AN ASSESSMENT OF PEOPLE'S PERCEPTIONS ON DEFORESTATION AND CLIMATE VARIABILITY AND CHANGE: A CASE OF KISARAWE DISTRICT TANZANIA

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CERTIFICATION

The undersigned certifies that she has read and hereby recommends for acceptance by the Open University of Tanzania a dissertation titled "***an assessment of people's perceptions on deforestation and climate variability and change in Kisarawe District***" in partial fulfillment of the degree of Masters in Environmental Studies of the Open University of Tanzania.

……

Dr. Magret S. Bushesha

(Supervisor)

……..

Date

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DECLARATION

I, **Joseph Andrew Cornel**, do hereby declares that this dissertation is my own original work and that it has not been submitted and will not be presented to any other university for similar or any degree award.

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Signature

…….

Date

DEDICATION

This work is dedicated to my mother Esther Aaron Nkanda, my wife Valeria and our beloved son Allen.

ACKNOWLEDGEMENT

Specifically, I express my gratitude to the following: Dr. Magret Bushesha for closely supervising this work in every stage from the beginning up to this end. In the same way, I would like to thank the District Executive Director-Kisarawe, for granting me a research permit so as to make this study a success. The same gratitude is extended to various village leaders in the visited locations, for their hospitable welcoming and field preparations including organizing the meeting venues and inviting participants. I am grateful for their involvement in data collection and participation in answering questions and making necessary clarifications for some issues during various discussions in the field. There are many other people and institutions not mentioned here, who, in one way or the other contributed to the realization and production of this study. Their efforts and inputs are sincerely acknowledged and well appreciated.

ABSTRACT

This research aimed to assess perceptions of people surrounding Kazimzumbwi Forest Reserve and neighboring areas on the contribution of deforestation on climate variability and change in the area. Focus Group Discussions and in-depth interviews with key informants as well as non- participant observations were used to collect Qualitative data that was complemented by other documentary review from other studies. Both closed and open-ended questionnaires were also used to capture people's perceptions regarding the study. The Qualitative and Quantitative information collected was integrated and synthesized to make this research. Qualitative information collected from FGD and in-depth interviews was analyzed by means of thematic and content analysis while Quantitative data was analyzed by Exploratory Data Analysis. Research findings revealed people's perceptions that; increased peasant agriculture, firewood collection and charcoal burning have massively contributed to deforestation of Kazimzumbwi Forest Reserve (KFR). As a result, due to such deforestation there has been a substantial increase in temperature condition and the rain is somewhat unpredictable. For sustainability of KFR, there is a need for training on REDD and related concepts in all villages through training of trainers (TOT) where REDD professionals may train selected villagers (to become Para professionals) who will in turn train other villagers in their villages. Feasible livelihood option is ought to be advised in the community so as to give a room to the re-growing KFR.

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ABBREVIATIONS

ACIA	-	Arctic Climate Impact Assessment
EDA	-	Exploratory Data Analysis
EMNet	-	Environmental Media Network
FAO	-	Food and Agriculture Organization
FGD	-	Focus Group Discussion
GHG	-	Green House Gases
HIMADA	-	Hifadhi Mapafu ya Dar es Salaam
IPCC	-	International Panel on Climate Change
KFR	-	Kazimzumbwi Forest Reserve
MNRT	-	Ministry of Natural Resources and Tourism
NCSSD	-	National Conservation Strategy for Sustainable Development
NEP	-	National Environmental Policy
NFP	-	National Forest Policy
NGO	-	Non Governmental Organisation
$REDD_+$	-	Reduced Emissions from Deforestation and Forest Degradation
SPSS	-	Statistical Package for Social Science
TFCG	-	Tanzania Forest Conservation Group
TFAP	-	Tanzania Forest Action Plan
UNFCCC	-	United Nations Framework Convention on Climate Change
WCST	-	Wildlife Conservation Society of Tanzania
WMO	-	World Meteorological Organization
WWF	-	World Wide Fund for Nature

CHAPTER ONE

1.0 INTRODUCTION

This study assesses the perception of people on deforestation and climate variability and change in areas surrounding Kazimzumbwi Forest Reserve in Kisarawe District. This chapter presents a background to the study, statement of the research problem, research objectives and questions and significance of research.

1.1 Background to the study

As Tanzania's population that is largely traditionally based on subsistence agriculture continues to grow, deforestation is becoming an increasing serious concern. At present, one of the challenges facing Tanzania has been the alarming rate of deforestation that is experienced in various parts of the country (NEP 1997). Analysis of forest and vegetation cover of Coast Region conducted in 2013 by Mngumi, *et al.,* show that the Coast region has lost most of its forest cover ,therefore, utilization of wood resources in the region is higher than the rate of renewal. The local rate of deforestation is still a major problem as by the end of 2011 annual deforestation in Tanzania was estimated to be 412,000 hectares per annum (Clarke, *et al.,* 1995).The Kazimzumbwi Forest Reserves is currently the forest reserve in Tanzania that is under heavy deforestation rate, and there are several, often conflicting, interests for land use in the reserve between the community surrounding the forest and the government. There has been an underlying heavy pressure from agricultural encroachment, from the east and the south-west, especially from Dar es

Salaam as agricultural products can easily and cheaply be transported to the city market.

Local people collect firewood, poles and minor forest products such as medicinal plants within the Kazimzumbwi Forest Reserve. Pole cutting on a commercial scale has posed damaging effects because young canopy trees are being removed, therefore, altering the natural composition of the forest as certain species are selected in preference to others.

Recent surveys of TFCG (2013) have confirmed that Kazimzumbwi FR has lost most of its tree cover due to deforestation and most of the biodiversity values of the reserve have also vanished. The same survey by TFCG (2013) also found that communities surrounding the forest collect firewood, poles, thatch grass, ropes, mushroom, wild fruits, raffia, toothbrushes, honey, traditional medicine and other forest products. Based on local community observations, by end of 2011 deforestation of Kazimzumbwi FR has made small rivers and springs disappear, for example Nzasa River and Fukwi dam in Kazimzumbwi village. Villagers indicated that from 1980s to around 2000 when Kazimzumbwi Forest Reserve had a good tree cover, they had reliable rains but now there is a long drought, resulting in poor agricultural production. Villagers also reported that they are currently experiencing dramatic gusts of wind and increase in temperatures due to loss of tree cover. Women and children use more time looking for water instead of engaging in gainful employment. In Maguruwe village, for instance, it takes up to three hours to fill a 20 liter bucket of water. The ongoing destruction of the Kazimzumbwi FR is threatening life of many people due to a scarcity of water.

The expansion of the Dar es Salam city has had considerable impacts on Kazimzumbwi forest and its surrounding areas particularly Dar es Salaam City. Kazimuzumbwi Forest Reserve has suffered severe deforestation associated with land use and land cover changes on the surrounding forest boundaries and within the forest reserve respectively (Mdemu, *et al.,* 2012). Land use changes occur mainly due to conversion of forest reserve areas into peri-urban settlement and agriculture. On the other hand, land cover changes are caused by illegal human activities in the forest reserves including logging, charcoal burning, cutting of trees for construction purposes. These activities are driven by demands for land and forest products from the population in the communities surrounding the forest reserves and to the large extent by the increasing demands of the population from Dar es Salaam City. Existing assessments shows that between 1991 and 2000 open woodlands in the forest reserves declined by 29.1% while land cover and use under grassland with cultivation increased by 16% over the same period (Kaoneka, (1990); Mdemu, *et al.,* 2012). As result, increased encroachment in Kazimuzumbwi has infringed the biodiversity of the forest reserve affecting their capacity to provide the forest ecosystem services. Apparently, various studies have been conducted both globally and locally focusing on forests and climate change but so far there is no a single study that examined how people perceive the role played by forests in influencing climate of the area hence their action towards forest.

Communities in the study areas are experiencing livelihood challenges due to a number of factors. These include increased pressure on resources from increasing population that transforms community's into more urban environment, declining

agricultural production of traditional crops such as cassava, groundnuts, maize and passion fruits. Agriculture production was reported to have declined in the study areas due to climatic changes and variability, increased crop diseases and declining soil fertility among other causes. According to the indigenous people, climatic changes and variability is identified by declining rainfall amount and increasing rainfall variability, increasing temperature over the last ten years, drying of cassava crop for the past three consecutive years, and increased incidence of diseases pests for crops and livestock. With declining soil productivity it is increasingly becoming difficult to obtain good crop harvest without using farm manure. As result of declining agriculture production, farmers are shifting to production of high value horticultural crops and have taken the advantage of urban demands on the vegetables. Also dependency on forest resources was reported to have increased, a factor which contribute to decline of forest resources and disappearance of wildlife in the forest reserves. Other forest products which community's depend include wild fruits, mushrooms, building poles and fodder for livestock.

Although Kazimzumbwi forest offer a significant potential to surrounding communities, due to its location and relative short distance to the commercial capital of Dar es Salaam, protection of the forest to get rid of deforestation activities remain a pervasive challenge. In this regard, it is important to assess whether people's perceptions on the role of deforestation on climate variability and change has influenced their actions on forest use. Michner, *et al.,* (2004) clarify that social psychology shows that behaviors and knowledge influence each other. People's perceptions can be unknowingly influenced by knowledge that people have recently

perceived, and knowledge influences behaviors of individuals as well in various areas such as judgment and feelings. In this study therefore, people's perceptions of deforestation may be highly influenced by people's knowledge or information about the social-economic values of forests. Literatures show that, local communities' perception on climate variability and changes resulting from deforestation at times varies between people living near forest areas from those living far from the forest areas (Glen, S. *et al.*, 2011). Consequently, people who found living close to the Kazimzumbwi Forest Reserve seemed to engage themselves directly in activities related to deforestation such as agriculture activities, charcoal and timber production, firewood collection that led to deforestation. A deliberate effort to conserve Kazimzumbwi Forest Reserve is therefore required.

1.2 Statement of the problem and justification

Kazimzumbwi Forest is highly deforested mainly due to human activities (Mdemu, *et al.*, 2012). As it has been discussed earlier in the background information, human perceptions highly influence our own behaviors and actions. Thus, the ongoing activities that cause deforestation of Kazimzumbwi Forest Reserve are either a direct or indirect result of people's perception and behaviors on the value of the said forest. Various studies have been conducted both globally and locally focusing on forests and climate change but so far there is no a single study that examined how people perceive the role played by forests in influencing climate of a given area hence their action towards forests. Despite this fact, understanding this mutual interrelationship of these two variables, namely human perceptions on how deforestation can affect the climate of a given area and their respective actions on forests remains to be

fundamental towards proper forest management in view of mitigating climate change. It is important not only to anticipate the nature of expected changes caused by deforestation activities, but also how they are perceived, interpreted and adapted to by local residents. In this regard, this study intended to establish an authentic study confirming how people perceive the contribution of deforestation to climate change in the study area.

1.3 Research Objectives

1.3.1 General Objective

The general objective of this study was to assess people's perception on the role of deforestation on climate variability and change in the study area.

1.3.2 Research Specific Objectives

Specifically the study aimed to:

i. Assess how people perceive the role played by forests in influencing rainfall and temperature patterns over years in the study area.
ii. Identify socio-economic activities related to deforestation in the study area.
iii. Establish whether there is a link between the conduct of deforestation related activities in the study area and people's perceptions of the role of deforestation on climate.

1.4 Research Questions

The motive behind this study was based on the question that “what are the people’s perceptions towards contribution of deforestation on climate variability and change?” The research was guided by the following specific research questions;

i. What are the roles played by forests in influencing rainfall and temperature patterns in the area?
ii. What are the social-economic activities relating to deforestation in the area?
iii. What are the people’s perceptions regarding the role of deforestation on climate change.

1.5 Significance of the Study

The study aimed at examining people’s perceptions on the roles of deforestation in climate variability and change. The findings of this study will contribute to knowledge and skills in developing proper forest management policies among users and establish a well mutual relationship between forest managers and people surrounding forest so as to insure sustainability. This study is considered to be an important step towards bridging the information gap between how people perceive the role played by forests in influencing climate of the area and their action towards deforestation. The findings of the study are also expected to contribute to understanding of the dynamics of deforestation in Tanzania. Moreover, the findings of this study will help policy and decision makers especially environmental stakeholders who want to understand better the threats of climate change on their surrounding environment. The results of this study can hopefully lead to a better

understanding of the inhabitants' view of nature, and be used in the work with improving the villagers' living conditions. In the end the intention is to increase the possibilities to involve local people in the work with preserving the forest reserves.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter presents the review of the literature. It includes the discussion of related concepts of the study from other researchers. The chapter discusses key concepts, policies, link between deforestation and climate change and how people in other parts of the world perceive the contribution of deforestation on climate change.

2.2 People's perception

The motive behind this study was to assess people's perceptions on the role of deforestation on climate variability and change. Like most concepts within the social science disciplines, perception (or what other scholars refer to as social perception) has been defined in a variety of ways. From the lay man's perspective, perception is defined as an act of being aware of "one's environment through physical sensation, which denotes an individual's ability to understand" (Chambers Dictionary, 2014). The Oxford Advanced Learner's Dictionary (2010) defines "perception" as the ability to understand the true nature of a phenomenon; it is a way something is regarded, understood or interpreted. This is a psychological phenomenon by which the brain receives the flow of information about the environment from the sense organs and uses this information to help an organism make sense of that environment (David, 2003). Perceptions therefore, not only create our experiences but also allow us to make good judgments as responses to our environment.

However, many social psychologists (Michner, *et al.*, (2004) have tended to develop the concept around one of its most essential characteristics that the world around us is not psychologically uniform to all individuals. This is the fact, in all probability, that accounts for the difference in the opinions and actions of individuals groups that are exposed to the same social phenomenon. That is the reason why this study was undertaken in order to give details of various perceptions regarding their experience in the contribution of deforestation on occurrence of climate variability and change.

2.3 The Concept of Climate Variability and Change

More rigorously, the term climate is referred to as the statistical description in terms of the mean and variability of weather elements over a period of time ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO, 2001). These elements are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system. The climate system is the highly complex system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the land surface and the biosphere, and the interactions between them. The climate system evolves in time under the influence of its own internal dynamics and because of external forcing such as volcanic eruptions, solar variations and human-induced activities such as the changing composition of the atmosphere and land-use change. (IPCC, 2007, 2001)

2.3.1 Climate Variability

The term is often used to denote deviations of climatic statistics over a given period of time (e.g. a month, season or year) from the long-term statistics relating to the corresponding calendar period. In this sense, climate variability refers to the climatic parameter of a region varying from its long-term mean (IPCC, 1996, 1997). Every year in a specific time period, the climate of a location is different. Some years have below average rainfall, some have average or above average rainfall. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability). Climate varies over seasons and years instead of day-to-day like weather; some summers are colder than others, some years have more overall precipitation. Even though people are fairly perceptive of climate variability**,** it is not as noticeable as weather variability because it happens over seasons and years. Evidence includes statements like: “the last few winters have seemed so short,” or “there seem to be more heavy downpours in recent years.” It is the way climate fluctuates yearly above or below a long-term average value.

2.3.2 Climate Change

The definition put forward by UNFCCC, 2005 states that climate change is a change that is attributed directly or indirectly to human activities that alters the composition of global atmosphere which is in addition to natural climate variability observed over comparable time periods. The UNFCCC thus makes a distinction between "climate change" attributable to human activities altering the atmospheric composition, and "climate variability" attributable to natural causes. Climate change is slow and

gradual, and unlike year-to-year variability, is very difficult to perceive without scientific records. Thus climate change is what societies in different parts of the world might expect to experience at a given time of the year based on past experience reasonably long run-weather average over 50 or 100 years. There is overwhelming evidence and consensus that climate change is real and happening now. In fact, the impacts of climate change are occurring faster than what many scientists first predicted (ACIA, 2004). In order to prevent dangerous climate change, governments, WWF and other NGOs have stated that global average temperature must stay well below 2^0 (UNFCCC, 2005). In order to ensure that this dangerous threshold is not crossed global greenhouse gas emissions will have to be rapidly and deeply reduced over the next one to two decades (Den Elzen *et al.,* 2005; Den Elzen and Meinshausen, 2005). An estimated 75 to 80% of global emissions shoot from industrial sources, specifically, the burning of fossil fuels. The remaining 20% to 25% can be sourced to deforestation emissions, predominantly in the tropics (IPCC, 2001). Both, the burning of fossil fuels and deforestation, must be urgently and effectively addressed in order to save the world's biodiversity and people from catastrophic climate change.

Alley, *et, al.,* (2007) for example, explain climate change as any change in climate over time, either due to natural variability or as a result of human activities. The United Nation's Food and Agriculture Organization (FAO) reported in 2005 that deforestation is mainly caused by small scale subsistence farmers and by government-backed conversion of the land to other purposes such as ranching and settlements. However, subsistence farmers slash down forests because they are poor,

unemployed and landless. The landless and the poor around the world today are assaulting the remaining forests for agricultural land and for fuel. As poverty is the root cause of the hunger problem, so also it is one of the causes of deforestation (Seitz, 2001).

2.4 The Concept of Deforestation

Desai and Potter (2007) refer deforestation to the temporary or permanent clearance of forest for agriculture or other purpose. It may occur abruptly when the forest is cleared for agricultural production, urban development or more gradually as a result of unsustainable logging practices (Houghton, 1995). The pressing causes of deforestation are the land uses such as farming, livestock keeping, settlement expansion and the like. Thus, the increase in demand for forest products such as charcoal, firewood and timber leads to increasing pressure on available forest resources which eventually results in deforestation and subsequent general environmental deforestation. Reliance on wood fuel and charcoal for energy supply have been identified as a key driver behind rates of deforestation at both local and global level, and it presents a real challenge as almost all domestic (rural and urban) energy consumption are derived from these sources (Miles et. al., 2009).

2.4.1 Status of Global Deforestation

In many parts of the world, deforestation is accounted to be one of the factors that greatly contribute to climate change (UNFCCC, 2006). Deforestation has recently become a major concern for many countries in the world. It is one of the most pressing land use problems. More than 30 per cent of the world's forest is believed to

have been deforested (Desai and Potter 2007). Africa is suffering deforestation at twice the world rate. According to FAO (2009) Africa lost the highest percentage of tropical forests of any continent during the 1980s, 1990s, and early 2000s.

The figures from the FAO (2001), only 22.8% of West Africa's moist forest remain much of this degraded. Nigeria has lost 81% of its old-growth forests in just 15 years (1990–2005) Massive deforestation threatens food security in some African countries. One factor contributing to the continent's high rates of deforestation is the dependence of 90% of its population on wood as fuel for heating and cooking. Present deforestation rates should therefore be a source of great concern for the international community.

The depletion of forests is of great concern for environment and development in many developing countries, Africa in particular. Unsustainable use of forests has resulted in severe environmental problems, especially land deforestation which is manifested by soil erosion, desertification and general loss of productive potential in rural areas. Soil deforestation has been the cause of stagnating or declining yields in parts of many countries especially on fragile lands from which the poorest farmers attempt to wrest a living (FAO, 2006). Deforestation has also affected water catchment areas and destroyed watersheds, affecting the quantity and quality of the water supplies they contain. In some cases, deforestation has resulted in extraordinary floods and loss of life.

Deforestation is an important factor in global climate variability and change. Climate change is because of increase of carbon dioxide in the atmosphere and if we fail to reduce this CO_2 build up, we can expect the climate of our planet to change considerably over the next decades. UNFCC (2006) estimates that more than 1.5 billion tons of carbon dioxide is released to the atmosphere due to deforestation, mainly from cutting and burning of forests every year. Over 30 million acres of forests and woodlands are lost every year due to deforestation.

When the forest is cleared for settlements or for farming or other purposes, the amount of carbon dioxide gas into the atmosphere accumulates to form Green House Gases (GHG) that deplete ozone layer that ultimately lead to significant changes in the climate. These changes usually mean Global warming, less rainfall and, or unpredicted rainfall, temperature variation, wind instability, disappearance of both plant and animal species etc. Serious floods that have been, and still occurring in India in areas that had never experienced flooding is believed to be a result of deforestation in the Himalayan Mountains (Desai and Potter, 2008). Deforestation is mentioned to aggravate these impacts (IPCC, 2007).

The spatial and temporal consistency of the decrease in precipitation in Amazonia implies that deforestation may result into a longer dry season with unpredictable rainfall which in turn may worsen the already cleared area (Seitz, 2001). This high rate of deforestation in the region, from 25,000 to 50,000 km2 per year (4-7 Mha), might thus be expected to have extensive effect on the regional climate. If

deforestation were to continue at this rate, most of the Amazonian tropical forests would disappear in 50 to 100 years (UNFCCC, 2001).

2.4.2 Deforestation in Tanzania

Deforestation is estimated to account for up to 20 % of carbon emissions worldwide as they are considered to be one of the largest terrestrial sources of carbon emissions (IPCC, 2001).Forests also play an important role in climate mitigation as reservoirs of carbon and can help societies to adapt through maintenance of essential ecological services. Researches (FAO, 2009) show that tropical forests are estimated to remove about 4.8 billion tones of CO_2 of which 1.2 billion are from African forests. Tanzania has lost thousands of hectares of forests through deforestation and deforestation arising mainly from anthropogenic factors. These include unsustainable harvesting of forest products, agricultural expansion, animal grazing, bush fires and mining. The high rate of deforestation makes Tanzania one of the significant contributors to carbon dioxide emissions in Africa. About 33.5 million hectares or 37.8% of Tanzania's total land is covered by forests and woodlands. Out of this total 33.5 million hectares classified as forest land, almost two thirds consists of woodlands on public lands. The main vegetation types include Afro alpine heath and moorland, forests, woodlands and grasslands, bush lands and thickets, swamps, mangroves and manmade forests. About 13 million hectares of this total forest area have been gazetted as forest reserves. Over 80,000 hectares of the gazetted area is under plantation forestry and about 1.6 million hectares are under water catchment management. (MNRT, 2001 &FAO 2005, 2006)

Tanzania is among the countries in the world experiencing high deforestation rates ranging from 130 000 ha to 500 000 ha per annum (MNRT 2001). The deforestation rate is expected to have severely increased accelerated by both direct and indirect factors. The direct agents of deforestation are: settlement and agricultural expansion, commercial charcoal and fuel wood production, overgrazing, uncontrolled fires, shifting cultivation and illegal logging The indirect or underlying causes of deforestation are rapid and uncontrolled population growth, poverty, market failures, absence of proper definition of property rights and security of tenure and general policy failures (Kaoneka 1990, MNRT 2001).

Although generalizations have been made on the rates, magnitude and causes of deforestation in Tanzania, differences exist in different areas because of local variations in the types of land use and economic activities, nature of the vegetation and demands for various forest products including fuel wood. Therefore, it is important to address properly these variations when dealing with the problem of deforestation. Of particular importance is the need to understand the contribution of the various factors such as settlement and expansion of agriculture, tree cutting for timber, charcoal production and mining to the deforestation problem in different areas. Such factors may be considered as proximate factors. The question is: what could be the underlying forces behind the problem of deforestation? Do people have knowledge on environmental impacts of deforestation? Is there any role(s) played by forests in regulating climate? How do they perceive climate change? From such unanswered questions, this study was purposely undertaken in Kisarawe District which, until only recently (about three decades ago), was still full covered with rich

natural forests of Kazimzumbwi Forest Reserve. However, the current large-scale deforestation that has been taking place is now a threat to the existence of this forest. Indiscriminate tree cut down is fast driving the landscape into bare land and modifying its natural climate. There is even encroachment on forest reserves causing extensive deforestation.

2.4.3 Deforestation in Kazimzumbwi

Kazimzumbwi National Forest Reserve has been experiencing very high rates of deforestation lately. During the 1960s, the reserve had good forest cover, home to a wide range of wild animal species including leopards, lions, hippos, monkeys and jackals, bush pigs, mongoose and hyenas. Most of these are hardly seen today due to deforestation. An assessment of forest condition carried out in the project area by Frontier Tanzania (2002) reports that Kazimzumbwi Forest Reserve was almost intact at the time of national independence (1961). According to information from indigenous, cultivation was permitted in the reserve following its gazettement during the 1930s. By 1995 Clarke & Dickinson reported that the forest was under heavy pressure from agricultural encroachment in the reserve, especially from the east and southwest. Violent confrontation took place between forestry officials and some local people over this issue in 1994, 1995 and in 1998 (Burgess and Clarke, 2000) whereby in 1998 several hundred families were evicted from within the forest reserve. Furthermore, report show that the area declined to 10 km2 by 1991 and was further reduced to only 4 km2 in around 1995. Forest condition in Kazimzumbwi is even worse today. The Reserve has almost lost more than 90% of its forest cover as of today. Given the current status, it could safely be shown that on average, the two

Forest Reserves have been losing 100 hectares per year during recent times. While the forest is now potentially retrieved, the relationship between the community and the government is still hostile, particularly in the south and south-eastern parts of the reserve. Concerns over continued illegal encroachment for cultivation in Kazimzumbwi FR by people from local villages meant that the forest reserve was earmarked for protection by Tanzanian Forest Action Plan (TFAP) (EMNet, 2011). Other national and international organizations have also recently taken a large role in helping alleviate the pressures on Kazimzumbwi Forest Reserve.

Surveys by Gwegime, *et al.,* (2013) have also reported massive deforestation of Kazimzumbwi FR and has lost most of its tree cover due to deforestation and most of the biodiversity values of the reserve have also vanished. The study also found that communities surrounding the forest collect firewood, poles, thatch grass, ropes, mushroom, wild fruits, raffia, toothbrushes, honey, traditional medicine and other forest products. Based on local community observations, by end of 2011 deforestation of Kazimzumbwi FR has made small rivers and springs disappear, for example Nzasa River and Fukwi dam both in Kazimzumbwi village. Villagers indicated that from 1980s to around 2000 when Kazimzumbwi Forest Reserve had a good tree cover, they had reliable rains but now there is a long drought, resulting in poor agricultural production. Villagers also reported that they are currently experiencing dramatic gusts of wind and increase in temperatures due to loss of tree cover. Women and children use more time looking for water instead of engaging in gainful employment. In Maguruwe village, for instance, it takes up to three hours to fill a 20 liter bucket of water. The ongoing destruction of the Kazimzumbwi FR is

threatening life of many people due to a scarcity of water. Agriculture is one of the key drivers to deforestation in the surrounding Kazimzumbwi Forest. In an analysis of land cover and land use change of the forest reserve and adjacent areas (Malugu, 2007) observed that, the area under grassland with cultivation increased while open woodland had declined drastically in a period of 10 years from 1991 to 2000 alone. The decrease of open wood was due to opening up of new farms planted with perennial and permanent crops such as palm and cashew, the southern part of Kazimzumbwi is the area which experiences serious woodland deforestation due to high encroachment from neighboring area.

Although deforestation in KFR is caused by many factors, including weak law enforcement and poor governance, environmental education for the surrounding communities is also lacking (Kashaigili, *et al.*, 2013); TFCG,2012). However, before this study is conducted, there has been no study conducted in KFR that focus to assess people's perception on the contribution of deforestation on climate variability and change. There is need to identify the knowledge gaps and, therefore, training is needed and conservation messages need to be communicated to local people. Among other things, the outcome of this study will help to raise awareness and understanding of REDD issues among KFR stakeholders, including policy and decision makers in the management of the forests, villagers living adjacent to the forests, forest practitioners, and the general public.

2.5 Review of Government Policies and their implication on Forest Resources

Deforestation in Tanzania on one side is driven by public policies that stimulate agro-export expansion, commercial logging for short-term profits and massive land alienation (Barrowclough and Ghimire 1994). Tanzania's desire to develop with a strong dependency on the agricultural sector, and the need to earn foreign exchange to meet her external debt obligations have led to over-exploitation of land and its resources causing massive deforestation. This section reviews some of the policies which have had a bearing on deforestation.

The forestry policy of Tanzania changed with the changing general macro policies in the country. The current formulated Forest Policy is based on the current thinking on joint management of resources between communities and the government and the macro policy of market economics**.** These initiatives include the review of sectoral policies (forestry, agriculture, land policy, etc.); and adoption of the Tanzania Forestry Action Plan (TFAP), the National Conservation Strategy for Sustainable Development (NCSSD), the National Environmental Action Plan, and the National Environmental Policy (NFP, 1998).However, there are challenges in how to address drivers of deforestation bearing in mind that rural communities depend on the natural resources base for their livelihoods. Much of the contemporary policies in Tanzania is a reflection of the colonial period and has inherent weaknesses characteristic of the colonial policies. Misana, Mung'ong'o and Mukamuri(1996) observe that the agricultural sector for example, in the Southern African region, including Tanzania, is still dominated by colonial agrarian structures and is highly cash crop oriented

based on smallholder and large-scale farming. These colonial agrarian systems have been reinforced by post-independence agricultural policies which, like their predecessors, have emphasized cultivation of export crops of high incentives (in terms of producer prices) such as tea, coffee, tobacco, sisal and cashew nut in order to generate foreign exchange. All these have had a negative impact on forest cover, accounting for the large-scale deforestation and land deforestation which has and continues to take place not only in Tanzania but in the whole Southern African region.

Management and conservation of forest resources in Tanzania are guided by the National Forestry Policy, which is more inclined towards control and protection of forest resources than to sustainable utilization. One of the provisions of the 1953 Forestry Policy is to demarcate and reserve in perpetuity, for the benefit of present and future inhabitants of the country, sufficient forested land or land capable of afforestation so as to preserve or improve local climates and water supplies, stabilize land which is liable to deterioration, and provide a sustained yield of forest produce of all kinds for internal use and also for export. The utilization of forests under this provision is, however, limited to commercial exploitation. The major weakness of this policy is that conservation efforts are directed to forest reserves. Forests outside the reserve areas have been neglected over the years causing significant deforestation and creating fuel wood scarcity.

The forest reserves have often been a source of conflict between the government and surrounding local communities encroach on these resources due to pressure and depletion of resources in public lands (EMNet, 2011) The Kisarawe case is a clear

evidence that Kazimzumbwi Forest Reserve is under a high pressure to disappear because of human encroachment that accelerate unsustainable use of this resource. The inadequate government control of this Forest Reserve has resulted in their encroachment for settlement, agriculture, grazing and charcoal production.

2.6 People's Perceptions in Relation to Deforestation

From different periods across different countries, deforestation remains to be a problem that has received growing attention from the media, the environmentalists, the policy makers and the general public. Deforestation has always been recognized to be fueled by continuous urbanization and rapid population growth (Seitz, 2001). The effects brought about by deforestation have intensely affected the quality of life of those people who continuously depend on these resources and those communities that settle near these resources.

According to FAO (2001), cited by Shitima (2005), in the latest ten years periodical assessment of world's forest the global loss of natural forest cover during 1990s was estimated at 16.1 million hectares per year were being lost in the tropics. During the decade under review, deforestation is said to have been highest in Africa and Southern America which includes Argentina, Brazil, Democratic Republic of Congo, Zambia, Tanzania and Zimbabwe. FAO (2001) further estimates that 56,000 hectares of tropical forests are destroyed each day worldwide. If this rate continued, it would only take 177 years to clear all tropical rainforests of the world.

As it has been discussed earlier in the statement of the problem, human perceptions highly influence our own behaviors and actions. Understanding people's perceptions of the impact caused by deforestation on climate change in the study area is fundamental to addressing properly the relationship between human perception (on how deforestation affect climate) and action (on forests). It will be important not only to anticipate the nature of expected changes caused by deforestation activities, but also how they are perceived, interpreted and adapted to by local residents (UNFCCC, 2001).This study likewise aims to find out perceptions towards impacts of deforestation particularly on climate variability and change among those living near and far from the forest in the study area.

The rationale of using local people’s perception in this study will give a basic input for designing appropriate management plans for sustainable development basing on the fact that, local people are the ones who interact with natural environment on daily basis as their major source of income. Thus the acceptability and hence success of any natural resource management intervention will highly depend on the perceptions of the local community towards the same, since such an intervention implies tempering with their livelihoods. In order to understand how human beings would respond to climate change, it is essential to study people's perceptions of climate and the environment in general. A study by (Mngumi, *et al.,* 2013) explains that perceptions of the local community towards a given natural resource management program is very essential and hence need not to be underestimated. Understanding of community perceptions is of paramount importance in natural resources management but also in understanding various climatic changes that people experience over time

i.e. a significant change in temperature, changes in intensity and duration of rainfall, reduction in production and other livelihoods and the like. Several studies stress the importance of using local people's perceptions as an input for designing and applying appropriate management plans for sustainable development, particularly in protected areas (Mngumi, *et al.,* 2013). However, studies that compare local communities' perceptions of forest management regimes and further identify factors that explain that these perceptions are of paramount importance.

Glen. *et al.,* (2011) conducted a research to recognize Local People's Perceptions towards Deforestation in Quezon Province, Philippines showed that the forest is an important resource for the people. The local communities' perception on the use, condition, changes and problems emanating from the forest and their willingness to undertake conservation were found to be significantly different for those living near and far from the forest and also on how they value their resource. Current conservation debates place high emphasis on the need to integrate the views and needs of local communities in conservation processes. Understanding local Community perceptions of forest management and the factors that influence these perceptions is important for designing management policies that are sensitive to their needs. However, more often, local communities' perceptions do not receive as much attention as they deserve (Guthiga, 2008). This implies that, low attention given to local communities' perception towards a given forest management approach has been a telling factor for their unsustainable use of these resources. This is a reason to why this study intends to assess the perception these people have on the issue of deforestation and its impacts on climate change in order to design appropriate

methods that involve both forest users and forest managers in conservation of this resource.

The incorporation of the perspectives of the communities on the resources is important as this enables the public to have a sense of ownership and responsibility on the resources involved so that in the long run they would immensely be involved in the management of the resources. Public perceptions and acceptance of the people are recognized to be the main factors for the success of the efforts that are geared towards the sustainable management of the environment. It has been recognized that early public involvement is crucial to the success of the environmental management related projects (Studsrod and Wegge, 1995)

1.5 Knowledge Gap

Due to its climatic and economic potentials, researchers have found important to conduct various researches on Kazimzumbwi Forest. Literature shows that there are number of problems facing the forest such as deforestation. Many of those studies have focused on climate change, land use and deforestation but before this study is conducted, there has been no study conducted in Kazimzumbwi Forest Reserve focusing on people's perception on the role of deforestation on climate variability and change. Social psychology asserts that human actions are more influenced by perception that ultimately determines actions. Therefore, it is important in this study to bridge gaps between people's perceptions on the role of deforestation on climate change in the area and their action on forests. This concept is not well featured in the

previous studies. The peoples' perceptions and drivers for the changes are presented and discussed in chapter four.

1.6 Theoretical Framework

Punc, (2000) states that conceptual framework represents the general focus of the study. This study was guided by different concepts of people's perceptions on deforestation and climate change. Perceptions of people in this study were meant to examine what people had been experiencing over a certain period of time concerning deforestation and its contribution to change of climate in the study area. The review of this study on people's perceptions of contribution of deforestation on climate variability and change to people surrounding Kazimzumbwi Forest Reserve and neighbouring areas is summarized in figure 2.1 below.

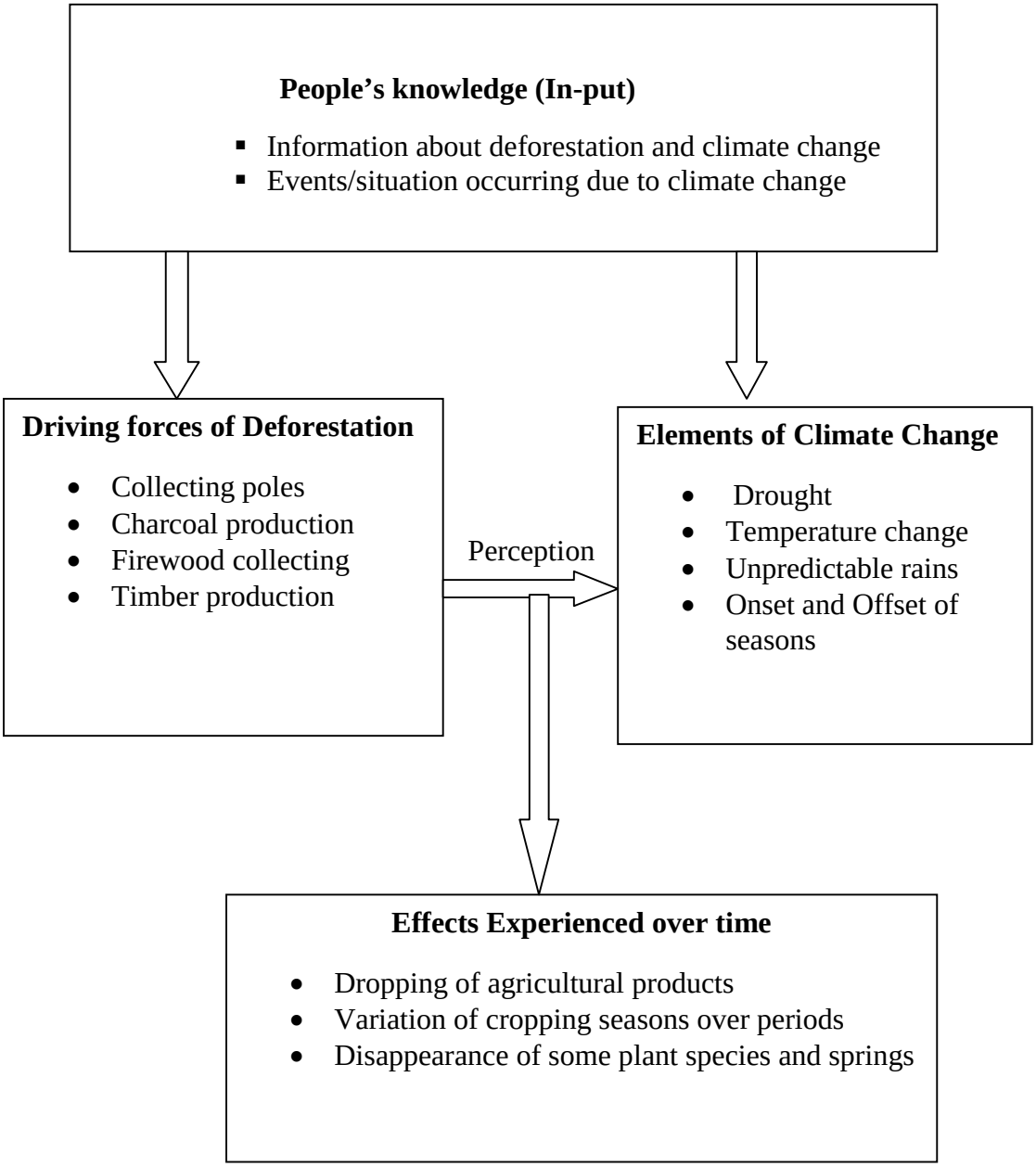

Figure 2.1: Conceptual Framework

Source: Godwin, O (2009), Bryman, A. (2008)

1.6.1 Conceptual Variables

Inputs: Perceived inputs are the knowledge about deforestation (meaning, causes, effects etc) that is received by the people through media, discussions and other means best available.

Process: The received input is processed through organization and interpretation that builds perceptions which sometimes is influenced by other external forces (i.e poverty, lack of availability of other alternatives sources of fuel other than woods in the forest).

Outputs: Through the processing mechanism, the output (feelings, actions, attitudes, etc.) is derived. Behavior is dependent on these perceived outputs. The perceiver's behavior, in turn, generates responses from the perceived and these responses in this regard are collecting woods, poles for building houses, extracting timber, charcoal making and the like.

1.6.2 Description of the Theoretical Framework

The concept is derived from people's perceptions; the perceptions of indigenous people in this study means information about deforestation and climatic variability and changes occurring in the area under study. These conceptions of people are based on human activities that cause deforestation of Kazimzumbwi Forest Reserve and its essential contribution to existing climate variability and changes. (Glen, *et, al.*,2011) clarify that local communities' perception on climate variability and changes resulting from deforestation tend to be different between people living near forest areas from those living far from the forest areas depending on effects that

people experience over periods. Such effects may be change in rain seasons, drought, dropping of agricultural products, disappearance of various plants, time for seed germination etc. It is this view that, this study will be conducted on two villages of Kazimzumbwi and Maguruwe in Kisarawe District.

CHAPTER THREE

3.0 RESARCH METHODOLOGY

3.1 Introduction

This chapter presents the study area, research design, study population, sample size and sampling procedures, instruments for data collection, data analysis, data interpretation, validity and reliability and ethical issues.

3.2.1 Description of the Study Area

Kisarawe District covers an area of 3535 square kilometers and is 100m above sea level. The District has temperature which varies between 28^0 C and 30^0 C. There are two major rain seasons in the region; the short rain season that is locally known as *Vuli* which starts from October to December while longer season *Masika* starts from March to June. The average annual rainfall varies yearly.

The Kazimzumbwi Forest Reserve became officially gazette since 1936 covering an approximate 53.7 square kilometers. It lies at an altitude of 120 to 280 m of altitude on the Pugu Hills in the District of Kisarawe, Pwani Region; some 20 km south-west of Dar es Salaam. It is surrounded by Kisarawe, Maguruwe, Kisanga and Kazimzumbwi villages. Kazimzumbwi Forest Reserve encompasses a diverse assemblage of vegetation communities and rich floral and faunal species diversity. The reserve comprises a mosaic of closed dry forest, scrub, woodland, wooded grassland and swamp forest. About four decades ago, the Kazimzumbwi Forest Reserve was much larger forest extending to nearby Dar es Salaam. Throughout this

time communities have depended on the forest resources in and around the reserve (Burgess, 2000 and MNR, 2001)

3.2.2 Rainfall and topography

Kazimzumbwi FR is influenced by tropical East African oceanic temperatures that are slightly modified by altitude. Average annual rainfall of 1,236mm data at Kisarawe has been recorded for Kisarawe falling principally from March to June (Clarke and Dckinson, 1995).

3.2.3 Land use

The close proximity of Kazimzumbwi Forest Reserve to Dar-es-Salaam and its outlying populations mean that the forest reserve is under significant resource use pressure from local communities that are dependent on it. In recent years high intensity resource use has led to conflict between Forestry officials and local communities. Awareness of such pressures amongst the non-governmental organization (NGO) community led to CARE International, World Conservation Society of Tanzania (WCST) and Tanzanian Forest Conservation Group (TFCG) collaboration in the Misitu Yetu Project. The project involved with enhancing the capacity of communities and other civil society institutions to manage and benefit forests of Eastern/Coastal Tanzania, in partnership with relevant departments of the government of Tanzania.

The motive behind choosing kazimzumbwi forest reserve is based on the following main reasons; first, this forest is facing major problems of deforestation and forest deforestation mainly caused by anthropogenic activities of farming, charcoal burning, settlement expansion and unsustainable harvesting of ecosystem services to meet demands of the population in the peri-urban and urban areas. Mdemu, (2012) argues that increased anthropogenic activities in the forest have altered the forest cover for Kazimzumbwi Forest Reserve and the neighboring Pugu Forest reserve, disappearance of valuable plants and animals is one among many effects. Figure 2.2 show the map of Kisarawe District and boundaries of Kazimzumbwi Forest Reserve and surrounding villages.

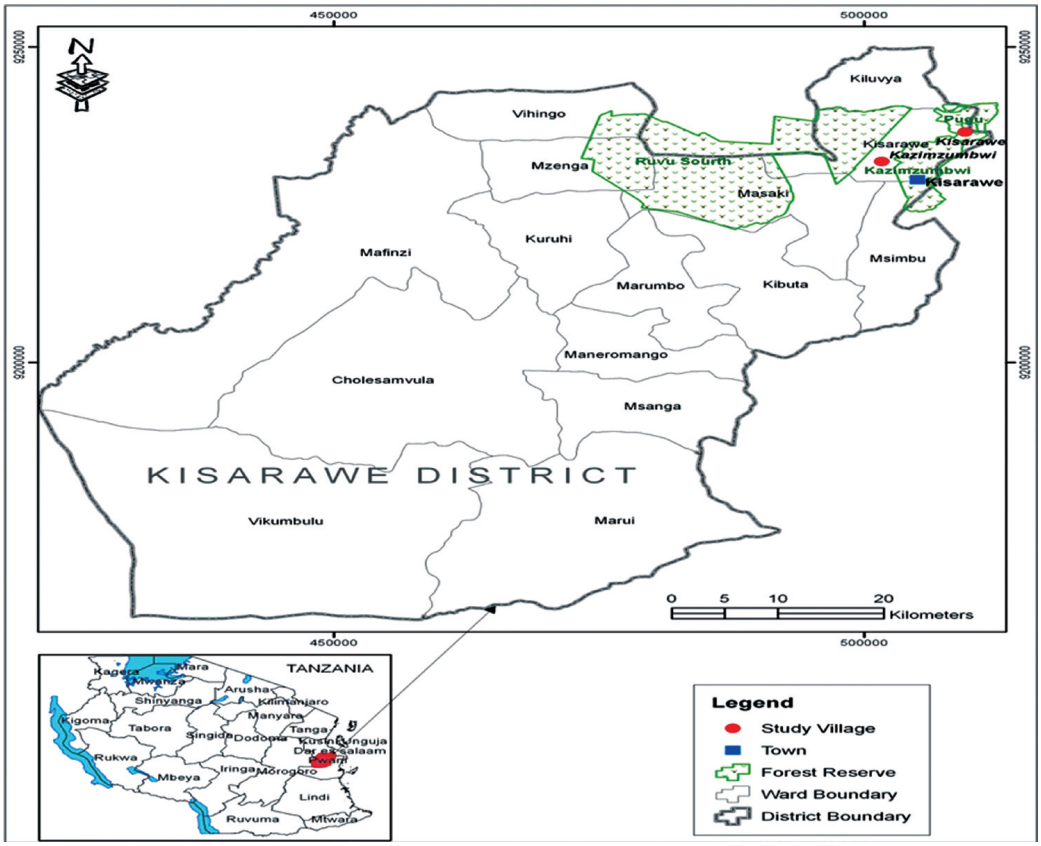

Figure 2.2: Location of Kazimzumbwi FR and surrounding villages

Source: Adapted from Mngumi (2013).

3.3 Research Methods

3.3.1 Research Design

This study used case study design. A case study research is a strategy for doing research which involves an empirical assessment of a particular contemporary phenomenon within its real life (Arthur*et al.,* 2013 & Robinson 1993). In similar way, Kothari (2004) add that research design is the conceptual structure within which a study is conducted. It constitutes a blueprint for the collection, measurement and analysis of data. The purpose of a case study research is to explore a phenomenon which is not much known, or to describe something in detail. According to Arthur *et al.,* (2013), case study research may be a single case study involving a small number of cases that are often related in some way. The rationales behind selection of a single case study research design was the reason that the Kazimzumbwi Forest reserve for many years has been a habitat to many valuable animal and plant species that are abundantly found in Kazimzumbwi Forest (Frontier Tanzania, 2002). Also, KFR has gained attention both locally and globally due to its locality in helping to regulate climate in areas surrounding the coast, and that, now the forest is likely to disappear due to uncontrolled human activities that cause deforestation. In addition to these facts, research studies EMNet (2011) show that people surrounding Kazimzumbwi Forest Reserve have little knowledge on issues about REDD and climate change related issues.

A triangulation method was employed where, data were collected through Focus Group Discussion (FGD), In-depth interview, Field Observation and Questionnaires (open and closed). This aimed to exhaustively collect perceptions of people on

deforestation and climate variability and change. The design was considered appropriate as it enabled the researcher to use all methods in order to tap people's views knowing that each method has its best way of use depending on the nature and characteristics of respondents included. Lastly, data collected were analyzed numerically using simple descriptive statistical analysis while thematic approach was employed to give content analysis of the study.

3.3.2 Research Approach

The study was a descriptive type of research. The justification of qualitative research design is based on the fact that there is a trend of change globally among researchers when investigating perception, views and experiences of individuals as they experience them in the world in order to make an in depth description of a particular situation or practices (Cohen, Manion & Morrinson, 2000). In this study perception is fundamental and a central focus of my study. According to Robinson (1993), a descriptive research study attempts to accurately portray the characteristics of an individual, group or a situation so that appropriate actions can be taken to that object. It aims to explore complex social or environmental phenomena, as experienced by people or individual human being and the experience differs from one individual to another (Malterud, 2001). For that matter qualitative research approach was considered appropriate for this study as the study involved digging deep down to get what people perceive to be the role of deforestation on climate change so as to plan proper policies of forest management. In order to ensure validity and consistence of findings data collected were analyzed numerically using simple descriptive statistical

analysis while qualitative approach was employed to give content analysis of the study.

3.3.3 Study Population

The total population in the two villages was 322 community members. Only 90 (28.5%) out of that 322 community members were randomly selected to be involved in this study where, 48 were from Kazimzumbwi village, and 42 from Maguruwe, (Table 3.1). The general composition of the selected population from both villages was 52 males and 38 females.

3.3.4 Sampling Techniques

Two sample villages were selected from Kazimzumbwi and Maguruwe both from Kisarawe District with a total of 11 sub-villages from both villages. The sub-villages involved in Kazimzumbwi were Darajani, Mkundi, Kilimani, Vibula, Kifuru station and Kigembe. Maguruwe involved sub-villages were Maguruwe kuu, Mkura, Yamba, Kitumbe and Makondeko. Responses from a total of 90 (28.5%) out of 322 community members were randomly selected to be involved in this study who later on were purposely selected to be used in different methods of data collection. Best and Khan (2006) have indicated that a sample is a small proportion of a population selected for observation and analysis. They further comment that by observing the characteristics of a sample the researcher can make certain inferences about the characteristics of the population from which it is drawn. Table 1 indicates the list of sub-villages sampled in the study.

Table 3.1: List of Villages and sub-villages involved

SN	Village	Sub-village	Sample size	Percentage
1.	Kazimzumbwi	Darajani, Makundi, Kilimani, Vibula, Kifuru Station and Kigembe.	48	53.4%
2.	Maguruwe	Maguruwe kuu, Mkura, Yamba, Kitumbe,and Makondeko.	42	46.6%
			90	**100%**

Source: Field Data (2014)

During data collection, purposive sampling was mostly employed to get the members for Focus Group Discussion and in-depth interview. Experience was considered as an added advantage. A respondent was supposed to be of 40 years of age and above. Also the respondent was supposed to be a permanent resident in the area under study for over thirty years. These criterions were set to allow those with enough experience to provide proper and relevant information required. In this study a purposive sampling technique was employed. But again, only respondents who were able to read and write were fit to give their information through questionnaires. Key participants for this study were farmers, charcoal dealers, livestock keepers, timber producers and firewood collectors. The selection of sample was therefore most

purposive because it based on age, economic activity of an individual and number of years an individual has been residing in the area (From at least 30 years and above).

3.4 Data collection methods

Focus Group Discussions and in-depth interviews with key informants as well as observations were used to collect qualitative data that was complemented by some literature review (Appendix II). Focus Group Discussion (FGD) was conducted by combining various key informants from groups of peasants, charcoal dealers and residents in general. To ensure exhaustive information, 2 FGD with total of 14 participants were conducted, where, 7 individuals from Kifuru station (Kazimzumbwi village) and other 7 from Maguruwe kuu (Maguruwe village) were selected to participate in the discussion.

In-depth interviews were conducted with semi structured questions guided by the researcher's checklist and some follow-up questions in dialoging with selected individuals. Through this way people's ideas were enriched, challenged and supplemented by other member's opinions during discussion. 10 interviewees (not same people involved in FGD) were selected from other 2 sub-villages, 5 from Darajani (Kazimzumbwi village) and other 5 from Mkura (Maguruwe village).This key informants were selected from individuals, households, and community leaders. Purposive selection of these individuals was done so as to collect the required information and gender equality was considered.

The questionnaires were also designed to capture numerical and qualitative data on perceptions of the communities on deforestation and climate variability and change

(Appendix I). Both closed and open ended questions were used whereby a respondent was to tick “yes” or “no” or underscores one or more items from the list given. Sometimes a respondent was asked to insert brief statements into blank spaces .All questions in the list were structured in a way that the answers had to reflect general and specific objectives of the study.

3.5 Data Analysis

The Qualitative and Quantitative information collected was integrated and synthesized to make this research. The exercise involved editing, coding, classification and tabulation. Data analysis was based mainly on two groups, being qualitative data analysis or quantitative data analysis. Qualitative information collected from FGD and in-depth interviews was analyzed using thematic and content analysis. Thematic analysis involved grouping responses under themes and content analysis examined the meaning of information given. Because the interview was conducted in Kiswahili in some parts, the recorded scripts were translated into English for discussion. On the other hand, Content analysis was used in the analysis of qualitative data (Bryman, 2008) whereby, Exploratory Data Analysis (EDA) method was employed to analyze information from focus group discussions and key informant interview during data collection with identification of major themes and ending with an in-depth description of the results. In accordance to Newing (2011) data from FGD and key informants was summarized according to key themes and illustrated by direct quotes, recounting particularly relevant experiences and views of people essential for authenticity of findings. Descriptive statistics was used to analyze quantitative data and results were presented either as percentages or counts.

Ms Excel was used to present the findings of this study by the use of graphs, charts, tables and computing percentages of responses. Other secondary data such as weather station data were recorded and compared to informant's responses so as to reach relevant findings.

3.6 Reliability and Validity

The terms "reliability" and "validity" are not the same as one can conceptualize; they have different meanings and applicability in relation to the evaluation of measures of concepts. Reliability is fundamentally concerned with issues of consistency of measures. Validity refers to whether an indicator that is devised to point a concept really measures that concept truly. Bryman, (2004) assert that, validity refers to the bridge between a construct and the data. Validity and reliability of methods used in this research were verified by the researcher after going through various literatures. Also, the researcher conducted a reconnaissance and pre-tested the methods by supplying samples of questionnaires and checklist of FGD and in-depth interview questions to few people in the study area to see if at all they were easy to understand and provide the relevant output.

3.6.1 Reliability

Something are said to be reliable when they are consistent and repeatable. Joppe (2000) defines reliability as the extent to which results are consistent over time and an accurate representation of the total population under study; if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable. Embodied in this citation is the idea of repeatability of

results or observations. Qualitative research reliability is concerned with the consistency and accuracy of the scientific findings of the study (Best and Khan, 2006).

To ensure reliability of the study, a pilot study was undertaken. About five questionnaires were administered to five respondents. Then editing of the questionnaires was made depending on comments and responses raised from respondents. In addition, one FGD schedule was pilot tested to five respondents, during the discussion, improvement were made in order to enrich the research objectives and research questions. But again, respondents' information about rainfall was compared with data from Kisarawe weather station to see if at all information given was reliable. Also, both questionnaires and Focus Group Discussions schedule were translated into Kiswahili so that respondents can comfortably respond and deliver reliable information. This led to revision of the instruments (i.e. interview guide and interview schedules) to suit participants.

3.6.2 Validity

Validity determines whether the research truly measures that what it was intended to measure or how truthful the research results are. In other words, does the research instrument allow you to hit the research object? Researchers generally determine validity by asking a series of questions, and will often look for the answers in the research of others (Joppe, 2000). The questionnaires with different set of questions that were distributed to different respondents adequately assisted the researcher to achieve the validity of the study. To ensure that the study obtained construct validity, a multi-methods strategy (triangulation) was used (FGD, Interviews, observation).

Triangulation implies that different techniques are employed to study same problem so as to obtain a high inter-correlation state that measures what is supposed to measure. Validity therefore, is concerned with the accuracy of scientific findings (Best and Khan, 1993).

In this study the preparation of questionnaires for example, adhered to the respondents' ethics and knowledge thus the use of proper frame of questions. Discussions were free and fair with no interference hence respondents could provide more information that could answer the problem of the study more precisely.

3.7 Research Ethical Issues

Research ethics involves the application of fundamentals ethical principles to variety of issues in conducting scientific research. Among the ethical issues regarded in this research were voluntary participation of respondents, humanity, confidentiality, national policies and adherence to rules and regulations during the process of preparation and conducting research. Research clearance letters were obtained from the offices of the Director of Post graduate of the Open University of Tanzania and from the office of District Executive Director, Kisarawe. Those research clearance letters are appended. During the study, all the respondents were informed about the purpose of the study and their commitment to participate in the study was appreciated. The consent of the respondents was maintained by persuading them to provide the needed information on their free will. Observing these conditions, the respondents were confident and under such circumstances they could provide more realistic information that would reflect the specific objectives of the study.

CHAPTER FOUR

4.0 FINDINGS AND DISCUSSION

4.1 Introduction

This chapter presents research findings. These findings were guided by research questions addressed in chapter one. Before the analysis of these research results, characteristics of respondents was described regarding age, gender, education level, livelihood and experiences in issues related to deforestation and climate variability and change in the study area. This meant to design a basis for investigating people's perceptions on contribution of deforestation in climate variability and change in the study area.

4.2 Characteristics of respondents

4.2.1 Age of Respondents

In the course of finding out the age of respondents, an age group was established, 58 (64.4%) were male and 32 (35.5%) were female. Respondents of the age from 40-60 years and above were purposely sampled due to their life experience, maturity and their familiarity with the study area. Also, this age group is regarded as a decision making cohort of the community. This implied that majority of the population interviewed were mature enough to understand the whole concept of deforestation and issues pertaining climate variability and change so as make study a success.

4.2.2 Education Level

Educational level of the sampled was examined because it gives a basic input for an individual to master the environment and be able to understand various issues pertaining deforestation and climate variability and change. (Figure 4.1) portrays the level of education of the respondents.

The findings showed that the level of education to most respondents was relatively low and for those who had an opportunity to formal education, majority of them i.e. 54 (60%) attained merely basic primary education (standard 1-7). 12 (13%) proportion of community representatives attended secondary education , and very few, about 6 (6%) had an opportunity to attend college education. The rest 18 (20%) reported to have not attended any level of education. The fact that, the level of education to majority of respondents was low had a bearing on the knowledge on the importance of utilizing forest resources sustainably, as, the higher the level of education the higher is the knowledge on the importance of sustainably using forest resources.

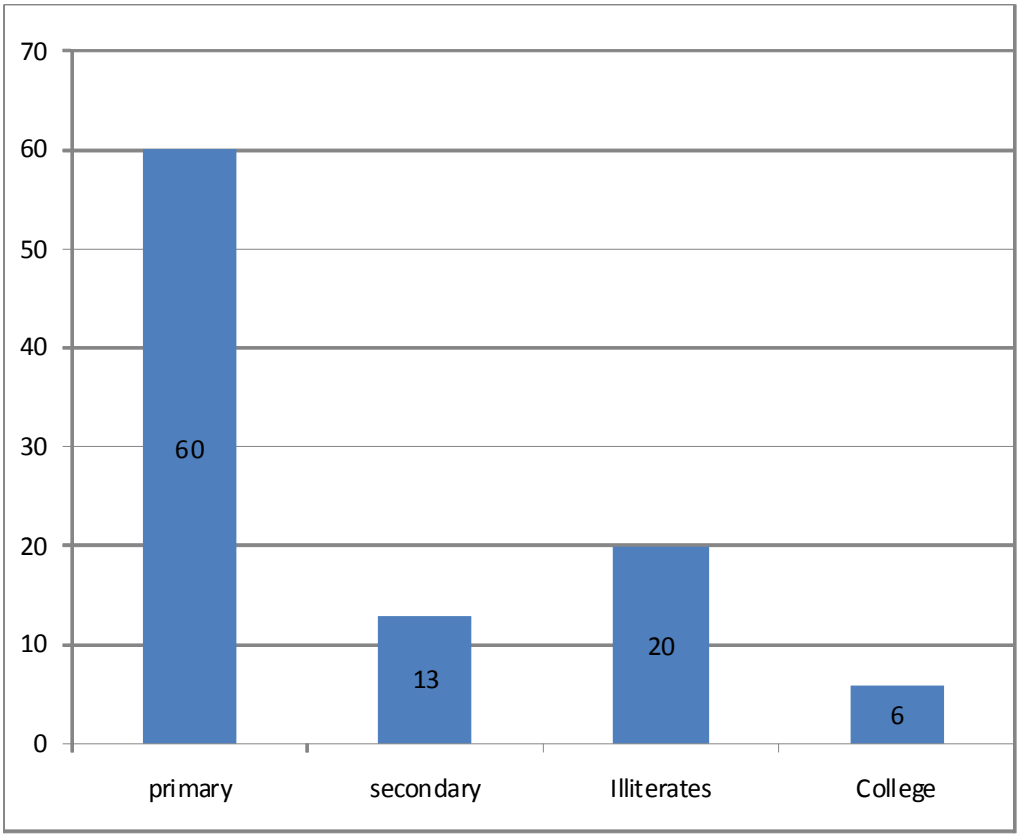

Figure 4.1: Respondent's level of Education in the study Area by %

Source: field Data (2014)

4.2.3 Occupation of Respondents

This study aimed at examining various perceptions of people concerning the impacts of deforestation on climate variability and change in the study area. The study included people who engage in various economic activities. The criteria for selecting a sample were also based on human activity that is environmentally related. 38(42%) of the sampled were peasant farmers, 20 (22%) reported to earn their income from charcoal production and selling. The other groups were 26 (28.8%) firewood collectors, 6(6.6%) were timber producers (Figure 4.2). During interviews,

respondents reported that women are more engaged in firewood collection and peasantry agriculture than men due to their gender position in the community. However, women claimed that men are more destructive to the environment and have no sense of using the forest sustainably as they only seek resources (i.e charcoal, wood, etc.) for profit making.

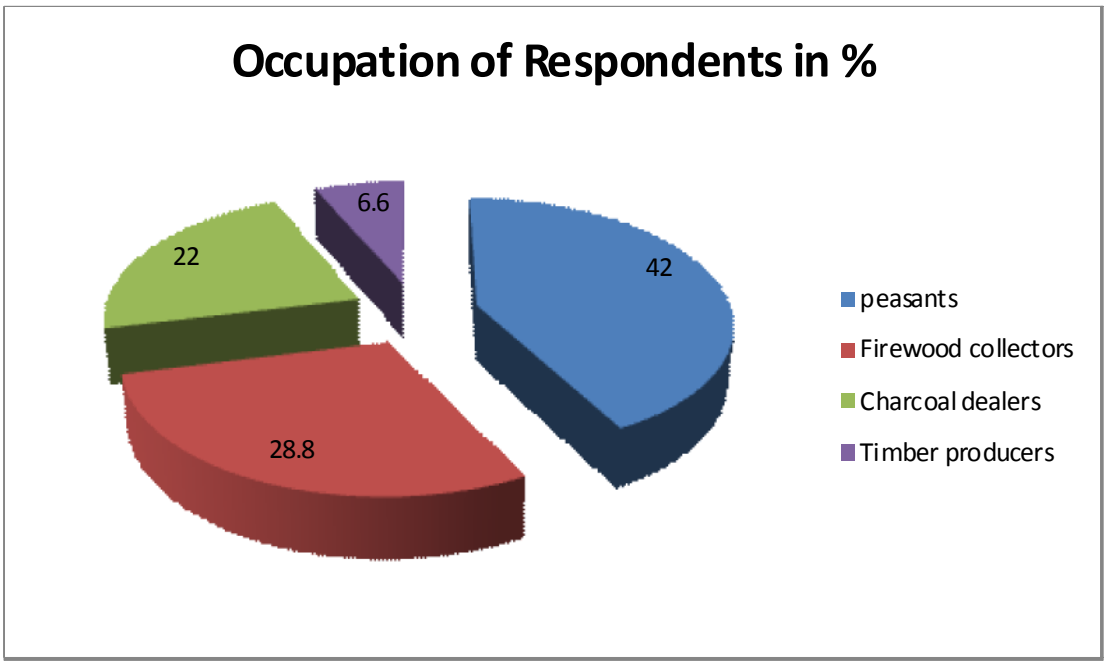

Figure 4.2: Occupation of Respondents

Source: Field Data (2014)

4.3 People's Perceptions on the role of Deforestation on Climate Variability and Change in the study area

4.3.1 Causes of deforestation and perceived solutions

Forest clearance for farming was seen by most (88%) as the main reason for deforestation. Everyone knows it is illegal to clear land for agriculture in protected forests (99% acknowledged this), but it happens nonetheless. During interviews and in questionnaires, respondents were asked why *others* still go into the forest while

they know this is illegal. In all villages a majority of respondents claimed that people break the law because they simply have to for survival. In Kazimzumbwi village everyone selected this answer. Little or no knowledge on deforestation and climate change was most often mentioned in both study villages. (20%) of respondents mentioned charcoal as the main cause of deforestation, but all of them are from Kazimzumbwi village where charcoal production is a big problem. Other causes, such as timber extraction and mining were mentioned by only a few respondents, (6%). Figure 4.3 shows people's perceptions on who is responsible to combat deforestation. Most respondents felt it is the government mostly the local (38%) but also the central government (23%) that is best placed to do something about deforestation. A large share of the respondents (36%) also felt it was up to the local people themselves to take action. NGOs are only seen by 3% as the best institution to counter deforestation.

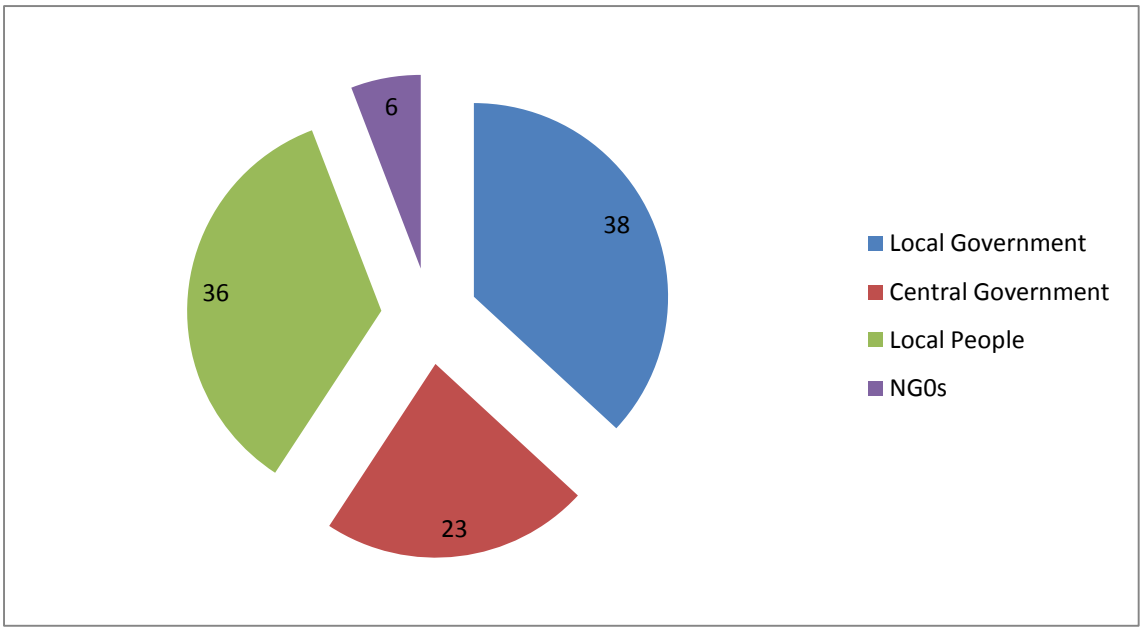

Figure 4.3: People's perceptions on who is responsible to combat deforestation (in %)

Source: Field Data (2014)

4.3.2 People's knowledge on impacts of social economic activities on deforestation

Regarding community perceptions on whether human activities (farming, firewood collection and charcoal production) have largely contributed to the loss of Kazimzumbwi Forest Reserve, Questionnaires revealed that, 82(91.1%) of the 90 samples said "Yes". Furthermore, 67(74.4%) agreed that deforestation in the Kazimzumbwi Forest has accelerated drought condition in the area. During in-depth interviews, some respondents in Maguruwe showed that about 20 years ago vegetation in KFR was still intact and there was no severity in drought condition compared to "these years" (present time when research was conducted). "*I was raised here since my childhood, this forest (Kazimzumbwi Forest) was a thicker forest indeed unlike today*"-(a resident from Kilimani sub-village). These findings

correlate with HIMADA project (2011). Only 13(15.8%) of all 90, stated other reasons for drought occurrence in the area such as longer periods of sunny condition and air pollution especially emission of smokes from industries located in Dar es Salaam. Other environmental effects which were reported during Focus Group Discussion include, drying out of water sources which have been there for decades. In Kazimzumbwi, Nzasa River which was permanent has become seasonal resulting into disappearance of hippopotamus, fish and increased river sedimentation.

During Focus Group Discussion with residents from Maguruwe, the discussion among other issues showed that majority of the community members surrounding the KFR are characterized by low income and they lack alternatives sources of income. Harvesting and selling of forest products seemed to be the only easy and quick option to make living. "*We used to camp in the forest (Kazimzumbwi forest) and stayed there for even a whole month making charcoal. It is a heavy job but it pays, apparently, the government is strict despite the fact that there is a shortage of trees and logs to produce charcoal due to deforestation that has taken place"* .In the process of rating the highest human activity that highly contribute to deforestation, study findings (Table 4.1) showed that Farming is a predominant livelihood activity among the community members of the sampled population that contributes to about 55.5% to deforestation. Again, 23.3% of respondents reported to depend on KFR for firewood, whereby 16.6% depended on forest for charcoal and 4.4% claimed to have engaged in timber production on small scale. In addition, charcoal was reported to be more destructive to the environment and also a good income generator. The continuous increase in price in charcoal in the urban areas such as Dar es Salaam was

said to have motivated people to scramble on the KFR. As the result, there has been tremendous encroachment of settlement in the forest reserve regardless of several governments' efforts to evict illegal settlers from the forest.

Table 4.1: Rate of contribution of human activities to Deforestation in %

Activity	**Frequency**	**Valid Percent (%)**
Farming activities	50	55.5
Firewood Collection	21	23.5
Charcoal production	15	16.6
Timber production	4	4.4
Total	**90**	**100%**

Source: Field Data (2014)

Local communities' perception on the use, condition, changes and problems emanating from the forest and their willingness to undertake conservation were found to be significantly different on how they value their resource. In the discussion when the researcher asked respondents on how they perceive the role of forest, a quick knowledge was that "forest attracts rainfall", no one had any knowledge about the "carbon cycle" mechanism. Respondents admitted to understand the value of forest that it helps to regulate rainfall but 2 respondents (aged) argued that forests are there to be used for human survival and only sacred trees should remain. Statement like this one implied that not all people in Kazimzumbwi have the same view about the role and use of forest. When asked directly in an open question to express what the forest meant to the respondents, people mainly referred to the forest's direct use

values, such as firewood, building materials, medicines, fruits, and animals (mentioned by 86%). A majority of respondents (68%) also mentioned a link with water provision, either exclusively or in combination with other things. Because these questions came at the end of the questionnaire, it is possible that the answers were influenced by the information received during the interview.

4.4 Perceived changes in the forest

Almost all respondents (90%) had witnessed a change in the forest over the last 30 years. When the researcher asked to specify the changes, 44% mentioned the reduced size of the forest as the most important change. Others mentioned the disappearance of animals or certain tree species, or, more in general, said that it had become harder to find forest products. Each of these last three answers was mentioned as the most important change by roughly 20% of the respondents.

When asked about the future of the forests, respondents were generally pessimistic (Figure 4.4). Most people think there will be further damage to the forest of Kazimzumbwi, while most think the forest will have completely disappeared in 10 years time. In Maguruwe people were most optimistic. There only 18% believed the forest would be much damaged or disappear completely, and 14% thought there would be no change, and 2% believed that situation would even improve. Again, this is not surprising considering the efforts of NGOs and the acceptance of farmers to change farming practices. Everyone expected deterioration and 66% even thought there would be very much damage or complete destruction.

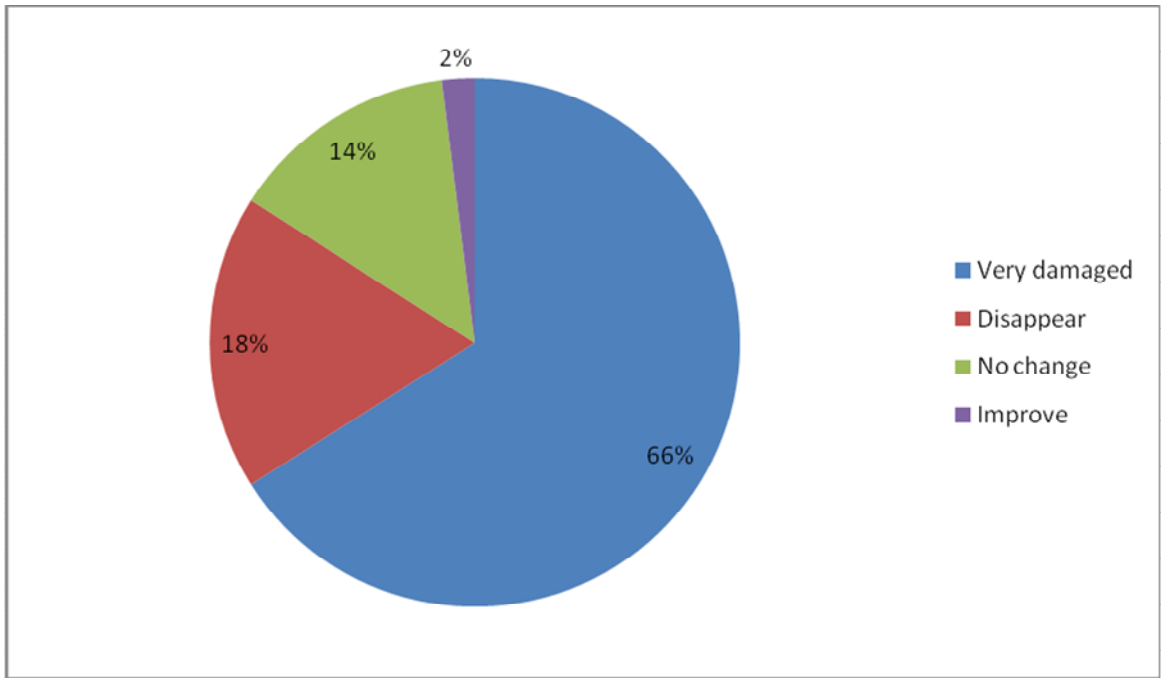

Figure 4.4: Perceived state of Kazimzumbwi Forest in 10 years.

Source: Field data (2014)

When the researcher asked about the most important effects of deforestation on the environment and people's lives, water related factors, such as reduced rainfall and water availability in the dry season were mentioned often. The availability of forest products was also mentioned a great number of times.

4.3.3 People's knowledge on influence of forests in climate of the area

During interviews and in questionnaires, the researcher asked household respondents to state or tick 'yes' or 'no' to if there is a relationship between presence of forest cover and occurrence of rainfall. 77(86.2%) respondents showed to have a partial knowledge on a relationship between rainfall and forest. One respondent from Kifuru Station stated that; "*We get information from media that vegetation attracts rainfall;*

that is all I know". He further continued, *"Apparently, rainfall is not falling on set, it is hard to predict, but about 20 years ago it was easier to predict, and during that time the KFR was at least still full of trees, unlike today."*This statement indicates that there are a small proportion of people who plainly can tell the association between deforestation and rainfall variability in the area.

Other respondents stressed that rainfall had decreased and became more unpredictable. However, there was a challenge among respondents in understanding the term 'climate', 'climate variability', and 'climate change'. When the researcher tried to translate 'weather' and 'climate' into Swahili, both terms were synonymously known to the locals as '*hali ya hewa'* Therefore, the phrase 'climate variability and change' were simply known to them (respondents) as *'mabadiliko ya hali ya hewa'*A small proportion of respondents were able to describe climate variability and change as *'mabadiliko ya tabia nchi'*. One of the respondents from Makondeko in Maguruwe said; *"The villagers are told not to cut down trees without replacement so as to avoid occurrence of drought,"* Statements like this one, enriched the researchers findings which corresponds to the objectives of this study of investigating people's perceptions on deforestation and climate variability and change.

Observation made by the researcher from the field (Figure 4.5) showed that the KFR has significantly decreased. Among the drivers for the decrease is the charcoal business. Also, this dependence of forest resources was reported to have speeded in disappearance of some plants such as fruit plants, building poles and drying up of

perennial rivers. Furthermore, the study revealed that here has been a tremendous decrease in agricultural production of traditional crops such as cassava, groundnuts, maize and passion fruits as a result of persistence in drought in the study area.

Figure 4.5: Charcoal making in KFR

Photo by the Researcher (2014)

4.3.3 Perceptions on Climate Variability and Change and Their Effects

This study suggests that climate change knowledge in the study area is limited; many people do not understand the scientific underpinnings of climate change, although there is a strong sense of some anthropogenic element. A key element in climate change knowledge that appeared in the study area is that, deforestation was more commonly recognized as a factor in climate change. The levels of climate change concern reported in this study are also comparable to those observed in North

America and Europe (Vignola, *et al.*, 2012) although they are on the higher end of the scale.

The communities' perceptions on climate variability and change revealed indicators of climate variability and change that include decreasing rainfall, increasing incidences of droughts, unpredictable rainfall patterns, disappearance of wetlands and failure to predict the on-set of rainy season using traditional indicators and indigenous knowledge. This study has shown that most smallholder farmers in the study area perceived shifts in the timing of seasons as mentioned above. Most common causes of climate change were due to environmental degradation particularly deforestation according to farmers' perceptions and majority of farmers perceived changes in the rainy season more than other seasons.

Farmers expressed shortening of the rainy season and increased variability in intensity and distribution. The extent to which deforestation was perceived by smallholder farmers (88%) as a cause to climate variability and change was very high. During data collection from residents in Makundi and Maguruwe kuu, it was very common for focus group discussants to come easily to a consensus that there is a substantial increase in temperatures wit decrease in rainfall. A female key informant reported to have experienced decrease in rainfall pattern for the past 20 years or so. "*Rainfall has greatly decreased nowadays; this situation has forced me and my husband to shift from cultivating many hectares of farms to horticulture where we cultivate cabbage, tomatoes, cucumber and watermelons for sale"*. She further said; *horticulture doesn't depend on seasonal rainfall, irrigation can do*

better although in recent years we have been facing a great problem of water shortage in Fukwi dam where we fetch water". Before 2000s, they used to receive short rains *(Vuli)* between October and December and long rains *(Masika)* from March and June but presently, the *Vuli* rains come late (until April for some years) and stops earlier. However, other respondents during Focus Group Discussion said that it has been difficult to determine the on-set of rainfall by traditional methods. In the past (1990s and 1980s) appearance of certain clouds, occurrence of certain insects, warming of the atmosphere were considerably used to determine rainfall availability. As a result of increasing rainfall variability, agriculture dependent households are now food insecure.

This study has therefore confirmed people's perceptions that climate is variably changing and many effects have been realized (Figure4.2). This study proves that, understanding of community perceptions is of paramount importance in natural resources management because it helps to understanding various climatic changes that people experience over time i.e. a significant change in temperature, changes in intensity and duration of rainfall, reduction in production and other livelihoods and the like. Several studies (Mngumi, *et al.,* 213) stress the importance of using local people's perceptions as an input for designing and applying appropriate management plans for sustainable development, particularly in protected areas.

Table 4.2: People's perceptions on deforestation and climate variability and change in the study area

Area	Main findings	Indicators of climate variability and change due to deforestation	Events occurred
Maguruwe village	• Deforestation has been the main cause of loss of the KFR • The spread of knowledge about climate variability and change is increasing	• Failure to predict on-set of rain seasons by traditional methods and indigenous knowledge i.e occurrence of certain clouds, wind severity	• Extreme high temperature and stronger winds than years before • Prolonged drought condition in Maguruwe • Dry out of some wells and springs in Maguruwe
Kazimzumbwi village	• Many people have been depending largely on forest resources from the KFR • Encroachment people in the KFR has increased (regardless of government's efforts to evict them) • Poverty is also the driving force for using the forest unsustainably	• Unpredictable rainfall compared to early 1980s i.e. Vuli (Oct-Dec) and Masika (March-June) • Drought severity	• Dry of Nzasa river in Kazimzumbwi • Decline of water level in Fukwi dam in Kazimzumbwi • Forest areas is changing into semi deserts

Source: Field Data (2014)

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of findings, conclusion and recommendations of the study according to research questions and objectives. The main aim of this study was to assess people's perceptions on deforestation and climate variability and change, a case study of KFR in Kisarawe District. Specifically, the study intended to first, identify socio-economic activities related to forestry in the study area, and why such activities are being conducted. Second, to compare rainfall and temperature data of over 30 years from weather stations with peoples' perceptions and experience in the study area and third, to assess how people perceive the role played by forest in regulating rainfall and temperature.

5.2 Summary

In carrying out this study, the research process was guided by research objectives which were accompanied by questions; and the study was mainly a qualitative with some quantitative elements for description purposes. The sample comprised of 90 respondents from two villages of Maguruwe and Kazimzumbwi in Kisarawe District. Data were collected through questionnaires, FGD, in-depth interviews and through direct observation in the field. Questionnaires, for example, were both closed and open in order to gather all necessary information from respondents. Qualitatively, the SPSS soft ware was used to obtain the content required while Ms Excel was used to present summaries of these findings by graphs, charts and tables.

5.2.1 Social Economic activities related to forestry in the study area

The findings revealed that, majority of people engage themselves in peasant agriculture in order to sustain their lives. However, firewood collection, charcoal burning and timber production were also reported to be practiced significantly in the study area. All of the above activities are conducted in and around KFR hence accelerating its decrease. The study also revealed that majority of people surrounding KFR and other neighboring areas lives in poor condition such that KFR is the best resource available for survival.

5.2.2 People's perceptions on deforestation and climate change

This study has shown that most smallholder farmers in the study area perceived shifts in the timing of seasons, increase in temperature, droughts and floods. Most common causes of climate change were related to environmental degradation particularly deforestation according to farmers' perceptions. Majority of farmers perceived changes in the rainy season more than other seasons. Farmers expressed shortening of the rainy season and increased variability in intensity and distribution. Perception related to droughts was significantly associated with deforestation. The extent to which deforestation was perceived by smallholder farmers as a cause to climate variability and change was very high. The findings revealed that there is a substantial increase in temperature condition and fluctuation of rainfall yearly, the rain is somewhat unpredictable. Similarly, majority of respondents concurred with the concept that since deforestation of KFR started few decades ago, there have been also some climatic changes in the study area. This study also revealed that communities around KFR have little knowledge on climate change and related

concepts. The Kiswahili terminology for climate change “Mabadiliko ya Tabia nchi” was also not very common among many. Although they could not define exactly what the above term mean, but they were able to mention local examples on adverse effects caused by climate change which they strongly associated those examples with trend of deforestation of Kazimzumbwi Forest.

5.2.3 Roles of forest in influencing climate of the area

The study revealed that there is a slight increase in community’s knowledge about the climatic roles played by forest. During interviews and from questionnaires responses the researcher found that most people only knows that clearance of forests have impact to the climate. The two major impacts that were mentioned were drought and lack of rainfall. Analytically, responses from households to this part were given basing on traditional experiences and knowledge. The reason to why the problem of deforestation is still at large in the area is because of poverty among the people and poor management by the government in protecting KFR. Deforestation has always been recognized to be fueled by continuous urbanization and rapid population growth. The effects brought about by deforestation not only have intensely affected the climate of the area, but also the quality of life of those people who continuously depend on these resources and those communities that settle near these resources.

5.4 Description of the Theoretical Framework and research findings

From theoretical framework findings show that Kazimzumbwi people are aware that deforestation is a problem and climate of that area is slightly changing from decade to decade. That response helped to provide a basic input to the researcher to demand more explanations and answers from respondents. The driving forces of deforestation were clear as indicated in conceptual framework and people's perception seemed to be influenced by the occurring climate impacts in the study area and how people associate those impacts with deforestation activities. These perceptions were well described by people by telling the elements and effects of climate change experienced in the area over time. A few indicators mentioned were such as prolonged drought condition, unpredictable rain, on-set and off-set of seasons which have caused dropping of agricultural crops. Responses from questionnaire show that majority (88.6%) of the sampled accepted that there is a relationship between actions of deforestation in KFR and occurring changes in climate in the study are, these changes were strongly associated with trend of the rate deforestation of KFR.

5.5 Conclusion

Kazimzumbwi Forest Reserves is highly deforested. Kazimzumbwi Forest Reserve, which had almost changed its vegetation type from forested to bush land and grassland has now started to regenerate after the government eviction in February 2011. People around KFR have a slight knowledge on impacts of deforestation on occurrence of climate variability and change.

5.5 Recommendations

This study raises the following recommendations;

To insure environmental sustainability in the study area and other similar areas, training on REDD and related concepts should be done in all villages through training of trainers (TOT) where REDD professionals may train selected villagers (to become Para professionals) who will in turn train other villagers in their villages. This modality will not only be cheap in terms of cost, but would also bring sustainability of conservation knowledge around KFR.

Feasible livelihood option is ought to be advised in the community so as to give a room to the re-growing KFR.

Climate change communication provides an avenue through which perceptions of resource users can be integrated in climate change adaptation projects. This would facilitate exchange of climate change information between local people on one hand and the local government on the other. In this regard, awareness creation on conservation of KFR should involve all community members in the adjacent villages. Current conservation debates place high emphasis on the need to integrate the views and needs of local communities in conservation processes. Understanding local Community perceptions of forest management and the factors that influence these perceptions is important for designing management policies that are sensitive to their needs.

The incorporation of the perspectives of the communities on the resources is important as this enables the public to have a sense of ownership and responsibility on the resources involved so that in the long run they would immensely be involved in the management of the resources. Public perceptions and acceptance of the people are recognized to be the main factors for the success of the efforts that are geared towards the sustainable management of the environment. Ignoring local communities' perceptions towards a given forest management approach has been a telling factor for their unsustainable use of these resources.

For effective information dissemination at local level, written materials should be published in adequate quantities, to reach at least each household, village leaders, and be distributed in primary and secondary schools. . These materials should be provided with illustrations, including pictures and local photographs (e.g. local signs of deforestation and climate change around KFR or with a photograph of a known villager) and be presented in simple kiswahili language.

There is a need to have a green revolution by establishing serious campaigns in environmental conservations. Serious National tree planting campaigns can be established; such efforts were conducted in China and India in 18th Century; Institutions such as schools, colleges, armies, prisons can take the lead when motivated. Such efforts will help to mitigate further climate variability and change by absolving more CO_2due increased economic activities.

Finally, I would strongly recommend the introduction of eco-tourism in the forest so that the local people can benefit from the earnings which could be generated, while at the same time protecting the forest. Eco-tourism would assist to improve the management of KFR.

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APPENDICES

APPENDIX I

THE OPEN UNIVERSITY OF TANZANIA

FACULTY OF SCIENCE, TECHNOLOGY AND ENVIRONMENTAL STUDIES

DEPARTMENT OF ENVIRONMENTAL STUDIES

A research Questionnaire

PART I

Introduction:

Joseph Andrew Cornel is a post graduate student at the Open University of Tanzania in Dar es Salaam doing a research about the people's perceptions on deforestation and climate variability and change inKisarawe District. This is a partial fulfillment of the requirements for the award of Masters Degree in environmental studies of the Open University of Tanzania. The information collected here is for public education and awareness in order to ensure people's wellbeing and environmental sustainability. The respondent is free to provide any relevant information. All responses remain confidential.

PART II BIODATA

i. Name (optional)…….
ii. Sex……
iii. Age……
iv. Place of domicile……
v. Occupation…….
vi. Educational level……..
vii. Number of years the individual has settled in the area……

Questions for objective 1

1. (i) Human activities such as farming, firewood collection and charcoal burning have caused loss of Kazimzumbwi Forest Reserve. Do you agree? (Please put a tick √)

   YES …… NO……

   (ii) If YES, in your opinion do you also agree that clearance of the forest can be considered as a source of drought?

   YES….. NO……..

   (iii) Apart from drought outline other environmental effects that have resulted from loss of Kazimzumbwi Forest Reserve.

   i……..ii……iii……

2. Who is responsible to counter deforestation? Please tick appropriately
   i. Indigenous people……ii. The local government…..iii. NGOs…….iv. The central government……
3. The following table indicates a list of human activities that have accelerated deforestation of Kazimzumbwi Forest Reserve. Arrange these activities in order of high contributing to least contributing by marking in the appropriate columns from 1- 5 to represent your choice from the scale.

Activity	**Rate**				
	1	**2**	**3**	**4**	**5**
Farming activities					
Timber production					
Firewood collecting					
Charcoal burning					

Questions for objective 2

1. (i) Does forest help to attract rainfall? (Please put a tick √)
   YES……. NO……
   (ii) I f Yes, in your view do you agree that clearance of Kazimzumbwi Forest Reserve has affected rainfall amount in the area? (Please put a tick√)
   YES…… NO……..
   (iii) If yes, how rainfall has changed (Please put a tick√)
   Increased…….. Decreased…….. Unpredictable…….

2. (a) .To what extent do you agree with the following statement; *Deforestation contributes to occurrence of drought?* please put a tick√ in the appropriate box

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
5…….	4……	3……..	2……	1……..

   (b). Why do you think other people still go into the forest while they know it is illegal and aggravates climate change(Please tick appropriately)

   (i). No other livelihood options……(ii.) Ignorance about impacts of deforestation on climate change……

3. The temperature condition of this area has subsequently become unpredictable after increasing activities of deforestation in Kazimzumbwi Forest Reserve. Do you agree?(Please put a tick√ in the appropriate box))

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
5…….	4……	3……..	2……	1……..

Questions for objective 3

1. (i) Are there any changes pertaining seasons of the year particularly from farm preparation, sowing to harvesting time?(Please put a tick √)
   YES…….. NO……
   (ii) If Yes, state those changes……
   ……
   ……
   ……..

   (iii) Do you relate those changes with deforestation activities that have taken place in the Kazimzumbwi Forest Reserve? (Please put a tick √)
   YES…… NO……...

2. (i) Have you experienced any environmental hazards such as flood in this area?(Please put a tick √)
   YES……. NO…….
   (ii) State the period (time) when the flood occurred.
   ……(i.e. in 1920)

Thank you for your cooperation!!

APPENDIX II

FOCUS GROUP DISCUSSION AND IN-DEPTH INTERVIEW QUESTIONS

1. How do you define deforestation?, what is the forest mean to you?
2. What are the most contributing factors of deforestation in this area?
3. Does forest have a role to play in regulating climate of an area? Please explain
4. In your opinion, do you believe that clearance of Kazimzumbwi Forest Reserve can be a source of shortage of rainfall in the area? Please explain.
5. How do you define climate change?
6. Has rainfall changed in the past few decades? (i.e. amount, prediction etc.) Since when? Does this change in rainfall have to do with deforestation of Kazimzumbwi Forest Reserve?
7. Elaborate various changes that have occurred particularly in farming seasons in this area.
8. How have people in this area affected by contemporary changing of climate?