agricultural Sciences

Waste Market in Urban Malawi

– A way out of poverty?

Juliette Barré

Department of Urban and Rural Development
Master's Thesis • 30 HEC
European Master in Environmental Science (EnvEuro)
Uppsala 2014

Waste Market in Urban Malawi

- A way out of poverty?

Juliette Barré

Supervisor: Linley Chiwona Karltun, Swedish University of Agricultural Sciences, Department of Urban and Rural Development

Examiner: Opira Otto, Swedish University of Agricultural Sciences, Department of Urban and Rural Development

Credits: 30 HEC

Level: Second cycle (A2E)

Course title: Independent Project in Environmental Sciences **-** Master's thesis

Course code: EX0431

Programme/Education: European Master in Environmental Science (EnvEuro)

Place of publication: Uppsala

Year of publication: 2014

Maps and images: Images and pictures: Juliette Barré. Maps are used with permission from copyright holder

Online publication: http://stud.epsilon.slu.se

Keywords: waste, development, poverty, Malawi, recycling, market

Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Faculty of Natural Resources and Agricultural Sciences

Department of Urban and Rural Development

Table of Contents

List of tables

List of Figures

Acknowledgment

I would like to thank Dr David Mkwambisi for giving me the opportunity to travel to Malawi and live an amazing experience in every place I have been. I also want to thank him for supervising my work and giving me the chance to meet great people along my research. I want to thank Mtisunge Clara Kaludzu who was a perfect co-worker and a great guide in Lilongwe. I learn so much of the Malawian culture from her that I will never forget her! I also would like to thank Dr Sikawa for the provision of the transport in all the times that I needed it, my driver, Mr Mbewe, who was the most patient and careful driver I met. I will like to thank the entire group of great student I met at Bunda College who offered me support and comfort during my journey, they were so kind and generous thank you so much for your time.

Of course my indebted thanks should go to the stakeholders in waste management and waste marketing who made my work a success, without their inputs and suggestions I would not have been able to make it. Special thanks for Mr. Kwanjana who helped me with the contacts of some stakeholders in waste management and who gave me a lot of good quality data, your contribution was priceless.

Finally I would like to thank my two supervisors from Europe Linley Chiwona-Karltun and Abebe Nigussie Nigatu I'm so grateful to them, without them I would not have been able to write my thesis as it is. Thank you so much.

List of Abbreviations and Acronyms

AYISE	Active Youth Initiative for Social Enhancement
ADI	African Development Indicators
BBCs	Buy-Back Centers
BCC	Blantyre City Council
CBO	Community Based Organization
CCODE	Centre for Communication, Organization and Development
EPA	Environmental Protection Agency
EU	European Union
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GNI	Gross National Income
IEP	Institute of Environmental Professional
LCC	Lilongwe City Council
MATAMA	Mineral and Appropriate Technology Applicable in Malawi
MSW	Municipal Solid Waste
NGO	Non Governmental Organization
OECD	Organization for Economic Co-operation and Development
PID	Perez Investment Director
SAWMEA	South African Waste Management Employers' Association
SLU	Swedish University of Agriculture
SSA	Sub-Saharan Africa
TORs	Terms Of References
UNDP	United Nation for Development
UK	United Kingdom
USA	United States of America
USD	United States Dollars
W4W	Waste for Wealth

Abstract

In 2012, world global production of Municipal Solid Waste (MSW) was estimated at about 1.3 billion tons per year and is predicted to grow to 2.2 billion tons per year by 2025. Massive and fast accumulation of waste is difficult to handle especially in urban areas where space is scarce. Accumulation of waste results the development of harmful toxins, bacteria, and odors. Moreover, it can lead to soil and ground water contamination. These challenges are spread in Malawi where the field study took place. More precisely, the research was done in two cities; Lilongwe (the capital) and Blantyre (the commercial city). The overall aims of this paper are (i) to explore urban waste management strategies and market in Malawi (ii) to determine the actors and their role in urban waste market (iii) to understand the economic and social benefits of urban waste management. The study was conducted for two months. Thirteen interviews with different stakeholders in the waste management business were carried out. Three urban waste marketing activities were identified in the study areas namely; trade of compost produced from organic wastes , trade of plastic waste for industry and residential waste collect by small local companies. The compost market has a huge potential for development due to the large quantity of organic waste produced, minimum competition for organic wastes and the simplicity of the process (no need for high technology to compost waste). The existing waste activities generate job opportunities and improve the livelihood of urban dwellings. Both women and men are equally represented in the business; however, they do not work together and often don't have the same tasks. For example women are cleaning the plastic waste while men are in charge of the collect and the process. However, the willingness of the government to promote private initiative regarding to waste management and marketing is very poor. All of the respondents identified lack of support from public authorities and regulations as a main challenge for waste management and marketing. Moreover, fuel price, lack of training and market visibility were the common impediments for the stakeholders

Other results are found and are discussed all along the thesis. However these results must be carefully handled as the sample chose for the study is very small (13 interviews). Additionally, the respondents provided data that couldn't be verified since it could be a personal choice by the respondents to overestimate their success or their issues, so there might be a bias towards quantitative as well as qualitative data. Finally, this study is a call for more research on the subject as waste trading seemed to have a great potential to answer poverty issue in urban Malawi. Therefore, there is a need for more specific research on the link between poverty alleviation and the mechanisms of the market especially in SSA countries.

CHAPTER 1: Introduction

1.1 Justification and Background

World global production of Municipal Solid Waste (MSW) was estimated to be about 1.3 billion tons per year in 2012 and it is predicted to grow to 2.2 billion tons per year by 2025 (World Bank 2012a). The Sub-Saharan Africa (SSA) region produces around 62 million tons of waste per year (5% of the global production). The average per capita is relatively low (0.65kg/capita/day) but this number varies a lot from one region to another (World Bank 2012). In comparison, the OECD (Organization for Economic Co-operation and Development) countries generate 572 million tons of solid waste per year (44% of the global production) with an average of 2.2 kg/capita/day (World Bank 2012). The population in a specific area and its consumption patterns define the amount of waste produced (Mavropoulos, 2012). In the current context, especially in Africa, these two factors are increasing rapidly (WorldBank 2011). Massive and fast accumulation of waste is difficult to handle especially in urban areas where space is scarce. Waste management is an "*economical abyss*" for cities in Africa due to their need in labor, technology, transport and energy (Van Dijk, 2008). For example, the city of Mzuzu (Malawi) spend 500,000 Malawian Kwacha (1,500 USD) per week to dispose urban wastes (Mtika, 2013). Accumulation of waste promotes the development of harmful toxins, bacteria, and odors (Mkambisi, 2007). Furthermore, accumulation of waste leads to soil and ground water contamination.

This large amount of uncollected waste creates the opportunity for formal and informal businesses to develop especially in SSA (Medina 2002). Statistics show that "*2% of the population in Third World countries survive by recovering materials found in waste" and that "1% of the world's population makes a living from waste picking"* (Medina 2002). Fifteen million people in the world are estimated to be waste pickers (Schenck, 2012) and the share of them using the waste for themselves and/or selling it directly and/or processing it varies a lot from one region to another. According to Onibokun (2009b), while the main business concerning waste management in Africa is focused on its collection and its disposal to landfill, few efforts are geared to reducing the amount of waste or to its recovery like recycling and/or composting. Recovery process will be analyzed to understand if there is a potential market for recovery products in Malawi. According to Schenck (2012) the waste market in southern Africa is an opportunity for the marginally poor to get out of poverty because although they are often part of the informal market (don't pay taxes) they can create a formal output through institutional and more formal bridges like buy back centers. Others argue that waste markets which are subject to little involvement by the state or by the privatization of waste collection activities tend to increase inequalities and precariousness for the marginally poor (Samson, 2004). This especially concerns women who are not included in the social regime and are the result of an anti-gender policy (Samson, 2004).

These challenges are spread in Malawi, which is a landlocked country located in the southern part of Africa. Malawi has 50.7% of its population living under the national poverty line and is one of the poorest countries in the world (World Bank, 2012b). Waste is a problem in urban areas. Public services struggle to collect all the waste produced which leads to inappropriate dumping and sanitary issues (Mkwambisi, 2007). In 2008, there were 13.1 million inhabitants in Malawi, among which 670,000 were living in Lilongwe, the capital located in the center of the country and which has an annual growth rate of 4.3%, while 662,000 people were living in Blantyre, the commercial hub located in the southern part of the country and which has an annual growth rate of 2.8% (Census, 2008). Like all fast urbanizing cities in the world, Lilongwe and Blantyre are challenged by the accumulation of waste due to the increase of their urban population and the limited resources of their public services. In 2010 the production of MSW in Lilongwe was estimated at 4kg per capita per day, which is about six times more than the average production in SSA. However, the city is only able to collect 30% of this waste (LCC interview, March 2013). Similarly, 300 tons of wastes are produced per day in Blantyre and only 28% are collected by the municipality (BCC interview, March 2013*)*.

Both city councils are struggling with their budget to offer appropriate waste management services (LCC & BCC interviews, March 2013). However, alternative options like recycling, composting or any partnership with the private sector are not taken into account (LCC & BCC interviews, March 2013). According to Sanitary Directors at both Lilongwe and Blantyre City

Councils; most governments do not consider waste management a priority. Attention and funds are more focused on food security and educational projects. Waste is considered an unnecessary waste of time and resources and is not seen as a potentially valuable resource (LLC Interview, March 2013). Lilongwe and Blantyre are not isolated cases. In Sub-Saharan Africa, while 20 to 50% of these cities' budgets are going to waste management services, only 20 to 60% of the waste are successfully collected (Achankeng, 2003). This thesis will try to highlight what institutional support is implemented in Malawi to face these issues and how it is succeeding or failing to achieve its goals.

1.2 Objectives of the study

The overall aim of this paper is to understand the current urban waste management practices and waste marketing strategies in Malawi. More specifically the objectives of the study are

(i) To understand the current relationship between the waste market and Malawi's institutional bodies.
(ii) To identify the main types of wastes and the way they are traded in urban Malawi
(iii) To describe the potentials and benefits of waste marketing in urban areas
(iv) To identify the possible challenges and impediments in urban Malawi for the sustainable development of waste management and waste marketing.

To fulfill these specific objectives this thesis is constructed in three parts; 1) the literature review concerning Malawi's (and other low-income countries), waste management and waste marketing situation 2) the analysis of the interviews of stakeholders involved with waste management which were conducted over a 2 month-period in urban Malawi (Lilongwe and Blantyre). 3) Discussion and conclusions on the outcomes of the first two parts.
This thesis is based on three hypotheses:

(i) The market of waste and waste recovery products does exist in urban Malawi
(ii) Currently Malawian formal institutions are not involved in the market of waste or waste recovery products
(iii) There is potential value for Malawian to manage and/or trade waste and waste recovery products in urban areas

These hypotheses will be tested and verified by analyzing who the actors of the potential market are and if they exist in urban Malawi. This thesis will go through the literature to find out what the laws or rules implemented by the institutions that regulate the market are, and the interviews will allow us to see if these institutions have an impact on the market. Finally the potential value of the market will be assessed by analyzing the success of the market actors.

1.3 Scope and outline of the study

This thesis was done to identify what the potential of the marketing of waste is in urban Malawi nowadays and in the future. The aspects looked at are: the current situation in Malawi and other low income countries, the various type of waste produced and traded in urban Malawi as well as the social and economical benefits of the waste business in urban Malawi.
To do so this paper is laid-out in three parts;

- Part one (chapter 1 & 2): Introduction and justification of the subject (Chapter 1). The literature review (Chapter 2) offer an assessment of the various definitions used in waste marketing and of the institutional boundaries regarding waste in Malawi. These two chapters then examine which are the various waste management techniques that are or can be implemented in Malawi.
- Part two (Chapter 3 & 4): Methodology and approach of the thesis (Chapter 3), along with the results of all the interviews Malawi of the stakeholders involved with waste in urban and/or peri-urban areas which were conducted in Malawi (Chapter 4). Three

markets are looked at in more detail: the compost business in Lilongwe and Blantyre, the recycling plastic activity in Lilongwe and Blantyre and finally the waste collection business and its interactions with the public services in Lilongwe.

- Part Three (Chapter 5 & 6): Discussion of the literature reviews and the potential outcomes of all three activities: the role of the institutions, the actors, challenges and benefits for the Malawian as well as the potential development of these markets. Finally the conclusion summarizes the overall thesis.

CHAPTER 2: Literature review

This literature review covers various books, articles and reports published concerning waste management and marketing, especially in SSA. It aims to determine what is known and is not known about waste management and marketing in urban setting especially in low incomes countries. This is done by discussing and clarifying definition of terms and identifying the position of the Malawian government towards waste. It also reviews the major waste recovery techniques and their implication on the market in order to highlight what is available and doable in Malawi. It ultimately covers the basic market typologies and mechanisms along with their applications to waste market in SSA and Malawi.

2.1 Definitions

In literature, various definitions can be found for waste, solid waste, municipal solid waste, waste management, waste marketing, waste pickers... This section of the thesis discusses definitions found in various publications and their implication both in general and more specifically for this paper. Indeed, if the general meaning is quite well understood, what these terms actually mean, include and exclude isn't clear. To avoid confusion and in order to compare further results, definitions from the literature are analyzed and clarified.

"Waste":

- ***Adjective**, (of a material, substance, or by-product) eliminated or discarded as no longer useful or required after the completion of a process*
- ***Noun***
    1. *An act or instance of using or expending something carelessly, extravagantly, or to no purpose*
    2. *[mass noun] (also **wastes**) unwanted or unusable material, substances, or by-product*

(Oxford dictionary 2013)

The term of waste is commonly used on a daily basis and refers to an object with no value or purpose that is meant to be discarded. However, its legal definition has important implications especially for its management and implementation policy (commercial use, transport, disposal, hazardous product...). The European Union (EU) embedded it in the Waste Framework Directive in 2008 and defined it as "*any substance or object which the holder discards, intends to discard or is required to discard"*. This definition is rather large and difficult to implement on a legal basis as it can be interpreted in various ways and doesn't refer to when the object is intended to be discarded (Oelofse, 2008). Furthermore, it doesn't refer to waste as a potential valuable product. In Malawi the definition of waste arrived late in the nineties, the Malawian Environment Management N°23 Act (1996) specified that the word waste includes "*domestic, commercial or industrial waste, whether in a liquid, solid, gaseous or radioactive form which is discharged, emitted or deposited into the environment in such volume, composition or manner as to cause pollution*". This actually doesn't define what a waste is but only what it includes. There is however no reference to what the difference is between domestic, commercial or industrial waste. Wastes are considered as obviously pollutant and therefore dangerous for the environment and the population. This definition could be criticized but it would go beyond the aim of this thesis. Additionally, the Environment Management Act (EMA) distinguishes hazardous waste as "*waste which is poisonous, corrosive, noxious, explosive, inflammable, radioactive, toxic or harmful to the environment*" with adapted rules and laws for this category of waste.

The term "Solid Waste" is often found in various literatures and refers to waste in urban areas which excludes liquid, gaseous, radioactive waste and more importantly waste water. The term of Municipal Solid Waste (MSW) is often used as well. This refers to solid waste produced by the municipality and according to Oelofse (2008) this includes residential and commercial waste as well as waste from public services (hospital, school, ministries...) but excludes industrial

waste. Both terms can be found with no precise definitions which therefore makes the comparison of various studies difficult. The other issue with this term is the definition of municipality. It's rarely specified whether or not informal areas are included when researchers refer to MSW. Because it is often difficult for municipalities to estimate the production of solid waste in informal areas since they have little information as to how many people live there, it is usually admitted that informal areas are not included in the study or are only roughly estimated (Oelofse, 2008).

Waste management is a term often found in city planning reports, sanitary projects or various publications that refer to waste. In Ghana there is a definition for solid waste management, because this country relates waste water management to water management: "*solid waste management is defined as the direct generation, collection, storage, transport, source separation, processing, treatment recovery or disposal of solid waste*" (Foray, 2012). in this case, the definition includes waste production as part of waste management and includes all steps of a waste's life cycle as well as the possibility of its recovery. In the review of literature, no official definition of the term waste management has been found for Malawi, although policies and regulations regarding the treatment and the discard of waste do exist. This will be discussed in the next paragraph (2.2 Malawian regulations regarding waste).
Waste markets are handled by various kinds of people and a recurrent term used to describe people involved in the collection and trade of waste is "waste picker". This term is mostly understood to describe "*people who reclaim reusable and recyclable materials from what others have cast aside or thrown away as waste*" (Samson, 2010). At the First World Conference of Waste Pickers, the expression "waste pickers" was adopted as the term to be used for *"people involved in the collecting phase of the recycling industry"* (WIEGO, 2011:2 in Schenck, 2012). In this paper, waste pickers are considered as key players of the system and are not marginalized. They are part of both the waste market, the institutions and of the waste recovery process.
Waste markets and their mechanisms are defined further on (2.3 Markets and mechanisms) to avoid repetitions.

2.2 The government's position in Malawi

In Malawi, topics related to waste or waste management are embedded in three environmental documents;

- The National Environmental Action Plan (NEAP) of Malawi in 1994, created after the Earth Summit in Rio de Janeiro in 1992. This document introduced wastes in the *chapter 4 Environmental issues* under the section *Human habitat degradation*. This document aimed to describe the environmental situation in Malawi in 1994 and offered actions to slow down its degradation.

- The Environmental Management Act (EMA) N°23 of 1996

- The National Environmental Policy (NEP) adopted in 1996 and amended in 2004. In addition Malawi has developed strategic frameworks to improve economic performance and management. In this document waste subjects are embedded in the *industry and human settlement & health* sections.

In the NEAP (1994) the focus is mainly on solid waste which is divided into three categories: **Inert** "*Harmless [...] builder rubble, soil and spoil*", **general** "*threat to human health and the environment when incorrectly managed […] commercial wastes, domestic waste and garden refuse and industrial waste*" and **hazardous** "*corrosive, explosive, toxic, mutagen, carcinogen and eco-toxic, which pollute water and diminish public health safety when improperly managed*". The NEAP highlights the lack of facilities concerning dumping sites and the tendency in urban areas that people have of burning or dumping their waste out in the streets thus potentially creating harmful smokes. It also explains that most city councils struggle to collect residential waste but don't give any quantitative data. The paper doesn't deal with

strategies or actions taken, but reveals current issues that Malawi faces regarding waste and explains under which legislation waste falls into. According to volume 1 of the NEAP, there are two sets of legislation addressing human habitat degradation: legislation pertaining to land use and physical planning and legislation pertaining to the control of waste emissions and the handling of waste. If pollution control comes under the Water Resources Act, the NEAP acknowledges the fact there is some weakness in the legislation regarding the disposal of toxic industrial waste and the lack of procedures and specifications. The same constraint apparently applies to the Refuse and Rubble Disposal By-Laws of the Local Government (Urban Areas) Act (Cap 22:01).
The EMA (1996) is the regulatory tool regarding waste management and also gives an established institutional framework and directions to follow regarding waste regulation. In article 37 the EMA gives the council full responsibility and control of management, transportation, recycling, the safe disposal and the storage of waste. Article 38 explains that "*No person shall handle, store, transport, classify or destroy waste other than domestic waste, or operate a waste disposal site or plant, or generate waste*" unless they have a license delivered by either the Ministry or the council. Any person who takes part in a waste related activity without license can be charged and fined and required to fill in an application.
Additionally, according to articles 66 and 67 any person who fails to manage hazardous waste or deliberately discharges or emits any pollutant into the environment shall, if convicted, is liable to be fined up to K1,000,000 (2,582 USD) and risks up to 10 years of imprisonment.

The revised version of the NEP (2004) aims to create an enabling policy and a legal framework for cross sector coordination and participation of non state sectors. It is supposed to be an instrument for environmental policies and legislations as well as a guide for all sector activities. Under the Human Settlement & Health section the NEP exposes three strategies that Malawi should follow:

- The improvement of water borne sanitation systems and solid waste disposal
- Making it easier to implement systems to sort out industrial, clinical, domestic and other waste, as a starting point to then make it easier to recycle materials whenever possible
- To facilitate the privatization of waste management activities.

Concerning waste in the Industry section, the NEP offers a guideline that "*Safe waste disposal is key to environment management in industrial development"* and that industries should include in their strategy to develop industrial sites which have adequate waste disposal. It's important to highlight that the government supports privatization of waste management however nothing in the NEP refers to how and with which tools the government aims to support this activity.

The Lilongwe City Council (LCC) also published the Urban Structure Plan (2013), which is the urbanization plan for the city from now to 2030. The LCC urges that the low collection rate of waste should be improved. It also assumes that by 2030, since the collection rate will have improved by 100%, a new dumping site will be necessary after 2025, keeping in mind the current dump site of 25ha is almost already fully used up (USP, 2013)

2.3 Market definitions and mechanisms

There is no official definition for the term "waste market" found in the literature. However, a market is defined as: "*Any place where the sellers of a particular good or service can meet with the buyers of that good or service and where a transaction can potentially take place. The buyers must have something they can offer in exchange for there to be a potential transaction*" (Moffat, 2013). According to Capul and Garnier (1999) a market is mainly (but not only) regulated by the law of demand and supply: supply being the quantity of goods or services that sellers want to sell for a price while demand is the quantity of goods or services that buyers are whiling to buy for a given price. According to the same authors the law of demand and supply is the reaction of sellers and buyers when the prices fluctuate in a market. Additionally, markets

can be organised by types according to the numbers of actors (suppliers and demanders) which are involved in it (Capul & Garnier, 1999).

Table 1: Markets typology (Capul & Garnier, 1999)

Demand / Supply	*One business*	*Some businesses*	*Many Businesses*
One buyer	Bilateral monopoly	-	Monopoly
Various buyers	Monopoly	Oligopoly	Competition

The term *Competition* in economy defines a market structure where sellers and buyers are sufficiently numerous that none of them can influence the price of the goods or services (Capul & Garnier, 1999). On the contrary, the term *Monopoly* corresponds to an imperfect competition when there is only one buyer or for a good or a product. Another term used is *Oligopoly* which means that there are few suppliers (or sellers) that share a same market and that each of them can influence the price and decide of their strategy according to what the others are doing (Capul & Garnier, 1999). The competition "pure and perfect" is a notion introduced by the neo-classic theory describes a set of conditions necessary to obtain an ideal performance of the markets. If one or several conditions are not fulfilled the market will be imperfect or deficient. These conditions are: atomicity (numerous buyers and sellers), homogeneity (goods and services exchanged are equal), free access to the market (no barrier for anyone to enter the market), transparency (potential access to all the information related to the goods and services by anyone) and mobility of production factors (both labor and capital must be able to be oriented towards well-paid jobs) (Capul & Garnier, 1999). According to the authors this is just a model as in reality these five conditions are rarely respected and the competition is called imperfect when one of these conditions is not fulfilled.
In the waste market, price of items is governed by the way the recycle market operates (Agarwal, 2004). The factor that will determine this price is the actual demand for waste and the inflow of collected materials (Agarwal, 2004). This defines the power relationship: for instance if the material is scarce the dealer or the waste picker will dictate the price while it will be the other way around if the material is in excess (Agarwal, 2004). Other parameters come into consideration for waste/recycling activities especially the price of raw material. Even though raw material is cheap, the potentially recyclable waste will be very cheap if the price of raw product rises and then waste material prices will also rise. Furthermore, process costs must also be taken into account for this mechanism to be accurate (Agarwal, 2004).
Dealers and/or waste pickers with large storage capacities are able to regulate the market to some extend and increase their benefits or at least cope with periodic price fluctuation (Agarwal, 2004).

In complement of the traditional demand and offer, "market institutions" or the rules of the game, are also describe as key factor to understand a market dynamic. Nolles (2006) in her working paper "*The importance of market institution in generating prices*" describes it as "*the broad manner in which a price and quantity for trade are agreed*". According to Nolles (2006) there are six major market institutions;

- Posted Prices: one party (usually the seller) "posts" a price, which is fixed for some duration, and the buyer can either accept or reject.
- One-Sided Sequential Auctions: An auctioneer makes known a single price to the market for the good on sale, and then either raises or lowers the quoted price until the supply is equal to the demand.
- Double Auctions: Buyers make bids to buy, sellers make offers to sell, and the available bids & offers in the market are made known to all market participants.

- Decentralized negotiations: The form of market where buyers and sellers establish contact with each other to negotiate prices and quantities on a case-by-case basis. Frequently brokers enter into such markets to reduce the search costs, and this can lead to a decentralized market.
- Discriminative Auctions: Multiple buyers submit bids to a single seller with some quantity of units to sell. At the end of the auction the seller commences at the highest bid, and works down the bid stack until all units have been sold. Each buyer pays the price they bid. Different parties pay different prices.
- Uniform Price Auctions: Settle all bids at a uniform price that clears the market, since a buyer is unlikely to complain about obtaining a good at a price lower than what was bid. The clearing price is determined by the highest rejected bid.

With what have been said in the section **2.1 Definitions** and **2.2 The government position in Malawi**, it can be assumed that for waste market in SSA countries and especially Malawi not all this institutions are applicable as the market is not mature in terms of structure. But this list aims to show that the market can be complex and structured in different way with various people (buyers, sellers, intermediaries, brokers…) playing different roles. More informal institutions like the place of women and/or children in society or the already existent informal trade of product can play a role in waste trading (Samon, 2004).
Concerning the tools to regulate the market, according to Pitchel (2005) for both private and public sector it's possible to implement policy, pricing and regulation and especially for the waste market. "*Economic instruments entail two fundamental issues. The first component is revenue-raising through licenses and fees. The second component involves non-revenue rising, such as performance-based waste management, contracting, clean neighborhood competitions, and privatization*" (Mkwambisi & *Makuwira, 2011).* Like the authors highlighted in their paper such instruments need a strong institutional and legal background to be efficient and to avoid corruption.

In Nairobi (Kenya) wastes are collected by both public and private sectors. Around 60 companies provide solid waste collection and disposal services in the city, and they must be registered and licensed by the city (Van Dijk, 2008). The companies provide waste collection and disposal against a fee paid directly by the residents or by the city for a specific area. (Van Dijk, 2008). Van Dijk (2008) said that "*cost recovery is extremely important to make a solid waste management system work and continue to work without the need for too much subsidy.*" and "*the system is financially sustainable if the revenues cover the cost, including that of investments*". Additionally, according to the author, productivity needs to be assed as an indicator of efficiency in order to implement a market policy.

In Islamabad (Pakistan) where 387.6 tons of wastes per day are generated and 60% are collected, Anjum (2013) studied the willingness to pay for waste management services. According to him "*100% of the respondents are willing to pay some minimal amount for solid waste management services*". Anjum (2013) doesn't specify what the "*minimal amount*" is but this means that even the poorest are willing to pay something for waste collection. This results is consolidate by a study made in 2013 in Malawi by Maganga Assa who also explains in his paper "*Emerging Solid Waste Market in Lilongwe Malawi*" (2013) that there is "*factors that significantly affect willing to pay for household solid waste disposal including household income level, concern about waste management, education and satisfaction on waste correction*". This reinforces the role of institution (formal and informal) in the dynamic of waste management and market.

2.4 Waste management techniques

Other than collecting and transport, five standard waste management options have been identified; dumping, reusing, recycling, composting and incineration with the possibility of an energy recovery. According to Pichtel (2005), four of these options can be considered as sustainable waste management options. All these options are explained below along with examples, experiences and implications from around the world.

2.4.1 Dumping

In major African cities, waste generation is estimated at an average of 0.78kg per capita per day (Beukering et.al. 1999 in Mkwambisi, 2007). On the contrary Malawian city council reports generating 250 tons of refuse per day or 3.5kg to 4.5kg/capita/day (Mkwambisi, 2007). All the waste collected by the cities is dumped in dumping sites usually situated in periphery of the cities. So far there is no public plan to start a waste recovery process in cities of any kind (Takomborerwa, 2011).

Various literatures agree that dumping is the most commonly used practice by cities in SSA (Achankeng 2003, Pitchel 2005, Van Dijk 2008, Onibokun, 2009) and most of the authors criticize this unsustainable practice and/or its lack of security (mix of toxic waste, open access to unsecure areas, soil and ground water contamination, environmental and health issues for local communities, waste of valuable resources...). Dumping is used by cities but also by citizens in Malawi that legally or illegally dump waste in inappropriate places or burn them, thus emitting odorous smokes (Mkwambisi, 2007). This can be explained by the fact that in SSA only 20 to 60% of the waste are successfully collected (Achankeng, 2003). Additionally, with fast urbanization, the amount of waste the cities have to manage (and so must dump) increases quickly and local authorities face a land space issue for dumping sites (Van Dijk, 2008). Here the challenge is that landfill locations shouldn't be too far from the cities to limit fuel consumption but not too close either to allow cities to expand and limit various visual, odorous and sanitary pollutions (Medina, 2002).

2.4.2 Reusing

"*Any operation by which products or components that are not waste are used again for the same purpose for which they were conceived*" (Waste Directive Framework EU, 2008)

In the literature it has been found that the most frequent reuse product in SSA was bottle glass and clothes. However, since these two types of waste were not investigated during the field work of the thesis they will not be developed much further.

2.4.3 Recycling

"*Consists on the transformation of waste into goods*" (Pichtel, 2005)

Recycling "Consists of *any recovery operation by which waste materials are reprocessed into products, other materials or substances whether for the original purpose or other purposes. It includes the reprocessing of organic material but doesn't include energy recovery or the reprocessing into materials which are to be used as fuel or for backfilling operations*" (Waste Directive Framework EU, 2008)

Here, recycling and composting are seen as separate activities. It acknowledges that composting is a form of recycling but this will be defined as another waste management option since the management and the market of organic wastes are very different from the others.

In the municipality of Yala, Thailand, the population was encouraged to bring recyclable material in exchange for eggs on a monthly base. "*The amount of eggs distributed depended on the type of recyclables and on their weight (economic objectives), but also on the quality of the waste collected, on the participants' characteristics, (especially as to whether or not they belonged to neglected groups), and finally on the level of community participation (environmental and social objectives)"* (Mongkolnchaiarunya, 2005). In less than a year sanitations were improved, food security increased and community leaders received recognition from authorities. Additionally, the degree of willingness to pay the waste collection fee increased (Mongkolnchaiarunya, 2005).

In Malaysia and Singapore, governments are heavily subsidizing their recycling projects. "*A system of door-to-door purchasing of recyclables was introduced in Malaysia in 1993, but local authorities did not have sufficient knowledge and skills related to recycling thus the success was far below expectations"* (Mongkolnchaiarunya, 2005). Due to the lack of institutional support, knowledge and monitoring, the project failed and lost in credibility. It highlighted the need for support at a higher level, knowledge and literature on the subject as well as for a regular follow up, especially in low income countries and/or in areas where the private sector is not yet fully developed.

In Guatemala, the plastic recycling activity became a competitive sector where entrepreneurs are competing for recyclable source (Morriss, 2004). It is a relatively poor country, but its plastic consumption is relatively low compared to western countries. Nevertheless, the economy is flourishing and in order to continue to develop some businesses need to import waste from the USA (Morriss, 2004). The recycling process is labor intensive but according to the author, due

to the low cost of labor in Guatemala, the recycled process is done without the recycled product being more expensive than raw material. To earn time and fuel, waste is sorted out while still in the truck during residential waste collecting, so that when the trucks arrives at the recycling site a first selection has already been done (Morriss, 2004).

2.4.4 Composting

Is defined as the "*Controlled aerobic, biological conversion of organic wastes into a complex stable material*" (Pichtel, 2005)

Compost is a key player in waste management in SSA and especially in Malawi where the biggest sector of the activity is agriculture, employing 80% of the workforce (IFAD 2011), and where a majority of the waste is organic. Indeed up to 90% of the MSW is organic in poor areas (Takomborerwa, 2011).

In Sri Lanka compost markets have been identified as *"promising sectors for green jobs generation on the basis of their marketability and thus their potential for upgrading and expansion"* (ILO, 2012). Compost is not only seen as a way to manage waste but also as an economical value cheaper to produce than fertilizer. The development of these markets could create employment, bring in investments and develop local economy (ILO, 2012).

In Kumasi Ghana, researchers studied the reason why people don't or do use compost. They found that 57 % of farmers think the work is too labor intensive, 28% think they don't have enough raw material and 15% say the organic products market is too small. Their conclusion was that "*large-scale compost production from urban organic waste is not an economically viable project without some kind of subsidy. Sorting and transportation costs for compost at this scale outweigh the economic benefits associated with the use of compost* "(Nikita, 2009). The production itself wasn't the main problem but the price of fuel and thus of transport render the price too high to develop a business, even though 55% of the farmers admitted producing compost for themselves.

In Malaysia in 2007, the government implemented subsidies to promote organic farming. As a consequence the demand for compost and the development of the compost market exploded. Following this events the government "*made it compulsory for every house to separate non-organic and organic solid waste and imposed a penalty of RM 1000 (335 USD) on households which violated the regulation*" (Sivaharsh, *2012*). Since then, the money from fines is being used towards investments in compost centers.

In Yaoundé, capital of Cameroun, young farmers are very much into compost production. Jaza Folefack (2008) explains that this is due to "*the attractive salaries in NGOs employing those young farmers combined with the higher productivity of compost. These are the main reasons that justify their motivation for using compost*". High prices and transport costs are the main reasons that keep people in Cameroun from using it. While only 3% of non-compost users argue it's not productive, the rest of these non-compost users would be willing to use it if it was subsided (Jaza Folefack, 2008). Like in Kumas, the price of compost is higher than its commercial value (Jaza Folefack, 2008). Because of this, according to the same source, farmers make their own compost instead of buying it, even though the lack of skills renders the results generally below expectations.

2.4.5 Incineration with energy recovery

"*Conversion of solid wastes into energy by combustion in a controlled incinerator*" (Pichtel, 2005)

Incineration is done to reduce the volume of waste. Total waste volume can be reduced by 80% to 90% through incineration, which is when waste is first processed in an incinerator and then compacted in a disposal; in addition, the heat energy recovered from combustion can be used for water, space heating or electricity generation and detoxification (Pichtel, 2005).

Denmark has been burning waste to produce electricity for over a century. Nowadays Denmark burns 2 million tons of waste per year and some 140 000 households in Copenhagen use heat and electricity from incinerated wastes (OECD, 2009). However, experiences show that this activity doesn't seem to work in low incomes countries since in poor areas a majority of the wastes are organic and rich in water (Takomborerwa, 2011) thus turning incinerators into energy consumers rather than energy producers (Achankeng, 2003). Furthermore, incineration

facilities are expensive to build and operate. They have a low efficiency rate so they are an investment that few governments are willing to make and have a low efficiency rate (Achankeng, 2003).

This literature review gives some ideas and theoretical thoughts that will be useful further in the discussion to understand what is happening in urban Malawi in term of waste market. The key points to highlights are the lack of structure around waste regarding the official institution with no clear definition of terms and vague description of what should be implemented to structure the market. As for every market demand and supply are key aspect to understand the waste market situation in Malawi but formal and informal institution like the way people trade or the gender interaction must be understood as well. Finally there are different ways to process waste which demands different infrastructures and skills as well as awareness to be implemented in a sustainable way. These aspects must be looked into to understand the Malawian situation.

CHAPTER 3: Methods and approaches

3.1 Research purpose

To fulfil its specific objectives this research is structured in two parts: waste markets in general and the institutional framework and public polices related to waste management, and the actual existing market with a description of what it includes and excludes along with its socio-economic potential.

Concerning the institutional framework of waste management and the waste market in Malawi, this research is based on literature review of public policy documents; NEPA, EMA, NEP and on the interviews of public stakeholders: the Director of the Sanitary department of the Lilongwe City Council (LCC) and the Director of the Health department of the Blantyre City Council (BCC). Additionally all stakeholders interviewed were asked to describe their relation to official authorities.

To analyze the waste market, research is based mainly on the interviews of 13 stakeholders (Annex 1) met during a field work conducted in March and April 2013. This thesis uses data that was collected during an internship done by the student for the Bunda College, at the University of Malawi. The aim of this internship was to do a waste market analysis and to publish a report for the university and the City Council of Lilongwe. Due to the very rare amount of articles on the subject, the majority of the data for this section was collected from interviews. Nevertheless, results of the study are compared to other similar studies in SSA in order to highlight the market's principal trends. It's acknowledged that the study uses a small sample which is not representative and exhaustive, nevertheless the sample illustrates the diversity of actors and situations that can be found in urban Malawi.

3.2 Description of the study areas

Malawi is a peaceful country bordered by Tanzania at the North East, Mozambique at the south and Zambia at the West. It has four main cities, Blantyre, Lilongwe, Zomba and Mzuzu. With a GDP of 4.264 billion USD in 2012, Malawi is one of the poorest countries in the world with 50.7% of its population living under the national poverty line (World Bank, 2012b). Agriculture is the country's main economical sector and employs around 80% of the workforce. The main plantations are maize (80% of the agriculture land), tobacco, tea, sugar and coffee (IFAD, 2011). IFAD (2011) estimates the losses post-harvest at 40% of the production which both reduces the amount of available food and cash crop as well as increases the quantity of waste to be managed.

Figure 1: Map of Malawi (source: http://www.studentsoftheworld.info)

In Malawi, where the growing rate of urbanization is one of the fastest in the world (Indexmundi, 2013), the country has to face many other challenges such as food insecurity, unemployment and low access to education. The rapidly increasing number of people in cities which are not fit to handle so many people forces part of the population to concentrate in informal settlements. This induces waste dumping in inappropriate places (Mkwambisi, 2007). In 2008, 15.3% of the people lived in urban areas (Census, 2008). 88% of the population used firewood as energy for cooking while 43.4% used charcoal in urban areas and 11,7% had no access to toilet facilities (Census, 2008).
In Malawi the Minister is the person responsible for promoting environmental protection and management and is also responsible for implementing environmental regulation, according to the article 7 of the EMA (1996). However the Minister is not alone in this function since the National Council for the Environment advises the minister on the matter and also has the power to punish if a law is broken (Spong & Malwey, 2005). The National Council for the Environment is divided into two committees;

- The technical committee which examines scientific issues related to the protection and management of the environment, and which carries out investigations and conducts studies
- The District Development committee which co-ordinates the activities of lead agencies and NGOs dealing with the protection and management of the environment in the districts.

Malawi is a country that faces various environmental issues related to both landscaping but also the way the country is being developed and how policies are being implemented. Key parameters are environmental limitations such as:

- Variable and adverse climatic conditions leading to droughts and floods
- High dependence on land and the lack of alternative livelihoods
- Loss of biodiversity due to high levels of deforestation (Spong & Malwey, 2005)

The country also faces environmental impacts due to the development of its activities:

- Land degradation and soil erosion
- Water pollution
- Increase in domestic and industrial effluent and waste production. (Spong & Malwey, 2005)

Additionally, Malawi faces socio-economic limitations that slow down its sustainable development (Spong & Malwey, 2005). According to Spong & Malwey (2005), principal socio-economic limitations are:

- Low economic growth (related to an over-dependence on agriculture)
- Inadequate technological development
- Increasing number of urban residents
- High unemployment and declining employment opportunities
- High rates of HIV/AIDS
- Inadequate safe water supply
- Inadequate education facilities.

The country is progressively industrializing so urbanization is spreading, which dramatically increases the production of industrial and domestic waste (Spong & Malwey, 2005).

3.2.1 Lilongwe

In 2008, some 674,000 people were living in Lilongwe city, the capital which is situated in the central region and which has an annual growth rate of 4.3% (Census, 2008). The urbanization and the density are growing each year (Table 2). The city is the political and administrative hub where most of the institutions like the parliament are located. The district is managed by the

District Assembly which is the highest policy-making body responsible for promoting infrastructural and economic development in the district (SMP, 2006). The District Assembly operates seven service committees The Health and Environment committee is the one responsible for the treatment and management of waste and it has special sub-division called the Sanitary department which is in charge of collecting of domestic waste (SMP, 2006).

Table 2: Basic data for Lilongwe (USP, 2013)

Land Area		393 km^2
Population Growth Rate (1998-2008)		4.3 %
Population & Population Density		
	(person)	(person / km^2)
1966	19,425	49
1977	98,718	251
1987	223,318	568
1998	440,471	1,121
2008	674,448	1,702

NGOs and Community Based Organizations (CBOs) are largely represented in Lilongwe and cover various areas especially in the domain of development (SMP, 2006). It has been observed that most environmental NGOs are also involved in development programs and that most of them work more on sanitary facilities than directly on waste. CBOs in Lilongwe deal mainly with AIDS/HIV and health issues (SMP, 2006).
Lilongwe is divided between the New city, where offices, embassies and hotels are and the Old city where markets and restaurants are. The city is also divided into districts which have different activities and income levels. Today, Lilongwe counts 58 districts which are under Lilongwe jurisdiction and four additional areas which are considered part of the city (Figure 2).

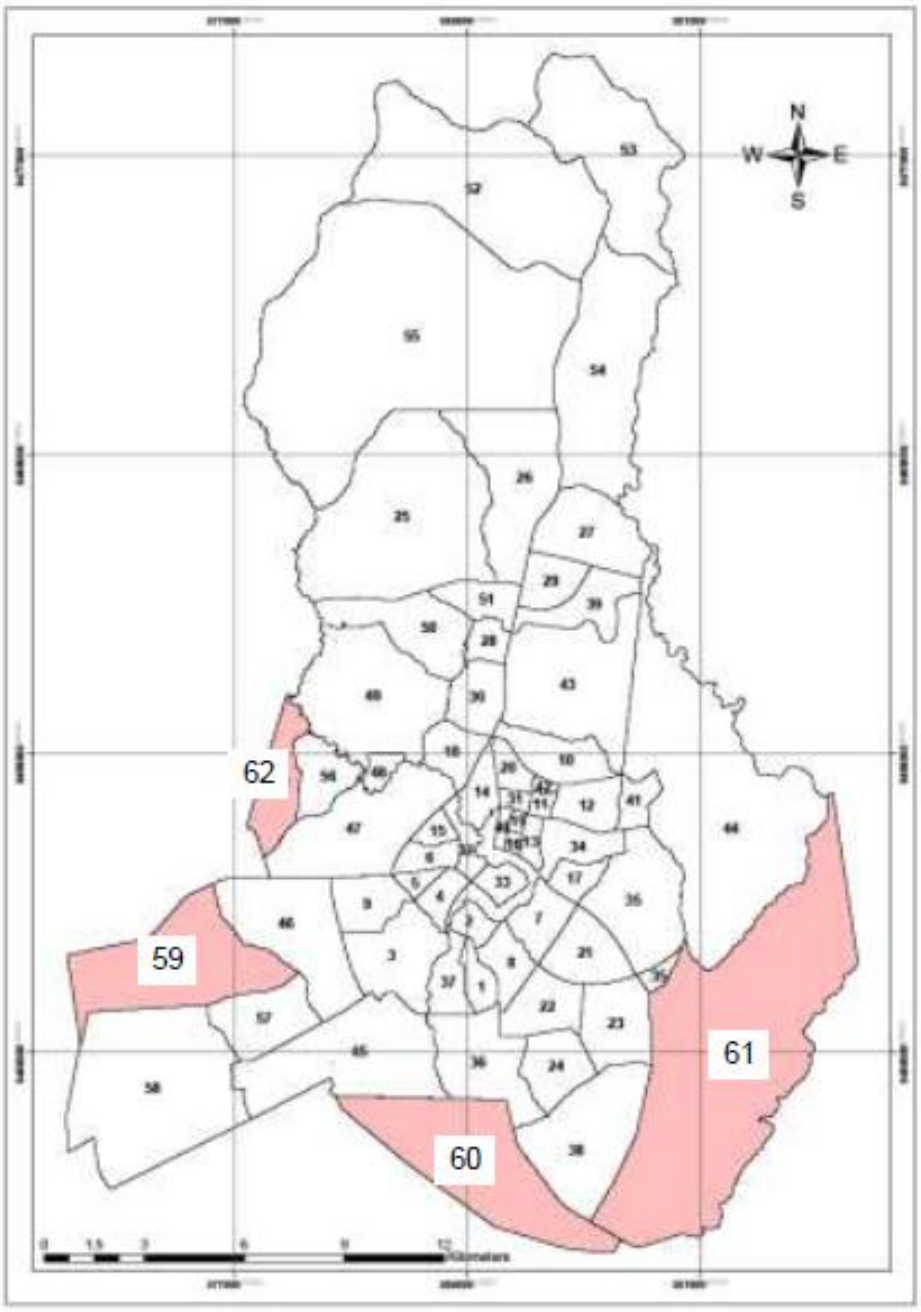

Figure 2: Lilongwe city and districts (USP, 2013)

In Lilongwe city not all 58 districts are densely populated and some have lower urbanized formal settlements (Figure 3). For instance, especially in the North West and the South Eastern part of the city, there are, at least officially, few built areas (USP, 2013).

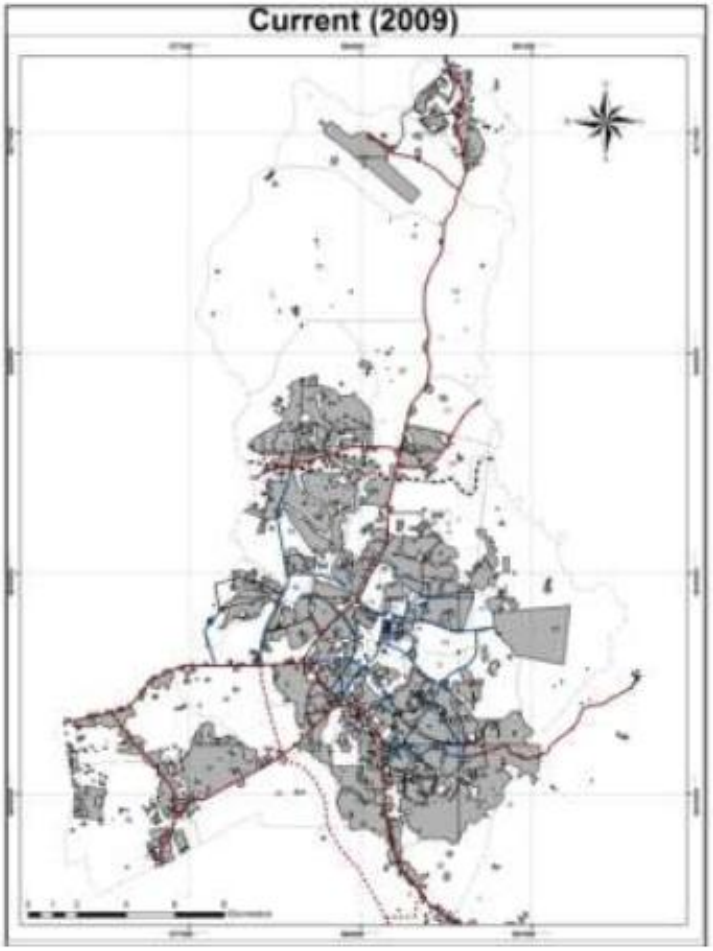

Figure 3: Built areas of Lilongwe in 2009 (USP, 2013)

3.2.2 Blantyre

In 2008, 662,000 people were living in Blantyre, the commercial city located in the southern part of the country which has an annual growth rate of 2.8% (Census, 2008). The rural–urban migration flow is estimated at 6.7% a year (Spong & Malwey, 2005). The city is considered the commercial and industrial hub and a majority of the international financial institutions are located here (Spong & Malwey, 2005). Like in Lilongwe, the city is divided into districts, 26 in total (Figure 4). It has been observed that the city seems richer than Lilongwe, even though over 65% of the city's population lives in unplanned settlements and that poverty stands at about 24% while unemployment is about 8% (UN-Habitat, 2011). Blantyre City has a participatory and democratic system of governance. Councilors are elected by city residents while the mayor is elected by the councilors. The secretariat is comprised of appointed staff members, and together with civil society groups and the regulatory central government authorities they make-out the government system (UN-Habitat, 2011). The city is also managed by the Local Government Act (1998). The Engineering Department, the Cleansing Department and the Leisure, Culture and Environment Department of the City Council are responsible for waste management, pollution control, sanitation services and environmental health. No Private-

Public-Partnership has been identified regarding waste management, but individuals and/or NGOs are known to hold individual projects.

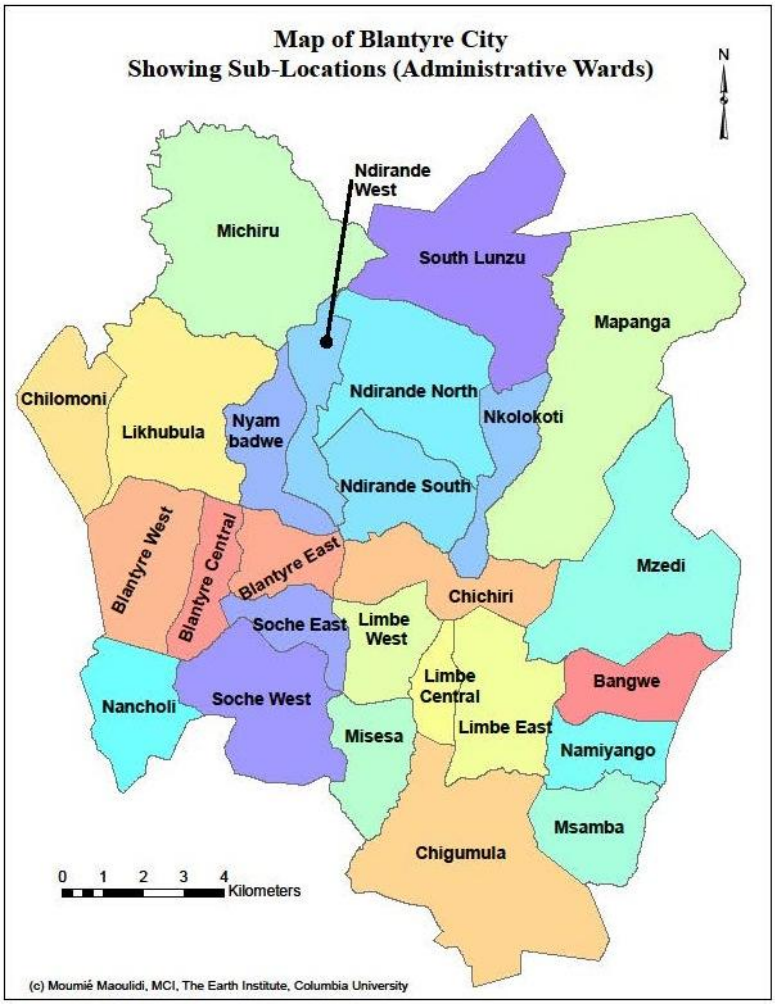

Figure 4: Blantyre city with districts (Columbia University, 2008)

3.3 Sample design

The size of the sample was small: 13 stakeholders. A field trip of 7 weeks was planned to collect the data. The sample was designed progressively during those 7 weeks. It took 10 days to identify relevant stakeholders. The principal aim of this sample wasn't to have an exhaustive list of all the people involved in the waste market but was to illustrate the different types of actors involved along with their interaction.

The sample of 13 stakeholders was chosen according to the following criteria:

- Their contacts with City Councils or with one or several actors of the market
- Their role in waste management and/or in the waste market
- Whether the activity is located in urban and/or peri-urban areas
- The ability of the respondent to give relevant data
- The diversity of the profile (not two actors doing exactly the same thing)

Sorting out the various actors started with the stakeholders of Waste for Wealth (W4W). The W4W project is a successful project that took place in 2010 in Lilongwe. It involved CBOs, NGOs, private and public sectors making compost out of waste collected in the street by women. At first, leaders of the W4W project were interviewed. Each person was asked to identify other stakeholders involved in the management or the market of waste in Malawi. If the designated stakeholders responded to the criteria, they were then contacted for an interview. All

the people contacted responded positively to the invitation. It has been chosen to start the sample this way because there weren't at the time list of people involve in waste management and waste market or at least no information was found.
In the selection process, the aim was to obtain a diverse panel of actors. The sample doesn't allow for a comparison between actors but gives a global picture of the situation in Malawi. This approach has been chosen due to the lack of time and of information already available during the field trip.
After 5 weeks of investigation and interviews the final sample was made of 13 participants from various sector; private, public, CBOs and NGOs in both Lilongwe and Blantyre. The participants, their roles and their positions are listed in Annex 1.
Not all participants interviewed are included in the results of the analysis because they weren't all relevant.

3.4 Methods for data collection

Interview of each respondent was made according to questionnaires written and revised in advance. The questionnaires are listed in Annex 2.
Questionnaires were divided into sections:

(i) The institutions' characteristics and role in waste management/market.
(ii) Labor data: gender breakdown, worker's social background...
(iii) Strategy and market (when involved in the waste market): Numeric data on the amount of waste handled and current strategies to develop the market...
(iv) Evolution and future prospects: how the institution has evolved since its creation, its future goals...

Each section contains both closed questions to collect quantitative data and facts and open-closed questions to collect data on trends, impediments and opinions. This approach was chosen after discussion with the research supervisor as it seemed to be the most appropriate to illustrate the market, to analyze its potential and to make recommendations. Indeed as there is for the moment, little information on the waste market in Malawi, it was necessary to take information at the source: the stakeholders. Additionally there wasn't enough time to conduct a large survey to collect several quantitative data and use them for statistics. In this situation, individual interviews with a panel of various actors to collect data as well as opinions, was the most efficient way to obtain concrete and accurate results. For each institution a questionnaire was created to ensure the most relevant interviews:

- Public services: The Deputy Director of the Sanitation department of the Lilongwe city council (LCC) and the Deputy Director of the Health department of the Blantyre city council (BCC) were willing to answer. They are the representative and official responsible of the city for the waste management (EMA, 1996) they are key actors to interview. Especially because it was assumed that they have a clear overview of the situation in urban area. The aim of these interviews was to understand the current situation of waste management in cities and the average production and type of waste per person and per area. Additionally both Directors were the starting point at defining who the actors of the waste market in urban areas are.

- Private firm involved in recycling and/or composting: As the study is about waste market and as the government is not involved in trading waste or at least at the local scale (NEP 2004) private sector actors had to be involved in the interviews. Four firms were picked, two in composting and two in plastic recycling. As these two activities are directly related to waste and because no other recycling actors from different sector had been identify during the selection process. The aim of the interviews was to define the current state of the market and its potential for development in the future. The questionnaires were

geared to understand what kind of raw product is used, at what point commercialization is done (commercialization of raw product or of the processed product), what are the main challenges in the production, how the prices are fixed and what are the main impediments in the commercialization of waste and waste product. Additionally, the questionnaires focused on the people involved in these firms, what their backgrounds are, what is their gender and what type of skills do they have access to. Personal opinion of the people in charge was also asked concerning the competition in the market, and their feeling for the future in order to better understand how the people directly involved in the market perceived it.

- CBO involved in recycling and/or composting: This type of stakeholders is relevant in this study as in Malawi it's becoming a common way to organize especially concerning residential and public matter (Mkwambisi, 2007). One respondent selected belonged to this category and was involved in the compost activity. The goal in this case was the same as for the private firms, which was to understand the state of the market, even from a different point of view, and also to understand what the impediments for the community are (are they the same in the private sector) and how they see the market and its future. The questionnaires also focused on the people involved, how they fix the prices and what kind of support they get from NGOs, the private sector and/or the government.

- Waste pickers: This category is selected as pertinent as 2% of the population in Third World is practicing waste picking and recovery (Medina, 2002). Additionally, they are key players in the waste cycle. Indeed, they are the actors starting the process of waste trading and can also be involved in the recycling process and/or the sale. Four respondents were involved in this category but only one was involved only in waste collection while the other three were also composting the organic waste they were collecting. The aim of these interviews was to define where people were collecting waste, the kind of waste it was (residential, organic, plastic…), for what purpose (commerce, compost and/or dumping) and what the economical benefits of this activity were. The questionnaires focused on the people themselves, who they are, what their background is, and on how they organize themselves and what got them started.

  NGOs: NGOs are rarely involved directly in the market as seller or buyer but they have support function and can influence the formal and informal institutions that regulate the market (Medina, 2002). For this reason, four respondents were interviewed. It was easier to identify the NGO involved with waste issues and they were good source to consolidate the data collected with the other stakeholders. The main goal with NGOs was to understand what kind of support the people involved in waste marketing received and what the kind of skills available were. As NGOs are rarely or not directly involved in the management or the market of waste, these interviews gave an outside view of the various issues and data showing who the people involved were. They also helped very much translating the questionnaires and linking with the local population. Some respondents were engaged in several categories (CBO/waste collecting, private

firm/waste collecting...). In these cases questionnaires where combined to understand the global activity of the respondent.

3.5 Reliability and validity of the methods

Stakeholders in the sample were not chosen randomly but were recommended or designated by one or several actors. For this reason the data cannot be extrapolated and it isn't possible to give a greater value to one respondent rather than to another. , They all belong to the same network. This parameter might partly false the final results of the interviews. However since there is no database concerning the various actors in Malawi, it wasn't possible to choose respondents randomly. Additionally the point of these interviews was to illustrate the market's situation and, as a starting point, to give a first glimpse of actors and their interaction, since there is for now no literature on the specific subject of waste market in urban Malawi.

The use of questionnaires and interviews allow connecting with the respondent and in a relatively short period of time (30 minutes to 1 hour) it was possible to collect not only a large number of quantitative and qualitative data but also that of feelings and ambitions. These last parameters are largely taken into account especially when emphasizing the differences or the similarities between reality and the institutional strategies. This was relevant especially due to short period of time available to gather data. As a first step in this topic, it enables to have a clearer view of the context and help to understand the place of informal rules of the market. This should be later on be followed by survey with larger sample to validate hypothesis and results of this study. Especially if policy makers want to develop this market, survey concerning the profile of people involved in this activity will help to focus efficiently on a target group for a better impact.

3.6 Methods of data analysis

Data was analyzed in such a way as to highlight how the waste market works. Who is involved, how actors behave in general and or each other and what the place of the institutional body in the market is. Data collected from the interviews was analyzed, first separately then through a cross cutting analysis for the actors dealing with the same type of waste.

For the City Council, the analysis focused on global production of waste in urban areas, current waste management strategies and the place of institutional bodies in the market as they are not involved in the trading scheme.

Main waste products trade was defined with the data collected during all the interviews. Three types emerged; the trade of **compost**, the trade of **plastic waste** and the **collecting of residential waste** charged by private firms. This three trade activities were identified by observing the custom in the streets and were pointed out by both city council (Lilongwe and Blantire) as the main waste related activities in urban areas. Additionally, no other type of trade have been observe except on small street shop who cell art made out old bottle caps. The questionnaires made it possible to understand where the markets were located and who the actors were. Once actors and the markets were defined, each market (compost, plastic, collect) was analyzed separately.

Some data were not available or not known to the respondents and had to be estimated. In order to fill the gap, coefficient of conversion was used based on information collected during interviews and compared with the information from previous publications..

Methodology to analyze the data was created progressively during the field work. This was due to the fact that it was not possible to predict what kind of data the actors would be able to provide and also because the initial purpose of the field work was to provide a report for the University of Malawi and the Lilongwe City Council (LCC) on waste activities and not a Master's thesis in the first place.

3.6.1: Organic waste estimation and compost market analysis

The questionnaires determined for participants involved in compost activity aimed to assess and illustrate:

- The amount of compost produced (Table 8): the product is a central component of the market it mandatory to see which type of stakeholders is able to produce compost and why some are more productive than other
- The amount of compost traded (Figure 7): The compost flow is also a characteristic of the market. Mapping who sell and who purchase is essential to understand the informal institution of the market
- Price and the negotiation processes: To understand where the power relation are and how they have been ensured
- The relationship between the different actors: Understand the informal and formal institution of the market
- The knowledge and skills of the participants: To assess what is available to the stakeholders, how much they need to succeed and what are the potential impediment
- Their vision of the market 's future: Opinions are subjective nevertheless understand the vision of the stakeholders help to understand the way they act and will invest or not in certain activities

Four participants were involved in this activity; one large scale gardening company *Four Seasons Nursery*, a small scale company *Perez investment* also involved in residential waste collection, one CBO created in 2009 by a UNDP project in Mtandire, an informal poor area of Lilongwe (CBO's members are 52 women from Mtandire), and a NGO in Blantyre.
Two of the participants couldn't estimate the amount of organic waste they used to make compost. According to J. Sprowson, the executive director of *Four Seasons Nursery* and an expert in compost making for the last 10 years, the coefficient of proportion between organic waste and final compost depends on the nature of the waste collected and the techniques used to process it. *Four Seasons Nursery* has always used the same types of waste and the same techniques for three years and according to his director they have found that in their case "*the coefficient of conversion for organic waste to compost manure is about one third*": meaning that one ton of organic waste gives about one third of his weight in compost.
For two of the respondents (the CBO in Mtandire and the company *Perez investment*) only the amount of waste collected or only the amount of compost produced were available. The CBO has been trained by *Four Seasons Nursery* and sells almost all its compost production to the company. Since the CBO uses the same techniques and the same types of waste as *Four Seasons Nursery,* the coefficient of one third was used to estimate the amount of compost produce per month since the compost is made in the same conditions. For *Perez Investment*, a small waste collecting company in a poor area of Lilongwe which makes its own compost without training or particular skills, we couldn't estimate the amount of primary organic waste collected. Indeed, the different types of waste they use are unknown and the techniques are different. Nevertheless the director of the company did know the amount of compost sold per month.
To understand the dynamics of the market, each producer was asked questions concerning production of compost, marketing strategy and the type of customers they sell to. Additionally, data concerning the labor was summarized in a table highlighting the educational background and the gender breakdown of the people involved. Finally, quality issues and challenges encountered by the stakeholders are summarized in several paragraphs.

3.6.2 Plastic recycling activity analysis

Two respondents of the sample were involved in plastic recycling. One was *Shore Rubber*, a plastic recycling company situated in Lilongwe and the other was *Plastico Industry*, situated in Blantyre. The questionnaire focused on

- The amount of plastic waste purchased (Table 11): The product is a key characteristic of the market as well as its flow. Mapping who sell and who purchase is essential to understand the informal institution of the market. It also give indication on the recycling

potential of a city if we make the hypothesis that one plastic industry is representative of all plastic industries in Malawi

- The price and process of negotiation: To understand where the power relation are and how they have been ensured
- The knowledge and skills of the participants (Table 12): To assess what is available to the stakeholders, how much they need to succeed and what are the potential impediment
- Their vision of the market's future: Opinions are subjective nevertheless understand the vision of the stakeholders help to understand the way they act and will invest or not in certain activities

The amounts purchased per month and per year were estimated. *Plastico Industry* had information on the amount purchased daily. *Shore Rubber* said it accumulated 250 tons of plastic waste between the 1st of January and the 1st of March in 2013, but and has stopped purchasing since then, however *Shore Rubber* estimated that it purchased 1,000 tons of plastic in 2012 (Table 3).

Table 3: Plastic waste purchase

	Purchase per day	Purchase for three months	Purchase per year
Shore Rubber	NA	250 tons	1,000 tons*
Plastico industry	5tons	NA	1,320 tons**

NA = Not Available

* In 2012 and stopped purchasing after 2 months in 2013.

** Assuming Plastico industry doesn't buy waste during the week end and purchases continuously the same amount during the rest of the year.

Both respondents agreed that "*40% to 60% of the waste collected/bought is recycled to make new items*" (*Shore Rubber* Manager Interview, March *2013 & Plastico Industry* HRD Interview, April *2013*). To estimate the quantity of plastic recycled by the industries it has been assumed that 50% of the plastic collected or bought by plastic industries was recycled while the other 50% was burned or dumped.

Finally, data concerning the labor is summarized in a table highlighting the educational background and the gender breakdown of the people involved. Following quality issues and challenges are summarized in several paragraphs.

3.6.3 Waste collects in Lilongwe data analysis

Five respondents were involved in waste collection. The CBO in Mtandire and *Perez Investment*, which are both also involved in compost production. A small scale company named *New ID*, involved in residential waste collection, LCC which is responsible for the waste collection in the city and the Health department of Blantyre City Council (BCC).

- The amount of waste collected (Table 11): The product is a key characteristic of the market as well as its flow. Mapping who sell and who purchase is essential to understand the informal institution of the market. It also give indication on the potential of the private sector to handle waste in cities
- The price and process of negotiation: To understand where the power relation are and how they have been ensured and the will of civil society to pay for waste collect services
- The knowledge and skills of the participants (Table 12): To assess what is available to the stakeholders, how much they need to succeed and what are the potential impediment

- Their vision of the market's future: Opinions are subjective nevertheless understand the vision of the stakeholders help to understand the way they act and will invest or not in certain activities

Data are summarized in a table which gives the amount of area covered and the price charged for the collecting (when charged). The CBO was included in the analysis because they collect a large amount of waste, however they do not practice residential collecting like the other stakeholders but only street collecting. Assessment of the participants' efficiency is made by combining the data summarized in the table and the statements given by the respondents.
Waste pickers characteristics are summarized in a table to highlight their educational background and the gender breakdown. Finally, statements of the participants concerning challenges and issues are summarized in the final section.

CHAPTER 4: Results

This chapter summarizes all the information collected during the 13 interviews as well as from the observations made during the field work. It also analyzes the data from the market's perspective.

The interviews were conducted with two people; a young researcher from Malawi and myself. We did not have trouble to conduct the interview, however some of the respondent were suspicious about our intention. One of the respondent thought we were from the city council and here to provide them support, while another one wasn't comfortable to give us quantitative data concerning the negotiation process and the price they charge for waste collect. Additionally, information collected from the interviews hasn't been verified by a third party or through other sources, which means the results explain below might be over or under estimation of the reality.

4.1 Waste in urban Malawi

In Lilongwe like in Blantyre, the city council is in charge of waste management. The role of the council is strictly restrained to the collecting of MSW and to its transport to a safe and secure dumping site (LCC & BCC interviews, March 2013). In reality, the population of Lilongwe produces around 95.000 tons of MSW per year (LCC interview, March 2013) and that of Blantyre around 100.000 tons of MSW per year (BCC interview, March 2013), while both city councils are only able to collect and transport around 30% of it. The amount of waste produced and the amount of remaining waste by city are summarized in Table 4. Both councilors agreed that the MSW are estimations since production of waste in informal areas is unknown.

Table 4: Waste production in urban Malawi

	Total production of municipal waste (ton/year)	Amount collected by public services (ton/year)	Remaining uncollected waste (ton/year)
Lilongwe	95.000	28.500	**66.500**
Blantyre*	100.000	30.000	**70.000**

* There is a divergence with the readings. According to Takomborerwa (2011) Blantyre city produces 220.000 tons of waste per year and the city collects and transports around 25% of it to the dump sites. This might be explained by a different definition of municipal solid waste and whether or not the city council takes into account waste produced in informal areas. Nevertheless this paper follows data given during the interview of the Deputy Director of the Health department of Blantyre.

In both cities over 66.000 tons of wastes are left in the streets or on market sites. It has been observed that people burn their waste to avoid waste accumulation and nauseous odors. This common practice is also used by *Perez Investment,* a company involved in residential waste collection and compost, which "*segregates the waste they collect, takes the organic waste to make compost and burns the remaining waste" (Perez Investment Director (*PID) interview, March 2013). Furthermore, hills of waste in the streets and along the roads have been observed in several areas of the cities.

4.2 Waste businesses in urban Malawi

There are four main types of waste which are converted, reused and/or marketed: **organic waste** (i.e. food waste from restaurants, leaves, maize brand, vegetables peels...), **plastic** (i.e. all plastic except fully printed plastic bags, rubber and condoms), **glass bottles** (i.e. beer bottles, soda bottles) and **paper** (Table 5).

The glass bottle recycling and reusing process is mentioned here. However, as it was not possible to interview stakeholders from drink companies there is no data on the subject, so this market won't be covered in this thesis. Additionally, recycling and re-using of plastic bottles and capsules of beer for art has been observed in the center of Lilongwe, but this was one isolated case with only one person involved. There was no time to investigate this more but if further research is done on the subject it would be interesting to collect data from this activity.

Paper recycling business does exist. One of the participants was involved in the fabrication of briquettes. However, according to him the market is very small and even if NGOs have been trying to develop this activity for a decade, the project never got onto a bigger scale. Due to the lack of information and the poor quality of the data collected, this point won't be discussed in this thesis.

Table 5: Wastes in urban Malawi; source, conversion and actors

Waste	Conversion process	Actors	Main waste sources
Organic (food, plants...)	**Processed into compost**	Private sector (small and large scale companies) CBOs	Gardening activity, market waste, restaurants, residential waste
Plastic	**Recycled into plastic new items**	Plastic industries (large scale companies) Waste pickers	Plastic industries buy waste from waste pickers who collect plastic in the streets and/or dump sites
Glass bottle	**Re-used**	Drink companies (large scale companies) Bars	Small deposit on every bottle. Money is given back when bars or individuals returns the bottles
Paper	**Recycled into briquettes or into toilet paper**	CBO Private companies	Office paper, books

After the interviews, the first impression is that plastic recycling is the most developed market in Malawi, especially in Blantyre. Indeed, all plastic industries practice plastic recycling and pay waste pickers to collect plastic waste (Shore Rubber Manager interview, March 2013). Compost market seems to be an emerging market, with the development of CBO projects on compost, the diversification of gardening companies and with the creation of large scale companies since 2010. The market for recycled paper doesn't seem be developing in Malawi for the moment. Finally, residential waste collection activity seems to be a very young business with potential but challenged by the price of fuel.
Even if there is a big difference between the various developments of different types of waste conversion, most of the respondents started their business recently (Table 6).

Table 6: Waste process activity; starting point

Stakeholders	Activity	Starting date
Four Seasons Nursery	Gardening company, compost production, purchase and selling	The gardening activity started in 1995 and produces compost for itself, but has started to purchase and sell compost since 2009
Mtandire CBO	Compost production and selling	2009
Perez investment	Waste collecting and compost production	2012
New ID investment	Waste collecting	2012
AYASE	NGO involved in compost production and selling	The project started in 2011 and was stopped in 2013
Shore Rubber	Plastic industry, recycling plastic	Started recycling in 2009
Plastico Industry	Plastic industry, recycling plastic	Started recycling in 2011

Four Seasons Nursery is a gardening company that started in 1995 to produce compost for its activity. However it only started to commercialize it in 2009. All the stakeholders we interviewed started their business in the last 5 years (Table 6). *Perez investment* and *New ID* are waste collection companies that started very recently. According to them, the chronic accumulation of waste in their neighborhood was the main incentive to start their business. Scavenging activity only started in the last 5 years. However it seems like formal and informal businesses have started to emerge recently. A question that came up during the field work was why? In the EMA (1996) and the NEP (2004) the government wrote that waste management business should be supported. However, both agents of the City Councils acknowledged that no support was provided for this business activity even though they were grateful for the help provided by the waste collectors. Respondents were asked why they started their business and the answers differed (Table 7). A plausible hypothesis is the increasing pressure of waste accumulation in urban areas coupled with a rising education level and/or environmental awareness (for the last decade). However this thesis doesn't allow the verification of this hypothesis and further research should be done on the subject.

Tableau 7: Reason for respondents to start business with waste

Stakeholders	Activity	Reason for starting
Four Seasons Nursery	Gardening company, compost production, purchase and selling	Economical benefits (less purchase of expensive fertilizers), diversifying their activity and a desire to be more respectful of the environment
Mtandire CBO	Compost production and	Opportunity with the UNDP to ensure

	selling	economical and social independence
Perez investment	Waste collecting and compost production	Observed the accumulation of waste everywhere and heard complaints from neighbors ➔ Saw a business opportunity
New ID investment	Waste collecting	Observed the accumulation of waste everywhere and heard complaints from neighbors ➔ Saw a business opportunity
AYASE	NGO working in poor peri-urban areas involved in compost production and selling	Started a study on waste which revealed that 96% of wastes in poor areas is organic. Saw the potential to develop employment, soil fertility and reduce waste in poor peri-urban areas.
Shore Rubber	Plastic industry, recycling plastic	To limit the purchase of virgin plastic and for environmental reasons it seemed logical since there is so much plastic waste in the city
Plastico Industry	Plastic industry, recycling plastic	In 2011, due to a rise in exchange rates, purchasing virgin plastic abroad became way too expensive. Recycling plastic waste became cheaper even if they have to buy it from waste pickers

The interviews and the research allow neither a complete answer nor the verification of the hypothesis essentially because the sample is quite small. However two points can be highlighted:

- Environmental issues don't seem to be a strong incentive for individuals to start a business dealing with waste
- Economical benefits from waste market activity seem to be a common reason for all stakeholders

Concerning knowledge or awareness of Malawian legislation (EMA, NEP, NEAP...) none of the respondent mentioned owning a license for waste transfer. Additionally none of the respondents receive support from the councils for their activity. This point will be further be discussed in the Discussion chapter as it is quite contradictory with the Malawian legislation.

4.3 Compost Market

Organic waste conversion into compost is organized in two steps: collecting and processing. In order to make compost, organic wastes are collected from various sources. In the areas studied it has been observed that organic wastes come from: gardening activity (leaves, cut flowers...), restaurants (food waste), open markets (roasted vegetables, fruits and legume peels, maize bran...), residential housing (food waste, human manure) and agriculture (animal manure, crop waste...). The organic components are largely available in Malawi especially in poor areas. Indeed, in Blantyre the NGO AYASE did a study that revealed that in poor areas 94% of waste is organic since people don't have the money to buy food or other items in packages so waste comes mainly from organic products (AYASE Interview, April 2013).

4.3.1 Resource and production

Four respondents in the sample handle compost production and commercialization. From the interviews it has been possible to estimate the amount waste collected and the compost produced. Table 8 summarizes this information with additional comments for each respondent.

Table 8: Compost produced in 2012

	Skills & knowledge	Organic waste collected in 2012	Compost produced in 2012	Comments
Four seasons Nursery (large scale gardening company)	Expert, aware and trained in compost technology	**864 tons**	**288 tons**	Waste collected from gardening activity and own restaurant and coffee shop
CBO Mtandire (52 women in total 14 were present during the interview)	Good skills trained by Bunda College and *Four Seasons Nursery*	**2,500 tons total** **Or** **50 tons per woman**	**840 tons total** **Or** **17 tons per woman**	These numbers are averaged since some women work full time while others only work part time
Perez investment	Poor skills on how to make compost	**Unknown**	**36 tons**	Collects waste from residential housing and use the organic part to make compost
NGO: AYASE	Good skills supported by Mzuzu University	**Unknown**	**20 tons***	Produces and sells. Uses part of its production for a demonstration field. At the start, it gave its production for free to create a demand

*Their wastes are not collected but bought by city services. Moreover this is not representative of the total production because it doesn't include compost used on the demonstration field and given for free to create a demand. For this reason this actors was exclude of the compost flow figures 5.

The comparison between all the actors is impossible as they differ by their size, their turn over, their access to infrastructure and knowledge, but it nevertheless illustrates a panel of the diversity that can be found in the market.
In poor urban and peri-urban areas wastes are mainly organic. No competition has been observed to access the organic resource neither in Lilongwe nor Blantyre. However, due to fuel shortage and poor communication, the city of Blantyre stopped providing AYASE with skips of waste and the compost project is stopped for the moment.

Four Seasons Nursery is a producer, a buyer and a compost seller. It has a low production of compost compared to the CBO but because it uses compost for its own activity and sells it to its customers so the company's need for compost is high. For this reason the company purchases compost from five CBOs in Lilongwe including the CBO in Mtandire. The Nursery also provides training to the CBO to make good quality compost.

Figure 5: Compost center in Mtandire each hill of compost belongs to a woman

4.3.2 Price & market

Implementation of compost prices was for the CBO and *Perez investment* the result of a negotiation with their clients while *Four Seasons Nursery* and AYASE fixed their prices according to market prices but without consulting their customers. Table 9 summarizes information obtained during interviews that concerned compost price and customers. It shows that a majority of customers prefer to come to the site to purchase compost and that prices vary according to the weight purchased but also from one stakeholder to another. *Four Seasons Nursery* offers a delivery service however this service is rarely used: *"due to the price we charge for transport, people prefer to come themselves" (Four Seasons Nursery* CEO Interview, March 2013).

Table 9: Compost Customers & Prices

	Number of customers	Types of customers	Compost manure price
Four Seasons Nursery	NA	Sells mostly 50Kg bags at the shop, both to farmers from the central region, and to one big scale farmer from Salima	**1,000MK/50Kg bag (2.5 USD)** **7,160MK/ton <5t (17.46 USD)** **6,140MK/ton >5t (14.98 USD)**

CBO Mtandire	15 + self consumption for private garden	*Four Seasons Nursery* is their main customer + local farmers and friends buying small quantity of compost from them	**To Four seasons: 7.500 MK/ton (18.30 USD)** **To friends: 8.500 MK/ton (20.73 USD)** **To local farmers: 10.000 MK/ton (25,05 USD)**
Perez Investment	500	Local small scale farmers in the area or nearby areas of Lilongwe city	**10.000 MK/ton (24.39 USD)**
AYASE (Blantyre)	125	Local small scale farmers of the area where a sanitation project was implemented	**500 MK/50Kg bag (1.22 USD)**

In appearance *Four Seasons Nursery* is the cheapest seller along with AYASE. However as they mostly sell 50Kg bags and very little by tons and since the margin is much higher, they make good profit. The company admitted earning a lot of money with the commercialization of compost. On the contrary, the CBO and *Perez investment* are more expensive but only offer to sell their compost by tons. The margin is smaller and so are the benefits. This is estimation as neither the Nursery nor the CBO were able to give the margin they make per ton or per kilogram of compost.

Four Seasons Nursery is located in a rich area of Lilongwe which is close to a high income residential area. Customers are relatively rich people coming to the shop to buy compost for their garden and flowers, and this observation has been confirmed by the CEO of the Nursery. For *Perez investment* and AYASE, poor local small scale farmers are the main type of customers, mainly due to their proximity as both are situated in low income areas. Locals can easily manage the transport of compost without spending too much resource. Perez Investment CEO admitted that fuel was actually the biggest issue for her business. For all businesses fuel is a narrow factor; whether it is for the collecting of organic waste and/or for the transport of compost and/or for the customers.

*"The cost of manure production is low as it doesn't necessarily require machinery, however the collection of waste and the compost making without machine is labor intensive" (*Four Seasons Nursery CEO Interview, March 2013)

The CBO in Mtandire sells 80% of its production to *Four Seasons Nursery*, 15% to local farmers and friends and only few of the women use it for their own garden (Figure 7). The CBO relies strongly on their main customer who provides them with training. However, in March a radio group came to interview them and a week later farmers from neighboring areas came to buy

some compost explaining they had heard the interview on the radio and had found the price attractive. Local farmers didn't know about the CBO business and the radio interview worked like publicity for the business increasing the number of customers. The women of the CBO expressed their need to be more independent from *Four Seasons Nursery*, especially because the company doesn't come on a regular basis, leaving them at times with large amounts of compost and no financial resources.

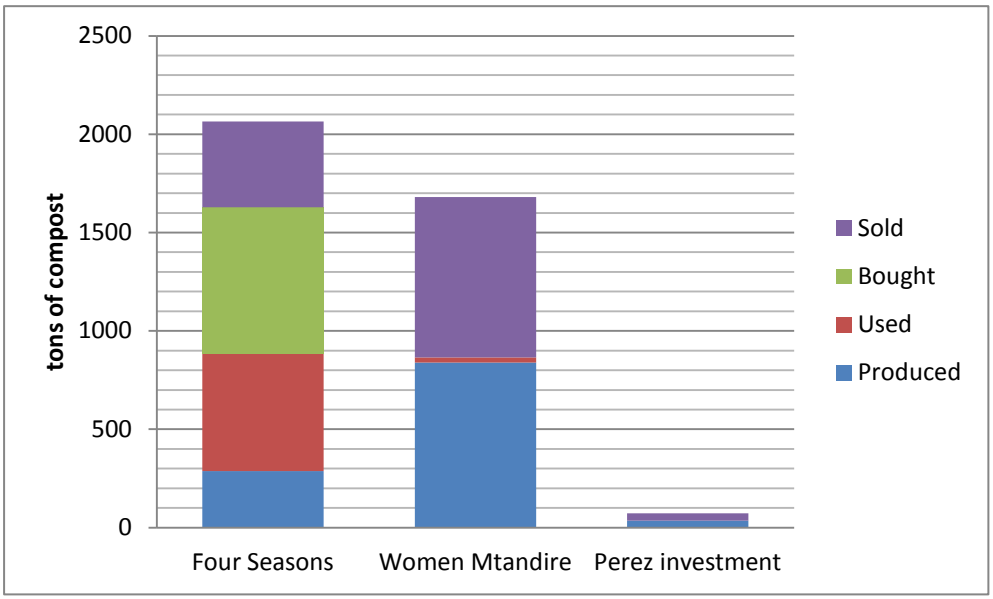

Figure 6: Compost actors and activity in 2012

Because it's not the aim of the research and because they differ by their size, turn over and the diversity of their activities these businesses cannot be compared. Nevertheless, it's possible to highlight some facts and trends from Table 9 and Figure 7.

- In the sample, one stakeholder predominates the market;
  - ⇨ The Nursery produces, uses, buys and sells compost while the CBO and *Perez Investment* only produces and sells (only few of the women are using their compost) (Figure 7).
  - ⇨ CBO's main customer is the Nursery that trained them and buys their good quality compost while *Perez investment* is not involved with any other partner concerning compost exchange except for local customers.
  - ⇨ The Nursery sets buying and selling prices without negotiating
  - ⇨ *Four Seasons Nursery* suppliers are five CBOs including the CBO in Mtandire. As the Nursery has a huge need of compost for its own activity, the company depends on its suppliers. "*We definitely buy more than we produce at the moment because of the lack of equipment here*" (*Four Seasons Nursery* CEO Interview, March 2013).
- Small scale producers are highly dependent on their customers;
  - ⇨ The CBO's main customer (80%) is the Nursery
  - ⇨ The Nursery prevents the CBO from diversifying its customers by buying all its production each time they come to visit the site.
  - ⇨ *Perez Investment* is continuously looking for customers to balance the price of labor and fuel.
- Fuel is an important factor in the market's regulation

- ⇨ The CBO cannot collect organic waste in other areas because they cannot afford the price of fuel for transport
- ⇨ *Perez Investment* budget mainly goes to fuel and the Director admitted thinking of stopping her businesses because of fuel prices
- ⇨ The Nursery offers to deliver the compost but customers don't use it because of the fee charged for fuel

According to the Nursery CEO the biggest market for the company is with the 50Kg bags that people buy at the shop and this is where most of the benefits are made. While the CBO in Mtandire and *Perez Investment* only offers one type of price (per ton), the Nursery offers more options tailored to the customers' needs. However, the CBO in Mtandire, with the support of the NGO CCODE (Center for Communication Organization Development & Environment), will start a marketing project in September to increase their number of customers and part of this project is to offer 50Kg bags as an option to their future customers. Moreover the CBO is slowly gaining in confidence and wants to expand its market. Since they started in 2009, they have all significantly improved their livelihood. One of the women members of the CBO was able to build a house while she used to be living in a shelter, another one was able to send one of her children to university, and most of their children are not working anymore and are able to go to school. They all agree that they gained more independence both from their husband and in general.

Where compost market is concerned, it can be generalized that stakeholders seem to be diverse from large to small scale companies, CBOs and with NGOs involved as technical and marketing support. There is also a variety of customers, small scale farmers, gardeners... According to Capul & Garnier (1999) the market is a competition. It needs to be balanced however by the fact that even if there are several suppliers and buyers and according to the respondents the demand is high and the feeling of competitions is low. City councils and authorities aren't involved in the market neither through taxes nor via supporting mechanisms (social or financial). Primary resources (organic waste) aren't scarce and there is no competition concerning where supply is concerned.

4.3.3 People, skills & knowledge

During the interview, each actor gave the number of people working in the compost activity (from collecting to selling) as well as the percentage of the women involved (Table 10). Gender breakdown in the sample was very heterogeneous: men and women are both involved however not together (Table 10).

Table 10: Gender repartition for compost activity

	Total number of worker (including manager)	Percentage of women
Four Seasons	13	8%
Women in Mtandire	52	100%
Perez investment	13	8%
AYASE	10	2%

In *Nursery*, which employs 235 people, 12 men are hired full time to work in compost production but they are managed by a woman. Once waste is collected by the Nursery, other people are involved indirectly in the process, and although no data is available about these people, according to the interview a majority of them are men.

In Mtandire only women are involved in the CBO (Figure 8), this situation started with the Waste For Wealth (W4W) project which aimed to empower women, so no men were involved except when training with Bunda College and *Four Seasons Nursery*.

Figure 7: Part of the group of women in Mtandire at the compost center

For *Perez investment,* 12 men are working to collect, transport and segregate the waste while they are managed by a woman who is the director of this small scale business.
The sample might not be representative of the gender breakdown. It nevertheless that in these cases women are involved when they are supported by an NGO or a specific project. This cannot be generalized. Indeed even in Lilongwe and Blantyre, city councils have different patterns: 60% of the people hired by Lilongwe city are women while in Blantyre only 30% of them are women. According to Mr. Kwanjana (interview March 2013) Deputy Director of the cleaning and sanitation department at Lilongwe "*women are less reluctant to work with waste for cultural reasons It's why I think they work better than men in this area and this is why I prefer to hire women*", while in Blantyre "*more men are working in waste management because it can be labor intensive and the transport is traditionally mainly done by men*" (BCC interview, March 2013).
Concerning the level of skills and knowledge in the compost activity, large scale companies like *Four Seasons Nursery* are expert in the field and stay in touch with the university and other industries to be aware of new technologies and techniques to make compost. According to the Nursery's CEO, two other companies in Lilongwe arrived in 2010 and are making compost with high-tech machinery and use biotechnology and micro-organism to convert organic waste into compost.
Local groups supported by NGO like those in Blantyre or in Mtandire have relatively good levels of skill as they are supported by university experts, and in the case of Mtandire are supported by a private expert. However, they are not always supervised and are free to make compost the way they want.
Perez investment has very poor skills to make compost: they only accumulate organic waste in their backyard and wait four months before selling it as compost. Nevertheless this didn't seem to keep them from selling it at a good price.
Except for the CBO in Mtandire, who received funding during the W4W project, none of the respondents received funding, training, help or any kind of support from the government. Even in the context of the W4W project, the UNDP was the main player providing funding. The city council supported the project, helping with linking with local community but its role was really quite limited and as soon as the funding was over, the women didn't receive anymore support from officials. However, NGOs, like AYASE and CCODE, are still supporting the communities even after both projects are over.

4.3.4 Quality issues & challenges

Compost production out of organic waste requires skills and knowledge which are relatively well spread for people involved in the activity. According to all the respondents, the biggest issues concerning compost quality are: the amount of sand mixed into the compost, the lack of water during the dry season, intensive labor, the transport and the price of the machinery that could replace labor.
For the CBO the lack of water during the dry season slows their production down by 50% however they don't complain much about the labor intensive work. For Nursery, the lack of

machinery is the biggest issue and it is what limits their production "*if the market grows we will be able to invest in machinery to increase our production*" (*Four Seasons Nursery* CEO Interview, March 2013). In area 25, the director of *Perez investment* explained that their biggest challenge is the lack of appropriate equipment to collect the waste and the cost of transport during the collecting process; they don't make enough benefits because of the price of fuel and so they are thinking about stopping their activity after less than a year.
Concerning the market's challenges all respondents agree that the lack of communication and awareness from the public concerning the availability and the benefits of compost are the biggest issues. *Four Seasons Nursery* and AYASE both hold demonstration fields, but compost benefits compared to inorganic fertilizer take time to show their advantages (between two and three years). This is precious time for farmers that cannot always afford it. Moreover, even if compost can compete with inorganic fertilizer concerning results on crop production, the lack of nitrogen in organic compost is difficult to make up for. Finally, *Four Seasons Nursery* director highlighted the fact that "*small scale farmers don't always have the money to purchase high quality compost because of their poor crop production. This is frustrating as compost both increases the quality and amount of their production*".

4.4 Plastic recycling

Plastic recovery, unlike compost activity, is only handled by the large scale companies. Plastic industries obtain plastic by collecting their own waste and by purchasing plastic waste from waste pickers. In this regard the plastic recovery market structure is completely different from that of the market of compost; plastic waste is less abundant (6% or less of the residential waste in poor areas) and is not collected by the companies but by waste pickers.
Additionally, the process is more complex because not all plastics can be recycled, some plastic bags can contain a lot of ink which needs to be washed with lots of chemical that also alter the plastic. Rubber and condoms cannot be recycled. More importantly, plastic can only be recycled between one to three times maximum (Shore Rubber Manager Interview, March 2013). This hinders plastic waste recovery. Moreover, the process requires specific machinery that cannot be replaced by manual labor.
The percentage of recycled plastic output can vary from one item to another, but according to the manager of Shore Rubber (2013) about 20% of an item made in Malawi is made of recycled plastic "*but this is a large estimation*".

4.4.1 Resource & Prices

Two respondents from the sample were plastic industries recycling plastic. The companies were about the same size, one located in Lilongwe (*Shore Rubber*) and one located in Blantyre (*Plastico Industry*). Both recycled plastic bought from waste pickers and also processed their own plastic waste in 2012. However *Shore Rubber* stopped buying plastic waste in March due to the accumulation of plastic in its factory. This is not a representative sample however it can illustrate the basic mechanism of the plastic waste market and what the potential variations in the market between Lilongwe and Blantyre can amount to.

Table 11: Plastic collected and recycled in 2012

	Plastic waste collected in 2012 (tons)	Estimation of plastic used for recycling in 2012 (tons)	Price per kilo of plastic waste
Shore Rubber (Lilongwe)	1,000	500	40 to 80 MK but have stopped for the moment (0.1 to 0.2 USD)
Plastico industry (Blantyre)	1.300	650	220 MK (0.54 USD)

In Blantyre, in 2012, *Plastico Industry* bought more plastic waste than *Shore Rubber* and at a much higher price (around MK 150 more per kilogram of waste) (Table 11). Both industries were approximately of the same size but due to their location the market situation was different. Indeed; "*competition to buy plastic waste is very strong in Blantyre. We always have to check at what price other industries are buying in order to insure competitive prices and insure that scavengers continue to keep selling their plastic to us*" (*Plastico industry* HRD Interview, April 2013) even though *"there is no competition to access plastic waste as a resource in Lilongwe: look around you the city is full of plastic"* (Shore Rubber Manager Interview, March 2013). The quantity of plastic waste produced is unknown in Blantyre, but a study conducted in 2011 by the University of Strathclyde estimated the plastic waste up to 30% in high incomes areas, 20% in middle income areas and 8% in low incomes areas *(Takomborerwa, 2011)*. This estimation follows the study of AYASE on waste in poor areas. Out of the 5 tons per day of plastic waste collected by *Plastico Industry*, one ton is bought from waste pickers and from this information the budget the company has to purchase plastic waste was estimated at about 68,640,000 MK (167,000 USD) per year (assuming they don't purchase waste on Sunday). *Shore Rubber*, based in Lilongwe, doesn't buy plastic waste anymore as it has already accumulated too much of it since the beginning of the year. Also the company used to get a very cheap price. The annual budget for the purchase of plastic waste was unknown to the respondent and couldn't be estimated.

The interviews didn't allow us to understand why prices are so different. Both cities are approximately about the same size, with the same proportion of waste collection (30%), so the quantity of available plastic waste should be about the same. However, according to the literature and what has been observed, Blantyre is the commercial city where the majority of the industries are located. There are around 65 plastic industries in Malawi with a majority in Blantyre (MDP 2009). Resources are theoretically the same but the number of buyers is higher, thus creating a competition over supply of resources and according to the law of demand and supply (Capul & Garnier, 1999), thus increasing its price. This theory hasn't been verified and will need further research with a larger sample of stakeholders. Additionally, this theory could be challenged by the fact that Blantyre being a commercial city, its activities might produce more plastic waste and therefore increase the amount of resources.

4.4.2 Market place & size

For both businesses, waste pickers come to the company's location to deliver plastic waste. According to *Plastico Industry* Human Resources Director (HRD), around 25 people come every day bringing around 1 ton of waste, which means an average of 40kg of plastic per person. As the company buys at 220MK per kilogram of plastic, one waste picker can receive an average of 8,800MK (26.7 USD) when he/she comes. It cannot be estimated how much they earn per month since no interview was done of waste pickers and the frequency of their venue to the site is unknown.

Both industries sell their products either on site or at their shops in town. They both produce various items like shoes, hair brushes, bags for grocery stores or larger bags for agricultural products. They don't export products abroad but they have customers from all around Malawi.

According to both respondents all 65 plastic industries in Malawi recycle plastic. The interesting fact is that "*since 2011, because exchange rates have risen, it's very expensive to import virgin plastic*" (*Plastico Industry* HRD Interview, April 2013). According to both respondents this is the main reason why all plastic industries have started recycling plastic.

4.4.3 People, skills & knowledge

Both companies hire a total of 600 to 700 employees and only a small portion of them work full time on the recycling activity (Table 12).

Table 12: Employees repartition

	Total number of employees	Percentage of the recycling activity	Percentage of women in the recycling activity
Shore Rubber (Lilongwe)	620	8%	50%
Plastico Industry (Blantyre)	700	8,6%	45%

Table 9 shows that in average both industries hire the same proportion of people to work in plastic recycling and about 50% of them are women. However, the interviews reveal that women and men don't work on the same tasks. In both cases women only work on washing with chemicals while men are in charge of the plastic segregation and the manipulation of the machines. Both industries work 24/24, 7 days a week.
The two respondents agreed that most of the employees have little or no a primary education, and receive about two weeks of training depending on their tasks. Specific attention is bought on security and protective, wear especially for the women who handle chemical products.
Although none of the respondents could give the exact number of waste pickers and their characteristics, they tend to say that it is mainly women and children that bring in the bags of plastics waste. This was supported by observing in front of *Plastico Industry* in Blantyre.

4.4.4 Quality issues & challenges

According to the interviews, appropriate technology to recycle plastic is available in Malawi, "*it is worth investing in machinery to recycle plastic because you can earn your money back relatively quickly*", however "*the main cost comes from the chemicals used for washing, transport of waste, labor and the maintenance of the machines*" (Shore Rubber Manager, March 2013).
Both respondents mentioned that a new law was being implemented by the government to reduce the amount of plastic waste in the streets (at the time of the field work). According to them, the law stipulated the ban of the use of plastic paper by ensuring that the plastic industry uses 60 micron instead of 30 micron plastic paper. The interview revealed that this was a new challenge for the industries, which may lead to the closure of the companies if they cannot make enough profits, despite their investment in plastic recycling.
Chemicals used to wash the plastics are expensive and are part of the investment needed to start recycling plastic. Additionally they are very dangerous for the health of the people handling it, like the 25 women working at Shore Rubber. To reduce the risk they wear costly protective wear, but it this isn't always enough as the manager explained that the women don't like to wear the masks and sometimes prefer working without it.
Breaking down the waste is a challenge as well, since waste pickers bring all kind of plastic and the companies segregate need to divide it up and segregate it after the purchase. According to Shore Rubber manager; 40% to 60% of the plastic bought can be used which means that around 50% of it cannot be processed. Additional training is therefore needed to avoid breaking the machines. For example, condoms and heavily printed bags cannot be recycled. Some kinds of plastic cannot be made out of recycling plastic like PET bottle and PVC, or at least not with the machinery available in Malawi, which is extremely expensive according to the Director of human resources at *Plastico Industry*. It should be noticed that both respondents agreed that even taking into account the cost due to the purchase of machinery, that of chemicals and the fact that 50% of the plastic waste purchased cannot be used, the option of recycling is still more cost effective than purchasing raw plastic from outside Malawi. This could not be proven during the interviews as the respondent didn't show their accountability.

4.5 Waste collects in Lilongwe

Several respondents were involved in the collection of waste; while the CBO in Mtandire collects organic waste in its neighborhood, the *Four Seasons Nursery* collects organic waste from its gardening activity and the city council is Lilongwe's main waste collector. However, only two participants offer waste collecting as a service in exchange for money. *Perez investment*

(which is also involved in the production and the trade of compost) and *New ID*, two small scale companies, charge residents in particular areas and provide waste collection services in Lilongwe.

4.5.1 Actors and market places

Waste collection is in theory only handled by public services or by companies that own a license delivered by the council of the Ministry. However, as the council is only able to collect 30% of the total waste production (LCC interview, March 2013), private initiatives seem to emerge. They usually ask for support from the city, but even though the city acknowledges their presence, they aren't involved in any kind of relationship with them "*even if I'm grateful for their help the council doesn't have the resources to hire or support private companies to collect waste. Furthermore, at an upper level, the government doesn't want to hear about waste and especially doesn't want to have to budget the cost*" (LCC interview, March 2013). Waste collection is at the start of a waste management chain there is a huge potential for business, since only 30% of the waste is collected and almost none of this is done in informal settlements. Table 13 summarizes the data obtained during interviews from participants involved in waste collection and the characteristics of their activity.

Tableau 13: Waste collected in 2012 in Lilongwe

	Amount of waste collected in 2012 (tons)	Fee per household per month	Number of districts covered
Perez Investment	Unknown	Between 700MK and 900MK (2.1 USD to 2.7 USD)	4 (low income and informal areas)
New ID	6,000	1,500 MK (4.5 USD)	2 (middle income areas)
Lilongwe city council	28,500	Free	All areas except informal settlement areas
CBO Mtandire	2,500	Free*	3 (low income and informal areas)

*In this case waste collected is only organic waste and collected in the street or from markets, so there is no door to door collection from households.

Perez investment started its activity in February 2012. It collected waste in four low income areas of Lilongwe for a fee which was tailored to people's income (Table 13). Collection is done weekly, door-to-door, using two large cars and fees are collected every month, or in some particular cases every week. However, the total amount of waste collected is unknown or the director doesn't want to provide this information. During the interview the director was suspicious about the research and didn't want to give too much data. As the benefits aren't sufficient for the company, she diversified her activity and started to compost the organic wastes collected, and now more recently starting selling glass and plastic bottles to drink industries. Wastes that are not used for compost are burned.

New ID started in May 2012 collecting all kinds of refuse in two middle incomes areas of Lilongwe and was thinking about expanding their activity to other areas (Table 13). The company owns a 10-tons-vehicle that is used to collect refuse once a week for each customer. The firm collected approximately 6,000 tons of waste in 2012, which represents 7% of the

estimated annual MSW production. The director of New ID originally wanted to produce compost from the waste collected but the cost in labor, time and machinery was too high.

4.5.2 People, knowledge & skills

Both are small-scaled companies which hire men; cheap labor with poor education (Table 14). As for the City Council, collecting and transport need men, because mainly (only) men drive vehicles in Malawi and it's a very labor intensive work.

Tableau 14: Waste pickers background

	Number of employees	Number of women	Percentage of people with secondary or higher education
Perez Investment	11	0	22%
New ID	4	0	0
Lilongwe city council	600	500	20%

Perez Investment 's director is a woman; she hires 11 men to collect the waste and compost. *New ID* hires 4 men for the collecting, the transport and for the disposal which is directed by one man. For the council, a majority of the women are hired to work in the cleaning part while waste collection and transport is handled by men. Usually employees come from low income areas, have a low educational background and most of them don't speak English so they couldn't be interviewed. Both directors went to university to study business and obtain knowledge and skills related to entrepreneurship, communication and market dynamics.

Although the skills needed to collect and transport waste are not difficult to obtain, a driving license is necessary. This costs money. So does owning a vehicle and obtaining the additionally basic skills for urban planning, which are necessary to plan an optimum course which uses a minimum of fuel. Additionally, marketing and commercial skills are also needed to find customers, to assess their willingness to pay and to collect the fees. In that regards, *New ID*, with only four employees and one large truck.

4.5.3 Challenges

According to both companies and the city council, the biggest challenge is the price and the access to fuel. The city council can't collect more than 30% of the MSW due to fuel shortage and a limited budget. *Perez investment* activity and the city council services sometimes have to cease their activity due to the lack of money to purchase fuel. It is for this reason that *Perez investment* director was thinking about shutting down her business after a year, especially as even the sale of compost doesn't bring enough money back to pay for all the employees. Additionally, she highlights the fact that people are not always willing to pay so she has to go to peoples' homes to collect the money.

Both companies would like to receive support from NGOs and/or the city through a contract or its subsidies to invest in protective wear and fuel, but also would like to obtain recognition for their work. *New ID* director feels underestimated as the city doesn't recognize the work he's doing. For the development of its activity and for the improvement of waste management in general, he proposes "*to create an association with all the actors (city council, waste pickers, small scale firm, local leader...) to share their knowledge and organize their action to avoid overlapping and propose waste collection everywhere in Lilongwe*" (*New ID* CEO interview, March 2013).

CHAPTER 5: Discussion

Municipal solid wastes are abundant in Malawi and the authorities are struggling to deal with them, inducing waste accumulation on the streets as well as health and environmental issues. The trade of waste and waste management practices can be a solution to reduce those issues and at the same time develop urban economy in Malawi. Like it has been discussed before, a formal and informal economy of waste does exist since the primary resource is abundant with around 100,000 tons of MSW per year produced both in Lilongwe and Blantyre. However, before jumping into the world of waste market, it is important to highlight that in this study the market of waste hasn't been studied directly but only the market of certain types of waste! None of the participants were directly involved with the trade of different waste types. Some respondents were involved in the collecting of residential waste but never traded all the waste collected afterwards. This doesn't exclude the possibility that people in Malawi do, but this wasn't the case in this study.

Cities like Dar Es Salaam (Tanzania), Yaoundé (Cameroun) or Yala (Thailand) benefit from waste trading, not only by the reduction of waste in the street but also because it creates employment, improves food security and reduces health and environmental issues. After the interviews and the analysis it seems like this could also be the case in Malawi. This needs however some kind of supporting which we will discuss later. The discussion debates about the results of the interviews and what can be drawn from it. It is supported by a review of published articles to highlight the common characteristics and the individualities of each trading activities (compost, plastic waste collect services). Additionally, the place and the impact of the state in the market will be discussed. Finally, this section will highlight what could be needed for the institutional body to support sustainably this activity and reduce poverty in urban Malawi.

5.1 Common characteristics of the various types of trades

Compost, plastic waste and waste collection services are the three markets which have been studied.

From the result of the interviews and from what has been observed in Lilongwe and Blantyre it is possible to highlight general points and trends. First of all, the hypothesis made in the Chapter 1 is that:

(i) "The market of waste and waste recovery products does exist in urban Malawi". This statement is true. This has been observed and stakeholders have been interviewed to describe their different trading activities.

(ii) "Currently Malawian formal institutions are not involved in the market of waste and waste recovery products". This hypothesis can be discussed, and indeed previous publications along with the interviews show a distortion between the official position of the government and the reality. The government of Malawi does have legislation concerning waste reported in the EMA (1996). Article 37 gives full responsibility of management, transportation, recycling, safe disposal along with storage of waste and the control of this activity to the council. Article 38 stipulates that people who want to handle or transport waste need a license from either the ministry or the council. However during the interviews none of the respondents, not even the Sanitary Directors of the cities council mentioned this license and the fee people were to pay if they are caught handling waste without it. It seems there is a clear problem of communication and awareness concerning the law. Moreover, in the revised version of the NEP (2004), the government's strategy was to facilitate the privatization of waste management. But during the interviews both stakeholders and people from the city council were clear on the fact that the government didn't provide help for businesses in the waste area. Allan Kwanjana, Director of the Cleaning and Sanitation department in Lilongwe, explained that he is very happy that private initiatives are rising in Lilongwe to collect waste and that some people come to him for help. But he

also admits to not being able to give them any kind of support. So concerning this hypothesis it can be admitted that the government does have a will to increase the private sector in the waste area especially concerning the collecting of residential waste. However it does not appear in reality to the waste trader. The city council is responsible for waste collection and management but does not have enough money and sometimes has to stop collecting wastes due to fuel shortage. It can be assumed they don't have the money to support private initiatives either. The cleaning and sanitation departments need a bigger budget although according to both city council Sanitary Directors (in Lilongwe and Blantyre), in the higher sphere people don't want to hear about waste because "*it's a waste of time and a waste of money especially compared to subjects like education and hunger*" (LCC & BCC interviews, March 2013). This statement is in direct opposition with what is written in the NEAP (2004) and proves that the government is not yet fully invested in the waste topic and even if it acknowledges it as being important, it's not a priority.

(iii) "There is potential value for Malawian to manage and/or trade waste and waste recovery products in urban areas". This hypothesis will be discussed all along this thesis.

Another hypothesis was made, in Chapter 3, in which we assumed that "the markets are independent from each other, meaning there is no interaction between the market of compost, that of plastics waste or the market of residential collecting of waste". This can be verified. Indeed;

- None of the stakeholders are involved in more than one market (except for one but at such a small scale it has been chosen to not be relevant)
- None of the stakeholders had trouble accessing a resource due to another type of waste activity
- According to the 13 interviews, stakeholders trading one type of waste never interact with stakeholders trading with another type of waste. Even the NGOs supporting waste traders didn't interact with people involved in different activities.
- The stakeholders didn't talk about diversifying their activity, nor for the present nor when asked about their perspective in the future.

It was a surprise that people involved in waste collecting weren't interested in diversifying their activity by trading the waste they collected. Even though the only stakeholder who was doing compost with the waste she collected said she would stop because it wasn't worth it. For the others, the reason was the lack of infrastructure and people as well as the lack of information about the structure of the other markets. As mentioned before the term "waste market" is ambiguous because it encompasses several trading activities not necessarily connected to each other.

The challenges encountered by the different types of trading are similar as well. Even if each activity does have additional specific challenges like the price of fuel, the access to skills and the visibility of the market, these are common impediments for people. Indeed, fuel in Malawi is almost as expensive as in Europe. All the stakeholders mentioned it as the main challenge to face. This can also explain why the markets focus on people living in the same area especially because then the products are stocked, processed and sold at the same location, limiting the cost of transport. In Ghana and Cameroun studies show that farmers believe in compost's efficiency but the price of transport limits the market's development so support from the government through subsidies would help. In the case of Malawi, this could be considered a possibility since compost will increase food productivity which would help fight food security, one of the top priorities in Malawi. The potential of waste management to improve food security is unknown in Malawi but according to the studies that have been conducted abroad there is

room for improvement. Joining food security matters and waste management benefit is an argument that waste stakeholders should highlight to catch the government's attention and get the necessary funding to develop the market.
The last common characteristic of all these markets is that they produce income (only one of the stakeholders didn't succeed in its business and blamed mainly the price of fuel), they generate jobs (most of the people working in those markets were unemployed before, especially the women) and at a local scale it seemed to improve livelihood (cleaner streets, waste-free, income used by the women to build houses and send their children to school). This cannot be generalized due to the size of the sample but it does give a hint to what the possibilities are within the waste business. Moreover this should be an incentive for more research on the subject to be done to identify more precisely how this creates incomes and improves livelihoods.

5.2 The compost market: A market with infinite resource

The compost market is based on the final product; there is no market based on the raw organic waste in Malawi for the moment. Various types of organizations are involved in the compost market; private companies and CBOs, NGOs aren't directly involved in the market but support communities or spread the knowledge. The businesses involved also include several buyers so we can assume that we are in a competitive market. However this must be nuanced by the large availability of raw resource and the low cost of processing.
The supply of raw resource (organic waste) is very abundant, especially in poor urban and peri-urban areas. Due to the number of people and their consumption pattern, around 94% of the wastes in poor areas are organic. In Lilongwe around 66,000 tons of wastes per year are not collected by the city a majority of which is organic waste. Organic wastes are a cheap, renewable resource continuously produced by human society.
From the interviews, three types of actors have been identified. First is a big scale successful gardening company that produces, uses, purchases and sells compost to a large range of customers. This company also trains and updates its producers to obtain good quality compost. Due to its diversification the company is less vulnerable to the market's hazards. Next is a small scale company that depends solely on itself by being in charge of the collecting and where the customers all have the same profile (local small scale farmers). In the event of hazards like the fluctuation of the price of fuel, the company is vulnerable and might not survive another year. Finally, another type of actor is a CBO, located in a low income area, which has similar characteristic to that of the small scale company but which tries to diversify its customer's profiles as well as the packaging they propose with the support of an NGO. Additionally the NGO encourages the CBO to buy land and to produce crop on which they could use their own compost and ensure their food security and independence. In all these cases the actors collect their own waste and don't hire or buy from waste pickers.
Skills are heterogeneously shared; big scale companies usually have experts and are aware of new techniques and technology, and these local communities are supported by NGOs and university providing them training, even though their support is sometimes limited and they rarely provide enough funds to allow for new investments. But in the case of small scale companies or individual initiatives, people are usually isolated and have difficulties accessing knowledge if they aren't supported by an external party. In general people involved with the production and the labor intensive part of the work are poorly educated adults while managers and NGOs people usually have university degrees. There is also gender segregation in the sense that for cultural or traditional reasons men and women don't work together.
According to previous articles and to what has been said during the interview, the two main issues in trying to convince people to produce or purchase compost are first that compost takes times to reach its full potential and second that the cost of transport when collecting waste and when transporting it is high. Farmers want quick results. This is the case with inorganic fertilizer while compost can take two to three years to be fully efficient.
Nevertheless even with these impediments the market is developing quite well, with all sellers increasing their production due to the demand. The nursery multiplied by three the amount of compost it has sold in the last three years, the small scale company went from ten to five hundred customers in a year and the CBO now has the necessary skills and is able to produce much more than at the beginning. The compost market has to expand without the support of the

government. It's hard to define what triggered this change as compost is a very old process but it can be assumed that the two main reasons are the increasing amount of waste due to the rising number of people in urban areas and the international concern for the environment.
However the market is far from being completely developed and Malawian could benefit even more economically and socially from its sustainable development. The first step that previous publications and participants agree upon is the need to increase the awareness of potential customers of the benefits of compost and its availability at a cheaper price than inorganic fertilizer. Media as well as national reports are great functional tools for that: they prove compost's efficiency on a local scale. Partnership between compost producers and schools/university campuses like Blantyre creates a great opportunity to increase awareness and to educate people. Additionally, it's a great access to a supply of organic waste as these infrastructures are often surrounded by restaurants and small markets. As majority of wastes in Malawi are organic and because cities are struggling with waste disposal, it makes sense economically, environmentally and in term of planning to support composting activity. Incentives like subsidies on organic farming proved to be very effective for the compost market in Malaysia. A similar action could be considered in Malawi especially since many farmers don't have the money to purchase inorganic fertilizer. However, it can be argued that Malawi has an urge to increase its food production to deal with food insecurity and that budget is more focused on increasing the production. Segregation of organic waste is not offered by the city councils as collecting of waste is already an issue. Implementation, as in Malaysia, of a fee for people that don't their segregate organic waste could be done with the money from the fees invested in waste management for the city. Combined with a public-private partnership with compost producers responsible for the collection of the organic waste, this would reduce the weight and volume of waste handled by the city which would be able to collect waste in more areas. Theoretically it's a win-win situation for the city and the compost producers, but it requires a strong involvement by both parties as well as by the communities along with heavy investments from compost producers to handle all the organic waste collected. It is additionally challenging that city counselors make it clear that authorities are not interested in waste management. Nevertheless, small scale pilot projects (one area at the time) involving local leaders could be imagined like in Dar Es Salaam. Another option based on what has been done at Yala (Thailand), is to trade organic waste in exchange for food or valuable resources (eggs in the case of Yala). The project was a success, on the whole people were willing to pay for waste services as they were able to see the difference afterwards between a city with and without waste management planning. As food is a sensitive topic in Malawi a similar incentive could also work. This not only deals with the amount of waste managed but also increases people's awareness regarding waste management and its potential benefits.
There is almost no competition for the moment especially because the sellers are situated in different areas and because customers are local clients. However the Nursery's strategy to purchase CBOs production at a cheap price can be seen as a way to avoid competition on the market. Indeed, even if their customers are different (local small scale famers for CBOs, rich gardener for the nursery) the nursery prevents the CBOs from selling its compost to other potential customers and thus insure there is a continuous supply of compost available. Nevertheless, as the principal sector of activity in Malawi is agriculture, the market should in theory prosper with an infinite amount of renewable primary resource (organic waste) and a large panel of customers. However, like in Cameroun and Ghana, the expansion of the market might encounter obstacles because remote farmers cannot afford to purchase compost due to the cost of transport. And since 84% of the Malawian population lives in rural areas the question of access to compost needs to be studied along with the market's development. Concerning labor and labor conditions, the process of waste segregation and composting is labor intensive. The development of compost industries will increase the number of people hired to handle the process, creating jobs and welfare.

5.3 The plastic waste market

In the plastic market, it is plastic waste which is marketed not the processed product like it is for the compost market. Two actors are involved: the plastic industries and the waste pickers collecting plastic wastes. All the plastic industries in Malawi are recycling plastic, especially

since 2011: with the change in currency rates, buying raw plastic from outside Malawi became too expensive and companies had to start recycling.
All the plastics industries are recycling their plastic and purchasing plastic waste from waste pickers, and around 20% of the plastic in the items produced comes from recycled plastic. Waste pickers, mainly women and children, come directly to the industries sites. Markets vary a lot depending on the geographical situation of the industries. Plastic industries in Blantyre, the commercial city, compete to buy plastic waste from the waste pickers offering the best prices, while in Lilongwe, the capital and political city, industries buy plastic waste at a very cheap price and some have even stopped buying it because of the accumulation of plastic waste in their facilities. In Lilongwe the supply is greater than the demand so there is no competition for plastic. There are 65 plastic industries in Malawi and most of them are based in Blantyre, it's more likely that since both cities produce approximately the same amount of waste (around 100,000 tons per year), it can be assumed that competition for the resource is greater in the commercial city. This would explain why in Blantyre prices are much higher (150 MK/Kg (0.37 USD)), however more research should be done to determine exactly why there is such a discrepancy. The market is endangered in both cities by a new regulation on plastic production that might force several industries to close down. Both respondents are concerned by this regulation and think about closing their company if regulation doesn't change. It's difficult to compare with previous publications or experiences as few articles have been found on the economic benefits of this market since most of the Malawian companies only started to recycle plastic in 2011. In Guatemala, the recycling activity works very well but the companies don't purchase their waste: they collect it and this only concerns recycling companies' not plastic industries. The additional constraint for the market is that not all plastic is recyclable and the various types of plastic render the recycling process more complex. Skills and appropriate machinery investment are necessary.
Compost process is labor-intensive. The collecting of waste in streets and/or dumpsite can take hours. Concerning the processing of plastic, tasks are distributed according to gender: women are exclusively in charge of the washing part while men segregate the plastics and handle the machinery. The apparent gender equity in the number of employees is challenged by gender division depending on the task. The handling of the machine is one of the main issues for the market since its investment and maintenance represents a large cost, and because the new regulation for plastic production requires a new way of production.
New regulation has been implemented to reduce the amount of plastic produced and dumped. Some other legal tools have shown to be efficient in other countries, like a requirement that a percentage of recycled plastic be made into plastic items or a tax included in the price of non recyclable plastic. Ideally the money will help develop the recycling industry and create jobs. This can only be managed on a government level and will require both time and discussion through the institutional process. The problem is that taxes are efficient when there is no corruption and when there is a strong institutional and monitoring background which might not be the case in Malawi. Concerning waste pickers, their self-employed status makes them vulnerable to hazard if a majority of plastic industries close down, especially in Blantyre where a number of waste pickers will lose a valuable income (around 27 USD per time in Blantyre). This informal economy is not yet completely clear in Malawi, as it is for instance in South Africa where waste pickers cannot operate without having an access to waste and waste buyers (plastic industries in this case). Awareness and support for waste pickers should also be implemented as they expose themselves to hazardous wastes. Recognition of waste pickers, support for their activity as a benefit to the community, access to micro-credit to buy protective wear and transport material or communication on health risk would increase their livelihood and sustain their activity.

5.4 Waste collect in Lilongwe: A large potential limited by the price of fuel

In the capital, five respondents were involved in waste collect; the CBO in Mtandire collects organic waste from the streets to produce compost, *Four seasons Nursery* collects organic waste from its gardening activity, *Perez investment* collects residential waste in informal settlement areas, *New ID* investment collects residential waste in middle income areas and the city council collected 30% of the MSW in all areas of the city. They share some similitude:

poorly educated waste pickers, labor intensive work, essentially men involved in the collection and transport of waste, except for the CBO, and the availability and access to fuel is the biggest issue to accomplish the work.
However there were differences in their equipment and the number of people hired. They also differ in their efficiency. *New ID* has one truck and four employees and it collects 7% of the total amount of MSW per year while the council as 600 employees in the cleaning department (not all working for waste collection) and four to six trucks that collect 30% of the total MSW stream. These 600 employees don't all work at collecting but even then the difference in efficiency is huge. In both cases people received a quick training so their skills aren't very high, and it can be assumed that a small team is more efficient that a bigger one, especially because a small truck is able to navigate better in a densely populated area and uses less fuel so it can carry out more missions.
Waste pickers organizations like *New ID* and *Perez investment* are not yet developed in Lilongwe. The city council was aware of only two of those companies but acknowledged the possibility that other people were doing the same thing. Authorities don't support these businesses even though the NEAP (2004) recommends the council to do so. In Tanzania for the moment, waste management has become a political concern and this is how waste collection services have developed. In the case of Tanzania, the city council was replaced by a new one that is in charge of a new waste management strategy. This shows the power of the population to raise the interest of the authorities. Without necessarily changing the current council, local community leaders could pressure the council to show more interest on waste management and the potential benefits it could bring. In the case of Dar Es Salaam, the council didn't have to invest more money on trucks and labor because on the contrary all the collection was handled by the private sector and the public services had a monitoring and management role which reduced the cost of waste management for the city. However, on the other hand, people employed by the city to collect and transport waste might lose their jobs or need to find a new job with poorer conditions if the city completely stops its waste collection activity.
The unique dumpsite of the city is also an issue for several reasons: wastes collected in the northern part of the city need to be transported all the way to the south, thus consuming a lot of fuel, especially during the rainy season due to the mud waste which is discarded on the road instead of on the site and trash often drifts away. At some point the dumpsite will be full and without a backup plan waste will be disposed around the landfill at a the risk for the population and the environment. Finally the site is too far away so waste collectors might prefer to burn waste, producing hazardous smoke or dump it in inappropriate and illegal places.
Because of the few businesses involved, of the huge amount of waste produced and of the increasing need for collecting in Lilongwe, there is a very attractive, non-competitive market. However, there are obstacles such as the price of fuel, the access to densely populated areas and the lack of interest from the authorities.

5.5 Data quality & limit of the study

The respondents provided data that couldn't be verified since it could be a personal choice by the respondents to overestimate their success or their issues, so there might be a bias towards the amount of waste collected and/or the amount of compost produced. Moreover because data was collected from a small sample and because each respondent belongs to a specific category, generalization cannot be done just based on the results from each type of participant (i.e. large scale compost producers are not necessary successful and CBOs are not necessarily run only by women...). However, the sample does represent the diversity of profiles that can be found in Malawi concerning the market's activity.
The data concerning MSW production might not be completely accurate first because it's not clear what the data for MSW in Lilongwe and Blantyre includes, and secondly because due to the high rate of urbanization the amount of waste has grown considerably between 2010 (date of the MSW estimation) and 2014. The same concern applies to the articles written on the case of Dar Es Salaam, where although they all agree that privatization of waste management was a success, there aren't articles or papers published after 2006 on the subject. From 2006 to 2013 waste management may have changed in a country like Tanzania which has an urbanization rate comparable to Malawi's.

The estimation of waste collected using the coefficient of one third given by the director of *Four Seasons Nursery* couldn't be checked because of the short period of time during which the field work took place. When the director was asked to assess the production a second time to ensure this coefficient was relevant, he gave us confirmation but couldn't provide specific data, thus not giving any real proof. However as the compost processing for the Nursery and the CBO is done with the same techniques and with the same type of waste, it can be assumed that both have the same coefficient.

Finally, no attention has been paid in this thesis to: the environmental impact of waste management, biogas production out of waste, bottle recycling/reusing activity, clothe reusing businesses or the management and recycling of electronic and metal items. All those recovery activities exist in Malawi, however due to the lack of information and/or time it has been chosen to exclude them from this thesis.

CHAPTER 6: CONCLUSION

In conclusion, in urban Malawi waste markets do exist even though they are not completely mature. Formal and informal markets do exist along with weak but existing institutional frameworks. The official position of the government is not represented at a city level leaving the stakeholders without support and regulated by more informal institutions. In general, all kinds of actors are involved in the markets, both large and small scale companies, CBOs, NGOs as well as individuals. If everyone seems to benefit from it there is nevertheless a power relation within the market. Big scale companies are the ones setting the prices even if they sometimes have to negotiate with their suppliers. City councils struggle to collect waste and that waste production continues to grow due to the population's growth rate, which leaves a large space for private initiatives to develop. Additionally, as the majority of the wastes are organic and because a massive part of Malawians have crops (that need fertilizers) it is a huge advantage for the development of a compost market. The fact that all these activities are relatively labor intensive also mean that they can create jobs. So in theory according to the rule of demand and supply, the development of the already ongoing waste markets can be a solution to help Malawi out of poverty. However, major impediments like fuel prices and the lack of institutional support at a city level weakens this potential. But as informal institutions are strongly embedded in the waste market it's not clear what will be the consequences of the state implication. Additionally, more investigation should be done to understand these informal institutions with a bigger sample, more survey and interviews.

This thesis is a tool to show city planners, NGOs and people interested on the subject that waste is part of the solution for Malawi to develop by creating jobs, handling sanitary issues due to waste, creating incomes and also reducing food insecurity through compost. This paper also aims to prove that more research and study is needed on the subject, especially on the market's mechanisms and the consequences of public actions like subsidies or taxes. From a social point of view women are largely involved with waste due to cultural reasons. This paper can also be used to enhance women's equality when working with waste.

Because waste is an infinite renewable resource, Malawi could use it as a main strength towards development. Institutions could support private initiatives like waste collecting businesses or by engaging more effort at a public level to develop the Sanitary and Cleaning department of each city council. It could for example develop units in charge of the collecting, the segregation, the processing and the trade of wastes at a cheap price for the population. There are many opportunities and different ways to start dealing with all these issues. It seems however that governments at a local level need to be proactive and start acting more concretely.

References

Achanken E. (2003): Globalization, Urbanization and Municipal Solid Waste Management in Africa, , *African Studies Association of Australasia and the Pacific Conference Proceedings, African on a Global Stage*, October 1-3, Flinders University, Adelaide, Australia. Available at: http://www.inclusivecities.org/wp-content/uploads/2012/07/Achankeng_Globalization_Urbanization_MSW_Mgmt.pdf

AdeOluwa O.(2010*): Organic agriculture and fair trading in West Africa.* Rome, Italy Food and Agriculture Organization of the United Nations (FAO) Available at: http://www.fao.org/docrep/014/i2230e/i2230e11.pdf
Agarwal A. (2004): *Municipal solid waste recycling and associated markets in Delhi, India*, Department of Civil Engineering, Indian Institute of Technology, IIT-Delhi 110016, India

Anjum R.(2013): *Willingness to Pay for Solid Waste Management Services: A Case Study of Islamabad, Pakistan*, Islamabad Pakistan Institute of Development Economics CEECC Working Paper No. 3

Attahi K. (2000): Chapter 2 Abidjan Côte D'Ivoire in Adepoju G. Onibokun *Managing the Monster: Urban Waste and Governance in Africa* Ottawa International Development Research Centre
Baker S. (2000): Both sides of the bridge: Public-Private Partnership for sustainable employment creation in waste management, Dar Es Salaam, *ILO Seed program Workshop Planning for Sustainable and Integrated Solid Waste Management*, Manila, The Philippines, 18 - 21 September 2000 Available at: http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_policy/-invest/documents/meetingdocument/wcms_asist_7608.pdf
Census (2008): *2008 population and housing census*, preliminary report – National statistic office Republic of Malawi, September 2008
Columbia University (2008): Map of Blantyre city Showing Sub-location (Administrative Wards), Millennium cities initiative, Earth institute, Columbia University available at: http://mci.ei.columbia.edu/millennium-cities/blantyre-malawi/blantyre-maps-and-population-data/
Environment Management Act of Malawi (1996), Act N° 23 enacted by the Parliament of Malawi in 1996 and published in the official *Gazette* the 16 of August 1996
European Union (2008) Waste Framework Directive, Directive 2008/98/EC on Waste
FAO (2011): *Climate change and food systems resilience in sub-Saharan Africa: Adoption of organic farming technologies-evidence from semi arid region in Ethiopia 1st ed* Rome: Italy FAO
Farrant L. (2008): *Environmental benefits from reusing clothes*, Master thesis Technical University of Denmark
Fisher K. (2011): *Benefits of reuse case study: Clothing*, WRAP organization Final report

Foray J. (2012): Solid Waste management in Ghana: A comprehensive case for West Africa, Joseph Foray 2012 Africanreality online journal posted the 09/07/2012 visited the 15/08/2013 at: http://africanreality.over-blog.net/article-solid-waste-managment-in-ghana-a-comprehensive-case-for-west-africa-107960790.html

French ministry of sustainable development (2011): Compostage de déchet non dangereux: Définition, French ministry of sustainable development website updated the 17/01/11 viewed the 16/08/2013 at: http://www.developpement-durable.gouv.fr/Definition,13041.html

IFAD (2011): *Enabling poor rural people to overcome poverty in Malawi, International Fund for Agricultural Development* Available at: http://www.ifad.org/operations/projects/regions/Pf/factsheets/malawi.pdf

ILO (2012): *Employment creation model in Sri Lanka, Promoting Green Jobs and Livelihoods in Municipal Solid Waste Management*, ILO final report June 2012

Index Mundi (2013): Index Mundi website: *Malawi demographic profile 2013,* last updated 21/02/2013 viewed the 12/06/2013 at: http://www.indexmundi.com/malawi/demographics_profile.html

Jaza Folefack A.J. (2008): Factors Influencing the Use of Compost from Household Waste in the Centre Province of Cameroon *Ministry of Agriculture and Rural Development,* Yaoundé, Cameroon 2008

Kaseva M.E. (1996): Recycling – an environmental friendly and income earning activity towards sustainable solid waste management – case study: Dar Es Salaam, Tanzania *Habit International journal* Volume 17, Issue 4, October 1996, Pages 299–309

Kaseva M.E. (2005)**:** Appraisal of solid waste collection following private sector involvement in Dar es Salaam city, Tanzania, *Habitat International journal* volume 29, Issue 2, June 2005
Kassim S.M. (2006): Solid waste collection by private sector: Household's perspective – Findings from a study in Dar Es Salaam, Tanzania, *Habitat International Journal* volume 30, Issue 4, December 2006

KNBS (2009): Kenyan National Bureau of Statistic; Population and housing census 2009

Mavropoulos A. (2012): Waste management 2030+, *Waste Management World journal online* viewed the 18/06/2013 at: http://www.waste-management-world.com/articles/print/volume-11/issue-2/features/waste-management-2030.html

MDP (2009): Malawi Business Directory website at: http://www.malawiyp.com/category/Plastic_products/3 viewed the 19/04/2013

Medina M. (2002): *Globalization, Development, and Municipal Solid Waste Management in Third World Cities*, Tijuana: Mexico, El Colegio de la Frontera Norte

Mkwambisi D. & Makuwira (2011)***:*** *Waste conversation and market study,* Lilongwe: Malawi University of Malawi Bunda College

Mkwambisi D. (2007) *Earth and Environment: Urban Agriculture in Malawi, Poverty Reduction Waste Management and Institutional Barriers.* Lilongwe, Malawi University of Lilongwe Bunda College
Moffat M. (2013) Definition of Market in the economic dictionary: About.com Education Economics website viewed the 19/10:2013 at http://economics.about.com/cs/economicsglossary/g/market.htm

Mongkolnchaiarunya J. (2005): Promoting a community-based solid-waste management initiative in local government:Yala municipality, Thailand, *Habitat international* Vol 29 (2005) 27–40

Morriss A.P. (2004): *Recycling: A success story, Guatemala entrepreneurs do what U.S* Property & Environment Research Center report: Volume 22, N°3 Fall 2004

Mtika C. (2013): Mzuzu city council to export waste in South Africa*, Nyasa Times journal*, June 23, 2013

National Environment Action Plan of Malawi (1994), Chapter 4: Environmental Issues

Nikita (2009): Chapter 2: Urban Compost: A Socio-economic and Agronomic Evaluation in Kumasi, Ghana in Mark Redwood *Agriculture in Urban Planning. Generating Livelihoods and Food Security* Published by Earthscan & International Development Research Centre (IDRC), 2009 | ISBN 978-184407668

Nolles (2006): *The importance of market institution in generating prices; A review from experimental economics and implications for real world experience* **-** SEELab working paper: WP20060712

OECD (2009): Environmental examination of OECD: Denmark 2009

Pichtel J. (2005): *Waste Management Practices: Municipal, Hazardous and Industrial* 2nd edition CRC Press Inc

Oelofse S.H.H. (2008): Defining waste in South Africa: moving beyond the age of 'waste', *South African Journal of Science* ISSN 0038-2353 S. Afr. j. sci. vol.104 no.7-8 Pretoria Sept./Aug. 2008

Onibokun A.G. (2009a): Chapter 3: Ibadan Nigeria in *Managing the Monster: Urban Waste and Governance in Africa*, Ottawa International Development Research Centre
Onibokun A.G. (2009b): Chapter 6: Synthesis and Recommendations in *Managing the Monster: Urban Waste and Governance in Africa,* Ottawa International Development Research Centre
Oxford dictionaries (2013): Definition of waste in English in the online Oxford Dictionaries viewed the 14/08/2013 at: http://oxforddictionaries.com/definition/english/waste
Samon M. (2004): *Organizing in the Informal Economy: A Case Study of the Municipal Waste Management Industry in South Africa* SEED Working Paper No. 66 ILO 2004

Samson . (2010): Reclaiming livelihoods: The role of reclaimers in municipal waste management systems. 1st edition Ground Work publisher Ebook available at: http://www.groundwork.org.za/Publications/Reclaiming%20Livelihoods.pdf

Schenck C. (2012): *Unrecognized Waste Management experts: Challenges and opportunities for small business development and decent job creation in the waste sector in the Free State*, First report ILO available at: http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_195724.pdf

Sivaharsh S. (2012): Integrating Solid Waste Management and Organic Farming: A Case of Kerala, 1st edition

SMP (2006): Socio-economic profile of Lilongwe District, Scotland-Malawi Partnership organization available online at: http://www.scotland-malawipartnership.org/documents/68-LILONGWESEP2006-vers13.pdf

Spong P-J. & Walmsey B. (2005): Malawi country report, Southern Africa Institute for Environmental assessment, available at: http://www.saiea.com/saiea-book/Malawi1.pdf

Stone (2013): Sweden needs more trash *National Geographic Journal* online posted the 4/01/2013 viewed the 19/08/2013 at: http://newswatch.nationalgeographic.com/2013/01/04/sweden-needs-more-trash/

Takomborerwa H. (2011)**:** Waste management in developing countries: A case study of Blantyre City, Malawi, *EWB-UK National Research & Education Conference 'Our Global Future'* 4th March 2011 available at: http://www.ewb-uk.org/filestore/Takomborerwa%20Hove_Waste%20management%20in%20developing%20countries%20A%20case%20study%20of%20Blantyre%20City,%20Malawi.pdf

UN-Habitat (2011): *Blantyre Urban Sector Profile*, United Nations Human Settlements Program Regional Office for Africa and the Arab States available at: http://www.unchs.org/downloads/docs/8448_93033_BlantyreUrbanSectorProfile.pdf

USP (2013): Urban Structure Plan of Lilongwe city, 17th june 2013 by the Lilongwe City Council

Van Dijk M.P (2008): *Urban management and Institutional change - An integrated approach to achieving ecological cities,* Amsterdam: Netherland Institute for housing and urban development studies, working paper NUMBER 16 / 2008

WorldBank (2011): *Africa Development Indicators 2011, the little data book on Africa 2011* – The World Bank

WorldBank (2012a): Chapter 3 Waste generation in *What a waste a global review of solid waste management*, The WorldBank 2012

WorldBank (2012b): WorldBank website, Malawi's page viewed the 12/8/2013 at: http://data.worldbank.org/country/malawi

WorldBank (2013): *Malawi at a glance*, WorldBank report updated the 17/3/2013 viewed the 12/8/2013 at http://devdata.worldbank.org/AAG/mwi_aag.pdf

ANNEX 1

List of participants

Organization	Respondent	Sector	Activity
Lilongwe city council	Allan Kwanjana, director of the cleaning and sanitation department in Lilongwe	Public sector	Collect, transport, dump
Blantyre city council	Samdem Seunda, Deputy director of the department of health in Blantyre	Public sector	Collect, transport, dump
Four Seasons Nursery & Consultancy	John Sprowson, Executive director	Private sector	Compost, Recycle, Re-use, purchase and sell
Shore Rubber	Billal Malida, Operations Manager	Private sector	Plastic recycle and sell
Plastico Industry	Stevenson Ndlovu, Human resources manager	Private sector in Blantyre	Plastic recycle, purchase and sell
Perez Investment	Mrs. Perez, Executive Director	Private sector	Collect, compost, burn and sell
New ID investment	Alex Msukuma, Executive Director	Private sector	Collect, dump
	Group of women in Mtandire	CBO	Collect, transport, compost and sell
	Lukewale Likweli manager of the team of women making briquettes in Bunda	CBO	Paper recycling
Institute for Environmental Professional (IEP)	Kent Kafatia, Operations director	NGO	Consultant, process design support
Center for Communication Organization and Development (CCODE)	Tabbie Mdolo	NGO	Consultant, sanitation and marketing support
Mineral and Appropriate Technology Applicable in Malawi (MATAMA)	Glyciahnnie K. Mapulanga, Executive director	NGO	Sanitation support
Active Youth Initiative for Social Enhancement (AYISE)	Marcel Chisi: Executive Director	NGO in Blantyre	Sanitation support, compost and sell

Interview Private Sector

> *This interview aims to define the private sector strategy regarding urban waste management and waste market in Lilongwe. Specifically this study will highlight and define the main actors of the waste market, their activities and their interactions. With this interview and in correlation with other interviews, we should be able to analyse and understand the waste market dynamic in Lilongwe.*

Section 1:
Characteristics of the company
1.1: When did the company been created?
1.2: What does *Four Seasons* do in relation to waste management in Lilongwe city? (Summary)
1.3: What part of the waste management *Four Seasons* is taking care of? (If several answer precise the proportion in % please)
1 = Collect, 2 = Recycling, 3 = Re-using, 4 = Composting, 5 = Selling, 6 = Other (Specify)
1.4: How is *Four Seasons* involved in the market of waste?
1 = Absent, 2 = Seller, 3 = Buyer, 4 = recycler/composter5= Others (specify)
1.5: Does *Four Seasons* work with external actors? (If yes precise the context)

Actors	Yes	no
Medium/large company		
Small company		
NGO		
Local community		
Others		

1.6: Do you have financial support from the government or NGO concerning the waste management?
Section 2: Market
2.1: What are the main types of waste used by *Four Seasons*? (Precise the percentage if several answer)
1 = Food waste, 2 = Maize bran, 3 = Agri product, 4 = Paper, 5 = Plastic bottle, 6 = Gallon, 7 = tyre, 8 = Glass bottle, 9 = Drum, 10 = Grass and vegetation 11= Livestock manure 12= Market waste 13= Others (Specify)(specify)

2.2: Where do you get the waste from? (If several answer precise proportion in %)
1 = Self Collection, 2 = Bought on the market, 3 = Bought from local community, 3 = Own production, 4 = Brought by vendprs 5= Other (specific)
2.3: What are the products that *Four Seasons* produces out of waste?
2.4: Who are the buyers of your products? (For each category precise which type of products?)
1 = Small scale farmers, 2 = Large scale farmers, 3 = Local community, 4 = NGO, 5 = Government, 6 = Private company, 7 = Other
2.5: Which waste products are the more popular for your customers?
2.6: What potential do you think have the waste market in Lilongwe for the coming 10 years?
1 = Big potential, 2= normal potential, 3 = weak potential, 4 = No potential
2.7: Where are the products sold?
*1 = Central market place onsite, 2 = Central market place in town, 3 = Several market places in town and onsite, 4 = Several market places in town, 5 = Delivery to customer*s, 6 = International market, 7 = Other (Specify)

2.8: What is the average ratio of waste needed to produce new products?
2.9: What are the main issues to obtain good quality products?
1 = Quality of primary waste, 2 = Conservation of the primary waste, 3 = Adapted skills of the employee, 4 = Cost of the technology, 5 = Availability of the technology, 6 = Transport of the product, 7 = Other

Section 3: Strategy and evolution

3.1: How Four seasons evolved since its creation? (Precise number if known)

	Increase	Decrease	No change
Number of employee			
Primary waste managed			
Production			
Number of customers			
Demand of customers			

3.2: How do you see the development of the company in the future in the waste market?

	Increase	Decrease	No change
Number of employee			
Primary waste managed			
Production			
Number of customers			
Demand of customers			

3.3: What challenges do you face as a private firm in waste marketing?
3.4 How can these challenges be addressed
3.5: How is the competition in the waste market in Lilongwe? Who are the main concurrent in the waste business?
3.6: Do you think the private sector has much interest in waste marketing?
1 = Yes, 2 = No

3.6.1: If no, what do you think are the reasons for them to not venture into it?

1 = Lack of demand for waste product, 2 = Poor available infrastructure, 3 = Few skilled people, 4 = Reluctance of people to work with waste, 5 = Weak support of the government, 6 = Difficult collection of waste, 7 = Difficult transport of waste, 8 = Other

3.7: Who or what fixes the price of waste product?
1 = State, 2 = Price of oil, 3 = Market, 4 = International organisation, 5 = Price of food, 6 = Price of fertilizer, 7 = Other (Specify)
3.8: What is the influence of official infrastructures (city council, national law...) on the waste market in Lilongwe?
3.9: Do you think there is the potential for the waste marketing expansion to boost up the development of Lilongwe?
3.10: What do you think about other waste management options?

	Comments
Dumping site	
Incineration to produce energy	
Other	

Section 4: Employee/ Labour

4.1: How many people does *Four Seasons* employ to work on waste management for the city of Lilongwe?

4.2: What is the gender repartition of the employees?

This interview aims to define the city council strategy regarding urban waste management and waste market. Specifically this study will highlight and define the main actors of the waste market, their activities and their interactions. With this interview and in correlation with other interviews, we should be able to analyse and understand the waste market dynamic in Lilongwe.

	Men	Women	unknown
Collect			
Recycle			
Compost			
Sell			
Other			

4.3: What is the age ratio of the employee? (Number or %)

	Men	Women
15/20		
20/25		
25/35		
35/45		
>45		

4.4: What is the education level of the employees? (Number or %)

	Men	Women
None		
Primary		
Secondary		
University		

4.5: Does *Four Seasons* provide training or workshop to its employee to work on waste management?

4.6: Are they full time or seasonal workers? (%)

	Men	Women
Full time		
Seasonal		

4.7: How do you see gender issues related to waste management?

4.8: Are you aware of the wastes that are being marketed in the city? Who are the people involved?

Interview city Council

Name of the respondent and function:

Section 1: City council characteristics

1.1: What the city council role in waste management in Lilongwe?

1.2: Who are the main actors in Lilongwe regarding waste management and waste marketing? (Precise %)

1 = City council, 2 = Private firms from Malawi, 3 = International private firms, 4 = Local NGO, 5 = International NGO, 6 = Local communities, 7 = Individuals, 8 = Others

1.2: What does the city council do with the collected waste? (if several answer precise proportion in %)

1 = Dumping in landfill, 2 = Recycling, 3 = Re-using, 4 = Composting, 5 = Selling, 6 = Other

1.3: Do the city council is involved in the market of waste?

1 = No, 2 = Seller, 3 = Buyer, 4 = recycler/composter

1.4: Does the city council hire external actors to manage waste in the city? (If yes for what purpose)

	Yes	no
Medium/large company		
Small company		
NGO		
Local community		
Others		

1.5: How much waste does the city council collect per month/year?

Per month: ..... *Per year: .....*

How much is produce per habitant

1.6: Is there some area of Lilongwe where the city council has not access to collect waste?

1.7: Does the city council supports (funding, infrastructure, training...) local community based waste management?

1.8: Do you have financial support from the government or NGO concerning the waste management of the city?

Section 2: Employees

2.1: How many people does the city council employ to work on waste management for the city of Lilongwe?

2.2: What is the gender repartition of the employees?

	Men	Women	unknown
Collect			
Recycle			
Compost			
Sell			
Other			

2.3: What is the age ratio of the employee? (Number or %)

	Men	Women
15/20		
21/25		
26/35		
36/45		
>45		

2.4: What is the education level of the employees?

	Men	Women

None		

This interview aims to define the women compost team strategy regarding urban waste management and waste market. Specifically this study will highlight and define the activities of the team, their interactions with other actors of the waste market, their success and their issues to improve livelihood via the waste market. With this interview and in correlation with other interviews, we will be able to analyse and understand the waste market dynamic in Lilongwe.

Primary		
Secondary		
University		

2.5: Does the city council provide training or workshop to its employee to work on waste management? (If yes what kind of training)

Section 3: Strategy and market

3.1: Who are the main actors in waste management in Lilongwe?

1 = City council, 2 = Private firms, 3 = NGO, 4 = local community, 5 = other?

3.2: Does the city council is involved in market regulation for waste?

	Yes	No
Price		
Buyers protection		
Sellers protection		
Product quality regulation		
Other		

3.3: Do you know the average price of different wastes products?

3.4: Does the city council consider waste as a valuable resource?

3.5: What potential do you think have the waste market in Lilongwe for ten coming 10 years?

1 = Big potential, 2= normal potential, 3 = weak potential, 4 = No potential

3.6: What are the main issues/obstacles for the development of a waste market?

3.5.1: For the city council:

3.5.2: In general:

3.7: How will you assess the effectiveness of the current waste management plan considering the population increase in Lilongwe city?

1 = Very effective, 2 = Effective, 3 = poorly effective, 4 = none effective

3.8: What in your opinion could be the strategy to develop sustainably the waste market in Lilongwe?

3.9: Does the council have a mid or long term plan to manage waste in the future considering the fast urbanization in Lilongwe?

3.10: Does the gender issues are integrated in the waste management plan of the city? If yes how?

3.11: How the council see an interest of the private sector in waste management in Lilongwe?

Interview Women compost team

Name of the respondent and function:

Section 1: Characteristic of the team

1.1: When the Women Compost Team (WCT) has been created?

1.2: How many women where you at its creation and how many are you now?

1.3: What is the age ratio of the women of the team?

Age	Number
15/20	
21/25	
26/35	
36/45	
45<	

1.4: What is their level of education?

	Number
None	
Primary	
Secondary	
University	

1.5: What part of the waste management the WCT is taking care of? (If several answer precise the proportion in % please)

1 = Collect, 2 = Recycling, 3 = Re-using, 4 = Composting, 5 = Selling, 6 = Other (Specify)

1.5: Does the WCT work with external actors? (If yes precise the context)

	Yes	no
Medium/large company		
Small company		
NGO		
Local community		
City council		
Others		

1.6: Do you have support (funds, infrastructure, training...) from the government or NGO concerning the waste management?

1.7: What are your actual skills in matter of compost?

1 = Expert, 2 = strong skills, 3 = basic skills, 4 = poor skills

1.8: Where did you acquire your skills?

1 = School, 2 = Friends, 3 = Family, 5 = By yourself (Time + Experience), 6 = NGO, 7 = Government, 8 = Private firm, 9 = Other (Specify)

Section 2: Compost activity

2.1: What kind of wastes do you use to make the compost?

1 = Food waste, 2 = Maize bran, 3 = Agri product, 4 = Paper, 5 = Plastic bottle, 6 = Gallon, 7 = tyre, 8 = Glass bottle, 9 = Drum, 10 = Grass and vegetation 11= Livestock manure 12= Market waste 13= Others (specify)

2.2: What is the ratio of the raw materials you use to make the compost? (kg of primary waste/compost product) and the time you need to produce it.

2.3: Do you add any value to the compost to make it more effective just like fertilizer?

2.4: Where do you get the primary product?

1 = In the street (precise area), 2 = Own production, 3 = Local farmers (<15km), 4 = Remote farmers (>15km), 5 = Landfill/dumpsite, 6 = Local Restaurant (<15km precise area), 7 = Remote restaurant (>15km), 8 = Neighbour, 9 = Markets in tow (Precise area) 10 = Other (Specify)

2.5: What are the main issues to obtain good quality products?

1 = Quality of primary waste, 2 = Conservation of the primary waste, 3 = Adapted skills, 4 = Cost of the technology, 5 = Availability of the technology, 6 = Transport of the primary waste, 7 = other (Specify)

Section 3: Market

3.1: Who are the buyers of your products? (If several answer precise %)

1 = Small scale farmers, 2 = Large scale farmers, 3 = Local community, 4 = NGO, 5 = Government, 6 = Private company, 7 = Other (Specify)

3.2: Where are the products sold? (Precise the size of the market if possible)

1 = Central market place onsite, 2 = Central market place in town, 3 = Several market places in town and onsite, 4 = Several market places in town, 5 = Delivery to customers, 6 = Other (specify)

3.3: How much compost manure do you sell per month/year and at what price?

Per month = ... *Per year = ...*

	Price
20 litre pail	
50Kg bag	
1 ton	

3.4: Who or what is regulating the price of you compost manure?

1 = Yourself, 2 = The state, 3 = Private firms, 4 = Buyers, 5 = Quality of the product, 6 = Price of oil, 7 = Price of industrial fertilizers, 8 = Price of food, 9 = Other(Specify)

Section 4: Strategy and evolution

4.1: How the WCT evolved since its creation? (Precise number if known)

	Increase	Decrease	No change
Number of member			
Primary waste managed			
Production			
Number of customers			
Demand of customers			

4.2: How do you see the development of your organisation in the future?

	Increase	Decrease	No change
Number of members			
Primary waste managed			
Production			

Number of customers			
Demand of customers			

This interview aims to define NGO roles regarding urban waste management and waste market in Lilongwe. Specifically this study will highlight and define the main actors of the waste market, their activities and their interactions. With this interview and in correlation with other interviews, we should be able to analyse and understand the waste market dynamic in Lilongwe.

4.3: Does this activity help you to develop your livelihood? (If yes in what means)
4.4: What challenges do you face as a group of women in making compost manure and to sell it?
4.5: How is the competition in the waste market in Lilongwe? Who are the main concurrent your business?
4.6: Do you think there is the potential for the compost production to improve livelihood in urban area, considering the fast urbanization rate?
4.7: Do you seek the help of the government or NGO to develop your business, if yes it which way?

	Yes	No
Funds		
Training/skills development		
Infrastructures (compost centre)		
Technology (transport, cave...)		
Regulation (prices, social protection...)		
Other		

4.8: What do you think the market of compost can bring to women empowerment?

Interview NGO

Respondent and function:
Section 1: NGO role
1.1: What is the purpose of your NGO originally? (Brief summary)
1.2: What is its role in the waste market of Lilongwe?

1.3: How many people of your organization are involved in the waste market or work in relation with the waste market?
1.4: Who are those people (age, education, function)?
1.5: Does the NGO is involved in waste market activities?
1 = no, 2 = Collection of waste, 3 = Recycling, 4 = Composting, 5 = Incinerating, 6 = Selling primary waste, 7 = Selling final waste product, 8 = Support actors of the market, 9 = Other (specify)
1.6: Do you work with actors of the waste market? (If yes precise names)
1 = no, 2 = Local communities, 3 = Private firms, 4 = NGOs, 5 = Government, 6 = Individuals, 7 = others (specify)

1.6.1: If yes what are your relation with them?

	Training	**Infrastructures providing**	**Funding**	**Purchase primary waste**	**Purchase final waste product**	**Other (Specify)**
Local community 1						
Local community 2						
Private firm 1						
Private firm 2						
NGO 1						
NGO 2						
Government						
Individual						
Other (specify)						

1.7: How will you estimate the interest of CCODE for the waste market?
1.8: Do you receive funds or support from the government or international organisation in relation to waste management?

Section 2: The market

2.1: What potential do you think have the waste market in Lilongwe for the ten coming 10 years?
1 = Big potential, 2= normal potential, 3 = weak potential, 4 = No potential
2.2: What are the strengths or the advantages of the waste market in Lilongwe?
2.3: What are the main issues/obstacles for the development of a waste market?
2.4: What in your opinion could be the strategy to develop sustainably the waste market in Lilongwe?
2.5: How do you see the gender topic in relation to the waste market?

2.5.1: Does women have access to the market?
2.5.2: Does they have the power to fix their own prices?
2.5.3: In which activity of the market do you estimate women more active?

1 = Collect of waste, 2 = Recycling, 3 = Composting, 4 = Selling final product, 5 = Other (Specify)
2.6: How will you estimate the skills of the actors of the market?

	Actual skills/Knowledge
Local communities	
Private firms	
NGO	
Government	
Buyers	

Sellers	
Others (Specify)	

2.7: Do you know where market places for waste are?
2.8: Do you know the size of the market places?
2.9: Are you in contact with vendors (people collecting waste and selling them directly without adding values)? If yes could you give us some contacts?