



IMPACTS OF CUTTING OF NATURAL FORESTS IN THE ETAYI CONSTITUENCY IN
THE OMUSATI REGION, NORTHERN NAMIBIA

BY

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DECLARATION

I, **Lahya Magano Namulongelo Shivolo**, hereby declare that, “Impacts of cutting of natural forests in the Etayi constituency in the Omusati region, Northern Namibia” is my own original work and has not previously been submitted at any university for an award. Where the work of other authors has been used, it has been recognised and referenced.

Signed:..... Date:

ABSTRACT

Forests are being depleted and the land becoming bare, with little to no vegetation in the Etayi constituency and in Namibia at large. People rely on the resources of forests for different reasons. Areas that had trees years back have turned into a desert-like environment due to deforestation. The purpose of this study was to examine the impact that the cutting of natural forests has had in the Etayi constituency in the Omusati Region, Namibia. This examination has become necessary because forests in the Omusati region have undergone a rapid depletion over the past years. However, it should be noted that these environmentally degrading activities have contributed to the household income in the form of employment to the indigenous people. Forests has an important role to play in terms of the conservation of biodiversity. They also harbour unique and endemic species that are mainly adapted to extreme ecological conditions. They provide vital benefit to the ecosystem, such as wood for fuel, medicine, fodder for animals and tradable goods, like furniture. Furthermore, forests provide the soil with nutrients and reduce wind velocity, thus controlling wind erosion and the retardation of water and moisture depletion. With increasingly uncertain climatic conditions and their related impact across the continent at large, there is a need for new approaches towards the management of indigenous forests that support and promote land-users' resilience to climatic variability and change. The role of forests in climate change mitigation is important as it sustains the ecosystem.

The maintenance of ecological systems has been acknowledged as one of the most important facets of sustainable development. Subsequently, the involvement of several international and local policies and regulations has been established to ensure that natural resources, such as forests, are sustainably utilised. In rural areas/villages, overdependence on wood for fuel has been identified as one of the biggest threats to the forests. This has led to environmental degradation that includes, among others, deforestation, desertification, the extinction of species and soil erosion.

Based on the many issues caused by the over-reliance on wood for fuel, this research sought to investigate the impact of the over-exploitation of natural forests in the environment. Ninety-seven (97) respondents, comprising of 51 females and 46 males, were used in this study. Four (4) villages in the Etayi Constituency were chosen for the study. The study employed a qualitative and quantitative approach, which included the following methods of data collection: questionnaires, observation and interviews with respondents in the Etayi community. A quantitative method enabled the researcher to ask questions such as how many and how often? It helped the researcher further to plot the responses into graphs and diagrams. Government representatives from the Constituency

Council and Ministry of Agriculture, Water and Forestry and Traditional Authorities in the four villages were interviewed.

The study identified key threats to the forests as a result of high fuelwood collection. These threats include high levels of poverty, overdependence on the forests, a lack of understanding about the importance of forests for the environment, little or a lack of information regarding other alternative sources of energy and the lack of coordination in the management of fuelwood resources. Apart from fuelwood being used as a source of energy for cooking and lighting, the exploitation of local fuelwood has become commercialised to supplement household income. Since there is a lack of coordination in the management of natural resources, fuelwood resources are not being managed at all.

A main argument identified by this study is that forest management must be a combined approach by all stakeholders. The roles of traditional leaders in forest management should be made public. The lack of an awareness campaign on the importance of forests, a lack of management coordination as well as poverty, makes it difficult for the forests policies to be implemented and for the traditional authorities to manage the forests efficiently.

The study recommends that educational programmes, proper coordination between key stakeholders and awareness campaigns regarding the environmental importance of forests to residents would alleviate deforestation and over-exploitation of forests resources. Additionally, an emphasis on the relationship between traditional and local governance in the management of forests as sources of fuelwood and the physical environment should receive attention.

Keywords: Deforestation, Energy, Environment, Fuelwood, Overpopulation, Poverty.

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BIOGRAPHICAL SKETCH

Lahya Magano Namulongelo Shivolo was born in a small village known as Uukwangula, in the Oshana Region in Namibia, on 17 March 1976. She attended primary school at Ekamba, and matriculated at the Gabriel Taapopi Senior Secondary School in 1995. She then enrolled at the Windhoek College of Education (WCE) and obtained a Basic Teaching Diploma in Science and Social Science in 1999, majoring in Geography. She has been teaching Geography at Onampira Combined School from 1999 to date. While teaching, she furthered her studies at the North-West University where she obtained a Diploma in Educational Management in 2003, followed by a B.Ed. Hons. Degree at the same university in 2009. In 2012, she enrolled with the University of South Africa (UNISA) where she obtained a BSc Hons degree in Environmental Management in 2014. During the same time, she obtained a Certificate in Environmental Education from the Polytechnic of Namibia.

DEDICATION

This dissertation is dedicated to my daughter, Aishe, for her prayers and encouragements.

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LIST OF ACRONYMS AND ABBREVIATIONS

CBNRM	Community-Based Natural Resources Management
CBS	Central Bureau of Statistics
CFCs	Chlorofluorocarbons
ETA	Etayi
ESMA	Energy Sector Management Assistance
FAO	Food & Agriculture Organisation
GHGs	Greenhouse Gases
GAO	Government Accountability Office
IIPA	Iipanda yaamiti
MAWF	Ministry of Agriculture, Water and Forestry
MET	Ministry of Environment and Tourism
MME	Ministry of Mines and Energy
NDP	National Development Plan
NPC	National Planning Commission
NSA	National Statistics Agency
ONA	Onampira
ORC	Outapi Regional Council
OSHI	Oshipya
SME	Small and Medium Enterprises
SPSS	Statistical Package for Social Science
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
USAID	United Agency for International Development

CLASSIFICATION OF TERMS

Biodiversity: The diversity of Earth's plants and animals or different life forms, deoxyribonucleic acid they contain, the type of ecosystems in which they live and the ecosystem processes of energy flow and nutrient cycling that sustain all life (Sguazzin *et al.*, 1996).

Bio-energy: Energy derived from organic materials such as fuelwood, sugarcane, charcoal, bagasse, maize, livestock manure, algae, biogas, and the like (FAO, 2007).

Biomass: Material of organic source, excluding that which is entrenched in geological developments and changed into fossil (FAO, 2007).

Conservation: Describes the process of managing natural resources so that they are not degraded or destroyed but used in a sustainable way (Sguazzin *et al.*, 1996).

Deforestation: The removal of trees from an area in such numbers that new growth cannot replace them (Sguazzin *et al.*, 1996).

Desertification: Describes the process whereby the land loss plant life due to loss of soil fertility and structure that enable the land to sustain it (Idiata *et al.*, 2013).

Drought: A period of more than two years where the rainfall has been lower than the long-term means (average) of an area (Sguazzin, *et al.*, 1996).

Ecology: The branch of science concerned with the interrelationship of organisms and their environment (Micheals, 2013).

Ecotourism: Responsible tourism based on the appreciation of natural resources, such as wild life, plants and scenery (Sguazzin, *et al.*, 1996).

Energy: Is the capacity of power required to do work (Stephen, 2013)

Evapotranspiration: Is the process whereby water is lost from the land to the atmosphere through evaporation from soil and transpiration from plants (Stanhill, 2005).

Environmental education: The process of becoming informed about the environment (Sguazzin *et al.*, 1995).

Environmental legislation: A set of laws that protect the environment from abuse by people or companies (Sguazzin *et al.*, 1995).

Fuelwood: Wood used for fuel in which the original conformation of the wood is conserved (FAO, 2007).

Global warming: Global warming is the gradual increase of the earth 's temperature caused by the effect of greenhouse gases in the atmosphere (Beer, 2015).

Non-renewable: Are recourses that can be easily replaced through natural processes once they have been used up (Stephen, 2013).

Renewable resources: Energy obtained from continuous or repetitive currents recurring in the natural environment (Twidell & Weir, 2015).

Urbanisation: Is when people move from rural areas to towns or cities (Sguazzin *et al.*, 1995).

CHAPTER LAYOUT

The research was conducted in the Etayi constituency in Omusati region in Namibia. The focus of the research was to oversee the impact of cutting of natural forests from the environment. The research work consists of 7 chapters, which are outlined as follows;

Chapter 1 - Introduction: This chapter presents the environment of the study area such as the climate and vegetation, soil structure and type. The background of the research problem, research questions, aim and objectives of the research, significance of the study and delineation of the study is also presented in this chapter.

Chapter 2 – Literature Review: This chapter covers the literature review that provides an in-depth overview of the impact of the cutting down of natural forests. This chapter also delivers an overview of what contributes to the cutting down of natural forests and its effects.

Chapter 3 – Research Design and Methodology. This chapter provides a full description of the methodology used in the study for data collection and analysis.

Chapter 4 – Research Findings and Results: This chapter presents results of data collected from all stakeholders (community members from four villages, four headmen, constituency councillor and an official from the Ministry of Agriculture and Forestry). Thus, data were analysed and arranged in patterns and categories.

Chapter 5 – Discussion: This chapter deals with a discussion of the findings and results.

Chapter 6 – Conclusions and Recommendations: This chapter presents the conclusions and recommendations of the study as well as future research.

Chapter 7- References: This chapter provides supporting materials and documents consulted during the research.

CHAPTER 1

INTRODUCTION

1.1. Background to the Research Problem

In lieu of both the products and services they provide, forests are important components of our landscape and life-support systems. Forests are widely recognised as sources of various services and goods (FAO, 2011). They bind the soil together, protect it from erosion and maintain the rate of evapo-transpiration (Ekhuemelo *et al.*, 2014). Forests provide people with food, shelter and warmth. They also absorb carbon dioxide (from natural and anthropogenic sources) from the atmosphere and release oxygen that people and other organisms need to sustain life (Goodman & Herold, 2014; UN, 2014). Natural forests contain rich biodiversity (variety of flora and fauna) and serve as the main backbone of the tourism industries. They support irreplaceable ecological purposes, such as water and soil protection. It can be concluded that forests contribute to the livelihoods of rural people and to the socio-economic stability of a country (FAO, 2011).

About 42 million km² of tropical and boreal lands are covered by the forests (Ali *et al.*, 2014; Bonan, 2008). People are provided with social, ecological, and aesthetic benefits by natural forests systems. They (forests) protect the soil from wind erosion and act as a centre of biodiversity. Forests supply food and it have a medicinal value which help in the balancing of the hydrological cycle (Ali *et al.*, 2014).

Additionally, forests save about 45% of terrestrial carbon, and can sequester large quantities of carbon. Forests have a low floor albedo, can mask the high albedo of snow and assist regulate the surface temperature of the earth. Forests play a key role to regulate the hydrologic cycle through evapotranspiration and can be used as an advantageous tool to mitigate weather change (Bonan, 2008). Climate change model imitations exhibit that tropical forests hold excessive charges of evapotranspiration and increase precipitation, which help in the reduction of floor air temperature, the extreme emission amount of carbon dioxide with soil degradation and an increased floor run off at some points of flash floods (Ali *et al.*, 2014).

Removal of the forest cowls thus alters world and local climate patterns, and leads to catastrophic rainfall spells followed by lengthy drought periods (Bonan, 2008; Ali *et al.*, 2014).

In Namibia, endemic and business forests are necessary for the economic, environmental and socio-cultural well-being of the population because forests supply wood and non-wood merchandise and services. It is accepted that the economic, social and natural prosperity of the Namibian population is likely to be connected with the health of forests and their sustainability to give numerous advantages to current and the future generation (Mendelsohn, 2008).

Forests often play an important role in many people's cultural values and beliefs. They are also very important symbols in some people's social lives. The tree of knowledge, the family tree and the gallows tree are a few examples. Trees often feature in our sayings and proverbs. In Namibia's Herero and Owambo cultures, it is believed that the *Omumboromonga* tree (*Combretume imberbe* - leadwood) is the tree from which the first people, sheep, cattle and wild animals originated. There is a custom of greeting the tree and asking for its blessing for a journey. Furthermore, in some areas, people water trees as a sign of an offering (Du Toit & Sguazzin, 1995).

Trees and energy are closely connected, particularly in a water scarce and arid country like Namibia, where wood is regularly used as fuel for cooking, lighting and heating. In most developing countries firewood is the main source of domestic energy and accounts for 43% of the total energy consumed (Du Toit & Sguazzin, 1995). In the rural areas of Namibia, the high dependence on wood for fuel and easy access to forests have led to the deterioration of the forests' eco-system (FAO, 2015). Although forest depletion has been attributed to over-reliance on fuelwood only, there are other contributing factors to the depletion of the forests. Some of these are poverty, land tenure, lack of education, traditional and religious beliefs, as well as authority practices dating from the colonial administration (Ntsebeza, 1999). Subsequently, efforts to address the depletion of forests have emphasised the identification of alternatives to fuelwood, the devolution of management decisions and coordination between traditional leadership and local governance (Daweas, et al., 2010).

Thus, there is an increasing demand for fuelwood due to an increasing population. Therefore, there is a need to manage the forests more carefully if they are to continue to support people's livelihood. Therefore, the purpose of this study is to investigate the impact that the cutting down of natural forests poses to the environment.

Omusati is located in central, northern Namibia (Ovamboland) and covers an area of 26 551 km². Omusati shares borders with Angola in the north and three other regions, namely Oshana in the east, Kunene in the south and Ohangwena in the northeast. The region has an estimated population of 243 166, with a population density of 9.1 person per km. The regional population has increased by 6.14% in the last ten years (NSA, 2012).

Thus, Omusati has shifted from the third to the second-most highly populated region in the country. It is principally composed of rural areas with only 5, 7% of its population living in urban areas and 94, 3% live in urban areas (NSA, 2012).

The Omusati region is divided into 12 political constituencies, namely Oshikuku, Etayi, Ogongo, Otamazi, Okahao, Onesi, Ruacana, Outapi, Elim, Okalongo, Tsandi and Anamulenge (Figure 1.1). Outapi is the capital city of the Omusati region in terms of municipal, health, traditional and local government services. Outapi is located 90 km northwest of Oshakati, on the Oshakati-Ruacana (C46) main road (ORC, 2012).

1.2.1. Climate and Vegetation

The climate of the northern part of Namibia varies where rainfall and temperature have the greatest influence on the Namibian forests. Thus, those two climatic aspects have over the past fifty million years a fundamental influence on the nature of trees across the whole of the African continent in general and Namibia in particular (Mendelsohn & Obeid, 2005).

Namibia also experiences substantial variations in rainfall from year to year, particularly in the driest, western and southern areas where dry periods may last for several years. Thus, the average rainfall varies from approximately 650 mm in eastern Caprivi to less than 50 mm along the west coast.

During the rest of the year, the weather is dry and often hot. Often, the long dry spells limit tree growth. Trees, such as the Mopane, develop resilient characteristics to cope with arid conditions and variable access to water by retaining water in their succulent leaves, branches or stems (Mendelsohn & Obeid, 2005; Kangombe, 2010).

Additionally, trees in Namibia are commonly inadequately scattered, in small and have a slow growth rate, because of variable and low water supply (low rainfall). Temperature (heat) has the greatest effect on young plants in relation to their distribution and abundance. Tolerance to high temperature increases as plants grow and age, and temperature is thus seldom a limiting factor for big trees' growth. However, trees have to cope with seasonal and daily fluctuations in temperature, adjusting their metabolism to warm and cool conditions. Trees are influenced by two main properties of soil, namely moisture and nutrient contents. Soil in many areas of Namibia make little moisture available to trees because they are shallow or sandy (Mendelsohn & Obeid 2005; Kangombe, 2010).

The temperature of central Namibia differs greatly; it is extremely hot in summer and mild in winter. In summer, the heat is often subdued by the rains but temperature may rise above 35 °C (Kangombe, 2010). During the night in winter, the night temperature may drop to 27 °C to 28 °C (Erkkila & Siskoneen, 1992). The Oshana, which receives rainwater and surface flowing water, dries up by July at the end of the winter season. The area then experiences five months without rainfall and the lack of water regularly motives severe difficulties to rural communities, animals and plant (Cunningham *et al*, 1992).

It is projected that approximately 83% of rainwater evaporates quickly after it has fallen, while percolation level is also very high. This suggest negative water retaining capability of the soil in the vicinity and consequent discount in water reachable for plants. Seasonality of rainfall (Table 1.1) is essential riding force of organic and cultural processes in semi-arid environment. Mean month- to- month humidity ranges from 50% in March to 17% in September. This indicates the extreme impact of evapo-transpiration, consequently the quantity of water that is available for plant growth (Kangombe, 2010).

Table 1. 1: Omusati rainfall (in mm) patterns for the period 2004-2017 (Namibia Weather bureau, 2015).

Year	Jan	Feb	Mar	Apr	May	Ju	Jul	Aug	Sep	Oct	Nov	Dec
2004	96	97	28	6	-	-	-	-	-	-	16	20
2005	33	32	12	2	-	-	-	-	-	-	7	10
2006	19	12	11	-	-	-	-	-	-	-	8	5
2007	21	12	10	-	-	-	-	-	-	-	7	5

2008	218	120	73	54	-	-	-	-	-	-	-	10
2009	200	215	69	15	-	-	-	-	-	-	-	19
2010	282	87	94	23	-	-	-	-	-	7	8	27
2011	31	21	17	-	-	-	-	-	-	-	5	3
2012	41	33	8	-	-	-	-	-	-	-	12	-
2013	36	49	13	-	-	-	-	-	-	-	5	24
2014	56	115	30	8	-	-	-	-	-	19	17	15
2015	50	37	28	10	-	-	-	-	-	-	-	18
2016	118	187	76	40	10	-	-	-	-	-	18	30

The Omusati region, which receives about 350 mm to 500 mm of rainfall per annum (Table 1.1), only supports forest cover with an average of 32.6 trees per hectare and a volume of only 3.2 m³ per hectare (ORC, 2012).

There are timber trees (Table 1.2) that are found in this region, such as Mopane (*Colophospermus mopane*), that supply wood for selling, building houses, kraals and fences, as well as wood for fuelwood (energy) (Erkkila & Siiskonen, 1992; Mendelsohn, *et al.*, 2000).

Table 1.2: Common indigenous trees found in Omusati region (Mendelsohn & Obeid, 2005).

Common trees found in the Omusati region	Scientific name
Mopane	<i>Colophospermum mopane</i>
Marula	<i>Sclerocarya birrea</i>
Baobab	<i>Adansonia digitata</i>
Bird Palm	<i>Berchemia discolor</i>
Black thorn	<i>Acacia mellifera</i>
Camel thorn	<i>Acacia erioloba</i>
Makalani palm	<i>Hyphaene petersian</i>
Kiaat	<i>Pterocarpus angolensis</i>
Leadwood	<i>Combretum imberbe</i>
Silver-leaf terminalia	<i>Terminalia prunioides</i>
Anna tree	<i>Faidherbia albida</i>
Brukea	<i>Brukea Africana</i>

The mopane tree belongs to the *Caesalpinioideae*, which is a subfamily of the *Fabaceae*, which is locally abundant and may dominate the vegetation. In some areas, they grow relatively tall (up to 10 m), while in other areas, especially in the central Omusati region, mopane trees are part of shrubs, with an average height of 1 or 2 m. What determines these different growth forms is not known but the availability of water and the type of soil are likely to play a role in this discrepancy in growth (Mendelsohn & Obeid, 2005).

The Mopane trees provide many resources to rural communities and populations in and around the Omusati region. For example, goats such as Boer goats and Kudu graze trees and shrubs, whereas stems and longer branches provide poles for construction and fencing. Rope and twine can be made from the bark, which is used for tanning (Kangombe, 2010).

1.2.2. Soil

The nutrient content of most of Namibia's soil is low. A poor quality of soil is a limiting factor to the growth and productivity of different types of trees. Sandy soils are mostly low in nutrients because they consist of sand grains (quartz) and thus contain little humus. Moreover, the Kalahari sands that cover much of northern and eastern Namibia are, inherently, low in phosphorous. This is a constraint because low phosphorus levels limit the nitrogen content of the soil (Mendelsohn & Obeid, 2005).

The deep Kalahari sand is located in the eastern and western parts, whilst clay sodic sands occur on the surrounding excessive ground grounds. Sand and loam manifest generally to the south, north, east and west of Cuvelai delta, the place wind and water have continually transformed the soil to create a mixture of deposits. (Strohbach, & (Wall) Walter, 2000). Clay-type sodic is as a result of the cycle of recurring floods and water evaporation (Kangombe, 2010).

During wet (rainy) conditions in the Omusati region, soil will be formed more rapidly because of the weathering of rocks and more nutrients will be released (Mendelsohn & Obeid, 2005). Greater quantities of organic matter also become available due to an increased production of luxuriant plants and because the dead leaves and twigs are blown away or are less burnt. In certain areas of the Etayi constituency, soil is rich in sodium, with less tree growth. The salts are dissolved from the rocks by water, and then carried below the soil surface where they

crystallise, sometimes forming the well-known desert roses. Trees are also constrained by waterlogged soils, such as those on the flood plain along the Etaka River in the Omusati region. Water restricts the movement of air amongst the particles of soil, with a consequence of roots asphyxiation. These soils limit the presence of the woodiest plants. Other soils tend to be dominated by particular species that grow so well on them that they competitively exclude most other species (Mendelsohn & Obeid, 2005).

Regardless of being poor in humus and accessible plant nutrients (Erkkila & Siiskonen, 1992), the soil in Omusati region is fairly appropriate for crop cultivation relative to other soil types in different part on Namibia (Mendelsohn *et al.*, 2000).

1.2.3. Altitude

The spreading of trees is greatly affected by altitudes in many parts of Namibia. However, these effects are mostly due to other factors that are influenced by, for example. Topography. Hence, high rainfall over raised ground and hills contribute to plant growth. Many hills or raised plateaux are at high elevations because they differ geologically from the surrounding lower areas and the soil formed in higher areas, differs from that in the lower areas (Mendelson & Obeid, 2005).

1.3. Statement of the Research Problem

The historical background of man's reliance on natural forests resources for presence is as verifiable as the start of humanity. For many years, man has over-exploited forest resources for food, housing and as a means of survival. The unwanted misuse of forest resources has contributed to the destruction of biodiversity and the damage of its worth for the existence of humankind (Mmom & Mbee, 2013).

Fuelwood, for example, remains the main source of fuel for impoverished communities and dwellers worldwide. These areas are usually over-populated and the majority are overgrazed. Since fuelwood is the main source of energy, it is easily accessible and affordable by the occupants of the Etayi constituency. Recently, Namibia experienced perennial droughts during three consecutive years and both fauna and flora in this part of the country (Etayi area) have been greatly affected. Domestic animals have died and indigenous trees dried up.

It is, therefore, reasonable to believe that the current over-exploitation of natural forest resources for fuelwood is beyond the productivity of the wood vegetation in the Etayi constituency. Furthermore, the increasing degree of the harvesting of forest resources, due to the demand for fuelwood in villages and town areas, may also be the cause of the decrease in available domestic fuelwood. Changes in forest cover and the high dependence of people on natural forest resources (such as fuelwood) for their livelihood necessitate the introduction of alternative sources of energy to mitigate the consequences of the over-exploitation of forests resources. This can only be done if the actual effect on natural forests caused by the cutting of trees for fuelwood is known.

There is less information existing about the impact of the over exploitation of natural forests, as well as the relationship between the forest and the environment at large. Thus, this study will investigate the impact the loss of trees felled for fuelwood has on the natural forests, as well as to determine a sustainable practice for the conservation of the natural forests in the Etayi area and Namibia at large.

1.4. Research Questions

The following research questions were answered in this study to achieve the objectives:

- What is the impact of fuel wood's over-usage on the natural forests of the Etayi constituency?
- What roles do the local government and traditional leaders play in the conservation of the forests?
- What are possible alternative and sustainable sources of energy the community of the Etayi constituency could opt for?

1.5. Aims and Objectives of the Research

Within the framework of natural resources management and forest sustainability, this study aims to investigate the impact of the over-exploitation of indigenous forests on the environment in the Etayi constituency of the Omusati region in Northern Namibia. To achieve the main aim of the research, the following were the objectives of the study:

- To identify the impact of over-usage/reliance on fuelwood on indigenous forests;

- To investigate the role of community members and authorities in managing the exploitation of fuelwood;
- To suggest new sustainable alternative sources of energy for the community.

1.6. Significance of the Study

The study will benefit residents of the Omusati region, particularly those in the Etayi constituency, by providing information on how they can collect fuelwood sustainably. The results of the study will help lawmakers adjust and reformulate regulations that could help to approach the current state of the indigenous forests and to make the community aware of the need for the conservation of forests. Moreover, it could as well address other socio-economic difficulties among communities in rural areas, such as unemployment and poverty.

1.7. Delineation of the Study

Many rural households in Namibia depend on natural forests for fuelwood as a source of energy as well as for other uses, such as building material (NSA, 2012). This study was conducted in the Etayi constituency. This constituency was selected based on the distribution of the vegetation cover and the availability of fuelwood.

This study was limited to four selected villages (Onampira, Iipandayamiti, Etayi and Oshipya) in the Etayi constituency in the Omusati region of Namibia, where the forests have been depleted at a high rate over a large area. The constituency was mainly dominated by traditional houses with fuelwood as their main source of energy, and where traditional open cooking on fires is mostly utilised.

In the following chapter, the literature pertaining to this study will be reviewed.

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

Worldwide, approximately two (2) billion people rely on fuelwood to meet their energy needs (Momodu, 2013). Most African countries depend on fuelwood for their daily domestic energy needs. Additionally, fuelwood had a portion of between 60% and 86% of the energy ingesting in Africa, excluding South Africa (Momodu, 2013). In number of the Sub-Saharan countries, fuelwood accounts for between 80% and 90% of residential, energy consumption (Momodu, 2013).

Forests supply environmental goods and services, such as business timber and non-timber products, food and medicine, as well as a habitat to different animals and plants. They keep water catchments, work as carbon sinks and are used as famous sources of fuelwood. Forests play a vital role in agriculture as nutrition catchers, erosion protectors and rain regulators (FAO, 2015).

Forest depletion consequences soil degradation, carbon emissions due to the fact of plant decomposition left on the forest's ground and the increase of hydro-meteorological hazards. Forests cover the earth land with about 30%. Forests affect the world, climatic pattern through processes, such as climate, physical, chemical and biological that regulate the hydrological cycle, temperature steadiness and atmospheric composition. There has been a drop of 300 million hectares in primary forest area worldwide since 1990. Between 2000 and 2010, around 13 million hectares of forests were naturally lost or changed to other uses, associated to 16 million hectares every year in the earlier time. This did not only contribute in the degradation of biodiversity, but also to global warming by 12% to 15% by releasing CO₂ into the atmosphere (Ali *et al.*, 2014).

Despite its importance, the areas covered by forest have decreased rapidly in the last decades. This decline is caused by high population growth in rural areas, poverty and the lack of understanding regarding the importance of trees for people and animals, as well as the consequences resulting from the over-reliance on wood for fuel (Chakravarty *et al.*, 2012).

The government of Namibia, which provides subsidised water as well as education regarding the effects of deforestation, has not received much cooperation from the inhabitants of Northern Namibia who have been struggling to sustain their domestic animals as a source of income for their families. These subsistence farmers, who would supply their livestock to abattoirs, had no market for their meat when their meat supplying business came to a halt after an outbreak of foot and mouth disease that led to the closure of their main livestock buyer, Meatco (CBS, 2008). Thus, the situation led to most of these farmers having to sell fuelwood to town residents as a source of income.

Owing to the high cost of electricity, Namibia’s rural people rely on fuelwood as a source of energy and income (Du Toit & Sguazzin, 1995). During the period of 1981-1992, Namibia lost around 100 000 hectares of its forests and woodland. Such a deterioration give rise to the scarcity of fuelwood in the northern parts of Namibia (Thomas & Chakanga, 2003). Most of these affected areas are over-populated, with villages in the flood plains, grasslands and open woodlands, as well as peri-urban areas. However, the northern and central area of Namibia has the highest dependency on forests for fuelwood, building materials and income, with 95% of households from the Omusati and Ohangwena regions being dependent on fuelwood (Barnes *et al.*, 2010)

It is estimated that approximately two (2) billion people have no access to modern time energy services for the past decade and more than 1.5 billion people live with no access to electricity (World Bank, 1996). Access to modern energy service and electricity is low in many developing countries, particularly in Sub-Saharan Africa and part of Asia (Table 2.1).

Table 2. 1: Levels of electricity access in selected Sub-Saharan African country (Rena, 2012)

Country	Population (millions)	Access to electricity		
		% living in rural areas	Total	Urban (%)
Benin	9	59.2	51	5.5
Cameroon	18.5	44	77	16.5
Ethiopia	79.1	83.3	86	2
Kenya	38.5	78.7	51.5	3.5
Malawi	13.9	81.7	34	2.5
Mali	12.2	68.4	41	2.5
Senegal	12.4	57.9	82	19
Uganda	30.9	87.2	8.5	2.5
Zambia	11.9	64.7	50	3.5

If the Sustainable Development Goals (SDGs) are to be attained in Namibia, then major efforts are required to take rural areas out of lack of energy. This can be achieved in two different methods: a) domestic use of energy access must be increased, and b) expanding access to technologies that utilise modern fuels or make use of traditional fuel in cleaner, safer and extra environmentally sound ways and growing access to electricity (Rena, 2012).

2.2. Why are Forests Important?

Forests are areas where humans and other species of insects and animals can seek fodder and take shelter. Since the beginning of humankind, forests have played a significant role in the existence of our species. The forest's canopy has played a role in providing shade during hot days or rainstorm and individual trees have traditionally been utilised as sources of materials for building shelter where human being can protect themselves (FSC, 2013). In addition, wood has always been a critical source of energy for cooking, heating, and about half of the world's wood worldwide is harvested for energy purposes (Grebner *et al.*, 2013).

The forests' resources are amenable to the creation of a lot of modest and important tools of which some can be shaped or fashioned with relatively less effort. For example, young trees were once the main source of material for the creation of simple baskets used to transport edible berries and roots. Additionally, birds, insects and fur-bearing animals found in forests provide protein for human consumption. Thus, humans use all parts of wildlife species, which can be hunted, both as food to consume, clothing or as tools to improve their lives. For example, the lining of the stomach of some animals were used to make jugs for water, small bones were made sharp and used as needles and large bones were used as tools for self-defence or weapons for hunting (Grebner *et al.*, 2013; Powell *et al.*, 2013).

Forests are important for human as it provide them with variety types of plants that are used for pharmaceutical or consumptive purposes. The World Resources Institute (2010) issued a short list of medical drugs that are made from forests plants. Two examples are Taxolans Quinine. Taxol is a mitotic inhibitor used as a medicine to lessen the pain of ovarian cancer and is obtained from the bark of the yew tree (*Taxusbrevifolia*) of the Pacific North-West of North America. Quinine is an alkaloid used to minimize fever and deal with malaria symptoms, lupus and arthritis. Natural sources of quinine are trees of the genus *Cinchona* of South America (Grebner *et al.*, 2013).

Over the last hundred years, wood has provided a broad variety of wood products, including tissue and writing papers, reading magazines, sticking notes, files, personal sanitation products and toilet paper. Materials for construction made from the wood from forests include plywood, lumber strand board and other wood products (UN, 2014). Recently, there has been a great deal of concern about the use of wood to supply power pellets and liquid fuels such as butanol, ethanol and syngas in North America. Other items and experiences associated with the forest that are more important today than in earlier times contain sequestered carbon, items of aesthetic value, wilderness experiences and wildlife habitats (Grebner *et al.*, 2013).

2.3. A Brief History of Human Interaction with Forests

Forests offer many assets that are beneficial to humanity's existence and the need for natural substances to enhance human life has informed the continuous reduction and growth of forest regions around the world (Forusawa *et al.*, 2014). As the world population surpasses seven billion, forested land faces the challenging problem of meeting people's increasing entertainment facilities, conservational and consumptive needs (Grebner *et al.*, 2013).

Food and Agricultural organisation of the United Nations (FAO, 2012) introduced a convenient theoretical model that can be used to evaluate the connection of humans to forests and how this connection may change over time. This model suggests that when non-indigenous people interact with and manage forests for the first time, they have a tendency to view forests and natural resources as limitless. This perception ultimately leads to a logical reduction of the forested land, since originally, people have little concern about sustaining the resources over a long term. A society in general views the limitless resource perspective in a positive light because of the need for materials linked to basic human need for survival such as food, building material and fuelwood. Over time, a human society begins to deplete the forest and natural resources under their control. They become more worried with the reduction and damage of resources and take action in the form of conservation, importing goods or reducing consumption to address local issues. As conservation measures are put into place, at some point local forest growth will recover and forested areas will expand from their depleted state (Grebner *et al.*, 2013).

2.4. A Brief history of forests in Namibia

The history of forestry in Namibia can be divided into three periods in line with the three governments that have ruled the country. Each period was characterised by strong foreign influences. Firstly, the influence was from the German and the South African administrations and then by development advisors working with the Namibian government since 1990 until independence. Formal forestry activities began in 1894 when a small piece of land was cleared near Windhoek to grow trees experimentally. According to literature, the country's forest divided Namibia into four administrative forestry districts, namely Windhoek, Okahandja, Otavi and Keetmanshop, with each having a district forest station while headquarters was situated in Windhoek (Erkkilä & Siiskonen, 1992; Mendelsohn & Obeid, 2005). The zonation reflected the German administration's lack of interest in forests resources in the northern (Ovamboland) part of Namibia. Thus, the officials, instead, focused heavily on how to meet demands for wood by German settlers and the developing of infrastructure, such as railways and mines (Erkkilä & Siiskonen, 1992).

Two strategies were adopted to supply wood, namely the importation of wood and cultivation of suitable timber species. Many of the administration's efforts settled on the latter option. By 1910, ten forests stations and nurseries were established to supply seedlings to farmers and to test species that could be grown to supply wood (Erkkilä & Siiskonen, 1992).

While German policy and activities were devoted mainly to increasing the supply of wood, the administration was also concerned with issues of woodland over-exploitation, particularly around settlements and along riverbanks. The concern went hand-in-hand with the theory that the local climate and fertility of the soil could be improved if there were more trees in the country. In 1894, an ordinance was issued to restrict the felling of trees in the Windhoek area. This was followed in 1900 by another regulation regarding the felling of trees for domestic and commercial use. While, in 1914, another ordinance gave farmers more freedom to use wood for their own consumption but not for commercial logging (Erkkilä & Siiskonen, 1992).

South Africa assumed control of Namibia in 1915, and was given a mandate to rule the country in 1920. Little interest was shown in forestry until 1926, when South African forestry scientists were sent to evaluate aspects of the sector. Among the main findings of their work was that local trees could not meet the increasing demand for fencing and fuelwood.

For the first time, attention shifted to timber production in Caprivi, Kavango and the former Ovamboland. Indeed, commercial aspects of forestry were to remain at the forefront of policy and practice throughout the 75 years of South Africa administration which ended with Namibia's independence in 1990 (Erkkila & Siiskonen, 1992).

Two important pieces of forestry legislation were promulgated during the South African period: the Preservation of Trees and Forests Ordinance of 1952 and the Forest Act of 1968. Both emphasised aspects of control and the regulation of logging, but also provided for various conservation objectives. These included the special protection of 23 tree species in 1952 and the establishment of nature reserves and protected forests in the area in 1968. Other than its focus on the commercial harvesting of timber, the South African mandate was characterised by a minimal presence of forest administration. The magistrate in Grootfontein, the Native Commissioner of Kavango and former Ovamboland, all issued harvesting permits. They often had little idea of what was acceptable forestry practice and lacked measures to supervise and control harvesting (Mendelsohn & Obeid, 2005).

2.5. The Perception of People Regarding the Cutting Down of Trees

In developing countries, some may view the initial depletion of forests and natural resources as a natural process, since resources may be considered to have little value owing to their initial abundance. As human communities grow, forests and other natural areas may be changed into agricultural use or may be managed to provide better habitats for wildlife species used as food sources in those communities. For instance, as early European settlements were established, forests and natural areas were converted into agricultural fields to grow food from seeds. When early European explorers travelled across what is now the southern United States, forested landscapes were often described as having park-like characteristics, primarily owing to the frequent fires initiated by indigenous people in order to develop the forage necessary for potential consumption by the wildlife population (Grebner *et al.*, 2013).

Throughout human history, numerous reasons have contributed to changes in the character and condition of forests and natural areas, as well as the natural resources that rely on vegetative structure and protection provided by the forests. These factors include human population growth, political instability, impacts of religious views, poorly planned governmental policies, iron ore smelting, warfare, instabilities in international trade and a broad absence of land tenure along with changes in climatic situations (Robert *et al.*, 2016).

Nearly 1.4 million years ago during the time of *Homoerectus*, people have been changing the landscape. Archeological evidence indicates that humans used fire for cooking purposes and possibility for influencing the types of vegetation found in the landscape. Mesolithic people during the Bronze era (3300 -1200) used axes made out of stone and saws to clean the forest but also used forests to graze their household's animals, which contributed to the clearing of large areas of forests. In the classical era (8th to 5th century), the Greek and Roman societies were severely dependent on wood from forests as a main source of fuel (Grebner *et al.*, 2013).

The contributing factors to forest depletion have their roots in different areas and, as a result, the effects created are different across the world, national and local boundaries (Mahapatra & Kant, 2005). These influences may be categorised generally into human and natural. In most instance, the human effects are often more easily recognisable, because of the increasing recognition of the human footprint on the earth's systems (McCarthy, 2009). It is noted that the environmental changes caused by humans differ in nature and choices however, they can be broadly gathered together as commercial, authority, demographic, social science and technology (UNEP, 2006).

Wood extraction and agricultural food production are economic activities that are known to cause substantial environmental change. The process of deforestation is related to primary leading or various factors, such as agricultural/pastural increasing the consumption and trading out of forest products. This viewpoint concurs with the argument advanced by Insaideo *et al.*, (2012), who recognised bush fires, poor planned logging activities and the changing of forest to farmland as main causes of deforestation. Excessive forests cutting and the successive agricultural development has a negative consequence on every component of local ecosystems, for example the climate, soil and aquatic life and, most importantly, the ecology of local flora and fauna, which include the human disease factor (Beyene, 2011).

It must be emphasised that it is no longer the operation of these economic activities that causes deforestation, but their procedure. For example, agricultural activities do not directly result to deforestation but the way in which it is operated may lead to deforestation. 'Conventional understanding links the impact of the development of agriculture as a cause of deforestation to subsistence-orientated, slash-and-burn bush cultivation, which includes the felling of trees for farmland' (Tindan, 2013: 16).

Regarding the consumption and development of forest products over the years, the production of timber has been discussed as being the main cause of deforestation and this cannot be overemphasised, considering indication from the 1980s. However, an effect that is increasingly recognised is connected to fuelwood production. The forests are quickly being depleted in many marginal areas because of the endless demand for fuelwood. This is true particularly in rural areas where forests resources are regarded as the main sources of energy for most households. An example is that within many parts of Africa, over 90% of rural households rely on wood fuel for their energy supplies. This includes fuelwood and charcoal (UNEP, 2006).

It is noted that population growth, environmental and social engagements, as well as increasing urbanisation and industrialisation are also responsible for the damage and depletion of forests and woodlands, mostly in developing countries. Conflict related to the degree and state possession by native communities and formal establishments, particularly in developing countries has caused the destruction of natural resources such as forests in several places. Even though the government have taken over the power to control the utilisation of forests land, timber and other forest products, in most cases, it often lacks the sovereignty and power to execute such regulations. This is because the legal foundation of such rights by the government are often made against the rights of indigenous people and disregards their systems of tenure and guidelines of resource management (FAO, 2002). The problem of inadequate coordination amongst the authorities regarding the management and utilisation of forest resources, could be closely linked with the types of self-governing governments (whether representative or participatory democracy) being practised in an area (Adams, 2009).

The escalating development of science and technology is the fundamental cause of deforestation if linked to development of industries, which has been notable in the 20th century (Tindan, 2013). The development in science and technology has assisted to recover the production capacity for more resources in several countries. “This is mostly true of China, where industrial growth and development are noted to be fundamental forces leading to deforestation” (Tindan, 2013).

Political ecology “is central to the issue of deforestation” (Tindan, 2013). Tindan (2013) claims that definitions of deforestation are socially and politically made to the benefit of people who are powerful politically. However, the term ‘political ecology’ is understood otherwise, the definition by Batterbury (2018) and Kallis (2008) is suitable for this discussion. They state that political ecology is the study of the approach in which political, economic and social factors

disturb environmental concerns. It evaluates the effect that societies, states, business, international economic structures and geo-political power connections have on the environmental issues. Furthermore, it assesses the influence of these organisations and institutions on environmental policy at various levels. Forest clearance or deforestation has been, in many cases, a reflection of the material benefits of powerful people working both directly or through the tool of the state and is only analysed within the political frame (Tindan, 2013).

Apart from the noticeable human effects causing the spread of deforestation, the influence of natural causes on forest depletion at global, national and local cannot be taken too lightly. The main natural impact is forest fires, which destroy most or all of the trees and biodiversity in a forest (Martin *et al.*, 2016). “The nature and extent of natural fires are related to the evolutionary development of the natural fire regimes, to climatic conditions, such as drought and the amount of woody fuels in some ecosystems and drought” (Tindan, 2013). Between the 1990s and 2000s, Australia lost much of its forests because of natural causes, such as excessive drought and forest fires. Furthermore, in Ghana severe drought over several years and forests fires in 1983 have caused much damage and loss of forests (Tindan, 2013).

2.6. Fuelwood Exploitation, Ecology and the Environment

Forest dependants are categorised into three groups: a) traditional indigenous minorities living in their inherited land (e.g. Kayapo in Brazilian Amazon, Pygmies in the central African Equatorial forest), b) combination of people who were given a forest area to settle and live there for a long period but not considered as natives (e.g. Kinh people in Vietnam) and c) people who have experienced social changes/challenges and migrated to the forested area e.g. Latino migrants in many Latin America countries, war refugees in the Eastern Democratic Republic of Congo and trans migrants from Java and Bali to the outer Island of Indonesia (Sunderlin *et al.*, 2005).

Forest dependants in developing countries who live in or near forests are considered politically powerless. People who are powerful politically are in competition of accessing the forest resources they depend on.

The competition can be grouped as: (a) national governments seeking to nationalise natural forests, often disobeying customary or traditional laws; (b) forest concessionaries (often with ties to the military or national or local legislator); (c) agro-industrialists or business farmers

seeking land extension; (d) business people seeking to acquire number of non-timber forests products; and (e) operation of mining concessions (Sunderlin *et al.*, 2005).

Furthermore, infrastructural developments strive for the land with good natural forests, even if they do not directly involve competition for wood or other forest resources. The use of fuelwood to meet daily domestic energy demands has numerous ecological and financial impacts. All have significant effects on people's social lives because their lives depend largely on fuelwood (Arnold & Persson, 2003). The political weakness of people who depend on forests is strengthened by their geographical distance for urban centres when politicians, favouring forest change, have a tendency to be formed and sustained (Sunderlin *et al.*, 2005).

Fuelwood users access forest resources for either domestic or economic reasons. However, some people and institutions within the community control access to these resources while others maintain them through those who have control. Unless the fuelwood users' access to wood resources is reduced, the forest will not grow and it will be depleted (Ndamase, 2012). In Namibia, the Department of Forestry under the Ministry of Agriculture, Water and Forestry has the power to facilitate forests and forest resources programmes for the sustainability of forest resources. However, the major interference in achieving its ambition is the lack of human and financial capacity (MAWF, 2011). It is highlighted that the need for forest protection and management initiatives to be decentralised in order to complement efforts by traditional authorities, landowners, individual households and farmers (Stiftung, 2010, Ndamase, 2012, Chepngeno, 2014).

Poor forest management strategies are the major causes of environmental degradation; thus, these need to be addressed in a more practical way. This is a call for environmental managers to contemplate how they could protect the environment in a way that would contribute to the desired outcome. Environmental management ingenuities should not apply in the reduction of ecological impacts but they must promote sustainable access to wood fuel (Hughes, 2004).

In Namibia, the environmental effects on fuelwood usage include desertification, the loss of soil fertility and soil erosion. The country's current economic situation is not in favour of the continuous utilisation of fuelwood for domestic and other energy purposes. It is estimated that about 1 000 000 hectares of forest are destroyed every year due to fuelwood collection (Du Toit & Sguazzin, 1995). Fuelwood usage is regarded as the main factor contributing to

deforestation in Namibia as it contributes to soil erosion, affects groundwater levels and soil fertility negatively (Negumbo, 2004).

Forests provide home for wild animals. Once the forest has been cleared, the wild animals lose their habitats and are forced to migrate to other places. Forests absorb carbon dioxide, a greenhouse gas that causes global warming which lead to climate change (Goel & Bhatt, 2012). Shrubs and trees that are mostly used for fuelwood form part of the biological diversity that provides food, medicine and beautification objects to a country. An ongoing dependency of people on fuelwood as source of domestic energy will pose negative effects on the economy and social lives of the people (Barnes *et al.*, 1994).

Modern society is caught between the urgent demands to take of the needs of the growing population and preserving the earth's natural resources and its environment for future generations (Norgaard, 2008). When one keeps in mind the socio-economic role played by natural forests, it is necessary to identify and implement decisions that optimise short-term, socio-economic benefits.

Forests and climate change are essentially linked. It is noted that changes in global weather conditions are disturbing forests through higher temperatures, changed in rainfall patterns, common and extreme weather events throughout the year. At the same time, forests produce, trap and store carbon dioxide, helping in mitigating climate change effects. When forests are destroyed, harvested over limits and destroyed by fires, forests can turn to become sources of greenhouse gas carbon dioxide (Stone & Leon, 2010).

The destruction of forests is a big contributor to climate change in African countries such as Botswana, Ethiopia, Gambia, Republic of Congo, Malawi, Namibia, and Uganda (Somorin, 2010). In Botswana, over 50% of the livelihood of rural areas people depend directly on the forests and woodland products, for medicine, fruit and wild foods. Climate change will cause major changes in dominant vegetation and areas used for grazing or hunting animals and this, therefore, affects the structure and spreading of species, as well as those who depend on livestock for the products they offer for profit and for the benefits of families (Somorin, 2010).

Due to forests depletion, Ethiopia has experienced environmental problem like periodic drought, a great degree of deforestation, soil degradation and loss, over-grazing, and so on, which may be worsened by climate change (Somorin, 2010). In Gambia, people depend on

forests resource for domestic energy supply for about 80%. The analysis has shown that the forest resources will tend towards the dry forest type and some tree species may not survive the predicted climate-change situations. (Somorin, 2010).

The problems of soil erosion, droughts, and the presences of minerals in water are likely to increase in Uganda with the severe approaching climate change due to the depletion of forests at high rate (Somorin, 2010; Awojobi & Tetteh, 2017).

Deforested Namibia is experiencing shorter growing seasons, changes in the overall average seasonal temperature, persistent risk of drought and unusually severe flooding in regions/areas of Namibia and that have provided an indication of how climate change could affect the country (Rena, 2012; Wilhelm, 2012).

2.7. Fuel Wood and Poverty

Poverty is a worldwide problem. Approximately 1.1 billion people earn less than one dollar a day and they face adversities that control their survival. Natural resources play a major role in the lives of economically disadvantaged people. More than 1.3 billion people in the world depend on fisheries, agriculture and forests for employment and other services (USAID, 2006).

Natural forests have several characteristics that make them attractive and accessible as sources of income for rural and economically disadvantaged people. Some environmental resources can be renewed, distributed widely and often found in common property areas where economically disadvantaged individuals can access them without possessing a piece of land (USAID, 2006). For example, poverty in Namibia differs from one region to another and from urban to rural areas. The northern regions are home to about 1.2 million people, comprising mostly the poorest people in Namibia (NSA, 2012). The concentration of poverty in Namibia is among black populations living in rural areas. This is caused by the previous apartheid, government policy that forced them from their places of origin to be clustered around vulnerable woodlands (Mwinga, 2012).

In his inauguration speech in 2005, former president of the republic of Namibia President Hifikepunye Pohamba amongst others states that “Namibia is a middle income country, which faces a number of socio-economic challenges, such as poverty, a high unemployment rate, famine, low levels of industrialisation, a high population growth”. The HIV/AIDS pandemic

and inadequate economic growth (NSA, 2012). Approximately 90% of households lives in poverty, with 32% of rural households being economically disadvantaged. Those challenges limit the access of people who are economically disadvantaged to services, such as modern energy sources, education and infrastructure (CBS, 2008). This also causes them to become over-reliant on natural forests for fuelwood and building materials as sources of income. Fuelwood forms a key source of energy for most of Namibia's rural communities. For example, in the Omusati region, 4% of the households rely on fuelwood for cooking (Hainduwa, 2013).

The generating capacity of electricity in Namibia is 393MW, compared to the demand of 533MW by households and industries (Von Oertzen, 2009). The country imports almost half of the consumed power from South Africa and Zimbabwe. Due to poverty, not all Namibians can afford the ever-increasing tariffs. Thus, there is no other alternative than to exploit natural forests to supply their energy needs (MME, 1998).

In China, there is less economic disadvantaged people live in the forest region. During the "Twelfth-five year" plan (2011-2015) for national economic and social development, Chinese forestry improvement with ecosystem preservation and protection as the principal core of plan, totally enforced to implement woodland tenure reform, formulate extra preferential policies on emerging forests and encourage the beneficial interaction between ecosystems (Guangcui *et al.*, 2009).

2.8. Fuelwood Exploitation: Legal Framework

Before Namibia's independence in 1990, forests were not under any systematic management, nor were any forest reserves established. In the more densely wooded, north-eastern regions (Okavango and Caprivi), inappropriate harvesting took place for some time. After 1990, the government of the newly independent Namibia put much emphasis on more suitable and equitable forest resource utilisation. A forestry policy promulgated in 1992, followed by a ten-year strategic plan, was established in 1996 with the purpose of involving local communities in forestry governance. In the 1990s, work also started on upgrading Namibia's forestry legislation and concluding the promulgation of the Forests Act in 2001. The legislation provides for collaboration and a supremacy method by establishing the basic principles for decision-making on matters related to the forests and the environment at large and, secondly, providing principles for co-operative governance. The act aims to achieve these objectives by formulating principles for institutions that would promote engaging in advancing co-operative

governance and the rules and orders for coordinating environmental functions exercised by organs of state (Benkenstein *et al.*, 2014).

The Namibia Constitution proclaims its obligation to maintainable development with the presence of two key environmental sections, namely Article 91: *The role of the Ombudsman* and Article 95: *“Promotion of the Welfare of the People”*. These sections create a framework for environmental security and the astute management of natural resources in the country (MAWF, 2005).

Article 95(1) of the constitution states that Namibia shall actively encourage and maintain the wellbeing of the people, by approving policies, which include *“the maintenance of ecosystems and utilisation of living natural resources on a sustainable basis for the benefit of Namibians both present and future”* (MAWF, 2005). The declaration of *conservancies* and *community forests* is one of the key approaches that have been adopted by the government in its attempt to accomplish this important constitutional obligation (MAWF, 2005).

The National Act 12 of 2012 is the primary legislation that governs matters relating to forest resources and woodland use. It identifies that everyone has the constitutional right to value and protect it for the benefit of the present generation and future generations to come. The act acknowledges that the social, economic and environmental benefits have been unfairly distributed in the past.

It is, however, not allowing anyone the right to sell any indigenous, living tree, and gives authority to the ministry as having the right to declare a group of trees protected. Participatory Forests Management (PFM) is the main strategy proposed in the national forests’ action programme of the Directorate of Forestry (DoF). It is applicable to all forests types, such as natural forests, plantations or trees in the agro-forestry system.

Prominent details of Namibia’s Forest Act 12 (2001) principles are relevant to this study, namely Part V, 24(1): 2: No person shall ‘destroy or damage vegetation or harvest forest produce’.

Pre-independence, Namibia was traditional; natural resource governance was undermined by colonial government policies, racially discriminatory legislation which led to the failure of traditional community resources governance practices and the widespread depletion of forests and forest resources. Furthermore, the Forests Act gives communities the right to manage and use forest produce and other natural resources to graze livestock while the exploitation of these

resources must be guided by a forest management plan developed by local stakeholders in collaboration with the Directorate of Forestry (Dof) (Benkenstein *et al.*, 2014).

Namibia's Vision 2030 (2004) on the sustainable development of natural resources, acknowledges that secure tenure over all natural resources must be awarded to communities in order to help meet this goal. The vision for forestry reflects this by stating that "Namibia's diverse natural woodland and many resources they provide, [must be] managed in a participatory and sustainable manner to help support rural livelihoods, enhance socio-economic development and ensure environmental stability".

The objective for forestry in the 2nd National Development Plan (NDP2) in National Vision 2030 includes the close integration of the community forestry programme within other community based natural resources management (CBNRM) initiatives. These goals guide the national goals of poverty reduction, employment creation, economic empowerment and improvement environmental and ecological sustainability (MAWF, 2005).

The white paper on the 1998 energy policy of the Ministry of Mines and Energy (MME) in Namibia acknowledges that biomass is the basic energy source for most of the rural communities. Therefore, to mitigate problems leading to the destruction of forests and forest resources, the government, through the Department of Energy, has embarked on supplying electricity to rural areas. One of the outcomes of that intervention, among others, was to increase the forest cover in rural areas significantly and decrease the reliance of rural people on forests for fuel wood (MME, 1998).

2.9. Fuelwood and Gender

In most developing countries around the world, the collection and use of fuelwood are primarily the responsibility of women who spend most of their time in this activity (Figure 2.1). It is estimated that, for example, in Namibia, women spend 1.6 hours per day collecting fuelwood (World Bank, 2014), in Botswana 3.3 hours (Jan & Pervez, 2015), in South Africa 1.7 hours (World Bank, 2014), in Nigeria, 1.7 hours (World Bank, 2014) and in Nepal, 2.5 hours (Jan & Pervez, 2015).

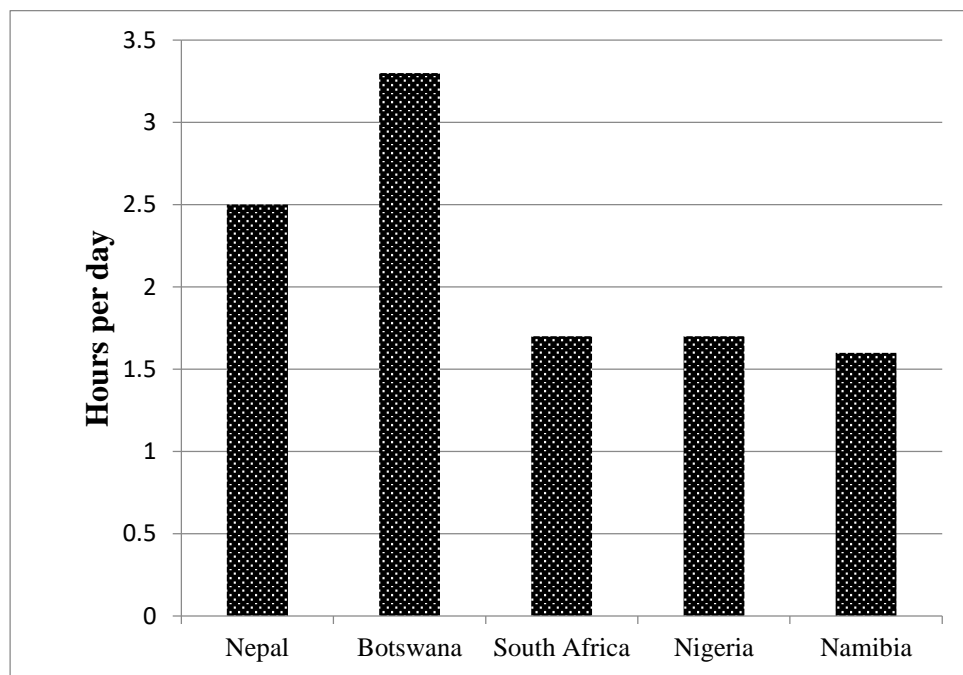


Figure 2. 1: Hours per day spent collecting fuelwood by women in some developing countries.

A serious problem in this concern, which is mainly common in developing countries, is the increasing proportion of women subjected to poverty. Women’s poverty has many proportions. They spend most of their time with non-productive chores, such as the rearing of children, caring for the elderly and sick people, cooking and serving food, cleaning, collecting water and fuelwood (Jan & Pervez, 2015).

Gender mainstreaming has become a slogan in development circles in developing countries. Increasing attention on women and household energy supplies has been demonstrated by the incorporation of women in various energy policies, programmes and projects at a national, regional and at international levels. These include the United Nation Development Programme (UNDP)’s Sustainable Energy and Environmental Division, the World Bank’s Energy Sector’s Management Assistance Programme and the FAO’s Rural Wood Energy Development Programme (Wamukonya, 2012).

Fuelwood collection is determined by the purpose for which it is used. Traditionally, women and children are mainly involved in collecting household fuelwood while men collect fuelwood for selling (Waris & Antahal, 2014). Whereas women collect a large portion of fuelwood for domestic use, it is ironical that men make most decisions regarding fuelwood harvesting (Ndamase, 2012). It is, therefore, important and necessary to involve women in the decision-making process and forest management (Leone, 2013).

In most cases, household energy and cooking are associated with women. They are also the first to detect the decline of fuelwood in the areas. When firewood became hard to find, the time needed for collection increases as well as the amount of money needed to spend on buying energy (Zschauer, 2012; Mercer & Soussan, 1992). Customarily, men are in charge of the household's income and economy, women are not included in the energy decision-making plans. This forces women and children to walk longer distances to collect firewood and such situation makes them vulnerable to cold weather, hot sun shines and diseases related to tiredness.

In Kenya's Taita Hills, women plant trees but the male decides on the harvest time. Even though women are often responsible for economic issues such as agriculture and energy in the households, have the known-how, and experience, they are neglected when promoting new technology. Furthermore, men are often trained to use modern farming methods and technology but 75% of agricultural labour is made up of women. This contributes to the situation where genuine needs are not observed in training for capacity building for those who mainly participate in the work. This also delays women's chances to advance their social and economic situation, which is emphasised by inadequate access to the income (Zschauer, 2012).

In Namibia, fuelwood is mostly associated with women. They build a stockpile of fuelwood behind the main dwelling. A big stockpile of fuelwood is a symbol of the industriousness of a housewife. It can, therefore, be assumed that the collection of fuelwood is not necessarily driven by need only but also by prestige per societal norms (Gisladottir & Stocking, 2005).

2.10. Impacts of Fuelwood Collection

Land degradation is defined as 'a temporary or permanent decline in the land production' (Murnaghan & Stocking, 2001: 7). High population growth in many African countries is a key factor considered causing loss of forest cover due to unsuitable agricultural activities, poor stock farming management and deforestation (Stocking & Murnaghan, 2001).

In Namibia, over-utilisation and the uncontrolled harvesting of forest resources (Mapaure & Ndeinoma, 2011) have caused the decline of forests. In Nigeria, harvesting of fuelwood has been bad and has led to a deforestation rate of about 400 000 hectares yearly (Dzioubinski & Chipman, 1999).

Primarily, crop production is the main source of food security and serves as the income generation for rural households. Soil fertility is improved by applying cattle and goats manure and crop residues to ensure high crop production (Sabiiti, 2011). Shortages of fuelwood add extra expenses to a household's budget, such as having to buy fuelwood and pay for hospital expenses caused by injuries obtained during fuelwood's collection (WHO, 2006). In areas where wood is hard to find people spend most of their time searching for firewood and are left with little time to engage in other socio economic activities that have potential to improve their livelihood (Barnes *et al.*, 1994).

Energy is a basic need and plays a very important part in keeping cleanliness in households. For example, it is needed to boil water to avoid water-borne diseases and malnourishment caused by consumed dirty water (WHO, 2006). Due to the scarcity of fuelwood, it is reported that cooking time is reduced, preparing small foods and discarding food (Hoffman & Ashwell, 2003) because carrying a large bundle of heavy fresh wood, could cause health hazards (Shackleton *et al.*, 2004). Globally, it has been reported that in many of rural households, the use of traditional open fire cooking practices resulted in respiratory infections that have led to a loss of lives. Chronic respiratory diseases, caused by burning of wood, kill about 1.5 million people (mostly children and women) every year (WHO, 2006).

Women are exposed to high level of indoor air pollution during the preparation of food, caused by the use of traditional stove in a closed hut (Dzioubinski & Chipman, 1999). Many people who mostly use fuelwood are reported suffering from conditions like eye irritation breathing problems, which later developed into respiratory diseases (Barnes *et al.*, 1994).

2.11. The Role of Local Government and Traditional Authorities in Forest Management

Traditional authority dominated pre-colonial and colonial political orders, which played an important role in challenging post-colonial rulers. After some time, the establishment of customary administration has been tested by numerous adjustments in its strategies and standards of arrangement, in its capacities and in its ward and power. A portion of these progressions has come about because of the common development of the foundation, while others have come about because of outside obstruction (Stiftung, 2010).

In Namibia, and elsewhere in African, traditional leaders' relevance for the post-colonial political order and feed stem from their control over (predominantly) rural communities.

Traditional leaders are still in control of critical sections, such as the allocation of the land for cultivation and settlements, communal labour practises and in some instance laws and order. They allocate land to municipalities and to business people. Their power, as rural headmen develop not only from their command over their designated communities, but it also mainly originate in the pre-colonial guidelines of indirect rule or what Mamdani (1996) calls "decentralised despotism". It was right for traditional leaders to be given broad powers, specifically powers of oppression. At the local level, they became tax collector, judge, lawmakers and police commissioners (Stiftung, 2010).

Before Independence in 1990, traditional leadership had no significant role in local leadership. They were only responsible for collecting penalties paid to a girl who became pregnant out of wedlock and also to fine those accused or found guilty of killing another person (Mendelsohn, 2008). However, traditional leadership was significantly constrained by the restrictive, apartheid regime (Ntsebeza, 1999). Since Namibia's democratisation in 1990, there has been an effort towards the implementation of shared responsibilities regarding the management of natural resources between local government and traditional authority structures through collaborative, community-based, natural resources management. The local government has the mandate to promote a safe and healthy environment. Furthermore, through the policy of decentralisation, the traditional authorities have been empowered in their area of jurisdiction to protect the forest resources from deterioration (Schiffer, 2004).

Since independence, there have been a number of incremental exertions relevant to the exploitation of woodland and forests in Namibia. For instance, the Traditional Authorities and Government on Communal Land Rights, Act 12 of 2012, was meant to ensure sustainable land use, leading to a better management of natural forests. Furthermore, the Department of Forestry has created provisions for formal interactions with communities neighbouring woodlots and natural forests. These interactions are aimed at establishing and strengthening laws that manage natural forests in areas under the governance of traditional authorities (MAWF, 2011).

However, efforts to harmonise traditional leadership authorities and government fully have been a challenge. Notable examples are the disputes in the Ohangwena and Okavango regions where the sharing of land and administrative responsibilities by government has caused tension between the two constituency councillors elected in 1995. Local governance and successive

elections were meant to extend democracy and create government-led service delivery to rural areas. Previously, this role was that of the traditional authorities and was perceived as being a downgrading of traditional leadership to simple, ex-officio members in the government set-up (Muduva, 2014).

2.12. Theoretical Framework

The theoretical framework has been adopted from the literature review. The primary aim is for it to serve as a guideline to help formulate the research outline and methodology used in achieving the objective of the study. From the reviewed literature, the cutting down of natural forests is a well-known challenge to development. It is identified that, the known causes of the cutting down of natural forests are categorised according to human and natural factors, which are believed to originate from, forests (extent of forest area), population growth, economic growth, agricultural growth, and level of democracy.

The impact of the cutting down of natural forests is examined according to the negative effects and socio-economic benefits. As per literature reviewed, the socio economic benefits of the cutting down of natural forests include its serving as a source of income, livelihood and employment for people. The literature uncovered occupations will be estimated by recognizing how forests resources have contributed towards family units' sustenance supply, vitality supply (fuelwood) and the arrangement of materials for sanctuary. The pay measurement of these advantages is built up by distinguishing the measure of salary and eminences paid to the conventional administration through the abuse of woodlands assets. The negative effect of the cutting down of natural forests as discussed include global warming, desertification, soil degradation, loss of biodiversity, increased poverty and climate change.

2.13. Summary

Historically, people have appreciated feared, used and conserved forests and natural resources. Forests and natural resources have played a significant role in the development and history of human society, dating back to early hunting and gathering communities. Forests have reliably provided humans with a diversity of consumable food and medicines, as well as wood for cooking and heating and resources for building shelters and homes. As human settlement areas has expanded, forests and natural resources have increasingly been removed to provide land

for agricultural activities, as well as to provide materials to support economies undertaking defence activities and trade.

For much of human history, forests and their associated forest resources have been viewed from an extractive perspective. There are many instance where forest resources such as wood and wildlife have been used with little regard to their long-term sustainability. The literature reviewed above revealed that fuelwood is the communities' sources of energy more especially in developing countries where people use it for both commercial and subsistence purposes. Communities depend on fuelwood; they cut down trees without knowing the long-term consequences of a bare soil and deforestation. It is not well known that there is a connection between climate change and forests. In the following chapter, research design and methodology will be explained to give approach to which the research was conducted.

CHAPTER 3

RESEARCH DESIGN AND RESEARCH METHODOLOGY

3.1. Introduction

Research is a procedure whereby individuals attempt to find solutions to the inquiries they present in their own commitment with the world to deliver knowledge. This chapter shows every one of the apparatuses and frameworks utilized for this examination. It examines the methodological epistemologies and methodologies that help numerical financial aspects and social decision inquire about. The exploration depends on the effect of the chopping down of normal woodlands.

3.2. Research Design

Research configuration is an arrangement for an investigation, giving the total setting to gathering information (Leedy, 1997). Durrheim (2004), states that exploration configuration is “a vital structure for activity that fills in as an extension between research questions and the execution, or usage of the examination strategy”. MacMillan & Schumacher (2001), define it as “a plan for selecting subjects, research sites, and data collection procedures to answer the research question(s)”. Further, they determine that the objective of a sound research configuration is to offer outcomes that are trustworthy.

The purpose of the research design is to plan the stages of the research. When preparing a journey, those who travel without planning the details will encounter many more obstacles than those who planned for it (Cresswell, 2014). The research design give a thorough arrangement of how unique research strategies and methodology techniques referenced in this exploration are executed. It empowers information accumulation, investigation, results and introduction such that intends to give an important commitment to the research.

This research employs a combination of qualitative and quantitative research methods and consists of the collection, analysis of statistical data, interpretation, presentation and discussion of the research findings to provide meaningful contribution to the research. The aim of this

research is to investigate the impacts that the cutting down/ falling of natural forests poses to the environment. It is important for people in the constituency to understand the importance of natural resources on the environment and the danger of its absence pose to the environment.

Information from the constituency was acquired, analysed interpreted and presented using a qualitative and quantitative methodology to achieve the objective of this research. Quantitative and qualitative methodologies are two fundamental methods that inform a research (Calmeyer *et al.*, 2011; Mutton, 2011).

Both methodologies have its advantage and disadvantage. Advantages consists of but not limited to enhancement of data and collection of research evidence, suitable for situations where systematic, standardised comparisons are needed, whereas disadvantage include extra data which requires more resources and work, and diverse skills for resolving inconsistencies in the data challenges (Queiros *et al* 2017, Kumar 2011, Silverman, 2013).

3.3 RESEARCH METHODOLOGY

The choice of a research methodology is determined by its significance to the research problem. Research methodology is a systematic way to solve a problem since it offers a way to collect the type of data involved in the research, to solve a research problem and the accurate approach to analyse and interpret the collected data. It is the science of studying the way in which research is to be carried out. It is also defined as the study of methods by which knowledge is gained. Its aim is to provide a work plan of the research (Rajasekar *et al.*, 2013).

Research approach is a “theory of how a request ought to proceed” (Schwardt, 2007). It includes investigation of the suppositions, standards and methods in a specific way to deal with request. Research strategies clarify and characterize the sorts of issues that merit exploring; what comprises a researchable issue; testable theories; how to outline an issue so that it very well may be examined utilizing specific plans and systems; and how to create fitting methods for gathering information (Tashakkori & Teddlie, 2003; Schwardt, 2007).

Research methodology conveys the qualities for sorting out, arranging, structuring, and directing examination. Methodological choices are dictated by the examination of the worldview that a researcher is following. It also presents the research the strategies used in the choice of the research participants, and for information gathering (Remenyi *et al.*, 1998).

Both qualitative and quantitative methodologies were used in this study. Qualitative and quantitative research are two basic approaches that illuminate a research project (Calmeyer et al, 2011). It is for this reason the researcher has chosen both qualitative and quantitative methods for information collection, examination and understanding of the result.

3.1.1. Qualitative Approach

Qualitative research concentrates on the knowledge of human beings, as well as stressing the uniqueness of individuals (McMillan & Schumacher, 2001). Qualitative research is referred to as social enquiry that pays attention to the way people interpret and make sense of the world in which they live (Mertens, 1998). In this study, a qualitative approach was employed to discover the perspectives, behaviour, experiences and feelings of people. Dickson-Swift (2007) contend that qualitative research is recognised in a logical example, inspecting nature, accordingly helping researcher to pick up proof about a territory in which little is known. The approach gave a researcher an exclusive understanding of how and why the forests have been depleted. The researcher had a chance to follow up on the answers given by respondents in real time, generating valued conservation around the reasons for the cutting down of the natural forests. Whereas, the data generated by qualitative research are unquestionably beneficial as the researcher is often looking for the 'why' behind the facts given. Thus, qualitative research became necessary as respondents had an opportunity to freely elaborate their answer. Therefore, it involves questionnaires, observations and interviews as part of the data collection methods.

3.1.2. Quantitative Approach

A quantitative approach is explained as the collection and examination of numerical data to explain, envisage or control phenomena of interest (Best & Khana, 1998). Quantitative efforts are essential in helping researchers to understand the generalisability of a model (Kaplan & Duchnon, 1988).

A quantitative report is an efficient and well-organised investigation of measurable presences utilizing factual examination (Best & Khana, 1998). It was used to determine to what extend the trees are being cut down for fuelwood and for other purposes such as selling, building and fencing. It was also used to assess the number of people in the community using trees for fuelwood and how many were using other source of energy. Furthermore, the researcher used quantitative method to quantify the problem by generating numerical data that is transformed into usable statistics.

3.4. Research Methods

Choosing the correct method for the research does not rely on the quality of accessible methods or the methods that researchers used mostly. The methods must relate to the study in light of the fact that various methods have different purposes.

Thus, in this study, the researcher used interviews, questionnaires, observations and desktop information as ways of data collection.

3.4.1 Interviews

This study made use of semi-structured interviews with open-ended questions to create the scope for the provision of in-depth information.

Semi-structured interviews include an arrangement of open-ended questions dependent on the topic the research needs to cover. The open-ended nature of the questions characterises the subject under scrutiny however, gives opportunities to both questioner and interviewee to talk in more detail. If the interviewee is unable to answer, the interviewer can utilise prompts to urge the interviewee to elaborate the question further. In a semi-organised interview, the interviewer has the opportunity to probe the interviewee to explain more on the first answer (Mathers *et al.*, 2009).

The four (4) headmen (traditional leaders), one constituency councillor (local government official at regional level) and one participant from the Ministry of Agriculture, Water and Forestry (MAWF) at the department of forestry (DoF) were interviewed individually. The traditional leaders were interviewed in their local languages (*Oshiwambo*) to enable them to express themselves freely, while participant from the Ministry of Agriculture, Water and Forestry were interviewed in English.

The interviews aimed at acquiring more information regarding the utilisation of forest resources by rural communities, as well as interventions by authorities to work against the depletion of forests. The participant groups were all policy makers at regional level. The traditional authorities were custodians of rural land management and political leaders who represented their communities in all developmental projects, whereas the MAWF official authorised local people to utilise and oversee forest resources. The purpose of the interviews was to find sufficient data from the field of study by seeking stakeholders' contributions to the main aspects of this study.

3.4.2. Questionnaires

A questionnaire is a set of questions that are either open or closed. They help the researcher to gather information without influencing the members by her physical presence (Leedy, 1989). Questionnaires in this study helped to provide information from a large group of people quickly. They were also a financially affordable means of data collection (McMillan & Schumacher, 2001). Furthermore, they required less time to administer than other methods of data collection, yet were easy to analyse (Mathers *et al.*, 2009). It was cheap, easy to manage and less time-consuming as it could be distributed via mail, email or be hand-delivered (Bryman, 2008).

The questionnaire assessed the participants' grade of preference and gave them a fair opportunity to provide comments (Cohen *et al.*, 2000).

Pre-testing of the questionnaire was done to build up the understanding of respondents and to decide if the questionnaire was objective (Babonea & Voicu, 2011). An informal testing was conducted with four respondents per village, a DoF official, a Grade 12 learner and a university student.

Questionnaires were distributed to household members around the four villages. Each household received one questionnaire, and it was emailed to those who preferred to receive it that way. About ninety-seven (97) households from different villages in the Etayi constituency participated. Twenty-five (25) were from Etayi, twenty-nine (29) from Onampira, twenty-four (24) from Iipanda and nineteen (19) from Oshipya. The questionnaires explored various uses of fuelwood in the homes and the different challenges participants were facing in their bid to conserve the forests. The questionnaire also explored how participants felt about conserving the forests in their different constituencies. Respondents had an equivalent scope of questions to reply, some on their own while others needed to reply under the direction of the researcher. This was on the grounds that the questionnaire should have been deciphered to respondents as they are unable to read and to write. Through this questionnaires, different reactions could be investigated to build up examples of ideas.

3.4.3. Observation

Observation is said to be one of the information gathering methods that have been there from the earliest starting point of the research. It involves the utilisation of the visual sense to gather information on recognisable phenomena (Sarantakos, 1998). For the purpose of this study, the researcher has selected non-participant observation, which is described as 'a process of a one-

way mirror' where the observer just watches without taking part in the activities that she is observing (O'Leary, 2014)

“Non-participant observation is a research assistant sitting quietly in the back of auditorium” (Best & Kahn, 1998). Thus, the observation allows the researcher to understand the phenomenon being studied (McMillan & Schumacher, 2001).

The researcher used field observations as one of the methods of data collection. There were three elements to consider, namely watching what the people did, listening to what was said in conversations and sometimes asking questions (O'Leary, 2014). This was not only limited to social observation, but also involved the biophysical changes of the land and the forests in the Etayi constituency.

Observations assisted the researcher in understanding how the people (residents) in the Etayi constituency collected fuelwood. In other words, did they cut and dry it, did they collect just the naturally dry woods and did they cut down the whole tree or just the branches? This method equipped the researcher with a good understanding of the reasons why the forests were being depleted in this constituency.

3.3.4. Desktop Study

Desktop study took place throughout the research. Text and document reviews of secondary data sources, such as government/official statistics, books, journals, magazines, pre-viewed articles and other relevant sources, were examined to find the concern, the extent, the reasons for forests depletion and the impact of the cutting down of natural forests, which provided information from the literature review and the background to the study. Mertens (1998) states, “The qualitative researcher must turn to documents and records to get the needed background of the situation and insights into the dynamics of everyday functioning. The researcher cannot be in all places at all times; therefore, documents and records give the researcher access to information that would otherwise be unavailable”.

3.5 SAMPLING METHODOLOGY

Sampling methodology is a strategy used to settle on a defined population, and includes the social occasion of number of unit that characterizes research project's population. (Creswell et al., 2007). Sampling method is used to select a smaller section from the bigger section to provide the simple way for calculating the occurrence of undisclosed part of data and a result concerning the larger population (Kumar, 2011).

Sampling was necessary to select respondents before distribution the questionnaire. Polit & Beck (2008) defined sampling as “the process of selected elements that are basic units from which data and information will be collected to represent the entire population”.

It is not possible to interview everyone that is qualified for the study. Probability sampling constitutes a random selection so that each unit in the population was selected for this study. The aim of probability sampling is to avoid errors.

The study took place in Etayi constituency, which comprises of 35101 people and 6162 households. The constituency has 12 villages, 12 headmen, one constituency councillor; the forestry department is at the regional offices in Outapi. Out of 12 (twelve) villages in Etayi constituency four villages namely Etayi, Iipanda, Onampira and Oshipya were selected based on their pre and post forests coverage and ninety-seven 97 households were randomly selected to participate in the study; twenty-five (25) from Etayi, twenty-nine (29) from Onampira, twenty-four (24) from Iipanda and nineteen (19) from Oshipya. Additionally, there were; 4 headman/traditional leaders of the selected villages, 1 constituency councillor and 1 forestry officer, from the ministry of Agriculture Water and Forestry were interviewed. The participants should be at least 30 years old and should have been in the Etayi constituency for ten years or more because they are the people regarded with more information on what had happened to the forest cover and what is happening now to the forests coverage in the constituency.

Etayi constituency is chosen because there are many unemployed people with (55% unemployment rate), and it is made up of 92% of traditional (wood made) houses and fuelwood plays a significant role in the local community.

3.6 VALIDITY AND RELIABILITY OF THE RESEARCH

To improve the rationality and value of the results, accuracy of measurements and honest responses were considered throughout the research.

“Valid instrument should measure what they are supposed to measure and as yielding score whose differences reflect the true difference of the variable being measure rather than random or continuous errors” (De Vos *et al*, 2003).

Validity is an increasingly mind boggling idea and it tell whether a thing portray or measure what is assumes to gauge or depict what it expected to quantify or portray. Validity tries to answer the question “Is the researcher accurate measuring what intend to measure?” (Wholey *et al*, 2004: 549). This was done in this research through pilot testing when the questionnaires were distributed to few number of responded before the commencing of the actual data collection to get a broad overview of the types of responses expected. A comprehensive linked literature

search on which the contents of questionnaire and interview were founded was done to ensure validity.

De Vos et al, (2003: 168) defined reliability as “the exactness or accuracy of an instrument, as the level of consistency or understanding between two freely determined arrangements of scores or the degree to which autonomous organization of similar instruments yield the equivalent or comparative outcomes under practically identical conditions”.

Equally, reliability measures the level to which the instrument produces the same results when used repeatedly to measure the same thing. Reliability ask questions: “will the measurement procedures produce similar results on repeated observation of the same event or condition?” (Wholey et al, 2004; Babbie 2007). A reliable measure does not change haphazardly and is utilised to find connections between variables. In this study qualitative and quantitative design were selected to deduce the impacts of cutting of the natural forests.

In this research, the validity and reliability quality was enhanced by methods of utilising multi methods in information gathering, such as, observation, questionnaire and interviews. The researcher is of the idea that the above-mentioned methods are an intertwined web of all the interactive methods. The “use of various methods that does not have the equivalent inherent shortcomings, improve the odds of tackling the problem” (Punch, 2005).

3.7. DATA ANALYSIS

“Data analysis is the process through which the researcher continually reflects on collected data, moving deeper to understanding and representing the data, and drawing in inference of broader meaning of the data” (Cresswell, 2003).

In this study, data analysis involved three major steps, namely the organisation of the data, describing the data and research questions or hypotheses testing, as well as modelling (O’Connor & Gibson, 2003; Leedy & Ormorod, 2013).

Data originated from interviews and questionnaires transcripts were reduced to major themes that revealed the impact of fuelwood collection on natural forests in the Etayi constituency. In doing this, the researcher created themes based on independent participation. Content analysis, as advised by GAO (2013), was done to supplement the statistical analysis. Graphs and Tables illustrating the various uses of fuelwood in houses, the frequency with which fuelwood was collected and alternative sources of energy in houses, were generated through the Statistical Package for Social Sciences (SPSS) Version 23 software. Histograms, pie charts etc., were drawn

to present the results. Descriptive statistics therefore enable the researcher to present the data in a more meaningful way, which allow simpler interpretation of the data.

3.8. ETHICAL CONSIDERATION

Research ethics as a branch of well-applied ethics has a well-established rules and regulations that explain clarify their conduct. (Akaranga and Makau, 2016). It is contended that researchers should treat the individuals who help them with their research with consideration, thought and affectability that ought to consistently regard human dignity. The people ought to be regarded in the event that one thinks about that without their assistance, data would not have been obtained.

During the primary stages of the research process, a consent letter was requested from Omusati regional council office for allowing the communities of Etayi constituency to participate in the research (Appendix E). The verbal consent statement was presented to participants and the purpose of the research was explained before the research process. Participants then had to indicate their consent for taking part in the study with either a no or a yes. This proclamation also indicated that the research was being conducted under the authority of Cape Peninsula university of Technology and had been ethically cleared by the institution. Participant were assured and guaranteed that all responses and information given will be dealt with strict confidential.

3.9. CHALLENGES ENCOUNTERED DURING RESEARCH

The researcher faced some challenges during the time of data collection. These challenges were encountered when seeking to obtain the consent letter from the constituency council. There was a delay in processing the letter to regional government as the governor was always out of the office. This caused an unnecessary delay in the whole research process. The researcher has to visit the office regularly to speed up the process.

Another challenge to the researcher was the language barrier. The questionnaires were written in English and some participant could not understand English. Some participants do understand English but have difficulty expressing themselves in a questionnaire.

Another element that presented a challenge to the research process was access to information. Officials that were supposed to release documents had to consult their supervisors, which were always away from their offices, and after their return to their offices, their responses were always, that they were not allowed to share some of those documents.

In this chapter, the research design and methodology utilized was clarified. Both qualitative and quantitative strategies were used and the gathered information was analysed and introduced in various structures tables, graphs and charts. The following was also explained, sample, data validity, reliability, and delineation of the study. The next chapter present the research findings or results.

CHAPTER 4

RESEARCH FINDINGS AND RESULTS

4.1. Introduction

This study was conducted in four villages in the Etayi constituency, namely Etayi (ETA), Iipanda (IIPA), Oshipya (OSHI) and Onampira (ONA). The purpose of the research was to investigate the impact of over-exploitation of indigenous forests on the environment in the Etayi constituency of the Omusati region in Northern Namibia. This chapter presents the key findings from data sources as per the objectives and research questions (Appendices A, B, C, D, E and F).

The findings in this chapter examine the over-utilisation of forest resources as sources of energy and income in rural communities, as well as the roles of the traditional authorities, local government and the Department of Forestry in the management of indigenous forests and fuelwood collection.

4.2. Biographical details of the respondents

4.2.1. Gender of Respondents

The total number of respondents in these categories was 97. The respondents comprised 50 females and 47 males. The reason for the low number of male respondents was that fuelwood collections in villages is believed to be the work of women and children. Men were more concerned with the building of houses, fencing and making furniture.

Table 4. 1: Gender of respondents in study areas.

Villages	GENDER	
	Male	Female
ETA	12	13
ONA	15	14
IIPA	11	13
OSH	9	10

4.2.2 Age Distribution

Of all respondents, 31 were between the age of 30 and 40 years. Respondents in the age group between 40 and 60 years numbered 41 and formed the largest group. While the 60+ years comprised 26 respondents.

Table 4. 2: Age distribution of respondents.

Age group	Villages			
	ETA	ONA	IIPA	OSHI
30-40	11	9	6	4
40-60	7	14	12	8
60+	7	6	6	7

4.2.3. Respondents' Length of Stay in a Specific Village

Most of the respondents indicated that they had been born in that specific village or had lived in the village for more than 40 years. However, some revealed that they had just come to the village because of marriages, while others stated that they had come a long time ago in search of fertile land to practice subsistence agriculture. Some respondents stated that they had come to settle in the villages because they could not afford urban living.

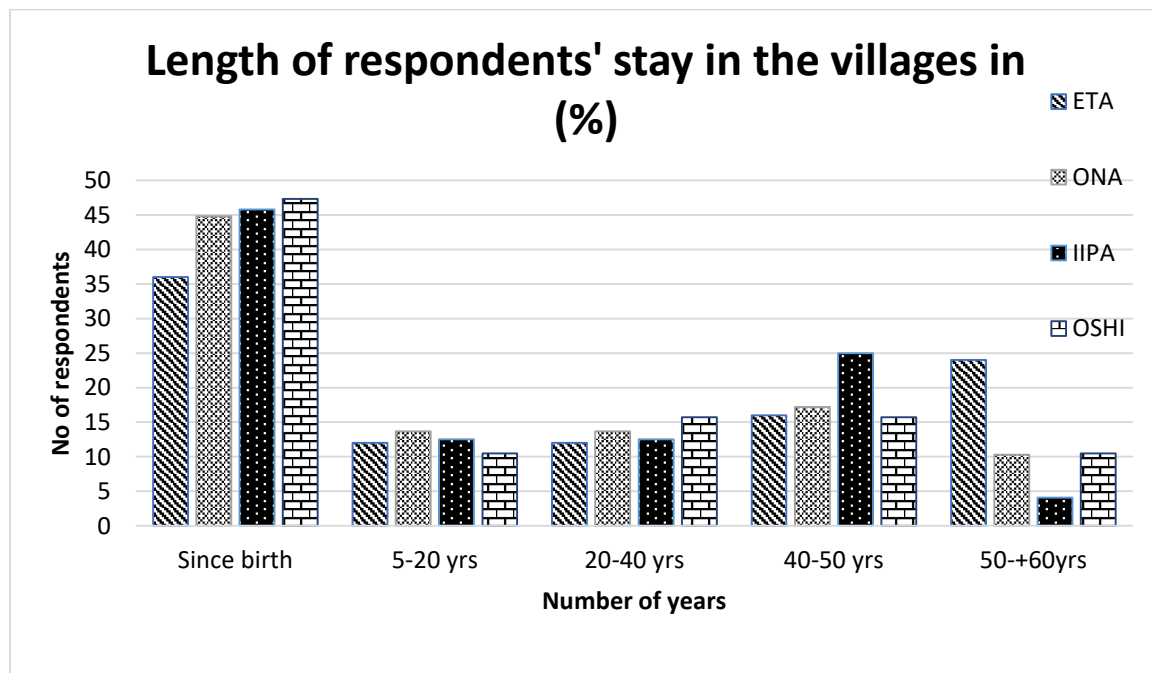


Figure 4. 1: Length of respondents' stay in the villages.

4.2.4. Tribal association of respondents

In Namibia, citizens are allowed to build their houses wherever they want to, as long as it is done in accordance with the rules of traditional authorities. For example, one cannot build a house in an area declared grazing land. Thus, different tribes (Figure 4.2) are found in areas that are different or far from their initial homes. Many people migrate for a variety of reasons, such as agricultural purposes, social problems or that they cannot afford urban living. In this study, 98% of the respondents were natives of the specific constituency.

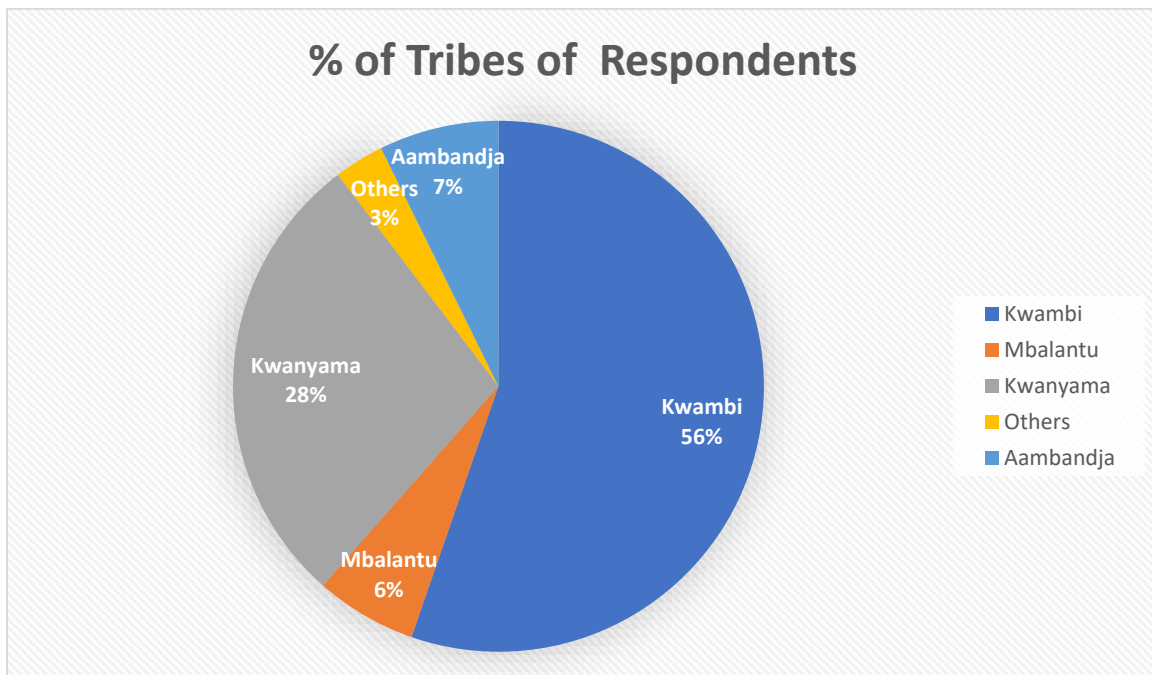


Figure 4. 2: Tribal association of respondents.

4.2.5 Employment Profiles of the Respondents

From a total of 97 respondents from the four participating villages, 61% were unemployed and depended on government grants, such as a pension or orphan and vulnerable children's grants, as income (Figure.4.3).

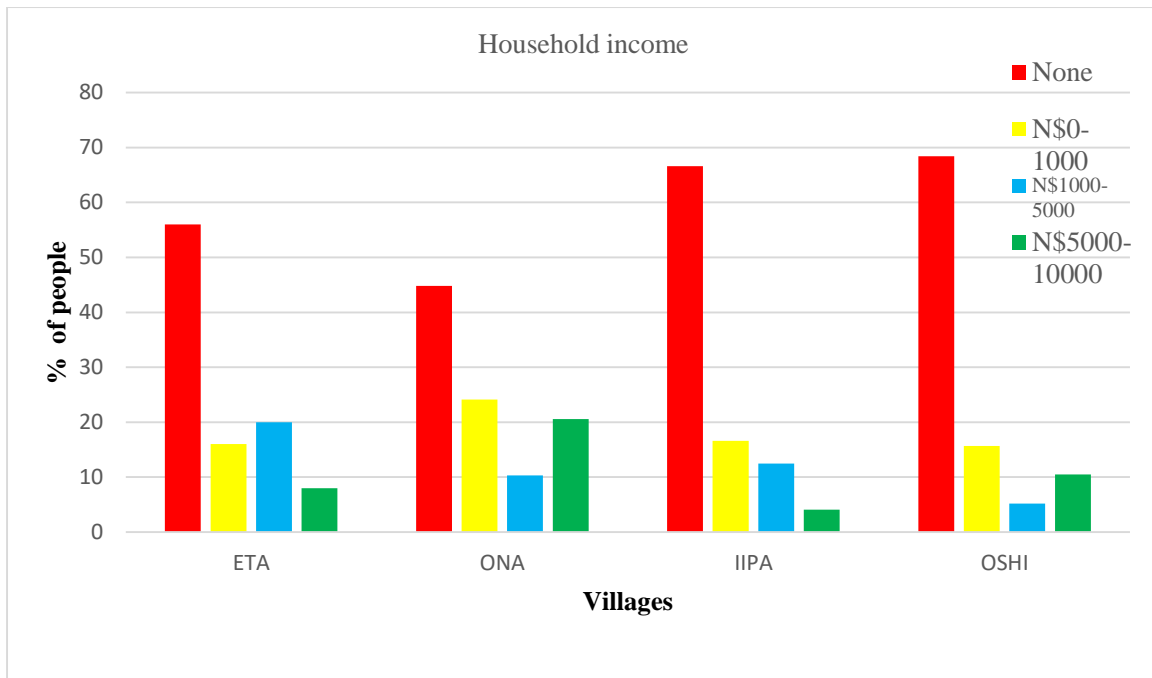


Figure 4. 3: Income of respondents in Namibian Dollars.

4.3. Fuelwood Sourcing

4.3.1. The Main Sources of Energy in Households

The results show that 85% of households used fuelwood, 9% used a combination of fuelwood, cow dung and gas, while 2% used solar energy as their primary source of energy. None of the respondents used charcoal and kerosene, whereas 1% of the respondents mentioned crop residues as one of their sources of fuel energy (Figure. 4.4).

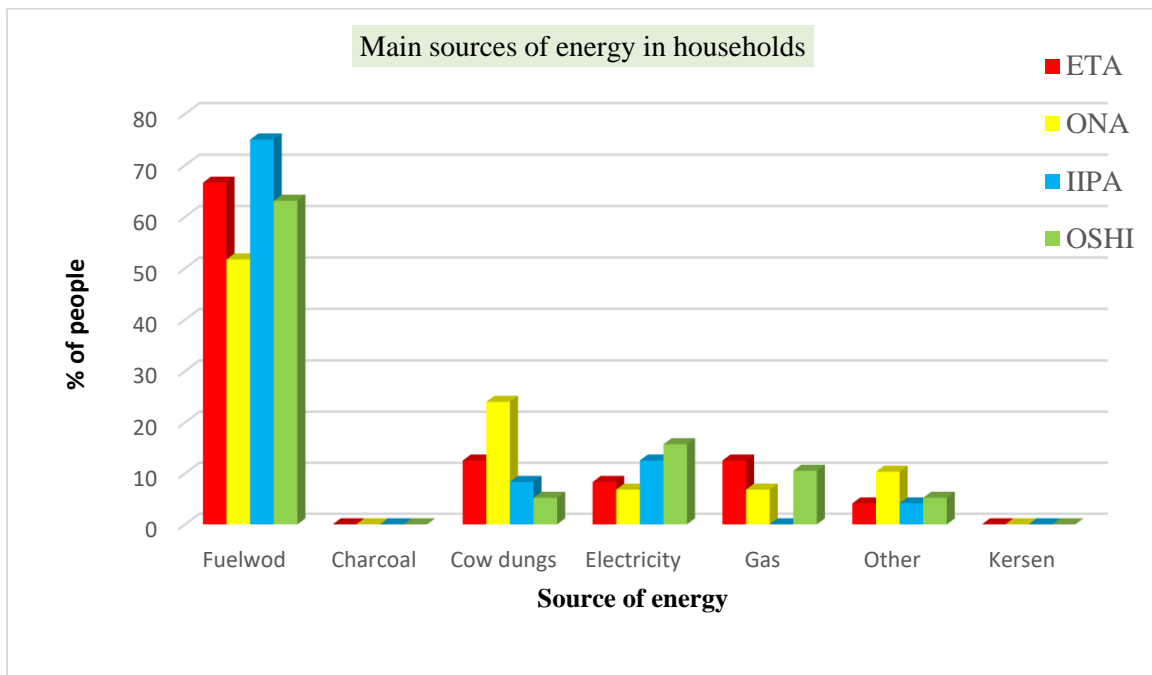


Figure 4. 4: Main sources of energy used in households.

4.3.2 Uses of Fuelwood in Households

It was found that 100% of households used fuelwood for multiple uses like cooking and heating. During fieldwork, the researcher found the participants cooking and heating, primarily on the traditional, open stove (Figure 4.5).

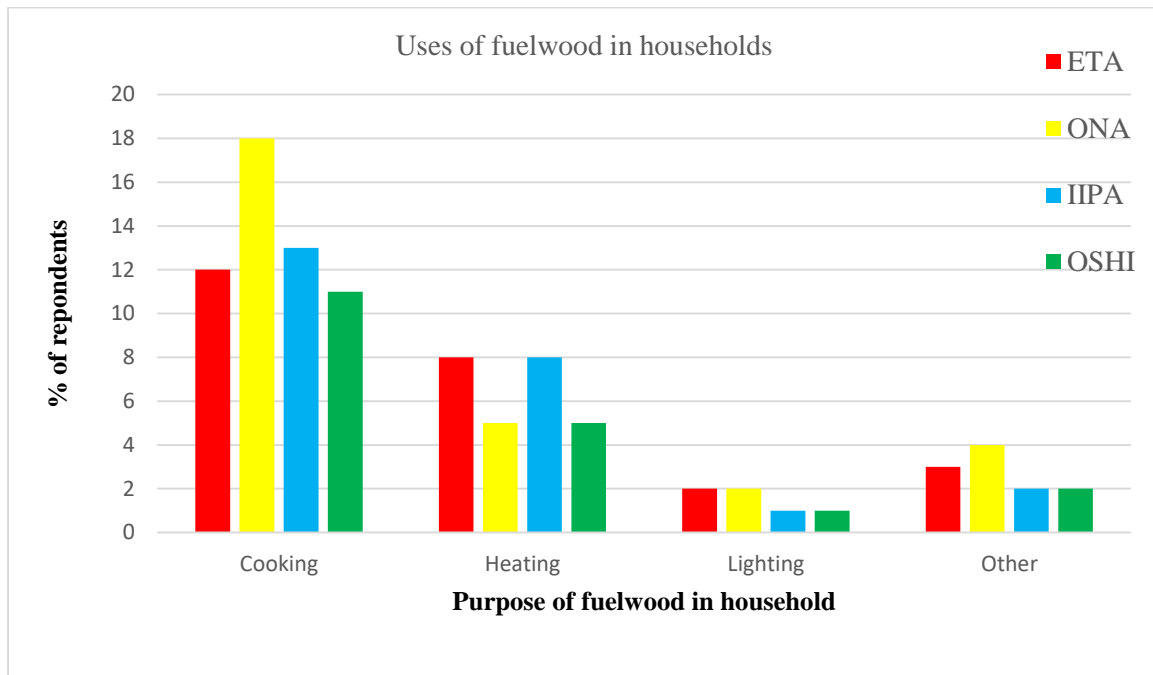


Figure 4. 5: Uses of fuelwood in households.

(a) Wood used for building material

In the rural areas of Onampira, Iipanda, Oshipya and Etayi, people use wood for building material. Respondents revealed that the residents of the Iipa, Ona, Osh and Eta cut down big trees (Figure 4.6 (a)), which are sold to business people to construct lodges, using other local people to build their houses. The headman's houses are always different from the others, because they use lots of wood to build [Figure.4.6 (b)].

Huts are made of wood that are connected together with wire before thatching [Figure. 4.6 (c)]. In all villages, houses are build out of wood [Figure.4.6 (d)]. In all four villages, people build their business infrastructure from indigenous wood. People who sell otombo/epwaka (traditional beers), construct their shops out of wood with the belief that the air circulation is good and prevents their beer from being spoiled fast [Figure.4.6 (e)].

Mopane sticks are tied together and turned into storage baskets for storing mahangu grains [Figure 4.6 (f)]. A household can have up to ten in storage. In all four villages, people are subsistence farmers. They own goats, cattle, donkeys and sheep. The subsistence farmers cut down trees to build kraals as a shelter for their animals. There is no any other material that can be used to construct the animal kraals besides wood [Figure.4.6 (g)].

The youth and adults of Iipa, Ona, Oshi and Eta, who are unemployed, cut tree branches for the fencing of their homes and to sell to other villagers [Figure 4.6 (h)]. The people in all villages need to fence their fields to avoid their crops being destroyed by animal [Figure 4.6(j)]. Milk is stored in calabashes, also made out of forest resources [Figure 4.6(i)].

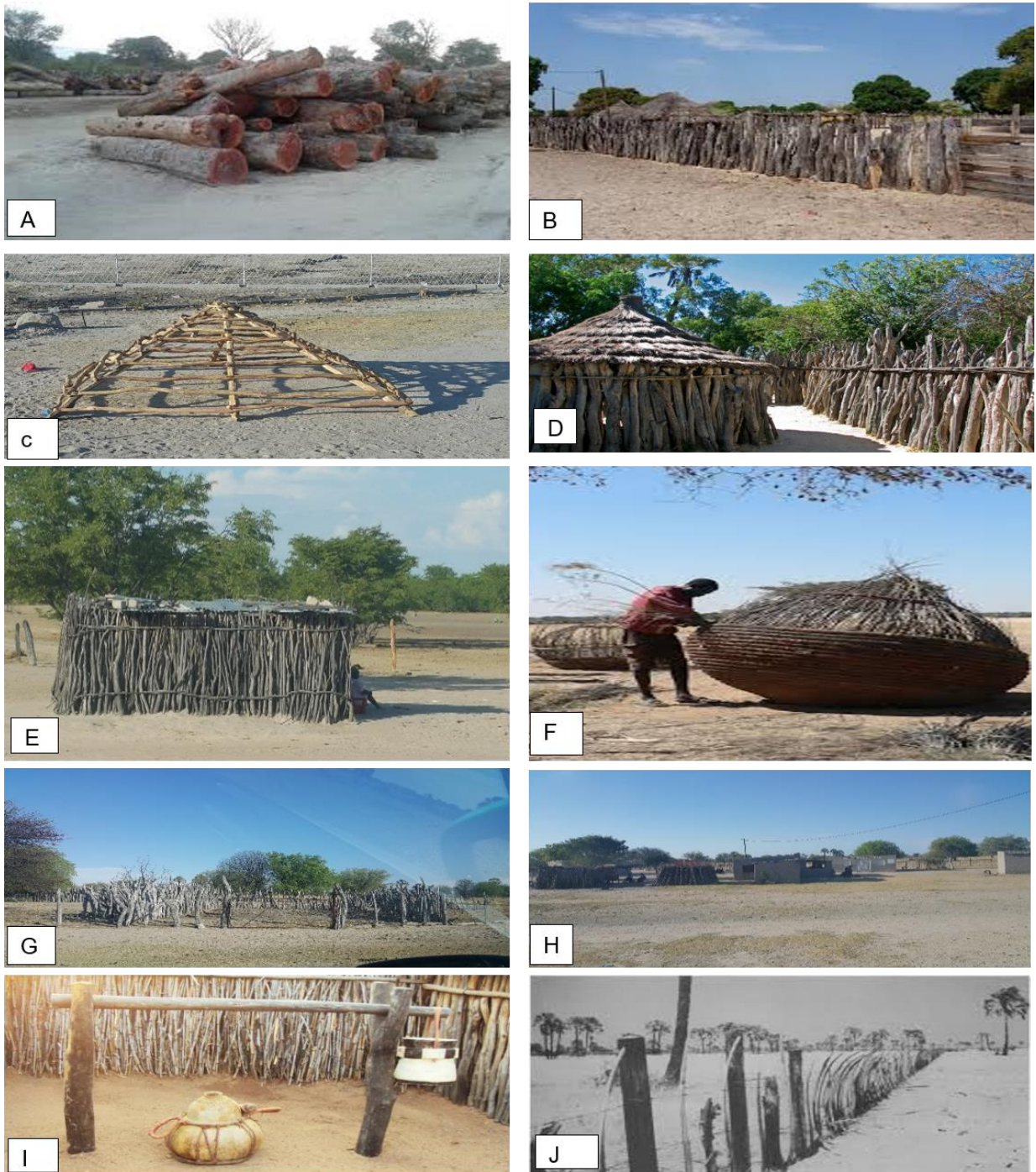


Figure 4. 6: Wood used as building materials.

(b) Wood used for ash

Villagers burn trees for ash (Figure 4.7). Wood ash is rich in potassium, calcium, magnesium carbonate, alkaline with a pH of 10-12, it is water-soluble and can neutralise acidic soil. The use of wood ash goes back centuries ago, probably back to the beginning of fire itself. The Iipa, Ona,

Oshi and Eta villagers burn the trunks of trees in order to harvest ash. Wood ash is an excellent source of lime and potassium for most crops grown in the villages. Wood ash can be scattered on its own on the fields or first mixed with other commercial fertilizers. It depends on which trees species are burned to produce ash for fertiliser because wood ash is not the same. The Mopane is the most common trees species used to prevent omahangu (millet) from being spoiled, while oak and maple produce good ash to prevent beans, nuts and sorghum from being attacked by insects.

Wood ash is a useful control against pest. The salt in the ash kills pests like snails, slugs and some of soft-bodied invertebrates. The farmers sprinkles ash around the base of the crops that are being attacked by pests. Wood ash can change the pH of soil and lower the acidity in soil. Thus, farmers are aware that they cannot use ash for crops/plants that need acids, for example sweet potato and peppers.

Most of the Oshipya villagers do not have access to clean tap water. Most of their clean/drinkable water comes from wells and pans around the villages. They use wood ash as a disinfectant to kill any germs or bacteria in the water before usage.

Christians, like the Roman Catholics, from all four villages use wood ash to symbolise penance, mourning and faith. Traditional healers also use wood ash to heal people from different sicknesses like knee problems and bad luck.



Figure 4. 7: Wood burned to produce ash.

(c) Cutting of indigenous forests for development

In all the villages, people cut down trees to make way for rural schools and electrification (Figure 4.8). It is common practice for an electricity service provider to maintain their electricity infrastructure. This has led to community members cutting down trees under the electricity transmission lines to avoid damage to their properties and animals.



Figure 4. 8: Forests cut for development.

The living standards in cities and towns are very expensive. Some people have moved to the villages. They clear land for space to build houses in rural villages [Figure 4.9(a)]. The migration of people from different places, including neighbouring countries, puts pressure on natural forests, as many cannot afford accommodation in towns. Thus, they clear land to put up their shacks to stay [Figure 4.9(b)].

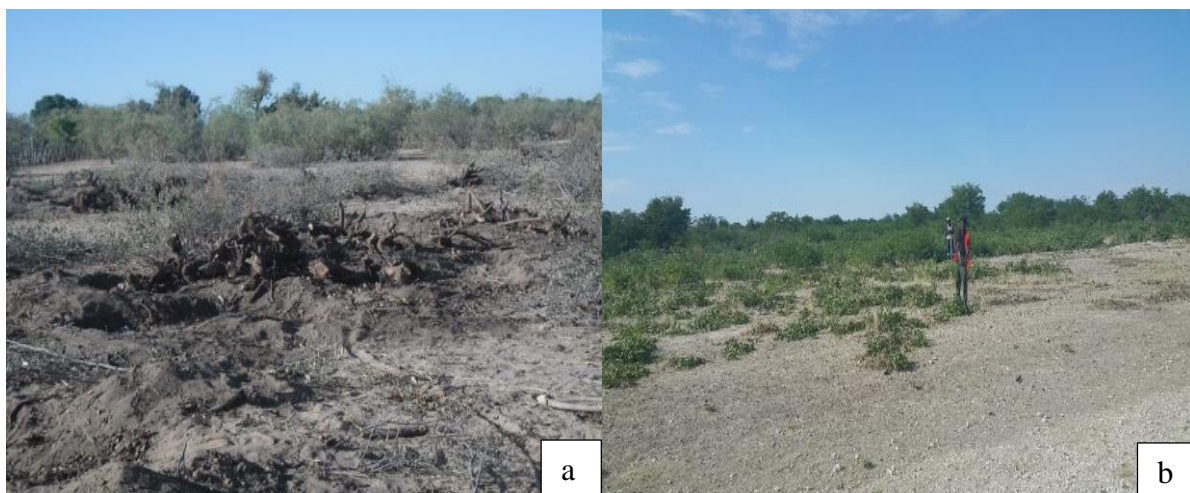


Figure 4. 9: Forests cleared for settlement.

(d) Wood used as fuelwood

Many youths are unemployed and they sell fuelwood to get an income (Figure 4.10a). In all the study areas, wood is the main source of energy in households for boiling water, for warming and

for cooking (Figure. 4.10b). Some villagers uproot the trees during harvesting, making it very difficult for the trees to grow again (Figure 4.10c). This practice has left other villages with bare land (Figure 4.10d).



Figure 4. 10: Wood used as fuelwood.

(e) Forests cleared for agricultural purposes.

The Aawambo culture depends on Mahangu (millet) or Mahangu as source of food. During the rainy season, the Aawambo people flock from urban areas to rural areas to cultivate their fields with Mahangu. They clear the land by cutting down trees for that purpose (Figure 4.11).



Figure 4. 11: Land cleared for settlement.

(f) Wood used as utensils

There are many uses for wood to make utensils. Pestles and mortars are made out of wood. A household can own up to four mortars and ten pestles. Women in all villages use a pestle and mortar to pound Mahangu (Figure 4.12a) into flour, which is used to cook porridge (Figure 4.12b). Aawambo women produce marula oil using a mortar (Figure 4.12c and Appendix C1). Wood can be used to make traditional baskets (Figure 4.12d). The bark of palm trees leaves can be used to weave baskets for different uses in homesteads, for example to carry omahangu (millet) during harvesting (Appendix B1), for winnowing (Appendix B2), used at traditional kitchen (B3), to hold cooked porridge (Appendix B4) and to hold grains (Appendix B5).

Women in the villages can weave basket for selling too (Appendix B6). Wood can be turned into cups (Figure 4.12e). These cups are very important especially at weddings where a bride is required to drink traditional beer (omalovu giilya) (Appendix A1) out of traditional cups (Appendix A2).

In the study areas, unemployed people brew a traditional whisky (ombike) made from palm fruit. For distillation, they use a container made out of wood (Appendix C3). Young men hunt small animals such as rabbit, meerkat and ground squirrels and birds using bows and arrow made out of wood (Appedix D1).

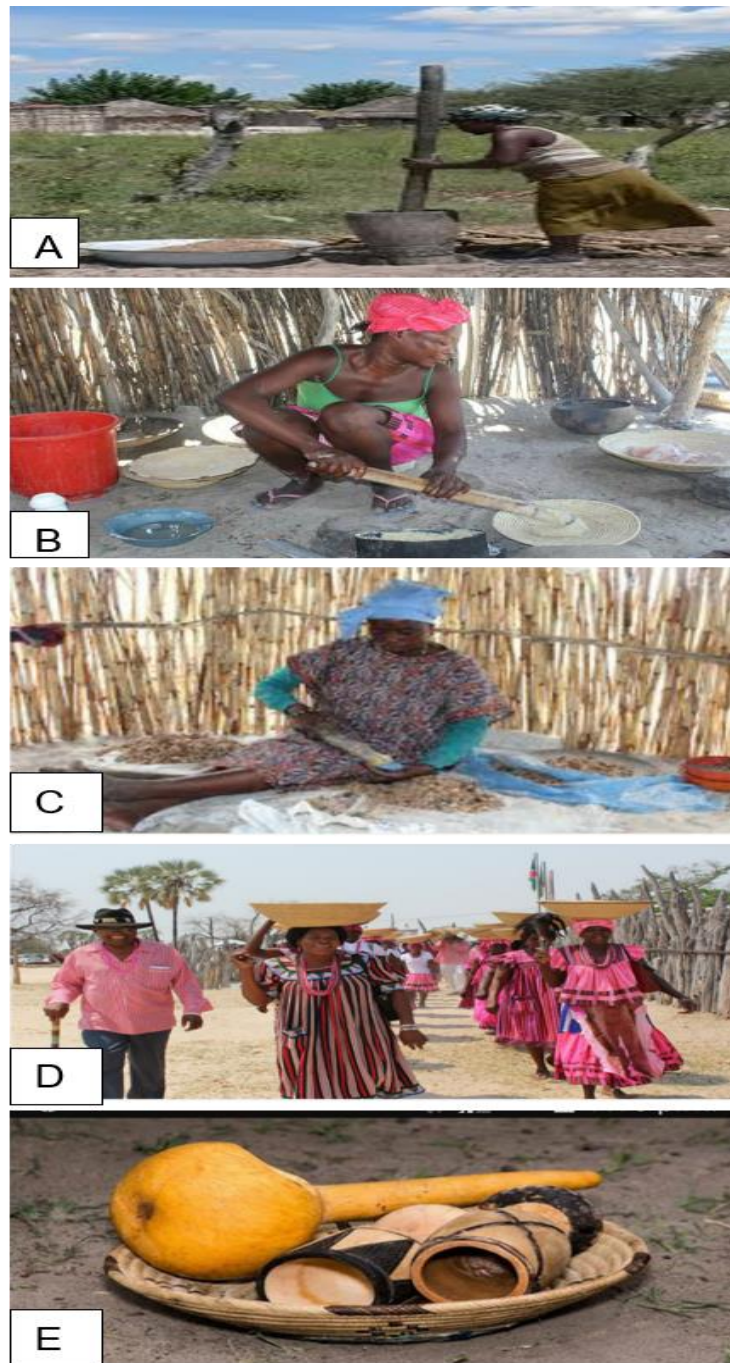


Figure 4.12: Wood used as utensils.

4.3.3. Area of Collection

In all villages, household sources of fuelwood comes from the participants' own plots, surrounding forests and villages further away. It was found that 52% of villagers from Etayi, 27% from Onampira, 30% from Iipanda and 17% from Oshipya (Figure 4.13), collected

fuelwood from their own plots surrounding the Mahangu fields. However, some people had to go to the nearest villages to collect fuelwood.

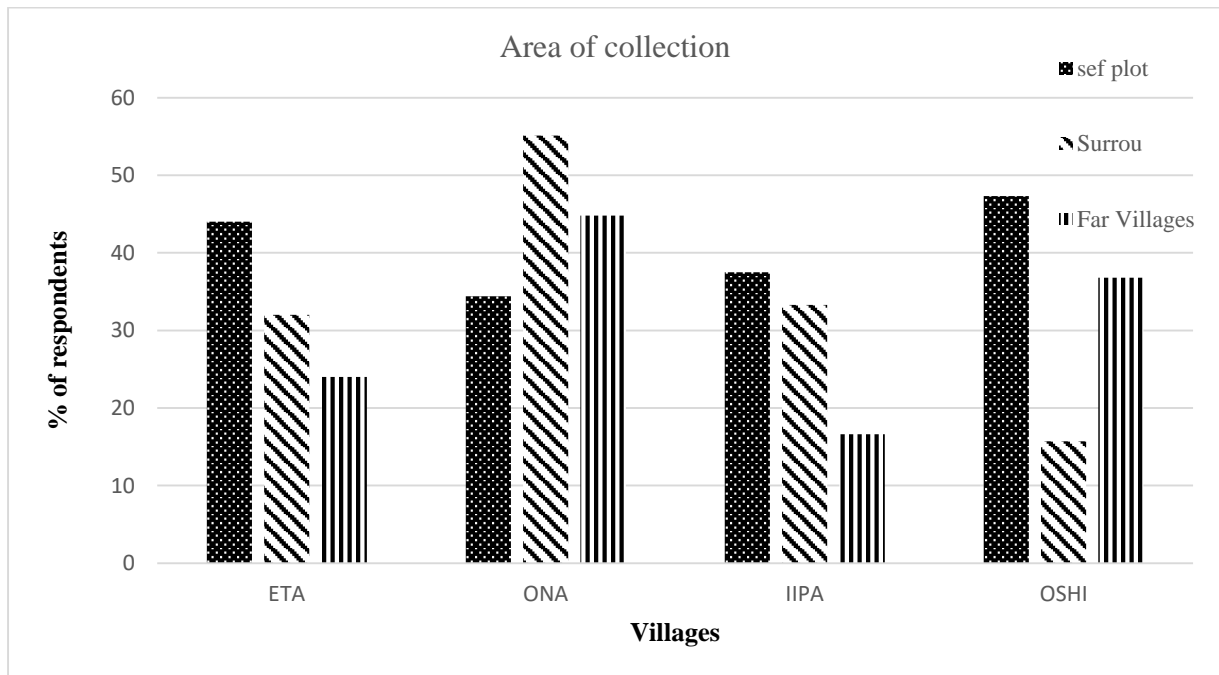


Figure 4. 13: Areas of fuelwood collection.

Women and children are the main collectors of fuelwood at household level, 87% from the villages of ETA, 91% from ONA, 96% from IIPA and 94% from OSHI. Out of the total respondents, 10% from Etayi, 5% from Onampira, 1% from Iipanda and Oshipya, respectively, indicated that men were the main collectors of fuelwood whereas only 14 of all the respondents stated that the responsibility of collecting fuelwood was that of men, women and children (Figure. 5.14).



Figure 4. 14: Women and children collected fuelwood (Iipanda village).

4.3.4. Frequency of Fuelwood Collection

A number of the respondents in all the villages indicated that they collected fuelwood twice to three times a day. Respondents were requested to specify the number of fuelwood used per week. On average, respondents in both villages indicated that they used five bundles of fuelwood per household per week. In general, more bundles could be used if there were extra economic activities, such as the brewing of liquor (Owambo liquor) or traditional beer (Omalovu giilya).

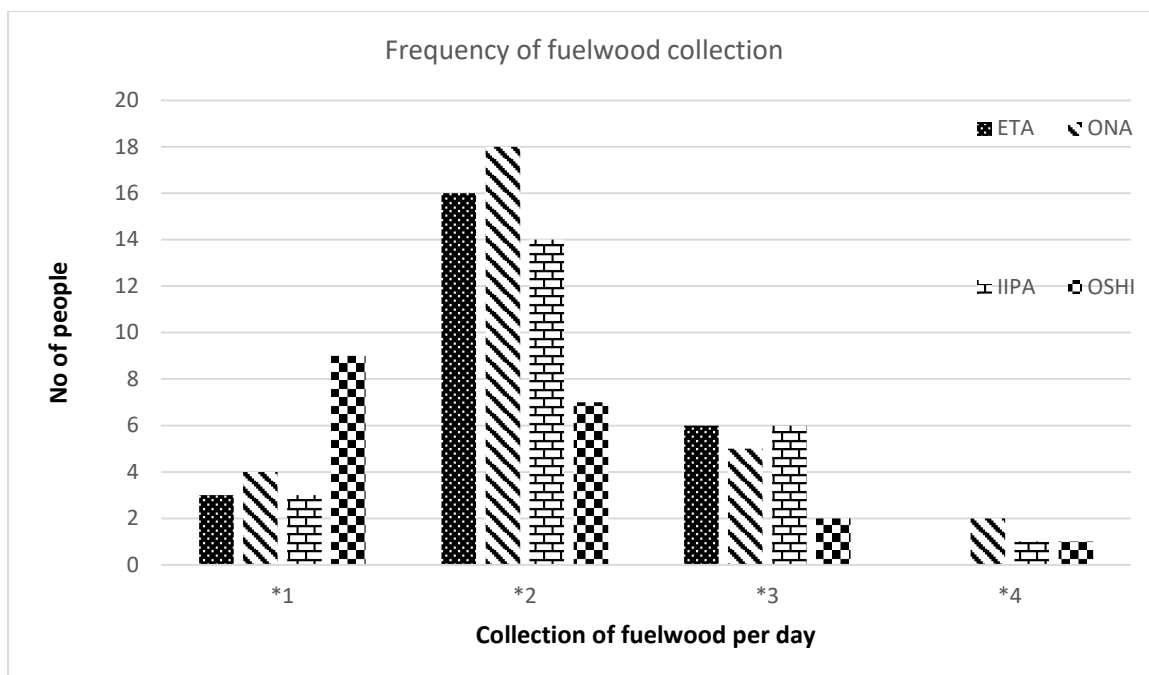


Figure 4. 15: Frequency of fuelwood collection.

4.3.5. Status of Fuelwood Collected

The most common way of collecting wood as fuelwood for the past 15 years was to cut down live trees. Villagers cut down live trees, dried them and split them up into different pieces. However, a few of the respondents in all the villages used the combination of felling a live tree, cutting off dead branches and cutting down dead or dry trees (palm trees and iizimba) as fuelwood (Table 4.3).

Some of the respondents in all the villages bought fuelwood from local cuca shops or at open markets at Oshakati and Outapi. The price of fuelwood bundles ranged from N\$20 to N\$100, depending on the size and type of fuelwood.

Tree roots are also used as fuelwood, but are more expensive than splintered wood because it takes a great deal of energy to dig these from the ground. Respondents indicated that they used a small pickup truck, wheelbarrows and headloads to transport fuelwood to their households.

Table 4. 3: Status of wood as fuelwood.

Status of fuelwood collected	Respondents Per Village			
	ETA	ONA	IIPA	OSHI
Cutting down of live trees	15	14	15	8
Dead branches	4	9	6	7
Dead/dying trees	6	6	3	4

Some respondents explained that winter was the best season to cut down trees for fuelwood. They would fell many live trees and leave them for 3 to 4 weeks to dry and then split them into smaller pieces. They employed two different ways of felling trees as they either cut them down with axes or burnt them at the stem. In addition, the respondents indicated that they uprooted the trees as well and then dried the roots for fuelwood. They saved up fuelwood for the rainy season (summer). Clay pot makers also used wood to bake their pots. They preferred semi-dry wood as fresh wood burnt more slowly and gave off less heat.

4.3.6. Preferred Species for Fuelwood

Respondents were asked to list the characteristics of the wood species they regarded as the best for fuelwood. The characteristics are explained in the Table 4. 4.

Table 4. 4: Characteristics of the best wood species for fuelwood.

Category	ETA: % of responses	ONA:% of responses	IIPA: % of responses	OSHI: % of responses	Description of best species	Species
Safe to burn	52	51.7	50	42.1	Makes quality ash for crop, odourless	<i>Terminaliapruinides</i>
User friendly	28	27.5	29.1	31.5	Easy to split, not heavy to carry when dry	Mopane
Burns efficiently	12	17.2	10.3	15.7	Burns longer; remains burning till the next day; safe for pots	Mopane
No idea	8	3.4	8.3	10.5	No comparison; utilise only one/any species available	

Respondents from Etayi and Iipanda indicated that some species, such as the *Euclea divinorun*, were never used because of their cultural value. Elders indicated that this species had been used by their forefathers to treat some diseases, such as epistaxis, and it was under those trees that small children were buried. Other species, such as *Boscia albitrunca*, were regarded as bad because they caused stomach ailments when food was prepared on them. Furthermore, they

produced a cloud of smoke, odour and sparks, which could cause breathing problems, eye irritation and influenza. Sixty two respondents recommended species such as *Terminalia pruinoides*, as the best to use, even at the time the rainy season, because it did not absorb much moisture and produced a great deal of ash, which Aawambo people used when storing millet, sorghum, beans and nuts to prevent these from being spoiled by insects.

4.3.7. Adjusting Household Energy

Respondents were asked to indicate whether they adjusted their household energy usage according to the seasons and time of year. A total of 77% of the respondents from ETA, 83% from ONA, 91% from IIPA and 90% from OSHI indicated that the use of fuelwood in households changed from time to time. Of the participants, 83% from ETA, 96% from ONA, 93% from IIPA and 90% from OSHI stated that they used more fuelwood in winter than in other seasons.

As winters were cold, villagers kept fires burning at the oshoto (traditional sitting areas) in their households throughout the day to keep themselves warm. During the night, participants warmed the bedrooms in their huts. Respondents states that in winter there were more traditional meals to prepare, such as fresh beans, groundnuts, maize and water melon brew. In addition, at the time crop harvesting (between May and August), households burnt more wood to obtain enough ash needed for preserving their stored crops from being spoiled. Respondents indicated that this was the time when men earned more when they cut down trees to build traditional wheat and millet storage areas. However, a few respondents indicated that the collection of fuelwood remained the same throughout the year, except in the rainy season when wood was collected only when it did not rain. Rain made it difficult for villagers to travel to nearby forests and the split wood stayed wet. Others used more fuelwood during rainy schooldays as they had to prepare lunch packs and iron school uniforms.

In the IIPA and ETA villages, energy use increased due to the harvesting of caterpillars. People would flock from all corners of the region to collect caterpillars and they needed hot ash to dry them.

4.3.8. Other Uses of Forest Resources

Respondents were asked to indicate other uses of forests resources, apart from fuelwood. The participants indicated many other uses of forest resources as outlined in Table 4.5.

Table 4. 5: Other uses of forest resources.

Villages	Response
Etayi	Furniture (table, chairs,) utensils, kraal, fish traps, building materials
Onampira	Fencing, kraal, building houses, fencing
Iipanda	Fencing, building materials, kraal,
Oshipya	Kraal, fencing, fish traps, furniture, utensils

4.3.9. Permission to Use Forest Resources

Of the 97 respondents in this study, 42 (11 from the villages of Etayi, 14 from Onampira, 11 from Iipanda and six from Oshipya) were very uneasy about answering this question. However, they indicated that sometimes they needed permission from the headman, depending on how fuelwood was collected, and sometime they did not need permission. Respondents indicated that even if the law required that one needed the headman’s permission to cut down live trees, villagers did not obtain it. They felled the trees illegally, claiming that it was a gift and that no one needed to control it.

The rest of the respondents 14f from Etayi, 15 from Onampira, 13 from Iipanda and 13 from Oshipya, indicated that it was a requirement to obtain permission to fell live trees but that they ignored it because it was a and time-consuming process, and also placed a limitation on the number of trees they could cut down. All 97 respondents from all four villages were aware of the reasons permission should be given to people who wanted to cut down live trees, namely to conserve the trees for future use, avoid the depletion of the forests, prevent deforestation and prevent the constituency and the region at large from becoming a desert.

4.3.10. Other Alternative Sources of Energy

Respondents were asked what they would like as an alternative source of energy. The majority of the villagers preferred electricity as can be seen in figure 4.16. Those who opted for electricity reasoned that it was safe and user-friendly, and those who opted for solar stated that solar energy was affordable and non-pollutant. Furthermore, they believed that it was effective since Namibia

had enough sunlight. None of the respondents opted for gas as it was expensive, a health hazard and dangerous if not handled with care.

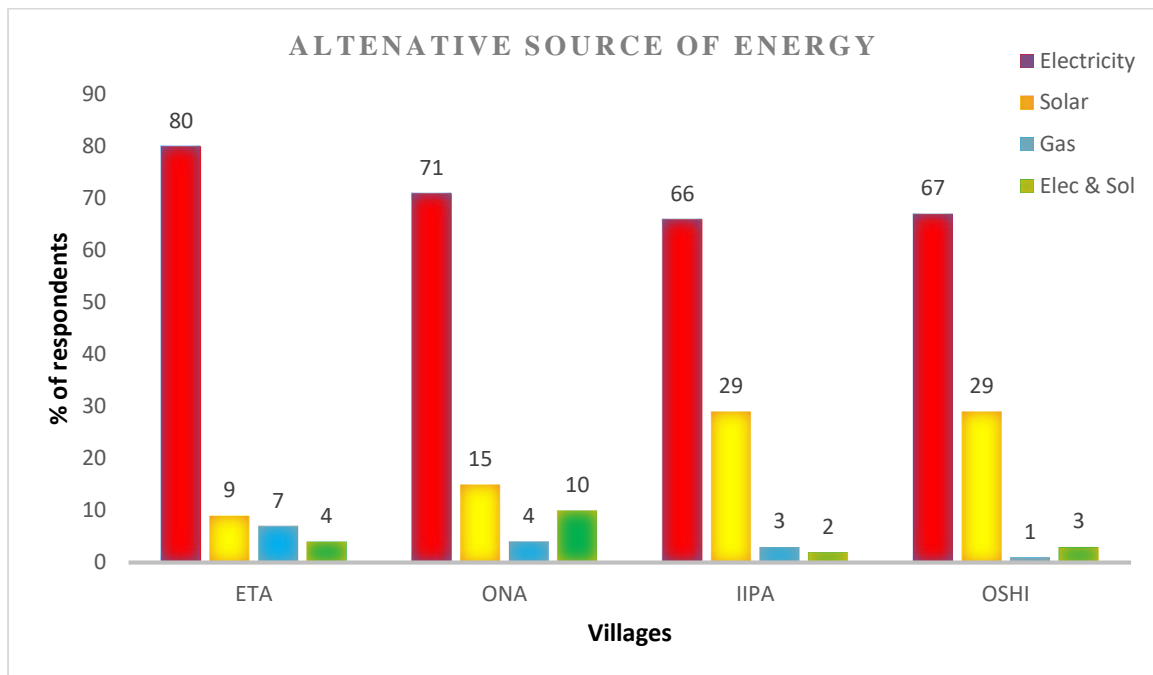


Figure 4. 16: Alternative sources of energy envisaged by respondents.

4.3.11. Scarcity of Fuelwood

All respondents (100% in Onampira and Oshipya) indicated that the scarcity of fuelwood in their households affected their lives economically, nutritionally and culturally. Cultural transmission among the younger villagers changed by the shortages of fuelwood. A few instances of customary practices that rural households used to perform incorporated the preparations of some traditional food, such as, Cleome gynandra (which requires much fuelwood), as well as warming of the main bedroom for ladies (ondjugo) and making fire in the living area (oshoto) which they used to do prior sunset. Households began distributing a part of their monthly spending plan for fuelwood and different fuels, such as, paraffin, particularly during the stormy season. Respondents indicated that they had to reduce the preparation of drinks, such as Omalodu and Owambo liquor. Omalodu is a traditional drink made from sorghum meal, which is boiled for at least more than one hour and the preparation requires much fuelwood. Owambo liquor takes two hours of preparation as it is made of palm tree seeds and requires lots of fuelwood.

The Etayi and Iipanda villagers still collected fuelwood from the remaining forest and still practised the above-mentioned traditional practices, although all the participants appeared to be worried that one day they would have to face the scarcity of fuelwood.

Table 4. 6: Concerns about fuelwood scarcity.

Villages	Concerns: fuelwood scarcity	Reasons
ETAYI	100% worried	<ul style="list-style-type: none"> -Before Independence one could not see the neighbour's house -few forests left -No wild animals anymore -Soil is infertile
ONAMPIRA	100% worried	<ul style="list-style-type: none"> -No forests left to hide when nature calls - No more rabbits or birds - Low rainfall - Very few trees left - No more fuelwood - Animals such as cattle and goats have no shade - Even the palm trees are gone - The little omano and iizimba have been depleted
IIPANDA	100% worried	<ul style="list-style-type: none"> - Rainfall patterns changed over several years - Too much heat from the sun - No shade for people and animals - Travel long distance to collect fuelwood - Fewer trees (like mopane) left - No more birds - No more wild animals
OSHIPYA	100% worried	<ul style="list-style-type: none"> -The landscape has changed -Forests cover decreased too much -The villages look like the desert -No shade for people and/or animals -The environment looks ugly - Too much heat from the sun

4.3.12. Impact of Cutting Down of Trees on the Environment

All respondents (100%) in Onampira, Oshipya, Iipanda and Etayi raised their concern about the impacts of cutting down of trees on to the environment. They are worried that in future, their villages will turn into a desert and they will be forced to migrate to other regions.

Table 4.7: Impact of cutting down trees on the environment.

<i>Villages</i>	Concern of respondents about the impacts of cutting down of natural forests
<i>Etayi</i>	Loss of trees cause climate change, It is casing desertification and soil erosion It cause low rainfall. Polluted air Lack of oxygen
<i>Onampira</i>	It contribute to global warming Reduced transpiration thereby reducing rainfall Reduce the amount of oxygen in the atmosphere Leads to loss of animal habitants Leads to soil erosion
<i>Iipanda</i>	Caused soil erosion Severe drought Periodic flood Leaching Less photosynthesis, cause a drop in oxygen levels in the atmosphere Less photosynthesis cause less carbon dioxide to be removed from the air, which result in global warming. Caused extinction of species, which lead to the loss of biodiversity.
<i>Oshipya</i>	More pollution occurred because of burning and smoke – combustion

	<p>A loss of income results because of less tourism.</p> <p>Disruption of food chains and food webs is a result of deforestation.</p> <p>Extinction of species lead means loss of sources for medicine and other chemicals.</p>
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4.4. The Role of Traditional Leadership

The main aim here was to investigate the role of traditional authorities in managing the forestry and the collection of fuelwood at the study site. Regarding the frequency of the meetings on forestry and fuelwood-related matters, one headman indicated that about seven years ago, they used to have meetings annually. However, they did meet when necessary, more especially when a new policy was introduced. Traditional headmen were aware of their role with regard to fuelwood and forest management in their villages (Table 4.7). From villages headmen interviewed three (3) were over eighty (80) years of age. Only in Onampira, the young headman was 39 years old. However, he was mostly occupied with other business and appointed a 76-year-old man to act on his behalf.

Regarding the obstacles that prevent headmen from achieving their objectives, Table 4.8 shows the headmen’s responses.

Table 4. 8: Role of headmen in managing resources.

Headmen	Objectives
ETA	Takes initiatives in organising initial community meetings in connection with forests.
ONA	Provides leadership support about forests conservation.
IIPA	<p>Identifies forest boundaries for their villages</p> <p>Approves areas to be cleared</p> <p>Approves harvesting of fuelwood in his village by other people from other villages.</p>
OSHI	<p>Acts as a chairperson or member of forest management plan</p> <p>Approves management forest plan for villagers</p> <p>Connects the villagers with the government</p>

Table 4. 9: Obstacles headmen encountered in managing forest resources.

Headman of:	Response regarding obstacles
ETA	<p>Grown up and did not have energy to deal with forestry and fuelwood-related matters as they required much movement. Government did not recognise them in terms of reimbursement for managing the forest.</p> <p>Ignored by villagers.</p> <p>Policy and regulation documents written in English, which were not well understood.</p>
ONA	<p>Government did not empower them to deal with those felling live trees without permission. Government took long (even one to two years) to act on a case reported to them by the headman and Government did not pay them for any work related to forests and fuelwood.</p> <p>Villagers did not recognise them and ignored their instructions.</p> <p>Traditional fees for transgressions were very low and transgressors did not feel it.</p>
IIPA	<p>The village was very big and could not be controlled by one person.</p> <p>Villagers and people came from other villages during the night.</p> <p>Villagers did not adhere to the policy against felling of live trees.</p> <p>Those who were fined because of offence related to forestry never paid.</p> <p>Government did not pay them for work done.</p> <p>Used own money to travel to meeting point which was sometimes very far.</p> <p>Poor meeting attendance. Increased number of people in the villages.</p> <p>Complicated government policy.</p>
OSHI	<p>Poor meeting attendance.</p> <p>Advanced in age and could not deal effectively with conflict concerning forestry. It required much energy.</p> <p>Ignoring of instructions by villagers.</p> <p>Too much deforestation. Felling of live trees without permission.</p>

Traditional leaders were not in agreement with who should give the instructions. Two headmen in Onampira and Iipanda indicated that community members should take instructions from their traditional leadership. Such preference was due to the area’s long history of traditional governance. The headman of Etayi wanted the villagers to take instructions from the government, because the government had more power. The Oshipya headman wanted villagers to take instructions from both government and traditional authorities because he could not govern effectively. Government had the advantage of authoritative power and traditional authorities interacted with people from time to time and were members of the community.

Table 4. 10: Preferred authority to manage the forests.

Headman	Traditional Authority	Government	Both
ETA		√	
ONA	√		
IIPA	√		
OSHI			√

According to the headmen of the villages, ETA, ONA, IIPA and OSHI, the government had introduced certain programmes. The government had meetings with villagers and explained to them what alternative sources of energy there were, such as solar energy and cooking pots that used less fuelwood. This did not help because the majority could not afford to buy the solar set, as it was expensive, with a price ranging between N\$ 2000 and N\$ 20000, while the pot that used less wood was ineffective, as every household required three to four pots. The forestry department informed the villagers to start up reforestation processes.

Additionally, there were programmes to sensitise community members to the impact of fuelwood collection on natural resources. All headmen indicated that they had called meetings where villagers were informed about the danger of forest depletion, also called deforestation. They were informed about the effects of climate change, for example low rainfall, severe drought and periodic flooding. The benefits of the forest to the environment were also explained in meetings. The high absenteeism of community members at meetings led to the ineffective implementation of programmes and this was the key challenge to managing forests in their area of jurisdiction. Furthermore, they said that there were regulations for fuelwood users but these were not effective and penalties issued to transgressors were not paid.

All four headmen believed that the current management of forestry resources was not their core responsibility since they had never been paid for it. Regarding whether they managed the forests and fuelwood collection satisfactorily, all headmen said that they did not. According to them, the villagers believed that they had a democratic right to collect fuelwood without regulations and most of the fuelwood and forest regulations were met with resistance.

4.5. Responsibility of the Department of Forestry in the Ministry of Agriculture, Water and Forestry

An official from the Department of Forestry in the Ministry of Agriculture, Water and Forestry was interviewed, with the aim of investigating the role of the line ministry in matters related to forest resources. He reported that The Department of Forestry has ensured that government community forestry programmes were being implemented and informed government of their progress. They assisted in forming community-based organisations (CBOs) and community-based natural resources management (CBNRM). The department provided maximum policy guidance in CBNRM, which included community forestry, as well as monitored and ensured that forest management operations adhered to laws and regulations. They identified human resources and training related to the impact of fuelwood collection and forest depletion on the environment. Furthermore, they provided guidance and technical backup for the implementation of forest management plans in communities.

The officials encouraged the community members to collect dead trees and branches as fuelwood and not to fell live trees, as well as to collect fuelwood for subsistence only. The respondent indicated that they discouraged community members from collecting fuelwood for commercial purposes. The official stated that where large parts of the forest were removed, the department applied charges that were market-related. Another way of ensuring that forests were not depleted by fuelwood collection was mainly through education and awareness campaigns where they educated people regarding the importance of forests for the environment. It was very difficult, but critical, to provide direction on matters related to fuelwood collection, as it was the only source of energy freely available.

It was noted that the forests had been depleted rapidly due to human activities. Rural communities depended a great deal on forest resources for survival. It was a tough process for the ministry to change its mind-set. The official indicated that they were supposed to meet once

a year with both local government and traditional leadership to discuss forest conservation, benefits to the environment, as well as how fuelwood collection could be managed and suggest alternative sources of energy to fuelwood. She noted that, in most cases, the meetings were ineffective due to poor attendance by community members but they could be effective because, through them, relationships and coordination between the forestry department, local government (councillors), traditional leadership and their communities could be improved significantly.

4.6. The role of the local government (Constituency Councillor) in managing indigenous forests

A similar set of questions that had been posed to the four traditional headmen, were posed to the Etagi constituency councillor to obtain the view of the government representative in managing forest resources. The councillor provided support for CBNRM in line with the regional development policies. He acted as a messenger between the constituency, the governor and communities. His responsibility was to ensure that fuelwood as forests resource was harvested at a level that did not compromise sustainability. The councillor met with forestry officials at their offices, his office and in villages to discuss matters related to forest resources. Meetings held at villages were discouraging because of poor attendance and the non-compliance of community members with the policies and regulations.

The councillor indicated that some communities preferred to respect the authority of traditional leadership, while others wanted both government and traditional leadership to tell them what to do. The cases of those not complying with the regulations of forest management were referred to the forestry department at the MAWF.

4.7. Summary

The responses regarding the overall harvesting of fuelwood gave an indication of the reason for forest depletion. The lack of well-defined and coordinated fuelwood management efforts highlights unregulated harvesting. The seriousness of the problem is also underscored by the harvesting of fuelwood and other forest resources for selling because there is no institution which can ensure the implementation of measures/regulations preventing over-exploitation. The responses of traditional leadership, local government and the Department of Forestry indicate a breach in policies and absence of coordination amongst the interested parties.

CHAPTER 5

DISCUSSION

5.1. Introduction

This chapter discusses the key findings that were presented in Chapter 4 as per the objectives and questions of the research. It refers to rural communities' dependence on fuelwood and its impact on natural forests. The chapter also looks at the role of the traditional authority and the concerned government department in managing the forests.

5.2 Profile of fuelwood collectors per household

The socio-economic structure of communities has direct consequences for natural forests. Rural communities are economically disadvantaged, or less well off, and dependent on forest resources for domestic use and the generation of household income.

In this study, 97 respondents were approached to participate in the survey. 61% of the respondents were unemployed while, 18% were informally employed. Only 21% of the respondents had formal employment. Unemployed people in the study villages use the most readily available forest resources and are more likely to engage in unsustainable fuelwood exploitation practices. Concurring with other studies (Negumbo, 2004; NSA, 2012; Hainduwa, 2013;), this study found an ostensible division of labour between gender, where women and children were the ones in charge of home responsibilities; including fuelwood collection. This supports the FAO (2010) findings that too pointed out the impact of fuelwood collection on household practices/exercises and livelihoods.

The strength of utilising forest species is determined by its needs. In the study areas, the mopane tree was the most favoured source of fuelwood due to its high heat intensity (ability to burn longer, producing stronger embers and being easy to cut). It does not produce a strong smoke that cause headaches and runny noses, thus it is regarded as safe to use and is in close proximity to the villages. Other species, like *Terminalia Pruinoides*, were preferred for their high quality of ash. In the studied villages, households used wood ash to protect grains from weevil attacks and to increase soil fertility when applied to crop fields.

In Namibia, the collection of fuelwood in the four villages changed with the seasons, causing an adjustment of household energy consumption. Thus, fuelwood collection varies from one village to another. In ETA, 13 households collected fuelwood in winter. In ONA, 19 collected fuelwood in both winter and summer, while, in IIPA, 13 households collected fuelwood in winter and in OSHI, 8 households collected in both winter and summer. Most households cut live trees in winter and reserved the wood for rainy seasons.

The harvesting of live bushes for fuelwood affects the sustainability of the household's energy use. Removing and cutting live bushes during the wrong season disturbs the cut stumps when 'shooting up' as well as restoration. Thus, the height at which stumps are cut, as well as the age or size of the trees (Zimmerman & Joubert, 2015) will slow down a regrowth process. In the case of the Oshipya village, the regrowth of the cut stumps would also be determined by the species' ability to survive during seasons with excess water because the area is allegedly flooded during the rainy season.

Hazards to the existing forests are plentiful due to the frequency of fuelwood collection and, in some cases, the high volumes harvested. Such pressure is likely to deteriorate the environment and lead to the depletion of forests (Strohbach & Walters, 2015). In some African countries, such as Nigeria, the excessive collection of fuelwood has led to huge soil erosion, decreased water quality and dam siltation. Decreased forests could further increase pressure on the remaining forest cover.

Forest depletion causes fuelwood scarcity, which affects women's contribution in other socio-economic activities, as well as in the education of children. Women in all villages have trouble in assigning time for other events, particularly at the time of harvesting and felling of live trees for fuelwood. Thus, women walk long distances and lose more of their spare time busy searching for fuelwood because of the scarcity of fuelwood (Jan & Pervez, 2015).

Additionally, the collection of fuelwood, particularly in areas where the forest has been depleted, affects children's performance in school. In some African countries such as, in Kenya and Malawi, fuelwood and water collection prompted the poor school enrolment of girls. They (girls) could not pursue their studies up to the secondary phase because, in some households, the time consumed on searching for fuelwood could be up to 10 hours. Thus, children are left with very little time to complete their homework and prepare for examinations (WHO, 2006).

5.3 Management of cutting of forests by Communities: Traditional Authorities and Government

Based on responses, there is a loophole in the management of forest resources in the study areas. Although there are clear policies in the management of forest resources by the Department of Forestry, initiatives, such as reforestation, the establishment of community-based, natural resource management organisations, seem ineffective due to several reasons, such as a lack of funds, traditional leaders not in full support of government initiatives, poor attendance of meetings etc.

In many cases, the forest cover is characterized by ‘open accesses. This situation is not unique to the study areas. It is noted that in Nigeria, uncontrolled access to local, communal, forestry resources and the absence of defined property rights have led to the major destruction of the ‘open’ forest resources (Ndamase, 2012). Similarly, to Ethiopia, in the absence of responsibility, the need to bring additional open access forests under the management of communities and increase local awareness regarding the forest’s management between stakeholders, local people have continued to exploit forest resources unsustainably to meet their immediate needs, which, in turn, further caused the depletion of forests (Ndamase, 2012).

The seeming failure of traditional governance systems with regard to fuelwood collection and management is a threat to the sustainability of forests in the study areas. None of the headmen indicated that their meetings with villagers were productive. The absence of villagers at meetings to discuss issues related to forest resources indicates a lack of interest in conserving the forest. This situation is not unique to the study areas. In South Africa, areas where fuelwood users harvest without any regulations are also characterised by weak, traditional governance systems, which impede guidance or policing of the misuse of local forest resources. In addition to the absence of regimes catering for fuelwood management, high poverty levels are another reason for the heavy reliance on fuelwood (Tee *et al.*, 2009). In neighbouring South Africa, more than 80% of people residing in rural areas still use fuelwood as the main source of energy. These discoveries reflect those in the study areas, which are characterised by poverty and a high unemployment rate (Ndamase, 2012).

Forestry department policies restrict fuelwood collection for domestic use to be carried on head. It thus implies that other modes of transport are also used to collect fuelwood. The forestry officer indicated that traditional authorities were in a better position to control the collection of fuelwood in areas under their own jurisdiction. A lack of motivating factors (in terms of remuneration) for traditional leaders by the government appears to be the main, contributing factor to the depletion of forests. The lack of understanding among community members regarding their own participation in conservation activities of forests leads to forest depletion at a rapid rate in all four study areas.

The DoF conducted awareness campaigns regarding the importance of forests for the environment. They went further, and invited officials from the Ministry of Mines and Energy to explain the use of alternative sources of energy. In most cases, the meetings were ineffective due to poor attendance by the people who needed the information. The development of community-based organisations is well founded in all the studied villages but there remain obstacles in the way of implementation.

5.4. Impact of forest depletion on natural forests

The process of forest depletion, known as deforestation in Geography, has many negative effects and in the long-term, there are dangerous consequences to the environment, such as global warming, loss of biodiversity and soil degradation (Mahapatra & Kant, 2005).

As far as global warming is concerned, it is noticed that deforestation and forest degradation in many African countries are accountable of about 18% to 20% of the expanded emission of ozone depleting substances (GHGs) that are in charge of a worldwide temperature alteration and climate change (Tindan, 2013). There is a connection between deforestation and global warming since forests are significant carbon sinks. The loss of forest in numerous nations implies the breakdown of significant carbon sinks and the generation of more carbon dioxide, which is a danger to the global climate and distribution of air temperature.

However, the economic impact of climate change are unclear and not easy to quantify. These are clearly noticeable and are known to influence the economically disadvantaged people and their occupations, especially agribusiness, in developing nations, such as Namibia, where the recurrence and harshness of drought increases (Wilhelm, 2012; Tindan, 2013).

Additionally, the depletion of forests in the environment rise surface temperatures over the treeless ground and builds the water-holding ability to release the hotter air. Thus, wind moves the warmer, drier air. It will, in general, apply a drying impact on adjoining forests and horticultural land. Trees and yields outside stripped zone experience heat and aridity stress which is not ordinary to their geographical location (Bonan, 2008). This will lead to high evapotranspiration, which adds to the increased aridity of the land, which may prompt desertification (Tindan, 2013).

All headmen indicated that forest depletion in their villages had led to the loss of biodiversity, which compromised intervention systems. However, this is hard to validate, especially as far as cross-ecosystem effects are concerned. It is indicated that when trees are cleared, the forest never again maintains a similar untamed life or clean water as productively as it did previously and this may put its occupants in risk. The Oshipya headman indicated that the village looked like a desert with no animals or birds in sight.

In the study areas, soil degradation, generally loss of soil richness is a known impact of the loss of forests to grassland. It has been realized that forest vegetation and biodiversity have turned out to be essential in the support of soil nutrients. This is because, as the branches, leaves and roses tumble to the ground or as roots die, the various soil-dwelling animals and bacteria follow up on them, changing the forest litter into organic matter, which reliably affects soil fertility. This is because, as the leaves, flowers and branches fall to the ground or as roots die, the numerous soil-dwelling animals and bacteria act on them, transforming the forest litter into organic matter, which has a reliable impact on soil fertility.

A close connection between forests depletion and poverty for households in rural areas is an established, policy account in the development dialogue. This is because that expanded deforestation implies loss of livelihood assets and pessimistic results, such as, the loss of income, food, medicine, employment and power for the majority of the people in the world.

5.5. Mitigating overexploitation of forests resources

Indigenous people groups' entitlement to land and resources ought to be perceived and, if necessary, suitable lawful structures ought to be created to ensure such rights. Effective forest resources management is best accomplished through local participation. It ought to be based on discovering shared belief, permitting adequate time for common comprehension and acceptance of objectives and strategies, making and keeping transparency throughout the process, and recognising that goals will change and that collaboration does not mean consensus.

Survival is regarded as cultural survival for indigenous people. Forestry service activities are methods towards an end, not an end in themselves. For instance, the survival of local languages is key to the maintenance of local natural information and values. Indigenous people should partake in activities supporting their intellectual property rights and bioprospecting (Clay *et al.*, 2000).

Poverty is the main driver for the destruction of forest resources. Poverty can be regarded as a great threat to the environment in the study area. Poverty, population expansion and the environment are viewed as a vicious cycle that eventually leads to the breakdown of environmental systems. The sustainable utilisation and management of natural resources can lessen high poverty levels among communities and this would guarantee a continued supply of environmental goods and services that can be exploited to reduce poverty. The attainment of such initiatives would require communities to be informed properly regarding the sustainable exploitation of forest resources. Leaders in communities need power and legal force to manage the forests in their respective areas. This would require concerted efforts that include fuelwood users, the forestry department, traditional authorities and local government (Ndamase, 2012).

5.6. Challenges in managing Namibia's forests

People consider things in their surroundings to be a part of the environment. The forest is viewed as the people's' personal sphere'. People do not think about themselves as being part of the environment but better than it is and responsible for controlling different parts of the earth.

The challenges of managing the forests are many and varied depending on one's perspective and professional orientation. The dry condition in Namibia limit growth and the yield of forest

products is different from those from wetter countries in Southern Africa. High demands of land and wood by rural communities put pressure on an already constrained system. The threat of climate change, with expected vulnerability to droughts, will most likely necessitate a variation in approaches that may have high costs for Namibia.

Namibia, as other natural resources-based economies, may want to utilise the natural resources to develop economically. Thus, there is a strain to utilise resources and this requires a proper controlling act between the protection of forests for biological functions and the necessity for direct economic use of the similar resources.

Therefore, maintaining forests for their dynamic functions tends to restrict use and make it politically difficult to implement in a developing country such as Namibia. A lack of understanding and knowledge among community members concerning the benefits and importance of forests on the environment is high and not easy to be controlled because of traditional beliefs, pride and poverty. Inadequate information and unaffordability of solar energy makes it difficult for the community members to do without forest resources such as fuelwood.

5.7. Summary

This chapter discussed the key findings in detail, and matches them to evidence from previous studies conducted in Namibia and other countries. The findings revealed that villagers used fuelwood mainly for household and less for commercial purposes, thus, putting a massive burden on the forest resources. A loophole in the structures for forest resource management by traditional authorities, local government and the forestry department, has worsened the problem of overexploitation. Based on observations, it can be argued that there is an apparent shortage of coordination amongst the actors in the management of forests and forest resources.

In the next chapter, conclusion and recommendations are made.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

This chapter gives an outline of the key findings in connection to the aims and objectives of the study. It identifies gaps for future research, as well as provides potential recommendations for policies to authorities in Namibia.

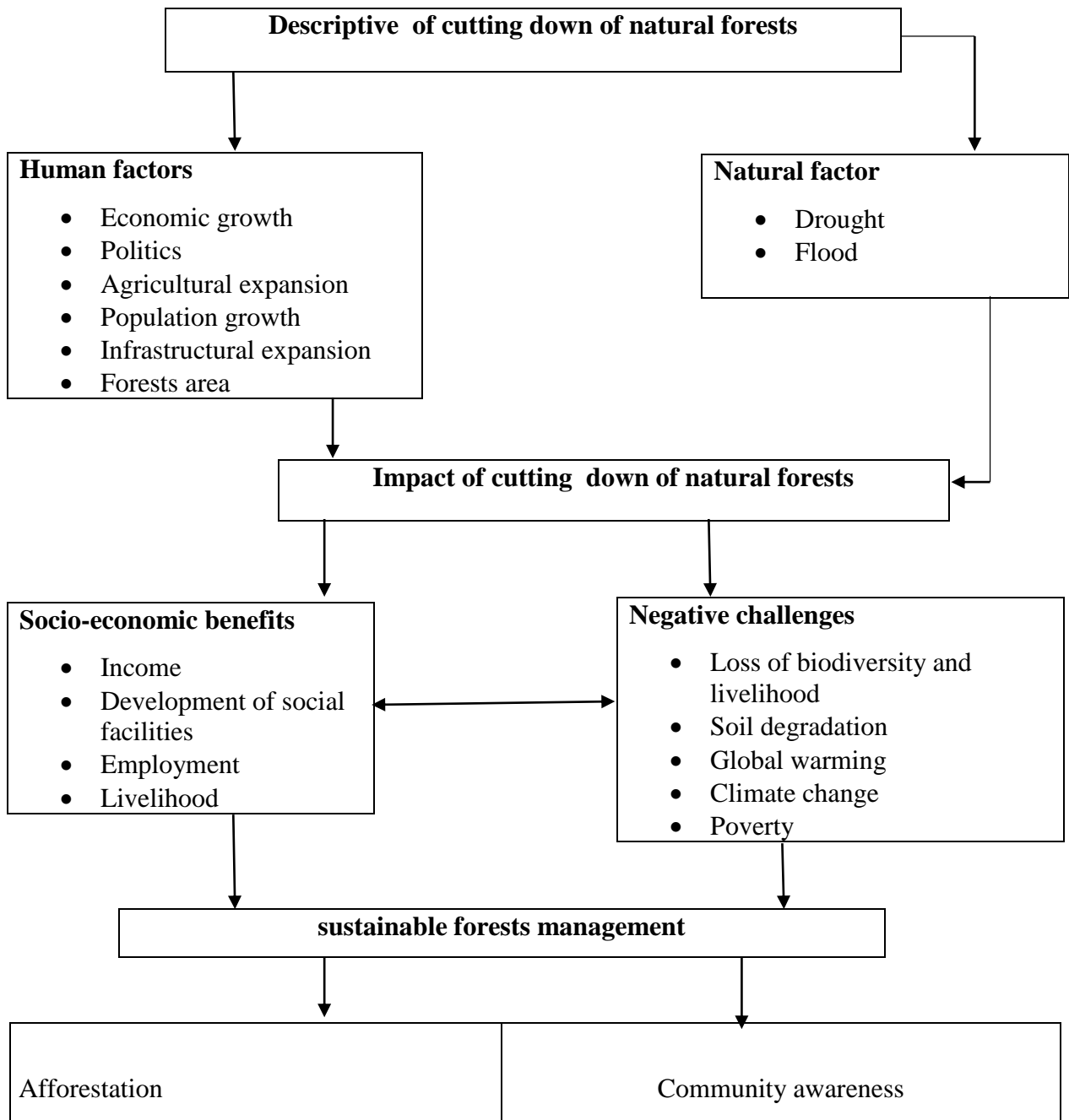
6.1. Conclusion

Fuelwood is a predominant source of energy while *Mopane* and *Terminalia Prunioide* are the dominant choice in the study areas. The findings of this study confirmed the findings of other researches, which shows fuelwood as being the primary source of energy for household usage in the study area (Negumbo, 2004; Hainduwa, 2013). In a few households, where some residents are employed, gas is used while other households, which are close to cuca shops or schools with electricity, used electricity but only for lighting.

Fuelwood collection leads to forest depletion and affects the biodiversity negatively. Changes in climate, such as flooding, drought and high temperatures, were also noted in these villages and in Namibia at large. The absence of forests affected households' engagement in cultural practices and behaviours among young boys and girls and increased poverty by increasing household expenditure, as well as reduced time for educational and social activities.

Huge amounts of fuelwood were collected at a time and reserved for the rainy season. Fuelwood was mostly burned in winter when people needed more ash to use as preventative measure for their wheat, sorghum and beans seeds from being spoiled by insects.

Table 6. 1: Summary of conclusion



The study found that in all areas, Iipanda, Etayi, Onampira and Oshipya, the collection of fuelwood has led to the depletion of the forest while the most unsafe way of harvesting fuelwood, namely the felling of live trees, is common. Some illegal cutting down of trees during the night made it difficult for traditional headman's to control the forest resources in their villages. Traditional authorities who are in a better position to manage the fuelwood collection are not recognised by the government and do not receive any remuneration from the government and municipality.

While there are clear regulations by the forestry department regarding the management of forest resources, the study indicates that a clear framework for the implementation of the necessary regulations is lacking. The Department of Forestry, in conjunction with the constituency's councillor, traditional authorities and other stakeholders, are mandated to conduct awareness campaigns regarding the effects of unsuitable practices with regard to forest exploitation. However, the implementation of these activities on the ground is lacking. The lack of interest by different shareholders involved in the use and management of forest resources may compromise the ability of the forests to deliver environmental goods and services.

6.2. Recommendations

Depending on the outcomes of this research, the following measures can be taken into account in order to decrease the impact of cutting down trees for fuelwood and to enable natural forests to restore the already damaged areas. Namibia, as a country, has features and circumstances that should be interesting to a curious, scientific mind.

- Familiarisation with science and technology and its application should be used for poverty relief. Thus, the government public service's purpose should be to focus on introducing, familiarisation and demonstration of forestry techniques to assist the rural poor.
- Forestry expert and specialists ought to be prepared consistently to effectively offer technical advises in rural areas. Well-formulated policies must empower government, non-governmental organisation, science and innovation research associations and rural organisations to take part in projects focussing on the alleviation of poverty.
- The introduction of affordable alternative sources of energy, more specifically solar energy, may lessen rural communities' dependency on forest resources for fuelwood.
- The Directorate of Forestry must ensure the sustainable utilisation of forest resources and, simultaneously, fulfil the requirements of households in rural areas. This can be achieved by teaching people about the effect the impact of cutting live trees for fuelwood. Education could be done by disseminating information through the media, such as television, radio, pamphlets or leaflets and community meetings.
- Prohibited trade and importation of forest resources illustrate the absence of strategies and policies amongst stakeholders. To guarantee the viable execution of projects in the

region, the ministry in charge should rise the number of staff who can make and translate policies to members of community, as well as to carry law requirement obligation.

- Traditional norms and practices as part of indigenous knowledge can be valuable in the management of natural forests. Thus, the government needs to empower/legalise traditional leaders in order for them to deal with the exploitation of fuelwood and illegal felling of live trees.
- Communities' educational programmes need to be implemented. The communities need to be well informed of the effects of deforestation on the environment. They need to know more about climate change, global warming, flooding, drought and its causes. People need to understand the role of trees in the environment and the effects of its absences.
- Poverty alleviation projects, such as gardening, could be introduced in rural communities in order to reduce the cutting of fuelwood as a means of income.

6.3. Future Research

Numerous potential mediation can empower an increasingly effective use of forests resources. I believe there are significant data gaps concerning the extent to which forests resources can contribute to the alleviation of poverty and forests conservation projects.

For future research, I suggest the following topics:

a) Spatial and natural resources as determinants of poverty

Many potential mediations can empower a progressively fruitful use of forest resources. I strongly believe that a gap in knowledge can be addressed if many studies are conducted. The studies should focus on how the natural resources can contribute to poverty alleviation and forest conservation. It is essential to enhance a better understanding of the spatial leaning among poverty and forests, its fundamental reason and its effects.

b) The relationship of forests and SMEs in poverty alleviation

This may be stretch out to address the connection between forests resources and Small and Medium Enterprises (SME) development. It will be beneficial to assess the situations required for poor households to take advantage of the chances that globalisation and market liberalisation offer for poverty alleviation.

CHAPTER 7

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APPENDIXES

Appendix A: Traditional Clay Calabash and Cups



A1. Traditional beer (omalovu-giilya) in a clay calabash



A2. Bride taking her first drink

Appendix B: Traditional Baskets



Mahangu flower and meal handled in traditional basket



Appendix C: More Pictures of Wood used as utensils



Appendix D: Bows and Arrows Made from Wood



Appendix E: Permission to Conduct Research from Omusati Regional Council



REPUBLIC OF NAMIBIA



OMUSATI REGIONAL COUNCIL

OFFICE OF THE CHIEF REGIONAL OFFICER

Tel: +264 65 251019
Fax: +264 65 251078 / 088639090
E-mail: info@omusatirc.gov.na
Website: www.omusatirc.gov.na
Our Ref: 9/6/4
Enquiries: M.K. Iita

Private Bag 523
OUTAPI

26 April 2017

Ms Lahya Magano Shipombo
P.O. Box 15695
OSHAKATI

Cell: 0811228007/0851228007

Dear Ms Shipombo

CONDUCTING A RESEARCH OF FUELWOOD IMPACT ON NATURAL FOREST IN ETAYI CONSTITUENCY

1. The Council is hereby acknowledging receipt of your Letter dated, 24 April 2017, regarding the above mentioned subject.
2. Thus, it is pleasing to inform you that the Council has granted permission for you to go ahead with your research.
3. However, you are requested to provide a copy of your findings to the Regional Council.
4. We hope you will find all in order and wishing you all the best in your study.

Sincerely,

G. Kashindi
G. Kashindi
ACTING CHIEF REGIONAL OFFICER



All official correspondence must be addressed to the Chief Regional Officer

Appendix F: Interview (constituency councillor)

Cape Peninsula University of Technology

Faculty of applied Science

Department of Environmental Management

Topic: The Impact cutting of natural forests in Etayi constituency in the Omusati Region, Northern Namibia.

RESEARCH QUESTIONS (INTERVIEW) CONSITITUENCY COUNCILLOR.

1. How often do you meet (government & traditional authority) to discuss forests related matter?
 - A. Per month
 - B. Once a year
 - C. Once a quarter
 - D. Other,
specify.....
2. What are your main objective in connection with fuelwood and forests management?
.....
.....
3. What are the obstacles you experience from achieving those objectives?
.....
.....
4. In your opinion, under which of the two bodies do fuelwood collector take authority, and why.
 - A. Government
 - B. Traditional authority
 - C. Both
5. What program do you have in your village about the impact of fuelwood exploitation on natural forests?
.....
.....
.....
6. How do you regulate fuelwood collection in your village?
.....
.....
7. How do you deal with people who do not comply with your regulation?

Appendix F: Interview (Traditional leader)

Cape Peninsula University of Technology
Faculty of applied Science
Department of Environmental Management

Topic: The Impact cutting of natural forests in Etayi constituency in the Omusati Region, Northern Namibia.

RESEARCH QUESTIONS (INTERVIEW) TRADITIONAL LEADER.

1. How often do you meet (government & traditional authority) to discuss forests related matter?
 - A. Per month
 - B. Once a year
 - C. Once a quarter
 - D. Other,
specify.....
2. What are your main objective in connection with fuelwood and forests management?
.....
3. What are the obstacles you experience from achieving those objectives?
.....
4. In your opinion, under which of the two bodies do fuelwood collector take authority, and why.
 - A. Government
 - B. Traditional authority
 - C. Both
5. What program do you have in your village about the impact of fuelwood exploitation on natural forests?
.....
6. How do you regulate fuelwood collection in your village?
.....

Appendix F: Interview: Ministry of agriculture, water and forestry
Cape Peninsula University of Technology

Faculty of applied Science

Department of Environmental Management

Topic: The Impact cutting of natural forests in Etayi constituency in the Omusati Region, Northern Namibia.

RESEARCH QUESTIONS (INTERVIEW) FOR DEPARTMENT OF FORESTRY OFFICIAL.

1. What is the responsibility of the department of forestry toward the mitigation of forests depletion?
.....
.....
.....
..
2. How does the forestry department work with local government in ensuring forests depletion due to fuelwood collection?
.....
.....
.....
.
3. Do you meet with both local government and traditional leadership to discuss forests resources used as fuelwood by community members?
A. Yes
B. NO
Elaborate.....
.....
.....
.....
4. What do you discuss in your meeting?
.....
.....
.....
.....
.
5. How do you measure the efficiency for your meeting in conserving forests?
.....
.....
.....
.....
..

Appendix G: Questionnaire(community)



**Master’s Degree in Environmental Management
Consent to Participate in the Survey**

Dear participant,

I am ... Lahya Magano Shivolo, Student number: 215199383 a Masters student at the Cape Peninsula University of Technology (CPUT) - Cape Town Campus. I am conducting a research project on the impact of cutting of natural forest in the Etayi constituency. Participations in this questionnaire is voluntary and participants can withdraw at any time, in this case their data will be destroyed. Completion of the attached questionnaire will be your informed consent to participate in this project. The contents of this questionnaire must be kept anonymous.

Participant Declaration

I _____ (Name _____ &Surname),
_____ agree to participate in
this survey titled

- I understand this information and consent form.
- My participation in this survey is completely voluntary.
- An interpreter will be assigned to me if I request so

I hereby give my consent to participate in this survey to assist in this research

Date

Signature.....

Impacts of cutting of natural forests in the Etayi constituency in the Omusati Region, Northern Namibia.

Questionnaire

Date		Month		Year	
------	--	-------	--	------	--

Section1: Details of the Interviewee

1. Constituency:
2. Village:
3. Gender of interviewee

Male		Female	
------	--	--------	--

4. Age of interviewee

	30-40		40-60		60+	
--	-------	--	-------	--	-----	--

5. Which tribe group do you belong to?

Omukwambi		omumbalantu		Omungandjera		Kwanyams		Others	
-----------	--	-------------	--	--------------	--	----------	--	--------	--

6. How long have you been living here?

.....

7. How many are you in your household.....

Male		Female	
------	--	--------	--

8. How many people are employed in your house?

Age	18-30	30-60	None
Male			
Female			

9. How much is the household s monthly income?

0-1000	1000-5000	5000-10000	Above 10000

10. Do you participate in any income generation activities? If yes elaborate

.....

SECTION B: FUELWOOD SOURCING

1. What is the main source of energy in your house?

Fuelwood	
Charcoal	
Kerosene	
Cow dungs	
Electricity	
Gas	
Others	

If others, please elaborate.....

2. What do you use fuelwood for in your household?

Cooking	
Heating	
Lighting	
Others	

3. Where do you get your fuelwood from?

.....

4. How far is the place from your homestead?

.....

5. Who is the main collector of fuelwood?

Men	Women and Children	Women, Men and Children

Motivate.....

.....
.....
.....

6. How many collectors go per time and why?

.....
.....
.....

7. What do you collect as fuelwood?

Fell live tree	
Dead branches	
Fallen trees/shrubs	
Dead/dying trees	
Others	

8. Which tree species you prefer as fuelwood?

.....
.....

9. Do you need permission to collect fuelwood? From who? Explain why do you need the permission.

.....
.....
.....

11. Which season do you most collect fire wood

Summer	
Winter	
Spring	
Autumn	
All year	

12. Does the collection of fuelwood changes over seasons? If yes, How?

.....
.....
.....

13. How many buddle of wood do you collect per time?

.....
.....

14. How many times do you cook in your house using fuelwood? What?

.....
.....
.....

15. Do you buy fuelwood? YES/No

.....

Elaborate.....
.....

16. How much do you pay for a buddle of fuelwood?

.....
.....
.....

17. Where do you buy your fuelwood?

.....
.....
.....

18. Do you sell fuelwood? Why?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
-----	--------------------------	----	--------------------------

19. Where do you sell firewood and why?

.....
.....
.....

20. Apart from falling live trees for fuelwood what other uses of wood resources?

.....
.....

.....
.....

20. As per you culture what else do you use fuelwood for?

.....
.....
.....

21. Have you ever thought of firewood in your area becoming extinct? Explain

.....
.....
.....

22. Which alternative source of energy do you use in your house?

Solar	
Electricity	
Gas	
Other	

Reason for your choice.....
.....

23. What is your wish on alternative source of energy?

.....
.....

24. What is your opinion regarding the use of forest cutting in your area?

.....
.....
.....

25. What are the impacts of cutting down trees pose to the environment?

.....
.....
.....