CHARCOAL GOVERNANCE IN ZAMBIA: ACTORS AND INSTITUTIONS

By

Ilitongo Kaywala

A dissertation submitted in partial fulfilment of the requirements of the Master of Science degree in Environmental and Natural Resources Management

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DECLARATION

I **Ilitongo Kaywala** do declare that this dissertation is my original work. It has not previously been submitted at this University or any other University for the award for any academic qualification. All published work or material from other sources incorporated in this dissertation have been acknowledged and adequate reference thereby given.

Signature: ..... **Date:** .....

APPROVAL

This dissertation of **Ilitongo Kaywala** has been approved as fulfilling the requirements for the award of a Master of Science degree in Environmental and Natural Resources Management by the University of Zambia.

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Examiner 1	Signature	Date
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Examiner 3	Signature	Date
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Chairperson Board of Examiners	Signature	Date
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Supervisor	Signature	Date

DEDICATION

This dissertation is dedicated to my beloved mother Nosiku Simonda.

ABSTRACT

Woodfuel (charcoal and firewood) is a crucial component of the energy supply chain in sub-Saharan Africa with over 80 percent of the population depending on it as their primary energy source (Sepp, 2008; Njenga, et. el., 2013). In Zambia, it accounts for more than 70 percent of total energy consumption (GRZ, 2019). Studies show that in the absence of new policies, this heavy reliance on woodfuel, charcoal in particular, is likely to continue in developing countries as access to alternatives such as LPG, kerosene and electricity is limited and costly (FAO, 2017; Mugo & Ong, 2006).

This research sought to determine the impact that actors and institutions have on the sustainability of the charcoal value chain in Zambia. The study employed the use of secondary data to establish the historical trends in the value chain. Further, using the value chain analysis approach, two case studies in a high charcoal production area (Kapiri Mposhi) and a high charcoal consumption area (Lusaka) were conducted to establish the current situation regarding charcoal. Questionnaires, Focus Group Discussions and observations were employed for data collection for the case studies.

The charcoal value chain consists of five stages, being: wood resource production, charcoal production, transportation, trade and consumption. The findings of the study were that there has been a general increase in charcoal production, consumption and prices over the past twenty years while forest resources have been declining. The actors in the value chain were found to be: state actors (Departments of Forestry and Energy) and non - state actors (traditional leadership, producers, traders and local people). The laws and regulations are mainly enshrined in the Forests Act, Energy Regulation Act, National Energy Policy and National Forestry Policy. However, it was observed that the governance of the sector was conducted in a segmented manner and this impacted on the value chain in that focus was on certain parts of the value chain while some parts remained mostly unregulated. Further, the informal nature of the charcoal value chain makes it difficult for the government to enforce regulations resulting in the overexploitation of the forest resources by end users.

The study concluded that the charcoal value was very unsustainable and that given the current interaction between the actors and the gaps in the regulatory framework, this situation is unlikely to change. This study thus recommends a two pronged approach to the governance of charcoal i.e. deliberately setting up charcoal production areas and secondly, regulation of the charcoal product throughout the value chain thus ensuring sustainable production and utilisation. This would involve formalisation of the value chain through development of subsidiary legislation and regulations for woodfuel to actualise some of the provisions of the Forests Act and Policies.

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ACRONYMS

CSO	Central Statistical Office
EFZ	Evangelical Fellowship of Zambia
ERB	Energy Regulation Board
FAO	Food and Agriculture Organisation of the United Nations
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GHG	Green House Gas
GRZ	Government of the Republic of Zambia
IEA	International Energy Agency
ILUA	Integrated Land Use Analysis
IRENA	International Renewable Energy Agency
JFM	Joint Forestry Management
LCC	Lusaka City Council
LPG	Liquefied Petroleum Gas
MEWD	Ministry of Energy and Water Development
MT	Metric Tonne
NGO	Non-Governmental Organisation
NEP	National Energy Policy
PFAP	Provincial Forest Action Programme
PFM	Participatory Forest Management
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WHO	World Health Organisation

CHAPTER 1: INTRODUCTION

1.1 Background

Biomass energy is the form of energy from organic matter such as woodfuel (firewood and charcoal), agricultural wastes, forestry waste, industrial/municipal organic wastes, energy crops & products and animal waste (GRZ, 2019). Biomass energy, woodfuel in particular, plays a vital role in meeting local energy demand in many developing countries as well as some parts of the industrialized world. Biomass-based industries are a significant source of enterprise development, job creation and income generation in rural Africa (Karekezi et al, 2002; Goldemberg, 2003).

The share of biomass energy in total energy consumption varies significantly with developing regions (Africa, Asia and Latin America) recording high levels of biomass energy consumption (IEA, 2016, World Bank, 2003) in comparison to developed regions. The International Energy Agency (2016) estimates that over 2.6 billion people, or 52 percent of the population in developing countries, depend on biomass (particularly woodfuel) as their primary fuel for cooking and that over half of these people live in India, China and Indonesia. However, the proportion of the population relying on biomass is highest in sub-Saharan Africa where over 80 percent of the population depend on woodfuel as their primary source of energy (Sepp, 2008; Njenga , et al., 2013).

In Zambia, woodfuel accounts for more than 70 percent of the country's total energy consumption of which 88 percent is utilised at household level (GRZ, 2019, CSO, 2016) while 12 percent is utilised in commerce and industry, as well as in the mines (GRZ, 2019). According to the International Energy Agency (201 6), in the absence of new policies, this heavy reliance on woodfuel, will continue with the number of people relying on it world over increasing over time from 2.6 billion in 2015 to 2.7 billion by the year 2030. This has been attributed to a number of factors that include: high poverty levels, increasing population, unemployment and lack of alternative income generating activities as well as inadequate alternative energy sources that are affordable and easily accessible (Langford, 2014; Ellegard, et al., 2003; Hibajene & Kalumiana, 1994). Further, charcoal is an integral part of rural and

urban livelihoods with the total number of people involved in charcoal trade at various stages of the value chain in Zambia being about 500, 000 (Mwitwa & Makamo, 2012). From production to consumption, charcoal passes through several stages collectively referred to as the charcoal value chain. These encompass wood resource production, charcoal production, transportation, trade (wholesale and retail) and consumption. However, the charcoal value chain in Zambia remains highly unsustainable as production and utilisation are characterised by inefficient technologies resulting in a lot of wastage of the wood resource (GRZ, 2019). For example, the earth kiln, which is the most widespread charcoal production method in Zambia is generally described as wasteful and inefficient due to its low conversion efficiencies which are as low as 5-20 percent (Hibajene & Kalumiana, 1994; Njenga , et al., 2013). Deforestation and a range of other adverse environmental effects are thus associated with charcoal production and utilisation and have been a major source of concern in the country (GRZ, 2013; 2015). The deforestation rate in Zambia is between 250, 000 to 300, 000 hectares per annum and woodfuel extraction has been recognised as being among the contributing factors (GRZ, 2008; 2013; 2015).

Further, given its informal nature, some parts of the charcoal value chain such as production and consumption remain largely unregulated (Mwitwa & Makamo, 2012). This has resulted in a situation where charcoal is produced, transported and traded without the necessary licences and levies being paid for to the relevant authorities (Gumbo, et al., 2013; Mwitwa & Makamo, 2012) and without remedial measures such as reforestation being put in place. Due to this situation, woodfuel can no longer be considered a renewable energy source as the rate of extraction of the trees far surpasses the rate of replenishment (GRZ, 2019). Further, studies often focus on the technical aspects of charcoal such as production without considering the effects that other underlying factors such as governance have on the value chain. The goal of this research in this regard was to assess the governance of the charcoal value chain with emphasis on how the value chain can be made sustainable.

By conducting an in-depth analysis of the charcoal value chain at macro level and two case studies at micro level in Lusaka and Kapiri Mposhi districts, this study aims to answer the research questions; what role do actors and institutions play in shaping the charcoal value chain and what are the governance options that can result in a sustainable charcoal value chain in Zambia.

1.2 Problem Statement

Over the years, there have been a number of initiatives and interventions by the government and various Non-Governmental Organisations (NGOs) aimed at reducing the high dependence on charcoal and increasing the sustainability of the charcoal value chain in the country (EFZ, 2012). Various policies and laws including the National Energy Policy, National Forestry Policy, Forests Act as well as the Energy Regulation Act, have been put in place to regulate the use of charcoal. However, despite all these efforts, the use of charcoal has continued to increase and the uptake of alternative energy sources, efficient production and utilisation technologies have remained low. Further, government and scholarly studies often focus on the production aspects without considering the effects of other factors such as governance on the value chain. As such, if interventions continue to focus on the production and utilisation aspects only without looking at the underlying causes such as the institutional arrangements and governance structures, the charcoal value chain will continue being unsustainable and impacting negatively on the environment. This study thus aims to explore how governance issues may be influencing the sustainability of the charcoal value chain.

1.3 General Objective

To examine how governance arrangements in the woodfuel energy sector affect the charcoal value chain in Zambia.

1.4 Specific Objectives

1. To determine the characteristics of the charcoal value chain in Zambia.
2. To examine how the interaction of various actors in the charcoal sector affect the governance of the charcoal value chain.
3. To examine how institutional arrangements shape the charcoal value chain in Zambia.

1.5 Research Questions

1. What are the salient features of the charcoal value chain in Zambia?
2. Who are the main actors in the value chain?
3. How does the interaction of the actors shape the charcoal value chain?

4. What institutions govern the wood energy sector?

5. How do the institutions governing the charcoal value chain affect its sustainability?

1.6 Significance of Study

Charcoal plays a considerable role in the energy mix and economy of Zambia. If the current energy scenario (low access to efficient and alternative energy sources such as LPG, briquettes and efficient cookstoves among others) and high poverty levels continue, the high dependence on charcoal is likely to continue hence exerting increased pressure on the country's forests and the environment. As such, in the absence of a robust governance framework for the sector, it will continue to be unsustainable. Understanding the factors that affect the governance of the resource and how the governance itself affects the value chain is important as it will contribute to development of policies with potential to foster sustainable charcoal production and consumption. Further, the study will result in an integrated synthesis of the governance issues in the charcoal value chain thus adding to the body of knowledge on biomass energy.

1.7 Organisation of dissertation

The dissertation consists of six chapters. The first chapter outlines the introductory part comprising of background to the study, problem statement, objectives and significance of the study. Chapter 2 reviews the relevant literature following the five stages of the charcoal value chain while Chapter 3 describes the study area in terms of locations, infrastructure, administration, population and economic activities. The fourth chapter provides Research Methodology outlining the methodological approach, selection of respondents, data collection methods and the analytical framework. Chapter 4 further discusses the limitations of the study. Chapter 5 presents the results and discussion of the findings while Chapter 6 provides the conclusion and recommendations of the study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Biomass energy is derived from organic matter such as wood, agricultural and forestry waste, energy crops etc. (GRZ, 2019). It is the primary energy source for about 2.7 billion people worldwide (Wicke, 2001; International Energy Agency, 2016). In Africa, the primary energy demand is predominantly biomass (47.9 percent) while in Sub – Saharan Africa, biomass provides as much as 80 percent of countries' energy demands (IRENA, 2013). Charcoal in particular is the primary cooking fuel for urban households and small scale businesses such as restaurants, bakeries and street food stands in most developing countries (FAO, 2017).

In Zambia, woodfuel consumption accounts for 70 percent of the energy requirements. Charcoal is produced in rural areas and consumed by 85 percent of urban households (GRZ, 2019) while firewood is mostly consumed in rural areas. Given current economic conditions and rapid urbanisation, charcoal consumption in particular, is increasing and this is not limited to Zambia as shown by many scholars, its use is growing in Democratic Republic of Congo, Malawi, Mozambique, Kenya and Tanzania among others, due to population growth, lack of alternative energy sources, high unemployment and weak implementation of legislation. Further, the increase in charcoal consumption in sub – Saharan Africa has been linked to countries in the region not having specific policy on charcoal (Ellegard, et al., 2003; Schure, et al., 2014; Langford, 2014; Smith , et al., 2017; FAO, 2017). Policies and laws relating to wood are scattered across different sectors such as energy, forestry and agriculture making it difficult for their provisions to be enforced. Few countries such as Sudan and Kenya have specific legislation to govern the charcoal industry (Mugo & Ong, 2006; Republic of Kenya, 2009; Khennas, et al., 2013).

The consumption of resources such as woodfuel is heavily influenced by human population numbers and growth rates. Charcoal demand and hence production is driven primarily by rising numbers of the urban population dependent on woodfuel for their cooking and heating needs. Charcoal is relatively cheap compared to electricity and petroleum based fuels and as such is the preferred energy source of low income peri – urban households (FAO, 2017). Demand is further driven by poverty and limited availability of affordable and cleaner energy alternatives. Poverty is still

widespread in Zambia despite national commitments to reduce it and this has a direct bearing on charcoal production (Gumbo, et al., 2013).

It is interesting to note that charcoal use is fairly recent in Zambia, having been introduced in the Copperbelt Province around 1947. By 1962, virtually all African households in the Copperbelt towns were using charcoal for cooking (Ellegard, et al., 2003) with the Forestry Department actually encouraging its use in place of firewood in Lusaka in the early 1960s and since then, its consumption has steadily increased. Chidumayo (2010), advances that given Zambia's 2.5 percent annual population growth rate and 3.3 percent urbanisation rate, charcoal consumption and demand will continue to rise in the country's cities.

Given these trends, it is clear that there is need for concerted efforts to determine the underlying factors leading to the increasing use of charcoal.

2.2 The Charcoal Value Chain

The value chain concept is used to link resources and market dynamics. According to Kaplinsky & Morris (2001), the value chain describes the full range of activities required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to consumers and final disposal after use. It thus represents an area where key actors (producers, traders, transporters and vendors) move back and forth, possibly switching roles and locations, while employing their various tangible and intangible assets to execute their activities (Schure, et al., 2014). In line with this concept, the Zambian charcoal value chain is comprised of the following stages: wood resource production and extraction, charcoal production, transportation, trade and consumption.

Most of the charcoal produced in Zambia comes from *Miombo* woodlands which predominantly consist of *Brachystegia*, *Isoberlinia* and *Julbernadia* tree species (Chidumayo, 1993). According to Zambia's Forests Act of 2015: Part III, Section 23, Subsection 1(a), charcoal production may not be done in National Forests, Botanical gardens, National Parks and other areas of national or biological importance. However, charcoal may be produced in local forests (which may fall under customary or state land tenure) specifically designated for use by local communities. Charcoal may also be produced from farms and privately owned forests (GRZ, 2015).

Although most tree species can be used to produce charcoal, species that are woody, have a long burning time, high heat content value and produce little smoke, sparks or ash, produce the best charcoal (Hibajene & Kalumiana, 1994). Tree species commonly used for charcoal production in Zambia include: *Acacia migrescens, Acacia sieberana, Afzelia quanzensis, Bauhimia thonningii, Boscia salicifolia, Brachystegia boehmii* and other *Brachystegia* species (Gumbo, et al., 2013; Hibajene & Kalumiana 1994; Mwitwa & Makamo, 2012; Chidumayo, 1993). Hibajene and Kalumiana (1994) further note that Eucalyptus and Acacia species are used in the absence of preferred species. Species such as *Pericopsis angolensis* (this species is very hard), *Erythrophleum africanum, Albizia Africana* and *Swartzia madagascariensis* do not make good charcoal while *Pterocarpus angolensis* are valuable trees for timber and hence are not used in charcoal production. Further, although it is illegal to use fruit trees such as *Uapaka kirkiana* for charcoal production, Gumbo et. al (2013), report that as preferred species become scarce in some areas, producers use less preferred species including traditionally protected species like fruit and medicinal trees.

The process of charcoal production starts with selection of production sites with preferred tree species of suitable diameter (13 – 95 cm). The production process is described below (Hibajene & Kalumiana, 1994; Ellegard, et al., 2003; Gumbo, et al., 2013; World Bank, 1990; FAO, 2017);

- Trees are felled, cut into short logs and left for about three weeks to reduce the moisture content to about 18 – 20 percent.
- The logs are then piled into a clamp which is then covered with dug up soil lumps.
- Fire is then applied to the kiln to initiate the carbonisation process through which wood is turned into charcoal. During carbonisation, the following processes take place - combustion, dehydration, exothermic reaction and cooling.
- Once the charcoal is ready, it is harvested and packaged into bags.

The charcoal production technology centres on the kiln, many types of which are in use in Africa including the earth clamp, pit and casamance. In Eastern and Southern Africa, the earth kiln is predominant with two types generally being used – the pit kiln and the surface mound kiln (Gumbo, et al., 2013). In Zambia, as noted by Hibajene

and Kalumiana (1994) and basically all charcoal is produced using the earth mound method. The most common traditional kilns are rectangular in shape ranging in size from $5m^3$ to over $80m^3$ (Hibajene & Kalumiana, 1994). What determines the size of the kiln is the availability of wood and labour.

The earth kiln method is however wasteful and inefficient due to its low conversion efficiencies. Efficiencies vary between kilns, which although similar in design can differ in terms of size and performance as patterns of stacking wood in the kiln, species used, stem size, wood moisture content, climatic conditions and the level of experience of producers affect efficiency (Mugo & Ong, 2006). Kiln efficiency is defined as the mass of charcoal that a producer obtains from a kiln expressed as a percentage of the mass of wood initially put in the kiln (Hibajene & Kalumiana, 1994). For most traditional kilns, only 35 percent of available wood carbon is fixed into charcoal with the rest being released into the atmosphere as smoke and non – condensed gases such as carbon dioxide, carbon monoxide, methane and others (Gumbo, et al., 2013). An average of 10 tonnes of air-dried wood is required to produce 1 tonne of charcoal in the earth kiln making the conversation efficiency about 10 – 12 percent (FAO, 2017; Luwaya, 2015; Hibajene & Kalumiana, 1994; Schure, et al., 2013) although efficiencies of upto 20 percent have been recorded (Njenga , et al., 2013). Further, losses are made during handling and packing as some charcoal pieces are too small to be sold and are left at the production site. Hibajene and Kalumiana (1994) estimated that 3 percent of the charcoal produced is left at the kiln and Gumbo et al (2013), estimated that about 20 percent of the charcoal produced is lost during handling at various stages of the value chain. As such, recovery of charcoal by-products could significantly contribute to the overall profitability while helping conserve trees (Mugo & Ong, 2006).

The adoption levels of charcoal production techniques of higher efficiency such as the casamance, stand-alone brick kilns and metal kilns have been very low. One of the main reasons for this is that these other kilns require capital for power tools for cutting and haulage while the traditional ones do not (Ellegard, et al., 2003; FAO, 2017).

Charcoal is produced in rural regions and transported to urban areas through an intricate chain of traders and transporters. Charcoal is mostly transported from production areas to redistribution points, roadside markets and bigger towns using

wheelbarrows, bicycles, oxcarts, pick-up vehicles and trucks. Increasingly larger forms of transport (10 – 30 tonne trucks) have been observed to be moving charcoal (Gumbo, et al., 2013).

Charcoal is available for sale in almost all parts of Zambia with markets present at local, district and national levels. Roadside markets exist in tiny clusters or near trading centres with some having been in existence for 20 years or more and are linked to individuals, families and groups (Gumbo, et al., 2013). It is sold in bags ranging from ‘‘10kg’’ to ‘‘90kg’’ in weight and sometimes repackaged into smaller bags. The size of the bag does not however necessarily represent the weight of the charcoal it contains as according to Ministry of Energy reports, charcoal in a 90 kg bag can weigh as low as 66 kg (GRZ, Unpublished). This is because weights vary according to tree species as *Brachystegia* and *Julbernadia* species for example tend to weigh less than *Colophospermum mopane* species (Hibajene & Kalumiana, 1994).

It may also be noted that seasonality affects both the production and marketing of charcoal with more charcoal being traded during winter than rainy months. Charcoal production in Zambia mostly takes place during the dry season as the conditions are best for charcoal production (less kiln losses through humidity or rain) and there are less agriculture activities. Further, there is more demand for charcoal during the cold season which may be attributed to the need for space heating in the cold season (Ellegard, et al., 2003) thus leading to increased production. In addition, during the rainy season when conditions are less favourable and seasonal producers are engaged in agricultural activities, there is reduced supply of charcoal which results in increased prices (Ellegard, et al., 2003).

Charcoal trade contributes significantly to household income generation through small scale retail businesses. Gumbo et. al. (2013) estimate that individual charcoal producers can earn between USD 3, 000 and USD 9, 000 per annum. Charcoal is a common means of gaining capital while clearing land for agriculture as trees cleared for agriculture are utilised for charcoal production and monies gained used to purchase farming implements (Ellegard, et al., 2003). At national level, estimates of the contribution of charcoal to the Gross Domestic Product (GDP) range from 2.2 percent (GRZ, 2005) to 3.7 percent (Gumbo, et al., 2013).

It is also of importance to note that charcoal trade is not restricted within Zambian boarders as informal trade and smuggling have been observed by various researchers. For example, Gumbo et. al. (2013), state that although statistics of the actual amounts of charcoal leaving the country were not available, charcoal was moved out of the country illegally. They further observed that despite export bans been imposed, 1 - 3 bags of charcoal on haulage trucks and other vehicles cross the border citing reasons that the charcoal was for domestic use. At Kasumbalesa and Chirundu borders for example, they noted that a daily average of 600 and 225 cars and trucks respectively cross the border carrying 1-3 bags of charcoal. There is thus need for further studies to quantify the actual charcoal leaving the country at Zambian borders and establish control mechanisms.

The last part of the charcoal value chain is that of consumption. Most of the charcoal produced in Zambia is used in the traditional brazier (*mbaula*) for domestic energy requirements. These cookstoves have low inefficiencies of 10 – 15 percent (Luwaya, 2015; Raman, et al., 2013) due to their design. The overall efficiency of a cookstove in this regard is defined as the ratio of useful heat input to the pot to the energy potential of the fuel burned (FAO, 2017). According to Ellegard, et al. (2003), it has proven relatively difficult to introduce cookstoves of higher efficiciency (improved cookstoves) as shown in a study conducted in Lusaka, Maputo and Dar es Salaam where adoption levels were very low with the exception of Dar es Salaam where adoption was about 40 percent. Reasons for the low adoption include: higher initial costs of shifting from the traditional cookstoves and the fact that improved cookstoves have a lower lifespan than the standard ones (Ellegard, et al., 2003).

Further to the efficient cookstoves, there are various alternative fuels to charcoal available in Zambia which include; gel fuel, briquettes, biogas and Liquefied Petroleum Gas (LPG). Below are detailed descriptions of some of the commonly available alternative fuels in Zambia and Sub-Saharan Africa:

1. Ethanol and Gelfuel: Ethanol is produced by fermenting the sugars in various types of biomass feedstock. The National Energy Policy (GRZ, 2019) describes gel fuel simply as an energy source obtained from sugar molasses (thickened ethanol). However, it can also be produced from starches if they are first converted into sugars. The resulting mixture is then distilled to yield a

high concentration of ethanol. There are a wide range of crops that can be used as feedstock, including sugarcane, cassava, sweet sorghum, maize and wheat (Schlag & Zuzarte, 2008). Ethanol can be burned directly in specialised stoves but is utilised more in the form of gel fuel which has a much higher viscosity, making it easier to handle and a safer alternative. Gel fuel works similarly with kerosene and can be an alternative not only to charcoal but kerosene (paraffin) stoves which have high Green House Gas emissions (Schlag & Zuzarte, 2008).

2. Charcoal briquettes: Briquettes are small fuel bricks made from compressed material, often from agriculture residues, saw dust, waste paper, etc. and provide an ideal sustainable alternative to conventional charcoal (GRZ, 2008; World Future Council, 2015). Briquetting technique allows the conversion of biomass residue into uniformly shaped blocks (briquettes) of charcoal that are easy to use, transport and store. The idea of waste briquetting is to use materials that are otherwise useless due to lack of density by compressing them into a solid fuel of convenient shape that can be burned like wood or charcoal. The briquettes have better physical strength and combustion properties than the initial waste. Briquettes can be used in combination with efficient cookstoves in households without requiring significant change to existing cooking practice. The raw material for briquette making varies greatly and depends on what is available locally. According to the National Energy Policy (2019), briquettes made from cow dung, coal and other agricultural residues have the potential to meet domestic energy needs in Zambia.
3. Biogas: Biogas is a clean cooking fuel that is produced through the anaerobic digestion of various organic wastes; the most commonly used feedstock being animal waste (Schlag & Zuzarte, 2008). The digestion process, which takes place in sealed airless containers called digesters, produces a mixture of methane (50-70 percent) and carbon dioxide gases from which the carbon dioxide can be separated to further increase the energy density of the gas. With a high total energy efficiency on combustion of nearly 60 percent, biogas is well suited to household cooking (Smith et al. 2000) and one of its advantages is its feasibility in rural areas where it offers the potential for sustainable development projects. The scale of digesters can vary to suit the energy needs of a household or small community, as the only inputs required are water and organic waste.

4. Liquefied Petroleum Gas (LPG): LPG is a mixture of propane and butane. Despite being a fossil fuel, LPG is considered to be clean because it can be burned very efficiently and emits few pollutants (Schlag & Zuzarte, 2008). Its use as a cooking fuel in Africa varies significantly across national borders and is highly dependent on government policy (Schlag & Zuzarte, 2008). For example, Schlag and Zuzarte (2008), state that the consumption of LPG in Africa is highly concentrated in North African countries (oil producing countries) although some countries such as Senegal have made head way in that it provides 37 percent of its household energy. The fuel has a high energy density and a total energy efficiency of between 45 percent and 60 percent (Bailis 2004).

In Zambia, the uptake of alternative energy sources to charcoal such as LPG, briquettes and others as outlined above have been very low and charcoal remains he main energy source at household level (GRZ, 2015 and 2019). Ibrahim (2003), as quoted by Mugo and Ong (2006) noted that charcoal has unique cooking properties that make it preferable even when other fuels are available as demonstrated in Sudan, where the price of LPG fell to a third that of charcoal but many homes still used charcoal. This suggests that other factors were at play that made migrating from charcoal to cleaner alternatives low and as such, interventions regarding charcoal utilisation need to address the underlying causes behind the high use.

It is thus clear from literature that charcoal is indeed an integral part of the livelihoods of people not only in Zambia but most of Sub Saharan Africa. However, it is not without issues as it is associated with a wide range of negative environmental impacts.

2.3 Environmental and health impacts of charcoal production and use

2.3.1 Environmental Impacts of charcoal production and use

Charcoal is mainly obtained from *Miombo* woodlands which are the most extensive of Zambian woodlands (GRZ, 2013; GRZ and FAO, 2016). The use of forests and woodlands for charcoal production has several ecological implications. Initially, there is a depletion of mature woodlands and trees favoured for charcoal production and as these species grow scarce, less favoured trees are used and when no mature trees

remain, charcoal production can no longer be sustained in an area. The fate of the area at that point then depends on external factors. If population has increased in the area, some of the previous woodland will be used for cultivation. If the cultivation is of a shifting nature, the land will be abandoned after a period of time and left to regenerate. If the cultivation is of a permanent nature however, then the land remains cleared indefinitely (Ellegard, et al., 2003).

Charcoal production has been identified as one of the leading drivers of deforestation in Zambia (GRZ, 2013; Gumbo, et al., 2013). However, the calculations of the actual contribution of charcoal production to deforestation varies among different scholars. For example, 12 percent of woodland clearing in 1990 was attributed to woodfuel production (World Bank, 1990) while in 1994, it was 28 percent i.e. 56, 000 hectares out of the country total of 200, 000 hectares (Hibajene & Kalumiana, 1994). Later estimates range from 4.5 – 19 percent (GRZ, 2013; 2014) i.e. upto 57, 000 hectares out of the 300, 000 hectares of forest loss.

Scholars posit that charcoal production areas have strong regenerative potential and environmental degradation can be reversed if proper management practices are employed (Chidumayo , et al., 1996). This is on account of *Miombo* trees having the capability to coppice and re-establish themselves within relatively short periods (Chidumayo, 1993). With improved management, their regenerative capacity is sufficient to withstand degradation caused by charcoal production (Ellegard, et al., 2003; Hibajene & Kalumiana, 1994; Chidumayo , et al., 1996).

Researchers thus advance that charcoal production in *Miombo* woodlands can be sustainable in the presence of robust production and/or management strategies. It is in the absence of these systems that charcoal production has significant impacts on forests. For example, Gumbo, et. al (2013) found that in the Eastern Province of Zambia, charcoal was being produced practically wherever suitable trees occurred including stream banks and hillsides. As such, tree species were generally depleted from roadsides, outwards into forests. Severe charcoal feedstock shortages were thus being experienced as less preferred species such as *Uapaka kirkiana* and *Piliostigma thonningii* were more often used to produce charcoal.

Charcoal production has also been linked to climate change due to the loss of carbon sinks and Green House Gas (GHG) emissions during production and utilisation (GRZ,

2014). In 1990, 1.8 million tons out of the country's 33.5 million tons of carbon dioxide emissions were attributed to charcoal (Hibajene & Kalumiana, 1994). Under the country's communications to the United Nations Framework Convention (UNFCCC), emissions from charcoal production and use are considered as a part of Land Use, Land Use Change and Forestry Emissions and also under total emissions from the energy sector. As such, actual emission levels from charcoal production currently are not well articulated as they are lumped with other activities.

Other effects of charcoal production on the environment include fragmentation of wildlife habitats although Hibajene & Kalumiana (1994) noted that current production areas have small numbers of wild animals so this impact is generally minimal in Zambia. They further noted that vegetation, wildlife and water use were not directly affected by the use of charcoal for energy while the nutrient status of the soil increased at the disposal sites.

2.3.2 Health impacts of charcoal production and use

The burning of charcoal does not convert all fuel carbon into carbon dioxide and water and the smoke produced poses a considerable health risk, especially indoors. According to the World Health Organisation (WHO, 2006), more than three billion people still burn wood, dung, coal and other traditional fuels inside their homes. The resulting indoor air pollution is responsible for more than 1.6 million deaths a year – mostly of young children and their mothers while millions more suffer with difficulty in breathing, stinging eyes and chronic respiratory disease (WHO, 2006).

At the production stage, charcoal producers are exposed to gases, smoke and heat from the kilns. As the cellulose, hemicellulose and lignin component of the trees break down, volatiles which consist of carbon monoxide, hydrogen, pyrolysis oils, tars, acetic acid and methanol are released (Hibajene & Kalumiana, 1994). Some of the gases produced, namely carbon monoxide, as well as some oils and acids pose great risks to the producer and have been linked to diseases such as cancers, acute lower respiratory disease, chronic obstructive pulmonary disease and other diseases (WHO, 2006). Further, Hibajene and Kalumiana (1994) indicated that charcoal producers often suffer from burns due to lack of protective clothing and also general body pains due to the strenuous nature of the work.

At the consumption level, studies indicate that households using charcoal stoves typically have particulate matter (PM10) concentrations of about 500 micrograms per cubic metre (m^3) and households using wood in open fires have PM10 concentrations of more than 3, 000 micrograms per cubic metre (Bailis *et al*., 2004 as quoted by WHO, 2006). As is the case with charcoal production, exposure to these substances as well as the carbon monoxide can lead to diseases.

The environmental and health impacts of charcoal effects are well recognised in the country's policies and laws whose provisions aim at sustainably managing the sector for the benefit the citizens in terms of income and energy provision as well as reducing the environmental and health impacts.

2.4 Governance of the charcoal value chain

Governance is defined by Toksoz (2008) as the political, economic and administrative power that societies use to administer their activities. It involves mechanisms, processes and institutions that citizens and societies utilise in joint decision making and implementation, in expressing their interest and in fulfilling their obligations and solving conflicts. It thus points to the nature of mutual interaction among social actors as well as public administration. This study applied Toksoz's definition with particular emphasis on institutions and the power relations between the actors.

2.4.1 Governance Systems of the Charcoal Value Chain

Different systems for governing the charcoal value chain have been observed across Africa. They are all mostly embedded in the forestry governance systems (Khennas, et al., 2013). They include Central Regulation, Decentralisation and a combination of the two.

Central Regulation has been the predominant system in managing the charcoal and wood energy sectors in Eastern and Southern Africa (Khennas, et al., 2013). For example, in Zambia charcoal is covered under Casual Licence, a permit issued for domestic use of forest produce. The permit is obtained from the District Forest office in the area of production upon payment of production and conveyance licences. In countries such as Mozambique, the legislation further specify trees that can be used for charcoal (Khennas, et al., 2013) while in Sudan there is a regulatory system for

planting and harvesting trees for charcoal production. Other countries however neither plant trees nor give land owners incentives to do so. (Mugo & Ong, 2006).

Extreme cases of central regulation include banning charcoal which has been tried in countries such as Gambia, Tanzania and Chad. However, this has proved not to be optimum as seen in Gambia where users started importing charcoal from neighbouring Senegal, while in Chad, the ban led to a sharp increase in prices and a proliferation of black markets for the commodity. In Tanzania, the ban was reversed after two weeks (Khennas, et al., 2013; Mugo & Ong, 2006).

When applied methodically, central regulation has recorded successes in some countries such as Sudan where charcoal (and woodfuel in general) is recognised as an important source of energy and as detailed by Mugo & Ong (2006) and Khennas, et al. (2013) the charcoal value chain in Sudan is formalised with a specific body responsible for its governance. Further, charcoal producer associations have been formed which have signed agreements with the government to sustainably produce charcoal under provided guidelines.

A combination of central regulation and decentralisation in which resource users play a major role in the management of their resources also exist. The aim of decentralised mechanisms is to address problems associated with charcoal production and the overall use of forest resources and include Participatory Forest Management (PFM) which has been tried in Kenya, Tanzania, Niger, Mali and Senegal (Khennas, et al., 2013). PFM aims at increasing the rights of the local communities when it comes to managing and using the forests and areas around them.

Regulations involving traditional leaders and local communities also play a big role as traditionally, forest resources have been managed by traditional leadership for the benefit of their subjects through environmental religious sanctions. These include taboos on cutting fruit trees and restrictions on use of certain tree species (EFZ, 2012). In this way several types of traditional forest reserves are distinguished and preserved, each having a specific function for which it is protected such as protecting valuable resources like water springs (EFZ, 2012).

2.4.2 Actors and Institutions in the charcoal value chain

This study draws on the definition of institutions used by Schure, et al. (2014) as being formal rules, informal constraints (norms of behaviour, conventions and self - imposed codes of conduct) and the enforcement of the characterisation of both carried out by first, second and third parties in the form of self – imposed codes, retribution, social or legal sanctions. Further, Leach et. al. as quoted by Schure et. al. (2014), consider institutions as the formal and regularised patterns of behaviour that emerge from underlying structures or sets of rules in use. Using the two definitions above, this study defines charcoal institutions as the formal and informal rules and regularised patterns of behaviour between different actors in society and associated enforcement mechanisms of the charcoal value chain.

In Zambia, regulations controlling the charcoal value chain are not promulgated by a single institution. Charcoal production and trade involve a diverse range of actors whose involvement is guided by the National Forestry Policy and legal regulations (Gumbo, et al., 2013). Informal institutions include conventions of resource users e.g. the views of politicians and society towards their roles (Mwitwa & Makamo, 2012).

The first organised forest management in Zambia was first recorded in Western Province around 1932 when the Barotse Forest Services was introduced (EFZ, 2012). Under this system, natural resources were vested in the traditional leadership on behalf of the local people. Some of the provisions under this system included protection of fruit and protected trees in forest reserves, gardens and open areas, issuing permits for felling protected trees. Forest Indunas (equivalent to modern day forest guards) played an active role in management. Proceeds from the forests were used to pay the forest indunas and for community projects (EFZ, 2012).

Zambia's forestry policy dates back to the colonial demarcation of local and national forestry reserves in the 1940's with the first formal policy being developed in 1949 (Gumbo, et al., 2013). Focussing on commercial production of timber and charcoal, the policies gave central government overall control over forest reserves. However, much of the forest activities omitted open areas comprising of 66.4 percent of forests falling under customary law which contained high value timber and were important sources of charcoal (Gumbo, et al., 2013).

This was followed by the Forest Ordinance of 1965 which imposed restrictions on harvesting of forest produce in forest reserves and the protection of forest areas. A license had to be obtained for harvesting and removal of any forest produce declared under the ordinance. It also provided for empowerment of local communities and councils to issue orders for the management of forests and licenses for exploitation of forest produce. In 1965 a new forest policy that was slightly more robust than the 1949 policy was formulated and implemented (EFZ, 2012).

Under the systems above, Gumbo et al., (2013) note that before the 1990's, charcoal production in Zambia was effectively regulated with production areas properly managed to promote natural regeneration. For example, woodland areas on the Copperbelt province were completely regenerated and harvested over rotational periods of 20 – 25 years. It has however been noted that regulation of charcoal production has continually declined since the 1990's and that this may be attributed to changes such as the abolishment of the position of Forest Guards that have occurred in the administration of the country's forests (Ellegard, et al., 2003). Further, the Forestry Department often lacks resources and logistics to monitor and inspect production sites leading to charcoal producers exploiting this limited presence of forestry officers in forests to produce charcoal illegally (Gumbo, et al., 2013).

Various scholars further note that the use of licences to regulate charcoal production has not been very effective due to the aforementioned ineffective monitoring of production sites and various legislative gaps. Mwitwa & Makamo (2012), note that when licence fees were increased, many charcoal producers and traders stopped paying for them, preferring to transport charcoal during the night, early morning or weekends when road blocks were not operational. Further, monies collected for licences are not utilised within the collecting district but remitted to central government (EFZ, 2012) and as such, licensing has ceased to perform its control function and now only serves the purpose of revenue collection for central government.

At the stage of wood resource production, ideally, traditional rulers need to be consulted before producing charcoal in their areas according to Gumbo, et al. (2013), who further note that some traditional leaders actually prohibit charcoal production in their areas but their control is sometimes limited as they are not backed by any legal

instruments to do so. In Eastern Province for example, they found that traditional rules controlling access to and use of trees had generally broken down and traditional leaders faced a dilemma in that they could not stop their subjects from engaging in charcoal production when there were few alternatives for generating income.

From the 1960's to the late 1990's, the Forestry Department implemented sustainable charcoal production through the coupe system based on the technique of alternating charcoal production areas. After the use of the coupe system declined with the abolition of the position of Forests Guards in 1997, rampant uncontrolled charcoal production in undesignated areas followed, resulting in significant forest loss (Gumbo, et al., 2013). To minimise such losses, the 1998 Forestry Policy provided for development and implementation of sustainable extraction and use of woodfuel by encouraging the use of plantation species in charcoal production, improving efficiency of technologies as well as use of alternative energy.

The 2014 National Forestry Policy recognises the importance of charcoal both as a source of energy and income for the rural, peri-urban and urban populations. It also recognises the need for sustainable charcoal production to reduce deforestation. The Policy encourages Participatory Forest Management (PFM) anchored on the active participation of local communities, traditional institutions, private sector and other stakeholders in the management and utilisation of forest resources (GRZ, 2014).

From literature, it is thus clear that charcoal is a very important fuel in Zambia and is likely to remain so into the future. Literature further shows that although the charcoal value chain poses some environmental challenges, it can be sustainable as noted by Malimbwi, et al (2001) who argue that if natural woodlands are harvested and not cultivated for agriculture, they can regenerate. This suggests that population control, change in land tenure, increased employment and appropriate woodland management strategies can reduce woodland degradation and deforestation while planned commercial growing of trees for charcoal production can supply energy and create employment. However, changes must be implemented systematically as drastic changes in the charcoal value chain most often affect the poor people. As illustrated by Ellegard, et al., (2003), too quick and sweeping changes are likely to cause great hardship for many poor people as was experienced in 1994 in Zambia where road blocks were manned for 24 hours over a period of two weeks restricting movement of

charcoal into the urban areas. The effect was an immediate increase in charcoal prices in the urban markets and nothing else.

Lessons from countries such as Sudan and Ghana show that the charcoal industry can be sustainable, providing the much needed energy and income to people and also contributing to countries' GDP. The challenge thus lies in improving the sustainability of woodfuel right across the value chain based on Zambia's specific needs and understanding the best governance structures for this purpose.

2.5 Research gaps

Following the literature review, the following were the main research gaps identified:

i. Research on the charcoal value chain is concentrated on the technical aspects of charcoal production and utilisation e.g. development of efficient kilns and cookstoves, as well as the impact of charcoal production on the environment. There were very few local level studies investigating in depth the reasons as to why these technologies were not being adopted in Zambia.

ii. In Zambia, there exists Policies and Laws (Forests Act of 2015, Forests Policy of 2014, Energy Regulation Act 2019 and National Energy Policy of 2019) governing charcoal production and use. However, these laws are promulgated by various Government Departments and some of their provisions are not being enforced. Further, there is limited information on the resulting impact of these provisions on the charcoal value chain.

The study thus focussed on determining the impact of the current governance structure on the sustainability of the charcoal value chain with emphasis on the roles of the institutions and actors in the sector.

CHAPTER 3: STUDY AREA

3.1 Selection of study area

The study used secondary data to examine charcoal value chain trends at macro level while at local level, studies were conducted in Kapiri Mposhi and Lusaka districts. These areas were selected on the basis of Kapiri Mposhi and Lusaka being among the highest producers and consumers of charcoal in the country respectively (GRZ and FAO, 2016; GRZ, Unpublished). In Lusaka, the study was conducted in the following areas based on the country's household income classifications: Chalala, Chilenje South and Lilanda townships which were selected to serve as points of comparison for consumption trends in high, medium and low income areas. In Kapiri Mposhi, the study was conducted in Mukonchi area, one of the high charcoal production areas in the district. The location of the two areas in the country is shown in Figure 3.1:

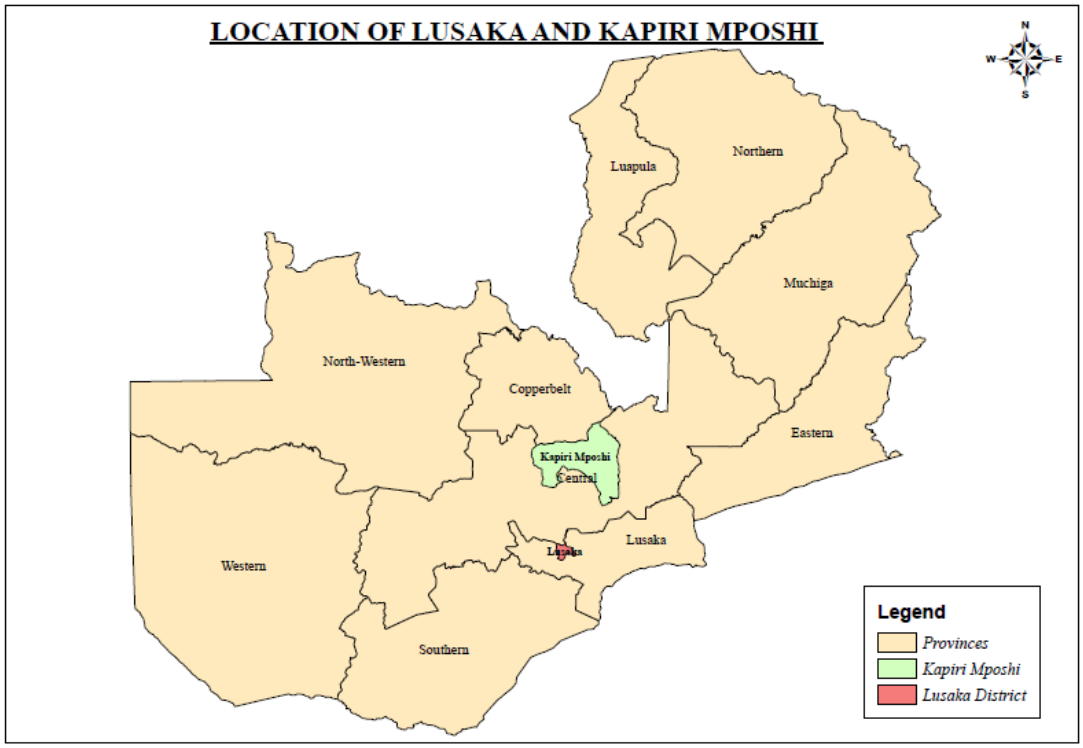

Figure 3.1: Location of Lusaka and Kapiri Mposhi in Zambia

Source: Google Maps (Adapted by author, 2019)

Detailed descriptions of these areas are as below:

3.2 Lusaka District

Lusaka's geographical location is 15°25'S and 28°17'E and has an altitude of 1, 280m above sea level (ZEMA & Lusaka City Council, 2018). It serves as both the capital city of Zambia and headquarters of Lusaka Province. It has a land area of 360km^2 and shares borders with Chibombo, Mumbwa, Chilanga and Chongwe districts.

Lusaka District is the most urbanised district in the country and has one of the highest population growth rates. The population grew from 1,084,703 in the year 2000 to 1,747,152 in the year 2010 representing a 4.9 percent growth rate. The district has a population density of 4,853.2 people per square kilometre (CSO, 2012). CSO (2012) further projected that by 2018, the population in Lusaka would be 2.4 million by 2018.

As the country's capital city, Lusaka provides administrative functions to Zambia as a whole and serves as the seat of the National Assembly, Cabinet and Government Ministries. The economy of Lusaka provides formal employment to 35 percent of the labour force while 65 percent of the city's labour force earns its livelihood from informal economic activities, which predominantly consist of small-scale non-agricultural economic activities such as metal fabrication and wood processing. Other economic activities include manufacturing, construction and food processing (ZEMA & Lusaka City Council, 2018).

Lusaka has three distinct seasons i.e. a cool dry season from April to August, a hot dry season from September to November, and a warm rainy season from November to March. The temperatures are moderate with average maximum temperature being 31.2°c in October and lowest temperature of 9.6°c in July. Being located in the country's Agro Ecological Region II, the district receives moderate rainfall of 803mm per annum on average with the highest rainfall occurring in January (GRZ, 2000).

Lilanda, Chilenje South and Woodlands Chalala townships which were the areas of focus within Lusaka conform to the above description in terms of the geographical description and weather patterns. These areas are as shown in Figure 3.2:

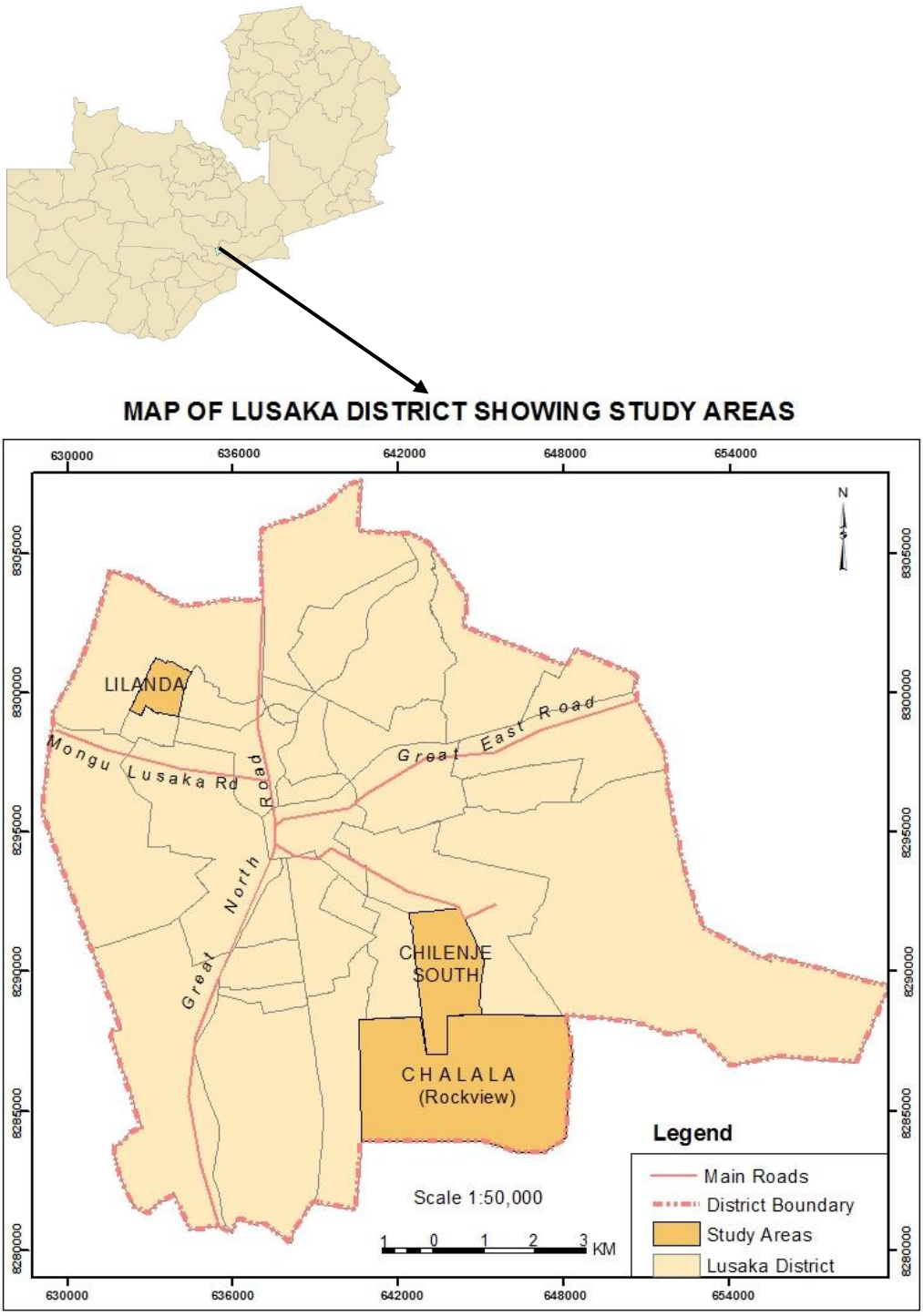

Figure 3.2: Location of study sites in Lusaka District

Source: Google Maps (Adapted by Author, 2019)

3.2.1 Lilanda Township

Lilanda Township is located in the western part of Lusaka at Latitude 15°27’ S and Longitude 28°7’’ E. The township is classified under unplanned settlements which are

compounded by high population density, high poverty levels, high unemployment and low access to basic services such as water and electricity. (Yasini, 2007; World Bank, 2002).

Although the area began as an illegal settlement, it was given legal status in 1999 (World Bank, 2002) and currently has access to social amenities such as clinics, police station and public schools. The houses are a mixture of low cost housing units to medium cost units with access to electricity and water. The area has access to public water supply from the Lusaka City Council although in some cases, this water is supplied to communal taps/water points.

The economic activities in the area include formal employment and also business ventures such as trading and carpentry among others. Lilanda thus served as a data collection point for low income areas.

3.2.2 Chilenje Township

Chilenje is located in the southern part of Lusaka city at Latitude 15°27' S and Longitude 28°20'' E. It consists of two sections of New Chilenje and Chilenje South and has an area of 10.9km^2 with a population density of 4.8 persons per square kilometre. According to CSO (2012), the population of Chilenje Ward is 52, 220 i.e. 24,367 males and 27,853 females.

New Chilenje is composed mainly of low cost houses built in the colonial era while Chilenje South consists of middle cost houses that were constructed by the local authorities, and is characterised as a middle income area according to the Zambian housing standards. The area is mainly resident to civil servants and others in formal employment. Other economic activities include trade at the local market as well as a number of upscale shopping centres.

The area has access to water and electricity as well as other social amenities such as the Chilenje Level One Hospital, public and private schools among others. The area has also seen an increase in the construction of smaller houses alongside the main houses and it is not uncommon to find two houses within the same space. Chilenje South served as a data collection point for middle income areas.

3.2.3 Chalala Township

Chalala Township is located in the southern part of Lusaka city at Latitude 15°27' S and Latitude 28°7' E. The area is a fairly recent township having previously been part of Lusaka South Forest Reserve Number 26 until it was degazetted in 1996 (ZEMA & Lusaka City Council, 2018). The area was demarcated into plots of sizes 20m*40m and consists of houses at various levels of construction which may be classified as high cost.

The area has access to water mostly through boreholes on individual houses and electricity as well as other social amenities such as public and private schools. As is the case with Chilenje South, the situation of constructing smaller houses (cottages) alongside the main houses is also common. However, there are some houses where construction has not been finished where caretakers reside. These houses do not have access to electricity and/or water in some cases. Chalala served as a data collection point for high income areas.

3.3 Kapiri Mposhi District

Data on charcoal production was collected in Mukonchi farming block of Kapiri Mposhi. Based on data collected from the Kapiri Mposhi District Forest Office, Mukonchi was purposively selected on the premise of being among the main charcoal production areas in the district. Only one site was selected in Kapiri Mposhi as charcoal production is predominantly conducted in rural areas which are not classified by income unlike the urban areas.

In terms of geographical characteristics, Mukonchi conforms to the general characteristics of Kapiri Mposhi. Kapiri Mposhi is located in Zambia's Central Province at geographical location 13°97´S and 28°66´E. It has an altitude of 1, 286m above sea level and has a land area of 17, 219 km². It shares borders with Ngabwe, Chibombo, Kabwe, Luano, Mkushi and Mpongwe districts.

The district's location along the Great North Road serves as an important point in the regional freight network. The district links to the Northern and Luapula Provinces and onward to the border with Tanzania; Copperbelt Province and onward to the border with the Democratic Republic of Congo and is also linked to Kabwe and Lusaka districts to the South. There are two railways stations, TAZARA railway station that

connects it to Dar – es – Salaam in Tanzania and Zambia Railways stations that connects it to Lusaka and Livingstone towns.

The population of the district grew from 194,752 in the year 2000 to 253,786 in the year 2010 representing a growth rate of 2.7 percent. The population density for the district is 14.7 people per square kilometre (CSO, 2012).

The major economic activity in the district is agriculture with maize, groundnuts, sweet potato, cotton and several other vegetables being the main crops. About 90 percent of the inhabitants depend on agriculture for their livelihood and most of them are smallholder farmers. In the urban areas, small-scale trade is predominant. Kapiri Mposhi is endowed with high quality sand which is a major raw material in glass or ceramic production (Xavier, et al., 2013). Charcoal production is also a big economic activity in Kapiri Mposhi. The charcoal is supplied to Kabwe and Lusaka and some Copperbelt towns. Other economic activities include manufacturing, maize milling and honey production. In addition, there is small scale mining in the Mukonchi area where manganese and cobalt are produced.

The district is situated in Agro-Ecological Region II and receives an average annual rainfall of 1, 026 mm. The daily temperatures range from 23 - 25^{o}C during the rainy season, but can reach 32^{o}C during the hot season and minimum temperature of below 10^{o}C during the cold season. There are four forest reserves in the district namely Chibwe, Kapiri Mposhi, Ipumbu and Luembe.

Mukonchi is located at Latitude 14°2’ S and Longitude 28°7’ E in Kapiri Mposhi district. The area is predominantly a rural population and the land is customary under Chief Mukonchi. As with most rural areas in Zambia, there is very low access to electricity in the area. The economic activities are primarily agricultural based consisting of small scale and large scale farmers. Other economic activities include charcoal production and small scale mining of manganese and cobalt. The area has access to public schools and health centres. Figure 3.3 shows the location of Mukonchi in Kapiri Mposhi district.

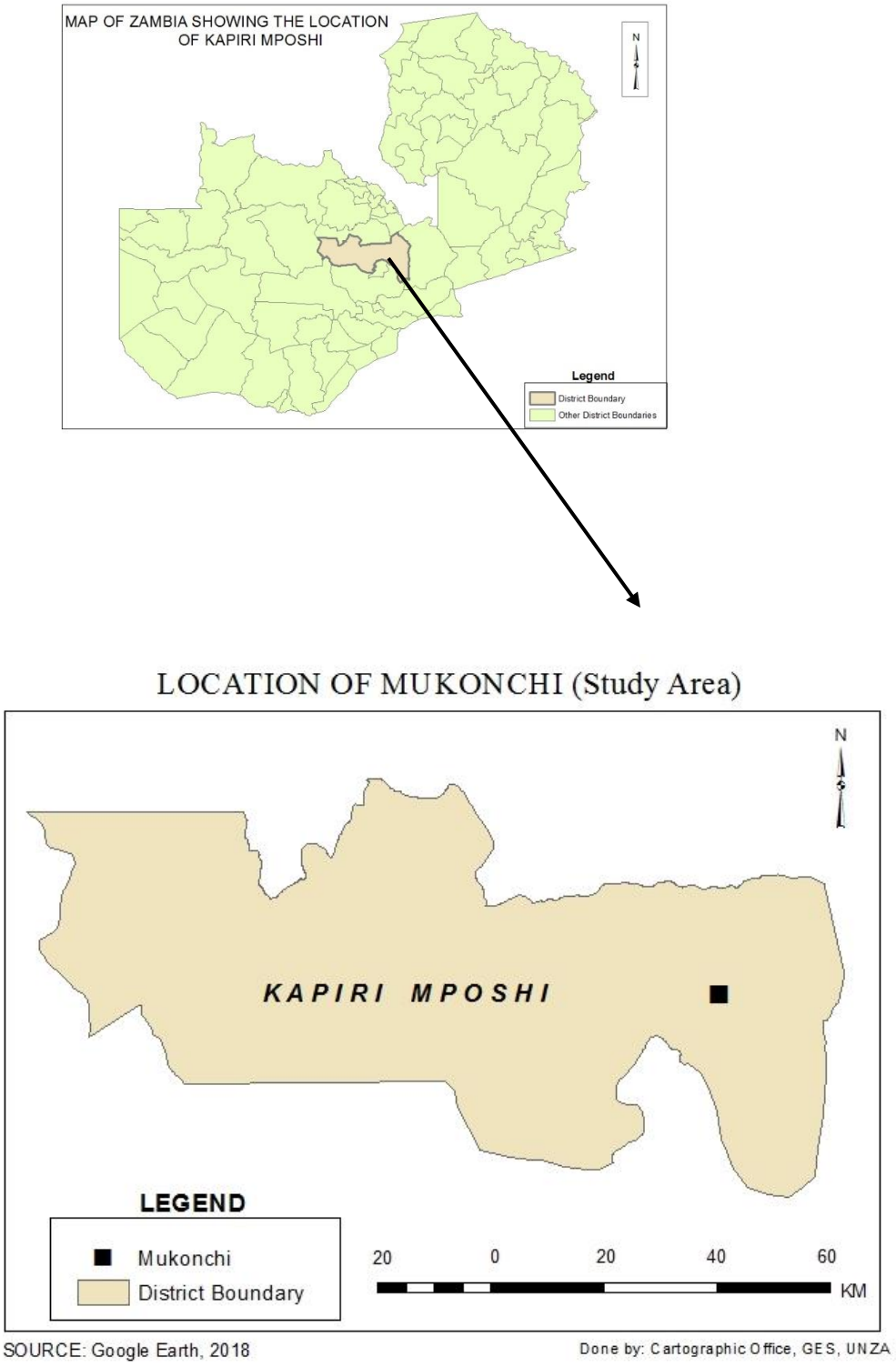

Figure 3.3: Location of Mukonchi in Kapiri Mposhi District

Source: Google earth, 2018

CHAPTER 4: METHODOLOGY

4.1 Study approach

A two level approach was used in the collection and analysis of data (i.e. macro and micro level approaches). A macro level approach sought to examine the charcoal value chain for the whole country through analysis of national level statistical data on wood energy. The micro level approach involved local level studies in Lusaka and Kapiri Mposhi districts in Lusaka and Central provinces respectively. Micro level data involved the collection of data regarding various aspects of wood energy from the two districts which were selected on the basis of Kapiri Mposhi being one of the highest charcoal production areas and Lusaka being one of the highest consumers of charcoal in the country.

The study employed the use of both secondary and primary data. Secondary data was mainly used to establish the trends in the charcoal value chain over a period of twenty years (1996 to 2015) as well as to establish the governance arrangements regarding the charcoal value chain. Primary data was collected from actors along the charcoal value chain being: charcoal producers, transporters, traders, consumers as well as other key informants such as traditional leadership, council officials and government ministries.

4.2 Methods

The study employed the following data collection methods:

4.2.1 Macro level data collection

Macro level data was collected for the purpose of getting an overview of the charcoal value chain in the country which included historic, current and projected future trends as well as the governance arrangements for the value chain.

4.2.1.1 National Documents Review

A number of documents including annual reports for government departments, government policy documents, international and local statistical publications such as the Integrated Land Use Assessment (ILUA) Report were reviewed in order to consolidate the national statistics on charcoal. To determine the governance structure of the charcoal value chain, the following Government documents were reviewed

among others: Forests Act (2015), National Forestry Policy (2014), Energy Regulation Act (1995), National Energy Policy (2008) and the Environmental Management Act (2011).

4.2.1.2 Interviews

To complement data from national documents, interviews were conducted with key players in the energy sector (Appendices 3, 4 and 6). These include the Ministry of Energy, Energy Regulation Board, Forestry Department (Headquarters and Two District Offices of Lusaka and Kapiri Mposhi), Centre for International Forest Research (CIFOR) and the Charcoal Producers Association of Zambia. In total, six interviews were conducted.

4.2.2 Local level data collection

Micro level data was collected for the purpose of establishing the current situation regarding charcoal. In this regard, two districts being Lusaka and Kapiri Mposhi, were selected to serve as case study areas on the basis of being among the highest charcoal producers (Kapiri Mposhi) and consumers (Lusaka). A Questionnaire Survey, Focus Group Discussions, Interviews and Observations were used to collect the micro level data.

4.2.2.1 Questionnaire Survey

In order to collect data on charcoal consumption, a survey was conducted in Lusaka district in three different areas based on income classifications: Chalala (High income), Chilenje South (Middle Income) and Lilanda (Low income).

Using the household as a sampling unit, the following locations were purposively selected in each of the areas above as the starting points for data collection, High Life Shopping Complex, Chilenje Market and Down Kawama Market for Chalala, Chilenje South and Lilanda Townships respectively. Using these as starting points, a questionnaire (Appendix 11) was administered at every 5^{th} house along all the roads leading from these areas until the target sample size in each area was reached.

4.2.2.2 Focus Group Discussions

For the charcoal producers, data was collected using Focus Group Discussions. According to Fusch & Ness (2015), a Focus Group is a flexible unstructured dialogue between members of a group and a facilitator that meets at a convenient location.

This data collection tool was selected due to the informal nature of the charcoal value chain that meant that there was no reliable database that could serve as a sampling frame for charcoal producers and also to ensure that they were free to discuss issues affecting them without fear of being singled out as a charcoal producer as the views would come out as group views.

The goal was to engage with charcoal producers who were actively engaged in or had previously engaged in charcoal production in Mukonchi area of Kapiri Mposhi district. The participants were recruited through the Forestry Department and the village headpersons and targeted people who were willing to be part of the discussion about the charcoal production situation in Mukonchi area and how they interacted with other actors such as the Government. A Total of 24 charcoal producers turned up for the meeting and as such, to keep the numbers manageable, two separate focus groups consisting of 12 charcoal producers each were conducted.

Further, the charcoal producers were requested to show the researcher some active charcoal kilns in the area. The following information was obtained from these sites: measurements of kiln size (using a measuring tape), estimation of kiln productivity (based on experiences and information of the producers) and observations of the status of the areas surrounding the kilns. A total of six kilns were observed in this manner over a distance of five kilometres.

The discussions were guided by the interview guide for charcoal producers (Appendix 2).

4.2.2.3 Interviews

Interviews were used for the following categories of the charcoal value chain: transporters, traders as well as Key Informants. Three different sampling techniques were used for this purpose as follows:

Snowball sampling was used to collect data from charcoal transporters. Snowball sampling is described by Bailey (1994), as a non probability sampling method that is usually employed in situations where potential participants are hard to find. In this method, one member of the target group is identified and then requested to refer the researcher to another member until the target number is reached. The study utilised this method due to the unavailability of a database to serve as a sampling frame and the fact that transporters were not stationed in one area. To this effect, two traders at Chilenje Market who also engaged in charcoal transportation were identified and interview schedules (Appendix 8) were administered to them. They further refered the researcher to other transporters who were similarly interviewed (usually as they brought charcoal to the market) over a period of two weeks.

As for traders, interviews were conducted at road side markets in Kapiri Mposhi as well as from an established trading place, Chilenje Market in Lusaka. Due to the small number of traders at both markets, the target was to interview all of them. However, not all traders were present at Chilenje Market and some were not willing to be interviewed and as such, 33 were interviewed while all 12 traders found at the site in Kapiri Mposhi were interviewed (Appendix 7).

Interviews were also used to collect data from the councils (Appendix 5), Charcoal Producers Association (based at Chawama Market) and the Marketers Association (Appendix 1) and one Village Headperson from the study area (Appendix 9).

4.2.2.4 Observations

The study further made use of observations to supplement the methods described above. According to Wagner, et al. (2012), observations are used to collect data about people, processes and cultures through the process of researchers observing the people under study within a specific research field. Further, observations help researchers to identify and guide relationships with informants, learn how people interact and how things are organised and prioritised within that setting as well as learn about what is important to the people under study (Wagner, et al., 2012).

This particular method was utilised in the study given the informal (and sometimes illegal) nature of the charcoal value chain and as such it aided the researcher to better understand and capture the context within which actors interacted and also provided a

chance to learn things that people were not willing to discuss in the interviews. Particularly, the research utilised Direct Observation approach where observations are done without the researcher engaging in the activities under study.

Observations were thus used to help map the main actors and gain overall understanding of the charcoal value chain, to obtain data on hidden practices such as transportation of charcoal at night, assessing of production methods, types of tree species used and other factors regarding charcoal production that the respondents were not forthright in bringing out. For example, in order to interview the transporters, the researcher had to be at the markets early in the morning when the transporters brought the charcoal. This gave an indication of the times of transportation. Observations were further used to triangulate and verify data findings derived from the other methods of data collection.

4.2.3 Sample size

The sample sizes for the questionnaire survey was 90 i.e. 30 from each consumer category of low, medium and high income residential areas. This was arrived at based on the arguments by Bailey (1994) and Creswell (1998) that in qualitative studies, 20 to 30 cases are sufficient to reach saturation. Data saturation is reached when there is enough information to replicate the study, when the ability to obtain new information has been attained and when further coding is no longer feasible (Fusch & Ness, 2015).

Further, according to Lasch et. al. (2010) and Onwuegbuzi et. al. (2010) as quoted by Fusch & Ness (2015), for Focus Group Discussions, it is recommended that the size of the group should be between 6 and 12 participants so that the group is small enough for all members to talk and large enough to create a diverse group.

The sample sizes are summarised in Table 4.1:

Table 4.1: Sample Sizes

SN	DESCRIPTION	SAMPLE SIZE
1.	Charcoal producers (12 from 2 Focus Group Discussions	24
2.	Charcoal transporters	30
3.	Charcoal traders (12 in Kapiri Mposhi and 33 at Chilenje Market)	45
4.	Consumers in low income area (Lilanda)	30
5.	Consumers in medium income area (Chilenje South)	30
6.	Consumers in high income area (Chalala)	30

4.2.4 Data analysis and presentation

The study relied on both qualitative and quantitative data. Analysis was guided by the Charcoal Value Chain Analytical Framework as illustrated in Figure 4.1.

The study utilised a value chain analytical approach. The value chain concept describes the full range of activities required to bring a product or service from conception, through the different phases of production, delivery to final consumers and final disposal after use (Kaplinsky & Morris, 2001). It also focusses on the actors and their relations at all levels and their networks. Based on this definition, the charcoal value chain consists of the following main elements (stages): feedstock production, wood carbonisation, transportation to markets, trade and consumption by end users. Figure 4.1 illustrates the charcoal value chain as utilised in this study based on the definition above.

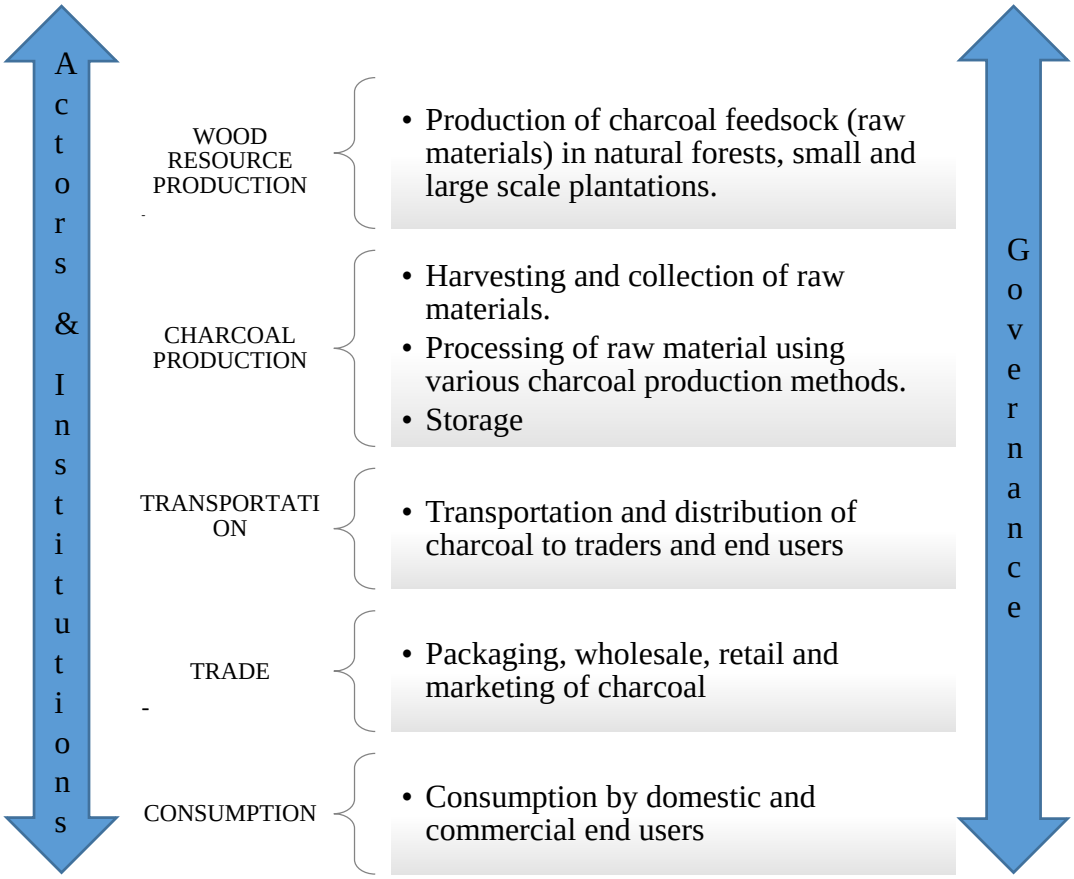

Figure 4.1: Charcoal Value Chain

Adapted from Khennas, et al. (2013) and FAO (2017)

The value chain analysis was used to characterise the charcoal sector and guided the development of the study's research questions. Further, each of the stages in the value chain was used as an analytical category. Thus, the charcoal sector in Zambia was seen through the lens of the five elements in the charcoal value chain.

Detailed descriptions of the analysis is as follows:

4.2.4.1 Questionnaires and Interviews

Data from the questionnaires and interviews was analysed using both qualitative and quantitative methods. Qualitative data was analysed using the thematic analysis method where major concepts/themes that emerged were identified.

Quantitative data was entered, coded and analysed using Statistical Package for Social Sciences (SPSS) and Microsoft Excel. This was used to calculate statistics such as Measures of Central Tendency, percentages, frequencies etc. that were then used as descriptive statistics to illustrate the findings of the study using tables, charts and graphs.

4.2.4.2 Focus Group Discussions

Data obtained from Focus Group Discussions was analysed using thematic analysis adapted from the definition of a theme given by Boyatzis (1998) and Kombo & Tromp (2006), as being a pattern found in the information that at minimum describes and organizes the possible observations and at maximum interprets aspects of the phenomenon.

The thematic analysis thus involved sorting through the transcripts, coding the distinctive themes in each discussion, comparing the themes with those found in the transcript of the other discussion and coming up analytically distinctive themes. Data was presented using quotes from participants as well as statistical data where possible.

4.2.4.3 Determination of historical trends in the charcoal value chain

1. In order to determine the charcoal production trends over a 20 year period in the country, the study relied on statistical data sets from the Ministry of Energy and the Central Statistical Office. As data was only available for the period covering 1996 to 2012, an estimated 2 percent growth rate was used for the period between 2012 and 2015 based on Ministry of Energy estimates that usage of charcoal increases by 2 percent per annum.
2. In order to determine the charcoal prices trends over a 20 year period in the country, the study relied on statistical data sets from the following publications:

   i. Energy Statistical Bulletin 1980 -1999 (GRZ, 2000)
   ii. The Energy Bulletin (GRZ, 2004)
   iii. Environmental Statistics in Zambia (CSO, 2007)
   iv. Reports on Charcoal Prices (GRZ, Unpublished)

Using the Excel Software, Measures of Central Tendency (Mean) were used to determine the annual average price of charcoal for Lusaka Province.

4.3 Limitations of the study

The woodfuel sector in Zambia is highly informal and as such, it was very difficult to access certain statistics and players such as the charcoal producers as there was no database to serve as sampling frame. Further, national level statistics were mostly unavailable or mostly outdated which made analysis of national level statistics very challenging resulting in some parts of the study relying on qualitative data when quantitative analysis would have been ideal.

CHAPTER 5: RESULTS AND DISCUSSION

5.1 Introduction

This chapter presents and discusses the results of the study focussing on both macro level and local level data on the charcoal value chain in Zambia. In this regard, the study first presents the national level perspective of the charcoal value chain before local level perspectives from Lusaka and Kapiri Mposhi districts.

5.2 Characteristics of the charcoal value chain in Zambia

The characteristics of the charcoal value chain in Zambia were examined in the context of the five stages identified in the analytical framework (Figure 4.1). These are wood resource production, charcoal production, transportation, trade and consumption.

5.2.1 Wood resource production

Based on information from key informants and analysis of Government statistical data and reports, the study shows that charcoal production is concentrated along the line of rail and roads surrounding the major urban centres of Lusaka, Central and Copperbelt Provinces. Further, North-western Province was identified as one of the new charcoal production hotspots due to the mining and industrial activities taking place there. From the results, the main charcoal production areas in the country were identified as Kapiri Mposhi and Mumbwa districts in Central Province, Rufunsa and Chongwe/Manyika areas of Lusaka Province, Masaiti, Mpongwe and Chingola districts of Copperbelt Province, Mulobezi District of Western Province (supplying Livingstone) and Solwezi Districts of North Western Province as shown in Figure 5.1:

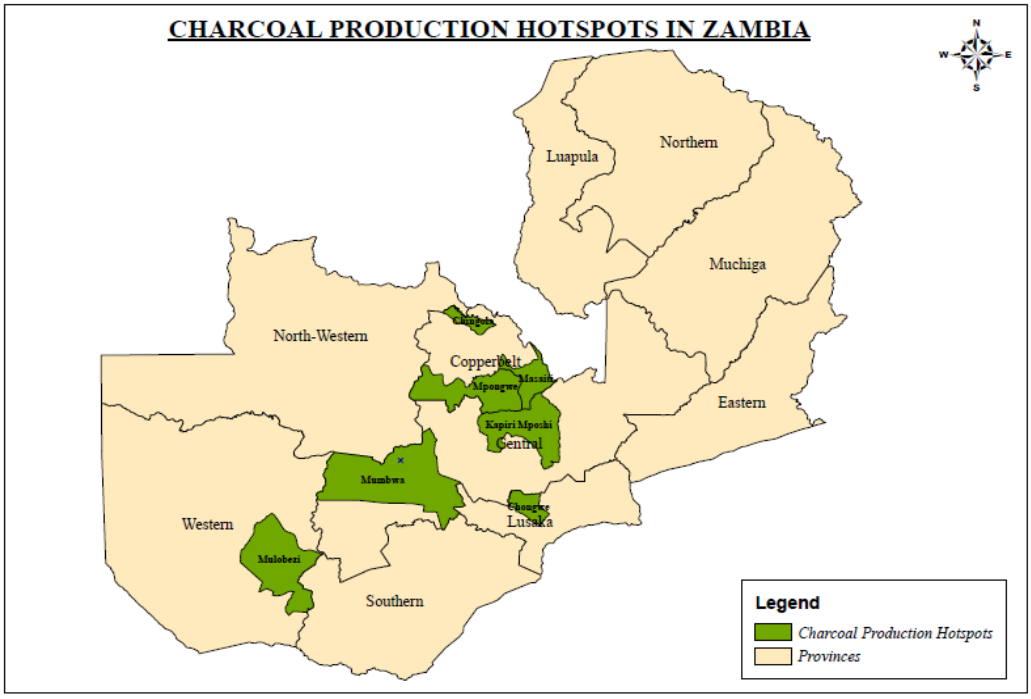

Figure 5.1: Charcoal production hotspots in Zambia

Source: Google Maps 2018 (adapted by Author, 2019)

From Figure 5.1, it can be seen that these production areas are mostly located near the big towns where the demand for charcoal is highest although the study found charcoal on the Lusaka markets that was sourced from places as far as Chingola and Kaoma. Further, within these production areas, charcoal was produced near the main roads targeting motorists.

As for harvesting methods, the study found that there was mostly clear felling of wood. Another harvesting method that had previously been employed in the country is that of the coupe system. The Forests Act of 2015, Part 1 (Preliminary) defines a coupe as any site or area for the cutting, felling or taking of forest produce, whether the boundaries of the area are demarcated on the ground or not. The Act further goes on to state, under Part VI, Section 56 Subsection 1 (d) that a licence or permit shall not, unless a contrary intention is expressly stated on the licence or permit, grant any exclusive right or confer on the licensee or permit holder any right to compensation for that any damage to, or loss of, any forest produce before its removal from the licence or permit area or coupe; and under Part X (Offences and Penalties) Section 85

that an authorised officer who wilfully or negligently permits the removal of unmarked produce from a coupe commits an offence. There were no other provisions for the coupe system in the Act and the study found no evidence of it being implemented in areas under study.

5.2.2 Charcoal production

In trying to determine the charcoal production trends in the country, the study relied on historical statistical data sets from the Ministry of Energy and Water Development covering the period between 1996 and 2012. However, this data was inadequate for the period after 2012 and as such the study estimated production trends for the period between 2012 and 2015 based on estimated 2 percent growth rate. In 2007, the Ministry of Energy and Water Development projected that in the absence of major policy shifts, this would be the expected growth rate of charcoal production. Based on these estimates, Figure 5.2 presents the charcoal production trends between 1996 and 2015.

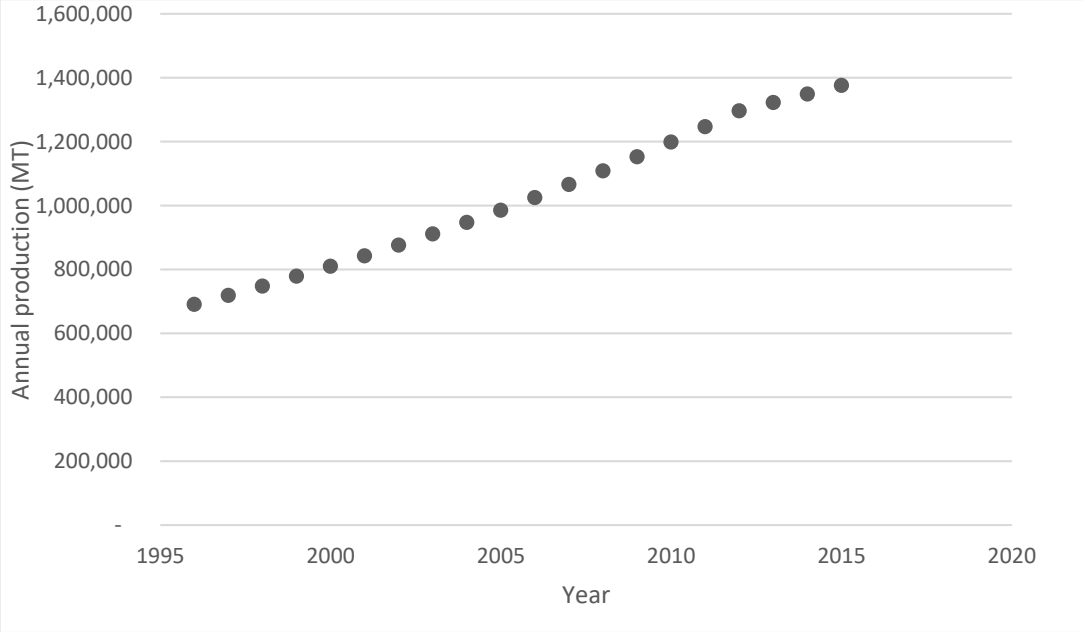

Figure 5.2: National Charcoal production trends (MT) 1996 – 2015
Source: Author, based on MEWD (2007) and PFAP (1996).

This upward trend of charcoal production is a source of concern due to its detrimental effects on the forests. For example, it is estimated that a tonne of charcoal produced translates into the removal of 0.1 hectares (1, 000m^2) of forest cover ((Karekezi,

2001). By these estimates, the current estimated charcoal production levels of 1, 180, 000 tonnes (as at 2015) results in approximately 128, 000 hectares loss of forests per annum. Further, according to Njenga , et al., (2013), 1 tonne of charcoal produced and consumed generates 9 tonnes of carbon dioxide emissions which would imply that the carbon dioxide emitted from charcoal in Zambia in 2015 was approximately 10.62 million tonnes.

5.2.3 Transportation

Various modes of transportation were found being used for transporting charcoal from the production sites to the trading and final consumption points. Depending on the distance, these include bicycles and motor vehicles. Further, the study found that bigger trucks were increasingly being utilised for transportation (Figure 5.3) and this may be attributed to the fact that demand for charcoal was increasing and as such, it had to be transported in bulk. Further, as charcoal production sites were getting further from the roads, it necessitated the need for bigger vehicles to cover the larger distances. Interviews with transporters revealed that on the most part, the owners of these trucks did not produce nor sell charcoal on a retail basis and were mostly engaged in other forms of employment.

Figure 5.3: Truck transporting charcoal in Kapiri Mposhi district

Source: Author, 2018

5.2.4 Charcoal Trade

As for charcoal trade, this consists of wholesale and retail trade. Wholesale trade occurs mostly at the point of production and in urban markets where it is sold in bulk. For example, wholesale trade of charcoal may be found at markets such as Chawama and Mandevu in Lusaka district. Retail trade is conducted at market places where the charcoal is often repackaged into smaller packages such as the ones shown in Figure 5.4.

Figure 5.4: Charcoal trade at a market
Source: Author, 2018

Unlike other energy sources such as electricity and petroleum, the price of charcoal is not regulated and is market driven. The study found that charcoal prices have been steadily increasing as illustrated in Figure 5.4. The charcoal prices were highest in Lusaka and Copperbelt provinces where demand was highest. Fluctuations in charcoal prices were further observed to be seasonal as they tend to be higher in the cold season when the demand is highest and in the rainy seasons when the supply is low. However, some scholars note that over the years, charcoal prices do not increase in real terms, although inflation causes current prices to increase (Ellegard, et al., 2003). The mean prices of a 90 kilogram bag of charcoal for Lusaka provinces for the years 1996 to 2015 are as shown in Figure 5.5 (Refer to Section 4.2.4.3).

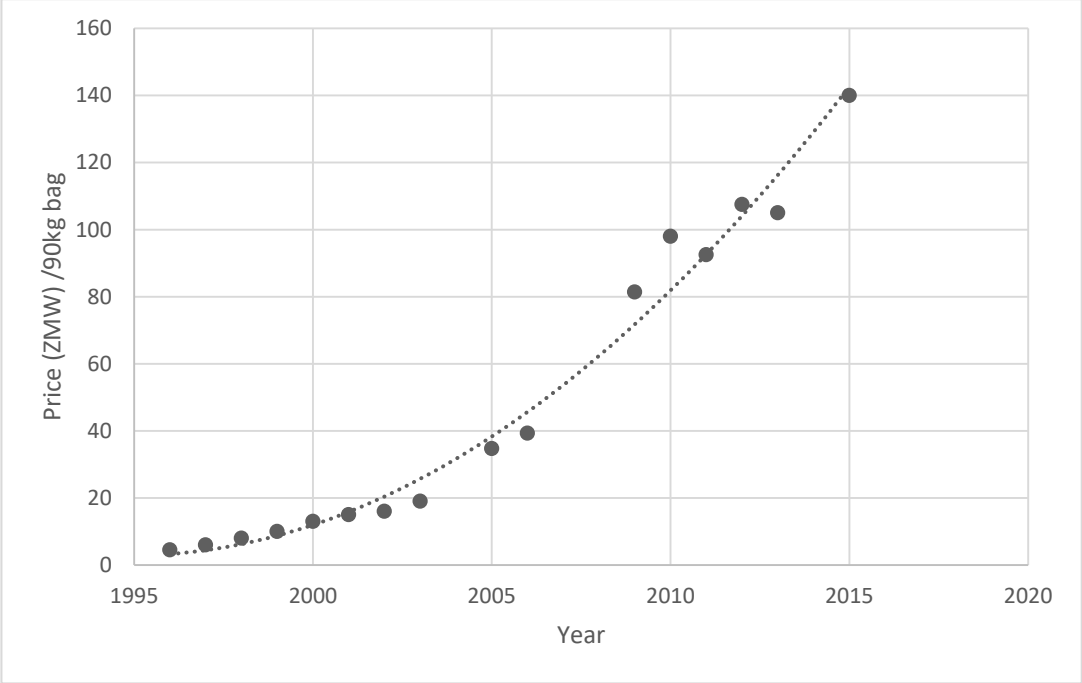

Figure 5.5: Prices of a 90 kg bag of charcoal in Lusaka district (1996 – 2015)
Source: Author, based on MEWD (2007 and unpublished)

As can be seen from Figure 5.5, the prices of charcoal have been increasing steadily since 1995.

5.2.5 Consumption

The CSO (2016), estimates that 51.4 percent of urban dwellers nationwide use charcoal for cooking and low and middle-income groups have been identified as the most likely to use charcoal. According to the Ministry of Energy, the dominant consumption methods include the use of traditional cookstoves known as *mbaula* such as the one shown in Figure 5.6.

Figure 5.6: Traditional cookstove (mbaula)

Source: Author, 2018

As noted earlier, charcoal production and consumption in Zambia have been steadily increasing over the years. As statistics on charcoal are not readily available due mostly to the informal nature of the charcoal value chain, most calculations regarding the use of charcoal are done by estimating the average daily consumption for households and extrapolating national figures from that. CSO (2016) estimated that in urban areas, 59.1 percent of the population used charcoal for cooking while 34.5 percent and 6 percent used electricity and firewood respectively.

The study found that although there were alternative fuels and technologies to charcoal such as Liquefied Petroleum Gas (LPG), biogas, gel fuel, briquettes and associated equipment like improved cookstoves which use less or no charcoal, there was very little use of these alternatives in the country. Based on interviews with the Ministry of Energy, the study further found that activities promoting the use of improved cookstoves had been ongoing at a national level as far back as the 1980s but the uptake had been very low (less than 5 percent). Reasons for this included charcoal being

cheaper and more readily available than the alternatives, high initial costs of purchasing efficient equipment like improved cookstoves, low access to electricity and perceived high electricity tariffs.

The study found that although there were designated markets where charcoal trade could be conducted, charcoal was sold in other areas such as roadsides and households in the communities where it was repacked into smaller packages such as plastic bags making charcoal more accessible than any other energy source.

5.3 The charcoal value chain – Local level view

5.3.1 Wood resource production

Charcoal producers indicated that charcoal is mostly produced from the local forest areas (73.7 percent) and farms when land is cleared for agriculture or other uses (26.3 percent). These forests were on customary land and producers indicated that they were required to obtain permission from the local leadership besides the necessary permits from the Forestry Department to produce charcoal. During the Focus Group Discussion with charcoal producers, one of the producers noted as follows:

> *As local people, we are already known by our Chilolo (village headpersons) and we can just go into the forest and make a chibili (kiln) and produce charcoal. However, those who are coming from outside need to introduce themselves to the traditional authorities before they can produce charcoal as you cannot just come into someone's forest to produce charcoal without their knowledge.*

However, the producers noted that it was not always the case that people from outside the production areas obtained permission from the local leadership to produce charcoal and that there were no systems in place to monitor who owned which kilns particularly those that were far from the homesteads.

Although the Forests Act (2015) makes mention of the coupe system under the Definitions Section; Part V, Section 56 Subsection I (d) and Part X Section 85, it does not explicitly provide for the coupe system where removal of forest produce (including charcoal) is only supposed to be done from specified sites with demarcated boundaries by the Forestry Department. On the ground, the study found that the coupe system was not being applied in the Mukonchi area and that charcoal production sites were mostly unregulated with production licences often being issued without the areas being

inspected or quantities produced verified. According to the District Forestry Office in Kapiri Mposhi, the department had inadequate capacity in terms of human resources and logistics such as vehicles to adequately enforce the laws at district level.

The older charcoal producers indicated during the focus group discussions that preferred trees for charcoal production were declining in Mukonchi area and other parts of Kapiri Mposhi especially those near the TAZARA rail line and Great North Road. The extent of the decline of these species was beyond the scope of the study but it would be interesting to study this in detail. Preferred tree species for charcoal production in the area as indicated by the charcoal producers are as shown in Table 5.1.

Table 5.1: Commonly used tree species for charcoal production in Kapiri Mposhi

No.	Local name	Scientific name
1.	*Mutondo*	*Julbenardia paniculata*
2.	*Mupundu*	*Palinari curatellifolia*
3.	*Kasabwa*	*Brachystegia spiciformis*
4.	*Musamba*	*Brachystegia boehmii*
5.	*Mubanga*	*Pericopsis angolensis*
6.	*Kaputu*	*Isoberlinia angolensis*

In areas of the district where trees were becoming scarce, producers indicated that they were no longer selective of the trees they used to produce charcoal. They however noted that there were some tree species that they were not allowed to use for charcoal production such as *Masuku (Urpaka kirkiana)* and generally all fruit or medicinal trees but these could be used when they were old and no longer producing fruits.

5.3.2 Charcoal production

The study found that the composition of the charcoal producers was such that producers were mostly men (94.7 percent). According to the only woman who indicated during the Focus Group Discussion that she was involved in charcoal production;

''Charcoal production is very heavy work and as a woman, I cannot manage. When women want to produce charcoal, we mostly hire men to produce it for us. I work with my sons to produce charcoal and they are the ones who do most of the heavy work while I do lighter tasks like monitoring the fire, packing the charcoal also supervise the process. I also have other duties at home so I cannot manage to spend as much time as my sons at the kiln.''

As for knowledge regarding charcoal production methods, the producers indicated that there were no formal training programmes for this and that this knowledge was passed down from the older producers to the younger ones. In terms of formal education, most of the producers that participated in the study (51.9 percent) had primary level of education, 37 percent had attained secondary education while 7.4 percent and 3.7 percent had tertiary and no education respectively. The trade was further dominated by the youth (85 percent) aged between 20 and 35 years old as shown in Figure 5.7:

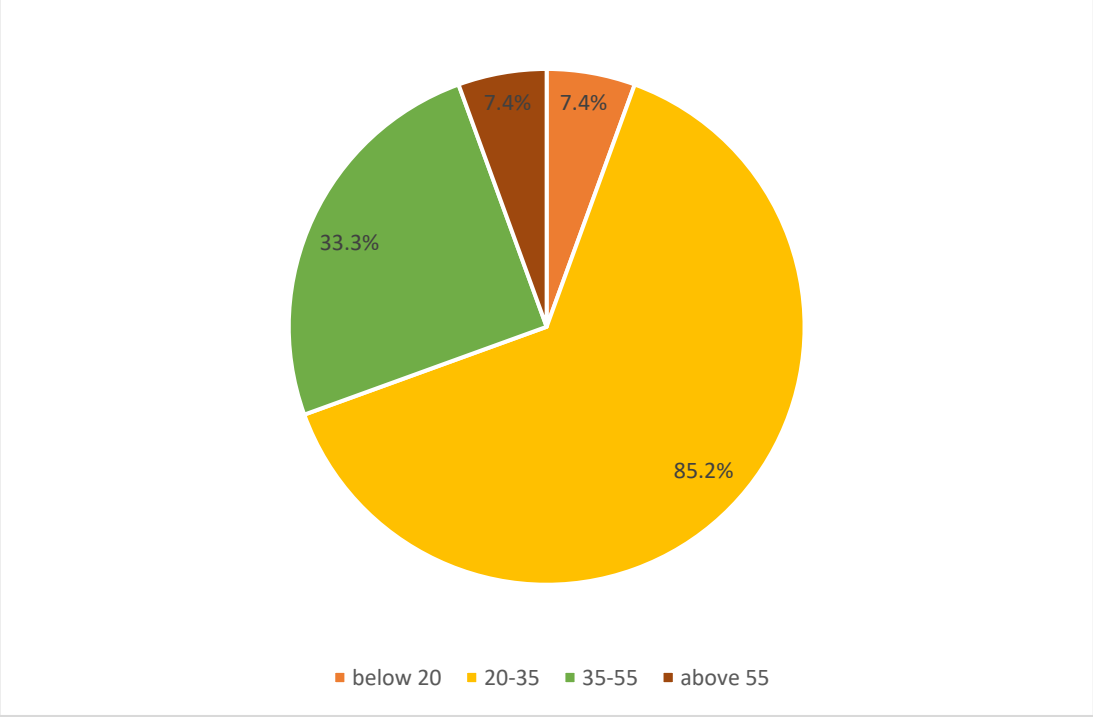

Figure 5.7: Age of charcoal producers interviewed in Mukonchi District

As can be seen in Figure 5.7, while all age groups are involved in charcoal production, this is a predominantly youth engagement (20 – 35 years old), with the youngest producer present during the discussion being 17 years old. The findings were that this was due to the fact that charcoal production was labour intensive as noted by some of the older producers:

''We are tired so we have left the heavy lifting to the younger men.''

While one of the younger producers stated:

''I had no alternative sources of income or means of furthering my education despite having completed secondary school so I started producing charcoal to support myself''.

Other reasons that producers indicated during the focus group discussions as to why they engaged in charcoal production included the following;

- Poverty
- Good profits in charcoal as compared to other ventures such as farming
- Raising capital for other businesses
- Additional income for school fees and other social needs.

As for actual charcoal production, the study found that rudimentary tools such as axes were used for harvesting trees. Other researches (Kalumiana and Hibajene, 1994; FAO, 2017) record the use of chain saws but during the study, all the producers interviewed were found to be using axes only. Although some of the charcoal producers (about 70 percent) indicated during the focus group discussion that they were aware of practices such as cutting trees at an angle to allow for coppicing, field observations revealed that this was not strictly followed.

Further, 100 percent of the respondents indicated that they used the traditional earth mound kilns (Figures 5.8 and 5.9 show some of the stages of charcoal production using the earth kiln) for charcoal production. The awareness levels among the producers interviewed regarding efficient charcoal production kilns/technologies were very low as only 5.3 percent (mostly older producers) indicated that they were aware of these methods. The village headperson present indicated that he was aware of the Charcoal Production Manual that was published by the Ministry of Energy in 1994 but was not utilising it. This indicates that one of the possible reasons that efficient charcoal production technologies were not being utilised could be lack of information.

Figure 5.8: Logs prepared for use in earth kiln

Source: Author, 2017

Figure 5.9: Traditional earth mound kiln

Source: Author, 2017

The kilns were observed to range in size from $2m^3$ to $100m^3$. However, presumably for fear of legal consequences and threats to their livelihood source, charcoal producers interviewed were reluctant to reveal the actual amounts of charcoal produced per kiln or how many kilns they produced in a year. They did, however, indicate that the number of kilns produced annually was increasing due to increased demand. Due to this increased demand, a phenomenon known as *contract buying* was noted as becoming popular. This was whereby charcoal producers were paid in advance to produce charcoal which was then collected by traders when ready. These traders also paid for the production licences and transit fees to the Forestry Department.

As noted earlier, the Forestry Department indicated that they had challenges in monitoring production sites and as such, traders paid for the charcoal at the local Forestry Offices and transported it to the market without the quantities being verified in some cases. This meant that producers could over-exploit the wood resources by producing more than they were paying for; and produce charcoal in restricted areas such as forest reserves. It also has an implication on Government revenue collection in that some traders could choose not to pay for the charcoal.

5.3.3 Transportation

Charcoal is transported from the production sites to market places within the district and also over long distances to big cities for final consumption. In most cases, producers did not transport their produce to the markets in urban areas as transporters collected the charcoal from the district and also paid for the production and conveyance licences.

For local transportation within the district, the Forestry Department indicated that they did not impose any charges as long as the Production Licence had been paid for. Transportation in this case was found to be in the form of bicycles (Figure 5.10) and vans depending on the bulk of the charcoal. Charcoal was also found to be transported on international trucks and private motor vehicles presumably for use during the journeys and for home use. The quantities transported in this manner were one or two bags per vehicle as shown in Figure 5.11. Estimating amounts of charcoal transported in this manner was beyond the scope of the research but the study recommends that

the quantities of charcoal being transported out of the country in this manner be further investigated.

Figure 5.10: Transportation of charcoal by bicycle

Source: Author, 2018

Figure 5.11: Truck carrying charcoal for use on the road

Source: Author, 2018

Further, it was noted that transportation was probably the easiest part of the charcoal value chain to regulate as transporters had to use the main roads when moving from one town to another and as such, road blocks could easily be set up. It is for this reason that the Forestry Department was charging the transporters both production and conveyance levies as they were easier to track as opposed to the producers. However, observations from the study collaborated with literature in that a lot of charcoal was transported at night when road blocks were not operational.

5.3.4 Charcoal Trade

An assessment of charcoal traders was done at a roadside market in Kapiri Mposhi and Chilenje Market in Lusaka District. The characteristics of the traders were such that men constituted 72 percent of the respondents at Chilenje Market while at the roadside trading point in Kapiri Mposhi, there were more women (60 percent). The ages of the traders were as shown in Figure 5.12:

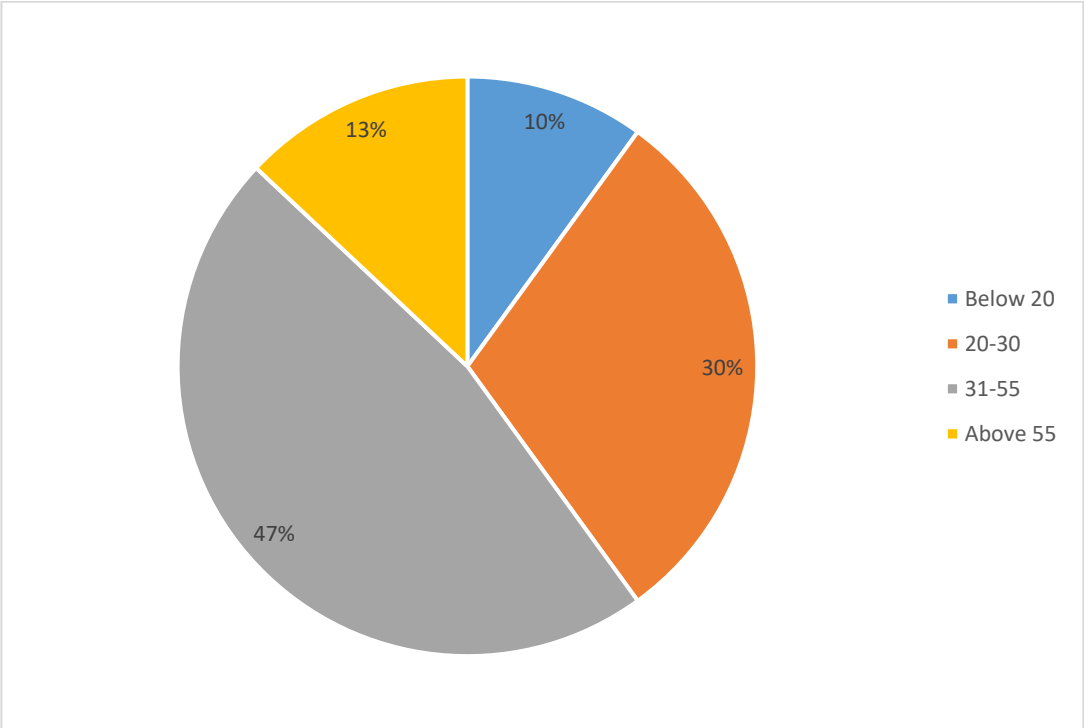

Figure 5.12: Age of the charcoal traders

As can be seen in Figure 5.12, charcoal trade at these points is dominated by people aged between 31 and 55 years old. The traders (60 percent) indicated that the number of young people especially school leavers had increased and attributed it to lack of employment and/or sponsorship for further education. At Chilenje Market for

example, there were six school leavers aged between 19 and 21 years old while at the road side market in Kapiri Mposhi, the youngest trader was 16 years old.

The traders indicated the following reasons for engaging in the charcoal trade:

1. Charcoal business was relatively easy as it did not require much capital (20 percent)
2. Others noted that they had simply continued in the trade as it was a family business (10 percent).
3. Some joined the charcoal business as a means of raising capital for other ventures but then continued with the business as it was found to be lucrative (18 percent).
4. Lack of employment (52 percent)

As for education, it was noted that people in the charcoal business were not necessarily uneducated as shown in Figure 5.13 that 50 percent of the traders interviewed had gone up to secondary school while 20 percent had attended tertiary education.

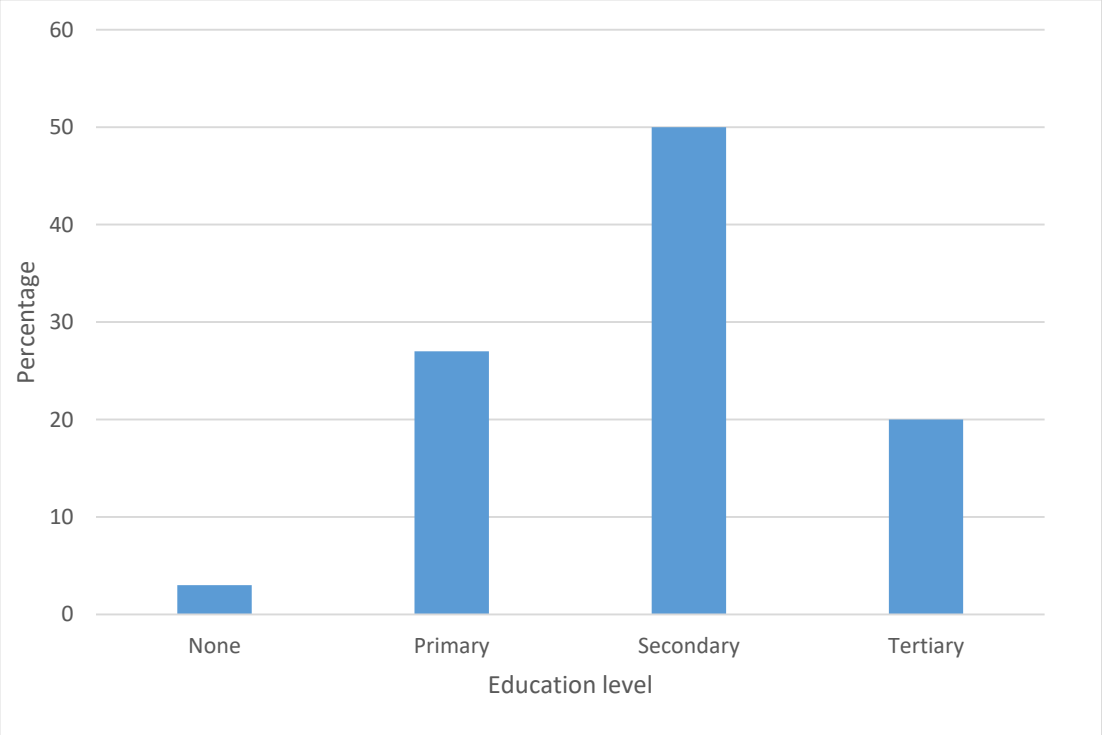

Figure 5.13: Educational levels of charcoal traders.

In Kapiri Mposhi, the charcoal trade was mostly concentrated along the Great North Road targeting travellers to and from Lusaka and Copperbelt Provinces. In Lusaka,

charcoal was sold in designated market places while smaller packaging were sold in the residential areas to households.

The prices of charcoal were found to be determined by market forces and also influenced by the costs of production. In Kapiri Mposhi, charcoal was being sold at ZMW40 inland and ZMW60 at the roadside markets for a ‘‘90’’ kilogram bag while in Lusaka, the same quantity was sold at ZMW110. Figure 5.14 shows a roadside market in Kapiri Mposhi.

Figure 5.14: Charcoal Trade along the Great North Road in Kapiri Mposhi District.

Source: Author, 2018

5.3.5 Consumption

As indicated by 62 percent of charcoal producers who participated in the study, Lusaka was the most important destination of charcoal produced in Kapiri Mposhi district. About 90 percent of the households surveyed in Lusaka during the study indicated that they used charcoal for cooking and space heating. Some used charcoal alone while

others used it in combination with electricity, Liquefied Petroleum Gas (LPG) and other fuels as shown in Figure 5.15.

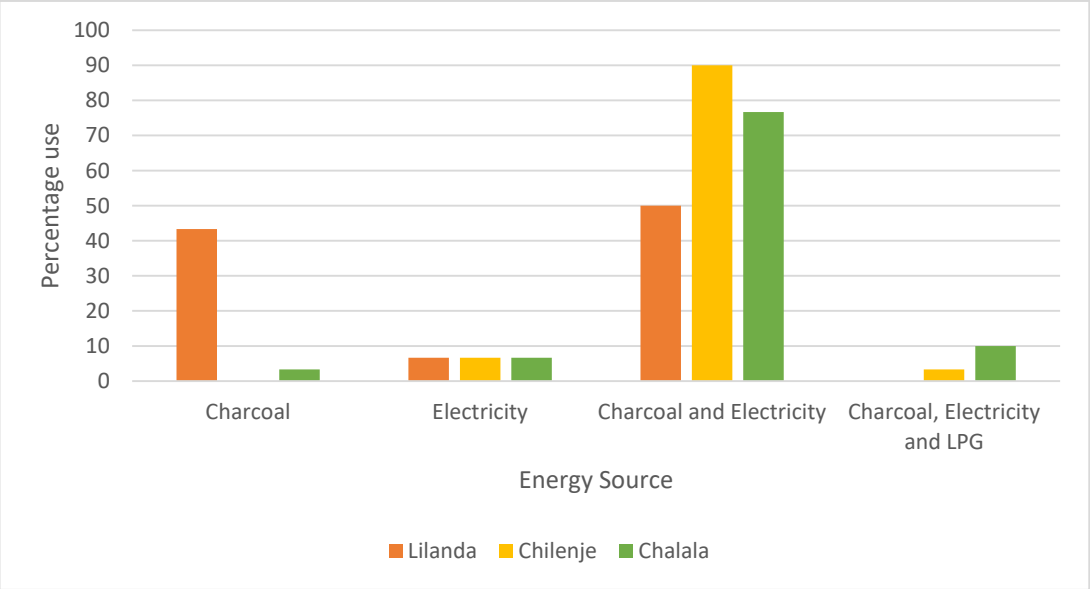

Figure 5.15: Energy use in Lilanda, Chilenje & Chalala households

As can be seen in Figure 5.15, the combination of charcoal and electricity was most commonly used. Households in low income areas mostly used charcoal for cooking while electricity was used for lighting and appliances such as television sets. In the middle income and high income areas, charcoal was mostly used in times of electricity outages. Very few of the households interviewed (6.6 percent) used electricity only and fewer still (3 percent in the middle income category and 10 percent in the high income areas used a combination of electricity and LPG). As such, from the sampled areas, it is clear that charcoal remains the cooking energy of choice in low income households and preferred alternative in households of higher incomes.

The reasons given by households surveyed as to why they preferred charcoal were as presented in Table 5.2.

Table 5.2: Reasons for charcoal preference by households

S/N	Reason for preference	Percentage (%)
1.	Charcoal is cheaper and more accessible	43.2
2.	High electricity tariffs	36.1
3.	Lack of / Limited access to electricity	18.9
4.	Others	2.7

As can be seen from Table 5.2, the major reason why charcoal was the preferred energy source was its accessibility and perceived cheaper price when compared with other energy sources. Further, it was noted during the study that there were some cultural aspects related to charcoal usage as some households believed that certain foods tasted better when cooked using charcoal. The majority of households interviewed (90 percent) indicated that charcoal usage had generally increased on account of increased load shedding and the increase in electricity tariffs.

As for technologies for cooking, the study found that the usage of and knowledge levels of the existence of technologies such as improved cookstoves that are known to be up to 50 percent more efficient than the traditional ones (Luwaya, 2015; Raman, et al., 2013; Njenga , et al., 2013) were very low among the sampled users. The majority of the respondents (73.3 percent) had no knowledge regarding improved cookstoves and alternative energy in general while 90 percent indicated that they had not received sensitisation in any form regarding alternative energy sources and technologies. Figure 5.16(a) and (b) shows a traditional mbaula and an improved cookstove respectively.

Figure 5.16: (a) Traditional mbaula (b) Improved cookstove

Source: Author, 2018

Further, the study found that the traditional *mbaula* was most commonly used among households. For example, 88 percent of all households interviewed indicated that they used the traditional *mbaula* while 3 percent used improved cookstoves and 7 percent used a combination of improved and traditional cookstoves. Very few households (2 percent) used electric stoves wholly or in combination with gas stoves as shown in Figure 5.17.

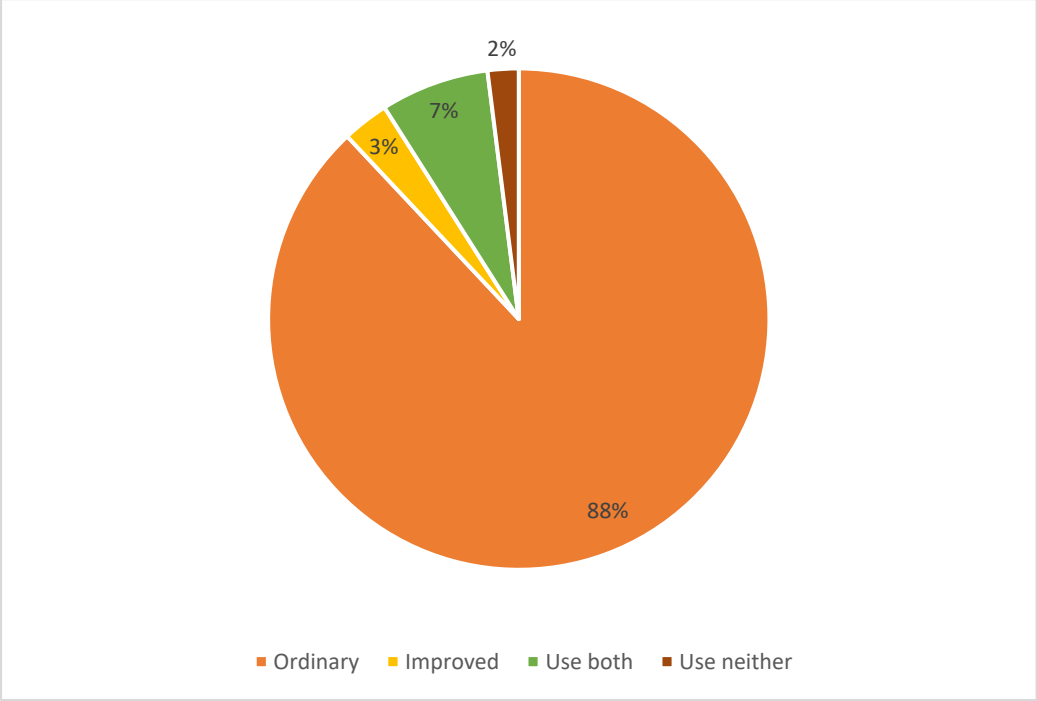

Figure 5.17: Use of cookstoves by households in Lilanda, Chilenje and Chalala

An assessment of the markets in the 3 areas sampled found no improved cookstoves being sold with the exception of Chilenje market where 4 tinsmiths indicated that they produced them when requested to do so. The average prices for ordinary cookstoves were ZMW27.4 while that of improved cookstoves were ZMW137.1.

5.4 Interactions between various actors in the charcoal value chain

Various actors and institutions are at play in the governance of the charcoal value chain in Zambia consisting of both state and non - state actors. The main state actors were District councils and Departments of Energy and Forestry while non - state actors include the traditional leadership, charcoal producers, transporters, traders, consumers, researchers and Non - Governmental Organisations. Other formal and informal associations such as the Charcoal Association of Zambia based in Lusaka and cartels/syndicates that control certain aspects of the value chain such as entry into the trade also exist. An assessment of the various players and their roles in the charcoal value chain is given in Table 5.3.

Table 5.3: Actors in the Charcoal Value Chain

No.	Charcoal Value Chain Node	Actors	Role	Level of involvement
1	Wood Resource Production	Forestry Department	Manage forest estates, Policy makers, Law enforcement.	National and local
		Traditional leadership and local people around forests	Have usufructal rights to forest resources.	Local
		Community Based Natural Resource Management Organisations	Promote sustainable forestry management.	National and local
		Community Forests Management Group	Protect and restrict access to community forest area by persons not part of the community Control restricted activities within community forest area.	Local level
		Charcoal producers	Wood extraction and charcoal production.	Local
		Department of Energy	Promote woodlots for charcoal production	National

2	Charcoal Production	Forestry Department	Issue production licences	National and Local
		Department of Energy	Promote efficient charcoal production, Energy Policy.	National
		Traditional leadership	Give permission for charcoal production	Local
			Protect forests through local norms, customs and traditions.	Local
		Charcoal Producers	Produce charcoal	Local
		Producer Associations	Safeguard interests of members.	Local
		Traders	Purchase charcoal before it is produced.	Local
3	Transportation	Forestry Department	Issue conveyance licences	National and Local
		Local Councils	Issue charcoal levy	Local
		Transporters	Transportation of charcoal	Local
		Zambia Police	Man Road check points	Local
4	Trade	Traders	Sell final product	Local

		Local Councils	Regulate trading points for charcoal	Local
		Marketers Associations	Protect the interests of their members	National and Local
		Charcoal Association of Zambia	Protect interests of charcoal traders	Local (Lusaka)
5	Consumption	Department of Energy	Promotes efficient charcoal utilisation.	National
		Forestry Department	Encourages use of alternative energy.	National and local
			Research	National
		ZESCO	Affects charcoal demand due to tariffs, load shedding and limited access to electricity.	National and Local
		Non – Governmental Organisations (E.g. Care International, DAPP, GTZ).	Promote efficient charcoal utilisation and alternative energy.	Local and National
		Research institutions (UNZA and NISIR)	Research on efficient cookstoves and alternative fuels.	National and local

As can be seen in Table 5.3, various actors are involved along the value chain. These actors can be split into two major categories, namely national level actors and local level actors. National level actors here include the Forestry Department and the Department of Energy. These national level actors are critical in the development of policies and enforcement of regulations pertaining to the charcoal value chain. The Forestry Department for example is mandated by the Forestry Act (2015) to manage the country's forests estates (as sources of charcoal) to develop sustainable charcoal resource harvesting techniques and to enforce laws relating to forests resource harvesting. Similarly, the Department of Energy has the mandate of developing and implementing the energy policy for the country (National Energy Policy, 2019). The Department is responsible for the supply of energy from various sources that include electricity, petroleum, biomass and other renewable energy. Regarding charcoal, the department promotes efficiency in production and consumption as well as provision of alternative and more sustainable energy sources.

At the local level, actors involved in the charcoal value chain include both formal and informal actors. Formal actors include the district councils whose role is to control the trade and transportation of all commodities (including charcoal) within the district boundaries. They are responsible for land use planning which includes designating trading areas. Informal actors on the other hand include charcoal producers, transporters, traders, consumers, community based organisations as well as producer and trader associations. The charcoal associations were created to be the platform through which the rights of the charcoal traders could be protected and represented the traders at meetings with the Councils and Government. The only charcoal association that the study came across was composed of charcoal traders.

From the results of the study, the interaction between these actors is fraught with many problems with implications for a sustainable charcoal value chain. For example, while the Forestry Department has the role of promoting sustainable charcoal production (and this can only be achieved by involving producers), the Department tends to view the producers as villains or destructive actors and in turn, the producers tend to view the Forestry Department as enemies. For example, views from the Focus Group Discussions were that when charcoal producers were found in possession of charcoal without licences, the authorities confiscated it with no regard for monies spent in procuring it. About 50 percent of the producers present indicated that they had lost

charcoal in such a manner and that the confiscated charcoal was shared by the officers involved for their own use. As indicated by one of the producers;

> '*These people* [Forestry Department] *have no mercy. They will get your charcoal without considering how much you spent on it. And we know that they just use that charcoal in their homes.'*

Further, the charcoal producers indicated that they had not been consulted when adjustments were made to the charcoal levies in 2013 nor were they sensitised regarding the prevailing levies and fees for charcoal production and trade. The Business Regulatory Act No. 3 of 2014, requires that consultations be made with the relevant stakeholders when adjustments are made to fees and licences in all fields including forestry. The majority of the charcoal producers (about 80 percent) were of the view that the charcoal levies were too high (Table 5.4 under section 5.5 shows the charcoal levies). This may be part of the reasons why charcoal producers and transporters resort to transporting their produce at night to avoid apprehension and paying for charcoal levies which they viewed as being too high.

Further, awareness levels of efficient charcoal production and utilisation technologies were found to be very low among the end users. This may be attributed to the fact that some state actors such as the Department of Energy were not present at district level and as such, information dissemination was limited. It was also observed that even when the state actors were present at district level, their influence was limited in some cases due to inadequacies in the system. For example, in Kapiri Mposhi, the District Forestry Office indicated that they did not have enough man power and resources to effectively monitor the charcoal production areas. Producers and transporters obtained licences without the production areas being inspected and quantities of charcoal produced being verified. It is thus possible that a lot of charcoal is produced and transported without being paid for and recorded. To collect licences therefore, the forestry officers set up road blocks with the local police. However, 80 percent of the transporters indicated that corruption was prevalent at the check points and noted as follows;

> *Even if you have the papers* [Licences] *from the Forestry Department to transport charcoal, you still have to leave something* [money] *with the officers at these checkpoints in order to be allowed to pass through. Even those without*

papers can pass through check points as long as they know how to talk to the policemen.

Among the state actors, it was sometimes not clear where the role of one ends and another begins. The Departments of Forestry and Energy for example, both have a role to play in charcoal production. The Department of Energy aims to improve the technology of charcoal production through training of charcoal producers in better organisation and management of charcoal production using the traditional kiln method and also encouraging the adoption of other production techniques which are more efficient and cost effective (GRZ, 2019). As outlined in the National Forestry Policy (2014), the Forest Department seeks to among others, ensure the establishment and sustainable management of wood resources for charcoal production through: improving the efficiency and technology and promoting and incentivising the utilisation of wood waste to generate energy. However, charcoal producers interviewed during the Focus Group Discussions viewed the role of the Forestry Department as mostly prohibiting charcoal production while that of the Department of Energy was largely unknown but viewed as promoting charcoal production (through their promotion of the Charcoal Production Manual), a situation which was viewed as contradictory as one Ministry appeared to be against charcoal while the other seemed to be promoting its production. One charcoal producer stated as follows:

‘‘*We are always told that charcoal production is bad and that we should start bee keeping but before long, another Ministry comes along and starts training us in how to produce charcoal using modern methods.’’*

This situation thus undermines the efforts being made by both institutions. Further, as can be seen in Table 5.3, some parts of the charcoal value chain such as transportation have no presence of state actors except for local authorities. According to the Local Government Act of 1995, one of the functions of district councils is to maintain, protect and control local forests and woodlands. However, the study did not find evidence of this being implemented apart from the Charcoal By - Laws of 2000 (Appendix 10) which imposed a levy on charcoal passing through Kapiri Mposhi. However, the charcoal was not weighed before the levy was paid for as provided for in the By- Laws. The regulation of the consumption part of the value chain was also

found to be minimal as there were no regulations or standards in place regarding efficient technologies.

Concerning benefits from forest resources, the Zambian laws through the Forests Act (2015) and Environmental Management Act (2011) recognise that local people have rights to use local forests for social and economic activities. According to the Forestry Department, local people did not need to pay for licences when using forest resources (including charcoal) for domestic purposes. However, the study found that monetary proceeds from the commercial use of these resources by state and other people not resident in these areas do not necessarily benefit the local people. The monies from production licences and levies for example were remitted to central government and not used for restoration of the forests or paid to the local communities. While the Forests Act provides for Joint Forestry Management (JFM) and Participatory Forestry Management (PFM), this has not been fully implemented in Zambia and was not found being implemented in Kapiri Mposhi.

It is thus clear that the interaction of the various actors in the charcoal value chain has implications on the effectiveness of governance arrangements and the sustainability of the charcoal value chain. Charcoal production is perceived as illegal when it is not and producers and traders often shun paying for licences and evade authorities by transporting charcoal at night resulting in loss of revenue for the government. Further, there is inadequate involvement of the locals in decision making regarding forestry management. As chiefs and local people are not benefitting from revenue collected from charcoal they are often resentful and uncooperative. The focus of non-state actors remains that of exploitation as a source of livelihood while conservation of these resources is often not the primary focus.

5.5 Institutions governing the value chain – formal and informal

The production of charcoal is governed by the Forests Acts (2015) being implemented by the Forestry Department. Further, the study found that before charcoal could be produced in an area, producers were required to obtain permission from the traditional leaders in the area although this was not provided for in the Forests Act. Further, as per Forest (Amendment) Regulations of 2013 (Appendix 9), charcoal producers are required to pay stumpage (charcoal production) fee to the Forestry Department

amounting to ZMW161 per chord (ZMW16.1 per 90 kilogram bag). A chord translates to about 10 * 50 kilogram bags of charcoal.

Charcoal thus attracts four types of levies: stumpage, conveyance, council and market fees. The stumpage (production) fee is paid by producers for the raw material (wood) while the conveyance licence is paid when transporting charcoal from one town to another and is paid for by transporters. The council fee/levy is paid to local authorities from where charcoal is obtained mostly by the transporters as they move the product from the area of production to the markets which are located outside the district. The fourth levy on charcoal is the market levy paid on a daily or monthly basis to the market administration where the charcoal is sold. These fees are summarised in Table 5.4;

Table 5.4: Licences and fees for charcoal production, transportation and trade

No.	Description	Cost ZMW / 90 Kg	Collected by
1.	Stumpage (production) fee	16.2	Forestry Department
2.	Conveyance levy	8.1	Forestry Department
3.	Council levy	2	District Council
4.	*Market levy (monthly fee at Chilenje market)	45	District Council through market officials.

*This levy was on all goods at the market and not specific to charcoal

Licences were issued from the Forestry Department but as noted earlier, the department faced a number of logistical challenges such as limited transportation and funding and as such was found to be unable to conduct adequate follow ups to verify the actual amounts of charcoal being produced. To compensate for this, Forestry Officers often set up road blocks in conjunction with the Zambia Police and confiscated charcoal which was being transported without licences. However, this was done periodically resulting in a lot of charcoal being transported undetected or at night when there were no road blocks. The money collected by the Forestry Department is remitted to Central Government while that collected by the Councils and markets are used by the collecting agencies.

Further, the fact that payments for charcoal licences and levies as listed in Table 5.4 are not always adhered to implies that charcoal is not being sold at its true market value. As such, other alternative energy sources such as LPG and briquettes that are subjected to taxes are more expensive than charcoal and hence cannot compete with charcoal.

As for the regulatory framework for charcoal, it is embedded in the Energy and Forestry Sector Policies and Acts. These are the National Energy Policy (2008), Energy Regulation Act (2005), National Forestry Policy (2014) and the Forests Act (2015). Other Policies which have an impact directly or indirectly on charcoal include the Agriculture Policy (2005), National Policy on Environment (2007) and the Environmental Management Act (2011). The provisions of these documents are as summarised in Table 5.5:

Table 5.5: Provisions for charcoal in the Zambian Policies and Laws

No.	Document	Objective	Strategy	Focus on Charcoal Value Chain
1.	National Forestry Policy (2014)	To improve the role of forests in addressing climate change.	Provide incentives for development of alternative energy sources and technology.	Charcoal consumption
		Promote sustainable harvesting of wood and production of charcoal.	Design and set aside charcoal production areas in each district.	Charcoal production
			Provide guidelines for efficient charcoal production and tracking system.	Charcoal production
			Promote and provide technical support enterprises in charcoal production.	Charcoal production
			Regulate export of charcoal	Charcoal trade
2.	Forests Act (2015)	Mandates the Forestry Department to manage forests.	Ownership of all trees vested in the president (Part 1, Section 3)	Wood resource production.
		Functions of Forestry Department	Devise and implement participatory forest management approaches (Part II, Section 5, Sub-section 2(a)).	Wood resource production.
			Sharing costs and benefits from licences / permits with local communities and	Governance / Regulation

			traditional institutions. (Part II, Section 5, Subsection 2(l)).	
			Facilitate and simplify the licencing system. (Part II, Section 5, Subsection 4(b)).	Governance / Regulation
		Community Forest Management	Locals living near a local forest may apply for Community Forest Management. (Part III, Sections 29 -35)	Resource management
		Joint Forest Management	Joint Forest Management Areas managed jointly by Government and local people. (Part III, Sections 36 – 39.)	Resource management
		Regulation of forest produce	Licence needed to fell, cut, work or remove any major forest produce from any forest (Part VI, Section 50, Sub-section 2).	Charcoal production.
			Regulation of export to be done at the recommendation of Minister in charge of trade and industry. Need permit to import or export forest produce (Part VI, Section 64).	Trade
3.	Energy Regulation Act (2019)	Defines woodfuel as a fuel and gives Energy Regulation Board	-	-

		Mandate to regulate all energy and fuels in Zambia (Part I, Preliminary, Section 2)		
4.	National Energy Policy (2019)	Better management of woodlands and forests as sustainable sources of woodfuel.	Developing management programmes for indigenous forest resources.	Wood resource management.
			Effective regulation of woodfuel sector.	Governance / Regulation
			Tree planting and establishment of woodlots.	Wood resource management.
		Improve the technology of charcoal production and utilisation.	Training producers in better organisation and management of charcoal production.	Charcoal production.
			Developing stoves that are more efficient and convenient.	Charcoal consumption.
		Promote appropriate alternatives to woodfuel	Encouraging use of alternative and renewable energy.	Charcoal consumption.
		Improve revenue collection from woodfuel industry.	Involvement of stakeholders in revenue collection and appropriation.	Governance / Regulation
			Establish appropriate mechanisms for utilising money collected by government.	Governance / Regulation
			Harmonisation of woodfuel resource management.	Wood resource management

5.	Environmental Management Act (2011)	Give citizens of Zambia the right to use natural resources (Part I, Preliminary, Section 4, Subsections (1) and (2).	-	-
		Natural Resources Management	Forestry resources shall be managed in accordance with the provisions of the Forests Act; (Division 8, Section 76, Sub section 1 (c))	Wood resource management.
6.	National Policy on Environment (2007).	To manage the country's forest resources in a sustainable manner to maximise benefits to the nation, especially forest dependent communities (Section 7.2.4.1)	Provide economic incentives and the necessary legal framework and technology to encourage and facilitate rural communities to introduce alternative sources of energy to gradually reduce reliance upon woodfuel and charcoal (Section 7.2.4.3 (c))	Charcoal consumption.
			Take direct measures to control production and organise sustainable practices which include rehabilitation of seriously degraded woodland (Section 7.2.4.3 (d))	Wood resource management.
		To meet national energy needs with increased efficiency and	Promote and control of production of charcoal and develop alternative	Charcoal production and consumption.

		environmental sustainability (Section 7.2.9.1)	environmentally friendly sources of household energy including bio-gas, wind and solar power (Section 7.2.9.3 (e))	
			Explore means of making electricity more affordable. (Section 7.2.9.3 (f))	Charcoal consumption.
7.	SI No. 18 of 2018: Forests (Community Forests Regulations)	A local authority shall, for forests within the jurisdiction of that local authority, identify, support and encourage local communities to apply to the Director for control, use and management of areas of forests for purposes of social, cultural and economic needs.	-	Wood resource management.

As can be seen from Table 5.5, most of the provisions in the Policies and Laws deal with three parts of the charcoal value chain i.e. wood resource production, charcoal production and consumption. There are very few provisions regulating charcoal trade and transportation and it is clear from literature and the study that these two areas of the charcoal value chain are highly exploited. Further, the aspects of the charcoal value chain covered in the regulatory framework are not being implemented adequately resulting in the whole sector being over exploited.

As with the actors, the interaction between the different institutions in the charcoal value chain has a great impact on the governance and sustainability of the value chain. For example, the National Energy Policy lists a number of measures concerning wood resources which are not under the mandate of the Ministry of Energy and results on the ground found that these policy measures were actually not being implemented by the Ministry. These measures include 'the improvement of the revenues from the woodfuel industry'' and also reforestation etc. Further, woodfuel is the only energy source that is not being regulated by the Energy Regulation Board (ERB) and the sole provision regarding woodfuel in the Energy Regulation Act is that of recognising woodfuel as an energy source (Energy Regulation Act, Part 1, Preliminary, Section 2, Interpretations). The reason given for this by one of the Key Informants was that woodfuel was catered for under the Forests Act (2015) and if it were to be regulated by the ERB, there was likely to be duplication of duties. While this is true to some extent, the consequence has been that the Forestry Department has been more concerned about charcoal being a forest product and not it being an energy source hence the gaps in the regulation of woodfuel. Other important legislation such as the Environmental Management Act No. of 2011 also have little to no provisions for charcoal. The only provision relating to charcoal; Division 8, Section 76, Sub section 1 (c) states that forestry resources shall be managed in accordance with the provisions of the Forests Act. While the National Policy on Environment has general provisions such as the promotion of alternative energy and making electricity cheaper so that people can migrate from use of charcoal to electricity.

It is thus clear that the interaction of various actors and institutions has had a major impact on the sustainability of the charcoal value chain. While it is recognised that charcoal is an important source of energy and major component of people's livelihoods, the charcoal value chain remains highly unsustainable with the rate of

extraction of forest resources exceeding the replenishment rate (GRZ, 2019). Further, while actors were found to be mostly aware of the environmental impacts of charcoal production and use, they have few incentives through existing institutions to change their behaviour.

It is worth noting that the lack of formal institutions at some parts of the charcoal value chain does not mean that the system is completely ungoverned. Informal institutions, traditional norms and conventions were also observed to be present at various levels of the charcoal value chain and served the role of mostly preserving and conserving the forest resources and protecting the rights of local people near forests or at the selling points. Traditional norms and conventions/practices are at play particularly at the level of resource production. This was observed in the study area as well as from literature where it was indicated that on a national level, certain forests were reserved for use by traditional leaders and cultural/spiritual processes and as such cannot be used for charcoal production (EFZ, 2012) and also as mentioned under Section 5.3.1, some tree species are prohibited from being used for charcoal production. These served to protect the forest resources from overexploitation.

Other informal regulations come into play for example when it comes to entrance into the charcoal business which was found to be controlled / restricted by these institutions to some extent. An example of this is Kapiri Mposhi where for one to sell charcoal at an already established market, they need to get permission from the other traders through the chairperson. A similar situation was found at Chilenje market where it was noted that there existed a kind of cartel/syndicate that controlled the trade. Some traders noted that organisations that had tried to sell coal at the market as a substitute to charcoal had been discouraged and driven off by the cartel that was also referred to as the 'Charcoal Mafia'. The situation of informal cartels was also noted in the roadside trading areas in Kapiri Mposhi where it was noted that some areas along the road could only be used by certain families or communities. As such, entry into the charcoal business is to some extent regulated by these informal regulations.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The charcoal value chain in Zambia i.e. wood resource production, charcoal production, transportation, trade and consumption is characterised by formal and informal attributes. Charcoal remains the main energy source contributing the bulk of Zambian household energy and given the current situation in Zambia where poverty and unemployment levels are very high with access to modern energy forms such as LPG and electricity are low, the use of charcoal is likely to continue to dominating the Zambian energy mix.

The interaction of the various actors in the charcoal value chain has implications on the effectiveness of governance arrangements and the sustainability of the charcoal value chain. This is so in that charcoal production was found to be perceived as illegal by some actors in the charcoal value chain such as producers and consumers when was in fact not. Producers and traders were found to be shunning paying for licences and evaded authorities by transporting charcoal at night resulting in loss of revenue for the government. There was inadequate involvement of the locals in decision making regarding forestry management and they few incentives through existing institutions to change their behaviour. State actors on the other hand faced challenges such as inadequate logistics to effectively regulate the charcoal value chain.

Further, although there was a regulatory framework in place for the charcoal sector, the study found that there were gaps such as overlaps in institutional mandates of the main state actors of the Ministry of Energy and the Forestry Department as well as lack of provisions for some parts of the charcoal value chain such as transportation and consumption and this too had implications on the effectiveness of governance arrangements and the sustainability of the charcoal value chain.

The study thus concluded that while charcoal was recognised as an important source of energy and major component of people's livelihoods, the charcoal value chain remained highly unsustainable and its governance fraught with challenges. As such, there is need to streamline the roles of the actors and institutions to ensure sustainability.

6.2 Recommendations

The study recommends that in dealing with the governance of the charcoal value chain, a two pronged approach be applied. This approach firstly addresses the charcoal value chain from the point of view of the wood resource and secondly from the point of view of sustainability of charcoal throughout the value chain.

Addressing the wood resource means dealing with the site of charcoal production, focussing not just on resource harvesting but availability of the resource itself. This means developing strategies that will ensure the availability of charcoal tree resources, promote sustainable harvest of the resource and facilitate efficient production. Here, in this study's view may supply a deliberate effort to manage woodlands specifically for charcoal production as until now, forests and woodlands in Zambia have been primarily managed for conservation and timber production.

Secondly, this study proposes, a decentralised charcoal resource management framework that would allow communities and charcoal producers to manage community forests or woodlots with the support of the council, Forestry Department and other actors. This can take place in the context of community forests or private forests which are provided for in the Forests Act No. 4 of 2015 and the Forest Regulations of 2018.

Based on the findings of the study, the following are the specific recommendations:

6.2.1 Management of the wood resource:

1. As provided for in the Forests Act of 2015, a Charcoal / Forest Development Fund should be created to facilitate development of charcoal production, trade and use. These funds will come from government funding / grants, charcoal licences, levies and taxes and will be used for management of forest regeneration, reforestation, research, development and promotion of technologies like briquetting and also promotion of community based forestry management practices. This will also ensure that monies collected from charcoal production areas are returned to the area and used to restore what was removed from the forests.

2. As has been in countries such as Kenya and Sudan, there needs to be specific and detailed Subsidiary Legislation on woodfuel to support the Forests Act, Energy Regulation Act and their associated policies.
3. As elaborated in SI No. 11 of 2018, there is need for closer attention to local level resource management systems based on traditional control mechanisms. Regulation of charcoal production, distribution and marketing should be decentralised to allow for self-governance by the end users in the form of private forests and/or operationalization of community forests.
4. Forest Management Plans should include setting aside land in each district for charcoal production. This will involve the establishment of plantations in low-population areas, under-used and degraded lands and should include short and long-term plans for tree planting by smallholders and the private sector specifically for charcoal production.
5. Zambia has considerable biomass materials such as bagasse, agriculture waste, sawdust, as well as charcoal waste that can be used to produce energy. There is need to establish how much electricity, charcoal briquettes and/or pellets can be produced from these resources as alternatives to charcoal. Agroforestry and establishment of woodlots can also be promoted for domestic fuel supply.
6. Increased roles for traditional authorities in the management of the wood resources as they are present at the grassroots and are able to formulate relevant, context specific institutions.

6.2.2 Sustainability of the charcoal value chain

The study recommends formalisation of the charcoal value chain and creation of a comprehensive enabling legal framework. The proposed governance structures for charcoal is thus as follows:

1. Charcoal stakeholder associations / cooperatives should be formed outside of which charcoal production or trade may not be conducted. Agreements are to be signed between government (Forestry Department as they are the ones given the mandate under the Forests Act of 2015, Part II, Section 5 Sub-section 2) and the associations to guarantee sustainable charcoal production.
2. Promotion of improved kilns and provision of guidelines for efficient charcoal production by the Government Departments responsible for Energy and

Forestry as well as Non-Governmental Organisations promoting efficient charcoal production.

3. As is the case in the transportation of petroleum in Zambia, all charcoal transporters need to be registered. No one is to transport charcoal if they do not belong to an association. Associations should ensure that their membership adhere to the conditions set out for them by the government.
4. Truck drivers are to use LPG for their journeys and not charcoal. No charcoal should be allowed to cross the borders even if in small quantities without licences.
5. Traders are further to be encouraged to sell energy efficient equipment such as improved cookstoves and charcoal alternatives such as briquettes and pellets to encourage the use of waste for energy. Tax breaks are to be considered in order to make these efficient fuels and equipment competitive with the traditional ones.
6. There should be designated trading points for charcoal outside of which charcoal trade should not occur. Further, producer groups are to have properly labelled bags for ease of tracking.

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APPENDICES

Appendix 1: Interview Schedule for Charcoal Associations

1. How is the governance structure for the charcoal value chain in Zambia:

…….....

…….....

2. What organisations are involved in the governance of charcoal and what roles do they play:

……

……

3. What are the Strategies, Acts, Policies and other Legislation used in the governance of the charcoal value chain:

……

……

4. Who is involved in the formulation and /or review of the above:

……

……

5. Where in the country is charcoal most produced:

……

……

6. What tree species are used for charcoal production:

……

……

7. What are the charcoal production methods used in the country:

……..…….....

……

8. What are the alternative sources of energy being utilized in the country:

…….....

……

9. How do the alternative energy sources in Question 8 above compare to charcoal: ……

……

10. What has been the impact of activities in Question 9 above on charcoal production and consumption: ……

……

11. What have been the major in the charcoal sector:

……..……..

……

Appendix 2: Interview guide for charcoal producers

1. Sex:

☐ Male (Number of)

☐ Female (Number of)

2. Age:

☐ Below 20 (Number of)

☐ 20 to 35 (Number of)

☐ 35 to 55 (Number of)

☐ Above 55 years (Number of)

3. Level of education:

☐ None (Number of)

☐ Primary (Number of)

☐ Secondary (Number of)

☐ Tertiary (Number of)

4. What is your average income per month:

……

5. Do you have another source of income apart from charcoal production? If Yes please specify:

……

6. How long have you been a charcoal producer:

……

7. What made you decide to venture into charcoal production:

……

8. What are the main charcoal production areas in Kapiri Mposhi:

……

9. Are these areas customary, state lands or other:

……

10. What production methods do you use:

……

11. How big are the kilns:

……

12. How much charcoal do you produce per kiln:

……

13. How many kilns do you produce in a year:

……

14. What tree species do you use to produce charcoal:

……

15. What are the costs involved in charcoal production:

……

16. Are you aware of other charcoal production methods apart from the earth kiln:

……

17. Do you use these kilns

☐ Yes

☐ No

18. If Yes to Question 17 above, what are the benefits or disadvantages that you have observed:

……..

19. Do you belong to any association for charcoal producers:

……

20. Do you have access to credit schemes as a charcoal producer:

……

21. What are the rules/ regulations regarding charcoal production in this area:

……

22. Who enforces these regulations:

……

23. What role do the local headmen and traditional leaders play charcoal production: …….

24. Have there been any changes in the production areas in Kapiri Mposhi in the recent past? If Yes, specify what these changes are:

……

25. What challenges do you face as charcoal producers:

……

Appendix 3: Interview Schedule for Forestry Department

1. What is the role of the Forestry Department in the governance of the charcoal value chain: ……....

2. What other organisations are involved in the governance of charcoal in the district and what roles do they play: ……

3. At what point do you come into the charcoal value chain:

- ☐ Wood resource production
- ☐ Charcoal Production
- ☐ Transportation
- ☐ Trade
- ☐ Consumption

4. Please provide details concerning the roles you play in Question 3 above:

……

5. What are the Strategies, Acts, Policies and other Legislation used in the governance of the charcoal value chain: ……

6. Who is involved in the formulation and /or review of the above:

……

7. Where in the district/country is charcoal most produced:

……

8. What roles does the Forestry Department play in the allocation of production sites: ……..……

9. Who else is involved in the allocation of charcoal production sites:

……

10. What tree species are used for charcoal production:

……

11. How much charcoal is produced and consumed in the district/country:

……

12. How do you ensure that actors in the charcoal value chain adhere to regulations: ……

13. What type of licenses do you issue out for charcoal:

……

14. How much money do you collect in terms of licenses:

Per month: …….. Per year: ……

15. How is the money collected in the district utilized:

……

16. Are there alternative sources of energy being utilized in the district? Please specify which ones: ……

17. How do the alternative energy sources in Question 16 above compare to charcoal in terms of prices and availability: …….

……

18. Do you promote alternative income generation activities in the district? Please specify which ones: ……..

19. What has been the impact of activities in Question 18 above on charcoal production:……

20. Does the Forestry Department play any role in the pricing of charcoal? Please specify the role: ……

21. If your answer to Question 20 above is No, what are the reasons for this:

……

22. Is Joint Forestry Management being implemented in the district/country? What have been the experiences so far: ..……..

……

23. What are the challenges faced by the Department in the governance of charcoal: ……

Appendix 4: Interview Schedule for Ministry of Energy/Energy Regulation Board

1. What is the role of the Ministry of Energy / Energy Regulation Board in the governance of the charcoal value chain: ……
……

2. What other organisations are involved in the governance of charcoal and what roles do they play: ……..……..
……

3. At what point do you come into the charcoal value chain:

- ☐ Wood resource production
- ☐ Charcoal Production
- ☐ Transportation
- ☐ Trade
- ☐ Consumption

4. Please provide details concerning the roles you play in Question 3 above:
……

5. What are the Strategies, Acts, Policies and other Legislation used in the governance of the charcoal value chain: ……..……
……

6. Who is involved in the formulation and /or review of the above:
……

7. Where in the country is charcoal most produced:
……

8. Does your organisation play any role in the allocation of production sites? Please specify if your answer is Yes: ……
……

9. Who else is involved in the allocation of charcoal production sites:
……

10. What tree species are used for charcoal production:
……

11. How much charcoal is produced and consumed in the district/country:
……

12. How do you ensure that actors in the charcoal value chain adhere to regulations: ……

13. What type of licenses do you issue out for charcoal (if any):

……

14. How much money do you collect in terms of licenses (if any):

Per month: …… Per year: …….

15. How is this money utilized: …….....

16. What are the alternative sources of energy being utilized in the country? Please specify which ones: ……

……

17. How do the alternative energy sources in Question 16 above compare to charcoal in terms of prices and availability: ……..

……

18. What has been the impact of activities in Question 17 above on charcoal production and consumption: ……

……

19. Does the Ministry of Energy / Energy Regulation Board play any role in the pricing of charcoal? Please specify the role: ……

……..

20. If your answer to Question 19 above is No, what are the reasons for this:

……

21. Do you collaborate with the Forestry Department in matters pertaining to charcoal: ….....

……

22. What are the challenges faced by the Department in the governance of charcoal: …….

……

Appendix 5: Interview Schedule for Local Councils

1. What role does the Council play in the governance of the charcoal value chain:

……

…….....

2. At what point do you come into the charcoal value chain:

- ☐ Wood resource production
- ☐ Charcoal Production
- ☐ Transportation
- ☐ Trade
- ☐ Consumption

3. Please provide details concerning the roles you play in Question 2 above:

……

4. Who are the main actors involved in the governance of charcoal value chain in Kapiri Mposhi/ Lusaka districts: ……...

……

5. What roles do the actors in Q4 above play:

……

……

6. What are the Strategies, Acts, Policies and other Legislation used in the governance of the charcoal value chain in the district:

……

……

7. Who is involved in the formulation and /or review of the above:

……

……

8. Apart from the national policies and laws, are there any laws or informal laws regarding charcoal in the district?

……

……

9. Of the two different laws/regulations in Q6 and Q8 above, which ones have more impact and why: ……...

……

10. At what point does the council collect levies on charcoal:

……

11. How much are these levies: ……...

12. How often are these regulations revised: ……...

13. How is the money from the levies utilized: ……

……

14. Do you collect data on how much charcoal is produced, sold and consumed in the district:

☐ Yes

☐ No

15. If your answer to Q14 above if Yes, how much charcoal is produced, sold and consumed in the district: ……

16. What are the main charcoal markets in the district: ……..

……

17. Are there designated markets where charcoal should be sold in the district:

……

...…….....

18. What factors affect the increase or decrease in charcoal trade in the district:

……

……

19. What challenges do you face in implementing policies and/or laws regarding charcoal: …….

……

20. Apart from the role that the council currently plays in the governance of charcoal, what else do you think the council should be doing regarding the governance of charcoal: ……

……

Appendix 6: Interview Schedule for Key Informants

1. How is the governance structure for the charcoal value chain in Zambia: ……
…….....

2. What organisations are involved in the governance of charcoal and what roles do they play: ……..
……

3. What are the Strategies, Acts, Policies and other Legislation used in the governance of the charcoal value chain: ……
……

4. Who is involved in the formulation and /or review of the above: ……
……

5. Where in the country is charcoal most produced: ……
……

6. What tree species are used for charcoal production: ……
……

7. What are the charcoal production methods used in the country: ……..…….....
……

8. What are the alternative sources of energy being utilized in the country: …….....
……

9. How do the alternative energy sources in Question 8 above compare to charcoal: ……
……

10. What has been the impact of activities in Question 9 above on charcoal production and consumption: ……
……

11. What have been the major in the charcoal sector: ……..……..

Appendix 7: Interview Schedule for traders

1. Name of trading area: ……

2. Sex:

   ☐ Male

   ☐ Female

3. Age

   ☐ Below 20 years old

   ☐ 20 – 35 years old

   ☐ 35 – 55 years old

   ☐ Above 55

4. Level of education

   ☐ None

   ☐ Primary

   ☐ Secondary

   ☐ Tertiary

5. How long have you been a charcoal trader: …….

6. What made venture into charcoal trade: ……

……

7. What other source of income do you have apart from charcoal trade:

……

……

8. Do you sell charcoal on retail or wholesale basis: ……

9. How much do you sell the charcoal: ……

10. How do you determine the price of charcoal: ……...

……

11. How much charcoal do you sell in a day or month: ……..

12. What is the order price for charcoal: ……

13. Where does the charcoal you sell come from: ……..

……

14. Do you go to the production sites or is the charcoal brought to you:

……

15. Do you sell alternate sources energy? Which ones:

……

……

16. If your answer to question 15 above is No, why not: ……

……

17. Are there any restrictions as to who can sell charcoal in this area: ……...

……

18. Do you belong to any association that protects the rights of charcoal traders:

……

19. Is this organization recognized by the government: ……..…

……

20. Do you have access to credit schemes as a charcoal trader? Please specify where from if your answer is Yes: ……...……

21. What are the rules and regulations regarding charcoal trade in this area:

……

……

22. What licenses, fees or levies do you pay for and to which institutions:

……

……

23. Has the number of charcoal traders increased or reduced at this place in the recent past: …….

……

24. What has led to the situation above: ……..

……

25. Has there been any changes in the demand for charcoal in the recent past:

……

26. What kind of changes have these been: ……

……

Appendix 8: Interview Schedule for transporters

1. Trading area: ……

2. Sex:

   ☐ Male

   ☐ Female

3. Age:

   ☐ Below 20

   ☐ Between 20 and 35

   ☐ 35 to 55

   ☐ Above 55 years

4. Level of education:

   ☐ None

   ☐ Primary

   ☐ Secondary

   ☐ Tertiary

5. How long have you been in the business of transporting charcoal:

……

6. Apart from transporting charcoal, are you involved in another part of the charcoal value chain: …….

……

7. Do you have another source of income apart from transporting charcoal? Please specify if your answer is Yes: ……

……

8. What type of vehicle do you use to transport charcoal: ……

……

9. Is this your vehicle or do you work for someone else: ……..

……

10. Are there any restrictions for one to join the business of transporting charcoal? If Yes, please specify these restrictions: ……...

……

11. Where do you order the charcoal from: …….

…….....

12. Is that where you have always bought the charcoal:

……

13. If your answer to Question 12 above is Yes, why have you changed:

……

……

14. What price do you buy the charcoal at: …….

……

15. How much do you sell the charcoal at: …….

……

16. How is the selling price of charcoal determined: ……..

……

17. How many bags of charcoal can be transported on your vehicle: …….

……

18. How many trips do you make in a month: ……

……

19. How much do you charge to transport charcoal from the production area to the selling point: ……

……

20. What costs do you incur while transporting charcoal from production area to selling point: ……..

……

21. What are the regulations regarding charcoal transportation: ……

……

22. Who enforces these rules: …….

……

23. Do the regulations affect your business? If Yes, specify how they affect your business: ……

……

24. Has the demand for charcoal increased or decreased over the recent past:

……

25. What is the reason for the situation in Question 24 above: ……

……

26. Do you belong to any cooperation for charcoal transporters: ……...

27. Do you have access to credit schemes as a charcoal transporter:

……

28. What challenges do you face as a charcoal transporter: ……

……

29. Do you have any recommendations regarding charcoal transportation:

……

……

Appendix 9: Interview Schedule for Village Head person/Traditional Leaders

1. Do you play any role in the governance of the charcoal value chain in Kapiri Mposhi District: ……

2. Please provide details for your answer to Q1 above: ……
……

3. Is charcoal production allowed on customary land: ……..
……

4. What are the main charcoal production areas in Kapiri Mposhi: ……..
……

5. Are these areas in Q4 above on customary or state land: ……..
……

6. Where do people who produce charcoal in Kapiri Mposhi come from: ……...
……

7. Has charcoal production increased or decreased in the recent past: …….
……

8. What are the reasons for your answer in Q6 above: ……..
……

9. What are the charcoal production methods used in Kapiri Mposhi: ……
……

10. What are the regulations regarding charcoal production and use in your area:
……
……

11. Do you work together with the government in the governance of charcoal in the area: …….
……

12. Have there been sensitization regarding charcoal in your area: ……
……

Appendix 10: Questionnaire for consumers

1. Residential area: ……...
2. How many people are in your household: ……
3. What is the average household income per month:
   - ☐ Below K1, 500
   - ☐ Between K1, 500 and K5, 000
   - ☐ Above K5, 000
4. What energy/fuel do you use for cooking:
   - ☐ Electricity
   - ☐ Gas
   - ☐ Charcoal
   - ☐ Other (Please specify):

   ……
5. Of the above, which one do you use the most (Please give reasons): ……..

……

6. How much money do you spend per month on the above fuels:

Electricity: …….

Gas: ……

Charcoal: ……

Other: ……....

7. Where do you buy the above energy/fuels: ……...

……

8. How much charcoal do you use per month per week per month: ……

……

9. Do you buy the charcoal on a daily basis or in bulk: ……

……

10. Has your use of charcoal increased or reduced in the recent past. Please specify the reasons for this: ……...

……

11. What type of cookstove do you use:
    - ☐ Ordinary mbaula
    - ☐ Improved cookstove
12. Where do you buy the above cookstoves: ……

……

13. What is the price of these cookstoves:

☐ Ordinary mbaula

☐ Improved cookstove

14. Are you aware of any regulations regarding the use of charcoal? If yes please specify the regulations: ……..

……

15. Have any NGOs or Government sensitized you /the community regarding charcoal or alternative energy sources and technologies. If Yes please specify the type of sensitization: ……..

……

Appendix 11: Kapiri Mposhi Charcoal By Laws

STATUTORY INSTRUMENT NO. OF 2000

The Local Government Act
(Laws, Volume 16, Cap. 281)

The Kapiri Mposhi District Council
(Charcoal Levy) By-laws, 2000

IN EXERCISE of the powers contained in sections *sixty-nine and seventy six* of the Local Government Act, the following By-laws are hereby made:

Title

1. These By-laws may be cited as the Kapiri Mposhi District Council (Charcoal Levy) By-laws, 2000.

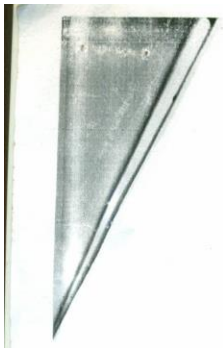
Interpretation

2. In these By-laws, unless the context otherwise requires:

"area" means the area under the jurisdiction of the Council;

"charcoal" includes coal and firewood;

"check-point" means any place within the area designated by the Council for payment of charcoal levy;



"collector" means any officer or agent of the Council authorised to collect charcoal levy for the Council; and

"Council" means the Kapiri Mposhi District Council;

Imposition of charcoal levy

3. A person who sells charcoal within the area or exports charcoal from the area shall pay to the Council a charcoal levy at the following rates:

(a) one hundred and fifty Kwacha per twenty five kilogram bag;

(b) three hundred Kwacha per fifty Kilogram bag;

(c) five hundred Kwacha per ninety kilogram bag; or

(d) ten thousand Kwacha per one tonne of fire-wood or part thereof.

No sale or export of charcoal without payment of charcoal levy

A person shall not sell charcoal or export charcoal from the area, any charcoal which has not been weighed at a check-point or business premises or charcoal in respect of which charcoal levy has not been paid to the Council.

Payment and collection of charcoal levy

5. Charcol levy is payable at any check point or business premises and shall be received by a collector or agent who shall immediately after weighing charcoal issue an official receipt for each such payment.

Offences and penalties

1. A person who contravenes any of the provisions of these By-laws commits an offence and is liable, upon conviction:

(a) in the case of a first offence, to a fine not exceeding eighty penalty units or to imprisonment for a period not exceeding six months or to both; and

(b) in the case of a second or subsequent offence, to a fine not exceeding sixteen penalty units for each day during which the contravention continues.

2. In addition to any penalty prescribed under sub-by-law (1), the court may order that any expenses incurred by the Council in consequence of the contravention be paid by the person committing the contravention.

Made by the Kapiri Mposhi District Council this...21.day of.....02.....,2000

Council Chairman
Kapiri Mposhi District Council

B. LUNGU

Council Secretary
Kapiri Mposhi District Council

Confirmed by me this..12th.....day of.....APRIL.....2000

BATES NAMUYAMBA MP

Minister of Local Government
And Housing

LUSAKA

,2000

[MLGH. 102/51/60]

Appendix 12: Statutory Instrument No. 52 of 2013

PART III

FEES FOR SERVICES

48.	Site for sawmills in national forests, local forest or plantations	600 per hectare or part thereof per year
49.	Open areas or joint forest areas	600 per hectare or part thereof per year
50.	Timber depots, logging camps	900 per hectare or part thereof per year
51.	Erection of communication transmitters construction of electricity substations in national and local forests	900 per hectare or part thereof per year

LUSAKA
18th June, 2013
[ML.64/95]

DR. J. KASONDE,
Minister of Lands, Natural Resources and Environmental Protection

GOVERNMENT OF ZAMBIA

STATUTORY INSTRUMENT NO. 52 OF 2013

The Forests Act
(Laws, Volume 12, Cap. 199)

The Forest (Amendment) Regulations, 2013

IN EXERCISE of the powers contained in section *sixty-eight* of the Forests Act, the following Regulations are hereby made:

Title
Cap. 199

1. These Regulations may be cited as the Forest (Amendment) Regulations, 2013, and shall be read as one with the Forest Regulations, in these Regulations referred to as the principal Regulations.

Repeal and replacement of First Schedule

2. The principal Regulations are amended by the repeal of the First Schedule and the substitution therefor of the First Schedule set out in the Appendix to these Regulations.

Copies of this Statutory Instrument can be obtained from the Government Printer, P.O. Box 30136, 10101, Lusaka, Price K2.00 each

APPENDIX
(Regulation 2)

FIRST SCHEDULE
(Regulation 2)

PART 1

FEES AND PRICES FOR INDIGENOUS FOREST PRODUCE

Type of produce	*Fees per cubic metre*
A. TIMBER	*Fee Units*
1. Afzelia quanzensis (Mupapa, Mwande)	1150
2. Albizia species (Musase, Mutanga)	1250
3. Baikiaea species (Mukusi)	1250
4. Brachystegia species (Miombo)	900
5. Daniellia alsteeniana (Mukulabushiku)	975
6. Entandrophragma species (Mofu, Mofwe, Mipumema)	975
7. Erythrophleum africanum (Kayimbi, Mukoso, Mubako)	1000
8. Faurea Saligna (Saninga, Mushokoso)	1050
9. Guibourtia coleosperma (Muzauli, Mushibi)	1250
10. Khaya anthotheca (Mululu, Mbewa)	825
11. Mitragyna stipulosa (Mupa)	825
12. Pericopsis angolensis (Mubanga)	825
13 Pterocarpus angolensis (Mukwa, Mulombwa, Mulombe, Mukula)	1250
14. Other species	675
B. POLES AND BAMBOOS FOR SALE	
15. Poles not exceeding 14 cm butt diameter	45
16. Poles between 15 and 19 cm butt diameter	60
17. Poles between 20 and 24 cm butt diameter	75
18. Poles between 25 and 30 cm butt diameter	90
19. Bamboos (Headload)	60 per 20 canes
C. FUEL WOOD FROM INDEGENOUS TREES FOR SALE	
20. Stacked in cubic metres	300 per m³
21. In cords of 1m x 1m x 3m	900 per cord
22. In headloads	60 per headload
23. Charcoal	900 per cord
D. HUT MATERIAL FOR LICENCE CAMPERS IN GAZETTED FORESTS	
24. For temporary huts	225
25. For semi-permanent huts built with poles not exceeding 17 cm butt diameter	300
E. MISCELLANEOUS	
26. Reeds	60 per 40 canes
27. Bark rope in headload bundles taken from trees felled for timber, poles or firewood	30 per headload
28. Top soil when available for collection per 5 ton truck	7500

F. NON-WOOD FOREST PRODUCTS	*Fee Units*
(i) Caterpillars	Free
(ii) Uapaca Fruits	Free
(iii) Parianari Fruits	Free
(iv) Diaspyros (Wild) Friuts	Free
(v) Papyrus	30 per headload
(vi) Palm Leaves	30 per headload
(vii) Tubers	30 per kg
(viii) Bees Wax	30 per kg
(ix) Honey	30 per kg
(x) Propolis	45 per kg
(xi) Devil 's Craw (Seto) Harvester	900 per kg
(xii) Arrow Poison (Mununga)	900 per kg
G. CONVEYANCE	
In country	
29. Timber (sawn)	90 per m³
30. Firewood	45 per m³
31. Charcoal	45 per 50 kg bag
32. Devils craw	900 per kg
33. Arrow poison	900 per kg
Export	
34. Timber (sawn)	100 per m³
35. Devils craw	900 per kg
36. Honey	45 per kg
37. Arrow Poison (Seed)	900 per kg
38. Bees Wax	50 per kg

PART II

Fees and Prices for Forest Plantation Produce

A. PINE TIMBER	
39. Final Felling (Mature crop)	600 per m³
40. Thinning (Immature crop)	360 m³
B. EUCALYPTUS TIMBER	
41. Final Felling (Mature crop)	450 per m³
42. Thinning (Immature crop)	300 per m³
C. POLES OF ALL PLANTATION SPECIES FOR SALE	
43. Poles less than 10 cm top diameter	15 per metre
44. Poles between 10 and 14 cm top diameter	22.5 per metre
45. Poles between 15 and 19 cm top diameter	27 per metre
46. Poles between 20 and 24 cm top diameter	30 per metre
47. Poles between 25 and 29 cm top diameter	37.5 per metre