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A case study of Lusaka City in Zambia

Danny Chibinda

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Danny Chibinda

Supervisor: Cecilia Mark-Herbert, Swedish University of Agricultural Sciences, Department of Economics

Examiner: Karin Hakelius, Swedish University of Agricultural Sciences, Department of Economics

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Abstract

Lusaka City, the capital of Zambia, has not been spared from the pervasive problem of managing municipal solid waste. Taking product life cycle approaches in the production and consumption of resources has been advanced as a panacea to closing resource loops through circular economic production systems in order to reduce the concept of waste. To this end, a case study involving four public and seven private sector players was conducted through in-depth interviews, field observations and content analysis to ascertain the feasibility of leveraging public policy and corporate social responsibility to stimulate a circular economy in order to abate the problem of garbage.

Going by the initiatives and measures being undertaken by the actors, where the respondents were selected, there seems to be positive prospects for a paradigm shift to embrace circular economic production approaches. The key specific measures are the integration of the Extended Produce Responsibility (EPR) in environmental regulations and the launch of a project, conceived and supported by one private sector player as part of their Corporate Social Responsibility (CSR), to establish a waste value chain to close the resource loops. However, there are incoherencies between policies and institutional organisation. These incoherencies are in part explained by waste management policies that mainly focus on public health dimension of waste management which hinders other aspects to be considered for a closed resource loop system development.

Therefore, calibrating policies and institutional organisations to reflect the aspiration to grow a circular economy is required. Some form of nudging in the case of the private sector coupled with enhanced dialogue and partnerships would also be required for reaching the desired goal of reducing waste.

Keywords: Case study, circular economy, corporate responsibility, extended producer responsibility, garbage management, partnerships, stakeholder dialogue

Abbreviations

CBEs – Community Based Enterprises
CE – Circular Economy
CLSC – Closed Loop Supply Chain
CSO – Central Statistical Office
CSR – Corporate Social Responsibility
DANIDA – Danish International Development Agency
DRS – Deposit-Refund System
ECZ – Environmental Council of Zambia (now ZEMA)
EMA – Environmental Management Act
EPR – Extended Producer Responsibility
ESD – Education for Sustainable Development
EU – European Union
HDPE – High-Density Polyethylene
ICT – Information and Communications Technology
IPPP – Industrial Pollution Prevention Programme
ISO – International Organisation for Standardisation
ISWM – Integrated Sustainable Waste Management
JICA – Japan International Cooperation Agency
LCC – Lusaka City Council
MLGH – Ministry of Local Government and Housing
MoU – Memorandum of Understanding
MSW – Municipal Solid Waste
NORAD – Norwegian Agency for Development Cooperation
PET – Polyethylene Terephthalate
PPP – Public-Private Partnership
PPW – Packaging and Packaging Waste
R&D – Research and Development
SDGs – Sustainable Development Goals
ShDG – Stakeholder Dialogue Gear
SHE – Safety, Health and Environment
SMEs – Small and Medium-scale Enterprises
SSCN – Sustainable Supply Chain Networks
UN – United Nations
UNDP – United Nations Development Programme
UNEP – United Nations Environment Programme
US EPA – United States Environmental Protection Agency
WBCSD – World Business Council for Sustainable Development
WMH – Waste Management Hierarchy
WMT – Waste Management Theory
WMU – Waste Management Unit
ZABS – Zambia Bureau of Standards
ZACCI – Zambia Chamber of Commerce and Industry
ZEMA – Zambia Environmental Management Agency

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1. Introduction

During the epoch of industrialisation, which some scholars refer to as the Anthropocene, the quest by humanity to improve living standards through increased consumption and utilisation of natural resources, amid high population growth, has had a telling effect on the environment (Rockström, *et al*., 2009; Gutberlet, 2015). The excessive pressure put on the environment has led to scenarios that could see the capacity of the planet (planetary boundaries) stretched to levels that could render the earth desolate to support the survival of humankind (Rockström, *et al*., 2009).

As stated by Belz & Peattie (2012), Sachs (1999) and Friedman (2008), the environment has two major functions in the realm of material consumption, that is being a source of raw materials and a sink for the waste generated in the production and consumption system. This system is founded on the cradle to grave approach which acts like a double-edged sword in terms of the damage caused to the environment – as the extraction of resources on one hand and the disposal of waste on another hand result in environmental degradation. Similar concerns have been raised by the UNEP (2015) where it is argued that a product life cycle method where resource loops are closed needs to be adopted in order to avert unsustainable forms of production and consumption that generate waste and jeopardise international development and ecological welfare.

1.1 Problem background

The problem of waste, as Miller & Spoolman (2012) put it, is not a contemporary phenomenon. However, from the time humanity started to live in organised urban settings and increasingly became dependant on industrial production, the problem of discarded or no longer useful materials which constitute waste has become more and more pronounced.

> Modern humans produce huge amounts of waste material that go unused and pollute the environment. Because of the law of conservation of matter[1] and the nature of human lifestyles, we will always produce some waste (Miller & Spoolman, 2012, p. 558).

According to Wright & Boorse (2011) the classification of waste takes several forms, either following the sector where it is generated, its physical/chemical state or potential to cause harm. Just as an illustration, if waste was to be categorised based on sectors, there is medical, agricultural or e-waste and based on the potential to cause harm we have toxic or non-toxic waste. This study will focus on municipal solid waste due to the high potential to reduce this pervasive problem (Miller & Spoolman, 2012).

Municipal Solid Waste (**MSW**), commonly referred to as garbage or trash, consists of various items that are discarded after being used. "*These include items such as packaging, food waste, grass clippings, sofas, computers, tires, and refrigerators. MSW does not include industrial, hazardous, or construction waste*" (US EPA, 2014, p. 2). The sources of such waste include residential areas, public institutions such as schools, offices, etc. and

[1] The law of conservation of matter states that we neither create nor destroy matter but can only transform it from one physical/chemical form to another (Miller & Spoolman, 2012).

commercial places such as markets or shopping centres (Miller & Spoolman, 2012; US EPA, 2014).

The responsibility to manage MSW, as Zotos *et al.* (2009) and Wright & Boorse (2011) indicate, is assigned to municipalities within which a particular city falls while "*important responsibilities for MSW management policy making have in the past and continue to rest with federal/state government*" (Taylor, 2000, p. 408). Taylor (1999) and Ezeah & Roberts (2012) argue that municipalities in the developing countries and in particular Sub-Saharan Africa have had huge problems managing garbage as seen from the indiscriminate disposal of waste. In contrast, the developed countries have made significant strides in managing garbage, the paradox however, is that these countries are still the highest producers of waste (Miller & Spoolman, 2012). The fact that waste is taken care of for us by municipalities might explain why some individual citizens see it as 'not a problem' even when it actually is for society.

The United Nations Economic Commission for Africa (2009) reported that a number of factors present challenges for African cities to manage garbage, such factors include the lack of adequate legislation, rapid urbanisation and industrialisation without appropriate city planning, waste management facilities are either non-existent or if they do – they are not designed to handle different types of waste. During the inter-ministerial meeting held in Luanda in 2010 on the implementation of the Libreville Declaration on Health and Environment, addressing the problem of waste was indicated as one of the top priorities for Africa (Global Partnership on Waste Management, 2012). In the case of Zambia, Lusaka City only has less than 10 % of the generated garbage reclaimed while the remainder ends up in undesignated dump sites, drainages and landfill (UN-Habitat, 2010). This challenge and the contributing factors, that is, inadequate financial and human resources within the local authorities and environmental management agency, were noted by the Parliamentary Committee on Energy, Environment and Tourism (National Assembly of Zambia, 2009) and the Zambian delegation to the United Nations Commission for Sustainable Development 18th session (United Nations Commission on Sustainable Development, 2010).

While the involvement of the private sector in the garbage management process has mainly been in providing collection, transportation and disposal services (UN-Habitat, 2010), McDonough & Braungart (2002) and UNEP (2015) contend that from a sustainability point of view, businesses should play a greater role in reducing waste generation through improving the production of goods using the cradle to cradle approach. The World Business Council for Sustainable Development [WBCSD, (2010)], in the Vision 2050 Report and Porter & van der Linde (1995) indicate that waste generation or pollution is a form of inefficiency which costs business entities money and reducing such wastages would not only improve environmental wellbeing but also boost profits. For the private sector to embrace this kind of thinking, Mark-Herbert *at el*. (2010) state that Corporate Social Responsibility (**CSR**) offers businesses an opportunity to participate in protecting the environment and contribute to the welfare of the society they operate from.

> As a part of environmental economic theory, Corporate Responsibility (CR) deals with business perspectives of sustainable development. […] where sustainable corporate conduct is managed with economic, environmental and social values in mind, in order to address various stakeholder needs from a holistic perspective. (Mark-Herbert, *et al*., 2010, p. 1).

1.2 Problem statement

Municipal solid waste is one form of the manifestation of unsustainable consumption of natural resources by humankind which has led to, and continues to lead to, the depletion of natural capital and environmental degradation (Berg, *et al*., 2013; Taylor, 2000; Zaman & Lehmann, 2013). Cities have for a long time been 'swallowed' in garbage as dump sites mushroom in all corners, blocking drainages, contaminating water sources, causing disease among the population and impairing the aesthetic value of the landscape (Wright & Boorse, 2011).

Whereas it has been common knowledge that garbage is a squandered resource, as stressed by Miller & Spoolman (2012, p. 558) quoting Arthur C. Clarke who said "*solid wastes are only raw materials we're too stupid to use*", cities still struggle with the problem of solid waste management. The prospect to reduce waste and its consequences could be as much as 90 % (*Ibid.*), but as shown by the UN-Habitat (2010, p. 11&38) the city of Lusaka which has an annual waste per capita of around 201 Kg only salvages about 6 % of the MSW. This is clearly unsustainable hence the need to find ways to tackle this problem and one of the approaches is engaging local businesses through CSR to improve their production patterns and close the resource loops. This is in line with Sustainable Development Goal number 12 which reads "*ensure sustainable consumption and production patterns*" and also directly linked to six other goals due to the correlation between municipal solid waste and issues of health and environmental wellbeing (UN, 2015, p. 12).

1.3 Research aim

The aim of the research is to ascertain the feasibility of engaging local business entities in abating the problem of municipal solid waste through closed loop or circular economy (**CE**) production approaches. Focus is placed on the role of the public and private sectors in bringing about the change and prospects for public private partnerships in this regard.

1.4 Objectives and Rationale

The specific objectives that will guide the attainment of the research aim are as following;

a. To establish what opportunities and challenges exist for local businesses to participate in closing the resource loops via circular economy production approaches that will lead to a reduction in garbage generation.

b. To find out the position of the public and private sectors on teaming up to collectively tackle the problem of garbage through 'green' business ideas.

The reason for undertaking this research is to look at how the private sector can be engaged to reduce the unsustainable consumption of natural resources that end up as garbage. The outcomes are meant to benefit the local authorities and residents of Lusaka in having a cleaner environment and reduce the costs associated with managing garbage and diseases that result from it as they can formulate better policies that include the private sector in reducing garbage. Besides, if the findings would be embraced, the private sector would benefit from

enhanced returns from their businesses as they will improve on resource efficiency and ensure a good corporate image. Finally, the outcomes of the research would benefit all those, general public and scholars alike, interested in the management of municipal solid waste.

1.5 Research questions

The following research questions are of particular interest;

a. How can the private sector contribute to reducing garbage?

b. What are the inhibiting and enabling factors for businesses to engage in circular economy production systems?

c. In what way are possibilities for Public Private Partnerships (**PPP**) an option?

1.6 Overview of study area

This section gives brief information about the location, demography, economic profile and municipal solid waste management in the city of Lusaka.

1.6.1 Location and demographic profile

Lusaka, shown in figure 1, is the capital city of Zambia located in Lusaka Province. It lies on latitude 15°30'S and longitude 28°10'E with a projected population of 2,281,702 and about 3.8 % population growth rate for 2015 (CSO, 2013, p. 99&104). The population density is around 4,853.2 people per square kilometre (CSO, 2012, p. 29).

Figure 1: Location of Lusaka City, UN-Habitat (2010, p. 66)

1.6.2 Economic profile

Apart from being the capital city, Lusaka district also has the highest number of commercial entities hosting several businesses involved in the manufacturing and sale of various merchandise ranging from food/beverages, household goods, construction materials to machinery (LCC & ECZ, 2008; Siaminwe, *et al*., 2005).

1.6.3 MSW management in Lusaka

Below is a brief perspective of the legal and institutional framework and operational dimensions of MSW management in Lusaka.

a. Legal and institutional framework

According to Scheinberg, *et al.* (2010), The Post (2015) and Global Partnership on Waste Management (2015) there are four types of legal protocols that govern the management of solid waste in Lusaka. These are the;

i. Local Government Act chapter 281 of the laws of Zambia which is the primary legal framework that governs the establishment and operations of all councils in Zambia and provides the mandates given to the local authorities which include waste management.

ii. Public Health Act chapter 295 of the laws of Zambia where all matters pertaining to maintaining a clean and healthy environment in order to prevent the outbreak of diseases are specified.

iii. The Environment Management Act Number 12 of 2011, preceded by the Environmental Protection and Pollution Control Act – Cap 204, which covers issues of environmental protection and the prevention of pollution. It goes further to stipulate how wastes should be managed and for the first time included the Extended Producer Responsibility (**EPR**) element.

iv. Waste management regulations such as statutory instruments 100 of 2011 and by-laws of 2004 which provide for the establishment of the municipal solid waste management unit, operational guidelines and fees/charges to residents/businesses for municipal solid waste management within Lusaka City.

From an institutional point of view, the Environmental Council of Zambia (2004), renamed Zambia Environmental Management Agency (ZEMA) in 2011, states that a number of institutions are involved in solid waste. They range from the public (government ministries/agencies), private, civil society to those in the education sector. Their roles vary and sometimes complimentary, they include policy formulation and enforcement (research and standards development), information dissemination and coordination (ECZ, 2004). The Lusaka City Council (2003) and Scheinberg, *et al.* (2010) recognise the key players in municipal solid waste as being the Ministry of Local Government and Housing (MLGH) and Environmental Council of Zambia (now ZEMA), at national level, involved in policies formulation, capacity building and information exchange with other stakeholders. At district (city) level, the Lusaka City Council is responsible for some policy formulation while at the same time doing its core mandate of policy implementation with the stakeholders within its jurisdiction that carry out different tasks – see table 1 for an elaborate explanation on the roles that the various stakeholders play. The tasks range from providing waste collection and

transportation services to waste reclamation. However, there have been some changes in the last four years such as an increase in the number of entities involved in recycling.

Table 1: Stakeholders in municipal solid waste management under Lusaka City Council, Scheinberg, et al. (2010, pp. 42-43)

Stakeholder	Description
Lusaka City Council	The Lusaka City Council has established a *Waste Management Unit* (WMU) as part of the DANIDA funded Lusaka Waste Management Project. The WMU presently has the responsibility of not only planning for waste management in the city, but also contracting for services, landfill management and general provision of technical advice to various actors. The WMU is equally involved in the collection and transportation of waste from the selected parts of the city.
Franchise contractors	Presently, there are nine local waste management companies who have each been assigned a waste management district, or zone. The franchise gives these companies the right and obligation to service the zone on a monopoly basis. These franchisees have the responsibility not only for providing collection services, but also for billing and revenue collection from those that have subscribed to the system. Some of the contractors are involved in recovery of waste for sale to recycling industries. The materials mainly recovered are waste paper.
Community Based Enterprises (CBEs)	The City of Lusaka has almost 70% of its population living in peri-urban areas and/or unplanned settlements which are not easy to access due to lack of roads. Additionally, the peri-urban areas are mainly low income areas and this includes a majority of poor people some of whom are unemployed. The status of these areas has made it difficult for the private sector to provide solid waste services, hence Lusaka City Council agreed to involve *Community Based Enterprises* to provide primary collection, which they accomplish using muscle power and hand-tools, moving material to communal collection points with wheelbarrows. The Lusaka City Council then provides secondary collection to move the materials to the disposal site. The CBEs can be considered as semi-formal with about thirty established to date. Although, only eight of the CBEs provide comprehensive solid waste management services for their areas.
Licensed Waste Generators	Under the Waste Management Regulations, the ECZ is mandated to license waste generators who wish to manage their own waste arising out of manufacturing and production process. The licensed waste generators collect and transport their own waste from their premises to the official dumpsite. The ECZ provides certain conditions to ensure that these licensed waste generators work within the license and do not illegally dispose of their waste. From the information available from ECZ, there are fourteen companies in the City of Lusaka who are licensed to manage their own waste.
Performance Contractors	The Lusaka City Council, in conjunction with the Ministry of Local Government and Housing has awarded performance contracts to six companies to provide street sweeping and drainage clearance services in selected parts of the city. The contractors are responsible for ensuring waste generated through the performance of their services is appropriately transported and disposed at the official Chunga dumpsite.
Recycling Industries	Recently, Lusaka has seen an increase in the number of recycling industries. Previously there was only one known waste paper recycler, *Zambezi Paper Mills*, but there is now a Zimbabwean outfit, *Flexi-Waste* that has established operations in Lusaka. Also, there is an increase in the recovery of scrap metal and a new company, *Universal Steel and Mining* which is in the process of setting up a steel plant has been actively buying and stockpiling scrap metal. There is also *Central Recyclers* involved in the recovery of non-ferrous metal. There is limited recycling of plastics although nothing is done in terms of PET or PVC materials. The recycling industries like Flexi-Waste and Zambezi Paper Mills, go out and collect their own waste paper from different clients.
Unregistered Waste Collectors	In spite of the law that requires that all transporters of waste be duly licensed by the ECZ and awarded a franchise contract through the City Council, there are a number of illegal (unregistered) waste collectors who are involved in the provision of waste collection services in the city, who can undercut the official collection price because they do not pay all the necessary fees. In most cases these collectors illegally dispose of the waste in outskirts of the city and so avoid the disposal fee charged at the dumpsite. It is estimated that there are about 20 of these companies operating in the city.

Street Pickers	High levels of unemployment and poverty in the city contribute to the growing number of waste pickers, who mainly collect waste paper and scrap metal –particularly high-value, non-ferrous metal. Waste picking is not well organised and the pickers have to walk long distances from the points where they collect the recyclable materials up to the recycling industries. In some instances, the Recycling Industries have provided support in the form of handcarts to allow for efficient collection of waste materials. It is estimated that there are about 190 street waste pickers who are known to supply their materials to the recycling industries although there could be more who pick waste but use it for various purposes.
Dumpsite pickers	Due to the lack of effective controls and management at the official dumpsite, there are a number of waste pickers involved in the recovery of waste paper, scrap metal and plastics. There are about 200 waste pickers on the dumpsite and these include women, children and men. The waste materials that are recovered are either sold directly to the recycling industries or consumed or used by the waste pickers themselves.

In addition to the players in table 1, the residents; business entities; and public institutions such as schools are expected to have garbage bins and required to pay user fees for garbage collection.

b. Municipal solid waste management operational context

The operational aspects of municipal solid waste management are based on the Strategic Municipal Solid Waste Management Plan for Lusaka City of 2003 and the National Solid Waste Management Strategy of 2004 (ECZ, 2004; LCC, 2003). The operations are premised on the principles of cost recovery, polluter pays principle, source reduction, integrated life-cycle approach, pre-cautionary and cooperation among stakeholders (ECZ, 2004). It is imperative to note that the public health part is more cogent than environmental protection or resource optimisation in the way municipal solid waste is managed (UN-Habitat, 2010).

For administrative convenience, Lusaka is divided into twelve (12) waste management districts. The city council manages two (2) and the other ten (10) are divided among franchises and community based enterprises with the former covering high cost areas and the latter covering low cost and peri-urban areas (Scheinberg, *et al*., 2010). Garbage skips, plastic and sack bags and bins are used to hoard the garbage before it is transported to the dumpsite as illustrated in figure 2 (Scheinberg, *et al*., 2010).

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Figure 2: Solid waste hoarding and transportation, UN-Habitat, 2010

According to the UN-Habitat (2010), the problem of illegal garbage dispose is very rife in Lusaka. Table 2 show the quantity or percentage of garbage generated and illegal disposal

accounts for the highest amount since only about 26 % is disposed using acceptable procedures.

Table 2: Selected municipal solid waste statistics for Lusaka,UN-Habitat (2010, p. 67)

Description	**Quantity or %**
Total tonnes municipal solid waste (MSW) generated per year	301,840 tonnes
Generation per capita in kilograms per year	201
Percentage coverage	45
Percentage disposal in environmentally sound landfills or controlled disposal sites of total waste generated (estimate)	26
Percentage diverted and valorised of total waste generated	6

The UN-Habitat (2010) indicates that organic waste constitutes the highest component of the MSW in Lusaka alongside what is categorised as others (furniture, clothing, tyres etc.). The other categories, that is, plastics; metal; paper; and glass constituted less than 10 % each as illustrated in figure 3.

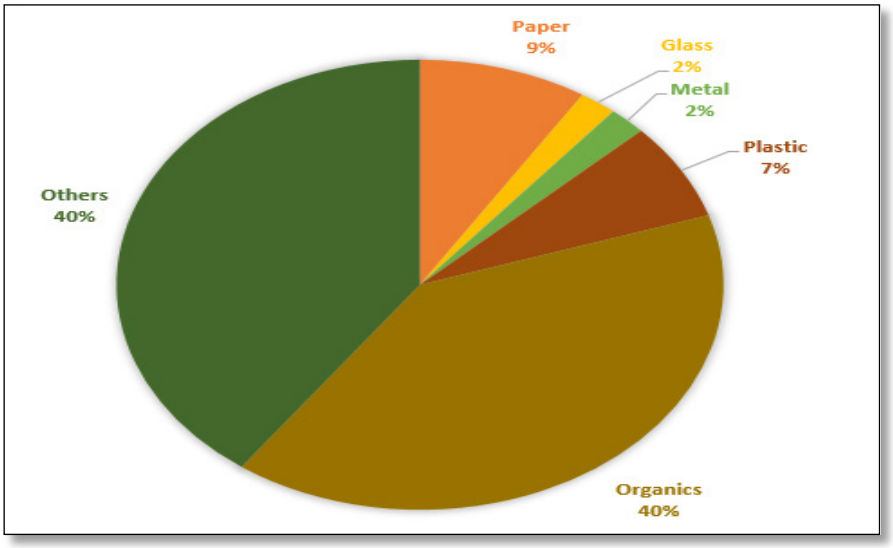

Figure 3: MSW composition by weight in Lusaka, UN-Habitat (2010, p. 129)

1.8 Paper Outline

The arrangement of the paper is as follows; chapter 1 gives background information to the problem under consideration and chapter 2 gives a version of some salient issues highlighted by other researchers in the same field. Chapter 3 covers the theoretical and conceptual aspects that underpin the research and chapter 4 spells out the material and methods employed to collect and analyse the empirics. Chapter 5 gives an account of the research findings while chapter 6 synthesises the results in order to draw meaning. Chapter 7 discusses the implications of the results and finally chapter 8 bring the paper to a conclusion and stipulates suggestions for future research.

2. Empirical background

This section gives an overview of relevant literature around reducing garbage generation through the engagement of the private sector. It begins with considering literature on how the private sector by changing to or embracing principles of circular economy (CE) production systems have been able to reduce garbage generation whilst improving on resource optimisation. The final part looks at some examples of Public Private Partnership (PPP) in waste management.

2.1 Waste reduction through circular economy production approaches

Holmes (1983) states that in the field of salvaging garbage, the private sector has invested and continues to invest in innovations meant to recovery useful materials from the waste stream. However, in order to improve material usage and reclamation from garbage, Taylor (1999) and Das & Posinasetti (2015), stipulate aspects that would bring about the much needed change and they include developing market mechanisms/policies that promote reusing and recycling of materials; product attributes that ensure products last longer and are repairable. The other aspects are components that can easily be separated and recycled; packaging that requires less materials or recoverable; and public procurement principles that encourage reduction of waste at source e.g. bulk purchases. The UNEP (2015) and McDonough & Braungart (2002) posit that taking a life cycle approach in the quest to eliminate waste from the production system offers society a pragmatic and effective option which should be explored. To this end, Winkler (2011) and Andrews (2015) suggest that using sustainable supply chain networks (**SSCN**) and sustainable design and production foster a process connection among producers which enables change from an open-loop economy into one which is a closed circular economy. A similar concept that supports such a proposition has been advanced by Das & Posinasetti (2015), that is, closed loop supply chain (**CLSC**) as a desired business ideal for forward looking companies because of the capabilities of value reclamation. CLSC also ensures environmental sustainability through the collection of end-of-life goods/materials returned using retailers in a milieu with an incentive scheme that motivates both the retailers and customers. As an illustration of how businesses can contribute to environmental sustainability, a case study was conducted and the outcomes showed that by sacrificing about 2 % of the total profit, there was a potential to reduce nearly 10 % of overall energy utilisation and 5 % reduction in harmful emissions (*Ibid.*). Such measures are believed to attract the attention of consumers who are likely to give distinctive attention to a firm's products which creates an opportunity for business growth (*Ibid.*).

A circular economy, where the loops are closed and stimulated by life cycle analysis of products, in the long run achieves both economic and environmental goals such as the reduction of waste and energy usage (Erses Yay, 2015; Winkler, 2011). Pearce and Turner, working in the area of environmental economics, initiated the concept of circular economy (CE) based on the view that the traditional open loop economy is inherently inefficient since it does not promote the reuse and recycling of materials which consequently leads to garbage generation (Su, *et al*., 2013). According to Winkler (2011, p. 244) "*studies show that the share of reused or recycled materials can be increased up to 80% by closing process chains (instead of 1% with unclosed process chains*)." Germany, Sweden, Japan and few other developed countries were the first to embarked on regulatory reforms to promote cleaner

production/circular economy in the late 1990s (Su, *et al*., 2013; Hage & Söderholm, 2008). As indicated by Li *et al.* (2013) and Su, *et al.* (2013), China, having had the highest economic growth for decades that resulted in higher utilisation of raw materials and generation of enormous quantities of waste, in 2003 decided to follow the precedence set by Germany and other countries by passing legislation to support cleaner production. Issues such as Extended Producer Responsibility (EPR) are among the key elements that such legal forms ought to reflect in order to ensure a lifecycle approach among producers is invoked to stimulate recycling and reusing of materials (Hickle, 2014). To operationalise the cleaner production law, circular economic production has been mainstreamed in the national development plans of China and subsequently into firms' production systems (Li, *et al.*, 2013). This is demonstrated by the establishment of eco-industrial parks where industrial ecology/symbiosis acts as condition for firms to create synergies in the management of resource movement thereby improving their ecological footprint while at the same time reducing their overall production expenditure (Su, *et al*., 2013).

The desire for society to move to a resource efficient production system has moved from being a local/within a business, regional/national to being a global crusade – as demonstrated by the various efforts done in the private and public sector over time with SDGs epitomising the need for a paradigm shift (UN, 2015; Porter & van der Linde, 1995; Esty & Winston, 2009).

2.1.1 Achievements in the implementation of circular economy

Specific examples of the achievements recorded, in regard to reducing waste and promoting efficiency in production processes, by applying cleaner production/circular economy in different jurisdictions are highlighted below.

The European Union (**EU**) among the directives aimed at encouraging waste reduction and promote resource optimisation, issued directive on packaging and packaging waste (**PPW** Directive) which according to a study done by Marques, *et al.* (2014, p. 23) in Belgium and Portugal demonstrated that the two countries were able to meet the 60% threshold set in the directive with the former achieving 80% - above the target. The implications of such directives, as Ferrão, *et al.* (2014) state, showed that the Portuguese by shifting upwards on the waste hierarchy, figure 4, – to recycling from landfilling – certainly resulted in adding new jobs and broadened the economy. Another example from within the EU is that of Sweden with the introduction of the producer responsibility as early as 1994, manufacturers were required to engage their customers and provide mechanisms to recycle or reuse waste from their products (Hage & Söderholm, 2008; Hage, 2007). The preceding measure coupled with consumer awareness and investment in supporting infrastructure and systems, has resulted in Sweden making sufficient progress in waste valorisation to as much as 99 % in some cases thereby creating jobs and reducing waste disposed in landfills (Hage & Söderholm, 2008; Fredén, 2015).

Other parts of the world have, and continue to, strive to adopted production models that are centred on cleaner production/circular economy with positive outcomes. In Asia, China started with piloting the concept in four (4) cities and in the City of Dalian MSW generation declined by 17 % between 2006 to 2010 while a 20 % rise in waste treatment was recorded (Su, *et al*., 2013, p. 220). Li, *et al*. (2013, p. 1552) also state that the decision by the Chinese authorities to adopt circular economic production approach has had positive implications and information shows that *"by the year 2010, about 60% of the overall solid waste generation*

had already been reutilised" with the main potential being in the agricultural sector. Similar achievements have been recorded in Japan i.e. through innovative MSW management Kawasaki City could, by 2015, achieve a reduction of "*69 kilo tonnes of carbon dioxide (equivalent) emissions and 8 kilo tonnes of ash from incineration of waste*" (Geng, *et al*., 2010, p. 993). The assertion that a circular economy reduces the quantity of materials that end up in landfills also holds true as shown by a study in Malaysia where with the right support households participated in organic/food waste separation at source for use to produce biogas and composite fertiliser (Ghani, *et al*., 2013).

In Africa, some of the examples of closed loop production approaches meant to reduce waste generation and accumulation include, recycling of plastic waste by Blow Plastic Industry Ltd in Accra, Ghana – which had the potential to process 24 tonnes of plastic waste per day (Oteng-Ababio, 2010). A plant to process organic waste into compost was also established as early as 1979 but failed to operate due to inadequate water and electricity supply (*Ibid.*). Zambia, where this study has been conducted, had in the early 2000s embarked on a programme to promote cleaner production with the support of the World Bank (Siaminwe, *et al.*, 2005). The programme had a desk established and jointly managed by the Environmental Council of Zambia (ECZ) and Zambia Chamber of Commerce and Industry (ZACCI) aimed at enhancing end of pipe technological solutions for reducing waste generation within firms.

Burnley, *et al*. (2015) and Cucchiella, *et al.* (2014) argue that using waste to generate energy in waste to energy plants, where systems to sort or reclaim materials from waste do not exist, was environmentally and economically sustainable than sending the waste to a landfill.

2.1.2 Challenges in implementation of circular economy

The encumbrances that have been observed in the implementation of policies to promote a circular economy offer lessons that need to be looked into for better planning by both the public and private sector.

Park & Chertow (2014) state that despite having a growing demand to recycle and ensure prudent utilisation of material resources, the ever changing product intricacy and composition makes it hard for material managers to anticipate well in advance what investments must be made to ensure materials are efficiently recovered from garbage in future. They (Park & Chertow) contend that there is need to develop an objective waste reuse potential indicator to guide decision making, based on sound technical capacity, in the reclamation of resources from the waste stream.

According to Su, *et al*. (2013), some of the challenges encountered in China in the implementation of CE comprised of – reliable information was not readily available, lack of cutting-edge technology, frail economic motivations and enforcement of legal requirements was weak. The other challenges were – leadership to manage the process in both private and public sectors was inadequate, public awareness was low and no consistent system for performance assessment. Some of these observations (challenges indicated by Su and others) were also made in Zambia where cleaner production was being propagated (Siaminwe, *et al*., 2005).

A study of 175 firms in China indicated that there was disparity between being aware and practice of CE among the firms (Liu & Bai, 2014). Further, the environmental performance of a producer is influenced by several dynamics ranging from those within (management and

operational needs) to external factors such as government policies, consumer behaviour, competitors in the market among others (*Ibid.*). For instance, the obstacles to Small and Medium scale Enterprises (SMEs) uptake of clean technology were technical and managerial at the firm level but the most significant were the exterior barriers to do with financial and policy issues (Su*, et al.*, 2013).

2.2 Public Private Partnership in municipal solid waste management

The need for partnerships in the management of MSW is accentuated by Taylor who stated that none of the public, formal or informal private sector, community based or non-governmental organisations can individually solve city waste problems. *Rather, the development of sustainable MSW management systems requires the development of effective partnerships among all MSW stakeholders* (Taylor, 1999, p. 264). As Plata-Díaz, *et al*. (2014) indicate, PPP could create groundswell that offers authorities a viable option to provide MSW services due to growing shortfall in public budgets and increasing population. In view of the foregoing, economic pundits stress that hybrid organisations comprising both private and public sectors give society a good prospect for better service delivery due to the fact that the involved players use each other's strengths to leverage their shortcomings. Partnerships also provide room to move away from lock-ins and path dependence (Ahmed & Ali, 2004; Christensen, *et al*., 2014; Rotter, *et al*., 2012). Ezeah, *et al.* (2013) posit that in forming partnerships, it is paramount that authorities do not side-line the informal private sector as these play a key role in reaching out to places or areas where the formal private sector might not be able to cover.

According to Winkler (2011) and Su, *et al*. (2013), the need for partnerships among actors participating in a circular economy is essential for the creation of industrial parks that thrive on industrial ecology. Evidently, there is no entity that can run a closed loop production system alone, therefore, it is incumbent that an all-inclusive approach is applied due to limitations in process-product integration and end of pipe technologies in the quest to reduce waste within a firm (Winkler, 2011).

2.2.1 Highlights of successes Public-Private Partnerships in municipal solid waste management

Oteng-Ababio (2010) points to some cities in India, Tanzania and Ghana where PPPs have been adopted in MSW management. The resultant synergies have enabled pooling of resources and expertise from the private and public sectors to reduce risks and build in economies of scale thereby improving service delivery and this was demonstrated in Accra – Ghana where there was a 25 % improvement in waste collection. Comparable outcomes were observed in Lagos – Nigeria (Oteng-Ababio, 2010; Aliu, *et al*., 2014). Developing countries are ever more getting attracted to such approaches as they grapple with managing waste in urban areas because partnerships result in cost reduction and effective service delivery (Ezebilo & Animasaun, 2012). It is further argued that with clearly defined roles and responsibilities such as the public sector focusing on monitoring performance, planning and issues of accountability, PPPs become sustainable and rational way to manage MSW (*Ibid.*). A study conducted by Aliu, *et al*. (2014) in Nigeria showed that with PPP, services become accessible, affordable to people in the areas where such initiatives were implemented. The

perception of the residents towards PPP in MSW management was also optimistic which in the long run was contributed to cleanliness as people were willing to join the scheme (*Ibid.*).

2.2.2 Challenges in Public-Private Partnerships

As stated by Oteng-Ababio (2010, p. 328) "*PPP works well until one of the stakeholders fails to deliver*" – it is therefore, required of all the parties in the partnership to honour their obligations for such an enterprise to thrive. Failure to capture or fact in the heterogeneous characteristics of the players in MSW management would result in a partnership that is not all encompassing and implementation becomes a problem (Ezebilo & Animasaun, 2012). For example, community based or non-governmental organisations and those in business (informal or formal) are likely to have different aspirations and it requires finding some common grounds for collaboration to be successful (Ezebilo & Animasaun, 2012; Oteng-Ababio, 2010).

Biasness in the manner public sector officials relate to the informal and formal sectors, where due to prestige and perceived or actual benefits of associating with the formal private sector with vast resources, preference is given to the formal sector – this can result in alienation of the informal private entities due to unequal power relations and sometimes conflict of interests (Oteng-Ababio, 2010).

This chapter has highlighted examples of municipal solid waste management with emphasis placed on successes and challenges of circular economic models and partnerships between the public and private sectors. The information is key in explaining the occurrence and existence of a certain phenomenon or system – which the next chapter seeks to address.

3. Theoretical and conceptual framework

The study is anchored on two main theoretical frameworks and relevant concepts in the field of waste management and environmental sustainability in the private sector. The chapter beings with looking at waste management theory and ends with stakeholder theory where corporate social responsibility falls.

3.1 Waste Management Theory (WMT)

According to Pongrácz (2006, p. 60), WMT is an evolving cohesive form of knowledge aimed at addressing the issue of waste and waste management – *"it is founded on the expectation that waste management is to prevent waste from causing harm to human health and the environment and promote resource use optimisation."* The achievement of the aforesaid expectations, in the management of MSW, is mainly via the Integrated Sustainable Waste Management (**ISWM**) framework developed by Anschütz *et al*. which is premised on the Waste Management Hierarchy (**WMH**), a framework which has been embraced internationally (Christensen, *et al*., 2014; UN-Habitat, 2010).

To expand on the expectations or primary drivers for development of waste management, three drivers are presented. The drivers refer to the public health aspect which considers maintaining healthy conditions in cities/residential areas through a sound waste management system. The second driver is the environmental aspect which involves safeguarding nature in the entire waste chain, in particular at the point of treatment and disposal. The third and final facet of resource optimisation looks at closing the loops by ensuring that materials and nutrients are returned to valuable use through minimising waste, reuse, recycling and recovery of materials (Wilson, *et al*., 2012; Gregory, *et al*., 2009).

3.1.1 Waste Management Hierarchy

Also known as waste hierarchy or Lansink ladder, the WMH was developed by G.W.A.J ('Ad') Lansink in 1979 and it stipulates the priority order for waste management preferences as shown in figure 4 (Van Ewijk & Stegemann, 2014). As Wilson (1996) put it, the WMH illustrates that precedence is given to avoiding generating waste from the beginning; when it is inexorable to generate it, the amount should be reduced. What follows is re-using or recycling the waste by all means possible and recovery of energy should be done in order to reduce the amount to be disposed in a landfill (*Ibid.*).

In its original form, the WMH was considered inadequate because the nuances on how the illustrated steps would be achieved were insufficient – if not missing (Van Ewijk & Stegemann, 2014). The ISWM framework is considered as a versatile tool that can facilitate the attainment of the milestones set out in the waste hierarchy (Christensen, *et al*., 2014).

Figure 4: The Waste Management Hierarchy illustrates priority order in material usage, Eco-energy Ventures (http://www.ecoenergyventures.com/about/why-waste-to-energy/)

3.1.2 Integrated Sustainable Waste Management

The ISWM framework make a distinction about three propositions for analysis of solid waste management and recycling mechanisms: *the physical system and its technological components, sustainability aspects (social, institutional, political, financial, economic, environmental and technical) and the various groups of stakeholders involved* (Wilson, *et al.*, 2012, p. 238). It goes further to encourage solutions tailored to each locality with comprehensive institutions and pro-active policies, a bottom-up approach and above all an all-inclusive process which promotes dialogue through transparent and full participation for all stakeholders (Christensen, *et al*., 2014; Wilson, *et al*., 2012). A schematic presentation of the ISWM model is presented in figure 5, it shows the three features that are necessary for sustainable waste management.

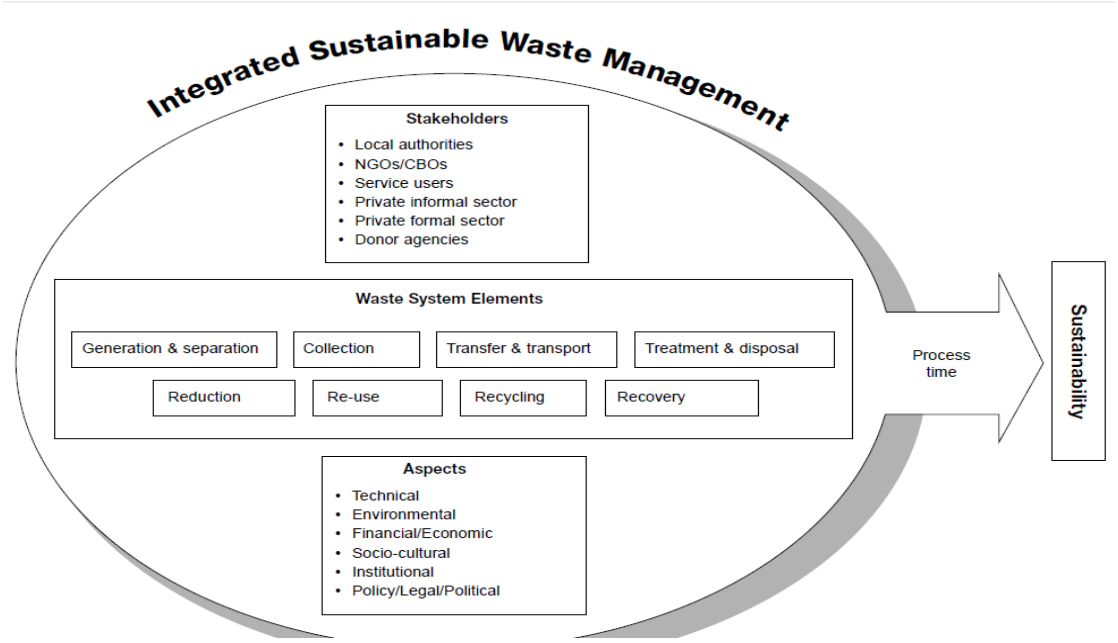

Figure 5: An Integrated Sustainable Waste Management Model, Anschütz, et al. (2001, p. 14)

In the illustration (figure 5), the consumers or households fall under service users while the aspects should include ethical issues which are also relevant in the area of waste management. The three dimensions (stakeholders, elements and aspects) are all required to be in place for waste to be managed effectively.

Owing to the fact that authorities are responsible for policy formulation and enforcement (Taylor, 2000) and the private sector produces the goods from which the waste emanate (Friedman, 2008). This paper focuses on how the actions and interactions of these two stakeholders impact the MSW stream so as to move up the waste hierarchy. The decision to primarily focus on policy makers and producers does not in any way underrate the role of the actors not covered here – because in one way or another they affect or affected by the actions of the two.

Over time, society has increasingly become aware of the detrimental impact of the current production system where natural resources are used to produce products and in the production process and at the end of life of the product, waste is generated and discharged/discarded in the environment through emissions or at landfill/dumpsite instead of reusing the materials over and over again in a cradle to cradle approach which will entail eliminating the concept of waste (McDonough & Braungart, 2002; Miller & Spoolman, 2012; Esty & Winston, 2009). Eliminating the concept of waste from the production system requires elements of systems thinking and life cycle methods based on sound policies and business acumen (UNEP, 2015; Wilson, 1996; Friedman, 2008). According to Su, *et al.* (2013) one way this change can be brought about is by enacting policies that consider both facets of production and consumption to encourage a circular economy in which material loops are closed.

3.1.3 Policy measures to stimulate circular economy

As stated by Wilson (1996, p. 385) "*a systematic shift in waste management away from disposal and towards waste prevention and recycling requires the use of an integrated set of policy measures to change the behaviour of waste generators; industry, commerce and consumers.*" The shift should encourage sustainable design and production which emulate natural life cycles where materials are recycled and establishing and supporting a circular economy is essential (Andrews, 2015). For CE cannot happen in a vacuum, there is need for clear direction and barriers which hamper the development of a CE have to be overcome – it is also cardinal that engineers, designers and managers move away from the idea of planned obsolescence proposed in 1932 as an avenue for stimulating frequent demand for products (*Ibid.*). There are policy alternatives, each with advantages and disadvantages, which can lead to the attainment of the goals, these can be categorised into two domains, that is, command and control (sticks) and economic incentives (carrots) (Taylor, 2000; Wilson, 1996). The policy measures in themselves would not achieve much if they are not accompanied by education for sustainable development, information dissemination and constant consultation among the concerned stakeholders (Wilson, 1996; Zotos, *et al*., 2009; Andrews, 2015).

Under 'sticks', authorities can develop policies based on the principles of polluter pays and extended producer responsibility to reduce, reuse or recycle waste because the existing market structure provides less initiatives for producers or final customers to increase their costs by spending on waste management after consumption for no or insignificant gain to themselves (Massarutto, 2014; Wilson, 1996). "*EPR is seen as a practical way to introduce green supply chain management and to extend it to the post-consumption phases*" and it goes

beyond the end of pipe technologies approach to preventing waste generation (Massarutto, 2014, p. 11). It is envisaged to encourage producers to be more innovative so that resource efficiency is attained through industrial ecology and strategic synergies with other players on the market (*Ibid.*). It is essential to note that sometimes green innovations are driven more by autonomous market strategies than by EPR and the change (waste valorisation) can be spearheaded by new actor not by those already on the market (Esty & Winston, 2009; Massarutto, 2014).

Specific measures under 'sticks' include: setting criteria and/or limitations on the type and amount of materials used to manufacture or package merchandises and benchmarks for producers to increase resource efficiency and reduce waste; introduce licences and fees on the production of or trade in certain products that generate so much garbage, for instance, Deposit-Refund Systems (**DRS**s) which involves a fee attached to the purchase of items such as beverages in plastic or glass bottles and aluminium cans – the customer gets a reimbursement when the container is returned at a designated collection point; and pollution or emission information disclosure system dubbed 'regulation by embarrassment' which encourages managers to act in order to make their company appear as a good corporate citizens (Wilson, 1996; Taylor, 2000; Marques, *et al*., 2014).

The measures stated hitherto are not without hurdles, according to Wilson (1996) Su, *et al*. (2013), the fees can make locally produced products more expensive that imports as producers transfer the fees to consumers and stifle the growth of SMEs with limited capital, landfill fees might lead to illegal waste disposal if not well developed and authorities need to put in place thorough enforcement, monitoring and evaluation modalities

Under 'carrots', policy makers provide economic motivations that enthuse producers to reduce waste generation, it involves providing some financial or capacity development incentives to manufacturers and the basis for such steps is that the public benefits from having less waste in their surroundings (Wilson, 1996; Liu & Bai, 2014).

Specific measures can include, subsidies on inputs, tax rebates/concessions, grants or low interest loans for plant and equipment and research and development; setting up serviced industrial parks underpinned by principles of industrial ecology and reduced land rates for new companies, especially SMEs engaged in waste reduction and recovery; training programmes and sponsored learning exchange visits to actors with best practices; and preferential procurement policies that encourage the purchase of green products and bulk buying in public institutions (Su, *et al*., 2013; Wilson, 1996; Taylor, 2000).

Caveats that prevent the abuse of the economic incentives are required and they mainly hinge on having a transparent system that ensures only actors that deserve the incentives get them coupled with mechanisms where beneficiaries have subscribed to achieving agreed milestones (Wilson, 1996; Liu & Bai, 2014).

From a practical point view it is argued that 'carrots' are more effective than 'sticks' (Wilson, 1996). Regards of the option taken by authorities, whether the measures are voluntary or mandatory, there is need to create room for actors in production of goods to steadily assimilate the changes (*Ibid.*).

3.2 Stakeholder Theory (Corporate Social Responsibility - CSR)

Brusseau (2011) and Elkington (1997) state that CSR which challenges the dogmatic view that corporations exists to solely maximise profit is derived from stakeholder theory. This theory as proposed by R. Edward Freeman, covers business aspects that relate to morals and ethics which entail that business is not all about making profits and leaving society to face the externalities emanating thereof, but rather, should ensure economic, societal and environmental sustainability – in contrast with the view of profit maximisation as the sole purpose of companies as propagated by Milton Friedman in the 1970s (Mark-Herbert, *et al*., 2010). The integration of CSR into a company's strategies is a voluntary undertaking which stems from the belief that the private sector, as they assume more and more responsibility in the provision of goods and services – those considered to be public included – should go beyond being accountable to the legal system and stockholders but also be accountable to their stakeholders by scoring on all the three fronts, that is, profit, people and planet (Henriques & Richardson, 2004; Mark-Herbert, *et al*., 2010; Rotter, *et al*., 2012).

As Olson (2010) and Belz & Peattie (2012) stress, environmental pressures due to population growth, resource (raw materials) scarcity and environmental degradation have been precursors to the demand for environmental stewardship among consumers. Availability of information on issues of sustainable development, or sustainability in general, among the population – where producers draw their customers – means such matters can no longer continue to be at the fringes of business entities (Olson, 2010; Esty & Winston, 2009). As indicated in figure 6, Ottman writing in Charter & Polonsky (1999), advocated for change from production methods that have caused detrimental impacts on the environment to sustainable methods while being able to satisfy customer needs, returns on investments and societal wellbeing.

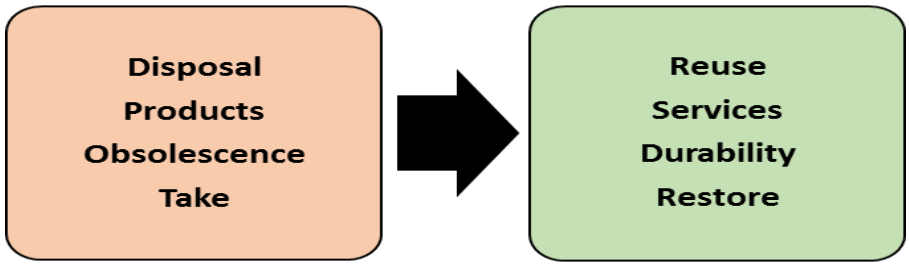

Figure 6: Production paradigm shift building on changes in mind-set, Ottman (1999, p. 83) in Charter & Polonsky

Belz & Peattie (2012, p. 32), quoting the European Commission, indicate that CRS "*is a concept whereby companies integrate social and environmental concerns in their business operations and their interactions with stakeholders on a voluntary basis."* Companies have progressively realised that CSR offers them an avenue to demonstrate their commitment to matters that concern their stakeholders, in so doing, they (businesses) build their reputation which subsequently enhances the value of the products or brand among consumers (WBCSD, 2010; Belz & Peattie, 2012; Olson, 2010).

> Corporate social responsibility (CSR) is no longer viewed as simply a regulatory or discretionary cost of doing business. Instead, it is increasingly viewed as an investment that brings financial returns (Olson, 2010, p. 19).

According to Winkler (2011) and Belz & Peattie (2012) some instruments for launching sustainability actions within a company include the implementation of standards such as ISO 14001, Eco-Management and Audit Scheme (EMAS) or ISO 26000 on CSR standards which elevate environmental management to the strategic level of the company. The implementation itself could just be the beginning of the paradigm shift, greener operations could be realised much later (Belz & Peattie, 2012). As shown in figure 7, the change is a process that requires several steps targeting the soft and hardware features of a company, that is, from the people (board members, management and other staff) to systems (technical and way of doing things). Planning for the shift is paramount, using available information, with mechanisms for back stopping and benchmarking (Olson, 2010).

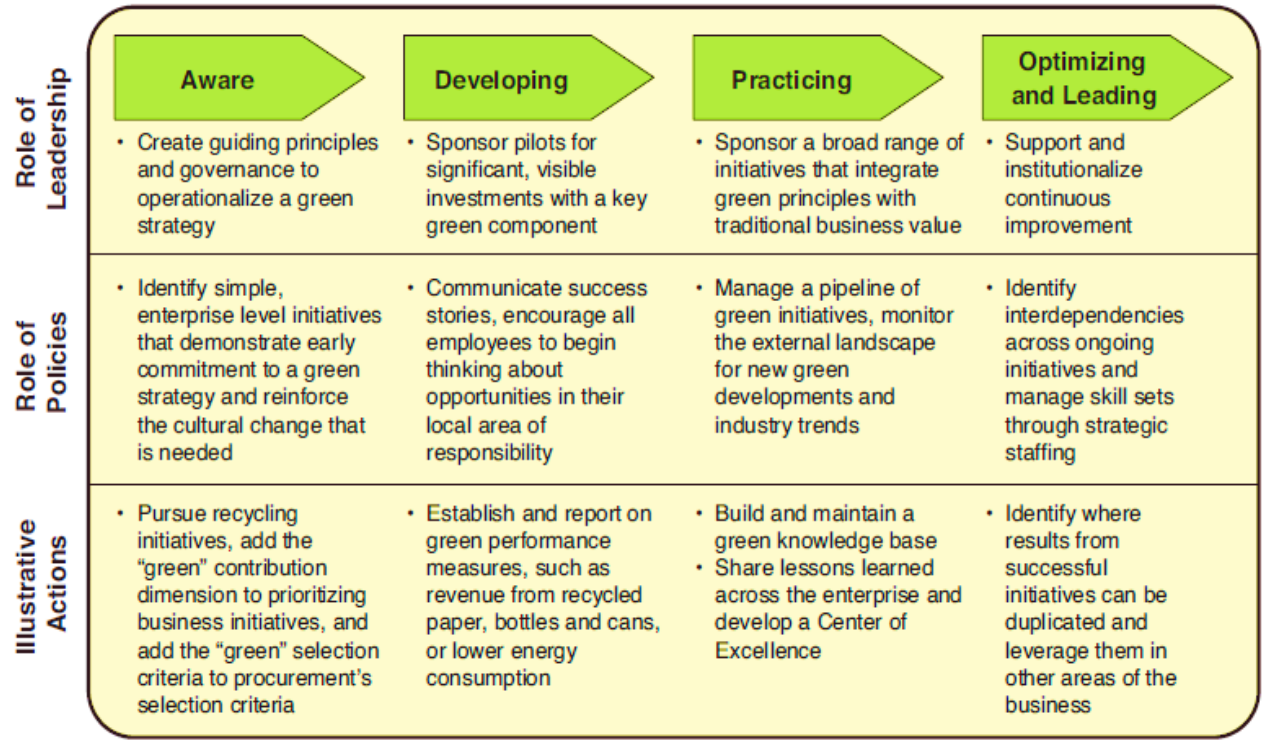

Figure 7: Green strategy maturity model, Olson (2010, p. 55)

As argued by Ottman (2011), Piacentini, *et al*. (2002) and Henriques & Richardson (2004), CSR stimulates producers to be more innovative, which brings about new systems and methods of doing things better, and become role models to their peers. Some of the other benefit of innovation include de-materialising the enterprise by focusing on providing services instead of selling more and more products that need fresh natural resources (Ottman, 2011). Business entities need to be proactive in going green for their own good as the move exposes inefficiencies, however, producers should avoid greenwashing at all costs (*Ibid.*).

3.2.1 Implementation of Corporate Social Responsibility

A schematic presentation of the modalities through which companies take their responsibility for societal and environmental wellbeing is shown in figure 8 and they include establishing networks with other players on the market; partnerships with public entities; code of conduct

to guide daily operations; stakeholder engagement; and category management by ensuring ethical production mechanisms (Gimenez, *et al.*, 2012; Mowat, 2002; Belz & Peattie, 2012; Smith, 2013) .

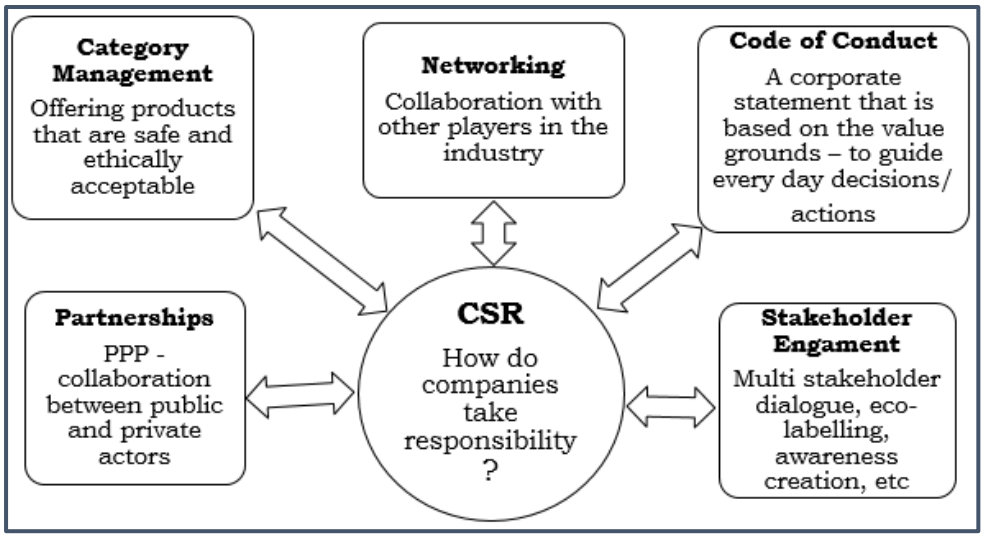

Figure 8: Generic example of Corporate Social Responsibility implementation.

Partnerships: As asserted by Rotter, *et al.* (2012), partnerships between the public and private sectors (Public-Private Partnerships) since the Earth Summit in 1992 – also known as the United Nations Conference on Environment and Development (UNCED) – have primarily been considered to be an option towards achieving sustainable development. PPPs lead to the inception of hybrid organisations and systems that draw resources and expertise from the public and private sector for mutual benefit to the parties involved and the greater good of society (Pongsiri, 2002). PPPs also provide room for collaboration on issues of Research and Development (R&D) which leads to innovation (Ottman, 2011). However, as stated by Rotter, *et al.* (2012) and Pongsiri (2002), PPPs do not succeed by chance, they require trust building, equity, mutual respect, clearly defined regulations and mandates. The existence of the partnership should not in itself limit innovation or penetration of the market by new enterprises (Pongsiri, 2002).

Stakeholder Engagement: Taking into account the legitimate interests of all those with a stake in the business, that is customers, employees, media, the local community and regulators, is key to building the reputation of the business (Piacentini, *et al*., 2002). Some of the interest can be about environmental management and since the reputation of a company affects its value and can make or break a business, it goes that such interests can no longer be ignored by companies (Roberts, 2003). It is argued that stakeholder engagement creates awareness among the concerned parties and helps highlight the effort being made by the company which facilitates buying-into its (company) values thereby attracting their (stakeholder) support (Belz & Peattie, 2012; Ottman, 2011).

Code of Conduct: Putting in place a code of conduct to guide routine operations of the company, from the lowest to the highest level, drawn from the company's vision, values, strategies, etc. that reflect the principles of the TBL keeps the company on course to fulfilling its sustainability goals (Belz & Peattie, 2012; Olson, 2010; Ottman, 2011). Such an

undertaking translates into commitment from employees and managers as they align their way of doing business to the set ground rules and that is how the culture of a company is transformed towards being green (Mowat, 2002). The transformation, engraved in the working culture of corporation, should be visible in the policies/plans, implementation, accounting and reporting/communication within and outside the firm (*Ibid.*).

Networking: Staying connected and joining forces with other business players, i.e. suppliers, retailers and other producers, works as a foundation for sustainability (Henriques & Richardson, 2004). As an example, for a SSNC or CLSC, which are necessary for a closed loop economy to thrive, Winkler (2011) and Das & Posinasetti (2015) contend that combined environmental and economic measures among interacting producers improves ecological and financial performance. Producers can also use their leverage to form networks with suppliers and retailers (value and supply chain management) that value issues of sustainability and by so doing improve their credibility and profitability (Belz & Peattie, 2012; Ahi & Searcy, 2015).

Category Management: This aspect relates more to the planning, implementing and reviewing the performance of the set targets for a product to achieve or fulfil the desired value in order to maintain one's market position, that is, how to guarantee that products meet the set criteria for them to be considered fairly produced and ensuring that relevant changes are made whenever necessary (Mihalčová & Pružinský, 2015). For companies that have built a reputation on sustainability issues, it is critical that category management is taken seriously, as failure to do so can be disastrous (Esty & Winston, 2009; Olson, 2010). A recent good example being that of Volkswagen (VW), which according to The Wall Street Journal lost significant value on its shares and most likely will be penalised by state agencies in certain jurisdictions such as the USA and pay huge sums of money in fines due to failed car emissions test – after claims that its products (category) were helping improve air quality and reduce emissions of greenhouse gases that are responsible for anthropogenic climate change (Boston, 2015).

3.2.2 Conceptual framework

The conceptual framework that will be used to present and analyse the empirics is based on stakeholder perspectives about a particular subject matter – following Roberts (2003) example as illustrated in figure 15 in this paper. The framework puts the subject matter, which in this paper is creating value from municipal solid waste through a circular economic system, at the centre of the model. It (model) also indicates the concerned stakeholders whose engagement is important to the subject matter and finally presents the point of views for the stakeholders regarding the issue which is central to the model. Since stakeholder views and engagement are cardinal to the waste management industry, an additional model (figure 16) focusing on stakeholder dialogue is used in the discussion chapter showing steps that can be followed to resolve an issue – which is municipal solid waste in this case.

From a policy implementation and planning point of view, the model forms a very important base from which responsive and targeted regulations and actions can be developed to bring about the desired change. This is made possible by the fact that the concerns of the stakeholders are brought to light and that acts as a foundation for evidence based decision making.

4. Design and methods

This sections presents the research design and methods employed to collect and analyse the empirical information gathered during the study. It is vital to state that the study was based on an interpretive methodology and the reason for this is the study sought to interpret shared understanding among the involved stakeholders within the context in which the reality or phenomenon being studied was situated and from the subjective perspectives of the stakeholders.

4.1 Approach

This study is interpretive and context dependant, a qualitative case study was deemed as appropriate for this research. Qualitative because – according to Yin (2011) qualitative research is an approach in which providing detailed narrative descriptions and explanations of phenomena being investigated is done. It is done with lesser emphasis given to numerical quantifications (quantitative methodology).

The justification for the choice of a case study is primarily that it is an in-depth examination of the subject under study in order to understand the dynamics prevailing within existing settings. This choice is supported by experts of case method such as Eisenhardt (1989) and Flyvbjerg (2006). Above and beyond, Yin (2009) contends that case studies are good for situations where the researcher cannot manipulate or control the conduct of those being studied and "*the method allows investigators to retain the holistic and meaningful characteristics of real-life event*" (p.4). More substantiation is drawn from Baxter and Jack (2008, p. 544) stating that "*qualitative case study is an approach to research that facilitates exploration of a phenomenon within its context using a variety of data sources […] a variety of lenses which allows for multiple facets of the phenomenon to be revealed and understood*." In conducting this study, respondents from different actors, documents and field visits were used in order to have diverse lenses.

This approach also ensures the veracity of the research due to triangulation of the information gathered by/from the different methods/actors where comparable patterns or observations can be made (Singh, 2006).

4.2 Methods

The methods used to collect qualitative data include ethnographic practices *inter alia* the review of documentation/archival records, surveys or interviews, observations and focus group discussions (Yin, 2011). When conducting this study, three methods were used as presented in table 3. Multiple sources of data facilitate triangulation which amplifies the validity of the findings (Bhattacherjee, 2012).

Table 3: Methods applied in the study; their merits and constraints, adapted from Bhattacherjee (2012); Flick (2009); Noor (2008); Singh (2006) & Yin (2011)

Method	Merits	Constraints
Interviews (semi-structured)	• Semi-structured interviews offers ample elasticity to approach diverse respondents differently and still facilitate collection of required information. • Allows for probing for clarification since the interview is done face-to-face. • Body language and tone of the voice can tell more about the views of the respondent which without direct contact cannot be detected. • Capture broad range of information as compared to surveys.	• Open ended questions can make the respondent digress from the core topic. • Some respondents might not be comfortable letting a strange into their office or home. • Interviews are expensive as more time and resources are needed. • Exceptional enquiring abilities are a requisite on the part of the researcher. • The researcher is part of the measurement instrument, thus must ensure not to artificially prejudice the given responses.
Participatory and direct observations	• Capture real-life occurrences in their setting. • When triangulated with other sources of data, observations enhance the coherence of the data gathered.	• The presence of the research can act as an imposition to those being observed. • Since observation are done at a given time, one can miss some important aspects if they occur during a season or period outside the time the field visit is done.
Textual (Content) analysis	• Documents offer access to data which the researcher might not be able to collect on their own due to limited time or resources. • Data collected using other methods assist counterbalance one's own data.	• Too much data can make one 'drown' in the text. • Changes in some cases occur so rapidly and finding from previous studies might be out of fashion.

The visitation to the study area was done between the 20th July and 27th August 2015. Before making contact with the actors, a research permit was obtained from the local authority by submitting documents and paying a prescribed fee for college/university students in accordance with the regulations of the Lusaka City Council. Appointments and submission of introductory letter together with the interview protocol were made to 15 diverse actors of which 11 were in the private sector and four (4) from the public sector (see **annex A**). The nature and purpose of the research were explained to enable the actors assign a respondent(s) that was considered suitable to interview.

While some actors did not hesitate to consent to participating in the study, it is fundamental to state that due to various reasons on the part of the actors, the undertaking required perseverance and a persuasive strategy to secure an interview. In some cases several visits and calls, seven (7) or more, were made before an interview could be conducted – in some cases interviews were not obtained despite the efforts.

A total of eleven (11) semi-structured interviews were conducted and interview protocols, **annex B**, were used to guide the interview while a field note book was at hand to record in the responses during the in-depth interviews. Respondents that consented to be being record using an audio recorder were recorded alongside note taking. For each interview, key information such as the organisation and individual's name, position and date of the interview were recorded so that the responses were assigned to the right actors/respondents. A summary of the responses were sent to the respondents for any clarifications and feedback was received within a week or two from the date of the interviews.

Direct observation were made at eight (8) sites where MSW is dealt with and these included; waste recovery depots and collection points, landfill and undesignated dumpsites within trading and residential areas. The issues of interest that were recorded in the field note book included the type of waste, evidence of sorting and collection and disposal methods. Photographs were taken as part of the record. The places visited and observations made are given in **Annex C**.

A content analysis was made of obtained documents such as plans, policy documents and reports. In addition, news articles from both print and electronic media were studied. Significant texts were selected and separated into segments (themes) which were used for a content analysis following the process outlined by Bhattacherjee (2012). The contents that were relevant to the study are covered in the section that looks at results and analysis.

The field visit coincided with the launch of the first project initiated by a private business entity, on the 26th of August 2015, dubbed '*Manja Pamodzi*' which translates into 'let's put our hands together' meant to stimulate business based on recycling garbage. The country (Zambia) managing director of SABMiller, deputy minister of local government and housing and the deputy mayor of Lusaka City were key speakers at the launch and therefore, participatory observation was employed to obtain information from the aforementioned officials.

4.3 Unit(s) of analysis

The units of analysis for the study were actors in the public and private sectors purposefully selected due to their relevance in the MSW domain. The public sector actors were those involved in policy formulation, enforcement and activity implementation. The private sector involved actors in the manufacturing and sale of products that contribute to MSW and those involved in salvaging items from the waste stream and reusing or recycling them. The comprehensive list of the actors involved is presented in **annex A.**

The units of analysis from Lusaka were chosen because the city has one of the highest population growth rate amid increasing poverty levels which means most people might not have money to pay for waste management (LCC & ECZ, 2008; CSO, 2012). The city also has 'land scarcity' as indicated by the mayor when the city was celebration 100 years of existence (Zambia Daily Mail, 2013) and will have challenges expanding or increasing the number of landfills in the near future.

4.4 Analysis

An inductive approach which allows the incipient of concepts through themes generated from the data and used for explanation building was engaged. To achieve the foregoing, a verbatim transcription of interviews was done and the process elaborated below was applied to the data collected.

Open coding was used because the process is meant to recognise, reveal, and identify concepts that are hidden inside textual data, which can later be used to elucidate a social phenomenon (Yin, 2011; Bhattacherjee, 2012). The textual data was scrutinised to find

distinct events, cases, ideas, activities, insights and relations of relevance that were coded as concepts. Similar or related concepts were grouped into categories in order to reduce the array of concepts which could be used for explanation building, pattern matching, linking the concepts to propositions, logic models and subject synthesis as outlined by Baxter & Jack (2008), Bhattacherjee (2012) and Yin (2011).

4.5 Ethical considerations

Ethical features that were taken into consideration during the study included respecting the needs and interests of respondents on matters of privacy, disclosure to respondents on why I was doing the research and how the information they provided would be used, candidness on the way the research was done including presentation of findings and respect for work done by others by giving credit where it is due (Flick, 2009; Bhattacherjee, 2012; Singh, 2006). As a researcher, my position was neutral and I had no material interest in the matter under study or the publication of this paper.

4.6 Assumptions and limitations

The following assumptions were made while conducting the research; first, that the actors covered while collecting empirical data assigned the rightful individuals to respond to the interview questions and secondly, that respondents provided the best possible answers which were representative of the views of the actors.

Elements that affected the research included lack of corporation from some actors, limited time and resource constraints.

4.7 Delimitations

Since the study was meant reveal the underlying factors that enable and impede the adoption of circular economic systems by the private sector, a case study which facilitates an in-depth examination of a particular subject matter was employed (Yin, 2011). For practical reasons, as case studies are based on detailed information, the choice of the area and actors to be covered were restricted to one city (Lusaka) and selected players from the public and private sectors. This was done bearing in mind the fact that the findings might not be generalised to a broader set of conditions as contested by Noor (2008).

The empirical delimitations ensured that only processes and activities, by the concerned public and private actors, that relate to municipal solid waste management were covered. Particular attention was given to matters relating to the creation of a system meant to close the resource loops so as to avert the problem of garbage.

From a theoretical point of view, the choice of the waste management and corporate social responsibility theories was made because they both deal with sustainability issues that relate to environmental stewardship, resource optimisation and stakeholder engagement as indicated by Belz & Peattie (2012), Pongrácz (2006) and Van Ewijk & Stegemann (2014).

5. Empirical findings

This section gives an account of the empirics obtained from the various actors (respondents), field observations and content analysis during the study visit to Lusaka. The information is presented in accordance with the conceptual model discussed at the end of chapter 3. Consequently, the data is presented in sections, beginning with stakeholders from the private sector and ending with those under the public sector category. The empirics relate to the issues of understanding the temporal efforts made by actors in the quest to manage MSW, what motivates them (producers) and their future plans. Factors that facilitate or impend their efforts to reduce, reuse or recycle waste are covered. In addition, interactions with other players and in the case of public sector players, their commitment to purchasing green products as a way of encouraging businesses incorporate environmental issues in their operations were also covered.

5.1 Private sector (producers)

Out of the seven (private) actors that were responsive to the study; three were producers, one umbrella body, two engaged in waste valorisation and one operating as a consultant while at the same time involved in waste valorisation.

5.1.1 Temporal transition in waste management

Under this segment, the progressive changes that the private sector players have been making over a number of years, in terms of managing waste, are presented.

a. Parmalat Zambia (dairy and beverages)

Matters concerning the environment, including waste management, are governed by the companies Safety, Health and Environment (**SHE**) policy (pers.com., Nakanga, 2015). The policy states that *"Parmalat is committed to a ZERO Harm business philosophy, striving to ensure that the operation of our business does not result in harm to our employee's, contractors, visitors or the environment."* (Parmalat, 2014, p. 1). Until in the recent two to five years, the company complied with environmental regulations by ensuring that all solid waste generated within the premises was collected and discarded at the landfill, at present some of the waste (plastic containers, cardboards, paper, etc.) is collected weekly by processers, such as Zambezi Paper Mill, at no fee thereby diverting it away from landfilling (pers.com., Nakanga, 2015). A probe into why waste from products on the market is not taken care of as the case was with the in-house arrangement, Nakanga (pers.com., 2015) asserted that while the company was concerned and recognised the need to do something about the problem, there was no arrangement to easily manage the waste outside the plant but would consider supporting one if established in future.

b. SABMiller PLC (Zambian Breweries, National Breweries and Heinrich's Beverages)

The Group has made significant progress in embracing issues that relate to sustainable development, waste management included, based on the company's 10 sustainable development priorities (pers.com., Kafwimbi, 2015). The priority that specifically relate to waste reduction, as shown in figure 9, is the "*working towards zero-waste operations and packaging, reuse and recycling,"* where headway is being made by using state of the art

technology to improve resource efficiency since the priorities were introduced in 2007 (SABMiller PLC, 2014, p. 3).[2]

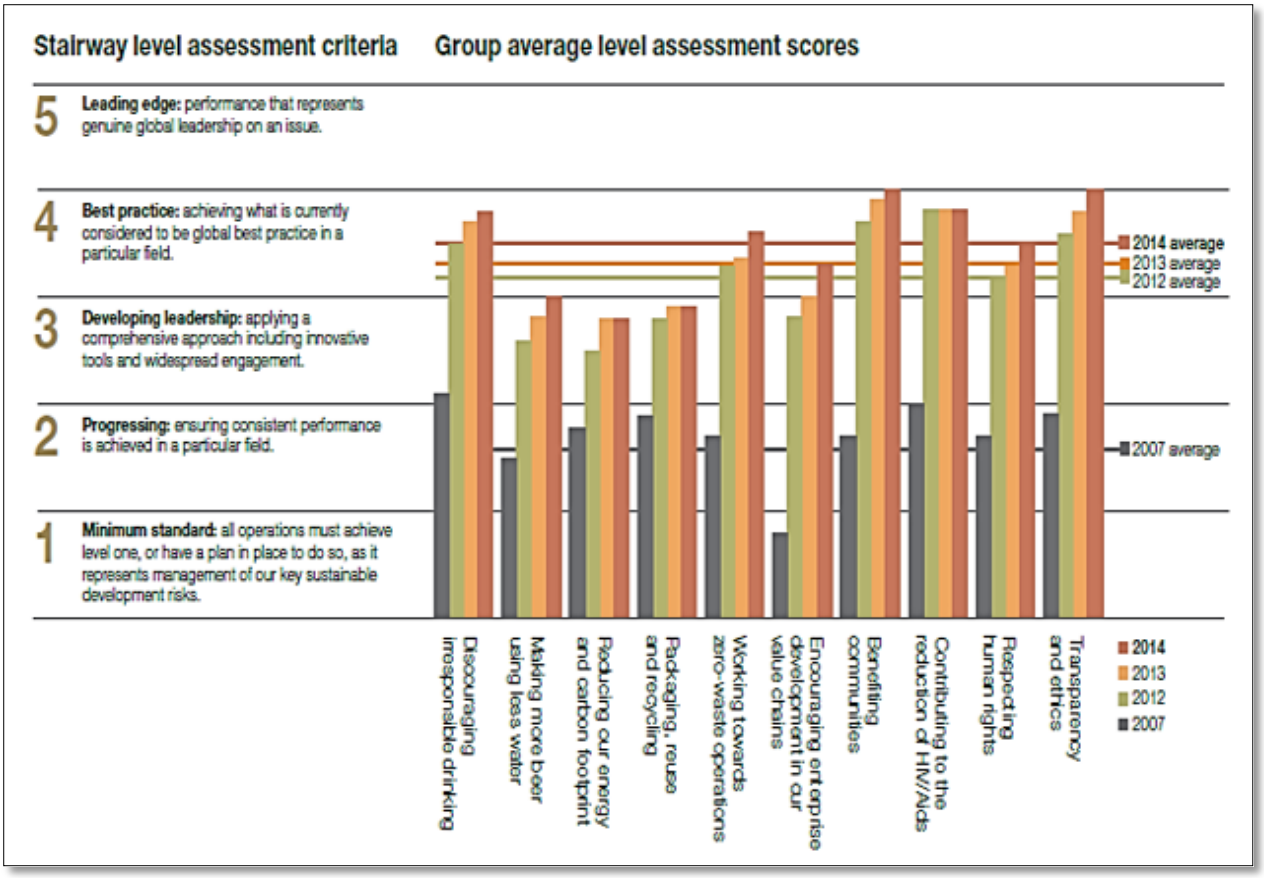

Figure 9: SABMiller Sustainability Assessment Matrix, SABMiller PLC (2014, p. 3)

Figure 9 gives an overview of the progress made, based on a five steps hierarchy, against each of the 10 sustainability benchmark from the base year (2007) up to 2014. Of interest are two benchmarks that relate to packaging and waste that have improved from level 2 to levels 3 and 4 respectively.

Kafwimbi (pers.com., 2015) indicated that apart from using returnable glass bottles, the group has identified items that constituted municipal solid waste in the past such as spent grain, coal ash, sacks, cardboard boxes, etc., which are no longer discarded as waste but sold or recycled. In fact, almost all spent grain is sold and used to make animal feed or enrich agricultural land as organic fertiliser. However, glass bottles when damaged or at end of life cycle, containers such as Polyethylene Terephthalate (**PET**) and High-Density Polyethylene (**HDPE**) bottles, cans and cartons still constitute waste (pers.com., Kafwimbi, 2015). Current and future plans include constructing a recycling room where waste within the plant will be sorted in order to facilitate easy collection by waste aggregators. Beyond that, in order to take care of the waste from the products that are supplied to consumers, the group has engaged a consultant (Trash Park) to develop a value chain project for their (SABMiller's) and other producers' related packaging waste. The waste value chain will comprise of waste collectors,

[2] All the information from the SABMiller 2014 report reflects the group's global outlook, Zambia included.

aggregators and processors/producers as shown in figure 14 (pers.com., Kafwimbi, 2015; pers.com., Degroot, 2015).

> At SABMiller, we recognise the need to move global business practice and local economies from one way consumption, where waste is commonplace, towards a more circular economic model based on reusing, recycling and eliminating waste (SABMiller PLC, 2014, p. 12).

According to Kafwimbi (pers.com., 2015), the measures taken to appoint a recycling coordinator and looking at waste as a resource have brought in additional revenue to the business and reduced on the costs associated with waste disposal and was hopeful the waste value chain will succeed. For example, in the financial year April 2014 to March 2015 about USD 16,700 and April 2015 up to June 2015 about USD 5,000 was raised from the sale of some materials that were previous discarded as waste.

c. Varun Zambia

Varun, with one of the prominent products being Pepsi drinks which the corporation had a license to produce in Zambia for about 5 years. Its products are packaged in glass bottles, sachets, PET bottles and cans (pers.com., Manda, 2015). The glass bottles were returnable and thus do not considerably contribute to the problem of municipal solid waste as compared to the other packaging materials. An in-house arranged exists where defect items such as PET bottles are remanufactured instead of discarding them while at the same time allowing some Chinese processors to collected materials weekly which would have otherwise been discarded as waste (pers.com., Manda, 2015).

5.1.2 Motivation for engaging in waste reduction

This section highlights what the producers deemed as their motivation to support and implement actions meant to reduce waste generation.

a. Parmalat Zambia

In line with the company SHE policy, the entity is motivated by the need to ensure the environment is protected (pers.com., Nakanga, 2015).

> Even if it is the company's customers that litter the environment whenever they indiscriminately discard the packaging waste from the products, our name is on that waste and people associate it with us. (pers.com., Nakanga, 2015)

Land can be used for better things other than landfills for waste and therefore, we would like to do something so that the company maintains a good name (pers.com., Nakanga, 2015).

b. SABMiller (Zambian Breweries, National Breweries and Heinrich's Beverages)

The motivation to manage waste generation comes from the company's corporate social responsibility goal of improving the environment where we operate. That is the reason the company has gone beyond having a policy on safety, health and environment by developing a policy on waste management to ensure adequate attention is given to this issue (pers.com., Kafwimbi, 2015). The policies, SHE and Waste Management, were displayed at the reception, workers and visitors can easily access them. According to Degroot (pers.com., 2015), the company realised that packaging materials from its products were so conspicuous among the litter in the city and it was seen as a negative image on the corporation and thus

impelled the entity to come up with *Manja Pamodzi* Project aimed at empowering people dealing in waste recovery while at the same time contributing to a clean environment.

The other motivating factor was the desire to move ahead of the Extended Producer Responsibility (EPR) crafted in the Environmental Management Act of 2011, which when enforced, would require producers to take care of their products throughout the life cycle. And the repercussions for not doing so would be fines or penalties on the producers (pers.com., Kafwimbi, 2015).

c. Varun Zambia

The major motivating factor to reduce waste is to contribute to a clean environment and also abiding by environmental regulations (pers.com., Manda, 2015).

5.1.3 Stakeholders engagement

Under this section, the level and nature of interactions among stakeholders, in regard to waste management, are explained.

a. Parmalat Zambia

Insofar as meeting with other stakeholders regarding tackling the problem of municipal solid waste was concerned, Nakanga (pers.com., 2015) stated that there were no such meetings, scheduled or systematically arranged, where actors meet to deliberate on such matters during her time with the company. The company had an informal arrangement with waste collectors/processor that visit the plant to obtain recyclable materials from the waste (pers.com., Nakanga, 2015).

b. SABMiller (Zambian Breweries, National Breweries and Heinrich's Beverages)

The corporation has had meetings with waste collectors and aggregators involved in the waste reclamation project in addition to meetings with the local authority. The major issues covered in the meetings include what role each player will play in the project and what support will be provided (pers.com., Kafwimbi, 2015). A meeting was also arranged for stakeholders to consider the introduction of the EPR by the public authorities, however, most stakeholders did not participate for unknown reasons and no concrete outcomes were agreed up on after the meeting (pers.com., Kafwimbi, 2015).

Apart from having formal working agreements with the waste collectors and aggregators, the corporation had signed a memorandum of understanding (**MoU**) with the Lusaka City Council to enable collectors access the council's waste collection points and landfill (pers.com., Degroot, 2015).

c. Varun Zambia

The company had not attended nor was it invited to one in the recent past (pers.com., Manda, 2015). An informal working relationship with processors that collect discarded items from the plant exists but hoped to establish formal engagements with other players aimed at tacking the garbage issue (pers.com., Manda, 2015).

5.2 Private Sector (waste reclaiming entities)

Three actors were involved in the study that had waste reclamation business ventures. Two were exclusively engaged in waste reclamation while the other one was in both waste reclamation and consultancy.

5.2.1 Temporal transition in waste valorisation

An account of the progressive steps taken by the actors to grow their waste reclamation businesses is given below.

a. Recycle-mania

Recycle-mania was started as an informal player in reclaiming waste by one individual around 2006 and was only formally registered in 2015 with three to five workers. About 15 waste collectors supply the company with materials, that is, carton containers for opaque beer and PET bottles among others, which are aggregated and sold to local and international processors (pers.com., Sikanyika, 2015). The company had acquired a baling machine housed in a metallic shipping container at a rented site (ditch) behind Chunga landfill and was looking forward to securing a better place and more equipment in order to expand the business in future (pers.com., Sikanyika, 2015).

b. Trash Park

According to McNaught (pers.com., 2015), the company was new in Zambia, albeit having been operating in South Africa for some years, mainly working as a consultant to help SABMiller PLC set up a value chain system for waste reclamation.

c. L&N Matrix Limited

The company had been in the recycling business for over five years and collects various waste materials such as PET, HDPE, cans and cartons containers (pers.com., Masiya, 2015). The company was renting a depot in Chinika industrial area with two baling machines installed. The aggregated materials are exported to South Africa where the processors were based (pers.com., Masiya, 2015). The aspiration of the company was to acquire better equipment and secure its own premises where operations could be scaled up (pers.com., Masiya, 2015).

5.2.2 Stakeholders engagement

This part covers aspects that relate to interactions among the players involved in waste reclamation and other actors relevant to their operations.

a. Recycle-mania

The company has been participating in meetings arranged by the local authority and SABMiller to discuss issues of business licences and operations alongside participation in the waste recovery project which the company will participate in as an aggregator (pers.com., Sikanyika, 2015).

As stressed by Sikanyika (pers.com., 2015), the company was working with the local authority because the waste collectors that supply the company with materials needed to access waste holding stations and the landfill to recover materials. The company also had a

formal working relationship with SABMiller as one of the participants in the waste recovery value chain (pers.com., Sikanyika, 2015).

b. Trash Park

Several meetings have been organised and held with actors participating in the proposed project by SABMiller and pertinent issues that came out included ensuring there is a market for the waste in order for the project succeed and access to sites operated by the council where waste collector could pick items that can be recycled (pers.com., McNaught, 2015). The company had a working relation, in form of a contract, with SABMiller through which it works with the parties that have a stake in the waste value chain project being set up (pers.com., McNaught, 2015).

c. L&N Matrix Limited

Masiya (pers.com., 2015) indicated that meetings have been held with public sector players and those from the private sector and some of the reforms stated earlier where as a result of such meetings. However, there was need to have a systematic approach in the way the meetings are arranged so that more players could participate.

Apart from the informal working relationship with the waste collectors, the company had a formal connection with SABMiller to participate in the waste value chain project as one of the aggregators (pers.com., Masiya, 2015). The relationship with the public sector players, the council and environmental management agency, was more to do with compliance and enforcement in nature (pers.com., Masiya, 2015).

5.3 Private sector umbrella body (ZACCI)

Zambia Chamber of Commerce and Industry (ZACCI) "*is an apex organisation and the voice of the organised private sector in Zambia*" (ZACCI, 2012, p. 2). The function of the organisation is to represent the interests of the private sector so that government enacts policies that create a business friendly environment that promote economic growth (pers.com., Nsakanya, 2015).

5.3.1 Temporal transition in waste management

Members of the organisation have been investing in technology to improve their production methods in order to reduce the amount of waste they produce but there was still room for more improvement (pers.com., Nsakanya, 2015). Nsakanya (pers.com., 2015) argued that for substantial progress to be made in recycling waste, there was need for a deliberate policy that gives proper attention to the issue, through practical steps such as providing support and incentives to the private sector. The association also recognised the need for collaboration between public and private sector players in all economic spheres, "*enhancement of strategic partnerships (both public and private) with clear mandates and robust functional relationships*" (ZACCI, 2012, p. 5).

5.3.2 Stakeholder engagement

The association had had no meetings with its members to discuss issues of reducing, reusing or recycling waste but had once met officials from cabinet office to propose restrictions on the productions and usages of plastic bags that had created a menace to the environment due to widespread littering by users who in most cases get such bags for free (pers.com., Nsakanya, 2015).

5.4 Enabling and inhibiting factors for growth of a circular economy (private sector)

The factors that were indicated by private sector players were categorised as enablers (those that were deemed necessary for the establishment and growth of a circular economy which is key to the waste valorisation sector) and inhibitors (those that would hamper development of a circular economic system). These factors were either internal or external, that is, the internal ones being those within the control of the actor and external ones pertain to those beyond the control of the actor. The factors given by each actor are presented in table 4 and they range from socio-economic, regulatory to technical dimensions.

Table 4: Factors affecting the development of a circular economy according to the respondents from the private sector

Entity Name	Enablers	Inhibitors
Parmalat (Lusaka)	a. Proliferation of waste reclaiming entities and processors.	a. Indiscriminate disposal of waste by consumers. b. Waste from households was mixed in most cases. c. Limited policy options that encourage recycling of garbage – maybe that accounts for having few large scale recycling plants.
Varun Zambia	a. Existence of the processors that use discarded materials such as cardboard boxes to manufacture trays sold to poultry farmers used for eggs.	a. Depreciating and unstable local currency, the Kwacha, which made it problematic to plan for investment. b. Power deficit which has negatively affected production that depends on electricity.
SABMiller PLC (Zambian)	a. Committed individuals with an entrepreneurial mind, that is, 73 waste collectors and 3 aggregators involved in the waste value chain project in the initial phase. b. Momentous support from the public sector towards the project. c. Synergies with top level players like consultants and processors to train or link local (Zambian) enterprises involved in waste recovery.	a. Lack of access to sufficient capital by the small enterprises involved in waste recovery. b. Limited number of local processors of waste, for example glass bottles. c. People's mind-set towards waste management leaves so much be desired as shown by indiscriminate disposal of waste. d. Higher preference for disposable containers than returnable ones due to perceived inconvenience associated with reusable bottles.
Zambia Chamber of Commerce and Industry	a. Presence of some enterprises involved in recycling acts as a springboard to expand business in waste reclamation.	a. People arbitrarily throw away waste in places like drainages. b. Lack of a clear policy on waste reduction and recycling.
Trash Park	a. Existence of players operating as waste collectors, aggregators and processors. b. Availability of support from producers as SABMiller, "*in fact what SABMiller was doing could be the best example of CSR in the*	a. High administrative costs for collecting waste for a producer's products would certainly outstrip the financial benefits. For example the value of about 500 PET bottles was about USD 3.00 (based on what processors were willing to pay) yet the administrative cost of collecting that

	region" (pers.com., McNaught, 2015).	quantity in an environment where there is no incentive scheme is colossal and would bring the viability of such an initiative into question.
Recycle-mania	a. Positive relationship with waste collectors. b. Availability of materials and demand for the materials. c. Support from actors such as SABMiller PLC that is setting up waste value chain project and provide a bicycle with a trailer, shown in figure 11, for ferrying collected waste items.	a. Volatile market conditions, especially slow economic growth in China where PET pellets are supplied for processing, has reduced demands for certain materials. b. Limited support from the public authorities in terms of accessing land, development of business ideas and formalisation. c. Lack of access to finances (credit) for investment or expansion.
L&N Matrix Limited	a. Government pronouncements and subsequent development of the Keep Zambia Campaign by the government which encouraged a good section of the population to discard waste in designated areas where materials are collected. b. The local authority through the WMU permitted waste collectors to gather materials from their waste transfer stations and landfill. c. Access to information and communication technology such as mobile phone services make it easy to contact waste collectors and transporters thereby improving efficiency. d. Positive reforms by ZEMA where renewing licences and reporting period have been extended, that is, from one to three years to renew licences and three to six months for reporting.	a. Poor waste management practices by residents who burn, bury and indiscriminately throw waste. b. Lack of sorting of the waste. c. Waste collectors reported conflicts with some people that worked for the franchises or CBEs who wanted to prevent them from collecting recyclable materials because of vested interests. d. The waste collectors also reported that street vendors that operate in areas with no toilets and garbage bins use cartons (for opaque beer) and bottles to defecate and urinate while their waste is dumped in drainages with dirty water and thus could not collect such materials. e. Collection of materials from the collectors is difficult due to increasing traffic in the city. f. Inadequate support, financial or other resources, from the government to promote recycling as compared to other sectors such as agriculture. g. Underdeveloped local market due to limited number of processors presents a challenge since export procedures, transportation and accumulation of sufficient stocks take long and expensive thereby reducing profit margins.

Some of the factors, for example indiscriminate disposal of waste, in Table 4 were observed in the central business district and undesignated dumpsite visited during the study as shown in figure 10.

> If the government could support the existing venture that have experience with soft loans, grants or tax waiver on plant and equipment, Zambia can have processing plants that would make more people engage in business around waste and help create jobs and reduce waste – Masiya (pers.com., 2015).

Figure 10: Indiscriminate disposal of waste at Soweto Market (left) and Lusaka Central Business Districts in a drainage (right)

The ability by SABMiller PLC (Zambia) to hire Trash Park from South Africa to establish a system for waste reclamation and train people involved in the project was a huge demonstration that multinational corporations could use their international links to help societies reduce waste through business solutions (pers.com., Degroot, 2015).

Figure 11: Trailer for bicycle used to ferry recovered items (left) and baling machine (right) at Recycle-mania depot

The trailer shown in figure 11 was one of the trailers that go along with bicycles, as part of the support SABMiller provided, meant to facilitate ferrying of collected waste materials from the surrounding areas to a point where they are aggregated.

5.4 Public Sector (Policy formulation and implementation)

This segment covers three public actors, Zambia Environmental Management Agency (ZEMA), Ministry of Local Government and Housing (MLGH) and the Lusaka City Council (LCC), that are responsible for waste management policy formulation and implementation.

5.4.1 Temporal transition in waste management and the role of the private sector

The measures taken by the aforementioned players to improve waste management and minimise the garbage problem are stipulated here. This sections also covers the views of the public sector players on how the private sector can participate in waste minimisation.

a. Zambia Environmental Management Agency

According to Sichinga (pers.com., 2015) efforts to tackle waste, MSW included, have developed with time – from a regulatory to implementation perspective. Before the current enactment of the Environmental Management Act (**EMA**) No. 12 of 2011, where the EPR was incorporated, the Environmental Protection and Pollution Control Act (EPPCA) of 1990 amended in 1999, several conservation, environmental protection and pollution prevention programmes were put in place to manage waste (ECZ, 2004; pers.com., Sichinga, 2015). A waste management strategy was put in place in 2004 and the polluter pays principle formed the foundation for most of the programmes. However, limitations in the enforcement of regulations, poor attitude among consumers and production methods that perpetuate garbage generation have resulted in more and more garbage accumulation (pers.com., Sichinga, 2015). It is envisaged that the introduction of the EPR would compel producers to either reduce or eliminate waste from their production (pers.com., Sichinga, 2015). As stated in the EMA, EPR means *"actions that extend a person's financial or physical responsibility for a product to the post-consumer stage of the product"* – requiring the producer/person to put in place measures to reduce waste and mitigate the impacts of waste on society and the environment (The Parliament of Zambia, 2011, p. 97).

b. Ministry of Local Government and Housing

The ministry, as Ngwale (pers.com., 2015) stated, had the longest institutional experience in dealing with garbage in the country, drawing its mandate from acts of parliament regarding local governance which informed statutory instruments, programmes and actions meant to manage MSW. The local government act chapter 281 and statutory instrument (SI) number 100 of 2011 form the legal framework through which programmes such as the Keep Zambia Clean Campaign launched in 2007 with equipment provided to councils, National Urban Water Supply and Sanitation Programme to be implemented up to 2030 under which several proposal meant to manage garbage have been developed (MLGH, 2014; pers.com., Ngwale, 2015). To this effect, the government had a national proposal dubbed the Zambia Solid Waste Management Project where funds were being solicited from the European Investment Bank (EIB) and French Development Agency (ADF) valued at US$91.0 Million and the suggested plans for Lusaka would cost US$ 15,608,700 broken down as indicated in table 5 (MLGH, 2014).

Table 5: Proposed items for Lusaka City under the national solid waste management project, MLGH, 2014, p.36

S/N	**Item**	**Amount (US$)**
1	Waste collection equipment	2,048,000
2	Transfer stations	3,406,000
3	Closure/Rehab. of old dumpsite	0
4	New landfill and compositing plant	4,920,000
5	Equipment for disposal site	1,580,000
6	Institutional capacity building	0
7	Technical assistance and contingencies	1,642,200
8	Studies and design	2,012,500
	TOTAL	**15,608,700**

A similar proposal for Lusaka City with a much lower budget, US$ 1 million, was made to the Japanese International Cooperation Agency (**JICA**) to work on access roads, securing the facility, improving working conditions for the workers and material recovery facilities including methane gas at Chunga Sanitary Landfill (MLGH, 2015).

The role of private sector is recognised as vital to the successful achievement of the plans to manage MSW in Lusaka and the nation at large through participation in clean-up activities and most importantly investing in innovations that minimise waste generation (MLGH, 2007; pers.com., Ngwale, 2015).

c. Lusaka City Council

MSW management, before the formation of the Waste Management Unit (WMU) in 2004, was managed alongside other public health related municipal services which meant that issues of MSW didn't really receive adequate attention (pers.com., Munalula, 2015; LCC, 2009). The establishment of WMU, with complementary regulatory and policy documents that recognised the need to management waste properly in order to protect the environment and prevent diseases, resulted in the creation of structures and systems to improve garbage management – including matters of waste valorisation (LCC, 2004; Ministry of Finance, 2006; Ministry of Finance, 2011; pers.com., Silwimba, 2015). Although recycling is gaining recognition, much of the emphasis in most of the projects and initiatives at national and city level, e.g. the **NORAD** (Norwegian Agency for Development Cooperation) sponsored Industrial Pollution Prevention Programme (**IPPP**) and World Bank sponsored Cleaner Production Programme were meant to minimise waste generation within entities involved in production of goods in Zambia (Siaminwe, *et al*., 2005; LCC, 2003).

The council appreciate the role of the manufacturing sector in reducing and recycling waste and the need for teamwork between the public and private sector for progress to be seen and it was hoped the inclusion of the EPR in the EMA would bring about the much needed investment in waste minimisation and recovery as the council had plans to invest in waste recovery facilities (LCC, 2003; pers.com., Silwimba, 2015). However, "*due to their character, waste prevention and minimisation initiatives towards the branches of the economy are in general beyond the direct influence of local authorities*" (LCC, 2003, p. 37) and therefore, require greater involvement of central government that can set product standards, incentives, regulations and systems as such DRS in this domain (LCC, 2003; pers.com., Munalula, 2015; pers.com., Silwimba, 2015).

5.4.2 Stakeholder engagement and procurement of green products

a. ZEMA

The agency had no specific plan for meeting producers or players involved in waste valorisation but conducted routine audits on manufacturers to monitor compliance with existing regulations and advise was given on how the players could minimise waste generation (pers.com., Sichinga, 2015). The agency had no deliberate policy to procure green products and was not in any mutual relationship with private sector player(s) involved in waste minimisation.

b. MLGH

Although there were no fixed meetings planned, the ministry met actors whenever need arose but as the Unit gets embedded in the system, improvements will be made to ensure systematic programming of meetings/interactions with other parties (pers.com., Ngwale, 2015).

Strengthening collaboration with private sectors players in tackling the problem of MSW is another important area that will receive attention, for example the ministry had budged for baling machines to be distributed to waste aggregators after signing MoUs with the beneficiaries (MLGH, 2015; pers.com., Ngwale, 2015).

c. LCC

The council recognises the need to engage stakeholders in waste management and has regular meeting with members of the waste management districts and those contracted to collect and transport waste to the designated sites but meetings with producers, entities in waste valorisation and other public actors are held when need arises (LCC, 2003; pers.com., Silwimba, 2015; pers.com., Munalula, 2015). Procurement of green products has not received attention and as such no specific % in the budget is allocated by the council (pers.com., Silwimba, 2015).

5.5 Public Sector (Zambia Bureau of Standards)

This part covers the statutory body that is responsible for setting product and manufacturing standards. Of interest was knowing what role the agency plays in ensuring production processes and products have or meet standards aimed at reducing waste generation.

5.5.1 Role in waste elimination/reductions

The Zambia Bureau of Standards (ZABS) has a limited part to play in waste reduction as it depends on institutions such as ZEMA that propose standards, where aspects of product reusability, durability, repair-ability and recyclability should be reflected, which ZABS enacts through standard guidelines that producers should follow (pers.com., Lungu, 2015). As indicated by Lungu (pers.com., 2015), there was no deliberate policy to procure green products as such directives were a preserve of the Zambia Public Procurement Authority.

5.6 Enabling and inhibiting factors for growth of a circular economy (public sector)

Actors in the public sector gave various, some were matching, factors that they considered as enabling and inhibiting to the creation of a circular economy where waste is used as raw materials instead of discarding it in landfills or dumpsites. The factors stated by each actor are presented in table 6.

Table 6: Factors affecting the development of a circular economy according to the respondents and information from the public sector

Entity Name	Enablers	Inhibitors
Lusaka City Council (LCC)	a. Improvements in regulations, policies and systems such as the introduction of EPR. b. Increasing realisation that waste as a resource as evidenced by the upsurge in the number of registered private sector players involved in waste valorisation (see figure 12). c. Establishment of waste value chain project by SABMiller PLC. d. The council had a policy to allow waste collectors to reclaim valuable items from transfer stations and landfill where about 240 waste collectors recover scrap metal, cardboard boxes and PET bottles at the Chunga site.	a. Lack of synchronisation of policies and regulations among public sector players due to fragmented institutional arrangement – too many players that rarely meet to exchange ideas e.g. the country has not set goals for waste valorisation. b. Poor attitude among residents as shown by failure to segregate waste and resistance to pay fees and opt to dump waste at undesignated sites especially in the night resulting in most of the waste generated in Lusaka not reaching the designated disposal site (see figure 13). c. Low electricity tariffs and availability of subsidised synthetic fertilisers has hampered investment in waste to energy and composting ventures respectively. d. Few players in waste valorisation, for example Zambezi Paper Mill, have the capacity to process the recovered materials local. Even these face challenges because some materials collected at disposal sites are contaminated. e. For organic waste which is putrescible and unsegregated, most of it comes from household and collecting it presents logistical challenges and it might explain why no registered company is dealing in organic waste. f. Land scarcity which the council could provide at flexible terms to recycling companies. g. Street vending which causes massive littering in the central business district that requires political good will to control. h. Inadequate dialogue with the private sector.
Zambia Environmental Management Agency (ZEMA)	a. Presence of institutions dealing with issues of waste management b. Realisation that waste is a resource as evidenced by the increasing number of business entities involved in waste reclamation c. Positive reforms that were being	a. Lack of separation and indiscriminate disposal of waste. b. Limited support (incentives) for those entities involved in waste reduction. c. Some regulations are perceived to be too stringent by SMEs. d. Large scale processing (recycling)

	done in the waste management domain, for example flexible licensing for SMEs dealing in waste recovery.	ventures to handle more waste were lacking.
Zambia Bureau of Standards (ZABS)	a. Availability of avenues to train SMEs, that constitute a high number of the producers, would help in bringing issues of waste reduction to the attention of the private sector.	a. Most of the SMEs have limited resources, human and capital, to invest in technology or measures aimed at waste reduction.
Ministry of Local Government and Housing (MLGH)	a. Institutional and legal reforms such as the establishment of the solid waste management unit within the ministry with personnel deployed about two years ago to spearhead issues of waste management. b. Enactment of the EMA with EPR and subsequent passing of SI 100 that prohibits burning, burying or disposing waste in undesignated areas. c. Growing interest in recycling business, for example various plans that consider putting in place infrastructure and support to support material recovery from waste. d. Good prospect for collaboration with the private sector, for example the ministry will buy baling machines for some SMEs engaged in recycling business.	a. Indistinct legal and institutional framework resulting in poor enforcement of statutes. b. High number of slums with no or little sanitary facilities. c. Low participation and dialogue among stakeholder in the sector. d. Poor disposition towards waste management among residents, for example resistance to pay for services, lack of sorting and indiscriminate disposal of waste which results in contamination of materials that can be recovered. e. The national goal on waste management is focused on public health – this implies that issues of recycling are not given adequate attention but this could change with time.(The national goal for the year 2015 was to ensure that 65% of the generated waste was discarded at the designed disposal sites (Ministry of Finance, 2011).

To amplify the assertion that there is increasing realisation of waste being a resource, figure 12 shows the increase in the number of registered actors that have ventured in waste valorisation.

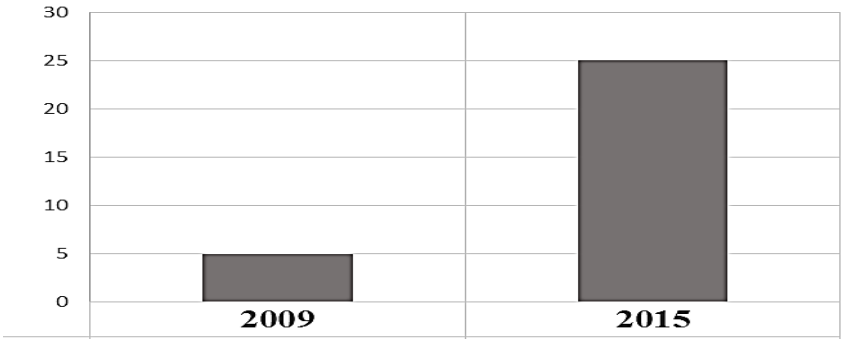

Figure 12: Number of registered companies dealing in waste recovery in the year 2009 and 2015 – informed by data from LCC (LCC, 2015; LCC, 2009).

The information in figure 12 shows that the number of registered business entities in waste reclamation increased from 5 to 25 between 2009 and 2015. There were also about 240 waste pickers at the Chunga landfill alone in addition to undocumented pickers operating in the city [pers.com., (Mbewe, 2015)]. The change in the way waste is viewed is also reflected the current plans and policy pronouncements by the government of Zambia (MLGH, 2015).

> Mr. Speaker, with regard to solid waste management, Government will procure solid waste equipment and construct engineered landfills to better manage waste and ensure a cleaner environment. In addition, Government will promote more research in sustainable solid waste management initiatives such as recycling and waste-to-energy innovations. The above interventions will complement the Keep Zambia Clean and Healthy Programme. Hon. A.B. Chikwanda – Minister of Finance (Ministry of Finance, 2015, p. 11).

Among the inhibiting factor that was common among the actors in the public sector was indiscriminate disposal of waste by residents – which in most cases was not segregated (LCC, 2009 ; MLGH, 2014). Figure 13 indicates how much, in percentage terms, of the municipal solid waste ends up in undesignated sites and designated areas in Lusaka.

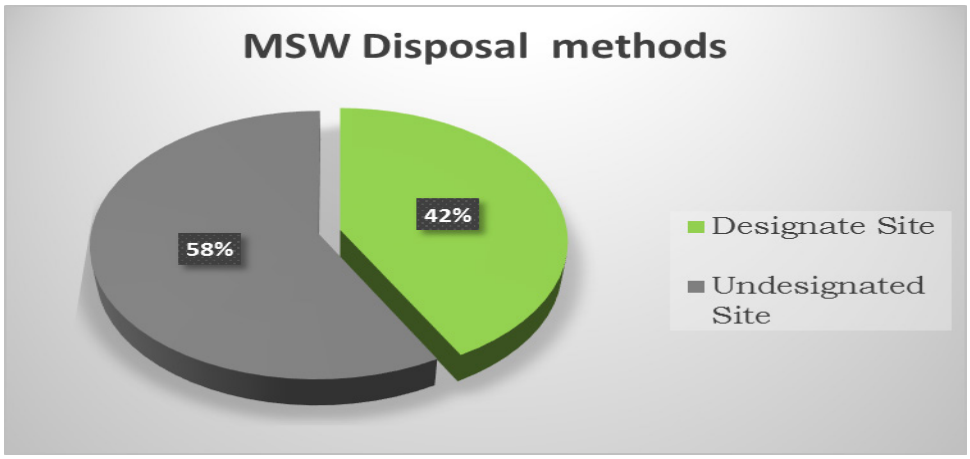

Figure 13: Lusaka City MSW disposal methods, LCC, 2014 Waste Disposal Records

As of 2014 about 60% of garbage generated in Lusaka ended up in undesignated areas as shown in figure 13.

6. Analysis

The chapter provides a synthesis of the information obtained, as presented in the preceding chapter, into conceptions that give an explanation of the results and subsequently underpin the discussion chapter.

6.1 Waste value chain based on circular economy approach to be enhanced by SABMiller

According to the explanations from McNaught (pers.com., 2015) and Masiya (pers.com., 2015), the waste value chain is arranged in such a way that recyclable waste is collected from residential and commercial areas, undesignated dump sites, waste transfer stations and landfill by collectors. The aggregators purchase the waste at agreed rates per kilogram or tonne and supply it in bulk to established processors or producers. The processors/producers are either based within Zambia or abroad. Figure 14 gives a visual illustration of the resource value chain.

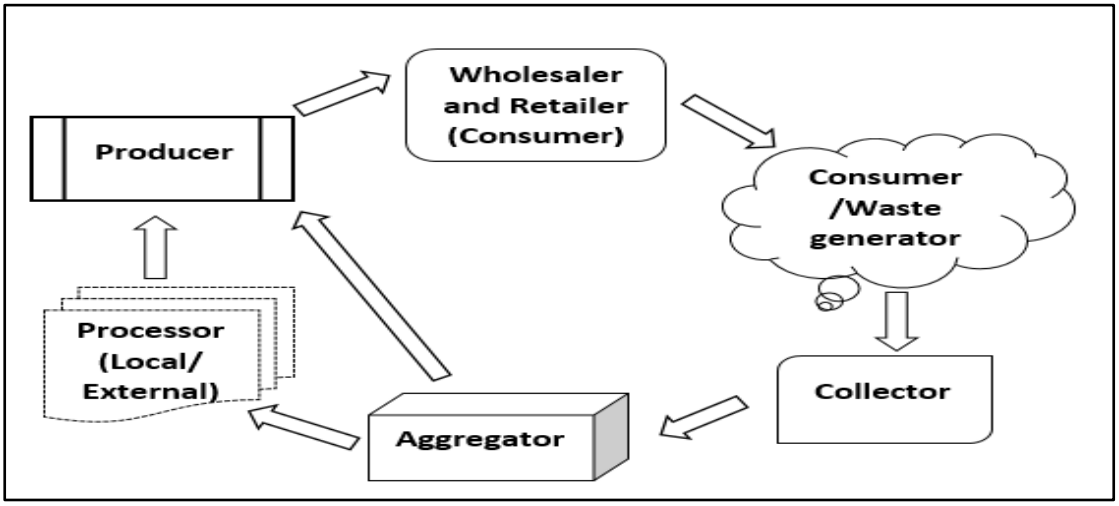

Figure 14: Resource value chain

According to Degroot (pers.com., 2015) and McNaught (pers.com., 2015) the project by SABMiller is meant to train the collectors and aggregators in basic entrepreneurial skills and safety, provide them with basic equipment such as a bicycle with a trailer and help them secure access to council facilities (transfer stations and landfill or the waste recovery stations to be constructed). Linkages will also be created among the actors including between aggregators and processors to ensure the value chain flourishes with less challenges. The MLGH had also planned to support the project by providing the aggregators with baling machines (MLGH, 2015; pers.com., Ngwale, 2015).

6.2 Transformation in municipal solid waste management

The public and private sector have all undertaken steps, of different magnitude, in their quest to minimise waste generation, recycle or reuse the waste. The motives and commitments, towards this cause, are also at different levels.

6.2.1 Public Sector

Being responsible for policy formulation and implementation, the public sector since the late 1990s and early 2000s, has made significant strides in putting in place measures meant to manage MSW as described by the Lusaka City Council (LCC, 2003; LCC, 2009) and ZEMA, formerly known as ECZ (2004). The measures cover core aspects, although in some cases not comprehensively, relating to the three pillars of ISWM developed by Anschütz, J. *et al.* (Wilson, *et al*., 2012). The pillars are the **systems** which relate to waste generation and separation, collection and transportation, reclamation, up to treatment and disposal; **stakeholders** – highlighting actors with legitimate interest; and **sustainability aspects** that relate to technical, policy, socio-economic and institutional issues (Anschütz, *et al.*, 2001).

Under the **sustainability aspects**, some key measures have been the enactment of environmental regulations for example the EMA and SI 100 (MLGH, 2011; The Parliament of Zambia, 2011) and establishment of institutions such as ZEMA (previously known as ECZ), Solid Waste Management Unit under MLGH and WMU including the structures under it at LCC (LCC, 2004; LCC, 2009; ECZ, 2004; Scheinberg, *et al*., 2010). In order to reflect the desire to strengthen the sustainability aspects, national development plans and programmes have been put in place to guide implementation of the measures (MLGH, 2014; pers.com., Ngwale, 2015; Ministry of Finance, 2015; pers.com., Silwimba, 2015) . These aspects recognise the need to engage stakeholders and having systems that ensure proper management of MSW despite the shortcoming highlighted in figure 15 on stakeholder views (LCC, 2003; pers.com., Ngwale, 2015).

The waste **system** elements are managed through the Waste Management Districts allocated to CBEs or franchises, some being performance based contracts, that collect and transport waste to transfer stations and the landfill managed by the council (pers.com., Munalula, 2015; UN-Habitat, 2010; LCC, 2009). However, poor attitude from residents and issues like street vending, inadequate resources and unplanned settlements count for lack of segregation and indiscriminate disposal of waste which pose a huge challenge to the viability of MSW management in Lusaka (LCC, 2009; pers.com., Sichinga, 2015; pers.com., Munalula, 2015). While waste reclamation is growing, going by the number of registered actors in the sector – see figure 12, the lack of supportive policies coupled with limited access to capital to stimulate the growth of a circular economy locally hampers progress in this area (LCC, 2009; pers.com., Silwimba, 2015; pers.com., Sichinga, 2015). According to the Lusaka City Council (2009) and MLGH (2015) the reason for this dire situation was having a goal that mainly focuses on the public health aspect (where national goals are in place) while the resource optimisation (waste reclamation) and environmental aspects have no set goals and thus receive little attention. The other factor is fragmented legal and institutional framework, for example economic 'sticks' or 'carrots' fall under the Ministries of Finance, Commerce and Industry and Environment and Natural Resources among others yet these ministries have very insignificant engagement in issues of waste management (LCC, 2003; MLGH, 2015).

The importance of **stakeholder dialogue,** including issues of collaboration (partnerships), is recognised as crucial to the successful MSW management (LCC, 2003; MLGH, 2007). Efforts have been made to engage some stakeholders such as CBEs, franchises and team

leaders of the Waste Management Districts in a systematic manner (LCC, 2009 ; pers.com., Munalula, 2015). In the past some schemes such as the NORAD industrial pollution prevention and World Bank cleaner production sponsored programmes were implemented in partnership with ZACCI which is an umbrella body for the private sector (Siaminwe, *et al*., 2005; LCC, 2003). There were current and planned collaboration between the public and private sector to support the waste value chain initiative (MLGH, 2015; pers.com., Silwimba, 2015; pers.com., Ngwale, 2015). That said, the public and private sectors have no systematic engagement strategy as most of their interactions are based on 'as the need arises' arrangement (MLGH, 2015; pers.com., Munalula, 2015; pers.com., Silwimba, 2015).

6.2.2 Private sector

The private sector, having the responsibility of manufacturing goods from which most of the MSW emanates, recognised the need to invest in technologies that promote efficiency in the utilisation of material in order to reduce garbage generation (pers.com., Nsakanya, 2015; SABMiller PLC, 2014; pers.com., Nakanga, 2015). To this effect, the use of returnable bottles and remanufacturing defective containers are seen as some of the measures that demonstrate the resolve to meet the aforementioned objective (pers.com., Kafwimbi, 2015; pers.com., Manda, 2015). Beyond the internal initiatives, there is an appreciation of the limits in the process-product integration and thus the need for other players to close the resource loops (SABMiller PLC, 2014; pers.com., Manda, 2015; pers.com., Nakanga, 2015). The guiding principles for such initiatives are Safety, Health and Environment (SHE) policies, however, SABMiller had a Waste Policy and Sustainability Assessment Matrix beyond and above the SHE policy (Parmalat, 2014; pers.com., Manda, 2015; pers.com., Kafwimbi, 2015). Apart from compliance with regulations, the motivating factors for waste minimisation were to reduce the costs associated with transporting and disposing the waste (pers.com., Nakanga, 2015; pers.com., Manda, 2015). Nakanga (pers.com., 2015) also stated that waste though discarded by consumers, has the name of the producer on it, and could have implications on the reputation of the producer. Kafwimbi (pers.com., 2015) and McNaught (pers.com., 2015) indicated that SABMiller through its CSR strategy saw an opportunity to empower people with an entrepreneurial conviction while contributing to a clean environment hence the decision to invest resources in setting up a value chain for waste. The role of SABMiller PLC in the project was to sponsor the creation of the value chain through training identified entrepreneurs (small scale) and linking them to markets. The foregoing information indicates a shift, though at different stages, in approach to societal and environmental wellbeing by producers just as emphasised by Ottman in Charter & Polonsky (1999).

The implementation of the initiatives based on CSR mechanisms, as indicated in figure 8, cover issues of **networks**; **partnerships**; **stakeholder engagement**; **code of conduct**; and **category management** which ensure the environmental, societal and financial goals are attained simultaneously (Belz & Peattie, 2012; Rotter, *et al*., 2012; Das & Posinasetti, 2015; Mihalčová & Pružinský, 2015). The safety, health & environment and waste policies; and sustainability assessment matrix reported by the actors fall under the **code of conduct** which form part of the daily actions of the producers as evidenced by the recruitment of staff to work with such issues. The waste value chain that will be enhanced by the project supported by SABMiller involving several actors reflects aspects of **networking** among the concerned actors participating in the scheme. The fact that the council signed agreements to cooperate with the private sector and consultation meetings have been, and are being held, to ensure the waste value chain project succeeds coupled with the proposed construction of waste recovery sites where the private sector players can access materials demonstrates the level of

stakeholder engagement and **partnerships** being formed. Under the project supported by SABMiller, clean up and education campaigns are planned targeting packaging waste from their products – which is in itself an aspect of **category management**.

6.3 Factors enabling and hindering progress towards waste valorisation

The stakeholders (public and private sector) identified several factors, most of them similar, that were deemed supportive and otherwise to the growth of waste reclamation sector. The factors presented in figure 15 can be classified into the following broad categories namely; economic, socio-cultural, regulatory & institutional and infrastructural & technical.

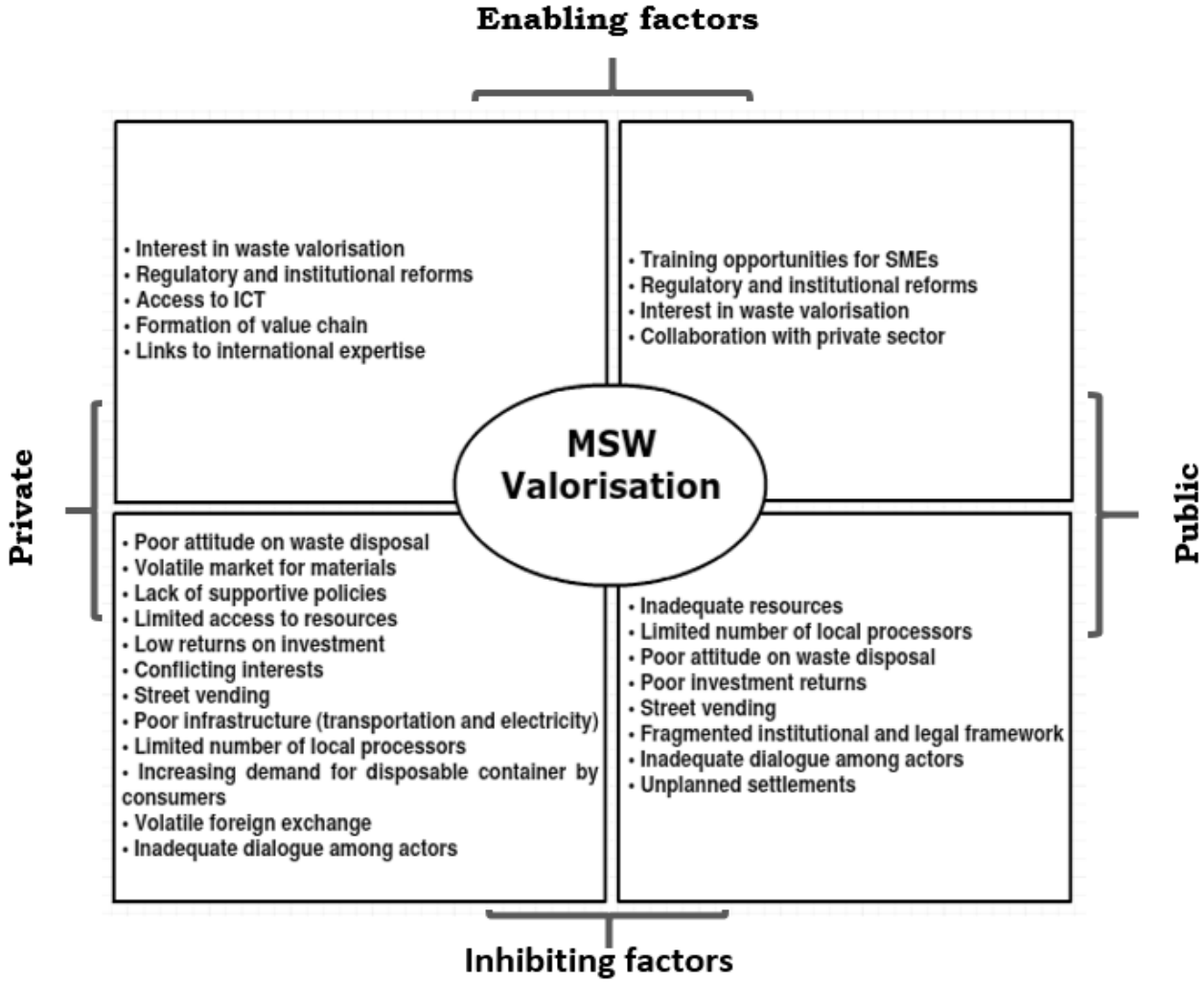

Figure 15: MSW valorisation enabling and inhibiting factors using Roberts (2003) theoretical model

The **economic factors** encompass issues of access to capital (resources), demand for recovered materials which affect prices and interest in the sector and foreign exchange rates. Factors pertaining to attitudes such as demand for disposable containers instead of returnable containers and lack of segregation and indiscriminate disposal of waste fall under the **socio-cultural** domain. The **regulatory & institutional** matters relate to policy issues, street

vending, unplanned settlements, poor coordination/dialogue, collaborations as well as enforcement of rules and laws. The last category, **infrastructural and technical**, includes issues of access to energy, processing plants, transportation and information and communication technology.

7. Discussion

The chapter is divided into three sections. The first and second part focus on the implications of the results on the public and private sector roles respectively. The third and final part looks at prospects for improvements where dialogue is proposed as the starting point for change in the management of MSW including the growth of waste valorisation sector centred on the CE approach.

7.1 Public Sector

The strides made by actors in the public sector are immense going by the institutional and regulatory reforms indicated in the previous chapters. Nevertheless, what is evident is the fact that most of the reforms have been skewed towards one aspect of waste management, that is, the public health component (LCC, 2009 ; pers.com., Ngwale, 2015). This approach has not spurred the much needed change thereby prompting the authorities to enact the EPR in 2011 as indicated by Sichinga (pers.com., 2015) and MLGH (2011). Since 2011 when the law and statutory instrument (SI 100) were put in place, there is no specific strategy with measureable benchmarks indicating how the institutional arrangement, policy issues and systematic changes that will bring about tangible results in the manner waste is managed. For example, Hickle (2014), Wilson (1996) and Su, *et al.* (2013) indicate that for EPR to succeed, there is need to set up eco-industrial parks that thrive on industrial symbiosis to stimulate CE, economic incentives such as reduced land purchasing rates in the parks or tax waiver on machinery, setting standards on products and packaging to incorporate issues of recyclability, repair-ability, durability, among other and tax rebates for producers that reduce their waste generation. A pragmatic step that can be taken is to limit new entrants in the manufacturing industry to use packaging materials that are recyclable while a transition period to phase out those that cannot be recycled used by old companies can be agreed up on. As indicated by Degroot (pers.com 2015), consumers prefer PET, aluminium cans and carton containers, which are recyclable and can have a DRS fused in them, the use of glass bottles, which cannot be recycled at a large scale as indicated by Kafwimbi (pers.com., 2015), can be limited. Glass bottle are heavy by design and transportation of heavy items require more energy (fuel) and when they break the chance of contaminating other recyclable materials is very high and such measure if well planned can be executed with less resistance from both producers and consumers (Davis, 2015).

Furthermore, the strategy can consider issues of collaboration with the producers to conduct life cycle analysis of products that produce most of the waste in order to determine who can participate in a CE to close the resource loops as stated by Winkler (2011) and Erses Yay (2015). As indicated by Wilson (1996), it is imperative that the public sector, in consultation with the private sector, agree on a period when all producers should adopt any proposed standards or measures.

As recognised by MLGH (2015) and Silwimba (pers.com., 2015), the need for coherent institutional and regulatory frameworks coupled with political good will from the leadership and buy-in from the private sector and general public, is crucial to putting in place a system that delivers for all. For instance, the council's MSW strategic plan (LCC, 2003) brought to the fore important aspects that needed to be worked on such as DRS to improve service delivery but those issues remain wishes in the absence of policies and systems that translate

the desired goal into reality. A well planned deposit refund system (DRS) supports inculcating behavioural change as consumers realise waste is a resource and can encourage sorting of waste and the creation of jobs in a CE for those involved in waste valorisation (Wilson, 1996; Ferrão, *et al*., 2014). As indicated by Plata-Díaz, *et al*. (2014) and Su, *et al*. (2013) financial challenges faced by public actors involved in managing MSW could be reduced in the long term if some initial investments are done to establish a CE and supportive policies and systems such as an incentive driven mechanism like a DRS, public procurement of green products and support to establish processing plants for recycling waste. Starting such a scheme with producers like SABMiller that has demonstrated commitment by supporting the *Manja Pamodzi* Project, can be a beginning of greater transformation in the way MSW is managed. Here, it should be stressed that the public sector players should not let this project go the same way the cleaner production and industrial pollution prevention programmes had gone where after the funds from NORAD and WB were phased out, the programmes were not sustained (Siaminwe, *et al*., 2005; LCC, 2003).

Although composting of organic waste might not be profitable as a business as specified by the LCC (2009) due to availability of subsidised synthetic fertiliser, the same cannot be said about using organic waste to enrich soils in backyard gardens or community and school gardens which can be started through sensitisation (Miller & Spoolman, 2012; Ghani, *et al*., 2013). Similarly, with the current electricity supply shortfall as indicated by Manda (pers.com., 2015), the issue of using the organic waste to produce biogas should be explored – including investment in vehicles and facilities that use biogas in view of the global desire to move to low carbon and renewable energy sources. The fact that about 40% of MSW is organic material (UN-Habitat, 2010), implies that efforts to minimise wastage of food should also be factored in the sensitisation messages and any programmes regarding Education for Sustainable Development (ESD) as proposed by Andrews (2015).

In the long term, the strategy to effectively manage waste in a sustainable manner should focus on for example, Education for Sustainable Development (ESD) where from childhood issues of waste management such as minimisation, reusing, recycling, segregation are taught and practiced and at higher levels (tertiary education) issues of sustainable design and production become part and parcel of the curriculum (Taylor, 2000; Andrews, 2015). Furthermore, enhancing stakeholder engagement through a systematic dialogue agenda is key to the formation of alliances such as Public Private Partnership (PPP) with both the formal and informal sectors and Research and Development (R&D) which according to Ahmed & Ali (2004) and Oteng-Ababio (2010) result in hybrid organisations or systems that lead to better service delivery and achievement of goals for the involved parties. The importance of partnerships has also been highlighted under the just adopted SDGs as a vehicle through which the world, countries and communities can achieve their goals or overcome issues such as MSW (UN, 2015). Other measures should include proving training, as alluded to by Lungu (pers.com., 2015) to SMEs on sustainability issues, sponsor exchange visits to producers with the best practices as well as developing and supporting a business incubator centre, under for instance the Zambia Development Agency, where business ideas including in waste valorisation can be supported. Owing to the fact that Zambia is not an island, that is, there is regional and international trade where imports come in from other countries, the need for reforms at international level similar to the EU directive on Packaging and Packaging Waste (PPW Directive) described by Marques, *et al.* (2014) which set targets that member state should strive to achieve, are key to comprehensive management of waste. With the adoption of the Sustainable Development Goals by several nations, where issues of sustainable

production and consumption are included, such regional or international reforms should gain momentum in due course (UN, 2015).

7.2 Private Sector

The efforts of the private sector to minimise waste and help the growth of a CE thereby diverting materials from the waste stream cannot be overlooked. However, it is important to state that there is a disparity among the producers, that is, in regard to whether their efforts are driven by CSR or compliance. For example, while SABMiller has gone beyond having a SHE policy by having a waste policy, sustainability assessment matrix which is reported on, employed a recycling coordinator and established a project based on its CRS strategy as alluded to by McNaught (pers.com., 2015), SABMiller (2014) and Degroot (pers.com., 2015), the other actors only had a SHE policy and officer. The other producers, had indicated their willingness to support initiatives that will enable them take care of their waste beyond their plants as demonstrated by their efforts to allow processors in waste valorisation collect waste materials form their plants at no cost. Certainly, these efforts need to be appreciated and strengthened through nudging using a mixture of incentives and regulations (Belz & Peattie, 2012; Olson, 2010; Ottman, 2011).

As Geng *et al*. (2010) argue, most of the restructuring of the production system as regards managing waste focused on end-of-pipe cleaning or cleaner production within each firm, however, such technologies have limits and thus the need for industrial symbiosis. For instance, the producers can through LCA establish Sustainable Supply Chain Networks where other (even new) players that can participate in industrial symbiosis can be identified and work together as a network or in partnership so as to close the resource loops to achieve the three dimensions of the triple bottom line, that is, financial, societal and environmental goals (Winkler, 2011; Das & Posinasetti, 2015; Mark-Herbert, *et al*., 2010).

Partnerships, as stated under the public sector, are important and producers should take advantage of the policies that offer mutual benefits to both the public and private sector. For instance, Zambia has a law, the Public-Private Partnership Act of 2009, which encourages joint ventures between the public and private sector with clear roles and responsibilities that producers should take advantage of. As Olson (2010) and Belz & Peattie (2012) state, partnerships and other measures such as having green initiatives or centre of excellence where others can learn need to be planned for and communicated to other stakeholders in order to attract support and build the entity's reputation.

The players in waste valorisation should take advantage of the initiatives by the public sector and producers to coordinate their efforts and probably begin to think of collaborating with each other and be that missing link for SSCN between the consumers and producers. That way it might be easier for the public sector to provide support for the establishment of large scale recycling plant and systems to support it.

7.3 Prospects for Improvements

Taking advantage of the ingenuity and progress made by one of the producers, SABMiller, public sector players can tailor and sponsor a local exchange program to enable other producers visit, get exposed and learn from the efforts being made by one of their peers. This is in line with one of the suggestions that Wilson (1996) made for policy makers. In addition, as Olson (2010) indicates, SABMiller with support of the public sector can set up a centre of excellence with a clear communication strategy to generate interest and facilitate learning among other producers. Clearly, the opportunity to spread green initiatives should be seized and strengthened regardless of who conceives them – going by Esty & Winston (2009) and Massarutto (2014) who argue that sometimes such changes can be driven by the private sector.

The aforesaid can begin to happen through dialogue. Through dialogue or stakeholder engagement as stressed by Christensen, *et al*. (2014), Wilson, *et al*. (2012) and Piacentini, *et al*. (2002), stakeholders will be accorded an opportunity to state their legitimate interests, share ideas and build groundswell for internal change and symbiotic partnerships among themselves. Using what I would call a Stakeholder Dialogue Gear (**ShDG**) model, figure 16, it is envisaged that the interactions will bring about reforms (institutional and regulatory) and investment in research and development (R&D), jointly or separately. For example, a research can be done to establish what factors would bring about behavioural change in consumers so that waste segregation is done and indiscriminate disposal is reduced. Additionally, look at whether reforms (increase) in electricity tariffs can stimulate investment in Waste to Energy plants so that waste which cannot be reused or recycled is used as stock for such plants. The ShDG sets in motion open and inclusive dialogue between and among actors which would result in reforms and research & development. The reforms and research would result in innovations in technical and non-technical spheres. Finally the innovations would bring about new and improved products and systems (ways of doing things) as stated by Ottman (2011) and Henriques & Richardson (2004).

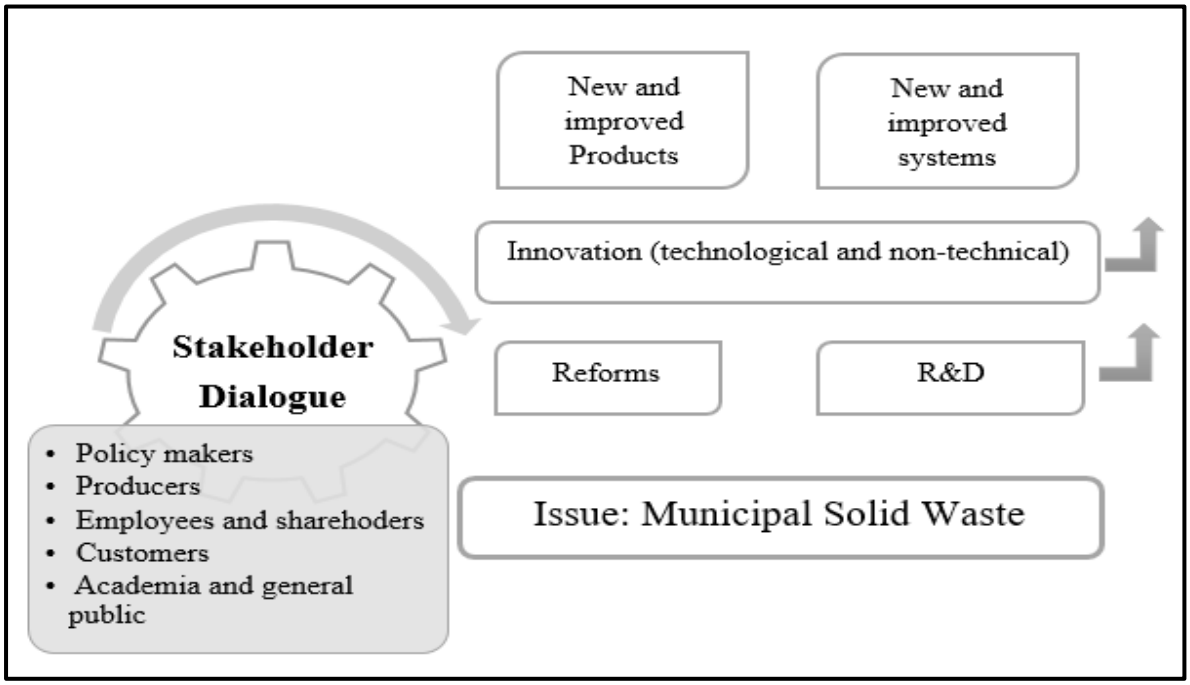

Figure 16: Stakeholder Dialogue Gear; setting in motion MSW management

All the stages are driven by the Stakeholder Dialogue Gear because their (stakeholders') input and actions are necessary at every level. In the case of MSW management, the issues specified in 7.1 and 7.2 can be set in motion using the ShDG model, in line with the assertion by Zotos, *et al*. (2009) that states that constant stakeholder engagement is key to successful management of MSW.

8. Conclusion and recommendations for future research

8.1 Conclusion

The aim of the research was to ascertain the likelihood of engaging local business entities in abating the problem of municipal solid waste through closed loop or circular economy (**CE**) production approaches. Focus was placed on the role of the public sector in bringing about the change and prospects for public private partnerships in this regard.

Going by sentiments from the actors involved in the study and the initiatives being undertaken, the most significant ones being the incorporation of the EPR (considered as a precursor to the development of a circular economy) in in environmental regulations and a project propagating the creation of waste value chain that is based on a non-incentive scheme, supported (financially and materially) as part of CSR initiatives of SABMiller - Zambia, the potential for a circular economy to develop and contribute to reduction in municipal solid waste exists. However, government policies, institutions and systems must be calibrated to stimulate development of a circular economy where waste valorisation is enhanced. Principally to ensure processing of the recovered materials is done locally – because exporting the aggregated waste require more time and procedures that seriously disadvantage the aggregators and deprive the country of job creation in the processing domain – with systems such deposit-refund system that facilitate smooth flow of materials and access to capital in order to compliment efforts by the private sector whose actions are to an extent drive by CSR and compliance. The reforms will require shifting from public health centred MSW management approach to including resource efficiency and environmental goals by a combination of economic incentives and regulations.

The incentives can include establishing eco-industrial parks where land can be accessed at reduced rates; tax waiver on equipment used in waste valorisation; and tax rebates for producers that meet set waste reduction goals. Regulations can include aspects such as limiting packaging materials to those that are recyclable, set standards to reduce the quantity by volume or weight of packaging materials used, etc.

The prospect for Public Private Partnerships (PPP) also exists as evidenced by the memorandum of understanding signed between the Lusaka City Council and SABMiller to facilitate growth of the waste value chain project. The fact that the other producers have informal agreements with waste aggregators is a positive sign that they too could support and go into formal partnerships.

With the ever increasing population and land scarcity, the Lusaka City Council and concerned stakeholders can no longer afford to relegate issues of waste management that relate to resource optimisation and environmental wellbeing to the back burner. There is urgent need for systematic shift from the current paradigm that focus on huge capital investments in landfills and auxiliary equipment for the sole purpose of addressing public health aspects of garbage. Procrastination in this regard will only lead to more land being turned into landfills and illegal dumpsites and in the long run degradation of the environment. And as Marques, *et al*. (2014) put it, in places with limited land resources (like Lusaka City)

the cost of establishing landfills can be very high and thus gobble resources meant for other important development needs.

8.2 Recommendations

The following are some of the recommendations that people interested in studying the issue of MSW management in Lusaka – Zambia can consider.

a. Look at what would enable behavioural change among consumers towards waste to enhance sorting and appropriate disposal methods.

b. Assess the impact of a non-incentive scheme in terms of, for example, how many other producers join and support the scheme and progressive changes in the quantity of materials recovered and its overall bearing on the MSW picture.

c. Look at what institutional and regulatory reforms the public actors intend to undertake, or would have undertaken and their impact, to back the implementation of the EPR.

d. Given an opportunity, I would pursue a PhD on this subject matter in order to assist Zambia establish targeted policies that would spur the development of a circular economy.

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ANNEX A: List of selected actors for Semi-Structured Interviews

No.	Entity Name	Category	Role/Business	Respondent/Designation	Date(s) of interview
1	Lusaka City Council	Public	Provision of municipal services	Mr. Silwimba Michael – Head of Waste Management Unit; Mr. Munalula Melvin – Senior Health Inspector; and Mr. Mbewe Aaron – Landfill Supervisor	24th July, 5th & 7th Aug, 2015
2	Zambia Environmental Management Agency	Public	Environmental management	Ms. Chembo Sichinga – Inspector	5th Aug, 2015
3	Zambia Bureau of Standards	Public	Setting industrial/product standards	Ms. Margaret L. Lungu – Standards Development Manager	28th July, 2015
4	Ministry of Local Government and Housing	Public	Policy formulation and monitoring	Mr. Hartman K. Ngwale – Senior Solid Waste Management Officer	25th July, 2015
5	Shoprite	Private	Chain store	Mr. Charles Bota – Country Manager	Interview unsuccessful
6	Parmalat (Lusaka)	Private	Dairy products and beverages	Ms. Catherine Nakanga – Safety, Health, Environment and Risk Officer	28th July, 2015
7	Varun Zambia	Private	Beverages and dairy products	Mr. Manda Kapompo – Safety, Health, Environment and Risk Officer	29th July, 2015
8	Tangy Drinks	Private	Beverages	Mr. Mwanza – Office assistant	Interview unsuccessful
9	SABMiller (Zambian and National Breweries and Heinrich's Beverages)	Private	Beverages	Ms. Elaine Kafwimbi – Recycling Coordinator Ms. Annabelle Degroot – Managing Director	5th Aug, 2015. 26th August 2015.
10	Pick and Pay	Private	Chain store	Mr. Riccardo Franco – Manager Logistics	Interview unsuccessful
11	Zambia Chamber of Commerce and Industry	Private	Umbrella body for businesses	Mr. John Nsakanya – Research and Information Officer	10th Aug, 2015
12	Trash Park	Private	Waste Recycling and consultancy	Mr. Andrew McNaught – Director of Business	5th Aug, 2015
13	Mika Lodge	Private	Hospitality/Restaurant	Lodge Manager	Interview unsuccessful
14	Recycle-mania	Private	Waste recycling (aggregation)	Mr. Daniel Sikanyika – Director Finance and Administration	7th Aug, 2015
15	L&N Matrix Limited	Private	Waste recycling (aggregation)	Mr. Newton Masiya – Director	12th Aug, 2015

ANNEX B: Interview Protocol (7 pages)

INTERVIEW GUIDE: PRIVATE SECTOR

Closing the loops in the usage of materials in production and supply chain of products as one way of abating municipal solid waste.

1. Would you explain in brief the history, current trends and future plans on how you have been/intend to eliminate or reduce waste, which ends up as municipal solid waste, in your business and what motivates you?
2. What factors;
   a. Are enabling or could enable your business eliminate or reduce waste generation?
   b. Are inhibiting or could inhibit your business from eliminating or reducing waste?
3. How often do you meet other stakeholders to discuss the issue of eliminating or reducing waste and what are the key issues that came out?
4. Do you have any working relationship with other actors who are engaged in waste reduction/recovery? If yes, what is the nature of the relationship and if not, do you have any plans to enter into one?

Requested are documents in form of plans, reports, memos or press releases where the responses or some of the responses given above are captured.

Thank you.

Danny B. Chibinda

Email: dannychibinda@gmail.com

Cell phone No.: +260973 098065

INTERVIEW GUIDE: PRIVATE SECTOR INVOLVED IN WASTE RECOVERY/RECYCLING

Closing the loops in the usage of materials in production and supply chain of products as one way of abating municipal solid waste.

1. Would you explain in brief the history of how and why you started your business, current trends and future plans about recovering/recycling materials as a business?
2. What factors;
   a. Are enabling or could enable your business improve or expand?
   b. Are inhibiting or could inhibit your business from improving or expanding?
3. How often do you meet other stakeholders to discuss the issue of reusing or recycling materials and what are the key issues that came out?
4. Do you have any working relationship with other actors who are engaged in waste reduction/recovery? If yes, what is the nature of the relationship and if not, do you have any plans to enter into one?

Requested are documents in form of plans, reports, memos or press releases where the responses or some of the responses given above are captured.

Thank you.

Danny B. Chibinda

Email: dannychibinda@gmail.com

Cell phone No.: 0973 098065

INTERVIEW GUIDE: PUBLIC SECTOR (LUSAKA CITY COUNCIL)

Closing the loops in the usage of materials in production and supply chain of products as one way of abating municipal solid waste.

1. Kindly explain in brief the historical, current trends and future plans on eliminating or reducing municipal solid waste in the City of Lusaka.
2. How can the private sector eliminate or reduce waste in their production and supply chain?
3. What factors;
    a. Are enabling or could enable businesses eliminate or reduce waste generation?
    b. Are inhibiting or could inhibit businesses from eliminating or reducing waste?
4. How often do you meet stakeholders to discuss the issue of eliminating or reducing waste and what are the key issues that came out?
5. Do you have any working relationship with other actors who are engaged in waste reduction/recovery? If yes, what is the nature of the relationship and if not, do you have any plans to enter into one?
6. Why has the issue of municipal solid waste persisted despite the measures put in place?
7. How much of your procurement, in percentage, is deliberately directed at producers or suppliers involved in waste reduction/recovery (green products)?

Requested are documents in form of plans, reports, memos or press releases where the responses or some of the responses given above are captured.

Thank you.

Danny B. Chibinda

Email: dannychibinda@gmail.com

Cell phone No.: 0973 098065

INTERVIEW GUIDE: PUBLIC SECTOR (MINISTRY OF LOCAL GOVERNMENT AND HOUSING)

Closing the loops in the usage of materials in production and supply chain of products as one way of abating municipal solid waste.

1. Kindly explain in brief the historical, current trends and future plans on eliminating or reducing waste in Zambia and in particular the City of Lusaka.
2. How can the private sector eliminate or reduce waste in their production and supply chain?
3. What factors;
    a. Are enabling or could enable businesses eliminate or reduce waste generation?
    b. Are inhibiting or could inhibit businesses from eliminating or reducing waste?
4. How often do you meet stakeholders to discuss the issue of eliminating or reducing waste and what are the key issues that came out?
5. Do you have any working relationship with other actors who are engaged in waste reduction/recovery? If yes, what is the nature of the relationship and if not, do you have any plans to enter into one?
6. Why has the issue of municipal solid waste persisted despite the measures put in place?
7. How much of your procurement, in percentage, is deliberately directed at producers or suppliers involved in waste reduction/recovery (green products)?

Requested are documents in form of plans, reports, memos or press releases where the responses or some of the responses given above are captured.

Thank you.

Danny B. Chibinda

Email: dannychibinda@gmail.com

Cell phone No.: 0973 098065

INTERVIEW GUIDE: PUBLIC SECTOR (ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY)

Closing the loops in the usage of materials in production and supply chain of products as one way of abating municipal solid waste.

1. Kindly explain in brief the historical, current trends and future plans on eliminating or reducing waste in Zambia and in particular the City of Lusaka.
2. How can the private sector eliminate or reduce waste in their production and supply chain?
3. What factors;

   a. Are enabling or could enable businesses eliminate or reduce waste generation?

   b. Are inhibiting or could inhibit businesses from eliminating or reducing waste?
4. How often do you meet stakeholders to discuss the issue of eliminating or reducing waste and what are the key issues that came out?
5. Do you have any working relationship with other actors who are engaged in waste reduction/recovery? If yes, what is the nature of the relationship and if not, do you have any plans to enter into one?
6. Why has the issue of municipal solid waste persisted despite the measures put in place?
7. How much of your procurement, in percentage, is deliberately directed at producers or suppliers involved in waste reduction/recovery (green products)?

Requested are documents in form of plans, reports, memos or press releases where the responses or some of the responses given above are captured.

Thank you.

Danny B. Chibinda

Email: dannychibinda@gmail.com

Cell phone No.: 0973 098065

INTERVIEW GUIDE: PUBLIC SECTOR (ZAMBIA BUREAU OF STANDARDS)

Closing the loops in the usage of materials in production and supply chain of products as one way of abating municipal solid waste.

1. How can the private sector eliminate or reduce waste in their production and supply chain?
2. What factors;
    a. Are enabling or could enable businesses eliminate or reduce waste generation?
    b. Are inhibiting or could inhibit businesses from eliminating or reducing waste?
3. To what extend do you take into consideration issues of product reusability, durability, repair-ability and recyclability when setting standards?
4. How often do you meet stakeholders to discuss the issue of eliminating or reducing/recovering waste and what are the key issues that came out?
5. How much of your procurement, in percentage, is deliberately directed at producers or suppliers involved in waste reduction/recovery (green products)?

Requested are documents in form of plans, reports, memos or press releases where the responses or some of the responses given above are captured.

Thank you.

Danny B. Chibinda

Email: dannychibinda@gmail.com

Cell phone No.: 0973 098065

INTERVIEW GUIDE: PRIVATE SECTOR (ZAMBIA CHAMBER OF COMMERCE AND INDUSTRY – UMBRELLA BODY FOR PRIVATE SECTOR)

Closing the loops in the usage of materials in production and supply chain of products as one way of abating municipal solid waste.

1. Briefly explain the historical, current trends and future plans about how your members have been involved in eliminating or reducing waste generation in their businesses?
2. What factors;
    a. Are enabling or could enable businesses eliminate or reduce waste generation?
    b. Are inhibiting or could inhibit businesses from eliminating or reducing waste?
3. How often do you meet your members and stakeholders to discuss the issue of eliminating or reducing waste and what are the key issues that came out?

Requested are documents in form of plans, reports, memos or press releases where the responses or some of the responses given above are captured.

Thank you.

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ANNEX C: Field observations (2 pages)

No.	Area/Place Name	Date	Type of Site	Salient Issues noted	Remarks
1	George (Compound) Residential Area	23rd July, 2015	Undesignated dump site	• Mixed waste comprising of food waste, PET, HDPE, metal and glass containers, hair from barber shops/salons, clothing, plastic bags, and broken furniture etc. • Open burning. • Ditches where stones have been excavated are used to dump the waste. • Opaque beer cartons (Chibuku, Nkwazi, etc.) were also common.	The waste was either packed in sacks or dumped in the open.
2	Lusaka Central Business District (Near Lumumba Bus Station)	23rd July, 2015	Trading area	• Open burning • Drainages used to dump waste. • Containers (like those in 1) and plastic bags were prevalent. • Opaque beer cartons (Chibuku, Nkwazi, etc.) were also common.	
3	Soweto Market Undesignated waste dump site (Under ZESCO Pylons)	28th July, 2015	Trading area	• Opening burning • Organic waste from vegetables and fruits was prevalent. • Other waste ranging from cartons for opaque beer, containers, types and few electronic waste were seen.	
4	Libala Residential Area	30th July, 2015	Undesignated dump site	• Similar observations as those in 1 (George Compound) with piles of garbage forming hills.	
5	Chunga Landfill	7th Aug, 2015	Landfill under Lusaka City Council	• The area size is 24 hectares. • One cell is properly built as a landfill. • Mixed waste is hauled and dumped in the cell. • 230-240 waste collectors are allowed to recover scrap metals, carton boxes, PET bottles etc. before the waste is covered by a layer of soil. • A section at the entrance is reserved for aggregating the recovered waste. • Open burning • Some of the machinery was broken-down e.g. compactor for about 4 years.	About 15 business entities purchase the recovered waste, from the collectors, at the landfill.
6	Kamwala Trading Area	12th Aug, 2015	Recovered materials collection point	• Waste collected from the trading area and sold to aggregators included carton boxes and opaque beer containers, metallic cans and	Most of the waste collectors are women.

				PET/HDPE bottles.	On the day the site was visited, 5 women and 2 men were working.
7	Recycle-mania Chunga Depot	7th Aug, 2015	Aggregation point	• One belling machine • Deals in opaque beer cartons and plastic bags	Rented and located in an open ditch
8	L&N Depot in Chinika Industrial Area	12th Aug, 2015	Aggregation Point	• Two belling machines • Deals in opaque beer cartons, PET, HDPE and aluminium cans	Rented Warehouse