The Economic Context of REDD+ in Zambia.

Republic of Zambia
Ministry of Lands,
Natural Resources and
Environmental
Protection

This assignment was undertaken on request by the Food and Agriculture Organisation of the United Nations in Zambia under contract Number: **UNJP/ZAM/068/UNJ – 09 – 12 – PHS**

Team Director: Saviour Chishimba

Consultant: Monica Chundama

Data Analyst: Akakandelwa Akakandelwa

Technical Team

Chithuli Makota (REDD+)

Edmond Kangamugazi (Economist)

Saul Banda, Jnr. (Livelihoods)

Authors:

Saviour Chishimba (Lead Author)

Monica Chundama

Akakandelwa Akakandelwa

Citation:

Chishimba, S., Chundama, M. & Akakandelwa, A. (2013). The Economic Context of Reducing Emissions from Deforestation and forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks (REDD+) in Zambia.

The Economic Context of Reducing Emissions from Deforestation and forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks (REDD+) in Zambia.

FINAL REPORT

Saviour Chishimba (Lead Author)
Monica Chundama
Akakandelwa Akakandelwa

2014

ACKNOWLEDGEMENTS

The directors and staff of Even Ha'Ezer Consult Limited are indebted to Mr. Deuteronomy Kasaro and Mrs Maurine Mwale of the Forestry Department and Dr. Julian Fox and Ms. Celestina Lwatula of the UN-REDD Programme at FAO for providing the necessary logistical support, without which, the assignment would not have been completed.

Saviour Chishimba

Chief Executive Officer

Even Ha'Ezer Consult Limited
"Cornerstone In Integrated Consulting"

EXECUTIVE SUMMARY

INTRODUCTION

Preserving forests entails foregoing the benefits that would have been generated by alternative deforesting and forest degrading land uses (for example agriculture, charcoal burning, etc). The difference between the benefits provided by the forest and those that would have been provided by the alternative land use is the opportunity cost of avoiding deforestation and forest degradation.

Thus, the economic context of REDD+ was assessed as part of a series of studies aimed at informing the development of the national REDD+ strategy for Zambia. The framework for the assessment included desktop studies and a socio-economic survey in the Sesheke, Kapiri Mposhi, Isoka, Nakonde and Kapombo districts, thereby sampling each of Zambia's agro-ecological regions.

BACKGROUND

The UN-REDD programme (FAO, UNEP and UNDP) in Zambia has been supporting government, civil society and community level stakeholders in preparation of the REDD+ mechanism. During the REDD+ readiness process, Zambia will have to undertake the following in order to benefit from the initiative:

- Develop a National Strategy or Action Plan to reduce deforestation;
- Develop a national forest reference emission level and/or forest reference level (interim measure at sub national);
- Develop a robust and transparent national forest monitoring system for the monitoring and reporting of the REDD+ activities (interim measure, sub national); and
- Establish a system for providing information on how the safeguards on local community and forest biodiversity are being addressed and respected throughout the implementation of the REDD+ activities while respecting sovereignty.

Executing the above processes involves undertaking various studies to develop an in-depth understanding of the whole range of political, economic, social, technological, environmental, legal and administrative factors that underpin REDD+ implementation. Central to all the processes is due consideration of Zambia's aspiration to attain desirable social economic and environmental indicators, which include, inter alia, increasing income levels, addressing better balance of payments, ensuring equitable distribution of benefits, reducing poverty levels and attracting investment.

Achieving these socio-economic goals may require substantial exploitation of the country's natural assets (renewable and non-renewable). Thus examination and understanding of positive and negative factors that influence the relationship between the socio-economic and the natural environment goals is crucial.

SOCIO-ECONOMIC OVERVIEW ON DRIVERS OF DEFORESTATION

Poverty: Zambia has been classified as a low middle-income country. However this status has not significantly reduced poverty levels in the country. The poverty situation is characterized by the inequality in access to and distribution of specific resources such as financial services, information, land, and insufficient public investment in rural areas. 7.6 million Zambians are dependent on subsistence agriculture, and UNDP has established that there is a strong correlation between poverty and environmental degradation due to poverty resulting in a high dependency on the exploitation of natural resources for survival.

Agricultural Expansion: The majority of Zambians work in agriculture and are mainly smallholder farmers. They practice low-input, low-output production and depend on family labour and hand tools with limited use of oxen. These farmers mainly produce maize and other staple food crops such as cassava, sorghum, millet, groundnuts, and mixed beans although cash crops like cotton and tobacco have also become popular in recent years in areas with good market access and out-grower support.

There are many factors that force smallholder farmers into adopting environmentally unsustainable agricultural practices, including lack of access to knowledge and appropriate technology to increase their productivity without practicing shifting cultivation.

Charcoal/Fuel Wood: Charcoal and fuel wood are the main sources of cooking energy in the rural areas of Zambia. However it must be noted that the use of charcoal is also high in urban areas. Firewood is also an important source of energy for cooking among rural dwellers, and becomes an important cause of deforestation and forest degradation, in combination with other drivers such as shifting cultivation.

Timber Extraction: Almost all rural households depend on forests for fuel, wood and construction materials, and as important sources of non-wood forest products both for subsistence and commercial use. An estimated 68% of total forest product harvested by rural households is consumed within the household, and the remainder (32%) is sold for cash or exchanged for household goods (Jumbe, Bwalya and Husselman, 2008, cited in ILUA policy report, 2008). As a result of growth in infrastructure developments, there will be an exponential increase in demand for timber.

Mining: Mining and mineral exploitation is a strong industry in Zambia; copper mining and export accounts for almost 90% of export earnings and has made a significant contribution to the country's GDP. The expansion of mining operations will contribute to deforestation in Zambia, but due to the high economic benefits of investments in the mining sector, mining will continue to take precedence over land and forest management. According to the International Development Law Organisation (2011), mining is linked to the Sixth National Development Plan and Vision 2030, and overwhelmingly takes priority over other rights tied to the same geographic location.

Mining and mineral exploitation impact REDD+ implementation insofar as subsurface rights often take precedence over land and forest management, and can thereby cause reversals or displacements and compromise results-based payments to persons involved in forest management (ibid.).

Mining and mineral processing affect the environment, biodiversity, and livelihoods (Caritas 2009, Mwitwa *et al.* in prep) through impacts (Campbell, D. et al, 2010) for instance land users in mining concession areas tend to seek alternative areas to settle and embark on land clearing for agriculture. The clearing of forest for agriculture magnifies the expansion of deforested land – the sum of vacated land plus the new clearing.

Mines in the Copperbelt have had a long history of dependence on indigenous timber sources. In the post-1970 era, demand has primarily shifted to the forests of the North-western Province where timber has been sourced using contractors holding concession licenses. The demand for specific tree species has largely resulted in forest degradation in concession areas, and it impacts regeneration and biodiversity of target forests.

Furthermore, human population growth associated with mining brings with it other harmful environment and biodiversity-impacting activities, such as the indiscriminate clearing of forests and woodlands for timber and non-timber forest products, charcoal production, and fuel wood. This leads to the loss of habitats for a large number of animals and plant species. The increase in demand for timber, non-timber forest products, charcoal, and fuel wood puts the survival of a large number of animal and plant species at stake.

Roads: The road sector is expected to take center stage in the quest to open up rural areas to markets. It has been established in some studies that infrastructure development like roads follow natural resources. Therefore, as more areas are getting access to markets, there will also be increased access to forests and other natural resources.

Insecure tenure of Forest Land: Today the land law of Zambia recognises only two tenure regimes: "state" and "communal," and all land is officially categorised as either "State Land" or "Customary Land" respectively (Republic of Zambia 1995,

cited by Chileshe, R). An estimated 94% of the country is officially designated as customary land and is occupied by 73 tribes, headed by 240 chiefs, 8 senior chiefs and 4 paramount chiefs (UN-REDD Programme Document).

There is no security of tenure under customary land. Therefore, it is important to ensure that ongoing land reforms take into account the need to ensure security of tenure. This is because lack of security will not only negatively impact potential REDD+ projects, but also the environment generally.

OPPORTUNITY COSTS FOR REDD+ IMPLEMENTATION

The opportunity cost of avoiding the conversion of a hectare of high density forest into commercial agricultural use (soybean) is US$80.8/tCO$_2$ while that of small-scale agriculture (maize) is US$2.4/tCO$_2$. The opportunity costs for conversion due to low and high intensity charcoal use are US$0.5/tCO$_2$ and US$1.3/tCO$_2$ respectively. Apart from commercial agriculture whose opportunity costs are high, expansion of small scale agriculture and unsustainable charcoal production are relatively low.

Comparatively, the average opportunity cost estimate for the Africa region is US$2.22/tCO$_2$ eq. In a study of 29 opportunity cost estimates, Boucher (2008) established that most of the values were relatively low, the mean standing at US$2.51/tCO$_2$ eq. Notably, 18 of the 29 estimates were less than US$2/tCO$_2$ eq. while the overall range was from less than zero to US$13.34/tCO$_2$ eq. Of all the 29 case studies, only one was above US$10/tCO$_2$ eq.

ALTERNATIVE LIVELIHOOD OPTIONS UNDER REDD+

Key informants suggested a wide range of alternative livelihood options, which included the following: Sustainable Conservation Oriented Enterprises (SCOEs) like bee keeping, diversified agriculture activities (fish farming, gardening, poultry farming, and dairy farming), retail business and conservation farming.

Suggestions for the success of alternative livelihood options included the following:

- Increasing the provision of fertilizer to small scale farmers;
- Provision of credit facilities to small scale farmers;
- Reducing electricity tariffs in rural areas; and
- Subsidising the price of solar energy equipment.

Suggestions for alternative sources of energy also included rural electrification (49.0% of respondents), solar energy (28.6%), gas (8.2%), firewood (4.1%), bio fuel (4.1%), charcoal (2.0%), cow dung (2.0%), and kerosene (2.0%).

CONSTRAINTS TO AND PROSPECTS FOR REDD+ IMPLEMENTATION

Constraints to REDD+ Implementation	Prospects for REDD+ Implementation
Policy Level	**Policy Level**
(a) Weak governance structures and inability to harmonize fragmented pieces of legislation in the environmental sector may remain the biggest constraints to the successful implementation of REDD+ interventions, which require strong transparency and accountability for equity. (b) Stagnant or declining socio-economic conditions will tend to impact negatively on the REDD+ resource base.	(a)Targeting key causes and processes that alter forests and opportunity to determine acceptable levels of deforestation needed for socio-economic development by expanding the horizons for managing forests for multiple uses. Added to this is an understanding of the underlying and proximate causes driving change in forest cover. (b) Lesson gathering, especially in the legal framework that can inevitably be used to amend or enact new laws.
Operational Level	**Operational Level**
(a) Capacity limitations arising out of individual, organisational and institutional weaknesses that REDD+ may not be able to address directly e.g. education levels, HIV/AIDS and corruption, enforcement of laws and controlling drivers of deforestation and implementing an effective MRV. (b) Inadequate stakeholder engagement and participation. (c) The limited adaptive capacity to climate change among smallholder farmers will continue to put pressure on forest resources for livelihoods as the only alternative to subsistence agriculture.	a) Cooperation between various levels and multi-actors (new partnership arrangements) of forest/national resources management including resource mobilisation beyond REDD+ implementation.
Source: Socio-economic survey of this study	

CONCLUDING NOTE

When the five study districts are considered, Kapiri Mposhi, Isoka and Nakonde ranked highest in charcoal production. Small-scale agriculture was dominant in all the districts. However, all calculated opportunity costs are positive, therefore the value of the forests in terms of standing carbon does not compensate for forgoing deforesting activities. There will need to be additional external investments in alternative livelihoods to supplement the value of standing carbon under a REDD+ mechanism.

From the opportunity costs standpoint, the evidence to support the conclusion that REDD+ implementation is feasible in Zambia can be drawn from the fact that the opportunity costs of avoiding conversion of a hectare of natural forest to small scale agriculture (US$2.4/$tCO_2$), high intensity charcoal use is US$1.3/$tCO_2$ and low intensity charcoal is (US$0.5/$tCO_2$.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ASB	Alternatives to Slash and Burn
BoZ	Bank of Zambia
CBA	Cost Benefit Analysis
CBO	Community Based Organisation
CSO	Central Statistical Office
FAO	Food and Agriculture Organisation of the United Nations
FD	Forestry Department
FRA	Food Reserve Agency
GDP	Gross Domestic Product
GRZ	Government of the Republic of Zambia
ICT	Information and Communication Technology
ILUA	Integrated Land Use Assessment
LCMS	Living Conditions Monitoring Survey
LU	Land Use
MTENR	Ministry of Tourism, Environmental and Natural Resources
MT	Metric Tonne
ND	No Date
NF	Natural Forest
NHCC	Heritage Conservation Commission
NPV	Net Present Value
REDD+	Reducing Emissions from Deforestation and forest Degradation, as well as conservation and enhancement of carbon stocks in forests and sustainable forest management in developing countries
SCOE	Sustainable Conservation-Oriented Enterprise
SPSS	Statistical Package for the Social Sciences
SWOT	Strengths, Weaknesses, Opportunities and Threats
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNFCC	United Nations Framework Convention on Climate Change
UN-REDD	United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation
WBI	World Bank Institute
ZAMMOD	Zambian Macroeconomic Model
ZDHS	Zambia Demographic and Health Survey

1. INTRODUCTION

1.1 General Overview

The Reducing Emissions from Deforestation and forest Degradation, as well as conservation and enhancement of carbon stocks in forests and sustainable forest management (REDD+) mechanism has gained international prominence as part of the climate change mitigation strategy within the parameters of the United Nations Framework Convention on Climate Change (UNFCCC).

As part of preparations for REDD+, the Government of the Republic of Zambia (GRZ) has been executing a national FAO/UNEP/UNDP supported REDD+ readiness programme[1]. It is expected that participating in the REDD+ readiness process will contribute to a well-designed national REDD+ strategy and framework, which will have positive effects on biodiversity, ecosystem conservation and the livelihoods of forest-dependent communities (Kokwe 2010), and subsequently the attainment of the country's sustainable development goals.

Thus, this report is a contribution to the evolving understanding of the economic context of REDD+ in Zambia and as part of REDD+ preparedness. This report focuses on the (developing) interface between the socio-economic aspects, the natural environment and the resultant environmental changes.

For the purposes of this report, the term "*environment*" includes three facets: firstly the natural environment (made up of natural and other physical resources), secondly the ecosystems and their constituent parts, including people and communities, and thirdly the social and economic aspects within which the first and second facets operate.

The specific focus is on those socio-economic drivers influencing changes to natural assets and ecosystems and consequently on the Zambian population. "Environmental change" in this report is defined as alterations that manifest in the natural environment i.e. change in the status of natural assets, ecosystems and the socio-economic status the population.

Broadly, this report discusses the relationships between key economic sectors and forests and the associated socio-economic implications of REDD+ implementation in Zambia.

1.2 Purpose of the Study and Scope

The overall economic goal of GRZ is to create wealth and improve human wellbeing as espoused in the country's Vision 2030 and National Development Plans. At the centre of its plans is the attainment of desirable social economic and environmental indicators and movement to middle income status by 2030 (GRZ, 2009; GRZ 2011).

Increasing income levels, addressing better balance of payments, ensuring equitable distribution of benefits, reducing poverty levels and attracting investment will require substantial exploitation of the country's natural assets (renewable and non-renewable). Therefore, it is crucial at this stage of the REDD+ process to examine and understand those positive and negative factors that influence the socio-economic-natural environment relationship and the prospects and pressures presented.

The reduction of emissions from deforestation and forest degradation will also require investments in alternative livelihood options. Foregoing the economic benefits that come with deforestation and forest degradation will only make sense to policy makers and the general population if alternatives that are advanced under REDD+ offer sustainable benefits.

Against this background, this report informs policy formulation and national REDD+ strategy development within Zambia's socio-economic context. This is based on the understanding that while a number of REDD+ interventions are universal, their applicability and sustainability are to a large extent determined by the local policy and socio-economic contexts.

1 FAO/UNDP/UNEP. 2008. Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD). UN-REDD Programme Secretariat. www.un-redd.org

1.3 Organisation of the Study Report

The report is structured according to specific sections starting with this section, which has provided a general overview of the study. Section two describes the methodological approaches that were used to gather economic data including the estimation of actual opportunity costs for REDD+ in Zambia. The limitations that potentially affected the study in one way or the other are highlighted in section three. The global and national contexts of REDD+ are discussed in section four and five respectively. Section six covers findings of the study, and conclusions and recommendations are presented in section seven and eight respectively.

2. METHODOLOGY

2.1 Desktop Study

A systematic review methodology was used to identify published and unpublished studies that are relevant to the economic context of REDD+. While the primary focus of the literature review was on studies that have been undertaken in Zambia, relevant reports from other countries were equally reviewed for the purposes of broadening the understanding of how socio-economic factors affect the natural environment and REDD+ implementation in other countries. This was for the purposes of gathering key lessons on methodological approaches from other countries which have undergone or are currently engaged in the REDD+ processes.

2.2 Socio-economic Survey

Key Informant Interviews

Government Departments: Data was collected from eighteen informants from five departments, namely Department of Forestry (5), District Administrative Office (3), District Agriculture Department (6), District Council (3), and Department of Lands (1).

Smallholder Farmers: Data was collected from 37 smallholder farmers in five districts of Zambia, namely Kabompo (12), Kapiri Mposhi (8), Sesheke (1), Isoka (8), and Nakonde (5). Three questionnaires missed the data on the districts of informants. Twenty-seven (27) were males while eight (8) were females. Two omitted to state their gender.

Charcoal Burners: Data was collected from twenty two (22) households in four districts of Zambia involved in charcoal burning or trading, namely Kabompo (5), Kapiri Mposhi (6), Isoka (5), and Nakonde (5). All the informants were individual sole traders. Fifteen (15) of the informants were charcoal burners or primary producers while the remaining seven (7) were charcoal dealers or buyers. Seventeen (17) of the informants were males while five (5) of them were females.

Traditional Leaders: Data was collected from 19 traditional leaders in the five districts of Zambia, namely Kabompo (6), Kapiri Mposhi (4), Sesheke (1), Isoka (5), and Nakonde (3). One (1) informant was a chief and eighteen (18) informants were village heads.

Community Based Organisations (CBOs) in the environmental sector: Data was collected from eighteen (18) CBOs in the five districts of Zambia, namely Kabompo (7), Kapiri Mposhi (5), Isoka (3), and Nakonde (1). Two (2) questionnaires missed the data on the districts of two (2) informants. Ten (10) informants were males while six (6) were females. Two (2) omitted to state their gender. The oldest CBO was established in 1987, two were established in 2003, two in 2004, two in 2008, one in 2010, four in 2011, and one in 2012. Three did not state their year of establishment.

Timber Producers: Only one timber producer was interviewed in Sesheke. This was due to the non-cooperation of other timber producers, and the situation was compounded by the suspension of timber production licences during the course of data collection.

Household Interviews

Data was collected form 220 households in five districts of Zambia, namely Kabompo (58), Kapiri Mposhi (60), Sesheke (27), Isoka (35), and Nakonde (33). In terms of district representation, there were seven questionnaires with missing data. 65% (136) of the informants were male while 35% (73) were female. 79% of the informants were married, 13% were single, 0.9% were divorced, 1.4% were separated, 4.7% were widows, and 0.9% were widowers. Eight (8) informants did not state their marital status. The table below gives a general overview about respondents.

Table 1: Distribution of Informants by District

	Number of Respondents	%	Valid %	%
Kabompo	58	26.4	27.2	27.2
Kapiri Mposhi	60	27.3	28.2	55.4
Sesheke	27	12.3	12.7	68.1
Isoka	35	15.9	16.4	84.5
Nakonde	33	15.0	15.5	100.0
Total	213	96.8	100.0	
Not stated	7	3.2		
Total	220	100.0		

The number of persons in the households ranged from one to twenty, with an average of seven persons.

2.3 Estimation of Opportunity Costs

Five Step Process used for Estimating the Opportunity Costs of REDD+

Predominantly based on the UN-REDD Programme report for Vietnam (2011), these steps were followed for estimating the opportunity costs for REDD+ in Zambia:

Step 1: Identification, Classification and Description of Major Land Uses in Zambia

This involved identification of current land uses based on historical trends. After identifying current land uses, future trends in land uses were predicted. The Drivers of Deforestation and Forest Degradation consultancy team led this process.

Step 2: Land Use Characterisation and Land Use Change Analysis (Development of Alternative Land Use Scenarios)

Step 2 was also led by the Drivers of Deforestation and Forest Degradation consultancy team. Essentially, land use characterization and land change analysis was done using remote sensing data and extensive ground-truthing in the selected project sites.

Step 3: Calculation of Time-averaged Carbon Stocks for each of the Land Uses

Analysis of carbon stocks for each land use was based on existing data sources from relevant documents.

Step 4: Calculation of the Private and Social Profitability of Land Uses in terms of Net Present Value (NPV)

The Net Present Value (NPV) for each land use was then calculated. The NPV takes into account the time-value of money. Since waiting for profits is less desirable than obtaining profits now, the "value" of future profits is discounted by a specific percentage rate.

Step 5: Estimating Actual Opportunity Costs (Computations)

This step integrated all the information generated from the previous steps. Opportunity costs for REDD+ gives a money-based figure calculated as $/CO_(2)e.

2.4 Data Procession and Analysis Plan

2.4.1 Desktop Study

Summarising the Evidence
The findings from the studies were summarised using the following criteria:

1. Socio-economic parameters in the country of implementation;
2. International approaches used;
3. Pros and cons for each of the approaches used;
4. Steps followed in estimating opportunity costs; and
5. Applicability in the Zambian context.

Interpretation of Findings
The summary of evidence fed into the final interpretation of findings from international studies on estimating opportunity costs for REDD+.

2.4.2 Socio-economic Survey

Five questionnaires were used to collect data. These were the Smallholder Farmers' Questionnaire, the Households' Questionnaire, the Traditional Leaders' Questionnaire, the Charcoal Burners' Questionnaire, the Community Based Organisations' Questionnaire, and the District Government Officers' Questionnaire.

Data was coded and entered initially into Microsoft Excel and then later transferred into the Statistical Package for the Social Sciences (SPSS) version 16. Quantitative data was analysed using SPSS to run various statistics such as frequencies, averages, and minimum and maximum values.

Responses from open-ended questions were also entered into Microsoft Excel, standardised into emerging themes, and then later transferred into SPSS and analysed separately. Each questionnaire was treated as a separate dataset. Some of the charts were then transferred from SPSS to Excel to make it easy to edit for reporting purposes.

2.4.3 Opportunity Cost Analysis

A bottom-up approach was adopted and this involved a review of data on actual land use changes based on historic trends. Each of the selected land uses was then subjected to Cost Benefit Analysis (CBA). After CBAs, the data including carbon stock estimates were used to do the actual computations of opportunity costs. The economic data, which was obtained from the survey, was adjusted based on expert input on productivity estimates.

For the purposes of estimations, 10% was used as a discount rate, as in nearly all the REDD+ projects this is the rate used. In addition, the inflation rate (7%) was factored in. Therefore, the cash flows for each land use were discounted by applying 10% as a discount rate and 7% as the average inflation rate in Zambia[2].

The Net Present Value (NPV) for each land use type was derived using the following formula:

Where,

$$NPV = \sum_{t=0}^{T} \frac{TR_t - TC_t}{(1+r)^T}$$

2 Zambia's inflation rate has averaged 7% (BoZ, 2011, 2012; CSO, 2010, 2011). The 10% discount rate has been adopted as the social rate, which has been widely used under the World Bank studies (World Bank Institute, 2011).

NPV = The net present value for each land use type, expressed in US$ ha,

TR_t = Total revenue, expressed in US$ ha,

TC^t = Total cost, expressed in US$ ha,

T = The total time (30 years) horizon for NPV analysis management cycle, and

r = The discount rate (10% was used).

After calculating NPVs for each land use type, the results were used as input data into the opportunity cost formula.

Formula for Opportunity Cost Analysis of REDD+ (Engineering, Bottom-Up Approach)

Where:

$$OppC_{NF} = \left[\frac{NPV_{NF} - NPV_{LU}}{C_{LU} - C_{NF}} \right]$$

$OppC_{NF}$ = The opportunity cost of avoiding the conversion of one ha of natural forest to an alternative Land Use (Driver of Deforestation and forest Degradation), expressed in US$/t$CO_2$;

NPV_{NF} = Discounted cash flow from a natural forest, expressed in US$/ha;

NPV_{LU} = Discounted cash flow of an alternative land use (Driver of Deforestation and Forest Degradation), expressed in US$/ha;

C_{LU} = The mean carbon stock value (aboveground and belowground) of a particular alternative land use (driver of deforestation and forest degradation), expressed in tCO_2/ha;

C_{NF} = The mean carbon stock value (aboveground and belowground) of a natural forest, expressed in tCO_2/ha

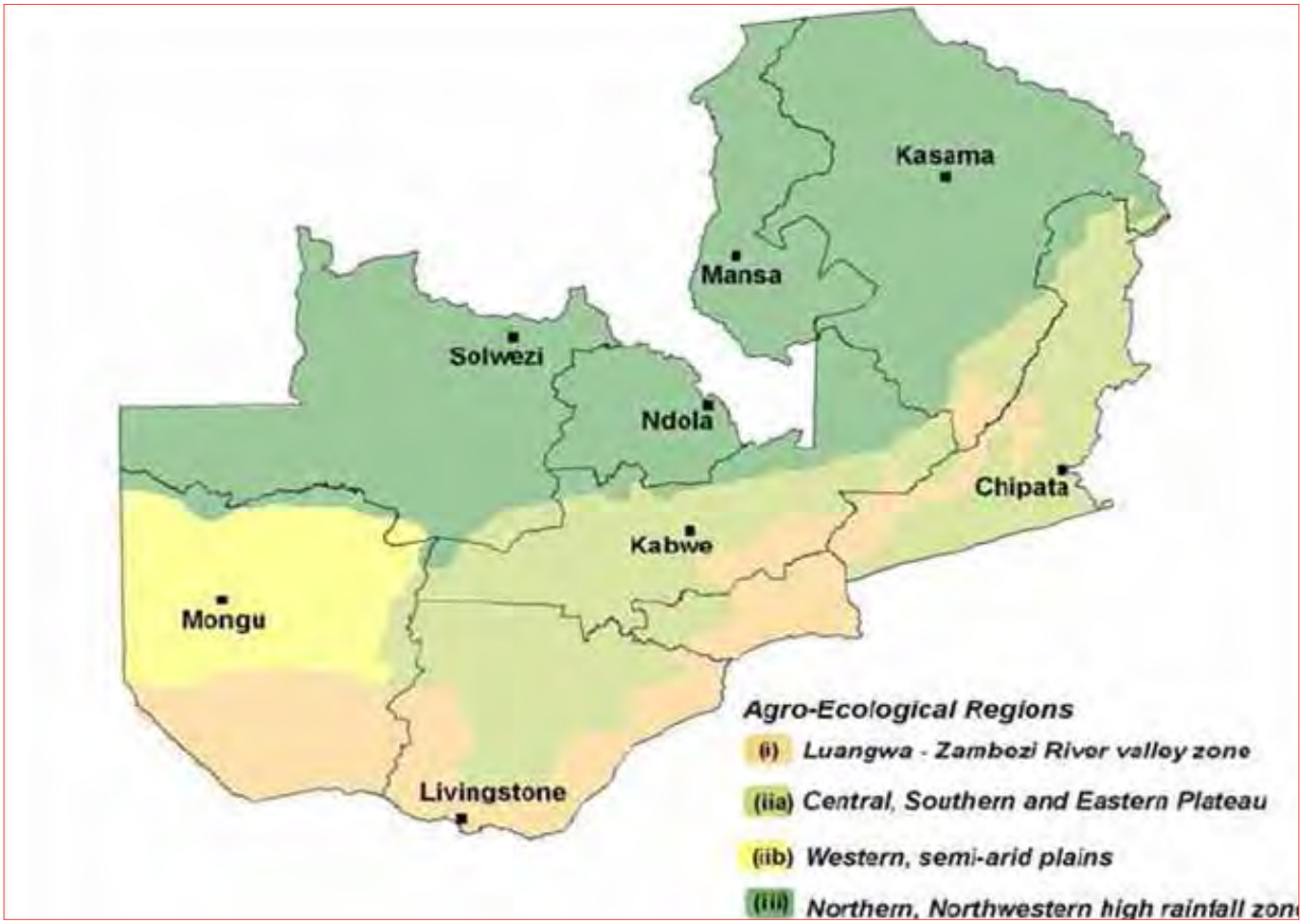
For ease of all computations, calculations were done in Excel.

2.5 Selection of Study Sites in Agro-ecological Regions

Selection of study sites was based on Zambia's agro-ecological zones (see figure below) as follows:

- Sesheke District: located in zone 1 (Luangwa – Zambezi River Valley Zone) and zone 2b (Western, Semi-arid Plains);
- Kapiri Mposhi District: located in zone 2b (Central, Southern and Eastern Plateau); and
- Isoka, Nakonde and Kabompo Districts: all located in zone 3 (Northern, North-western high rainfall zone).

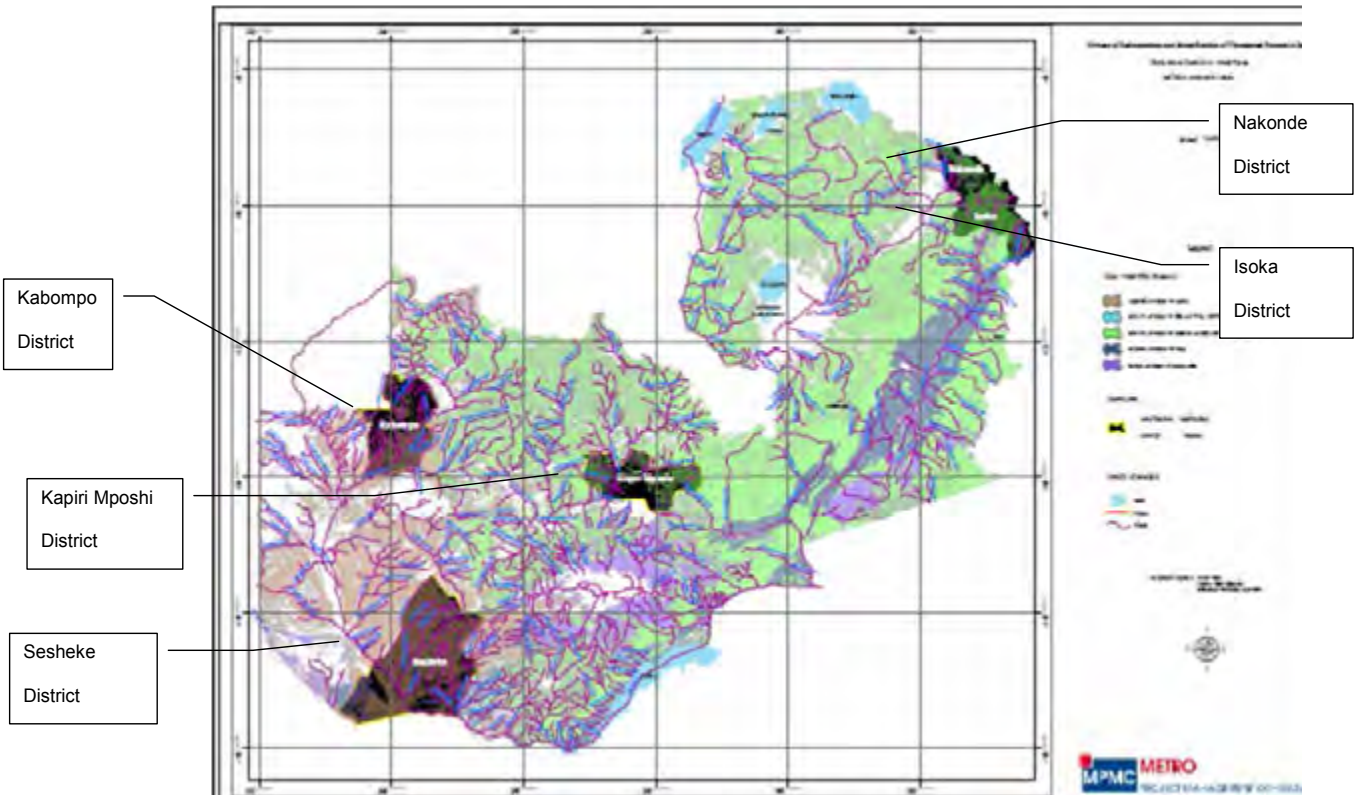
Figure 1: Zambia's Agro-ecological Regions



Source: FAO, 2010

The rationale for picking Sesheke was based on evidence from the literature review that timber extraction is high in the Western Region of Zambia. Kapiri Mposhi, Isoka and Nakonde districts were selected for the purpose of sampling households that are engaged in shifting cultivation. Kabompo District in North-Western Province was selected to sample households that are in the high rainfall zone. The map below shows the geographic location of study districts.

Figure 2: Selected Study Areas



Source: *Chomba, B.M., Tembo, O., Mutandi, K., and Makano, A.,* (2012)

3. GLOBAL CONTEXT

3.1 International REDD+ Policy Context

The UNFCCC came into being more than 20 years ago at the Earth Summit in Rio de Janeiro following from discussions to establish a global framework for international efforts to tackle climate change. The international community adopted the UNFCCC recognizing that the climate system was a shared resource that can be destabilized by emissions of greenhouse gases from human activity.

The overall objective of the Convention, as included in its Article 2, is: "to *stabilize atmospheric concentrations of greenhouse gases at a level that would prevent human-induced actions from leading to dangerous anthropogenic interference with the global climate system." It further states that "such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure food production is not threatened, and to enable economic development to proceed in a sustainable manner.*"

The UNFCCC has been ratified by 193 countries and it entered into force on March 21, 1994. It is intended to allow governments to:

- Gather and share information on greenhouse gas emissions, national policies and best practices;
- Launch national strategies for addressing greenhouse gas emissions and adapt to expected impacts, including the provision of financial and technological support to developing countries; and
- Cooperate in preparing for adaptation to the impacts of climate change.

Forests in Climate Change Negotiations
In 2001, the Marakesh Accords were negotiated and established the rules for how the mitigation targets laid out in the Kyoto Protocol would be achieved, including emissions from land use change in developing countries. An eligible mitigation strategy was controversial due to concerns about permanence, leakage, additionality, and the technical capacity to measure and monitor emission reductions.

Since the mitigation targets had already been set in the Kyoto Protocol, including new sources of emissions reductions (i.e. from land use change in developing countries) was seen as an 'offset' rather than an additional reduction in emissions. Emissions reductions from avoided deforestation in developing countries were not included as an eligible mitigation strategy.

The Bali decision further calls for the inclusion of REDD+ as part of a post-2012 mitigation strategy: The 'Bali Road Map' states that:

- The technical capacity to accurately measure and monitor emissions reductions from reduced deforestation and degradation exists.
- The decision acknowledges that degradation also leads to emissions and needs to be addressed when reducing emissions from deforestation.
- The needs of local and indigenous communities have to be considered.
- Demonstration activities and capacity building are necessary for countries that may not be ready to engage in the mechanism by 2014.

3.2 International Approaches to Estimating Opportunity Costs for REDD+

The predominant international approaches for estimating opportunity costs for REDD+ are top-down and bottom-up approaches. Top-down approaches, which are also known as global models, include global empirical and global simulation models.

Top – Down Approach

Global Simulation Model

Primarily, global simulation models are based on dynamic economic models[3]. Proponents for and practitioners of this approach utilise aggregate economic variables to ascertain the REDD+ economic potential. The forces of supply and demand are also factored into the analysis.

Global Empirical Model Approach (Per Area Approach)

Global-empirical models use local estimates, which are then aggregated to global per-area costs of reducing deforestation (Boucher cited in Wertz-Kanounniko, 2008). The conversion of the global area-based costs ($/ha) to emission-based costs ($/t$CO_2$ eq) tend to be based on uniform values of carbon density (ton/ha), obtaining a single, global estimate of opportunity costs ($/t$CO_2$ eq) (ibid).

Strengths of Top-Down Approaches

According to WBI (2011), the strengths of global models include:

- Explicit assumptions about future conditions shaping timber models (e.g., population pressure); and
- Explicit consideration of REDD+ policy effects on timber prices.

Weakness of Top-down Approaches

The weaknesses of global models for estimating the opportunity costs for REDD include (WBI, 2011):

- Use of aggregated average carbon stock estimates at national level. There is no differentiation of carbon stocks at regional/sub-national level and yet other regions may have higher carbon stocks than others;
- Estimates of forest extent in each region based on imprecise data;
- Simplistic modeling of land use change (e.g., one type of forest to one type of agriculture);
- Only timber production considered to determine forest value; and
- Lack of regionally specific data.

Bottom – Up Approach

The bottom-up approach is also referred to as the regional-empirical model. Its applicability is more suited to a local level. The bottom-up approach is a preferable option at the country level because determination of opportunity costs is based on actual country specific data, which take into account the local economic conditions and carbon stocks and land use change patterns. The local-empirical approach is thus based on detailed studies within a particular area.

3 See The World Bank Institute (2011, Version 1.3), Estimating the Opportunity Costs of REDD+: A training Manual, p.1- 24

Swallow, *et al.* (2007)[4] present sub-national opportunity cost curves for Alternatives to Slash and Burn (ASB) sites in Indonesia, Peru and Cameroon. Such studies generate detailed cost curves based on detailed field research thus requiring fewer assumptions than global models. Nevertheless, bottom-up approaches do not necessarily take into account global feedback relationships that would change prices (e.g., food and timber), and thus costs as a REDD+ system develops (Boucher, 2008b)[5].

Weakness

The disadvantage is that the area studied is often quite small. When the results from these studies are generalised to a larger area or transferred to other areas, which might have different physical and location factors, accuracy is lost. For this reason, global-empirical estimates such as those prepared for the Stern Review, and which draw on the results of local studies, can only be approximate (Bond *et al.* 2009, p. 18). In addition, very few of these studies address the cost of avoiding forest degradation.

Strengths

These studies have the advantage that they take into account location-specific factors that affect the returns to different land uses, such as proximity to markets, soil fertility, climate etc., and differences in carbon density. This means that their accuracy for the area studied is high (Bond *et al.* 2009, p. 18).

Concluding Methodological Note

Even though various theoretical frameworks for estimating opportunity costs for REDD+ exist at international level, there are many complexities associated with their practical application. These include consensus building on methodological points and the challenges associated with generating the required data for estimation purposes.

Due to complexities and the wide variations in opportunity cost estimates that global models give, the bottom-approach is more commonly used in many emerging REDD+ countries.

4 Ibid 2
5 Ibid

4. ZAMBIA CONTEXT

4.1 Geography

Zambia is a large country (752,614 km^2) located in mid-continental south central Africa. Being surrounded by eight neighbouring countries presents challenges in the management of trans-boundary resources. Most of Zambia lies between 1,000 and 1,700 meters above sea level. The highest parts of the country are in the northeast with the plateau gradually sloping to the south east (MENR 1997). Temperatures are moderate and fluctuate around 25oC, with an average seasonal range from approximately 28oC in the summer months, to 15oC in winter (Pope 2006).

The country receives moderate rainfall ranging from an annual average of approximately 600 mm in the south of the country to 1335.9 mm in the north (National Water Policy 2011). The rainfall data available for the country shows progressive reduction in annual cumulative rainfall amounts between 1950 and 2005 (ZEMA 2008, cited by Campbell, D *et al.* 2010), though further analysis has shown that these trends are not statistically significant (New *et al.* 2006, cited by ibid.).

Surface water trends in most cases follow the rainfall patterns since surface water responds quickly to seasonal rainfall patterns. The country thus has a highly vascularized river system along with water bodies that cover as much as 6% of the total land area (MENR 1997). The country is located in the Congo-Luapula and the Zambezi River Drainage Systems.

Ground water is well distributed in many areas and is the most reliable source of potable water in rural areas. Water quality in the natural environment is relatively good in many parts of the country.

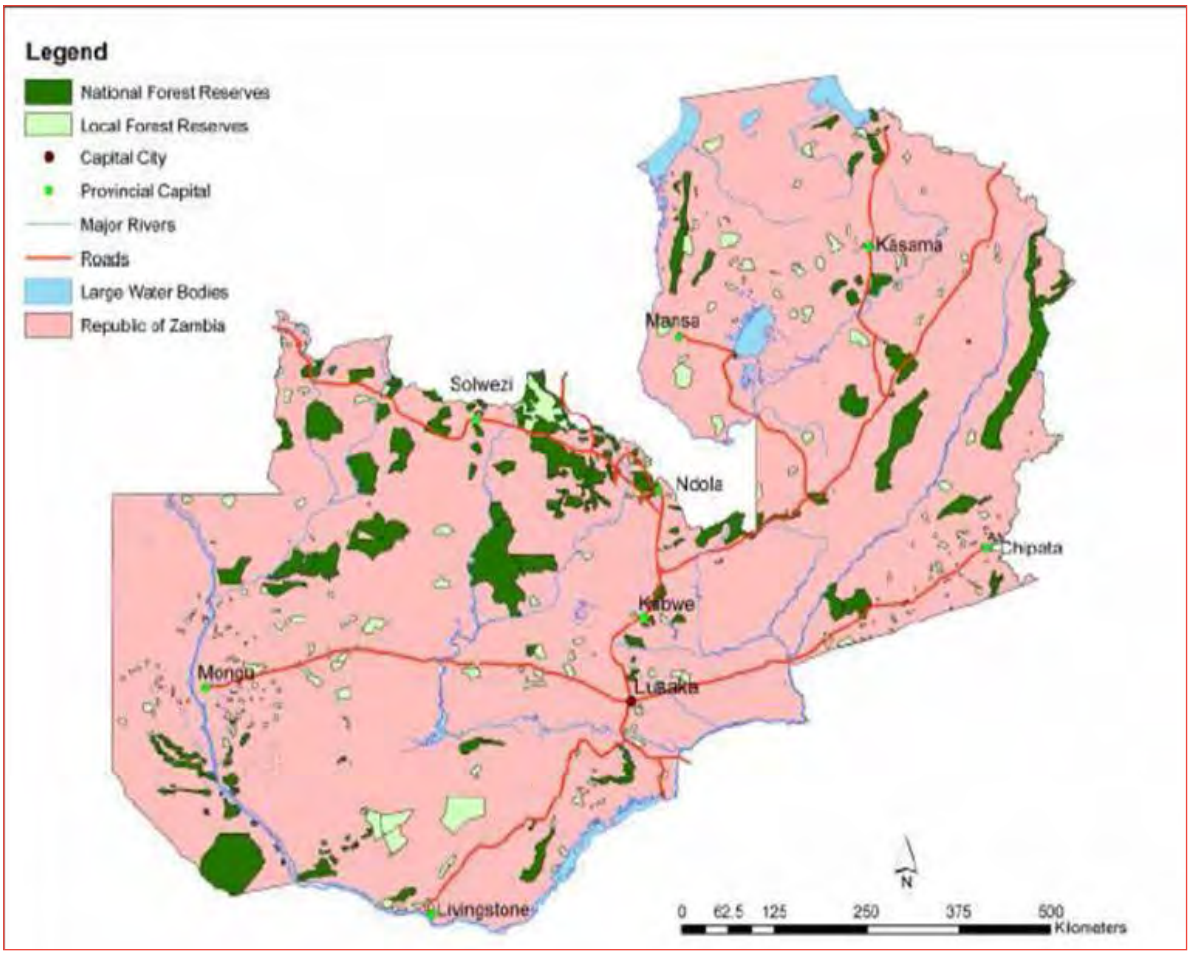
In terms of ecosystem diversity, 16 ecosystems have been identified within the country's main biomes: forests, woodlands, and grasslands, aquatic and anthropic types. Woodlands and forests cover at least 45% of Zambia, with a greater density in the northern half of the country (MTENR 2006; Pope 2006). About 60,000 ha are covered by exotic pine and eucalyptus plantations, mainly (50,000 ha) on the Copperbelt, with the balance in small, mostly degraded stands scattered through most districts (Pope 2006).

The total area of indigenous forest in Zambia is 44.6 million hectares and covers 60% of the total land area, out of which 9.6% are gazetted forests. There are 481 forest reserves; 181 National Forests and 300 Local Forest Reserves (MTENR, 2007), (Shakacite, 2000). Encroachments in forest reserves are a major problem (Hansugule 1998). Figure 1 below shows the extent of national and local forest reserves. About 51% of forest reserves are either encroached or depleted due to over-exploitation of wood products, settlement and cultivation. About 2% of the National Forests are depleted, while 46% are encroached and 52% are intact. Seventeen (17) forest reserves have been degazetted for other land use representing about 3% of the total forest reserves area (FD, 2008).

Effective management in protected areas is very limited (Makano, 2008). The rest of the forests are ungazetted, mainly found on traditional or state land and within the municipalities for human settlement, farming and infrastructural development. The national biomass (above and below ground) is estimated at 5.6 billion tonnes, with an additional 434 million tonnes of dead wood biomass, a total biomass estimate of 6 billion tonnes. Of this, approximately 2.8 billion tonnes of carbon is stored in forests. The forests therefore hold a considerable amount (90%) of the country's total aboveground biomass (Siyanga and Muyoyeta undated), (Mukosha & Siampale, 2008); (GRZ, 2010).

A further 6% of the country is made up of vast wetlands and swamp forests with their specialized riparian vegetation. The wetland biome covers approximately 14 % of Zambia when dambos are included.

Figure 3: National and Local Forest Reserves



Source: GRZ, 2009 cited by Campbell, D. et al. 2010

Based on annual rainfall, Zambia is divided into three agro-ecological zones (see table 2) whose characteristics have a bearing on agriculture activity. An estimated nine million hectares of land (12% of its total land area) is suitable for cultivation and 16 million hectares suitable for rangeland grazing (Jain 2007) (World Bank 2012).

Table 2: Average rainfall by agro-ecological zones

Agro-Ecological Region	Description of AER
Agro-ecological Region I (12% of the total land area)	• Population: low about 2.5 million; • Forest Cover: Generally little; • Rainfall per annum: less than 750 mm; • The valley is hot and humid. • Agro-based economic activities or potential: cotton, sesame, sorghum and millet (potential for irrigated crops, like winter maize) - Potential for cattle production, but tsetse flies renders region unsuitable.
Agro-ecological Region II (42% of the total land area)	• Population: about 4 million; • Forest Cover: primarily deciduous forests consisting of mopane woodlands, munga and Kalahari woodlands and Baikiaea forests; • Rainfall per annum: 750 and 1000 mm; • Agro-based economic activities and potential: the greatest agricultural potential.
	Region IIa (fertile plateau): permanent settled systems of agriculture - maize, cotton, tobacco, sunflowers, soya, irrigated wheat and groundnuts. Also suitable for flowers, paprika and vegetable production.
	Region IIb (generally sandy soils): suitable for cashew nuts, rice, cassava and millet, including vegetable and timber production, beef, dairy and poultry.

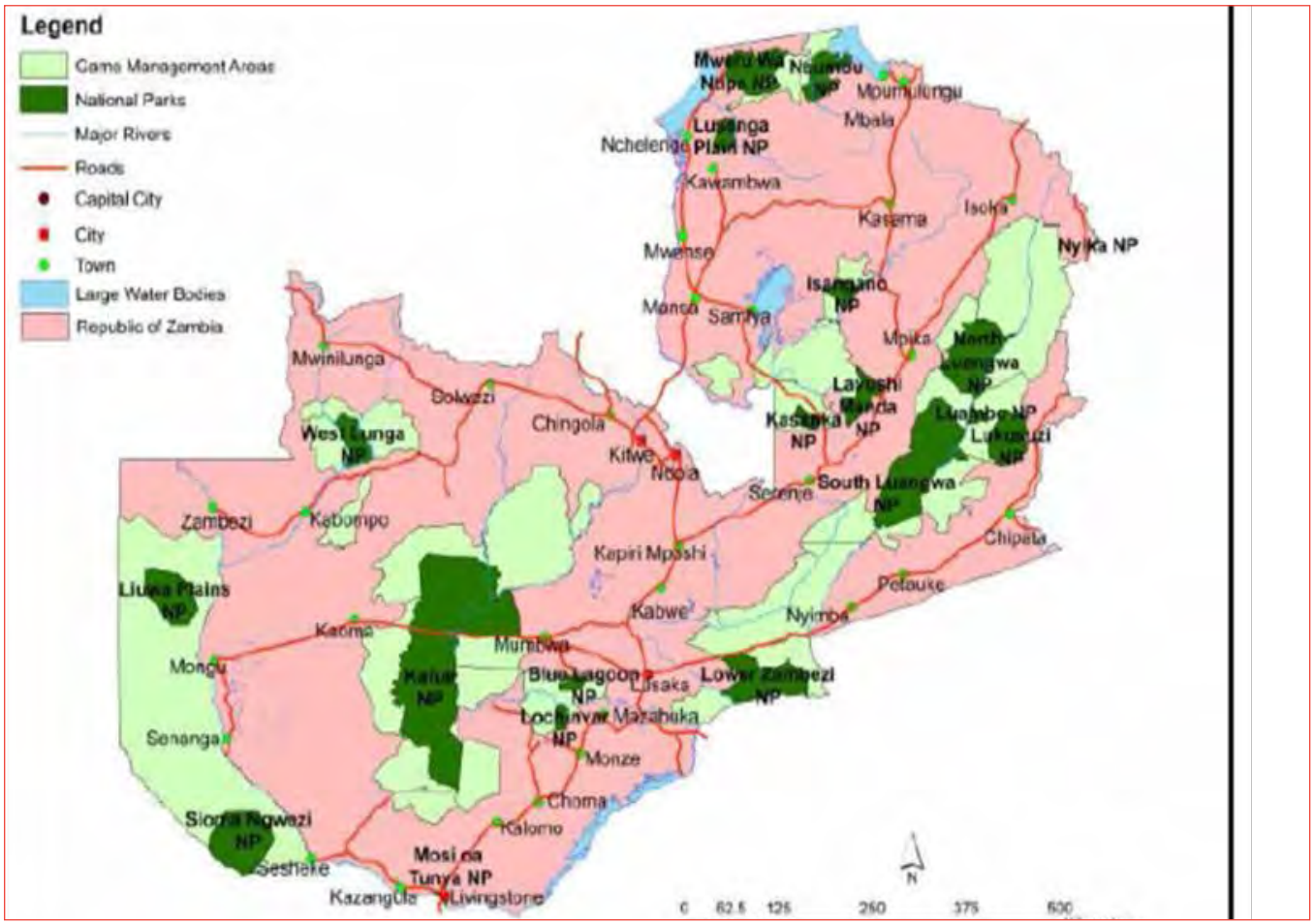
Agro-ecological Region III (46% of the total land area)	• Population: over 3.5 million; • Forest Cover: primarily semi-evergreen forests consisting of miombo woodland. The miombo woodland covers approximately 60% of Zambia's total surface area and thus is the most important vegetation type in terms of carbon storage; • Rainfall per annum: over 1000 mm (soils are highly leached and acidic, except Copperbelt province); • Agro-based economic activities: millet, cassava, sorghum, bean, groundnuts, coffee, sugarcane, rice and pineapples.

Source: FAO, 2010

The diversity of fauna has been estimated at 3,407 species, of made up of invertebrates (1,808), birds (733), fish (409), mammals (224), reptiles (150), and amphibians (67), (MTNER 2006).

Species and their supporting ecosystems are given legal protection in the 20 national parks, 4 sanctuaries and 36 Game Management Areas (GMAs) established around the country. GMAs are protected areas established by law to control the hunting of wild animals through a licensing system, and were essentially set up as buffer zones to the National Parks, covering an additional 23% of the land area. The GMAs are communally owned areas where human habitation is permissible, and over 1.5 million people are estimated to live in these areas (GRZ 2009, cited by Campbell, D. *et al.* 2010).

Figure 4: National Parks and Game Management Areas



Source: GRZ 2009, cited by Campbell, D. et al. 2010

Fisheries in the major lakes, rivers flood plains cover approximately, 45,000 km2 or 6% of the country. Key fisheries are located in the Kafue River system which includes:

- The Kafue Flats, Lukanga Swamps and Lake Itezhi-thezi;
- The Zambezi River system (including the Barotse flood plains and Lake Kariba);
- The Luapula Rivers system (including the Chambeshi River and flood plain, and the Bangweulu Swamps) and;
- Lakes Tanganyika, Mweru, and Mweru-wa-Ntipa.

Zambia has 3,687 national heritage sites listed in the national register of the National Heritage Conservation Commission (NHCC). Many of them are in national parks and game management areas. They represent an underdeveloped tourism potential that, if properly developed, could contribute to tourism and sustainable financing for protected areas

Zambia's wide spectrum of mineral resources spans a range of metals, particularly copper-cobalt and gold, gemstones, a variety of industrial minerals and potential energy resources - uranium, coal and hydrocarbons. The multiplicity and variety of resources demonstrate clearly the opportunities for further exploration and exploitation. Limited exploration for hydrocarbons to date has been unsuccessful, though recent reviews indicate the potential for commercial deposits for oil and gas (GRZ 2010; Chilumbu 2010).

4.2 Demography

According to the 2010 Census report the population of Zambia is 13,881,336 with a population growth rate of 3.062%, which is the eleventh highest in the world.

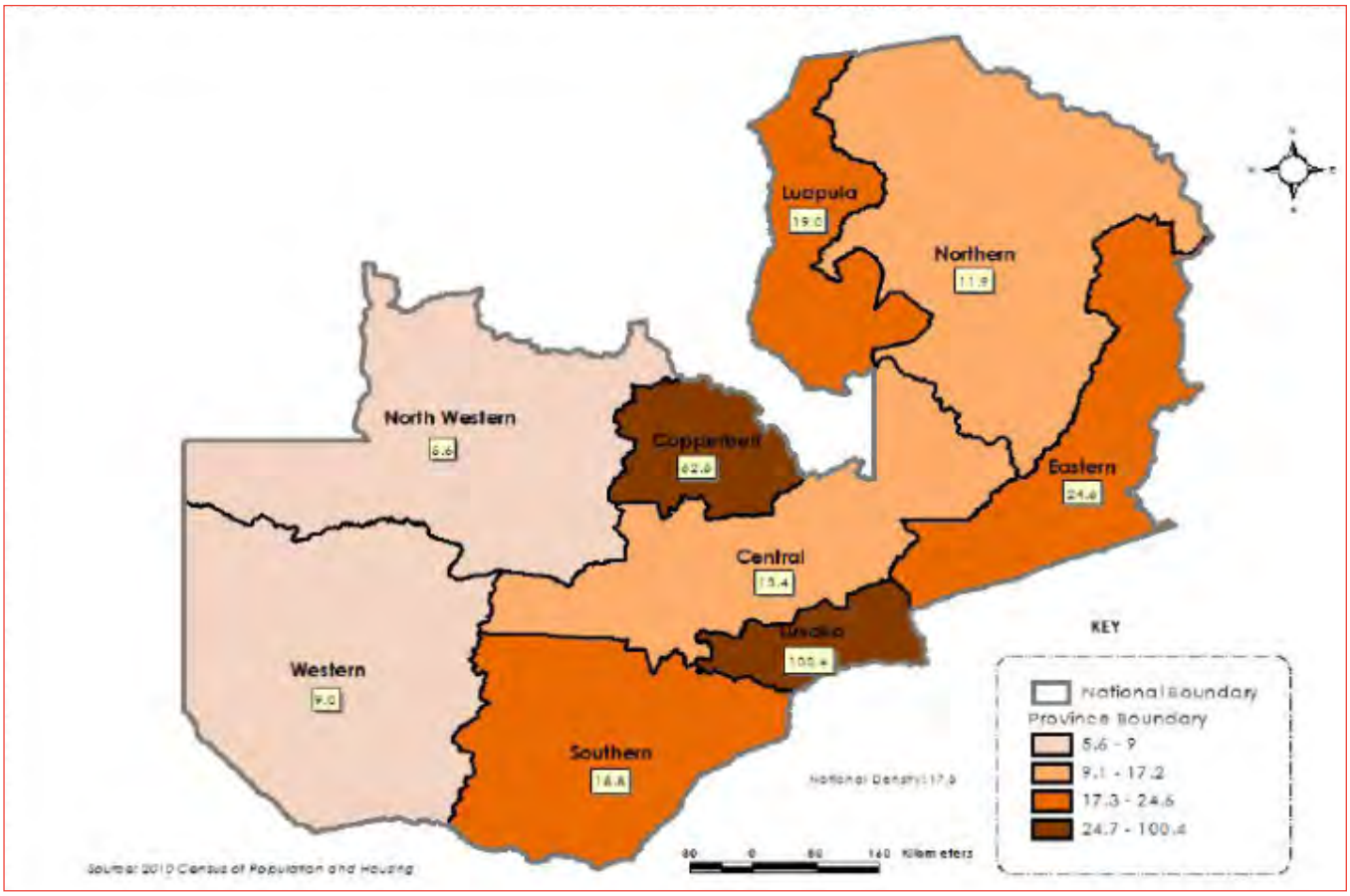
In terms of age structure, 47% (of which 3,253,125 are males and 3,228,844 are females) are in the age range 0 – 14 years, 50.8% (of which 3,544,640 are males and 3,508,344 are females) are in the age range of 15 – 64 years, and 2.5% (of which 148,531 are males and 197,552 are females) are 65 years and above.

It is clear from the above demographic data that Zambia's population is predominantly young. This poses a number of implications, the most important being increased pressure on job creation interventions that are aimed at absorbing the youth into gainful employment. If the number of young people seeking employment outstrips the available jobs, as is the current case in Zambia, youth will seek survival through various income generation ventures including those that contribute to deforestation such as charcoal burning.

Another important factor of critical importance to the environmental sector is the population density in Zambia. According to Sooka M (ND), population densities are higher in urban areas as compared to rural areas. Usually, the higher the population density, the higher the environmental concerns in poor countries. This is because the majority of the populations in poor countries depend on the direct exploitation of natural resources for their livelihood (ibid.).

Zambia's population density has increased from 7.5 in 1980, to 9.8 in 1990, to 13.1 in 2000, and currently stands at 17.3 persons per square kilometer (CSO, 2010). See figure 5 for the number of persons per square kilometer by province.

Figure 5: Number of Persons per Square Kilometer by Province, Zambia, 2010



Source: CSO, 2010

4.3 Environment and economic development in Zambia

4.3.1 Overview

In unfolding the Strengths Weaknesses Opportunities and Threats (SWOT) of the environment and natural resources and economic sectors in Zambia, it is often easy to refer to the proximate causes of change (e.g., charcoal production) which are only symptoms of change. In this report we want to focus on the more underlying causes of such changes e.g., policies. In the table below, some of the broader SWOT issues are presented, and then analysed further.

Table 3: Strengths, Weaknesses, Opportunities and Threats of the Environment Sector in Zambia

Strengths	Weaknesses
Good geographic location Political and economic stability Emerging democratic society Consistent economic growth	Poor governance/ corruption Inadequate capacity in the public sector Poor health and education levels Poor infrastructure
Opportunities	**Threats**
Resource endowment and potential An emerging private sector and PPPs Sustained foreign direct investment and international acceptance Integrated land use planning Conservation Farming Sustainable conservation-oriented enterprises	Regional instability Weak environmental governance Unsustainable resources use Mining projects Climate change High/slowly falling poverty levels Down turn in copper prices Lack of employment

Source: Study (based on various reports)

4.3.2 Strengths

Good Geographic Location

Previously Zambia's geographic location as a landlocked country was perceived as a weakness imposing constraints on the countries development objectives. Today Zambia's central location and multi-modal transport routes provide a sound foundation for linking the countries in the region, and fostering meaningful cooperation, economic expansion and trade with all its neighbours and with global markets (Pope 2006). Maintaining this strength will however be dependent on the quality of basic infrastructure (transport, energy, ICT), and improved levels of trade facilitation capacity if Zambia is to reap the full benefits of being a part of sub-regional cooperation arrangements.

Political and Economic Stability

Zambia's political stability and peaceful history is one of the major factors explaining why the country continues to attract increasing investments, despite the relative high cost of doing business (ABD 2010). Due to being touted as a safe and important destination for investment, Zambia is internationally well accepted for foreign investments looking to yield sound returns. This strength has also contributed to the growth of the tourism industry.

Emerging Democratic Society

Zambia first successfully transitioned from being a one-party state to a multi-party democracy in 1991. Many stakeholders positively view the peaceful alternation of power between opposing parties, locally and internationally. The 2011 change of government marked the second peaceful transfer of power in Zambia´s democratic history. Zambia's commitment to democracy can be seen by its willingness to subject itself to peer review mechanisms[6] and the engagement of citizens in the political process (Chipenzi et al 2011).

Support for democracy is generally high with more Zambians (80%) holding the view that democracy is preferable to any other kind of government (AfroBarometer Bulletin 2010). Generally a democratic dispensation supports good governance and the tenets of transparency, accountability and autonomy in decisions making. This is expected to support environmental management both at the national and local level.

Consistent Economic Growth/Rapid Exports

The World Bank[7] reports that Zambia has had a decade of rapid economic growth. A combination of prudent macroeconomic management, market liberalization and privatization efforts, investments in the copper industry and related infrastructure, and a steep increase in copper prices have helped achieve an average annual growth of about 5.7% GDP during the last decade. In 2011 Zambia was reclassified as a lower middle-income country.

Zambia's reclassification is expected to enhance investor confidence and further boost the investment climate, thereby creating jobs and wealth for the people. In terms of financing, the government is positioned to be able to access more non-concessional financing for infrastructure development for economic development. Local businesses[8] are also positioning themselves to take advantage of the improved confidence in the Zambian economy to access cheaper credit from the international capital markets.

4.3.3 Weaknesses

Inadequate Capacity in the Public Sector

Weaknesses in international capacity across the public service sector continue to compromise service delivery, which is central to attaining human development. It may be a technical and governance issue, but also impinges on people's

6 African Peer Review Mechanism

7 www.worldbank.org/en/country/zambia/overview

8 Caleb Fundanga, Governor of the Bank of Zambia: Recent economic developments in Zambia-talk delivered to the business community in Kitwe, 25 July 2011.

rights. For Zambia, service delivery bottlenecks are among the key factors slowing progress on development objectives, even that of attaining environmental sustainability. Areas needing capacity include rationalizing staffing (particularly in the core civil service), reforming pay, introducing more effective management payroll and establishment, and improving financial management systems[9].

Institutional capacity weaknesses, despite the many institutions dealing with natural resource management (NRM), continue to affect coordination, allocation, and management of the environment. Coordination is made even more difficult by the constraining effects of centralized sector Acts, resulting in potential overlaps and conflicts (Chundama et al 2004). Coordination is unlikely to be strengthened if institutions with the mandate are poorly funded.

Though Zambia has adequate policy and legal frameworks, the practice and enforcement of "modern" environmental law in Zambia is still relatively new. Enforcement is hindered by inadequate staff numbers and pervasive problems which include lack of transport and operational funds. Prosecutors in environment for example are generally in short supply leading to reliance on those from the regular police service, who may be unfamiliar with the principles and objectives of environmental management, to investigate and prosecute cases (GRZ 2006).

Poor Health and Education Levels

Health and education constraints limit the ability of many Zambians to fully participate in economic activity, and perhaps also in relating to modern environmental management concepts. Health problems have a direct impact on productivity and human capital in Zambia. For agriculture, a sector regarded as critical to poverty reduction in the rural areas, HIV/AIDs is limiting the output of Zambian farmers due to labour shortages as a result of illness and death impoverishing farming households, and is suppressing growth in the agricultural sector.

In the Central province for example, households that had lost a member to premature death planted 11% less cotton and produced 16% less cotton (Farming Systems Association of Zambia 2005). These crop losses at the household level deepen poverty and threaten the welfare of all family members. HIV/AIDS is believed to be a major contributor to the food shortages that hit Zambia in 2002, which was declared a national emergency. Equally, a Livingstone study by the FSAZ found that in wildlife management an estimated 5% loss of its total service delivery capacity as a result HIV/AIDS.

In education, reforms implemented in the 1990s have resulted in notable improvements in basic education, reflected in higher levels of access and participation. However, the quality of services remains poor. Beyond basic education, access and participation have been even lower than desirable, and gender and regional disparities remain high. The slow pace of decentralization and the lack of a legal framework for local institutions have resulted in limited local participation and accountability, which has hindered improvements in the quality of education and skills necessary for sustainable growth and human development (UNDP 2011).

5.3.4 Threats

Regional Instability

Though "traditional" security challenges in the southern African region are largely on the wane, new risks may emerge such as terrorism or violent extremism which could affect the environment. The origin of such acts are varied; however this report highlights inequality, conflict and competition (intra-state, interstate) over access and control of valuable natural resources and political instability as possible factors which could affect environmental sustainability.

Weak Environmental Governance

Environmental governance is embedded in the overall governmental structures at ministerial through district levels. Parallel to the political administration is a hierarchy of traditional administration in the customary areas. The Worldwide Governance Indicators measure five dimensions of governance:

9 http://go.worldbank.org/ARSM21O900

- Voice and accountability;
- Political stability and absence of violence/terrorism;
- Government effectiveness;
- Regulatory quality; and
- Rule of law and control of corruption.

Kaufman et al (2009) indicates that Zambia scored below the world average in respect of corruption control and government effectiveness.

The World Bank cites weak governance and in particular poor government effectiveness as principal factors behind the coordination failures observed in Zambia, and major obstacles to inclusive growth, and the Government has attempted to address weak governance and poor effectiveness through the Public Sector Reform Programme.

Inadequacies in environment governance are in relation to public/community participation in decision making; combating corruption; observance of the rule of law; protecting human rights and transparency which if not addressed impact on access to (environmental) justice of citizens (HRC 2010). Governance of the environment at the local government level has not received the attention needed partly because of the absence of effective structures to plan, implement, and monitor natural resource allocations (Campbell et al 2010). There is a danger that the views of marginalized groups in society and, especially rural resource-dependent communities, may not be heard.

Zambia suffers from prevailing governance constraints that disconnect the environment and development. An integrated approach would be of benefit to both. The lack of integration is reflected in the poor performance with respect to the attainment Goal 7 (Environmental sustainability) in the Millennium Development Goals (MDG).

Government institutions in general often function poorly, due to a diverse range of problems which include:

- Inadequate recognition and support for environmental institutions;
- Weak links between formal environmental institutions and development planning, finance and sector institutions
- Gaps in the overarching environmental policy (National Policy on the Environment; NPE)
- Inadequate integration of the environment into Zambia's development paradigm

Though the Zambia Environmental Management Authority has a very comprehensive environmental management mandate supported by policy and law, its decisions are continually questioned. Therefore it is continually having to prove itself, is perceived as anti-development, and at times is totally bypassed in development programming and implementation. Apart from the environmental impact assessment (EIA) process which seems to be sufficiently integrated into governance, environmental institutions tend to be advisory rather than an integral part of decision-making (Aongola 2009).

In Zambia, the mainstream planning institutions address economic and physical planning, neither of which has yet fully absorbed environmental dimensions. The national development planning and associated budget processes tend to keep environment as a separate sector. Budgeting of government bodies is still done by sector. Although the Government considers environment to be a cross-cutting subject, for budgeting purposes the environment is regarded by the Ministry of Finance National Planning (MFNP) as part of MTENR. Over the years, MTENR's budgetary allocations from MFNP have not been commensurate with its global and national environmental responsibilities, resulting in heavy dependence on donors for support to fulfil national obligations under international environmental conventions.

The National Policy on the Environment (NPE) is fairly comprehensive but leaves out key issues such as climate change, civil society and private sector engagement in governance and community involvement in environmental or natural resources. This is because there is no systematic picture of environment-development links, of how the environment is being used in development and with what costs and benefits, and how environmental limits are being approached and the climate changing. This information is vital for ensuring environmental sustainability. This points to the fact that development decision-makers are not using environmental information in either a voluntary or a statutory capacity.

Unsustainable Resource Use

It is widely recognized that Zambia's natural assets are in danger of widespread depletion and degradation from the unsustainable utilisation of resources. Unsustainable use is driven by the decline in the general social-economic situation of the population. The effects have been observed as a rapid degradation of biological resources due to over exploitation. The major resources that have been negatively affected include agriculture resources, forest, wildlife and fish resources.

Small-scale agriculture is by far the most common source of livelihoods and income options for rural dwellers in Zambia and continues to have a significant impact on the environment. Small-scale agriculture is characterized by low or stagnant productivity and extractive farming systems that depend to a large extent on mining the natural resource base upon which farmers depend for their livelihoods (due to traditional cropping practices).

One of the main factors to be considered in relation to agro-ecological sustainability is the soil, as it is the basis for food production in Zambia. Rapid depletion of soil fertility and non-sustainable land use has tended to reduce productivity. Though agricultural land is still relatively abundant, farmers who degrade their soil/land through continuous soil disturbance, cereal mono-cropping, and non-replenishment of nutrients, will migrate to pristine or rejuvenated woodland to temporarily exploit natural fertility to provide for the basic needs of their families. In Zambia it is all too common for members of food insecure families to abandon their crops and seek opportunities to supplement their income in the hunger months between October and January, or in the case of severe land degradation, uproot the entire family in search of land that has not been mined by extractive farming methods (CFU/CAP 2010).

Clearing forests for agricultural production is a major cause of deforestation. In Zambia, it is estimated to account for about 90% of forest clearing (USAID 2007). To a significant extent, this syndrome explains why Zambia suffers the 4th highest deforestation per capita in the world (according to Food and Agriculture Organization of the United Nations (FAO)).

Mining Projects

Mining and mineral processing affect the environment, biodiversity, and livelihoods (Caritas 2009, Mwitwa *et al.* in prep) through the impacts enumerated below (Campbell, D. et al, 2010). Land users in the mining concession areas tend to seek alternative areas to settle and embark on land clearing for agriculture. The clearing of forests for new agriculture magnifies the expansion of deforested land – the sum of vacated land plus the new clearing.

Mines in the Copperbelt have had a long history of dependence on indigenous timber sources. In the post-1970 era, the demand shifted primarily to the forests of the North-Western Province where timber has been sourced using contractors holding concession licenses. The demand for specific tree species has largely resulted in forest degradation in concession areas. The degradation impacts on regeneration and biodiversity of target forests.

Mine effluents have a negative influence on aquatic biodiversity. Mining operations use chemicals like mercury, cyanide, sulphuric acid, arsenic, and methyl mercury in various stages. A large amount of these chemicals are released into nearby water bodies through pipes, leading to water pollution.

Growth in human population associated with mining brings with it other harmful environment- and biodiversity-impacting activities, such as the indiscriminate clearing of the forests and woodlands for timber and non-timber forest products, charcoal production and fuel wood leading to the loss of habitats of a large number of animals and plant species. The increase in demand for timber, non-timber forest products, charcoal and fuel wood puts the survival of a large number of animal and plant species at stake.

Climate Change

Even with sufficient mitigation measures, the current scientific consensus holds that greenhouse gas emissions and atmospheric concentrations will increase in coming decades. Consequently, global mean surface temperatures will rise after peak emissions are passed. This global warming should affect global water and food systems in profound ways (IPCC, 2007).

Potential impacts from anthropogenic climate change are expected to be wide-ranging and affect multiple sectors (Campbell, D. et al 2010). Land-based activities have been identified as the most vulnerable sectors to climate change. These include agriculture, forestry, water, and anything in between (i.e. natural resources associated with these sectors) (GRZ/FAO/Forest Department/NFP Facility 2011). Climate change will likely interact with human drivers such as deforestation, unplanned development, and wildfire to adversely affect ecosystems and biodiversity. This will affect the populations and distribution of endemic species, which in turn will impact tourism as well as ecosystem services.

It is already evident that Zambia's economic performance has been influenced by climate variability, especially extreme weather events. Indeed some of the more substantial declines in economic growth over the last three decades have occurred during major drought years (Thurlow et al undated). It is likely that marginal agricultural systems will likely be severely compromised by increased incidences of droughts, floods, heat, and pests.

It is predicted that climate change will include a shorter growing season and dramatically reduced crop yields, with smallholder farmers being most adversely affected. A knock-on effect will be that farmers trying to offset low incomes and household food insecurity as a result of low yields will be driven to charcoal production, illegal off-takes, human migration, and unplanned development/land conversion and other activities both legal and illegal to meet their livelihood needs (Campbell et al 2012).

High and Slowly Falling Poverty Levels

Poverty[10] in Zambia is "structural" (i.e., it is man-made as a result of the country's poor soil, harsh climate, inadequate resources and other physical or biological conditions) (Mukuka undated). Poverty is caused by the structural biases and distortions that are inherent in the country's political, economic, educational, cultural institutions, and external relations. It is these biases and distortions that are responsible for poverty and in turn put pressure on the natural environment and suppress national development (ibid).

Downturn in Copper Performance

Zambia's sizable deposits could, if managed well, drive increased production, exports and government revenue, with the benefits spreading more widely. However a downturn in copper performance could affect earnings and employment levels. By comparison, employment in the copper mining industry in Zambia is small. As has happened in the past a poorly performing copper industry could also affect local businesses linked to the industry affecting the livelihoods of a significant number of individual/households. The enforcement of structural adjustment policies and consequent mass retrenchment of mineworkers in the 1990's pushed close to 13,000 individuals into informal economic activity (Sutcliffe 2012 and Shitima 2004). High unemployment is one of the factors explaining deforestation on the Copperbelt province of Zambia.

Lack of Employment

Despite a growing economy unemployment and underemployment continue to present major challenges for the Zambian

10 Poverty means low life expectancy, low educational opportunities, inadequate access to resources for a decent standard of living (e.g., income and consumption, housing, health, clean water and sanitation, nutrition, productive potential, and other central dimensions of well-being), and lack of freedom to exercise choice and participate in society-Lawrence Mukuka, The Conceptual Framework for Poverty Analysis and Reduction in Zambia. www.ossrea.net/index.php?option=com_content&view=article&id=362&limitstart=1

economy. Of the 5.4m people in the labour force, only about 522,176 are formally employed, with the rest unemployed or participating in the informal economy. In Zambia, the informal sector employs anywhere from three to six times the number of employees in the formal sector[11].

Non-wood forest products (NWFP) are an important part of the informal economy and consequently a source of livelihoods for the rural population. Mulenga et al (2011) found that NWFP account for 34% of total household income for households that reported income from these sources. Of significance however is that NWFPs represent a greater share of total incomes of the poor than the wealthy. In the Luapula, North-Western and Western provinces where charcoal, caterpillars & ants, honey, and wild mushrooms were prominent products, NWFP were found to be an important source of income. These findings bring into play the issue of sustainable use which must be addressed. For many of the households that depend on NWFPs, formal salaried employment is out question in view of the lack of employment opportunities. Thus NWFPs will be their mainstay for the foreseeable future.

4.3.4 Opportunities

Resource Endowment and Potential

There is real potential for Zambia to develop an economy 'based on sustainable environment and natural resource management principles' as envisaged by Zambia's Vision 2030. The country's natural assets offer great potential for developing rural areas however that potential is yet to be fully exploited. The environment is rich and largely the foundation for Zambia's development. Zambia could be producing higher levels of income and welfare for the population from its reserve of environmental wealth of soils, water and biodiversity, including through exporting environmental goods and services (food, freshwater, fuel and fibre); regulating services (climate regulation, flood regulation, disease regulation, and water purification); supporting services (nutrient cycling and soil formation), and cultural services (aesthetic, spiritual, educational and recreational) as indicated in the table below.

Table 4: Zambia's Natural Assets

A wealth of wildlife – rich biodiversity assets, with many species being unique to Zambia, and driving much of Zambia's tourist industry.
World Heritage landscape – landscapes such as Victoria Falls, which is a UN-registered World Heritage Site, an icon for Africa, and a flagship for Zambia's tourism industry.
Some of the richest farmland in Africa – with huge potential given that Zambia is a nation of farmers; 70% of the population has real knowledge of how to make the most of land.
An abundance of water resources – estimated at 186.65 km3, Zambia's water resources drive both ecosystem health and a diverse economy of agriculture, mining and manufacturing, energy, tourism and domestic consumption; yet the reliable irrigation potential is far higher than currently exploited.
Renewable energy – 99% of electricity is generated from renewable hydroelectric sources, and there is potential for biofuels
A great green carbon store – over 40% of the country is covered with forest, which can hold carbon to mitigate climate change, as well as produce thousands of other products.
A minerals bank – Zambia has one of the largest reserves of copper, cobalt and other minerals for global development.

Source: Aongola et al 2009

These realities would indicate that Zambia could do well to invest in environmental management and institutions, which would yield some high returns. A study reviewed by Pearce (2005) estimated that the environmental services of the Barotse floodplains produce an average net financial return of US$405 a year for each household (cited in Aongola et al, 2009).

Emerging Private Sector and Public-Private Partnerships (PPPs)

NRM at the moment relies heavily on support from the government and from donors. There is need to leverage private sector investment and contributions for the benefit of environmental management.The emerging private sector presents an opportunity for improving capacity to manage the natural environment. The PPP model is a unique opportunity for the private sector to partner with government in diversifying incomes for rural and forest-dependent communities.

11 Muuka G., Africa's Informal Sector with Zambia as a Case Study: A Challenge to Scholars to Close the Knowledge Gap, Journal of Business and Public Affairs

Communities are limited in terms of technical knowledge and their abilities to understand investment initiatives and to negotiate effectively with investors and programme implementers. CBO ability to adopt business approaches requires training for transfer entrepreneurship skills. Public resources, both human and financial, are limited, constraining government capability to effectively manage the environment.

If well-designed and well-managed, partnerships could generate useful synergies. The private sector is already partnering with some communities in Mpika among other places to promote organic crops for export.

Sustained Foreign Direct Investment and International Acceptance

Zambia is among 17 African countries favourable for foreign direct investment (FDI). Zambia saw a 93% rise in investments over the past year. The significant rise in Zambia's investments is said to be as a result of a well-managed economy and a peaceful handover of power in the last elections.

Justification for investing in Zambia includes an investment-friendly environment, market access and resources and opportunities. The mining sector offers real potential for growth and expansion. Zambia has approximately 753,000 sq. km of landmass of which 58% is arable. Zambia's tourism potential lies in its vast resources (including forests) which are pristine and unexploited, and cater to a diverse and broad range of interests, including varied sceneries, wilderness and wildlife, diverse culture and national heritage.

Aside from the world famous Mosi-oa-tunya Falls (Victoria Falls), Zambia boasts other attractions that include 20 national parks and 35 game management areas covering over 2.4 million hectares. The Zambian wildlife estate is one of the largest in the sub-region covering more than 40% of the land surface of the country. There is opportunity for joint wildlife estates given the availability of land in communal areas (UNCTAD 2008). A GRZ/UNDP/GEF project[12] initiative has experimented with community/private sector joint ventures for which lessons are available.

Integrated Land Use Planning

According to Campbell, D. et al (2010), Land Use Planning (LUP) provides a basis for improved management and use of resources and, where implemented, can assist in promoting the appropriate use of land types. The conservation of natural resources, particularly land and water resources, is of paramount importance to the people of Zambia and to the national economy.

In some regions of the country, there is growing evidence of mismanagement of natural resources which has been brought about by the ignorance of natural factors governing the use of land. In some areas where there is fairly high potential for agriculture, wildlife or other uses, current land use patterns have often led to soil erosion, land degradation or biodiversity loss. Even in the headwaters of main river systems such as the Kafue and Luangwa, there are problems arising from the settlement of people, legally or illegally, in areas which should normally be protected from inappropriate land uses.

Through specific land and vegetation surveys adopted in Zambia, it is possible to undertake a rigorous analysis of all the natural economic and social factors governing productivity and ascribe to each factor its relative significance.

Conservation Farming

Over the last decade or so, a growing coalition of stakeholders from the private sector, government and donor communities have created a package of agronomic practices referred to as Conservation Farming (CF). Due to the proven benefits of CF, GRZ has been promoting it across the country. Campbell, D. et al (2010), notes that the number of farmers currently adopting CF on a portion of their holdings represents only 13% of the total farming households across Zambia.

12 Reclassification and Effective Management of the National Protected Areas System Project

Sustainable Conservation-Oriented Enterprises (SCOEs)

There are various sustainable conservation-oriented enterprises (SCOEs) in Zambia that present a rare opportunity for rural income diversification.

According to Rubin, D., Manfre, D., and Malpani, S. (2008), SCOEs are organized into four categories: cultivation-based, ecotourism-based (wildlife and landscape-based), natural product-based, and culture-based.

Activities from these enterprises have the potential for numerous benefits, such as increased levels of income for the individuals involved, both men and women, and for their communities. Further, these activities have potential to provide opportunities for training in business development; capacity building for natural resource management institutions; and technical training in animal husbandry, game tracking, handicrafts, and conservation.

Other SCOE opportunities include experiences accumulated from implementing UNIDO supported small energy pilot projects (EPPs). GRZ has promoted these ventures in energy deficit areas of the rural areas. They include: a 36 KW solar mini-grid project, a 1 MW mini-hydro project, and a 1 MW biomass project[13].

Charcoal is the cheapest source of energy for not only Zambia's poor but also the middle-class. Its usage is vital countrywide, but it is also at crossroads in view of calls from national and stakeholders to make its production and use more efficient. Policy makers pay little attention to the ways in which charcoal is produced and sold, and whether wood used for charcoal burning is harvested in a sustainable fashion. Campbell et al (2010) proposes supporting demand and supply side opportunities to help mitigate charcoal production. These include funding and distributing high efficiency household cook stoves (charcoal and non-charcoal fuelled) and improving biomass utilization through high-efficiency charcoal kilns, community forestry and twig farming, as well as cross-sectored natural resources planning, respectively.

4.4 REDD+ Readiness

Zambia's REDD+ readiness initiative is an opportunity for Zambia to address a number of shortcomings that it is experiencing in the management of environmental and natural resources.

As noted under the National Joint Programme (NJP), which is addressing the country's capacity issues pertaining to REDD+ readiness, the focus has been largely on getting stakeholders on board. To date the focus has been on generating data and information that would be the centre for discussions with stakeholders.

However, the meetings planned in the NJP have not yet been implemented, while the associated trainings are also still to be implemented. As shown from experiences from similar programmes implemented by the Ministry of Lands, Natural Resources and Environmental Protection, the involvement of other sections of government and indeed other stakeholders remains inadequate, and a challenge to mainstreaming environment into the development agenda.

The present Forest Policy (still in draft) is yet to fully address critical issues under REDD+ such as a national framework for the management of proceeds from REDD+ financial schemes and benefit sharing. Areas requiring further scrutiny include resource tenure and rights.

Concerns have been raised regarding the roles of communities under REDD+ readiness in Zambia. While the readiness period is short, communities can at least begin to think about the appropriateness of their governance systems. The REDD+ readiness period could be used to address shortcomings and should ideally also cover resource user rights and access. The role of communities in forest and carbon stock monitoring under REDD+ mechanism needs to also be considered.

Issues related to the developing of measurement, reporting and verification (MRV) under REDD+ readiness programmes have been raised. Shortages of baseline data on which to base major decisions including setting reference levels as well as forest management remains a big challenge and the REDD + readiness phase offers Zambia an opportunity to generate these data.

13 NJP Document

To a large extent REDD+ readiness program will help Zambia address most of country's weaknesses and threats through the opportunities offered.

4.5 Socio-economic Outlook

4.5.1 Social Outlook

The poverty situation is characterized by inequality in access to and distribution of specific resources such as financial services, information, land, and insufficient public investment in rural areas. 7.6 million Zambians are dependent on subsistence agriculture.

Official data suggest that the number of agricultural households rose from 1,552,000 to 1,631,000 while the proportion of total households which are agricultural remained at a similar level over time; 68% in 2006 compared to 66% in 2010. The proportion of rural households engaged in agriculture dropped slightly from 94% in 2006 to 91% in 2010 while the proportion of urban households engaged in agriculture remained at 21%[14].

With regard to poverty levels, extreme poverty declined from 58% in 1991 to 51% in 2006. This is a positive trend, but the rate of change at current levels could be too slow to meet the target of 29% by 2015, which would halve extreme poverty. Extreme poverty is also much higher in rural areas at 67% compared to 20% in urban areas. However, the poverty gap ratio declined from 62.2% in 1991 to 34% in 2006, indicating that the severity of poverty declined sharply, and providing evidence that with the right policies and investments the incidence of poverty can fall fairly quickly (UNDP, ZHDR, 2011)

Part of this high level of poverty is due to lack of employment opportunities for youth. As a proportion of the labour force, 63% of the urban 15-19 age group are unemployed and this improves to only 48% in the 20-24 age category[15]. In rural areas, 16% of the 15-19 age group and 7% of the 20-24 age group are unemployed, but these figures reflect informal agricultural employment. Significant gender disparities are also prevalent. There are only about 300,000 young people entering the labour market each year (ibid.).

The Human Development Report for Zambia (UNDP, 1998) has shown that there is a strong correlation between poverty and environmental degradation due to poor people's high dependency on exploitation of natural resources for their survival. Population increases in recent years have resulted in an increasing demand for natural resources such as wood fuel for energy needs, as wood fuel is inexpensive and readily available (Sooka M, ND)

Education and Illiteracy

Preliminary data for 2009 from the Ministry of Education indicates Zambia is on track to achieving the target for net enrolment rate (NER) in primary education, as it rose from 97% in 2006 to over 100% in 2009 (UNDP, 2011). However, caution should be exercised in interpreting these figures. The number of pupils in primary school (Grades 1-7) has increased at a rate of 4.6% per year from 2.2 million pupils in 2004 to 2.9 million in 2009 (ibid.). Primary school completion rate has also risen steadily from 64% in 1990 to 73% in 2003 and then to 91.7% in 2009. Secondary school (Grades 8-12) net enrolment increased from 416,261 to 673,185 in the same period, equivalent to a rate of 8.3% per year (ibid.).

A great concern is that the quality of education is not keeping pace with improvements in access to education, as can be seen in high pupil-teacher ratios (ibid.). Although the ratio for urban areas was 38 pupils per teacher in 2009, it was much higher in rural areas at 58 (ibid.).

In terms of illiteracy, about 42% of women are illiterate, against 23% of men in the same situation (ibid.). High illiteracy levels are an impediment to obtaining knowledge on improving agricultural methods, and this contributes to low yields. Evidence from various studies shows that low productivity causes smallholder farmers to increasingly practice unsustainable methods of agriculture like shifting cultivation.

14 Central Statistical Office, 2010 Living Conditions Monitoring Survey, p. 139

15 African Economic Outlook

Health

According to the 2007 Zambia Demographic and Health Survey (ZDHS 2007), the Maternal Mortality Ratio (MMR) was reduced, from 729 deaths per 100,000 live births in 2002, to 591 in 2007. The Under-Five Mortality Rate (U5MR) was reduced from 168 per 1000 live births in 2002, to 119 in 2007, and the Infant Mortality Rate (IMR) from 95 to 70, respectively (MoH, 2011). The Neonatal Mortality Rate (NMR) was reduced from 37 to 34, respectively (ibid.). During the same period, HIV prevalence in adults, aged 15 to 49 years, was reduced from 16.1% to 14.3% (ibid.).

The malaria and TB programme performance reviews conducted in 2010, and other reporting health systems, also reported major improvements in the prevention and control of malaria and TB (ibid.). Malaria incidence per 1000 population dropped from 412 in 2006, to 246 in 2009. TB treatment success rate improved from 79% in 2005 to 86% in 2008 (ibid.).

It is important to note that environmental conditions have a very big impact on human health. The UN-REDD Programme acknowledges that biologists, conservationists, public health experts, economists, and experts from a variety of backgrounds and sectors around the world have demonstrated through their research how and why ecosystem services and biodiversity impact human health, economic activities and ecosystem health.

Energy

Apart from petroleum, which is wholly imported, Zambia is endowed with indigenous energy resources such as woodlands for wood fuel, hydropower, coal and renewable energy (Sooka, M, ND). Wood fuel accounts for about 70% of the total national energy demand while electricity, petroleum and coal account for 14%, 12% and 2% respectively (ibid.). Traditional wood fuels such as charcoal and firewood dominate energy consumption in Zambia (ibid.). In 2004 for example, the Energy Service Report showed that the consumption of wood fuel far exceeded the potential sustainable supply and this is a very serious threat to Zambia's forest cover.

Water and Sanitation

In Zambia, urban and rural access coverage for improved water supply and sanitation (WSS) has increased overall since 1990, but Zambia is still unlikely to meet its MDG targets in water and sanitation (USAID). The proportion of the population without sustainable access to an improved water source fell from 51% in 1996 to 40% in 2006 (UNDP MDG status report (2011). Rural areas lagged behind, with 59% of the population with no access to safe drinking water (ibid.). Most of the rural population still depends on open rivers/streams and unprotected wells for its water supply (ibid.). A report on urban and peri-urban water supply and sanitation in 2009/10 by NWASCO indicated that 26.4% of the population in these areas have no access to safe water (ibid.).

The level of accessibility to water and sanitation especially among the people in rural communities must equally be a priority on the agenda of the environmental sector in Zambia. This is because unsustainable water harvesting is a threat to the environment. For instance, uncontrolled dam constructions meant to provide water to livestock may not only contribute to deforestation, but also to forest degradation.

4.5.2 Economic Outlook

Zambia is now classified as a low middle-income country with a number of key economic fundamentals showing signs of stability. The table below highlights key indicators.

Table 5: Macro-economic Indicators

Economic Highlights for Zambia
• Growth in 2012 is expected to be 7.3% GDP, even with a slight contraction in mining, brought on by a decline in global copper prices. The medium-term GDP growth forecast is also above 7% for 2013-14.
• Growth has been broad-based, led by strong performances in agriculture, manufacturing, and services.
• Agricultural growth has been accompanied by increased diversification of production, with a higher share of non-maize crops—such as wheat, barley, sorghum, and soybean—partly in response to uncertainty about the government's maize-buying program.
• Construction growth accelerated in recent years in response to increased demand from rising urban incomes and a marked pick-up in investment in mining and roads. Growth in transport services is also a response to strong demand from other sectors of the economy.

Data Source: World Bank, 2012

According to the Bank of Zambia (2011), the overall performance of the economy was favourable in 2011, with real GDP growing by 6.5%, which was broadly in line with the target. The growth in GDP was largely driven by transport, storage and communications, agriculture, forestry and fisheries, construction, and wholesale and retail trading sectors (see table below). Annual overall inflation at 7.2% was broadly in line with the end-year target, on account of the reduction in both annual non-food and food inflation (ibid.). However, these achievements have not yet significantly impacted on the socio-economic status of the majority of the population, most of whom have continued to face poverty and socio-economic deprivation (GRZ, 2011). The situation is further compounded by the inequities in the distribution of wealth and socio-economic infrastructure across the country, which currently favours urban areas and adversely impacts the provision of social services, such as health and education in rural hard-to-reach areas (ibid.).

In terms of key sector growth, the agriculture, forestry and fisheries sector grew by 7.7% compared with 6.6% recorded in 2010 and contributed 1.0 percentage to the national output (ibid.). Growth in the agriculture sub-sector increased to13.3% up from 12.9% in 2010 (ibid.). This was largely explained by increased output of maize which rose by 8.0% to a record 3.0 million MT during the 2010/11 agricultural season (see table below). While the increase in maize productivity was largely due to favourable weather conditions, input support and expansion of agricultural fields cannot be ruled out.

Table 6: Comparative Summary Results of 2008/2009 – 2010/2011 Crop Estimates

Crop	2008/09	2009/10	2010/11	Growth (%)
Maize	• 1, 887, 010	• 2, 795, 483	• 3, 020, 380	• 8.0
Cassava	• 1, 151, 700	• 1, 179, 657	• 1, 132, 156	• -4.0
Wheat	• 195, 456	• 172, 256	• 237, 336	• 37.8
Sorghum	• 21, 829	• 27, 732	• 18, 458	• -33.4
Rice	• 41, 921	• 51, 656	• 49, 410	• -4.3
Sunflower	• 33, 667	• 26, 420	• 21, 954	• -16.9
Ground nuts	• 120, 564	• 163, 733	• 138, 388	• -14.9
Soy beans	• 118, 799	• 111, 888	• 116, 539	• 4.2
Mixed beans	• 46, 729	• 65, 266	• 47, 070	• -27.9
Irish potatoes	• 19, 974	• 22, 940	• 27, 563	• 20.2
Sweet potatoes	• 200, 450	• 252, 867	• 146, 614	• -42.0
Virginia tobacco	• 18, 487, 000	• 22, 074, 000	• 27, 146, 000	• 23.0
Barley tobacco	• 8, 758, 000	• 9, 809, 000	• 11, 141, 000	• 13.6

Source: Ministry of Agriculture and Cooperatives, cited by BoZ (2011)

A number of crops such as maize, cassava, and groundnuts, etc. will continue to be grown by the majority of smallholder farmers who normally practice unsustainable methods of agriculture.

Studies attribute a positive incremental impact on maize production to the Farmer Input Support Programme (FISP), but question its cost-effectiveness[16]. This is especially so given the way the scheme starves other yield-increasing interventions of funds by claiming 37% of total agricultural expenditure[17].

4.6 Economic Sectors Relevant to Deforestation and forest Degradation

4.6.1 Agricultural Expansion

Smallholder Farming

Smallholder farmers dominate Zambia's rural sector and it is clear that agriculture is the main source of employment for rural dwellers.

16 UNDP (2011), Millennium Development Goals Status Report

17 UNDP (2011), Millennium Development Goals Status Report

Small-scale farming households together cultivate about 80% of the total land with farm sizes from 1 to 5 hectares, with an average area of 2 hectares (Keyser, C, J, 2007). They practice low-input, low-output production and depend on family labour and hand tools with limited use of oxen. This group produces mainly maize and other staple food crops such as cassava, sorghum, millet, groundnuts, and mixed beans, although cash crops like cotton and tobacco have also become popular in recent years in areas with good market access and out-grower support (ibid.).

Although farming is still practiced on a very basic level by most households, an increasing number of smallholder family farmers are beginning to expand and intensify their production in response to market liberalization (ibid.). This commercialization process has been progressing at different rates in different parts of the country.

There are many factors that force smallholder farmers into adopting environmentally unsustainable agricultural practices. Some factors are lack of access to knowledge and appropriate technology to increase their productivity without practicing shift cultivation.

The liberalization of agriculture marketing in the 1990s, while providing fiscal relief, inadvertently disadvantaged small-scale farmers, who were not able to market their produce (ibid.). They were forced to sell to speculative marketing agents at low prices (ibid.). In a bid to address marketing and input supply challenges, the government enacted a law to re-introduce cooperatives, but UNDP (2011) observes that performance there has also been lower than expected due to persisting structural difficulties.

Most cooperatives are agriculture-oriented principally because they want to benefit from subsidized inputs (ibid.). Among the key challenges is the provision of services that can assist small-scale farmers in developing capabilities to meet the contractual requirements of key market players, access to affordable credit given high interest rates, and access to appropriate transport facilities (ibid.).

Given the large population deriving livelihoods from agriculture, sustained growth would allow the employed access to better incomes, and thus improved living conditions (ibid). The benefits are, however, contingent on the extent of diversification and value addition that farmers engage in. Lacking this, growth has not been sufficient to trigger a major impact on poverty reduction. Ventures into agribusiness that enable sustainable and faster improvements for small-scale farmers have so far received little support (ibid.).

According to the Zambian Macroeconomic Model (ZAMMOD), if area productivity of small-scale farmers were to rise by 5% per annum from 2009 to 2015, the number of extremely poor households in agriculture would decline by 268,000, reducing extreme poverty in 2015 by 9% and overall poverty by 8% compared to the baseline[18]. Expecting an annual rise of 5% is actually very conservative as it would imply increasing productivity of maize from 1.5 MT per hectare in 2009/10 to 2 MT in 2015. By applying simple changes to farming practices such as the adoption of conservation farming and promotion of access to modern farm inputs, small-scale farmers could raise their productivity substantially[19].

Finding ways of advancing alternatives to unsustainable agricultural practices among smallholder farmers is strategic to the success of REDD+. Conservation farming offers a unique opportunity.

Commercial Agriculture

As persistently high levels of rural poverty suggest, successful agricultural commercialization remains highly concentrated among a small segment of rural households.

Apart from a small segment of farmers, Keyser, C. J. (2007), estimates there are some 600-750 large-scale commercial farmers with agricultural holdings that sometimes go up to several thousand hectares. These are mainly located along the line of rail or near urban centres. Large-scale commercial farming is mechanized and often employs high-level production and management technology. Irrigation is sometimes also used for winter crops.

18 UNDP (2011), Millennium Development Goals Status Report for Zambia

19 UNDP (2011), Millennium Development Goals Status Report for Zambia

Commercial farmers are important growers of maize, soybeans, tobacco, wheat, coffee, and cattle (for dairy and beef) (Ibid.).

Further, GRZ has continued to invest in the creation of Farm Blocks and these continue to be a driver of deforestation.

According to the Zambia Development Agency[20], GRZ has embarked on the development and commercialisation of 8 Farm Blocks by making land available for large-scale investment to the private sector (see table below for details).

Table 7: GRZ Initiated Farm Blocks

No	Farm Block	Size (Ha)	Province
1	Kalumangwe	100,000	Western
2	Luena	100,000	Luapula
3	Manshya	147,000	Northern
4	Mikelenge/ Luma	100,000	North Western
5	Musakashi (SADA)	100,000	Copperbelt
6	Mungu	100,000	Lusaka
7	Simango	100,000	Southern
8	Mwase-phangwe	100,000	Eastern

Source: Zambian Development Agency, 2012

4.6.2 Wood Extraction

Charcoal/Fuel Wood

Charcoal and fuel wood are the main sources of cooking energy in the rural areas of Zambia. It must however be noted that the use of charcoal is also high in urban areas.

At a national level, the majority of households, 54%, use firewood as the main source of cooking energy (CSO, LCMS, 2006 – 2010), and the majority of this firewood is collected rather than purchased (ibid.). Charcoal is the second most common source, at 29%, with the majority being purchased rather than collected (ibid.). Electricity is used by 17% of households (ibid.). There is a distinct rural/urban split. In rural areas most households (81%) used firewood for cooking, followed by charcoal with 16%; and electricity is used by only 3% (ibid.).

In contrast, 51% of urban households use charcoal for cooking; followed by 43% using electricity, while only 6% use firewood. Although not too substantial, there has been a reduction in the use of firewood in rural households since 2006 (ibid).

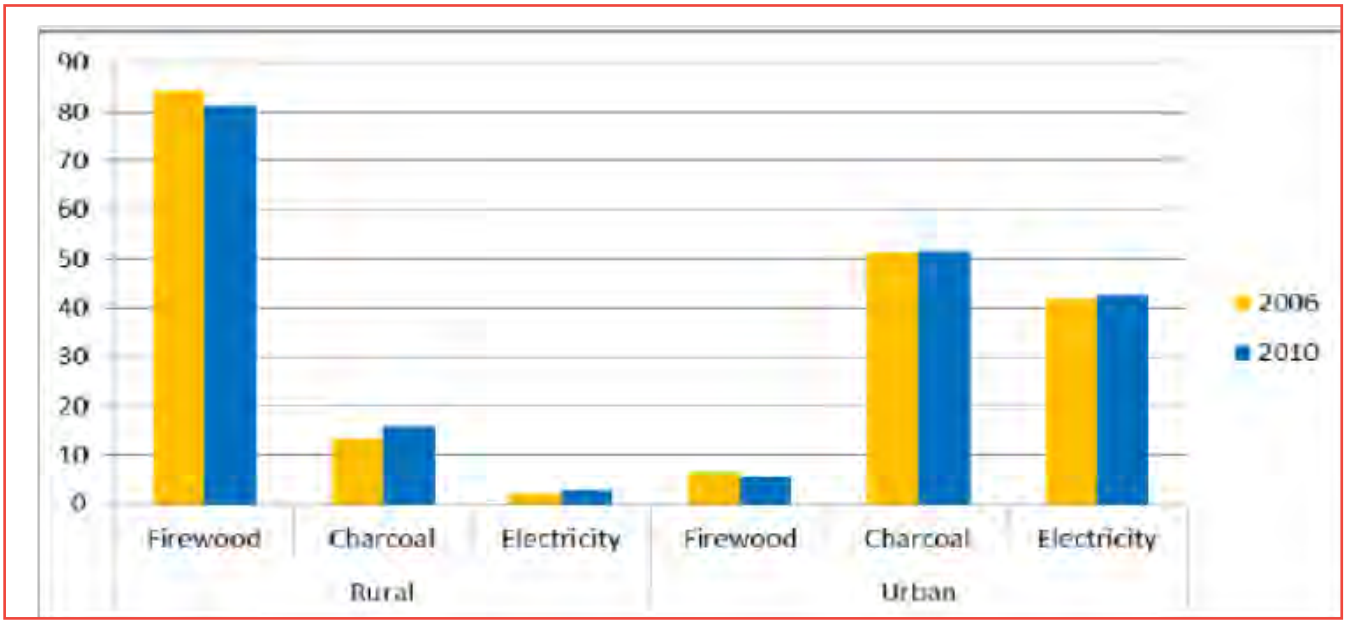
Use of firewood as the main source of cooking energy varies from around 85% in 'small scale' and 'medium scale' farmer households to around 2% of 'medium cost' and 'high cost' urban households (ibid.). The greatest reductions in the use of firewood for cooking are among the 'large scale' farmers and 'non-agricultural' rural households (ibid.). Both increasingly make more use of electricity, with charcoal also rising in 'non-agricultural' households.

Among households categorized as moderately poor and extremely poor, 64% and 81% use collected firewood as a main source of cooking energy, respectively (ibid). In contrast, among non-poor households, 36% use electricity, 35% use purchased charcoal and 25% use collected firewood (ibid).

20 www.zda.org.zm/node/1911

The figure below shows the distribution of firewood, charcoal and electricity as the main source of energy for cooking by rural/urban.

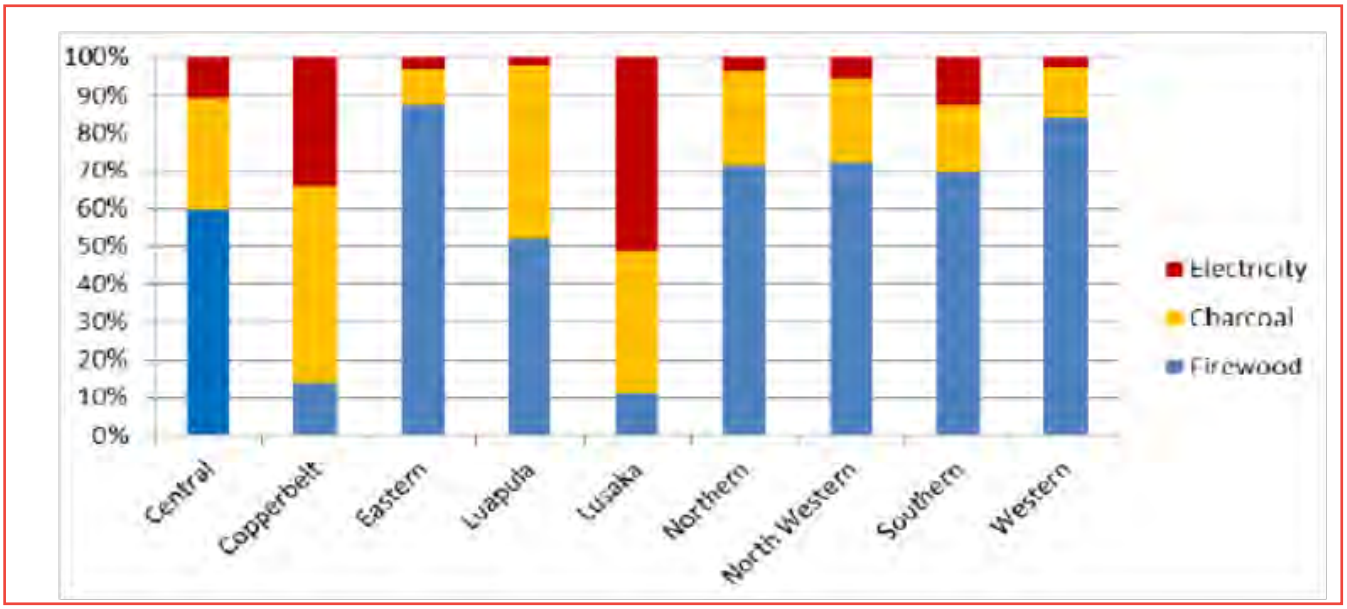
Figure 6: Percentage Distribution of Households using Firewood, Charcoal and Electricity as Main Energy Source for Cooking, by Rural/Urban, 2010 and 2006



Source: CSO, LCMS (2006 – 2010)

The figure below shows the distribution of firewood, charcoal and electricity as the main source of energy for cooking by province.

Figure 7: Percentage Distribution of Households by Province using Firewood, Charcoal and Electricity as Main Energy Source for Cooking, by Province, 2010



Source: CSO, LCMS (2006 – 2010)

It can be seen from the above figure that the Central, Eastern, Northern, North-Western, Southern, Luapula and Western provinces have the highest use of firewood while the Copperbelt, Luapula, Lusaka and Central provinces are the highest users of charcoal.

Timber Extraction

Almost all rural households depend on forests for fuel wood and construction materials and as important sources of non-wood forest products, both for subsistence and commercial use.

It is estimated that 68% of the total of forest products harvested by rural households are consumed within the household and the remaining 32% is sold for cash or exchanged for household goods (Jumbe, Bwalya and Husselman, 2008, cited in ILUA policy report, 2008).

While fuel wood, construction materials, wild foods and medicine are the most dominant products, other forests products are equally important. According to the ILUA report (2008), these other products include industrial wood (timber) and wood for carvings and making tools. See the table below for more details.

Table 8: Proportion of Households with Highest Ranked Forest Product/Services by Total Annual Income Levels (In non-rebased Zambian Kwacha)

Forest product/service	Less than 100,000	100,000-500,000	500,000-1,000,000	1,000,000-5,000,000	Above 5,000,000	All
Industrial Wood	3.9 %	5.8 %	6.3 %	5.1 %	**15.2 %**	7.2 %
Fuel Wood	**43.9 %**	34.9 %	36.3 %	36.9 %	35.8 %	37.6 %
Charcoal	5.2 %	5.0 %	4.6 %	5.4 %	5.4 %	5.1 %
Wood Products: carvings, tools	1.0 %	2.4 %	2.1 %	2.2 %	2.0 %	1.9 %
Construction Material	21.2 %	22.6 %	23.9 %	23.0 %	21.6 %	22.5 %
Non-Wood Utensils and Handcrafts	0.8 %	1.6 %	1.3 %	1.5 %	0.5 %	1.1 %
Plant food: vegetables, fruit, beverages etc	**10.3 %**	**11.3 %**	7.7 %	7.0 %	7.8 %	8.8 %
Other Plant Products	0.3 %	0.5 %	0.7 %	0.7 %	0.0 %	0.4 %
Fodder and Forbs (Include. Bess)	1.0 %	0.8 %	0.7 %	2.0 %	1.0 %	1.1 %
Medicinal Plants	9.6 %	9.6 %	9.8 %	9.4 %	**6.9 %**	9.0 %
Soap/Cosmetics, Exudates, Colorants	0.3 %	0.2 %	0.2 %	0.4 %	0.5 %	0.3 %
Honey, Beeswax	0.3 %	1.1 %	2.1 %	2.0 %	0.5 %	1.2 %
Animal and Animal Products (Meat)	1.3 %	2.9 %	2.0 %	2.6 %	1.5 %	2.0 %
Environmental, Education and Cultural	1.0 %	1.4 %	2.3 %	1.9 %	1.5 %	1.6 %

Source: ILUA Policy Report (2008)

4.6.3 Infrastructure Development

Mining

Mining and mineral exploitation is a strong industry in Zambia; copper mining and export accounts for almost 90% of export earnings and has had significant contribution to the country's GDP (IDLO, 2011).

Growth in the mining sector and quarrying sector declined by 5.2% in 2011 compared with growth of 15.2 % in 2010 (BoZ, 2011). The sector contributed negative 0.5 percentage points to real GDP, down from 1.4 percentage points the previous year (ibid.). This was largely on account of low-grade copper ore coupled with a fall in the output and price of cobalt by 10.9% and 7.0%, respectively (ibid.). Cobalt output fell to 7,701.6 mt from 8,782.0 mt. However, copper output rose by 7.6% to 881,106 mt from 819,159.0 mt (ibid.). Nevertheless, the other mining and quarrying sub-sectors grew by 7.4% in 2011 compared with a 48.7% contraction in 2010, mainly accounted for by higher construction activities (ibid.).

According to IDLO (2011), mining is linked to the Sixth National Development Plan and Vision 2030, and overwhelmingly takes priority over other rights tied to the same geographic location. Mining and mineral exploitation impact REDD+ implementation insofar as subsurface rights often take precedence over land and forest management, and can thereby cause reversals or displacements, and compromise results-based payments to persons involved in forest management (ibid.).

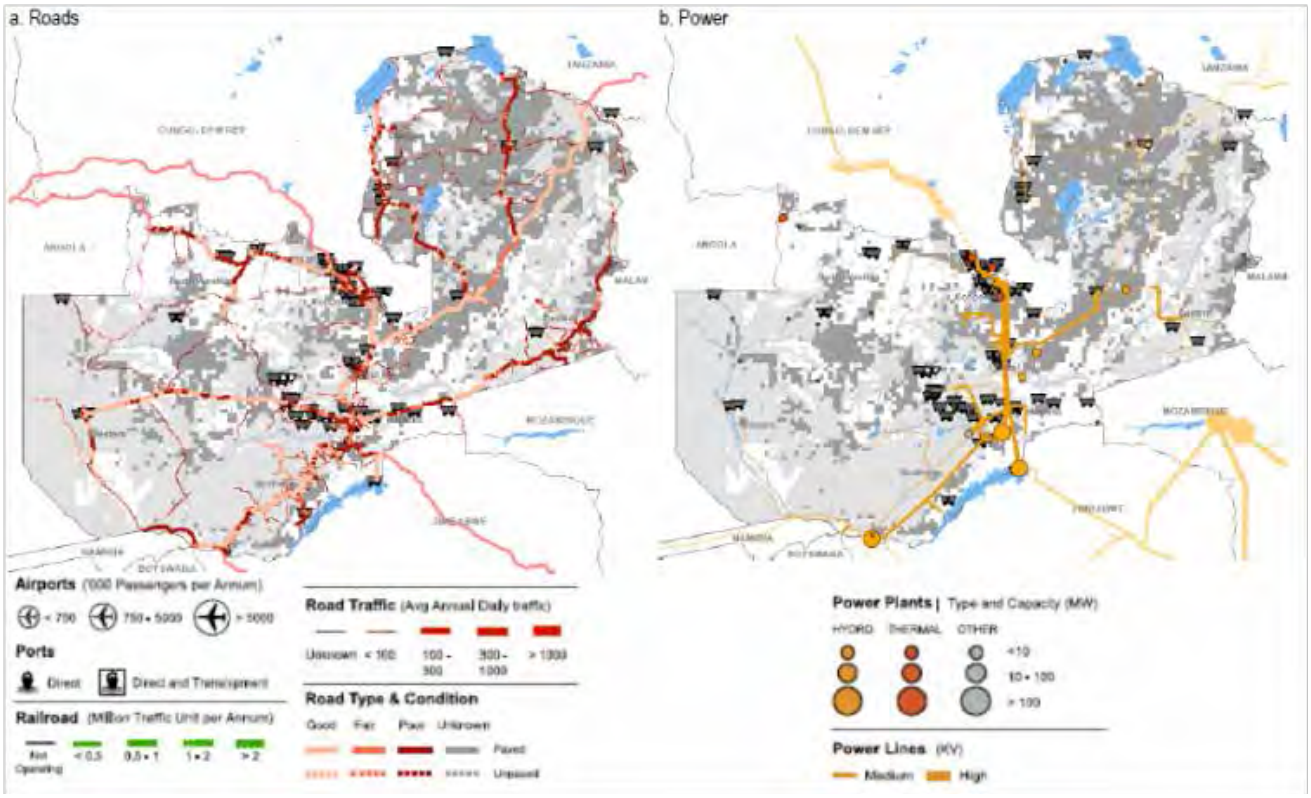
Roads

Infrastructure improvements contributed 0.6 percentage points to the annual per capita growth of Zambia's GDP over the past decade, mostly because of the exponential growth of information and communication technology (ICT) services (AICD, 2010). Poor performance by the power sector reduced the per capita growth rate by 0.1 percentage point. Simulations suggest that if Zambia's infrastructure platform could be improved to the level of the African leader—Mauritius—per capita growth rates could increase by 2 percentage points per year.

On just about every aspect of infrastructure, rural Zambians lag well behind their African peers. In a country where 70% of the population depends on agriculture for its livelihood, this represents a huge drag on the economy. Zambia would need to spend an average of $1.6 billion a year over the decade 2006–15 to develop the infrastructure found in the rest of the developing world. This is equivalent to 20% of Zambia's GDP (similar to what China invested in infrastructure in the mid-2000s), and is about double the country's rate of investment in recent years. The power sector alone accounts for 32% of these spending needs.

This subsection focuses on road infrastructure in Zambia mainly due to the fact that the road sector plays a role in economic development. It must also be noted that infrastructure developments including roads are extended to areas where there are natural resources and this involves cutting down of trees. This is confirmed by AICD (see figure below).

Figure 8: Zambia Infrastructure Networks Follow Natural Resources



Source: AICD (2010)

Zambia is one of the few countries in the region with a road sector budget in excess of what is needed to maintain the main road network, and adequate to address the rehabilitation backlog (figure below) (AICD, 2010). During the early 2000s, Zambia spent 3% of GDP on the roads sector on average – a relatively high allocation (ibid).

Table 9: Zambia's road indicators benchmarked against Africa's low- and middle-income countries

	Unit	Resource rich	Zambia	Middle-income countries
Paved road density	Km/1,000 km^2 of arable land	97.6	56.3	146.8
Unpaved road density	Km/1,000 km^2 of arable land	128.0	95.0	257.8
GIS rural accessibility	% of rural pop within 2 km from all-season road	19.7	16.8	22.9
Overengineering of network	% of main road network paved despite low traffic volumes	15.0	65.0	20.0
Paved road traffic	Average annual daily traffic	1,408.2	736.6	2,558.3
Unpaved road traffic	Average annual daily traffic	54.2	45.2	14.9
Paved network condition	% in good or fair condition	67.9	83.0	82.0
Unpaved network condition	% in good or fair condition	61.4	25.0	57.6
Perceived transport quality	% firms identifying as major business constraint	27.4	10.6	4.8

Source: Gwilliam and others 2008[21] .

It is argued by Shoch *et al.* (2011), that deforestation begins along roadsides and steadily progresses across a large area of intact forest, usually following a pattern dictated by access routes. Consequently, deforestation and degradation are often caused by immigrant agents, and frontier baselines often involve infrastructure or policies that open up access to formerly remote areas.

Furthermore, accelerated economic and infrastructural development will probably increase the risks of climate change in Zambia (Mudenda, M., 2010). Clearing forests for construction and increased industrialization will have negative consequences on Zambia's environment and atmosphere (ibid.). Climate risks are definitely a challenge to development in Zambia (ibid.).

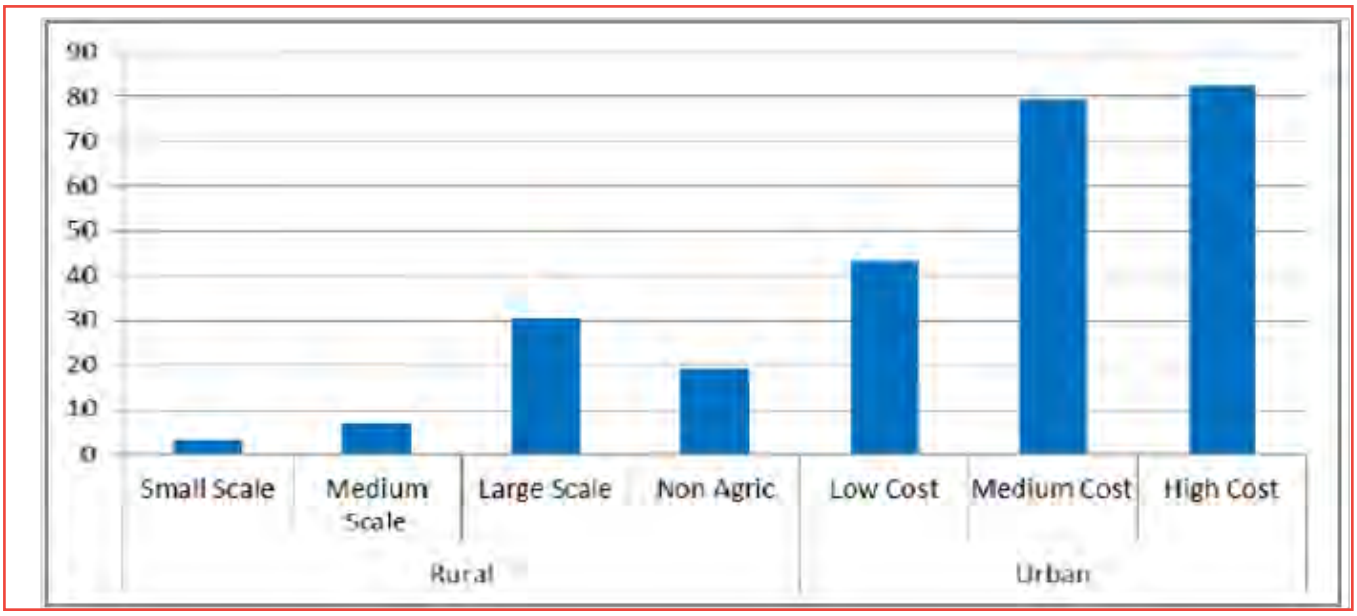
Hydro Power

In 2011, the electricity, gas and water sector grew by 8.2% compared with 7.4% in 2010 (BoZ, 2011). This was due to an increased demand for electricity, spurred by heightened economic activities, particularly in the mining and construction sectors (ibid.). This was complemented by completion of rehabilitation works at some hydro power stations (ibid.).

According to the Living Conditions Monitoring Survey 2006 – 2010 (CSO, 2010), almost 22% of Zambian households are connected to electricity. Electricity connection varies by stratum. By rural stratum this ranges from 3% of 'small scale' to almost one third of 'large scale' agricultural households being connected (ibid.). For the urban stratum connectivity ranges from 43% of 'low cost' to 83% of 'high cost' households (ibid.). See figure below for details.

21 Derived from /www.infrastructureafrica/aicd/tools/data, (AICD)

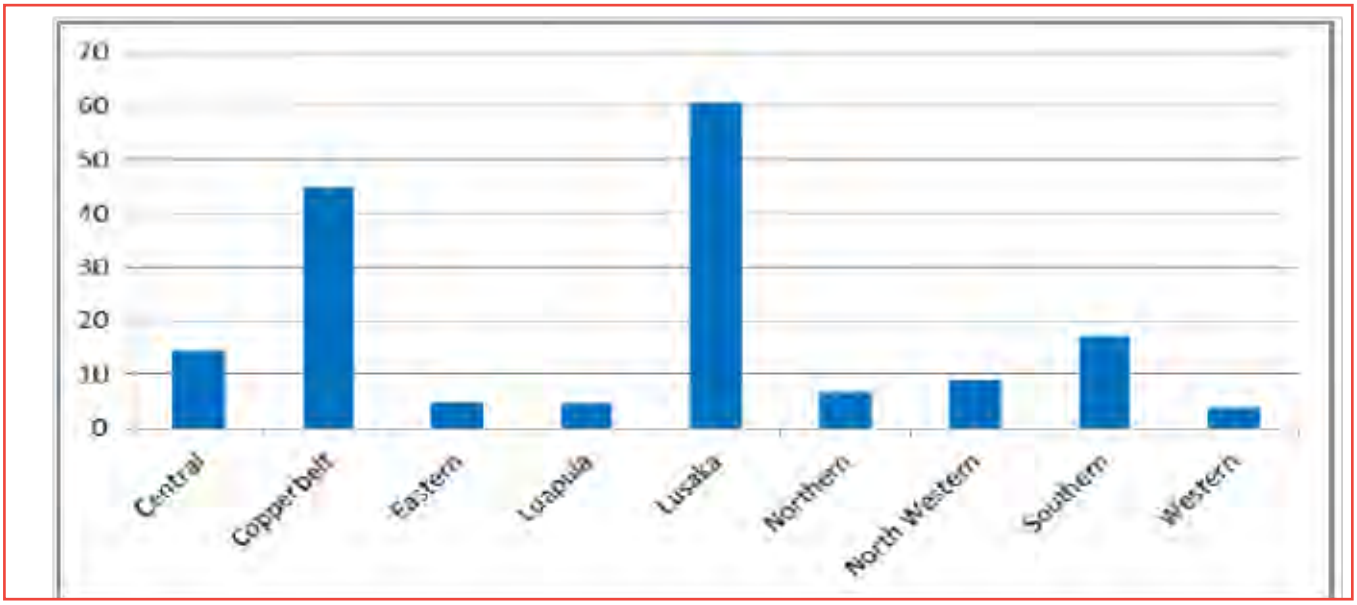
Figure 9: Percentage Distribution of Households Connected to Electricity by Stratum 2010



Source: LCMS 2006 – 2010 (CSO, 2010)

By province the greatest proportion of households with an electricity connection are in Lusaka (61%) followed by Copperbelt (45%) (LCMS 2006 – 2010, CSO). Western, Luapula and Eastern have the lowest rates of connectivity, ranging between 4% and 5% (see figure below) (ibid.). It is important to keep these variations of electricity connection in mind when reading the sections on main source of lighting and cooking energy (ibid.).

Figure 10: Percentage Distribution of Households Connected to Electricity by Province 2010



Source: LCMS 2006 – 2010 (CSO, 2010)

Cutting of trees for construction of power lines leads to the destruction of trees of commercial value, and may also open up protected areas (forest reserves and national parks) to charcoal production and poaching (Sooka M).

4.6.4 Human Settlements

Climate change will affect human settlements against a very dynamic background of other environmental and socioeconomic factors (Scott and Gupta, No Date). Human settlements are expected to be among the sectors that could be most easily adapted to climate change, given appropriate planning and foresight, and appropriate technical, institutional, and political capacity (ibid.). The required capacities to cope with the challenges of climate change must be built in Zambian institutions.

It is generally acknowledged that the mushrooming of informal settlements is a result of not only a failed housing policy, but also due to the migration of people from rural areas into urban areas (Muchima, 2006, cited by Mudenda, 2010). When these people cannot afford decent shelter, they create shelter for themselves on their own initiative and with their own resources (Mudenda, 2010).

4.6.5 Insecurity of Forest Land

Today the land law of Zambia recognises only two tenure regimes: "state" and "communal," and all land is officially categorised as either "State Land" or "Customary Land" respectively (Republic of Zambia 1995, cited by Chileshe, R). In general the land is often held by a group, community lineage, clan, family or individuals. In addition, an individual in the community may give a piece of it to another person for use, with the local leaders' knowledge (ILUA Policy Report).

An estimated 94% of the country is officially designated as customary land and is occupied by 73 tribes, headed by 240 chiefs, 8 senior chiefs and 4 paramount chiefs (UN-REDD Programme Document). Under the customary system, de facto land allocation is carried out by headmen of villages, although the state still has de jure ownership of the land (ibid.). It is not currently possible to privatise resources or land that is designated as customary land (ibid.). Under the Land Act of 1995, customary land can be converted to leasehold tenure, but this process is complicated by the lack of clarity about rights to the land, and this option has not been frequently exercised (ibid.). This presents potential legal obstacles to the distribution system of potential revenues and may lead to communities showing little motivation to invest in REDD+ initiatives and raise finance from external investors (ibid.).

Apart from legal impediments, the major forestry problem in Zambia is deforestation and forest degradation resulting from mismanagement for narrow, short-term gains Novoju, F. (no date). In addition to mismanagement Novoju, F. (no date) notes the reduction in government expenditure has also meant that few resources are available for the management of forests, resulting in diminished government control on the ground.. As a consequence, deforestation has increased, encroachment is up, and there is an overall degradation in the quality of the forest resource arising from uncontrolled and illegal practices.

Further, the stringent economic programmes that were implemented in the 1990s focused on liberalization and reduced state interference in the economy (ibid.). These were accompanied by reduced spending on social services and loss of formal employment, thereby increasing poverty levels (ibid.). The prevalence of poverty in rural areas has implications for forestry, as it remains the only resource that can provide fallback support (ibid.).

5. FINDINGS OF THE STUDY

5.1 District Level Socio-economic Conditions

5.1.1 Sesheke District

Generally, there is insufficient literature on the current socio-economic conditions of individual districts in Zambia. Therefore, the following socio-economic data is entirely based on the 2010 reports of the Central Statistical Office (CSO). Predominantly, the available data is at provincial level. In this context, the primary findings at district level will be compared to provincial level data by way of looking at the population of each district and the extent to which each district contributes to respective provincial economies.

Sesheke District is in the Western Province of Zambia. The population of the province as a whole is 881,524 of which 94,612 (10.7%) represents the population for Sesheke District and this makes Sesheke the fifth highest populous district in the province (2010 Census Report, CSO).

The unemployment rate in Western Province is 8% for both males and females (LCMS, CSO, 2010). Of the people who are employed, 90.6% are in the informal sector and of those in the informal sector 83% are in agriculture.

According to the Central Statistical Office (Living Conditions Monitoring Survey, 2010), Western Province as a whole has 205,000 households, of which 167,000 are agricultural, representing 81.3% of all households. Of the 167,000 agricultural households, 87.9% grow maize of all types, while 76.8% grow local maize only and 12.1% grow hybrid maize only. In total, households produced 100,000 metric tonnes in 2010. The percentage change over time in quantity produced from 2006 to 2010 was -0.1%.

Apart from maize the province produces cassava (flour), millet (threshed), sorghum and rice (paddy). The table below shows the type of crops and quantities produced by agricultural household in 2010.

Table 10: Percentage of Agricultural Households Producing Cassava, Millet, Sorghum and Rice in Western Province

Cassava (flour)		Millet (threshed)		Sorghum		Rice (paddy)	
Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)
43.6	284	3.5	20	2.5	6	16.6	130

Data Source: CSO

For mixed beans, soya beans, sweet potatoes, Irish potatoes and groundnuts produced in 2010, details are in the following table.

Table 11: Percentage and Quantities of Other Crops Produced in Western Province

Crops		Percentage and Units
Mixed beans	Percentage growing crop	1.3
	Production 90 kg bags (000s)	6
Soya beans	Percentage growing crop	-
	Production 90 kg bags (000s)	-
Sweet potatoes	Percentage growing crop	5.2
	Production 25 kg bags (000s)	102
Irish potatoes	Percentage growing crop	-
	Production 10 kg bags (000s)	-
Groundnuts (shelled)	Percentage growing crop	6.6
	Production 00 kg bags (000s)	49

Data Source: CSO

As for livestock ownership, official data shows that out of the 167,000 agricultural households in the province, 40,000 own livestock, of which 87.1% own cattle, 12.4% own goats, 14.4% own pigs. There is no data for sheep ownership (CSO, LCMS, 2010)

5.1.2 Kapiri Mposhi District

Kapiri Mposhi District is strategically located along the busiest railway line in Central Province. The population of the Central Province is 1,267,803, of which 19% are living in Kapiri Mposhi District, making it the district with the second highest population in the province (CSO, 2010 Census Report).

Generally, the unemployment rate in Central Province is 10.5% for both males and females (LCMS, CSO, 2010). Of the people who are employed, 83.9% are in the informal sector and of those who are in the informal sector, 80.1% are in agriculture.

Central province has a total of 250,000 households of which 185,000 are agricultural representing 74.1% of all households in the province. Of the 185,000 agricultural households, 92.8% grew all types of maize in 2010 while 47.1% grew local maize and 55.8% grew hybrid maize only. The total production of maize was 411,000 metric tonnes, which represents a 0.4% change in the quantity produced over time (2006-2010) (ibid).

In addition to maize, agricultural households also produce cassava (flour), millet (threshed), sorghum and rice (paddy). The table below shows the type of crops and quantities produced by agricultural households in 2010.

Table 12: Percentage of Agricultural Households Producing Cassava, Millet, Sorghum and Rice in Central Province

Cassava (flour)		Millet (threshed)		Sorghum		Rice (paddy)	
Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)
11.4	132	5.2	27	1.0	8	0.4	1

Data Source: CSO

For mixed beans, soya beans, sweet potatoes, Irish potatoes and groundnuts produced in 2010, details are in the following table.

Table 13: percentage and Quantities of Other Crops Produced in Central Province

Crops		Percentage and Units
Mixed beans	Percentage growing crop	11.4
	Production 90 kg bags (000s)	49
Soya beans	Percentage growing crop	5.5
	Production 90 kg bags (000s)	106
Sweet potatoes	Percentage growing crop	22.3
	Production 25 kg bags (000s)	1, 300
Irish potatoes	Percentage growing crop	2.0
	Production 10 kg bags (000s)	75
Groundnuts (shelled)	Percentage growing crop	28.7
	Production 00 kg bags (000s)	332

Data Source: CSO

In the area of livestock ownership, official data shows that out of the 185,000 agricultural households in the province, 79,000 own livestock, of which 61.2% own cattle, 70.3% own goats, 9.0% own pis and 2.0% own sheep.

5.1.3 Isoka and Nakonde Districts

Isoka and Nakonde districts were taken as one study site due to their proximity and in consideration of the forests that are continuous between them.

For the purpose of this study and for statistical expediency, the secondary data that is relied upon is for the Northern Province, notwithstanding the fact that these two districts are now part of the relatively newly created province, Muchinga. Further, the new province was created after the CSO census and LCMS of 2010 were already published.

The Northern Province has a population of 1,759, 600, of which 9.3% is the population share of Isoka District, which is the fourth highest in the province. Nakonde District has a population share of 6.7% and this makes it the eighth highest in the province.

The unemployment rate in the province is 4.9% for both males and females. Of the people who are employed, 93% are in the informal sector and of those who are in the informal sector, 88.5% are in agriculture (CSO, LCMS, 2010).

Northern Province has 318,000 households, of which 274,000 were agricultural representing 86.4% of all households in the province (ibid). Of the 274,000 agricultural households, 65.2% grew all types of maize between 2006 and 2010, while 41.4% grew local maize and 26.3% grew hybrid maize only (ibid). The total production of maize was 269,000 Metric tonnes, which represents a percentage change over time (2006 to 2010) in quantity produced of 36.0%.

Details for the production of cassava (flour), millet (threshed), sorghum and rice (paddy) are presented in the table below.

Table 14: percentage of Agricultural Households Producing Cassava, Millet, Sorghum and Rice in Northern Province

Cassava (flour)		Millet (threshed)		Sorghum		Rice (paddy)	
Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)
62.4	1, 517	29.8	223	2.4	30	7.2	170

Data Source: CSO

For mixed beans, soya beans, sweet potatoes, Irish potatoes and groundnuts produced in 2010, details are in the following table.

Table 15: Percentage and Quantities of Other Crops Produced in Northern Province

Crops		Percentage and Units
Mixed beans	Percentage growing crop	37.3
	Production 90 kg bags (000s)	260
Soya beans	Percentage growing crop	3.3
	Production 90 kg bags (000s)	17
Sweet potatoes	Percentage growing crop	27.3
	Production 25 kg bags (000s)	1, 584
Irish potatoes	Percentage growing crop	0.9
	Production 10 kg bags (000s)	74
Groundnuts (shelled)	Percentage growing crop	41.9
	Production 00 kg bags (000s)	292

Data Source: CSO

Insofar as livestock ownership is concerned, official data shows that out of the 274,000 agricultural households in the province, 75,000 own livestock, of which 22.2% is a percentage owning cattle, 70.3% owning goats, 28.7% owning pigs and 2.4% owning sheep.

5.1.4 Kabompo District

According to the 2010 Census (CSO, 2010), the population of North-Western Province is 706,462, of which the population share of Kabompo District is at 12.9%, and this makes the district the third most populous in the province.

The unemployment rate in North-Western Province is 9.2% for both males and females. Of the people who are employed, 86.1% are in the informal sector and of those who are employed in the informal sector, 87.8% are in agriculture (CSO, LCMS, 2010).

North Western Province has 138,000 households of which 106,000 were agricultural, representing 77.2% of all households (ibid). Of the 106, 000 agricultural households, 87.3% grew all types of maize in 2010 while 69.4% grew local maize and 21.1% grew hybrid maize only (ibid). The total production of maize was 100,000 Metric tonnes, which represents a percentage change over time (2006 to 2010) in quantity produced of 3.2%.

The table below shows the type of crops and quantities produced by agricultural household in 2010.

Table 16: Percentage of Agricultural Households Producing Cassava, Millet, Sorghum and Rice in North Western Province

Cassava (flour)		Millet (threshed)		Sorghum		Rice (paddy)	
Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)	Percentage growing crop	Production 90 kg bags (000s)
41.5	239	1.2	2	3.3	21		

Data Source: CSO

For mixed beans, soya beans, sweet potatoes, Irish potatoes and groundnuts produced in 2010, details are in the following table.

Table 17: Percentage and Quantities of Other Crops Produced in North Western Province

Crops		Percentage and Units
Mixed beans	Percentage growing crop	23.0
	Production 90 kg bags (000s)	55
Soya beans	Percentage growing crop	0.7
	Production 90 kg bags (000s)	2
Sweet potatoes	Percentage growing crop	20.7
	Production 25 kg bags (000s)	503
Irish potatoes	Percentage growing crop	7.2
	Production 10 kg bags (000s)	415
Groundnuts (shelled)	Percentage growing crop	11.7
	Production 00 kg bags (000s)	42

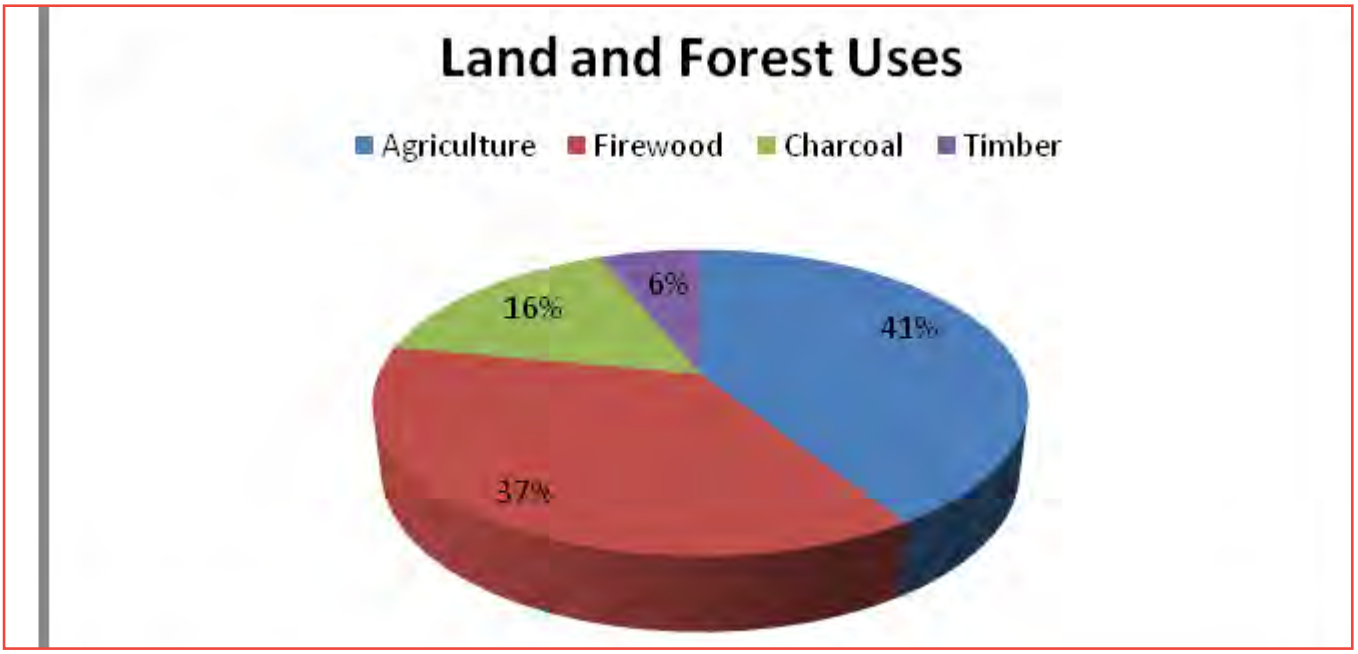
Data Source: CSO

As for livestock ownership, official data shows that out of the 106,000 agricultural households in the province, 28,000 own livestock, of which 18.8% own cattle, 85.7% own goats, 8.3% own pigs and 1.3% own sheep.

5.2 Land Uses in the Districts

The figures below show the main uses of land and forests at household level, as stated by household respondents. Accordingly, 41% of respondents said they used land for agriculture, 37% said they used forests for firewood, 16% said they used forests for charcoal, and 7% said they used forests for timber production.

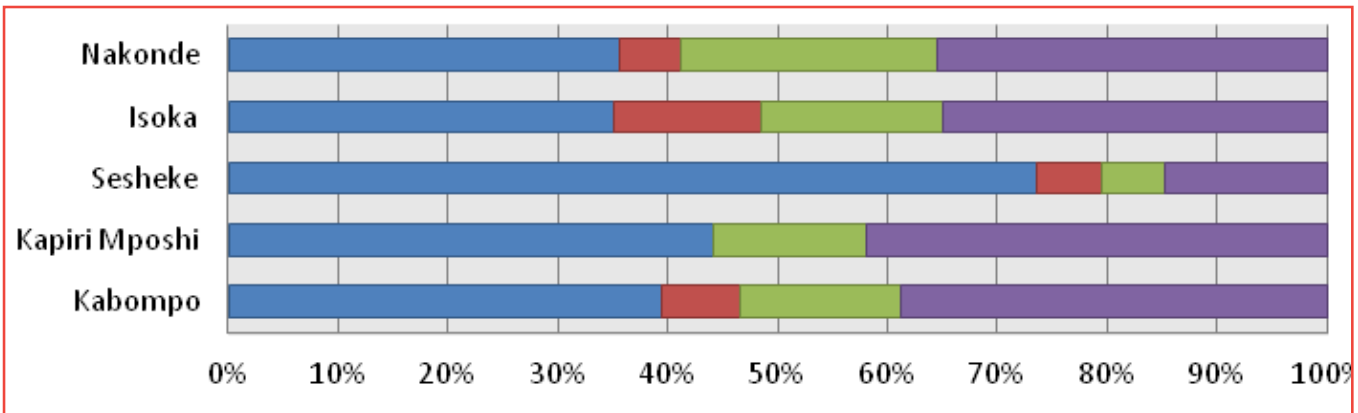
Figure 11: Main Uses of Land & Forests at Household Level



Source: Socio-economic Survey of this study

In terms of the most common land use, the figure below shows that agriculture was a predominant land use across all districts, more especially in Sesheke, Kapiri Mposhi and Kabompo. The second predominant land use was firewood, particularly in Kapiri Mposhi, Kabompo, Isoka and Nakonde, while it was least predominant in Sesheke. Charcoal was more pronounced in Nakonde, Isoka, Kabompo and Kapiri Mposhi, in that order.

Figure 11: Main Uses of Land & Forests at Household Level by District

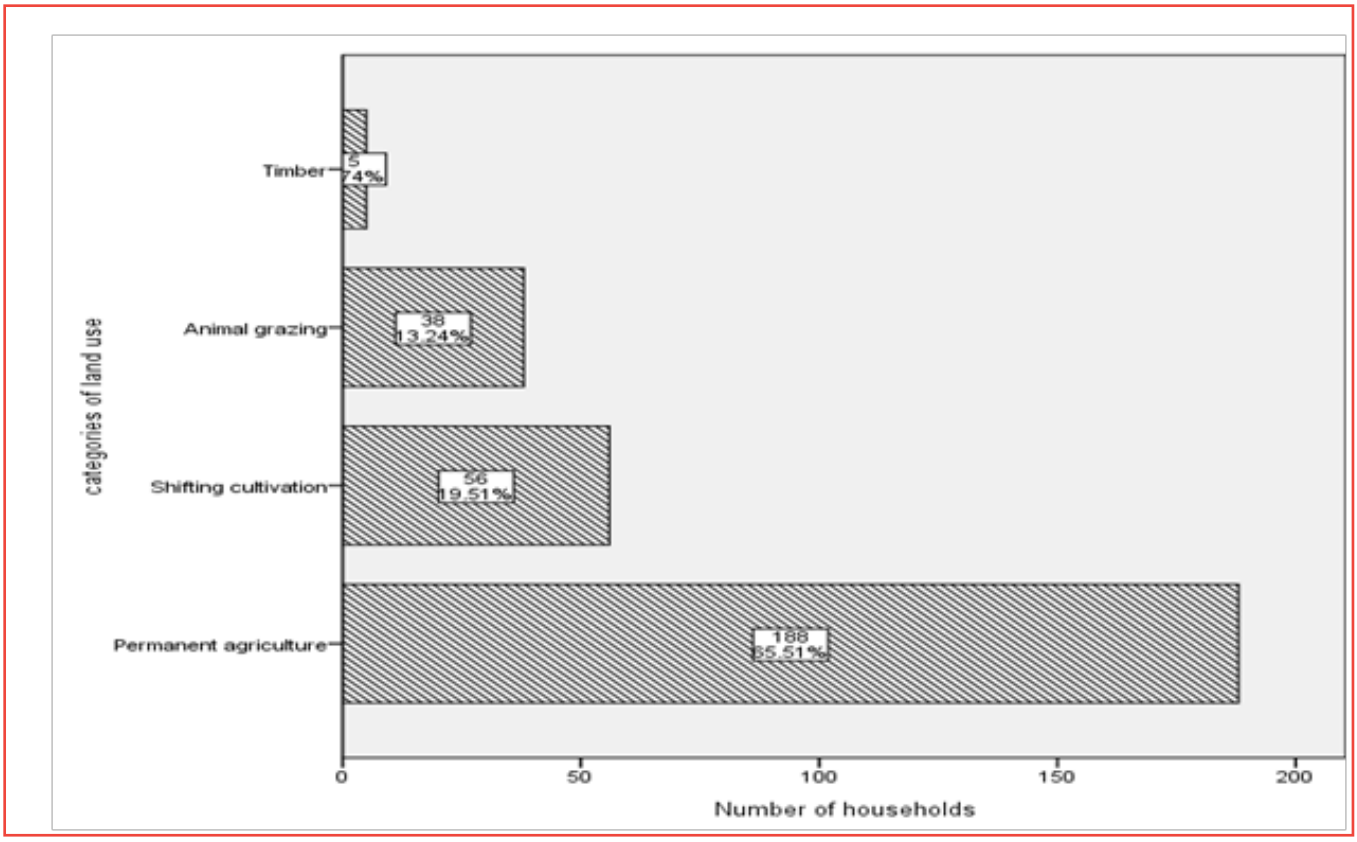


	Kabompo	Kapiri Mposhi	Sesheke	Isoka	Nakonde
Agriculture	56	57	25	34	32
Timber	10	0	2	13	5
Charcoal	21	18	2	16	21
Firewood	55	54	5	34	32

Source: Socio-economic Survey of this study

Furthermore, the major type of land use category in 65.5% of the households surveyed was permanent agriculture, followed by shifting cultivation (19.5% of households), animal grazing (13.2% of households), and timber production (1.7% of the households) (see figure below).

Figure 12: Types of Land Use Categories at Household Level (Aggregate for All Districts)



Source: Socio-economic Survey of this study

For ranking purposes, agriculture was sub-divided into shifting cultivation and permanent agriculture. Other major land and forest uses were included on the scale. The table below shows the results of the ranking of the land use categories starting with the most common; and these included agriculture (permanent), firewood, charcoal, animal grazing, timber extraction, shifting cultivation, grass cutting and mushroom collection.

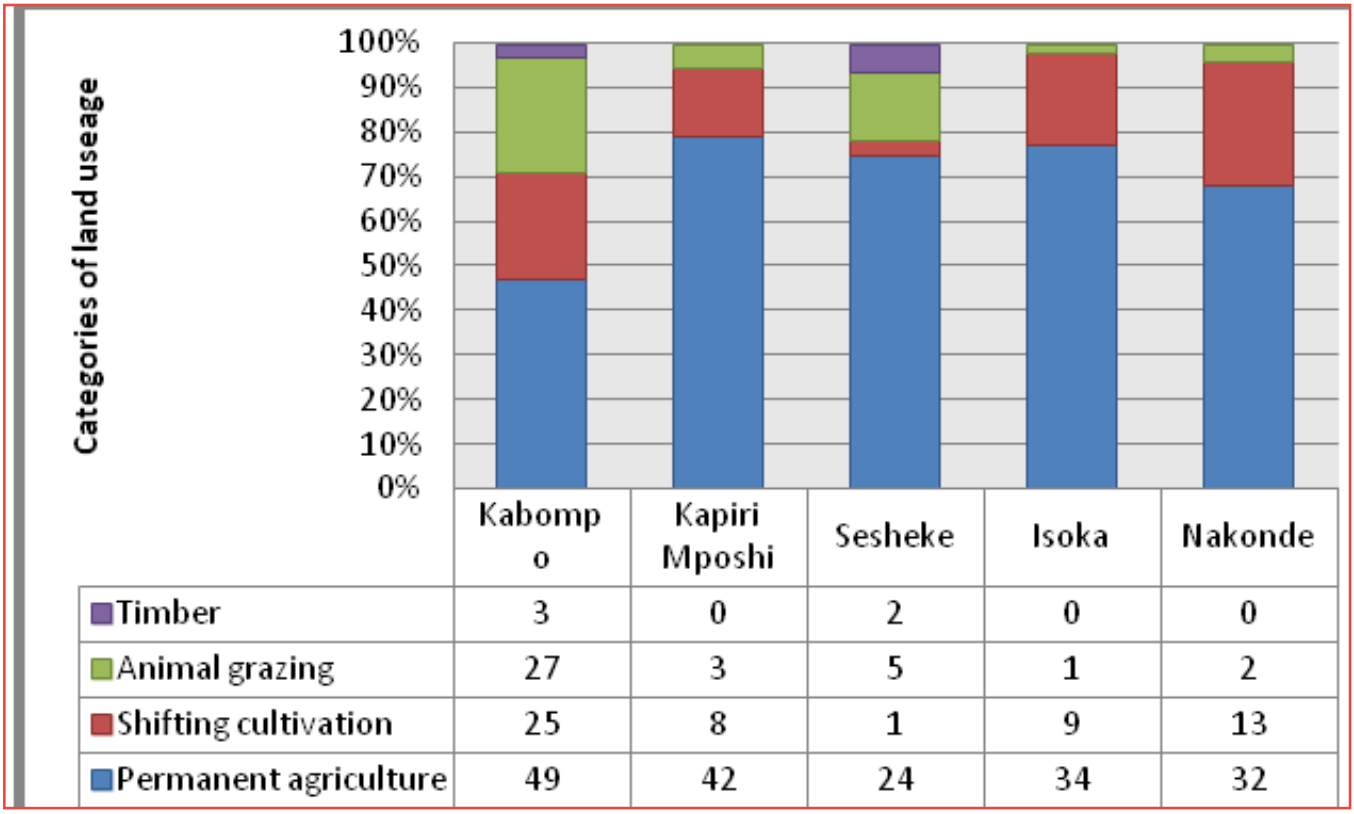
Table 18: Ranking of Land Use Categories

Land use category	Rank
Agriculture (Permanent)	1
Firewood	2
Charcoal	3
Animal grazing	4
Timber	5
Shifting cultivation	6
Grass collection	7
Mushroom collection	8

Source: Socio-economic Survey of this study

The geographic distribution of land uses shows that shifting cultivation was more predominant in Nakonde, Kabompo, Isoka, and Kapiri Mposhi (see figure below).

Figure 13: Types of Land Use Categories at Household Level



	Kabompo	Kapiri Mposhi	Sesheke	Isoka	Nakonde
Timber	3	0	2	0	0
Animal grazing	27	3	5	1	2
Shifting cultivation	25	8	1	9	13
Permanent agriculture	49	42	24	34	32

Source: Socio-economic Survey of this study

The types of crop grown under subsistence agriculture and shifting cultivation land uses include maize (29.7%), groundnuts (16.7%), cassava (14.8%), sweet potatoes (10.6%), beans (10.2%), millet (3.3%), sorghum (3.1), vegetables (onion, green pepper, cabbage, tomatoes) (2.8%), soya beans (2.4%), cotton (1.4%), popcorn (1.4%), pumpkins (1.0%), bambara nuts (0.9%), cowpeas (0.9%), rice (0.3%), sunflowers (0.3%), and mushrooms (0.2%).

Table 19: Types of Crops Grown

Type of Crop	Frequency	%	Cumulative %
Maize	171	29.7	29.7
Groundnuts	96	16.7	46.4
Cassava	85	14.8	61.1
Sweet potatoes	61	10.6	71.7
Beans	59	10.2	81.9
Millet	19	3.3	85.2
Sorghum	18	3.1	88.4
Vegetables	16	2.8	91.1
Soya beans	14	2.4	93.6
Cotton	8	1.4	95.0
Popcorn	8	1.4	96.4
Pumpkins	6	1.0	97.4
Bambara nuts	5	.9	98.3
Cowpeas	5	.9	99.1
Rice	2	.3	99.5
Sunflowers	2	.3	99.8

Mushrooms	1	.2	100.0
Total	**576**	**100.0**	

Source: Socio-economic Survey of this study

The above findings from households on land use was not markedly different from those identified by key informants. According to key informants, the following were the major land and forest use categories in all the districts put together:

- **Land Use 1:** Agriculture (permanent)
- **Land Use 2:** Shifting cultivation (small scale or subsistence agriculture)
- **Land Use 3:** Timber production
- **Land Use 4:** Charcoal burning
- **Land Use 5:** Firewood
- **Land Use 6:** Animal grazing

While some of the land uses that key informants reported were similar to the ones itemised by households, there were small variations including the order in which they (land uses) were ranked, as can be seen above.

Land Tenure
Estimated land with title ranged from 3 to 158 hectares, with an average of 49.83 hectares. This is land allocated to individuals who acquire land under customary tenure and then they get the titled deeds in due course.

5.3 Cost Benefit Analysis of Land Uses in the Districts

5.3.1 Overview

Key informants were asked to estimate the productivity of land uses with regard to commodity productivity, product unit price, establishment cost, production cost, employment creation, and target buyers/markets. Notably, while key informants and household respondents were able to identify various land uses they were not able to give cost benefit estimates for a number of land uses like grass cutting, mushroom collection, firewood, etc. Therefore, this report has concentrated on agriculture (permanent and shifting cultivation), timber and charcoal burning. The tables and figures that are presented in this section show summaries of the productivity statistics of these selected land uses.

5.3.2 Cost Benefit Analysis

Land Use 1: Permanent Agriculture
The table below shows estimates from key informants. The figures below are presented in the rebased Zambian Kwacha and the current exchange rate of one United States of America Dollar to Kwacha is K5.4.

Table 20: Productivity and Cost-Benefit Estimates for Subsistence Agriculture

Land Use 1: Permanent Agriculture (maize)	Estimates
Commodity productivity (unit/ha/year)	70 X 50 kg bags per hectare per year
Product unit price (ZMK/unit)	K65.00 per 50 kg bag
Establishment cost (ZMK/ha)	K950.00 per hectare
Production cost (ZMK/ha/year)	K3, 000.00 per hectare per year
Employment creation in the local community (jobs/ha)	14 people per hectare

Source: Socio-economic Survey of this study

The sizes of the smallholders' farms ranged from 2 hectares to 62 hectares, giving an average of 10.47 hectares. The average number of hectares normally farmed was 3.93 hectares. Of the smallholder farmers surveyed, 47.2% practised permanent agriculture while 51.8% practised mixed (shifting and permanent) farming.

Inputs and Technologies Used in Production

The major inputs used included fertilizers (including ashes and compost manure), seed, pesticides, and water. Other inputs included land and labour. The major technologies used included hand tools (hoes, axes and sprayers), ploughs, and tractors. The table below shows a summary of these details.

Table 21: Inputs and Technologies Normally Used

Input	Number of Respondents	%
Fertilizer	31	19.5
Hoes	29	18.2
Seed	22	13.8
Axes	18	11.3
Ploughs	17	10.7
Labour	17	10.7
Pesticides	10	6.3
Sprayers	5	3.1
Oxen	4	2.5
Land	2	1.3
Ash	1	.6
Compost manure	1	.6
Tractor	1	.6
Water	1	.6
Total	159	100.0

Source: Socio-economic Survey of this study

Land Use 2: Small Scale Agriculture (Shifting Cultivation)

According to households, the average commodity productivity was approximately 47.68 bags per hectare per year; the average product unit price was K290.44 per bag; the average establishment cost was K237.14 per hectare; the average production cost was K437.50 per hectare per year; and the average employment creation to the local community was 5 persons per hectare.

Table 22: Summary Statistics on Shifting Cultivation

Shifting Cultivation (millet)	N	Mean
Commodity productivity (no. bags/ha/year)	22	47.68
Product unit price (ZMK/bag)	23	290.44
Establishment cost (ZMK/ha)	14	237.14
Production cost (ZMK/ha/year)	18	437.50
Employment creation (jobs/ha)	16	5

Source: Socio-economic Survey of this study

Other Sources of Household Revenues

Other sources of household revenues were retailing, selling agriculture produce, charcoal burning, gardening, fishing and fish trading, poultry, beer brewing, trading in forest products (grass, caterpillars, mushrooms, etc.), bricklaying, bee keeping, piece work, carpentry, timber cutting, canoe making, dairy milk, moulding bricks, piggery, selling manure, auto repair, craft work, fish farming, grain milling, metal fabrication, real estate, sewing, thatching, tobacco trading and traditional medicine.

Land Use 3: Timber Production

There was only one key informant for timber due to the ban on timber that government imposed during the course of the study. Therefore, estimates from one producer could not be relied upon.

Land Use 4: Charcoal Burning

The table below shows a summary of statistics on the charcoal business. The length of period the informants had been in the charcoal business ranged from one month to 288 months (24 years), with an average of 61.3 months (5 years). The average commodity productivity ranged from 50 bags to 600 bags per year, giving an average of 198.60 bags per year.

Five to five hundred (500) trees were being cut per year, giving an average of 152.75 trees per year. Five to a hundred bags were being produced per kiln, giving an average of 25.87 bags per kiln. The product unit price ranged from K10.00 to K30.00 per bag, giving an average of K20.93750 per bag of charcoal. The establishment costs ranged from K20.00 to K310.00 per hectare, giving an average establishment cost of K85.00 per hectare. Production costs ranged from K10.00 to K2,500.00 per year, giving an average production cost of K307.73 per year. The number of persons employed in the charcoal business ranged from one to six, giving an average of three persons.

Table 23: Summary Descriptive Statistics on Charcoal Business

Charcoal	N	Minimum	Maximum	Mean
Length of time in the charcoal business (months)	19	1	288	61.32
Commodity productivity (bags per year)	15	50	600	198.60
Number of trees cut per year	16	5	500	152.75
Quantity of charcoal per kiln (50 kg bags)	15	5	100	25.87
Product unit price (ZMK/ 50 kg bag)	16	10.00	30.00	20.94
Establishment cost (ZMK/ha)	8	20.00	310.00	85.00
Production cost (ZMK/year)	11	10.00	2,500.00	307.73
Employment creation to the local community (jobs)	12	1	6	3.00

Source: Socio-economic Survey of this study

On average K64.79 is paid to the Government in form of tax and other fees. Other taxes and levies ranged from K16.20 to K81.00. The cost of rent ranged from K2.50 to K10.00.

Labour costs ranged from K30.00 to K60.00. Transport costs ranged from K15.00 to K75.00, giving an average transport cost of K46.67. Other production costs included the purchase of empty bags and axes and the repair of axes.

The table below provides a summary of other costs and revenues in the charcoal business. The other revenues raised from the charcoal business ranged from K1,040.00 to K1,746.67 per year. The other charcoal business related revenues are from the selling of firewood, i.e., the branches of trees that are cut off from the main trunks of trees that are burnt for charcoal.

Table 24: Other Costs and Revenues in Charcoal Business

Costs and Revenues	N	Minimum	Maximum	Mean
Other revenues (ZMK/year) e.g. firewood	3	1,040.00	3,000.00	1,746.67
Tax or other fees payable to Government (ZMK)	14	2.00	162.00	64.79
Quantities/purchases per year (bags) (ZMK)	5	30	600	294.00
Purchase price (per bag) (ZMK)	7	10.00	25.00	17.86
Transport costs (ZMK)	6	15.00	75.00	46.67
Taxes/levies (ZMK)	6	16.20	81.00	42.57
Space (rental) (ZMK)	5	2.50	10.00	5.90
Labour (ZMK)	2	30.00	60.00	45.00

Quantities sold per year (bags)	6	40	650	285.00
Income/revenue per year (ZMK)	6	600.00	5,400.00	2,350.0

Source: Socio-economic Survey of this study

Crop Marketing

According to key informants, growing maize was the main land use and the target market/buyer was the Food Reserve Agency.

According to households, the target market/buyers of various agriculture produce were, in their order of importance, the Food Reserve Agency (FRA), local markets, small scale traders, local millers, urban markets, home consumption, government institutions (e.g. schools, hospitals, and prisons), local breweries, and cotton companies (see the table below).

Table 25: Target Buyers/Markets

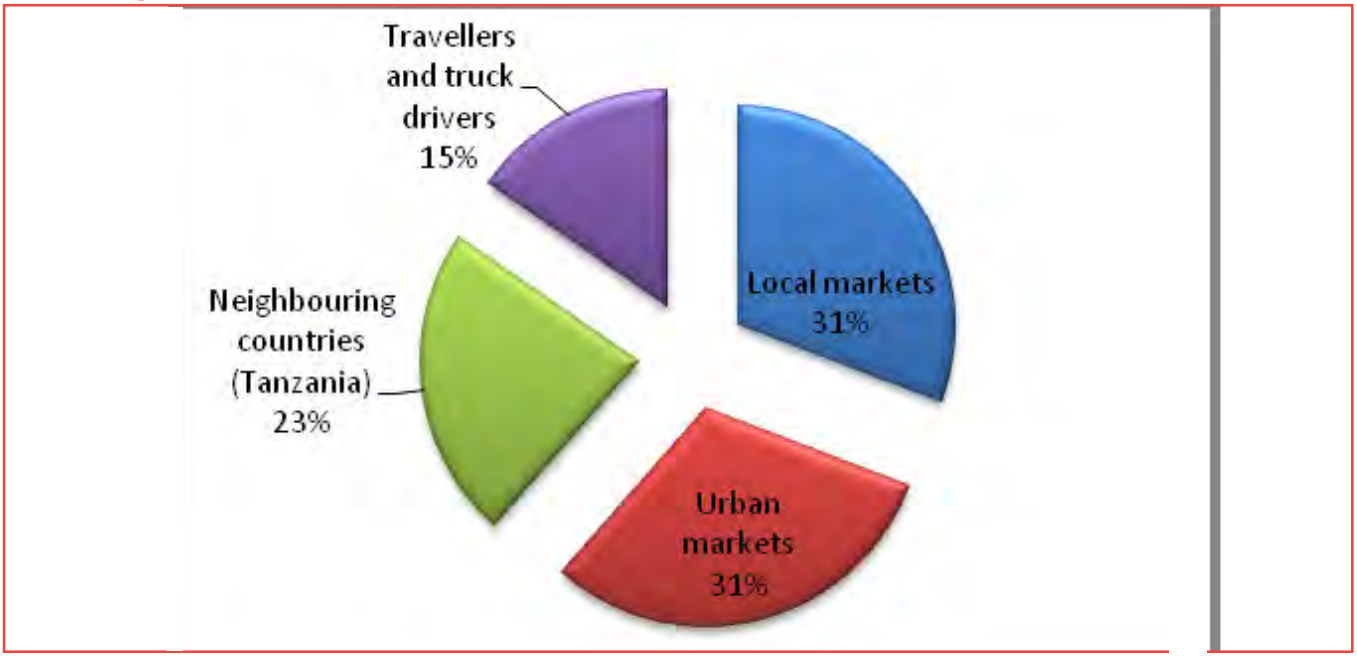
Input	Number of Respondents	%	Cumulative %
Food Reserve Agency	114	55.9	55.9
Local markets	31	15.2	71.1
Small scale traders	20	9.8	80.9
Local millers	11	5.4	86.3
Urban markets	9	4.4	90.7
Home consumption	7	3.4	94.1
Government institutions	5	2.5	96.6
Local breweries	5	2.5	99.0
Cotton companies	2	1.0	100.0
Total	204	100.0	

Source: Socio-economic Survey of this study

Charcoal Marketing

The target markets for charcoal include urban markets (31.0%), local markets (31.0%), neighbouring countries (23.0%), and travellers and truck drivers (15.0%).

Table 26: Target Charcoal Markets/Buyers



Source: Socio-economic Survey of this study

Adjusted Cost Benefit Analyses (CBAs)

After further literature review (Ministry of Agriculture and Cooperatives database) and expert input on productivity estimates, the field study CBA figures were adjusted and the tables from sub-section (a) to (d) present the summary of findings.

In the adjusted CBAs, commercial agriculture was included to ascertain economic benefits considering the fact that commercial agriculture is rapidly expanding.

(a) Permanent Agriculture (Commercial, Soybeans)

Table 27: Cost Benefit Analysis for Commercial Agriculture (Adjusted)

Permanent agriculture (Commercial, Soybeans)	US $ or unit
Establishment year 1	500
Inputs (per hectare)	
Soybeans (25kg)	240
Fertilizer (50kg) x 2 (inoculant)	86
Pesticides / herbicides	14
Labour (land preparation, harvesting and spraying)	420
Transport	462
Costs Total	1222
Expected yields per hectare (50 kg bags)	3 tons (60 bags)
Market price (soybeans)	35
Benefits Total	**2100**

Source: Socio-economic Survey of this study

(b) Small Scale Agriculture (maize)

Table 28: Cost Benefit Analysis for Small Scale Agriculture (Adjusted)

Source: Socio-economic Survey of this study

Small scale agriculture	US$ or unit
Establishment year 1	500
Inputs (per ha)	
Maize (10kg)	30
Fertilizer (50kg) x 4	160
Labour (land preparation, weeding and harvesting)	360
Transport (to and from the farm)	30
Costs Total	580
Expected yield per hectare	2.5
Market prices (Maize)	13
Benefits Total	650
Net Benefits	**70**

(c) Charcoal

Table 29: Cost Benefit Analysis for Charcoal Production (Adjusted)

Charcoal Production	$ or unit
Inputs charcoal (per ha)	
Labour	47.44
Licence	2.98
Council levy	74.79
Packaging (bags)	60.00
Transport (local)	113.18
TOTAL INPUTS	298.39
Revenues charcoal (per ha)	
Product yields	134
Sales prices	498.60
Net profit	**200.21**

Source: Socio-economic Survey of this study

5.4 Implications of REDD+ Implementation in Zambia

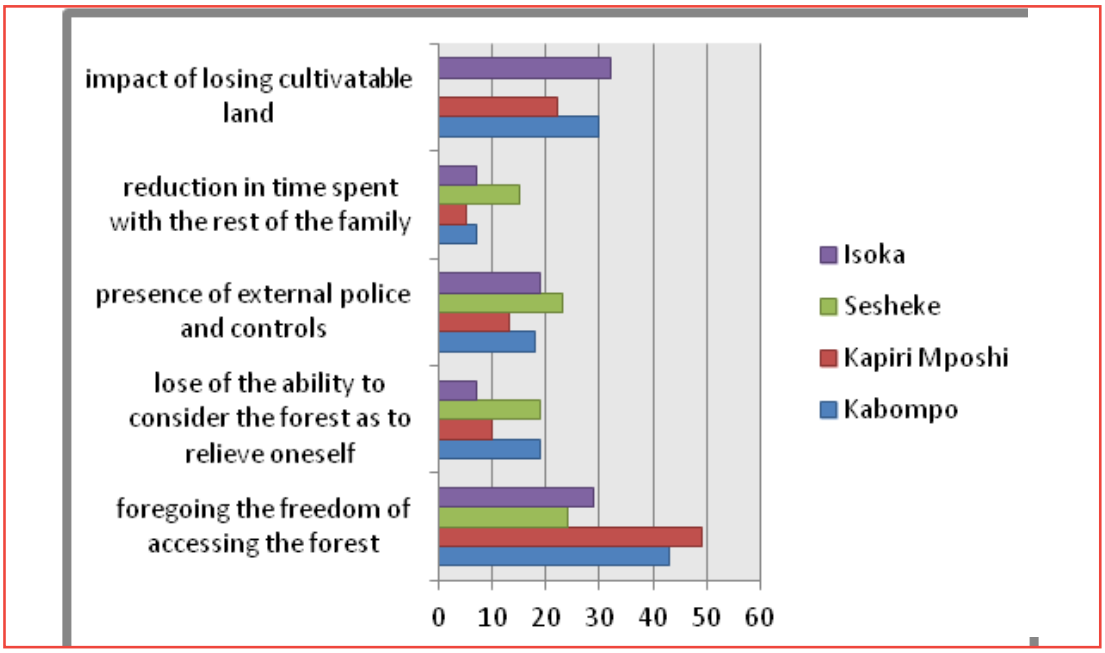
5.4.1 Non Market-Based Opportunity Costs

Informants identified the following impacts on the community emanating from the perceived restrictions on the use of the forests once REDD+ interventions are implemented: foregoing the freedom of accessing the forest (35%), impact of losing cultivatable land (22.6%), presence of external police and controls (18.8%), loss of the ability to consider the forest for relieving oneself (13.8%), and reduction in the time spent with the rest of the family (9.2%).

The figure below shows the impacts of not using forests on a per district basis. The greatest impact of losing acess to the forest is recorded in Kapiri Mposhi (48%). The impact of losing cultivable land ranks highest in Isoka followed by Kabompo.

Figure 14: Impacts on the Community for not Using Forests (per District Basis)

Source: Socio-economic Survey of this study



5.4.2 Market-Based Opportunity Costs

As undesirable as deforestation and forest degradation may be, people engage in environmentally unsustainable economic activities through both tradition and the need to satisfy their socio-economic needs often with no knowledge that their daily activities and way of life might be threatening the preservation of forests, the enhancement of carbon stocks and in time their own survival. Thus, the economic analysis of REDD+ primarily focuses on highlighting the foregone benefits from alternative land uses with a view to, inter alia, determining fair compensation.

Generally, the study identified six land and forest uses: agriculture (permanent), small-scale agriculture (shifting cultivation), timber extraction, charcoal burning, firewood use and animal grazing.

Out of these six, four were prioritised and these include expansion of permanent and small-scale agriculture (shifting cultivation), unsustainable timber extraction and charcoal production. However, unsustainable timber extraction has not been included in opportunity cost calculations because only one timber producer provided the necessary data[22].

Determination of carbon stocks and calculation of Net Present Values (NPVs) for land uses including natural forest use, preceded the actual computation of the opportunity costs of avoiding the convertion of a hectare of natural forest to each of the selected alternative land uses.

The carbon stocks (biomass and soil) for land uses that were considered for opportunity cost analysis range from 25 tC/ha to 80 tC/ha. As detailed in the table below, the carbon stocks for natural forest use is 80 tC/ha, and low intensity charcoal use and high intensity charcoal use are 50 tC/ha and 30 tC/ha respectively. Under expansion of commercial agriculture (soybean) and small scale agriculture (shifting cultivation) the carbon stock is the same at 25 tC/ha.

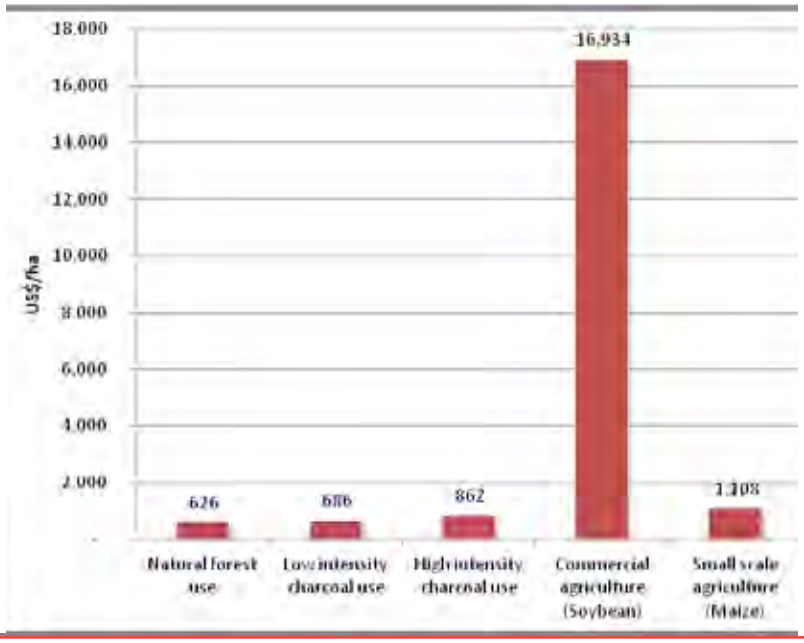
Table 30: Carbon Stocks for Land Uses
Source: Socio-economic Survey of this Study

Land Uses	Details	Carbon stock (Biomass and soil) tC/ha
Natural forest use	High density forest >80% forest cover	80
Low intensity charcoal use	Medium density forest; 20-80% forest cover	50
High intensity charcoal use	Low density forest; 10-20% forest cover	30
Commercial agriculture (Soybean)	Commercial agriculture	25
Small scale agriculture (Maize/Charcoal)	Small scale agriculture and charcoal in year one	25

In the calculation of Net Present Values (NPVs), a 10% discount rate over a 30-year period was applied. A 7% inflation rate was also factored into the computations. The NPVs for natural forest use, low intensity charcoal use, high intensity charcoal use, expansion of commercial agriculture and small scale agriculture are 626 US$/ha, 686 US$/ha, 862 US$/ha, 16, 934 US$/ha and 1, 108 US$/ha respectively (see the figure below for details).

22 As already noted in the report, there was only one timber producer who participated in the study due to the ban on timber extraction that the government imposed when the study was underway. Therefore, the submission of one producer cannot be generalised.

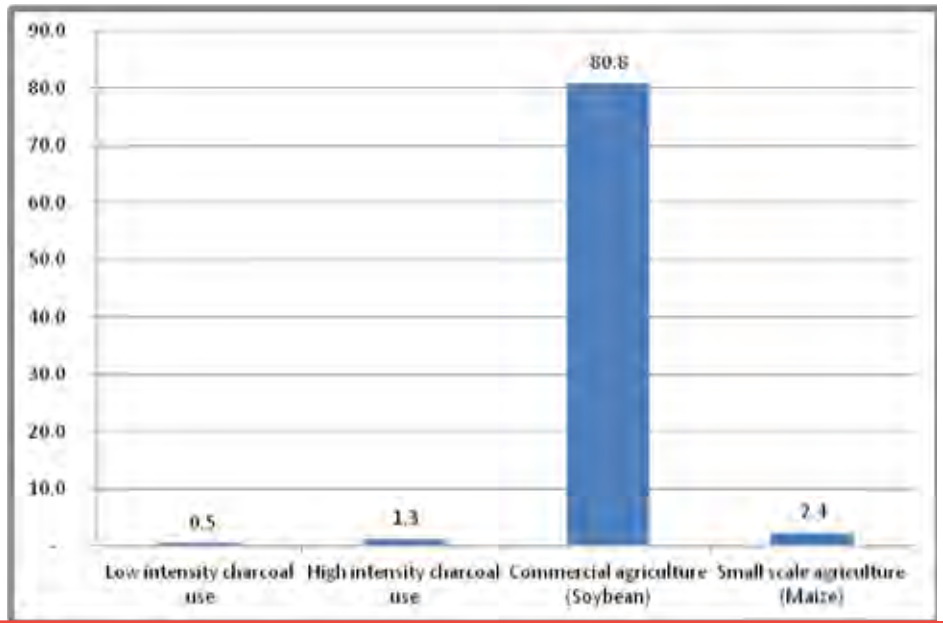
Figure 15: NPVs of Land Uses



Source: Socio-economic Survey of this study

Taking into account the aforementioned carbon stocks under the selected land uses and the economic data that was collected during the study, which also includes data from the Ministry of Agriculture and Cooperatives, the opportunity costs were computed and the figure below presents a summary of findings for avoiding the conversion of a hectare of natural forest to the selected alternative land uses, i.e. expansion of commercial agriculture (soybeans)[23], small scale agriculture (maize)[24], and low and high intensity charcoal use.

Figure 16: Opportunity Costs of Natural Forest Conversion to Alternative Land Uses (USD/tCO_2)



Source: Socio-economic Survey of this study

23 Soybean is the main crop of choice for most commercial farmers due to its high profitability that it has.

24 Maize is the staple food in Zambia and as such it was selected as the crop of choice for the purpose of calculating opportunity costs for small-scale agriculture, which occupies over 80% of Zambians who survive on subsistence agriculture.

From the above figure, it can be deduced that the opportunity cost of avoiding conversion of a hectare of a high density forest to commercial agricultural use (soybean) is US$80.8/$tCO_2$ while that of small-scale agriculture (maize) is US$2.4/$tCO_2$. The opportunity costs for conversion due to low and high intensity charcoal use are US$0.5/$tCO_2$ and US$1.3/$tCO_2$ respectively. Apart from commercial agriculture whose opportunity costs are high, expansion of small scale agriculture and unsustainable charcoal production are relatively low.

Comparatively, the average opportunity cost estimate for the Africa region is US$2.22/$tCO_2$ eq. In a study of 29 opportunity cost estimates, Boucher (2008) established that most of the values were relatively low, the mean standing at US$2.51/$tCO_2$ eq. Notably, 18 of the 29 estimates were less than US$2/$tCO_2$ eq. while the overall range was from less than zero to US$13.34/$tCO_2$ eq. Of all the 29 case studies, only one was above US$10/$tCO_2$ eq.

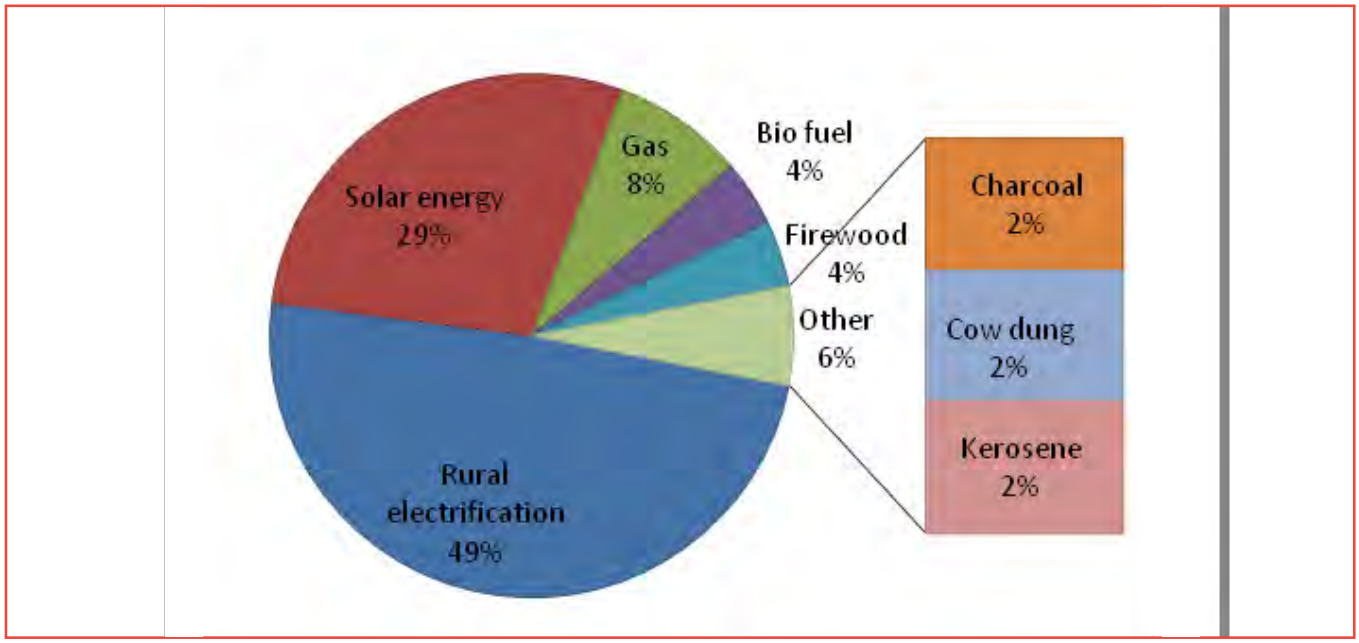
5.5 Alternative Livelihood Options under REDD+

Key informants suggested a wide range of alternative livelihood options, which included the following: Sustainable Conservation Oriented Enterprises (SCOEs) like bee keeping, diversified agriculture activities (fish farming, gardening, poultry farming, and dairy farming), retail business and conservation farming. Suggestions for the success of alternative livelihood options included the following:

- Increasing the provision of fertilizer to small scale farmers;
- Provision of credit facilities to small scale farmers;
- Reducing electricity tariffs in rural areas; and
- Subsidising the price of solar energy equipment.

Suggestions for alternative sources of energy included rural electrification (49.0% of respondents), solar energy (28.6%), gas (8.2%), firewood (4.1%), bio fuel (4.1%), charcoal (2.0%), cow dung (2.0%), and kerosene (2.0%) (see figure below).

Figure 17: Alternative Energy Sources



Source: Socio-economic Survey of this study

6. CONCLUSIONS

6.1 Drivers of Deforestation and Forest Degradation

The parallel study on drivers of deforestation has established that timber exploitation, subsistence agricultural expansion (permanent and shifting cultivation) and charcoal burning were the most critical drivers in all five districts put together. The underlying causes are multiple, but the most important ones can be grouped into the following:

Economic
The main economic reasons are high unemployment rates in all districts[25] and increased demand for forest-based products such as charcoal and timber for construction. Apart from local demands for products, there is an exponential increase in international demand epecially in the border towns of Zambia, namely Sesheke and Nakonde districts.

Demographic
The study has established, from secondary data sources, that there was an increase in provincial populations between the 2000 and 2010 inter-census periods. This has in turn put increased pressure on the forests. especially since more than 90% of the land in Zambia is under customary tenure. Under customary condition, settlers are fully aware that the land does not permanently belong to them and they therefore maximise their use of it.

Policy and Institutional Causes
The main policy and institutional causes are related to the weak implementation of forestry laws in the country, and inadequate funding going into the forestry sector. Informants noted that the number of forestry officers in all the districts was far too small to effectively control the indiscriminate cutting down of trees.

6.2 Constraints and Prospects for REDD+ Implementation

6.2.1 Constraints to REDD+ Implementation

Policy Level
(a) Weak governance structures and inability to harmonize fragmented pieces of legislation in the environmental sector may remain the biggest constraint to the successful implementation of REDD+ interventions, which require strong transparency and accountability for equity.

(b) Stagnant or declining socio-economic conditions can negatively impact the REDD+ resource base.

Operational Level
(a) Capacity limitations arising out of individual, organisational and institutional weaknesses that REDD+ may not be able to address directly e.g. education levels, HIV/AIDS and corruption, enforcement of laws and controlling drivers of deforestation and implementing an effective MRV.

(b) Inadequate stakeholder engagement and participation.

(c) The limited capacity of smallholder farmers to adapt to climate change will continue to put pressure on forest resources for livelihoods as the only alternative to subsistence agriculture.

25 District level unemployment must be understood in the context of the provincial data.

6.2.2 Prospects for REDD+ Implementation

Policy Level
(a) Targeting key causes and processes that alter forests and determine acceptable levels of deforestation needed for socio-economic development. In addition to this is an understanding on the underlying and proximate causes driving change in forest cover.

(b) Lesson learning, especially regarding the legal framework that can inevitably be used to amend or enact new laws.

Operational Level
(a) Cooperation between various levels and multi-actors (new partnership arrangements) of forest/national resource management, including resource mobilisation beyond REDD+ implementation.

6.3 Opportunity Costs and Prospects for REDD+

(a) The opportunity costs for REDD+ implementation in regions where there is commercial agriculture with high value crops like soybeans were greater. Out of the study districts, Kapiri Mposhi has more commercial farmers than others.

(b) The opportunity costs for REDD+ implementation in regions with small-scale agriculture and charcoal production as the main drivers of deforestation are lwo, and therefore potentially ideal sites for the piloting of REDD+ projects due to the low opportunity costs. When the five study districts are considered, Kapiri Mposhi, Isoka and Nakonde ranked highest in charcoal production. Small-scale agriculture was dominant in all the districts and it remains a very important economic activity among households.

A comparison of findings from Zambia with selected neighbouring countries reveals that the estimated opportunity costs are generally low. In the Democratic Republic of Congo (DRC), the opportunity costs for avoiding smallholder agriculture are estimated to be in the range of US$4.8/$tCO_2$ to US$5.0/$tCO_2$ (Simula M, 2010).

In the Tanzania studies, it was established that the opportunity costs for agriculture, fuel wood production, unsustainable timber exploitation and pasture expansion were between US$-7.8/$tCO_2$ and US$28.8/$tCO_2$ (Merger et al, 2012). These estimates were project-specific and the mean opportunity costs for the three projects ranged between US$10.1/$tCO_2$ and US$12.5/$tCO_2$ (ibid.) In an earlier 2011 study in 53 districts, the opportunity costs for avoiding charcoal and agriculture expansion were between US$1.90/$tCO_2$ and US$13.40/$tCO_2$ with a median of US$3.90/$tCO_2$ (ibid.). From the case for Tanzania, the high variability of opportunity costs for various districts in Zambia may exist, but these estimates could only be made once land use change matrices are compiled for Zambia including the total economic value of natural forests. This would also require more detailed economic studies in all the potential districts.

Further, it must be noted that opportunity costs are the key component of abatement (or mitigation) costs which include all the costs of activities needed to achieve emission reduction. According to Gregersen *et al.* (2010), in a well-functioning market economy opportunity cost can provide an indicator of the minimum amount to be paid to forest owners or users to ensure the forests are not used for purposes based solely on economic factors. In the case of REDD+ the additional non-leakage criteria may also be met (ibid.).

7. RECOMMENDATIONS

(a) There is need to identify specific priority REDD+ project areas and pilot project sites. This will further permit detailed analyses on the economics of REDD+.

(b) GRZ will need to commission a detailed economic study on selected livelihood options that will be advanced during the pilot implementation of the national REDD+ programme. This study will help to determine levels of investment that will be required for the successful promotion of such options, including support for local communities. Further, a detailed study on livelihood options is helpful in the determination of trade-offs between benefits (profitability) from forest products and those from REDD+ programme actions (interventions/options).

(c) GRZ must commission a rapid REDD+ multi-level stakeholder mapping exercise, and immediately after that, a national consultative forum may be convened as part of the environmental scanning, visioning and clear strategy development, which must feed into the national REDD+ programme strategy document. This will be essential for initial REDD+ readiness in Zambia. This recommendation is based on the apparent lack of understanding among key players of what REDD+ constitutes. This can be deduced from the challenges in information provision that were encountered during the economic survey.

(d) As part of REDD+ readiness, there must be another detailed study on the economic benefits of forests. Notably, the success of a REDD+ programme is partly embedded in incentivising environmental protection, which includes maintaining natural forests in Zambia. From the economics standpoint of REDD+, the question that must be addressed at every stage of REDD+ readiness has to do with the foregone socio-economic benefits to households and local economies. On this account, the strategy must clearly show the multiple socio-economic and environmental benefits that accrue under REDD+.

(e) There is need to commission additional economic related REDD+ work for the purposes of producing national opportunity costs for REDD+. Detailed land use change matrices at sub-national and national levels will be required including the total economic value of forests in Zambia. Once all the detailed data is generated, the REDD Abacus software can be used to produce opportunity cost curves.

BIBLIOGRAPHY

Adam, P. 2006. *Country Environmental Profile Zambia*. Lusaka, Zambia: Report for the European Commission.

Adams, M. 2003. *Land Tenure Policy and Practice in Zambia: Issues Relating to the Development of the Agriculture Sector.* Oxford: Moroko Ltd.

African Economic Outlook. 2011. *Economic Outlook for Africa*. www.africaneconomicoutlook.org/en/countries/sothern-africa/zambia/youth.

Aongola, L., Bass, S., Chileshe, J., Daka, J., Dalal-Clayton, B., Liayo, I., & Sichilongo, M. 2009. *Creating and protecting Zambia's Wealth Experience and Next Steps in Environmental Mainstreaming*. International Institute for Environment and Development, UK.

Bank of Zambia. 2011. *Annual Report*. Lusaka: Bank of Zambia.

Bond, I., Grieg-Gran, M., Wertz-Kanounnikof, S., Hazlewood, P., Wunder, S., & Angelsen, A. 2009. *Incentives to Sustain Forest Ecosystem Services: A Review and Lessons fro REDD.* London, UK; Washington D.C., USA: International Institute for Environment and Development, CIFOR and World Resources Institute.

Boucher, D. 2008. *What REDD Can Do: The Economics and Development of Reducing Emissions from Deforestation and Forest Degradation*. Washington D.C., USA: Tropical Forest and Climate Initiative - Union of Concerned Scientists.

Campbell, D., Michael, F., Mike, M., Mwanza, H., & Sieber, S. 2010. *Zambia Environmental Threats and Opportunities Profile*. Lusaka: USAID.

Central Statistical Office (CSO), Ministry of Health (MoH), Tropical Diseases Research Centre (TDRC), University of Zambia, and Macro International Inc. 2009. *Zambia Demographic and Health Survey 2007*. Calverton, Maryland, USA: CSO & Macro International Inc.

Central Statistical Office. 2010. *Living Conditions Monitoring Survey 2006 and 2010*. Lusaka, Zambia: GRZ.

Chidumayo, N. E. 2001. *Charcoal Potential in Southern Africa*. Lusaka, Zambia: Funded by European Union (INCO-DC).

Chomba, B. T. 2012. *Forest Co-Benefits other than Carbon from REDD+ Implementation In Zambia. A Consultancy Report Prepared for the Forestry Department and the Food and Agriculture Organization of the United Nations*. Lusaka, Zambia: Ministry of Lands, Natural Resources and Environmental Protection.

Foster, V., & Dominguez, C. 2010. *Zambia's Infrastructure: A Continental Perspective*. Washington D.C. 20433 USA: African Infrastructure Country Diagnostic (AICD), The International Bank for Reconstruction and Development/The World Bank.

Gregerse, H. E. 2010. *Does the Opportunity Cost Approach Indicate the Real Cost of REDD+?: Rights and Realities of Paying for REDD+*. Washington D.C., USA: Rights and Resources Initiative.

GRZ. 2011. *National Health Strategic Plan 2011 - 2015*. Lusaka, Zambia: Ministry of Health.

GRZ/FAO/NFP Facility. 2011. *Forests and Climate Change: Integrating Climate Change Issues into National Forest Programmes and Policy Frameworks Backgroun Paper for the National Workshop*. Lusaka: GRZ.

Hoang. 2010. *An Assessment of opportunities for reducing emissions from all land uses - Vietnam preparing for REDD. Final Report*. Nairobi, Kenya: ASB Partnership for the Tropical Forest Margins.

International Development Law Organisation (IDLO). 2011. *Legal Preparedness for REDD+ in Zambia*. Lusaka, Zambia: FAO.

International Organization for Migration. n.d.. *Briefing Note on HIV and Labour Migration in Zambia*. Lusaka, Zambia: International Organisation for Migration.

Kalinda, K., Bwalya, S., Mulolwa, A., & Haantuba. 2008. *Use ILUA Data for Environmental and Agricultural Policy Review and Analysis in Zambia*. Lusaka, Zambia: Forestry Department (GRZ) and FAO.

Keyser, J. C. 2007. *Zambia Competitiveness Report*. Washington DC: World Bank, Africa Region.

Merger, E., Held, C., Tennigkeit, T., & Blomley, T. 2012. *A Bottom-Up Approach to Estimating the Cost of Elements of REDD+ Pilot Projects in Tanzania*.

MTENR. 2007. *National Policy on Environment*. Lusaka: Ministry of Tourism Environment and Natural Resources, GRZ.

Mudenda, M. M. 2008. *Climate Change in Zambia: Ignore, Mitigate or Adapt?* Lusaka, Zambia.

Mudenda, M. M. n.d. *An Integrated Approach to Rural Planning and Development in Lusaka, Zambia*.

Mulenga, B., Richardson, R., Mapemba, L., & Tembo, G. 2011. *Contribution of Non-Timber Forest Products to Rural Household Income in Zambia*. Lusaka: Policy Synthesis Food Security Research Project, Ministry of Agriculture and Cooperatives, Agriculture Consultative Forum.

Mwitwa, J., & Makano, A. 2012. *Charcoal Production, Demand and Supply in Eastern Province and Peri-urban Areas of Lusaka*. Lusaka: USAID.

Neubert, S., Komm, M., Krumsiek, A., Schulte, A., Tatge, N., & Zeppenfeld, L. 2011. *Agricultural development in a changing climate in Zambia: Increasing Resilience to Climate Change and Economic Shocks in Crop Production*. Deutsches Institut fur Entwicklungspolitik gGmbH.

Njovu, F. n.d.. *Forests Certification in Zambia.* Kitwe, Zambia: Copperbelt University.

Olsen, N., & Bishop, J. 2009. *The Financial Costs of REDD: Evidence from Brazil and Indonesia*. Switzerland: IUCN.

Pagiola, S., & Bosquet, B. 2009. *Estimating the costs of REDD at the country level, Version 2.2,*. Forestry Carbon Partnership Facility, World Bank.

Sichilongo, M., Mulozi, P., Mbewe, B., Machala, C., & Jean-Michel, P. 2012. *Zambia Wildlife Sector Policy: Situation Analysis and Recommendations for a Future Policy*. Lusaka: World Bank.

Sooka, M. n.d. *Energy Statistics: The Case of Zambia.* Lusaka, Zambia.

UNDP. 2011. *Millennium Development Goals Status Report*. Lusaka, Zambia: UNDP.

UNDP. 2011. *Zambia Human Development Report 2011*. Lusaka, Zambia: UNDP.

UNHCR. 2011. *UNHCR*. Retrieved from UNHCR: www.unhcr.org/pages/49e485ba6.html

University of Gothenburg. 2010. *Zambia Environmental and Climate Change Policy Brief*. Lusaka, Zambia: Prepared for SIDA.

UN-REDD Programme (Vietnam). 2001. *Final Report: Analysis of Opportunity Cost for REDD+*. Vietnam: UN-REDD Programme, Vietnam.

UN-REDD. n.d. *UN-REDD National Programme Document for Zambia*. Lusaka, Zambia: UN-REDD Programme (Zambia).

USAID. n.d.. *Water and Sanitation Profile*. Lusaka, Zambia: USAID.

Wertz-Kanounniko, S. 2008. *Estimating the costs of reducing forest emissions: a review of methods*, Working paper no. 42. Bogor, Indonesia: Centre for International Forestry Research (CIFOR).

World Agroforestry Centre. n.d.. *Abatement cost curves relating past greenhouse gas emissions to the economic gains they allowed*. World Agroforestry Centre.

World Bank Institute. 2011. *Estimating the opportunity costs of REDD+: A training manual*, Version 1.3. Washington D.C., USA: World Bank Institute.

World Bank. n.d. *Zambia Economic Brief: Recent Economic Developments and the State of Basic Human Opportunities for Children*. 19 December 2012. Retrieved from World Bank: www.worldbank.org/en/news/2012/12/19/zambia-economic-brief-recent-economic-developments-and-the-state-of-basic-human-opportunities-for-children

UN-REDD
PROGRAMME

Mr Ignatius Makumba
Director of Forestry
Ministry of Lands Natural Resources
and Environmental Protection
Forestry Department
P.O. Box 50042
Lusaka, ZAMBIA
Tel. +260 211 221087
inmakumba@yahoo.com

Dr Julian C. Fox
UN-REDD MRV
Facilitator for Zambia
FAO, P.O. Box 30563
Lusaka, ZAMBIA
Tel: +260 211 252277/252558
julian.fox@fao.org

Mr Deuteronomy Kasaro
National REDD+ Coordinator
Ministry of Lands Natural Resources
and Environmental Protection
Forestry Department
P.O. Box 50042
Lusaka, ZAMBIA
Tel. +260 211 221087
deutkas@yahoo.co.uk

Mr Philippe Crete
UN-REDD MRV
Africa
FAO HQ
Rome, ITALY
Tel: +39 0657053302
philippe.crete@fao.org

FAO Representation in Zambia

FAO Representation
Hse 5 Addis Ababa Drive
Ridgeway, Lusaka

Tel: +260-211-252277
Fax: +260-211-254173

un-redd@un-redd.org
www.un-redd.org