CONTRIBUTION OF VILLAGE LAND USE PLAN IN MITIGATING HUMAN-WILDLIFE CONFLICTS IN IKONA –WMA, SERENGETI DISTRICT

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MASTER DEGREE OF SCIENCE IN NATURAL RESOURCES

THE UNIVERSITY OF DODOMA

OCTOBER, 2017

CONTRIBUTION OF VILLAGE LAND USE PLAN IN MITIGATING HUMAN-WILDLIFE CONFLICTS IN IKONA –WMA, SERENGETI DISTRICT

By

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A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Natural Resources Management of the University of Dodoma

The University of Dodoma

October , 2017

CERTIFICATION

The Undersigned certifies that she has read and hereby recommends for acceptance by the University of Dodoma a dissertation entitled ***"Contribution of Village Land Use Plan in Mitigating Human-Wildlife Conflicts in IKONA-WMA, Serengeti District"*** in partial fulfillment of the requirements for the Degree of Master of Science in Natural Resources Management of the University of Dodoma.

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Dr. Mikova Kseniia

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I, **Jonas Nestory**, hereby declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

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ACKNOWLEDGEMENT

I thank the almighty God for enabling me to accomplish this work. I wish to express my earnest gratitude to my supervisor, Dr. Mikova. Without her guidance and support, this work would have no doubt been harder and painful. I would like to thank Professor Abiud Kaswamila who was immensely helpful to me during the initial research plan and writing of the proposal.

I would like to thank all staff and management of the students' affairs and my department members of the University of Dodoma for their unconditional support and guidance throughout my studies. My special thanks also go to my parents, Mr and Mrs Masingija, my wife Prisca Charles, my children and my employer for their endless support.

Finally, I have to recognize my friends, Mr. Emmanuel D. Magembe, Mr. Munezero and Mr. Emmanuel Gwatela, your kindness is highly appreciated and God bless you.

DEDICATION

I dedicate this work to my wife Prisca Charles and my children Charles, Magreth, Zephania, Martha and Jonsca. May Almighty God bless you and have a long life.

ABSTRACT

Many rural communities living adjacent to protected areas in developing countries are facing negative impacts as a result of increasing human-wildlife conflicts (HWCs). This study was conducted to assess the contribution of Village Land Use Plan (VLUP) in mitigating human-wildlife conflicts. The study involved two villages of Makundusi and Natta Mbisso in Serengeti district. Data were collected through households' survey; key informants interviews, focus group discussions and archive information, and 122 participants were involved in the study.

Results revealed that before the implementation of VLUPs (1997-2006), human wildlife conflicts were increasing at the rate of +9% to +11%. The results also revealed that human-wildlife conflicts started decreasing at the rate of -40% to -49% per year after implementing VLUPs (2007-2016). However in the next 10 years the HWC could start rising possibly due to the VLUP which will be not enough to overtake the population growth of human, livestock and wildlife. Despite the achievements, poor community participation and absence of demarcated boundaries for different land uses were revealed. The results revealed that68.8% of the respondents perceived the VLUP as a useful tool in mitigating human wildlife conflicts in the area.

The study concludes that, the VLUP has contributed in mitigating human-wildlife conflicts in the study area. The study recommends that there is need to improve and strengthen the implementation of VLUP towards mitigating the HWC in the area through reviewing VLUPs and their by-laws, enhancing awareness campaign on VLUP, strengthening capacity building for leaders and VLUM team and assurance of funds to undertake monitoring activities of VLUP.

Key words: human-wildlife conflicts, village land use plan and conflict mitigation.

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LIST OF ACRONYMS AND ABBREVIATIONS

DGO	District Game Officer
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
FZS	Frankfurt Zoological Society
GDP	Gross Domestic Product
GMP	General Management Plan
HWCs	Human-Wildlife Conflicts
IGGR	Ikorongo and Grumeti Game Reserves
IUCN	International Union for Conservation of Nature
LUP	Land Use Planning
MNRT	Ministry of Natural Resources and Tourism
NLUPC	National Land Use Planning Commission
PAs	Protected Areas
PLUM	Participatory Land Use Management team
SDC	Serengeti District Council
SNP	Serengeti National Park
SRMP	Sustainable Rangeland Management Project
TAWA	Tanzania Wildlife Management Authority
TAWIRI	Tanzania Wildlife Research Institute
TMA	Tanzania Meteorological Agency
URT	United Republic of Tanzania
VEO	Village Executive Officer
VLUM	Village Land Use Management committee
VLUP	Village Land Use Plan
VTs	Village Technicians
WD	Wildlife Division
WEO	Ward Executive Officer
WMA	Wildlife Management Area
WWF	Worldwide Fund for Nature

CHAPTER ONE

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Introduction

This chapter provides the background information on the human-wildlife conflicts and their negative impacts on both human and wildlife alike. The chapter also presents the statement of the problem, research objectives and research questions. Lastly, the chapter presents the significance of the study.

1.2 Background of the Study

Conflicts between humans and wildlife have been occurring as long as human and wild animals have been sharing the same resources and landscape (FAO, 2009; Mwangi, 2015; Manoa & Mwaura, 2016). They occur in all continents, in developed, as well as developing countries, yet the problems vary according to the particular environment and people's way of life (Lamarque et al., 2009; Fairet et al., 2012). Human-wildlife conflicts have adverse impacts on wildlife and human alike. Human-wildlife incidents involve crop raiding by wild animals that consume or destroy food crops and injure or kill people who protect their farms (Smith & Kasiki 2014; Wildlife Division, 2015; Munuo, 2016).Incidents to wildlife include poaching and poisoning.

Conflict between human and wildlife today undoubtedly ranks amongst the main threats to conservation in Africa, alongside habitat destruction and commercially motivated hunting of wildlife to satisfy the demand for bush meat and this represents a real challenge to local, national and regional governments, wildlife managers, conservation and development agencies and local communities (Amaja et al., 2016). Also transforming natural landscapes of the earth from predominantly wild to anthropogenic has created competition between humans and wildlife for space and resources and it has reached unprecedented levels (Ellis et al., 2010; Kate, 2012). In many countries of sub-Saharan

Africa, conflicts arise from a range of direct and indirect negative interactions between human and wildlife (Mashalla, 2013).

In Africa and in other developing countries of the world, fast growing human population, settlements and accompanied habitat fragmentation are reducing the wildlife habitats (Mwamidi et al., 2012). Similarly, Bhola et al., (2012) argue that, growth of human settlements around the protected areas is strongly correlated with species declines and linked to wildlife decline. Therefore, rapid population growth has led to an increase in human activities in rangelands bordering many reserves, thus leading to encroachment and habitat loss and increasing of the risk of retaliatory killings of wildlife from crop destruction and livestock depredation, thereby reducing the efficacy for conservation (Balme et al., 2010). Settlements around the protected areas inherently support pastoralism, agriculture and thus offer potential conflicts between people and wildlife (Bamford et al, 2014; Blackburn et al., 2016).

Human wildlife conflicts have negative impacts both on human socio-economic life and loss of wildlife species. The negative impacts resulting from human wildlife conflicts include crop damage caused by wildlife crop raiding species (Datiko & Bekele 2011; Mwamidi et al., 2012; Harichet al., 2013; Ringo & Kaswamila, 2014), human mortality and injuries (Ringo & Kaswamila, 2014; Blackburn et al., 2016), livestock depredation (Mwamidi et al., 2012; Hoare, 2012; Ringo & Kaswamila, 2014; Blackburn et al., 2016). On the other, hand killing of wild animals and reduced quality of wildlife habitats have great negative impacts on wildlife conservation initiatives (Bamford et al., 2014; Blackburn et al., 2016). Just in 2011 to 2015 about 11,846 acres of crops were raided by wild animals in Tanzania (Munuo, 2016). During this period the government spent about 856,333,000 TZS (USD 713,611) as consolation to farmers from the financial year 2011-2012 to 2014-2015 (WD, 2015). On the other hand, Alexander et al. (2010) argue that,

increase in human-wildlife conflicts cases in various protected areas of Tanzania has contributed greatly to the endangerment of a variety of plant and animal species.

In curbing human–wildlife conflicts, various measures and approaches like lethal and non-lethal methods, construction of electric fences (Graham et al., 2010), the building and manning of watchtowers, the use of license-required firecrackers, so called "Thunder flashes" (Sitati &Walpole, 2006), digging trenches (Harich et al., 2013) have been used. Another method is bee-keeping and beehive fences (Hoare, 2012; Harich et al., 2013) have been used. Also other inexpensive, low-technical strategies including passive barriers such as barbed wire or rope fences, walls, hedges and ditches strategically placed at elephant crossings or along riverbanks have been also used. Other active deterrents used are like shouting, stone-throwing, banging on tins or drums, shooting warning shots, lighting fires and use of chilli (Parker et al., 2007; Hedges & Gunaryadi, 2010; Graham et al., 2009; Hoare, 2012; Mwamidi et al., 2012). However, most of these methods mentioned so far have been considered short term due to their ineffectiveness during heavy rains (chili, lighting fires), labour intensive (digging trenches, stone throwing), and very expensive (construction of electric fences)as they address the immediate problem of human-wildlife conflict and not looking for the permanent solution (Sennett, 2013).

Correspondingly, the issue of human-wildlife conflict management and sustainable conservation of wildlife resources has been one of the core objectives of wildlife managers and biologists in many countries in Africa (Wilfred, 2010). Today, many governments have adopted a participatory approach to conservation as a result of pervasive loss of wildlife species and the challenges of a "fences and fines" approach (Adams & Hulme, 2001).

Increasingly, debates over local communities' ability to manage their lands and natural resources are part and parcel of broader struggles over political and economic power and authority in African countries (Roe et al, 2009). Many researchers consider the Land Use Plans (LUPs) as the basic Human-Wildlife Conflicts management strategy which offers possibly the best chance of overall and long-term success as it tackles the root of the problem (NLUPC, 1998; Shemweta & Kideghesho, 2000; Muruthi, 2005; NLUPC, 2006;URT, 2007b; Wilfred, 2010; Ringo & Kaswamila, 2014).Furthermore, the application of the Village land-use planning is seen by many in developing countries as a panacea for minimizing land-use conflicts, increasing the productivity of natural resources and offers many advantages in terms of mitigating HWC in African rangeland (Kaswamila, 2006; NLUPC, 2006).For example, Ringo and Kaswamila (2014) consider the Land-use planning as a long-term approach to conflict mitigation as it tackles an underlying cause of the conflicts.

1.3 Statement of the Problem

In Tanzania, Human-wildlife conflicts (HWC) around protected areas are not new and have caused serious damages both to human and wildlife (Kweka, 2010; Ringo & Kaswamila, 2014). Land use planning has been pointed out as one of the useful tool for mitigating HWC (NLUPC, 1998; Shemweta &Kideghesho, 2000; Murithi, 2005; Kaswamila, 2006;NLUPC, 2006). In Tanzania, the establishment of WMAs at local levels went in hand with the stakeholder's participation in preparation and implementation of Village Land Use Plans (NLUPC, 2006; URT, 2007b; Ringo & Kaswamila, 2014) as a tool to manage conflicts. Such strategy to solve HWC was first introduced in 1998 under Community Based Natural Resources Management (URT, 2007b). Due to that, the Village Land Use Plans (VLUPs) are considered by many researchers as the basic Human-Wildlife Conflicts management strategy. According to that strategy, the HWC

can be minimized but not avoided as far as human and wildlife co-exist and sharing the same areas. Currently, only few studies (Kaswamila, 2006; Ringo & Kaswamila, 2014) have been carried out to evaluate the contribution of LUP in other areas where human co-exist with wildlife.

In Serengeti district, the establishment of IKONA WMA and implementation of VLUP were adopted and implemented since 2006 as an attempt to conserve wildlife and overcome HWC (URT, 2011a).Since that time, the information about the number of the conflicts (increased/reduced) in IKONA WMA was documented but not studied. Despite the introduction of the VLUP, its implementation and monitoring were not evaluated and due to that, it is not known how successful this initiative is and how it is contributing to HWC mitigation. Likewise the community perceptions on how they were involved in the preparation and implementation of VLUP were not studied. Therefore, this study attempted to assess the contribution of VLUP in mitigating HWC in IKONA WMA.

1.4 Research Objectives

1.4.1 General Objective

The general objective of this study was to assess the contribution of the village land use plan on the human-wildlife conflict mitigation in IKONA-WMA.

1.4.2 Specific Objectives

i. To identify the trend of human-wildlife conflicts before and after the implementation of the Village Land Use Plan.
ii. To evaluate the VLUPs implementation and monitoring.
iii. To examine the perception of the local communities on the VLUP contributions to HWC mitigation.

1.5 Research Questions

i. What have been the trends of human-wildlife conflicts before and after the implementation of the Village Land Use Plan?

ii. How were the VLUPs implemented and monitored?

iii. What are the perceptions of the local communities on the VLUP contributions to HWC mitigation?

1.6 Significance of the Study

Human-wildlife conflict (HWC) is a serious management and conservation issue in Tanzania and as such, communities' participation in the management and conservation of wildlife, and ensuring benefits there from are highlighted as important activities (URT, 2007b). The results of the study could help the actors and contribute in taking appropriate measures, for instance, use of village land use plan as one of mitigation strategies of human-wildlife conflicts. The study also will help to understand the challenges which the stakeholders experience i.e. communities and conservationists to develop strategies on how to improve the performance of Village Land use plans in mitigating human-wildlife conflicts. This helps to minimize undesired negatives attitudes of communities particularly those living adjacent to wildlife areas. The study will also help to identify the weak parts of the VLUP establishment, management and monitoring and propose the way forward. The results will also contribute vital information to policy makers and decision makers in lands and wildlife sectors to find better ways of reconciling human-wildlife interactions and hence improving both human livelihood and wildlife conservation.

1.7 Organization of the Study

The dissertation is divided into five chapters. Chapter one through three provide the introduction, literature review and the methodology, while results and discussions are

presented in chapter four. Lastly chapter five gives the summary, draws conclusion, and gives recommendations and finally, it presents the areas for further studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter gives information in relation to which findings from the study are new and therefore enable the researcher to address the significance of the study. The chapter also gives the definition of terms, and in depth review of related literatures aiming at identifying the knowledge gap, that at the end this research seeks to merge. Therefore, the chapter is concerned with the definitions of terms, theoretical review, empirical review, research gap and conceptual framework.

2.2 Definitions of Key Terms

2.2.1 Village Land Use Plan

Village land use plan is a tool for proper management of village land resources (NLUPC, 2006). According to URT (1999) the village is empowered through the village assembly to prepare, approve and implement village land use plan in their areas of jurisdiction. Village land use planning aims at subjecting land users to adhere to its best utilization. Village land use planning involves zoning of lands into various uses such as human settlement, forestry, grazing, cultivation, and conservation of wildlife and water sources and for future village expansion (NLUPC, 2006; URT, 2007a).

2.2.2 Human-Wildlife Conflict

Human-wildlife conflict is any interaction between humans and wildlife that results in negative impact on human social, economic or cultural life; on the conservation of wildlife population, or on the environment (Gathuku, 2015). Human-wildlife conflict occurs when wildlife overlaps with those of human populations, thus creating costs to residents and wild animals (World Park Congress, 2003; IUCN, 2005).

2.2.3 Wildlife Management Area (WMA)

Wildlife Management Area (WMA) is an area declared by the Minister of Natural Resources and Tourism within the village land to be set aside for the conservation of wildlife with the purpose of enabling local communities in the participation of protection and utilization of wildlife resources (Stolla, 2005; URT, 2012; WWF, 2014).

2.3 Theoretical Literature Review

Abend (2008) states that, the application of theory as a general proposition, or logically-connected system of general propositions, establishes a relationship between two or more variables. Policy-oriented research as the analysis of social processes implies coming to grips with theory, particularly social theory about how change takes place (Thomas & Mohan, 2007). The study, therefore applied system thinking theory which allows involvement of different stakeholders in the preparations of VLUP in mitigating HWC in the study area.

2.3.1 System Thinking Theory

System thinking has its foundation in the field of system dynamics, founded in 1956 by MIT Professor Jay Forrester. Professor Forrester recognized the need for a better way of testing ideas about social systems. System thinking theory allows people to make their understanding of social systems explicitly and improve them in the same way that can use principles to make explicit and improve their understanding of mechanical systems (Aronson, 1996). The system thinking focuses on how the thing being studied interacts with the other constituents of the system. This means that the system thinking theory looks at a phenomenon as having several components that work together as a unit. Also, this means that instead of isolating smaller and smaller parts of the system being studied, the system thinking works by expanding its view to account for larger and larger numbers of interactions with an issue regard to being studied.

The character of the system thinking makes it extremely effective on the most difficult types of the problems to solve: those involving complex issues, those depending a great deal on the past or on the action of others, and those stemming from ineffective coordination among those involved. Also, system thinking has the power to help teams create insight of the problem (Aronson, 1996; Ansari, 2004).

One of the key benefits of the system thinking theory is its ability to deal effectively with the problems and raise thinking to the level which creates the results needed by individuals and organizations even in difficult situations marked by complexity, great numbers of interactions, and absence or ineffectiveness of immediately apparent situations (Aronson, 1996).

In this study, the System thinking theory was applied since, process of VLUP establishment, management and monitoring as one of the strategies in curbing with HWC calls for collaboration between different stakeholders and partnership between state, local government agencies, local authorities, non-governmental organizations, communities and private wildlife control professionals. The theory also calls for adoption of various HWC mitigation strategies like VLUP, for there is no single approach that can be perfectly eradicate HWC as far as human and wildlife share the same landscape.

2.3.2 Linear Regression Theory

The linear model involves only one independent variable and states that the true mean of the dependent variable changes at a constant rate as the value of the independent variable increases or decreases (Rawlings et al., 1998).The Linear Regression Model make it possibleto calculate the effect of one independent variable on one dependent variable (Cohen et al., 2007). Thus, the functional relationship between the true mean of Y_i, denoted by $\mathcal{E}(Y_i)$, and X_i is the equation of a straight line:

$$\mathcal{E}(Y_i) = \beta_0 + \beta_1 X_i \quad (1)$$

Where: β_0 is the intercept, the value of $\mathcal{E}(Y_i)$ when X = 0, and β_1 is the slope of the line, the rate of change in $\mathcal{E}(Y_i)$ per unit change in X.

The trend is evaluated and reported when the slope of the regression line is demonstrated to be statistically different from zero. A positive slope ($+\beta_1$) indicates an increasing trend and a negative slope ($-\beta_1$) a decreasing trend.

2.3.3 Multiple Regression Model

The purpose of multiple regression is to predict a single variable from one or more independent variables (Rawlings et al., 1998; Cohen et al., 2007).With multiple regression model the researcher can use more than one factor to make a prediction (Baker, 2006).The boundary of multiple regression when all possible predictor variables included is called the full model (Rawlings et al., 1998). Multiple regression analysis attempts to sort out the individual effect of each explanatory variable (Neuman, 2006; Baker, 2006).An explanatory variable's coefficient estimate allows us to estimate the change in the dependent variable resulting from a change in that particular explanatory variable while all other explanatory variables remain constant(Rawling etal., 1998; Neuman, 2006; Baker, 2006). According to Singh (2006), the intention is to determine predictability of one variable on basis of several other linear relationships. Its equation model is given as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_n X_n \quad (2)$$

Where: Y–is the dependent variable; *X*- is the predictor variables of interest; β_0 - is the intercept of *Y* when all predictors are equal to 0; β - coefficients calculated by the Ordinary Least Squares (OLS); *n* – is the number of variables.

Neuman (2006) highlights that the multiple regression results tell the researcher two things:

i). the results have a measure called R-squared (R^2), which tells how well a set of variables explains a dependent variable. This means reduced errors when predicting the dependent variables scores on the basis of information about the independent variables. A good model with several dependent variables might account for, or explain, a large percentage of variation in a dependent variable.

ii).The regression results measure the direction and size of the effect of each variable on a dependent variable. The effect is measured precisely and given a numerical value (Neuman, 2006). Multiple regressions provide a powerful method to analyze multivariate data. However, considerable caution must be observed when interpreting the results of a multiple regression analysis (Baker, 2006).

2.3.4 Index Approach

An index is a combination of several distinct indicators of a construct into a single numerical score (Neuman, 2006). Indexes give a researcher more information about variables and make it possible to assess the quality of measurement. Two things to be considered here are; i) Index Construction: Various components or subparts which are measured, then combined into one measured component. The composite score is often a simple sum of the multiple indicators. Indexes are often measured at the interval or ratio level. Researchers sometimes combine the features of scales and indexes in a single measure. This is common when several indicators are scales (i.e., that measure intensity or direction). The indicators are added together to yield a single score, thereby constructing an index.

ii). Weighting index: Unless otherwise, Neuman, (2006) suggests, assuming that an index is unweighted giving each item equal weight, because weighting of index leads to modification. However, the size of weights can come from theoretical assumptions, the theoretical definition, or a statistical technique such as factor analysis. When concluding

about the weighting of index, Neuman (2006) observed that, even if weighting can produce different index scores, but in most cases, weighted and unweighted indexes yield similar results. Researchers are concerned with the relationship between variables, and the weighted and unweighted indexes usually give similar results for the relationship between variables.

2.4 Empirical Literature Review

2.4.1 Human-Wildlife Conflicts and their Driving Forces Worldwide

HWCs are not restricted to particular geographic areas but happen everywhere where human and wildlife co-exist because they share limited resources (World Park Congress, 2003; Asimopoulos, 2016). Human wildlife conflict exists in both developed and developing countries, and it is more serious in developing nations (Lamarque et al., 2009; Fairet et al., 2012; Makindi et al., 2012).

In India, HWC in Kashmir region of Jammu and Kashmir State in India is a conservation concern that increasingly threatens the continued existence of some carnivore species like Leopard and Black bear (Habib et al., 2015). The rise of HWC, however, is reported to be accompanied by the increasing population with subsequent encroachment on wild land something that has resulted in close proximity between humans and wild carnivores which most often results in a negative outcome for humans, wildlife or both (Habib et al., 2015). The study conducted by Habib et al., (2015) reported that the human mortalities and injuries caused during man-bear and man-leopard conflicts have been increasing from 186 in 2010 to 252 in 2012. Of 252 incidents, 12 were listed death cases (Habibet al., 2015). Most of the people in such conflict live in wildlife prone areas of Kupwara, Lolab, Handwara, Baramulla, Tangmarg, Shopian, Ganderbal, Anantnag and Srinagar lose their crops, livestock, property and sometimes their lives, and are not satisfied with conflict management by the Government due to the negative attitudes towards wild carnivores

(Habib et al., 2015). The animals like leopard and black bear are also often injured or killed in retaliation. HWC occurs during summer and autumn; where bears are on prowl owing to availability of fruit and crop in adjoining localities of forests. According to Habib et al., (2015) as well as Vijayan and Pati, (2002) the HWC in India can be resolved by attitude, cooperation and concerns of the local community.

In Nepal, continuous increase of HWC is due to increase in the human population resulting in competition between people and wildlife for shared but limited resources, which manifest various types of conflict, such as crop-raiding, livestock predation, property damage, human death and injury, and the retaliatory killing of wildlife (Acharya et al., 2016). Conflicts become extremely controversial when people are attacked by species that are endangered and legally protected. First, attacks by wildlife are life-threatening and thus are not acceptable to society, so people often retaliate by killing the animals involved in the conflict. Most serious HWC challenges are human-elephant and human-leopard conflicts (Acharya et al., 2016). Of these, the study conducted by Acharya et al., (2016) in communities surrounding protected areas indicated that attacks of people by wild animals resulting in death or injury from 2010 to 2014 involved elephants (30%), leopards (21%). On the other hand, the researcher argues on the penalties imposed by the central government for illegally killing endangered animals that they further escalate hostile attitudes towards conservation efforts.

In Brazil, crop damage caused by wildlife represents a serious problem to conservation efforts (Nogueira-Filho & Petit, 2011). For example, the study by Nogueira-Filho and Petit, (2011) in the southern Bahia Atlantic Forest, in six municipal districts of Arataca, Buerarema, Ilhéus, Itabuna, São José da Vitória and Una shows the most affected crops were cocoa (Theobroma cacao) and cassava (Manihotesculenta) and the free-range poultry (Gallus gallusdomesticus). About 30% of the economic losses on cocoa crops

production, the rodent species were responsible for these highest levels in the South of Bahia. The species involved were cacao-rat (Oryzomyslaticeps) as the species with the highest number of complaints about. Other species involved in HWC include armadillos and the paca, Cuniculuspaca and the collared peccary, which affect cassava crops. To control the damage, the farmers pursue traps and kill wild animals, which also threaten biodiversity conservation within the biome (Nogueira-Filho &Petit, 2011).

2.4.2 Human-Wildlife Conflict in Africa

In Africa, HWC are prevalent, where large numbers of big mammals such as elephants and lions still roam freely in marginal rangelands and protected areas particularly to the communities bordering these protected areas (Makindi et al., 2012).

In Zambia, HWC involves African elephants and other carnivores which occur regularly in areas of traditional agro-pastoralism located near to the protected areas, whereby the rural villages experience the negative impact of these conflicts (Lamarque et al., 2009). The interactions have a wide array of emerging impacts, events or simply conflicts, which include: crop raiding; damage to infrastructure like houses, food stores, fences and other barriers; occasional injuries and demise of people on one hand (Nyirenda et al., 2011). On the other hand, habitat loss to elephants and retaliatory killing of elephants by inflicted people take place. The study conducted by Nyirenda et al., (2012) in Lupande Game Management Area (GMA), within Luangwa Valley, eastern Zambia revealed that smaller crop fields were more vulnerable than larger ones. Most crop fields (75.8%), surrounded by *Brachystegia* and Acacia dominated vegetation communities were damaged, largely due to high tree fruiting which were elephant attractants (ibid). However, it was found that solar powered electric fences were more effective than other counter-measures. Though traditional methods were prevalent, they were less effective than other counter-measures. It was posited that additional capacity development of local farmers was

required particularly, in participatory integrative land use practices to minimize elephant crop raiding (Nyirenda et al., 2012).

In Ethiopia, HWC arises from a range of direct and indirect negative interactions between humans and wildlife (Ocholla et al., 2013). The study by Acha and Temesgen (2015), in villages surrounding Chebera-Churchura National Park reveals that for the period between2007-2011 about 4,474 livestock owned, 30.48%(1,364) of them were depredated. Furthermore, 23 people were attacked by wild animals within the same period in the study area (ibid). Killing of large carnivores for revenge of livestock loss and human attacks were reported as the principal methods being used for carnivores' removal. Lethal control methods like trapping and shooting have been used in all villages illegally (Acha & Temesgen, 2015). The study argues that, these can culminate into potential harm to all involved, and thus lead to negative human attitudes, with a decrease in human appreciation of wildlife and potentially severe detrimental effects for conservation. This indicates that HWC if not well managed, can contribute to the future decline of large carnivore populations (Acha & Temesgen, 2015). Another study on HWC was conducted in Ethiopia by Amaja et al. (2016) in Gera district where it was revealed 50% of HWC was crop damage and livestock predation observed as the major problems in the community in the study villages. The major cause of human-wild animals' conflict in the study areas were habitat disturbance due to expansion of subsistence agriculture around forest edge, particularly coffee plantation proximity to natural forest. Furthermore, clear cutting with few trees remaining for the search of sun light for intensive coffee production by investors in Ganjichala increased the magnitude of HWC due to lack of food. Agricultural product loss, which can affect food security of the community, was the major type of damage identified. On the other hand, the negative attitude of the community towards wildlife due to the serious HWC has a great impact on the biodiversity conservation. The study argues for a need to develop strategies of reducing HWC by local

people, researchers, wildlife authorities and policy makers by finding mitigation measures for HWC. In addition, the strategies included leaving sufficient conservation areas, better buffer areas for wildlife to move and sufficient connectivity of wildlife habitats so that they can freely move to get their living from the ecosystem (Amaja et al., 2016).

In Kenya, wildlife heritage is a key asset for the tourism sector which accounts for about 10% of the Gross Domestic Product (GDP), thus making it the third largest contributor to the GDP after agriculture and manufacturing (Manoa & Mwaura, 2016). Wildlife tourism is occasionally the leading foreign exchange earner in Kenya, generating up to Ksh 75.2 billion (about US $1 billion) per year (ibid). However, this sector is affected by HWC which include crop damage, competition for water and grazing, livestock predation, increased risk of some livestock diseases, various inconveniences such as when protecting crops, and even human fatalities (Makindi et al., 2014). Additionally, the cause of HWC according to Makindi et al., (2014) was an increase in human population which as a consequence, resulted to encroachment into more marginal lands inhabited by wildlife, thus leading to fragmentation and conversion of land, for instance, to settled agriculture and other uses incompatible with wildlife. For example, the study conducted in Tsavo Conservation Area (TCA) and its adjacent villages of Makindu, Chyullu/ Mtito, Andei (Kibwezi), Voi, Taita, Taveta, and Rombo/ Kuku (Loitokitok) revealed the HWC to be 59%, and the most types of wildlife reported to be commonly visiting the community farms: Elephants were reported by 97% of the farmers, Monkeys by 91%, Baboons by 83%, Buffaloes by 71%, Hyenas by 61% and Lions by 26% of the farmers(Makindi et al., 2014).

Another study on HWC by Manoa and Mwaura (2016) in Kenya was conducted to assess the predator-proof bomas as a tool for mitigating conflict with carnivores in the livestock-dominated group ranches around Amboseli National Park in the Loitokitok sub-

county on the border of Kenya and Tanzania. The HWC involved problematic carnivores, and pastoralism is the main economic activity with over 75% of the population deriving their livelihood from livestock which accounts for 60% of the total labour force (OKello & Kikoko, 2010). It was found that depredation resulted to considerable losses for individuals, and some pastoralists continued to cherish negative attitudes towards carnivores despite the existence of fortified bomas. For example, the livestock predation resulted to both social and economic losses to the community. In 2015 before construction of boma, households lost Ksh 3,225,000 compared to Ksh 195,000 they lost after boma fortification (Manoa & Mwaura, 2016).In Amboseli, 4.0% indicated nothing would stop them from killing a carnivore which had attacked/ killed their livestock regardless of knowing there was a law in Kenya against killing carnivores or otherwise. Therefore, this indicates that people have negative perception on the measures taken by the Kenyan government to manage HWC (Manoa & Mwaura, 2016).

2.4.3 Human-Wildlife Conflict in Tanzania

Despite its endowment and its economic potentials to the national and the local communities, the wildlife sector hasn't spared the country from HWC particularly to the communities bordered by PAs. Most of the HWC have been crop raiding (Mwakatobe et al., 2014; Hariohay & Røskaft, 2015; Mariki et al., 2015), livestock depredation by carnivores (Hariohay & Røskaft, 2015;Ringo & Kaswamila, 2014), injury and killing of the people, spread of diseases, destruction of properties (Mariki et al., 2015), poaching (Ringo & Kaswamila, 2014; Wilfred, 2010), wild fires and habitat destruction (Shemweta & Kidegesho, 2000; Ringo & Kaswamila, 2014), and poisoning (Mariki et al., 2015).

Crop raiding, for example, the study conducted by Mariki et al., (2015) indicates that in 2009, a total of 901 acres were raided in three villages (Engare Nairobi, Namwai and Matadi villages) in SihaMagharibi Division, and 2222 acres in seven villages in Enduimet

Division, but also the incident of killing six elephants as a revenge by the residents were reported in these areas. A similar study on crop damage by Hariohay and Røskaft, (2015) in Kwakuchinja wildlife corridor, indicates total average losses of 383 kg equivalent to US $ 154 per household were caused by wild animals. About71.2 % of most crops damage was caused by elephants (Hariohay & Røskaft, 2015). The conflict resulted from the encroachment of the resident to the borders of PAs, destruction of wildlife habitat, and methods used to minimize these costs of HWC in Kwakuchinja include guarding of livestock and crops from being damaged by wild animals (Hariohay & Røskaft, 2015). Ringo and Kaswamila (2014) reveal that 62.5% of the crops were raided by animals in Kaloleni, Mwidu and Visakazi (Wami-Mbiki WMA) the most involved animal were elephants, wild pigs and baboons. Livestock depredations for example, in Kaloleni 17.3% of the reported cases were caused by lions (Ringo & Kaswamila, 2014). The study on Wami-Mbiki shows HWC was reduced from 66% to 64 % after the implementation of GMP (Ringo & Kaswamila, 2014).

Mwakatobe et al., (2014) conducted a study in communities surrounding Serengeti National Park, Ikorongo Game Reserve and Lake Victoria (Robanda, Nattambisso, Nyamakendo, Butiama, Busegwe, Rwamkoma, Ochuna, Makongos and Kowak) the results indicated that crop raiding differed significantly on the farms along the distance gradient from the PAs, and the baboons were the most destructive wild animals followed by elephants particularly to areas adjacent to the PAs. Measures taken by these communities to curb HWC were fencing and guarding (Mwakatobe et al., 2014). These methods are considered to be ineffective because of being labour intensive (Sennett et al., 2013).

In summary, the overlap is due to struggle between human and wildlife to perceive and pursue incompatible goals, scarce resources, and interference from others in achieving

their goals (Noa, 2012; Ringo & Kaswamila, 2014; Gasva & Moyo, 2016). Human-wildlife conflict threatens both human lives, livelihoods and the survival of wildlife throughout the world (Granados & Weladji, 2012) as a result of increasing human populations, livestock, loss of natural habitat for example in Kwakuchinja wildlife corridor 55.6 % of the reasons given were lack of free space for wildlife as a result of settlement expansion (Hariohay, 2013), land use transformation, climatic factors and, in some regions, growing wildlife populations resulting from successful conservation programmes in Protected Areas (Mariki et al., 2015; Granados & Weladji, 2012). Another factors to HWC are linked to persistence of drought (Mariki et al., 2015), poor land-use planning around protected areas and within the wildlife corridors and flawed development policies (Madden, 2006; Mariki et al., 2015), for example area which were identified as elephant route in Engare Nairobi Village in Siha division (Mariki et al., 2015).

2.5 The Village Land use Plan (VLUP) in Wildlife Management Area (WMA)

In Tanzania, wildlife protected area (PA) network covers 24% of the total and surface area. Of 6.4% of its surface area to PAs is where wildlife co-exists with humans (URT, 2007b). Despite its endowment and its economic potential to the national local communities, the wildlife sector was not able to develop to its full potential due to failure of wildlife conservation as a form of land use to compete adequately with other forms of land use, especially to the village communities (URT, 2007b).

In 1998 through the Wildlife Policy, the government decentralized wildlife management issues, and accommodated much of people's needs and interests in its conservation plans as a response to the rapid loss of wildlife (URT, 2007b). Implementation of the policy was evidenced by 16 Wildlife Management Areas (WMA) being taken as pilot projects in 16 districts with more than 135 villages in the country (Wilfred, 2010). Through WMAs, local communities expected to have considerable value to wildlife as they do in other

forms of land use such as agriculture and would lead to a reversal of wildlife declines and enhanced movements or dispersal of wildlife species (URT, 2007b).

2.5.1 Wildlife Management Areas

The Tanzania Wildlife policy 2007 has included the right of local communities particularly those bordered by PAs to benefit from wildlife conservation. The communities around the PAs through establishment of WMA can receive different benefits (URT, 2003; URT, 2007b). The main objectives of the establishment of WMA are to: increase the participation of local communities in the management of wildlife resources; enable local communities to derive benefits from wildlife resources; and enhance the conservation of wildlife resources (URT, 2007b; WWF, 2014).

The establishment of WMA shall go hand in hand with the preparation of VLUP as subject to sections 11 and 13 of the Village Land Act no.5 of 1999, the Village Council shall recommend to the Village Assembly, a land suitable for the establishment of WMA (URT, 2012). According to URT, (2012) various steps have to be followed when establishing the WMA (Table 1). The preparation of VLUPs, (step 4-6 of WMA establishment) should follow and adhere to the guidelines provided by the National Land Use Planning Commission (NLUPC, 1998; NLUPC, 2006).

Table 2. 1: Basic steps involved in establishment of WMA

Steps	Activity
12	Investments in WMAs are subjected to EIA and must be approved by Director of wildlife
11	CBO/AA enters into investment agreements
10	CBO/AA applies to the Director for a hunting block
9	CBO/AA applies to the Director for user rights
8	CBO applies to the Director of wildlife for Authorized Association (AA) status
7	CBO prepares a General Resource Management Plan
6	Villages prepare by-laws to support the land use plans
5	Land use plan is subjected to Environmental Impact Assessment (EIA)
4	Villages prepare land use plans, which must be surveyed and registered
3	CBO prepares a strategic plan
2	Villages form a CBO and register it at Ministry of Home Affairs
1	Village Assembly agrees to form WMA based on Village Council recommendation

Source: URT, 2012.

2.5.2 Village Land Use Plans

Village land use plan is a tool for proper management of village land resources (URT, 2007a). According to URT (1999) the village is empowered through the village assembly to prepare, approve and implement village land use plan (VLUP) in their areas of jurisdiction. Village land use planning aims at subjecting land users to adhere to best utilization. Village land use planning involves zoning of lands into various uses such as human settlement, forestry, grazing, cultivation, and conservation of wildlife and water sources and for future village expansion (NLUPC, 1998; NLUPC, 2006;URT, 2007a).

According to NLUPC (1998) and NLUPC (2006), there are six steps of establishing, implementing and monitoring of VLUP as follows:

1. Preparation; this includes the formation of participatory land use management team (PLUM); preparation of action plan and mobilizing the institutions at village level; collection and analysis of district data; preparation of a plan of operation with priority of villages.
2. Conducting PRA for land use management through: formation of PRA team; conducting village council meeting; reconnaissance; conducting village assembly meeting and formation of VLUM committee; data gathering in the village; ranking of problems and opportunities and creation of a community action plan for village land use management.
3. Supplementary surveys done through establishment of village boundaries; establishment of reference points; preparation of a village boundary map; conducting general land survey for the preparation of a village base map; assessment of existing land use; conducting socio-economic survey and agro-ecological survey.
4. Conducting participatory land use planning and administration through drafting a detailed VLUP; demarcation of public and private areas; finalizing detailed VLUP; Natural Resource Management Strategies and drawing of an agreed land use map; establishing land registry and creation of by-laws.
5. Implementation of appropriate land management measures through arrangements with the concerned extensionists and other experts; meeting with PLUM and VLUM; conducting supplementary land management appraisal; conducting village assembly and meeting at the sub-village level/hamlets; planning and implementing of the identified measures and continuation of on-job training for the village technicians.

6. Consolidation which is done through assessment impacts of the PLUM process in the village and the capacity of the village and its institutions to proceed; agreeing and formalizing the roles of the stakeholders in PLUM and VLUM and low profile follow-up.

In addition, the Participatory Land Use Planning (PLUP) helps communities to resolve on-going conflicts over land use and prevent such conflicts in the future, bring residents together to envision a better future and start creating it (NLUPC, 2006; URT, 2007a; FAO, 2009). VLUP facilitates informed decision-making in the course of allocating land for various uses and needs which require prior informed consent, negotiations and consultation between all stakeholders (NLUPC, 1998; ECA, 2005; NLUPC, 2006).

2.5.3 Village Land Use Plan Implementation and Monitoring

Successful VLUP implementation depends on meeting many conditions. Kaswamila (2006) identifies four key criteria for successful plan implementation:

(i) Solid stakeholders who possess different interests, different ways of perceiving the problem and different opportunities for utilization of natural resources. Implementation success depends on the level of stakeholders' support;

(ii) Sound plan characteristics; plans must be built upon an accurate conception of why the problem exists and adequately explain how intervention can address and solve that problem. Given adequate understanding of the stakeholders, implementation is more likely to be successful because stakeholders understand what a plan proposes to do are more likely to support its implementation;

(iii) supportive institutional structure; this includes clear delineation of stakeholders' roles and responsibility; supportive decision-making authority; adequate regulatory system;

effective mitigation strategies; sound monitoring and information flow; sufficient flexibility and solid legislative basis.

(iv) Collaborative implementation design; implementation should be a collaborative effort among all stakeholders.

2.6 Research Gap

In the review of the available studies and literature, it was revealed that many studies available have concentrated on the impacts, causes, and drivers of HWC (Hoare, 2012; Magige, 2012; Mashalla, 2013; Sogoseye, 2011; Mwakatobe et al., 2014; Hariohay & Røskaft, 2015; Mariki et al., 2015). Some of the literature focuses on mitigations measures like non-lethal control measures such as scaring, shouting, stone throwing, chilling, beehives, and fencing (Mwakatobe et al., 2014; Mashalla, 2013). The efforts made by the government and other stakeholders to address the problem of HWC within the villages bordered by PAs were the implementation of VLUPs during the establishment of WMAs. However, no studies have been conducted specifically to identify the trend of HWC before and after the implementation of VLUP, evaluating the implementation and monitoring of VLUP, and the perception of the local communities on VLUP contributing to mitigate HWC in the study area. Therefore, the researcher filled the gap by studying the contribution of the Village Land Use Plans in mitigating Human-Wildlife Conflicts in communities bordered by protected areas.

2.7 Conceptual Framework

Protected Areas in Tanzania cover 24%, and about 6.4 % of its network is where human beings co-exist with wildlife and are more experiencing HWC (URT, 2007b). Currently, about 70% of the people live in rural areas, and their main occupations depend on cultivation, livestock keeping, and wildlife resources for their livelihoods (URT, 2007b). The fact still holds to the communities living in villages forming IKONA WMA, where

about 90% of the population engages in agriculture, they need also to have development to reduce the extent of poverty. On the other hand, these communities are bordered by the PAs (Serengeti National Park, Ikorongo and Grumeti Game Reserves). Since the early 1990s, different initiatives and conservation programmes have created attention to the problem of the wildlife, and these have led to the demand of land for wildlife as a result of wildlife population growth in PAs and increased number of conservation initiatives. Likewise, communities around protected area in IKONA-WMA have been demanding of land for different activities as a result of population growth, growth of the settlements, increased demand of arable land for cultivation, increased number of livestock, and increased demand for the grazing land. As humans and wildlife sharing neighbouring areas, the conflict will surely persist. In case this problem remains unsolved, both human and wildlife will experience the negative impacts. These impacts include crop damage, property damage, and income loss, and human death/injury, constant stress of local community, wildlife habitat and wildlife species loss. Different initiatives have been developed to mitigate the HWC in this area; one of the measures was the establishment of WMA which went hand in hand with preparation and implementation of village land use plans (VLUP) in 2006, with proper land use zoning and allocation of the WMA in VLUP was assumed to reduce the interaction between human and wildlife. However,since 2006 its implementation and contribution to HWC mitigations has not been known.

In this conceptual framework (Figure 1), the study has three assumptions that understanding of the trend and factors contributing to HWC could help to make a projection in future, identification of the weaknesses of the VLUP could also help to improve the situation, and the Positive Community Perception could support the contribution of VLUP in mitigating HWC. On the other hand, Newmark et al., (1994) argue that, conflict between wildlife and local communities can never be entirely

eliminated but just minimized. The argument is also applicable to the villages within IKONA WMA, where human and wildlife co-exist and share the same land resource.

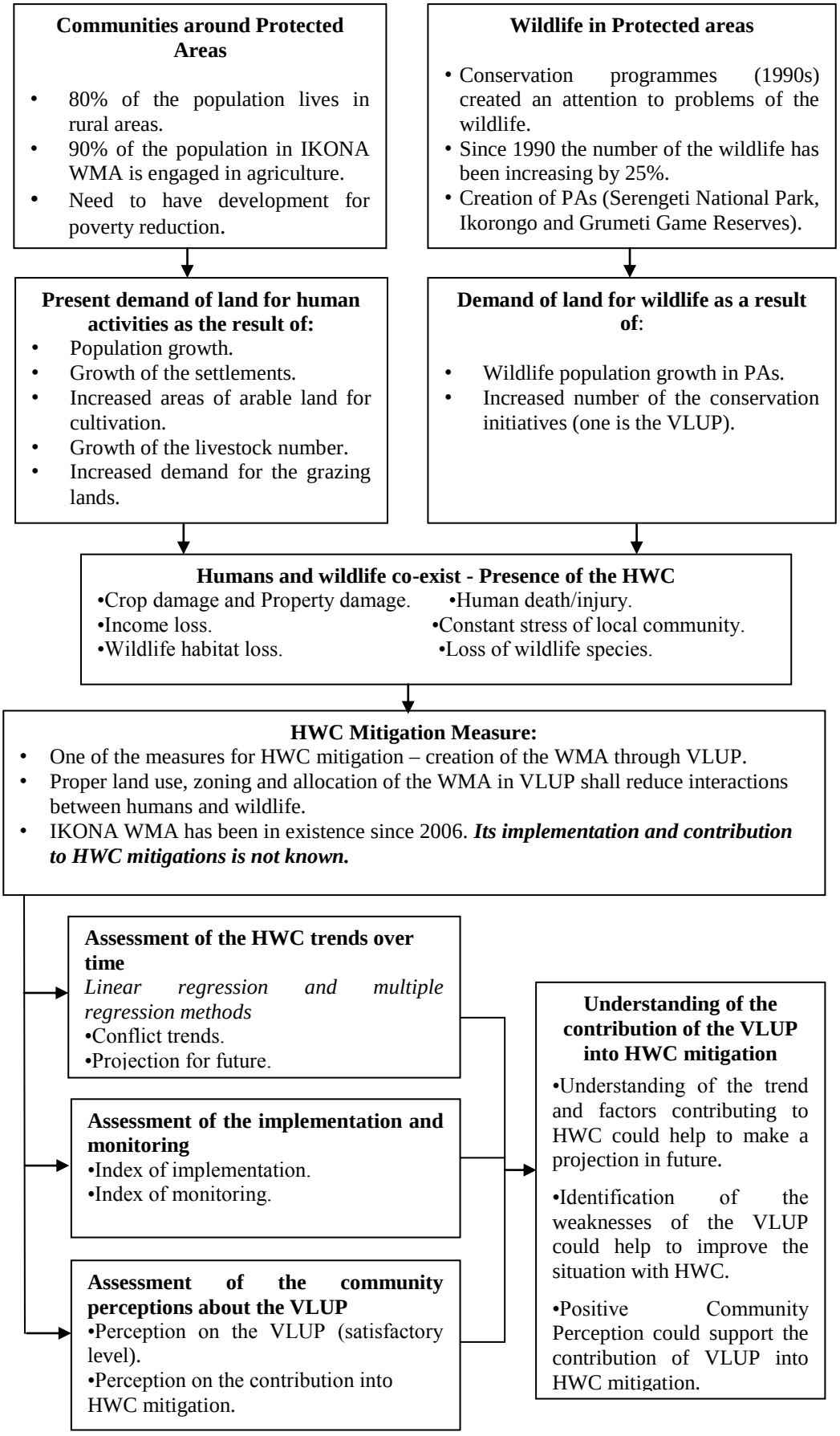

Figure 2. 1: Conceptual Framework
Source: Author, (2017).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides details on how information was extracted from the various sources and the methodology used to undertake the research. Therefore, the chapter comprises of research design, study area and its selection criteria, sampling procedure, sample size, data collection methods and techniques, data processing, data analysis and presentation of the data obtained from both secondary and primary sources. As well, the chapter ends with reliability and validity.

3.2 Research Design

Across sectional research design was employed in this study. The criteria for selecting cross sectional research were: the study did not require time series analysis of the same phenomenon, also the design was helpful to save both time and research costs incurred during data collection given the assumption that data did not change (Kothari, 2004; Kothari, 2007).Furthermore, the design assumed to give an understanding on the contribution of village land use plan in mitigating human-wildlife conflicts within the study area.

3.2.1 Study Area Selection and Criteria

The study was conducted in Serengeti district specifically in two villages of Natta Mbisso and Makundusi which form IKONA (IKOMA and NATTA) Wildlife Management Area in Mara Region. The other three village members were Robanda, Park Nyigoti and Nyichoka. Criteria of selecting the two villages in the study area were:

i. Bordering to the protected areas: Serengeti National Park (SNP), Ikorongo and Grumeti Game Reserves (IGGR) in which the Wildlife Management Area (WMA) was established.

ii. Presence of Village Land Use Plan (VLUP) in each village since 2006. These village land use plans were expected to play a big role in mitigating human wildlife conflicts.

iii. Availability of data about HWC in study villages, and were more experiencing the human-wildlife conflicts compared to other villages.

3.2.2 Location

Serengeti District is one of the five districts constituting Mara Region and it is located on the Eastern part of the region. To the East, it is bordered by the Republic of Kenya, East by Ngorongoro District Arusha region, and South East by Bariadi District Simiyu region, South West by Bunda District, West by Butiama District and North West by Tarime District. It is located 1° 30'S 2° 40'S of Equator and 34° 15' E 35° 30'E of Greenwich Meridian (Sinclair et al.,2007).

The district occupies a total area of 10,373 Km^2 of which 7,000 Km^2 is the area occupied by Serengeti National Park, 896.3Km^2 Ikorongo Game Reserve, 683.7 Km^2 Grumeti Game Reserve and 242.3 $Km^2$is IKONA WMA. The remaining area of 1,550.7 Km^2 is the area for agriculture, livestock keeping and residence (SDC, 2014).

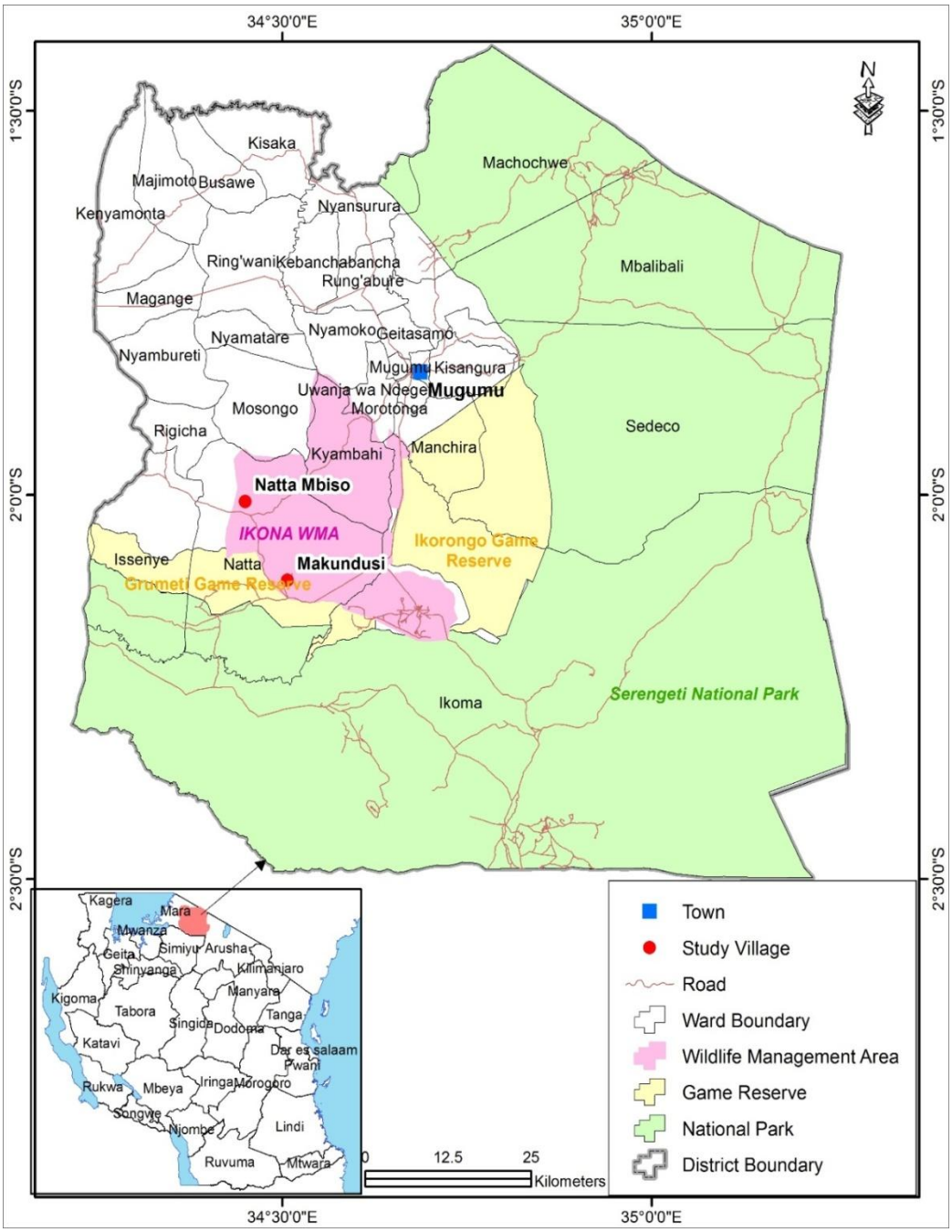

Figure 3. 1: Location of the Study Area

Source: Author (2017).

IKONA WMA is bordered by the Serengeti National Park to the south and south-east; Grumeti Game Reserve to the south and southwest; Ikorongo Game, to the east and north-east; and privately owned Grumeti Reserves to the West (URT, 2011a).

3.2.3 Climate

The study area is characterized by cool climate with an average annual rainfall of between 1,000 mm and 1400mm. The rainfall regime is typically of the bimodal type with a double rainy season from August to December and the second rainy season starts from February to April. The dry season is from end of May to July (SDC, 2014).The average temperature is 24^{o}C during the rainy season and 26^{o}C during the dry season. However, the human wildlife conflicts and the ongoing climatic change impacts affect agricultural productivity and thus people have to look for mitigation measures to improve their livelihood and food security at household levels, particularly those residing adjacent to wildlife protected areas (URT, 2011a; Makupa 2013; SDC, 2014).

3.2.4 Economic Activities

The majority of people in the study area, about 90%, engaged in agricultural activities as the main source of income(Makupa, 2013; SDC, 2014). The major crops grown are sorghum, cassava, maize, rice, potatoes and finger millet but also peasants cultivate beans, and groundnuts. Other crops include tobacco, sunflower, simsim, cotton and groundnuts. Agriculture in the area is still very traditional, depending on rain-fed agriculture, and peasants use hand hoes (SDC, 2014).

However, people's high dependence on rain-fed agriculture has been frustrated by unfavourable weather conditions, unavailability of agricultural inputs, declining prices and inefficient marketing and crop raiding animals for areas adjacent to the protected areas. Thus, mitigating human wildlife conflicts to the areas adjacent to the protected areas makes a diversified local economy and livelihoods through improved food security at household level (SDC, 2014).

3.3 Target Population

The target population were households and stakeholders involved in human-wildlife conflicts. The targeted population provided necessary information about strategies taken to meet the contribution of village land use plan in mitigating human wildlife conflicts. This included households and key informants like Village Executive Officers, Village Natural Resource Committee Members, WMA officials and District Game Officer.

3.3.1 Unit of Analysis

The unit of analysis were households drawn from the two selected villages within IKONA Wildlife Management Area. According to URT, (2013) the study area had 1,335 households in which the unit of analysis was drawn. The researcher used households as unit of analysis; because households living in areas adjacent to the PAs (Serengeti National Park, Ikorongo Game Reserve and Grumeti Game Reserve), experience numbers of human-wildlife conflicts annually.

3.3.2 Parameters of Interest

Parameters of interest are the specific parameters of the population, which are of interest to the researcher (O'Sullivan & Rassel, 1989).In this study, the researcher was interested in the contribution of the Village Land Use Plan in mitigating human-wildlife conflicts in the study area. As the WMA was established in 2006, to study its impact on HWC, two periods were selected:

- 1997-2006 - first period when the HWC were not managed through use of the VLUP;
- 2006-2016 – second period when the VLUP came into implementation.

As the study went back to the period 1997-2006, the respondents needed to have an experience and knowledge about HWC. In this regard, the researcher considered that in 1997, the respondent's age should be 18 years or above. According to URT (1977), the

age of 18 is regarded a working class, and therefore a respondent such aged was considered to be knowledgeable and matured enough to provide information related to HWC. Hence respondents were 38 years old or above.

3.4 Sampling Techniques and Sample Size

3.4.1 Sampling Procedure

Simple random sampling and purposive sampling were used in selecting the sample (Trochim, 2006; Bhattacheerjee, 2012). In each village, two groups of households were chosen due to their locality from the PAs and hence presence of the wildlife. The first selected group was located close to PAs and the second group was selected at maximal distance from PAs, and hence could have minimal number of the conflicts. The simple random sampling was used to draw the households for the study. Purposive sampling was used to select the key informants with experience in human-wildlife conflict management and establishment of WMA within villages.

3.4.2 Sample Size

Sample size is referred to as a subset of units selected from a large set of the same unit (Kothari, 2004). Yamane (1967) formula was applied to calculate the sample size from the population of study as follows:

$$n = \frac{N}{1+N(e)^2} \quad (3)$$

Where n –is the sample size; N -is the sampling frame; e - is the sampling error

The total number of households for the two villages was 1,335; Makundusi 755 households and Natta Mbisso 580 households (SDC, 2014). Therefore, using sampling error of 10% the estimated sample size was 93 households.

$$n = \frac{N}{1+N(e)^2} = \frac{1,335}{1+1,335\,(0.10)^2} = 93 \text{(Households)}$$

Therefore the researcher covered a sample size of 93 households from the two villages as part of population under the study.

3.4.3 Sample Size Distribution

The sample size distribution was computed by Israel formula (2009) for proportional sampling to obtain the sample size for the two villages as indicated in the equation below:

$$n = \frac{N \cdot p}{p} \quad (4)$$

Where: n -is the sample contribution/ proportion; N - is the Sample size; p - is the number of households in one village; P -is the total number of households in two villages.

Makundusi =93*755/1,335= 53 households

Natta Mbisso =93*580/1,335= 40 households

A total of 93 households from the population were under this study. In additional, purposive sampling was used to interview 13 Key informants who had experience and knowledge on the human-wildlife conflict. The researcher also conducted 2 Focus Group Discussions with 8 members from each village. Therefore, the study covered the total sample of 122 people (93 households, 16 participants for 2 focus group discussions and 13 key informants).

3.5 Types of Data

Primary and secondary data were used in this study. Primary data were collected from the field using households' survey, interviews and focus group discussion. Secondary data were obtained from archives, literatures and accessed from websites.

3.5.1 Primary Data

Primary data are referred to as information collected from sources such as personal interviews, questionnaires or surveys with a specific intention and on a specific subject, and observation and discussion by the researcher (Walliman, 2011). Primary data were obtained by the use of household's survey method, key informant interview and focus group discussions.

3.5.2 Secondary Data

Secondary data were obtained by documentary review and collection of maps and other information from different offices. These included maps, plans and reports, the reported and registered cases on human-wildlife conflicts from the Village Offices and District Game Office for the period of 10 years before and 10 years after the implementation of village land use plan (1997-2016). Annual rainfall data were collected from the Tanzania Meteorological Agency (TMA) for Mugumu weather station located in Serengeti District. Human populations in the study villages and livestock population were obtained from Serengeti District Council (SDC) and wildlife population from Tanzania Wildlife Research Institute (TAWIRI) for the period 1997-2016.

3.6 Data Collection Methods

Different data collection methods were used to collect both primary and secondary data. The use of different methods ensured validity and reliability, suitability and adequacy of data (Kothari, 2007). The researcher assumed no single technique was superior to the other while a combination of two or three methods made data highly reliable. In this study, household's survey method, key informant interview, focus group discussion and observation were employed to get primary data while documentary review was used to collect secondary data.

3.6.1 Household Survey

Survey is data collection operation that gathers information from human respondents by means of a standardized questionnaire in which the interest is in aggregates rather than particular individuals (Saris & Gallhofer, 2007; Ader, 2008). The survey was carried by using questionnaires to 93 households which were the unit of enquiry in both villages namely Natta Mbisso and Makundusi. Questionnaires were administered by the researcher and his assistants to the households (Appendix 1).

The researcher trained two assistants from among the villagers before conducting the survey as well as pretesting of questionnaires. The questionnaires included both closed ended questions and with a minimum number of open ended questions to give room for the respondents to express their views more freely (Kothari,2004; Saunders, 2004; Visser et al.,2009).

Pre-testing of questionnaire is very useful (Chaudhary & Isarel, 2014). Combination of methods for pre-testing of questionnaire was done including reading questionnaire aloud to identify difficulties of question, experts to review the questionnaire and finally questionnaire was tested in the field. In this study seven people were taken during pre-testing and the researcher was recording time.

3.6.2 Key Informant Interview

Structured interview was conducted to the key informants to obtain relevant information on land use planning, human wildlife conflicts and their impacts. As argued by Kombo and Tromp (2006), this method was used in order to get in-depth information. The key informants were probed on the problem of HWC and the aspects of VLUP as a mitigation measure, its implementation and monitoring, weaknesses, strengths and challenges. The key informants were: 1 Ward Executive Officer (WEO), 2 Village Executive Officers (VEOs), 2 Village Chairpersons, 1 District Game Officer, 1 Crop Officer, 2 Officials

from WMA office, 2 Officials from wildlife sector (1 SNP and 1 IGGR), 1 Coordinator from Frankfurt Zoological Society (FZS) and 1 Officer from Grumeti Reserves.

Pre-testing was conducted to two key informants by using the interview guide before engaging the interview in the study area. From Key Informant Interviews (KIIs), indeed the researcher was able to get issues, opinions and comments relevant to HWC and the contribution of VLUP as one of the strategies to curb the problem.

3.6.3 Focus Group Discussion (FGD)

According to Cohen et al., (2000) the Focus Group Discussion (FGD) method was used purposely to obtain in-depth information about the human-wildlife conflicts and the implementation of village land use plans. In this study, two focus group discussions were conducted in both villages. Each group had 8participants who had information on human wildlife conflicts. The discussions were guided by the researcher in Swahili language, since most of the participants were familiar with. The method helped to assess local people`s attitudes towards village land use plan and its contribution in human wildlife conflict mitigation.

3.6.4 Documentary Review

This method was used to collect secondary data. Secondary data have to do with the information collected previously by another researcher (Kothari, 2004; Kothari, 2007). Documents reviewed included books, publications of various associations, prepared reports by research scholars and universities, magazine, newspapers, policies, regulations, journals, maps, presented papers and other literatures related to the study topic. The review enabled the researcher to have general understanding of the area of study.

3.7 Methods of Data Processing, Analysis and Presentation

3.7.1 Data Processing and Analysis

The collected data from the questionnaires were thoroughly examined; variables were coded and were imported into statistical package for social scientist (SPSS) version 20. According to Kombo and Tromp (2006), and Singh (2006) data collected from the KIIs and FGD were mainly qualitative in nature, the researcher only recorded the key issues of the interviews, concepts and suggestions, then they were summarized to get the key findings and provide explanations of the findings. Most of the quantitative data were obtained from documentary review. The results were presented in forms of figures, charts and percentages.

3.7.1.1 Linear Regression

Regression analysis is used to predict values of a dependent or response variable from the values of one or more independent or explanatory variables (Draper and Smith, 1998). Regression analysis focuses on finding the simplest relationship indicated by the data. Linear regression analysis was used to structure data, interpret and present the findings for contribution of village land use plan in reducing human-wildlife conflict. The formula applied was as expressed below:

$$y = \pm ax + b \quad (5)$$

Coefficient *a* in equation $y = \pm ax + b$ show the direction of the slope.

- Positive trend (+a) correspond to the increased cases of HWC.
- Negative trend (-a) correspond to the reduction of the HWC.
- Size of “a” show the value of a trend.

3.7.1.2 Multiple Regressions

Multiple regression technique is used to estimate the impact of several variables simultaneously on the dependent variable (Singh, 2006; Saris & Gallhofer, 2007; Card, 2012). According to Singh (2006), the intention was to determine predictability of one variable on basis of several other linear relationships.

$$y = ß_0 + ß_1x_1 + ß_2x_2 + ß_nx_n \quad (6)$$

Whereby *y* -is the dependent variable (frequency of the HWC or number of HWC); *x* - is the predictor variables of interest (rainfall, distance, population); $ß_0$ -is the intercept of *y* when all predictors equal 0; *ß* –are coefficients calculated by the Ordinary Least Squares (OLS); *n* – is the number of variables.

In this study, the researcher included other variable like distance, amount of rainfall received in the study area, human population, livestock population and wild animal populations that contribute to the occurrence of human-wildlife incidents.

3.7.1.3 Indicators of Village Land Use Implementation and Monitoring

An indicator is defined as a parameter, or a value derived from parameters, which points or provides information about the state of a phenomenon with a significance extending beyond that which is directly associated with a parameter value (OECD, 1993). Delorme and Chatelain (2011) argue that indicators are quantitative or qualitative and are characterized primarily by the fact that they provide information in summary form, are communicable and are subject to relative consensus. Holzapfel (2014) sees the implication of indicators as a venue to provide information which extends beyond the properties directly associated with a parameter value. Their main functions: firstly, is to provide information in summary form and reduce the information need that would normally be required to paint a precise picture of a situation, and secondly, they can be

used to communicate complex phenomena in simplified form to different stakeholders (Holzapfel ,2014).

In this study, two indicators were used to evaluate the VLUP in the study area. These were indicator for management and establishment; and indicator for monitoring. The researcher adopted and used seven components with modification from NLUPC, (1998). The five components were under management and establishment; - Community participation; establishment of the borders for different land uses, public disclosure, enforcement and public trainings particularly at the local level and the last two components for monitoring; the monitoring entity and the number of regular visits conducted by the monitoring entity on annual basis which was responsible to carry out the monitoring of VLUP.

a) Indicator of Management and Implementation of VLUP

The index of management and implementation of VLUP was established through assessing four elements under this stage. These elements were community participation, establishment of borders for different land uses according to the agreed plan; public disclosure; enforcement and capacity building through public training at the village level. Indicator of management and establishment was measured as follows:

$$IME = CP + EB + PD + E + PT \quad (7)$$

Where: ME - Indicator of the Management and Implementation of VLUP; CP- community participation; EB- Establishment of the borders; PD - Public disclosure; E – Enforcement; PT - Public trainings.

Community Participation

Community participation refers to the direct involvement of the stakeholders in the various steps of the development activities, and has become a common and widely

accepted method to meet the needs of the resource poor rural population (NLUPC, 1998). Community participation could be established through reflection of different socio-economic groups with their interests, expectations and powers. The "reflection of communities" was measured by asking the selected households their evaluation of the community participation during establishment of VLUP on a Likert scale from 1 (very low reflected) to 5(very high reflected).

Establishment of the borders

The boundaries of different categories of land uses like crop cultivation, grazing, residential, wildlife, forest and water sources must be demarcated and their boundaries be clearly known at villages. Boundaries of different land uses can be in descriptive (only text document), map and full surveyed i.e. planted with beacons. Establishment of borders was assessed through the key Informant interviews of the respective officers and was measured by the asking their evaluation basing on a scale from 1 (descriptive boundaries i.e. only on text document); to 3 (full surveyed boundaries i.e. document, map and planted beacons).

Public disclosure

The implementation and management of VLUP require public disclosure with a two-way communication that assures village land-use plans tuned with higher level plans, interests and policies, and that planners and decision makers at all levels are sufficiently informed about the priorities identified by villagers. VLUPs should be publicly disclosed in relevant languages. The disclosure of the village land use plans was measured through asking the selected households their evaluation during the implementation and management of VLUP on the scale of 1 (Very poorly disclosed) to 5 (Very highly disclosed).

Enforcement

The management entity with roles to enforce the VLUP should be responsible for instances of noncompliance and make sure that are promptly and effectively addressed by using the available legal framework (e.g. by-laws). The enforcement actions may include warnings, fines, suspension or cancellation of land use contracts, or arbitration. This component was assessed through asking the selected households in their respective villages and be evaluated on the scale from 1(very poorly enforced) to 5 (very highly enforced).

Public trainings

After the VLUP establishment, the PLUM team will be no longer present in the village, so it was important to build capacity at the village level through training Village Technicians (VTs) who are capable for implementation and management of VLUP activities and who understand and implement the innovations rapidly. According to NLUPC, (1998) VTs can be selected among the Village Land Use Management (VLUM) team or other village members and not necessarily to be members of VLUM team. The trained VTs shall assist their fellow villagers and communicate with PLUM, VLUM teams and report to the village authority. Public training was assessed through the key Informant interviews of the respective villages and was measured by asking for their responses basing on a scale from 1(no training) to 3 (both VLUM and VTs).

b) Indicator of VLUP Monitoring

The main purpose of monitoring is to trace as early as possible any shortcoming with regard to VLUP implementation and compliance (NLUPC, 2006). The indicator of the monitoring was established by two components which were regular visiting and the monitoring entity as follows:

$$IM = ME + RV \quad (8)$$

Where: IM –is the Indicator of the monitoring of the VLUP; ME – is the presence of the Monitoring Entity; RV –is the Regular Visits variable.

Monitoring entity

Monitoring of VLUP requires an entity to trace as early as possible any shortcoming with regard to its implementation and compliance. The type of monitoring entity may include the village government (VG), PLUM, VLUM or both of them. The type of monitoring entity present in the village was assessed through the key informant interviews of the respective officers. This component was measured depending on the type of entity on the scale from 1 (no entity responsible) to 5(PLUM, VLUM and VG).

Regular visits

The PLUM and VLUM teams were supposed to conduct regular visits to monitor the villages with plans, and verify if decisions on action were taken in line with the VLUP. Regular visits were assessed through the key informant interviews of the respective villages. The "regular visits variable" expressed in percentages was appropriately transformed on a continuous scale going from 1 (0%, no visit) to 5(100%, quarterly).

3.7.2 Data Presentation

The major findings and results were presented statistically in various ways including charts, tables, figures, frequencies, percentages and graphs to make them easily understood(Kothari,2004;Singh,2006;Creswell,2007). According to Bhattacherjee (2012), in order for the study to maintain anonymity of results and findings, no names of persons or institutions should be linked to any response.

3.8 Validity and Reliability

Validity and reliability are the two important quality control objects in research design (Yin, 2003; Greener, 2008; Kumar, 2011). Validity and reliability were two factors considered during the designing of the study, analysing and presenting the results.

3.8.1 Validity

Validity is the degree to which the researcher has measured what he has set out to measure and reflect the real meaning of the concept under consideration (Babbie, 1989; Smith, 1991). In this study, validity was achieved in various ways. Firstly, it was through carefully formulation of questions and pre-testing of questionnaires to ensure that questions were clear and possible problems were identified earlier. Secondly, the collected data were edited and errors were eliminated. The main purpose was to attain the completeness, accuracy and uniformity.

3.8.2 Reliability

Reliability of the study is the extent to which other researchers arrive at similar results if they undertake study with the same case using exactly the same procedures as the first researcher (Kothari, 2004; Creswell, 2007; Saris& Gallhofer, 2007). In this study, the researcher used different methods in during data collections such as household survey, interviews, focus group discussion and documentary review. However, the reconnaissance was conducted to test the instruments before engaging in the actual study.

3.8 Ethical Considerations

Ethics is a system of moral values concerned with the degree to which research procedures adhere to professional, legal, confidentiality toward participants, sponsors and

social obligations (Creswell, 2007; Bhattacherjee, 2012). In this study, these were done using the dual principles of anonymity and confidentiality.

Ethical issues were considered by obtaining permission from the relevant authorities and the potential respondents respectively, to conduct the research (Appendix IV). Each respondent was informed about the purpose, significance and benefits of the study, and the time required to complete the questionnaire. In order to maintain confidentiality and anonymity, names of the respondents were not written on the questionnaires. In line with this, principle of self-determinations was respected.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the findings of the study obtained from the study area through household survey; key informants interview; focus group discussions and literature review. The chapter is organized and categorized into four sub-sections basing on the objectives of the study. Section one presents the findings on demographic characteristics of the respondents. Section two presents the trends of human-wildlife conflicts before and after the implementation of the village land use plan. Section three presents evaluation of the village land use plans (VLUPs) implementation and monitoring. Section four examines the perception of the local communities on the VLUP contributions into Human-Wildlife Conflict mitigation.

4.2 Demographic Characteristics of the Respondents and Duration of Stay

This part presents the demographic characteristics of the respondents and their duration of stay in the area. Demographic characteristics include respondents' sex, age, marital status, household size, level of education, main occupation and the types of crops grown. Duration of stay seeks to know the issue of native, whether born in the village or not, the reason for migration and the period the respondents had been staying in the area.

4.2.1 Demographic Characteristics of the Respondents

Table 4.1 presents the demographic characteristics of the respondents. As for sex of the respondents, the results show that the overall average of respondents was males (62.4%), while females were 37.6% in the area. Sogoseye (2011) argues that, in African culture men are more spokespersons of all matters and affairs affecting their families than women.

Age of the respondents was dominated by the age group with 38-49 years old (63.4%) implying the energetic and economically active population, while 36.6 % of the respondents were 50 years old and above(Table 4.1). The study targeted households who were living adjacent to protected areas, and experienced about human-wildlife conflicts from 1997 to 2016 (20 years) (See section 3.2.2). Due to that, during the data collection, all respondents were 38 years old or above. Those respondents, who were aged exactly 38 years during the time this study was conducted, were 18 years old in 1997. This age is regarded as starting age of working class in the country (URT, 1977). Having experience and knowledge on HWC, the respondents' ages were important to ascertain the contribution of VLUP in mitigating human-wildlife conflict in the study area.

Likewise, results on marital status of the respondents revealed that 87.1% were married, with the overall average of household members above 6 (57.0%) and 1-6(43%). Results on education levels of the respondents show that on average, majority (79.6%) of the respondents had attended primary education and 7.5% of the respondents had informal education (not attended school).Altogether, all these data indicate high illiteracy level. This corresponds with studies done by Magige (2012) and Makupa (2013) in Serengeti in the villages bordering the protected areas. Kaswamila (2006) argues that the high illiteracy level, if not checked can have negative implications for the development of any social group. In contrast, with education, one can easily learn issues of managing human-wildlife conflicts which require knowledge and broad understanding among all stakeholders involved.

Table 4. 1: Demographic Characteristics of the Respondents

Demographic characteristics		**Village names (%)**		**Average (%)**
		Natta Mbisso (n=40)	Makundusi (n=53)	
Sex	Male	65.0	60.4	62.4
	Female	35.0	39.6	37.6
	Total	**100.0**	**100.0**	**100.0**
Age	38-49	62.5	64.2	63.4
	50 and above	37.5	35.8	36.6
	Total	**100.0**	**100.0**	**100.0**
Marital status	Married	82.5	90.6	87.1
	Not married	7.5	3.8	5.4
	Divorced	2.5	0.0	1.0
	Widow(er)	7.5	5.6	6.5
	Total	**100.0**	**100.0**	**100.0**
Education level	Primary school	82.5	77.4	79.6
	Sec. school	12.5	5.7	8.6
	College/University	2.5	5.7	4.3
	Informal	2.5	11.2	7.5
	Total	**100.0**	**100.0**	**100.0**
Household members	1-6	42.5	43.4	43.0
	Above 6	57.5	56.6	57.0
	Total	**100.0**	**100.0**	**100.0**
Occupations ***	Cultivation	87.5	96.2	92.5
	Livestock keeping	40.0	37.7	38.7
	Civil servant	5.0	1.9	3.2
	Business	0.0	1.9	1.1
	Total	**132.5**	**137.7**	**135.5**

***Multiple responses

Source: Field data Survey, (2017).

The main occupation in the area was revealed to be cultivation as presented by 92.5% of the respondents(Table 4.1). Other economic activities include livestock keeping, employment and small business. Crops cultivated include maize, millet, sweet potatoes, beans, rice, cotton and cassava. This corresponds with NLUPC (1998) that, majority of the Tanzanian population, mainly small holder farmers living in villages depends almost entirely on land resources through agriculture and livestock.

4.2.2 Duration of Stay in the Area

Findings in Table 4.2 present the duration of stay of the respondents and the reasons for migration in the study area. Results show that majority of the people (66.7%) were born and matured in these villages while 33.3 % were not. Furthermore, the overall average of 76.3 % and 23.7 % of the respondents had stayed more than 20 years, and less than 20 years in the area respectively. The main reasons for people to migrate into the area include: access to the land for agriculture, pasture for livestock, marriage, small businesses and employment (Table 4.2).

The high rate of migration into these villages was due to; suitable land with good soil fertility and the amount of the rainfall received per year. If this situation remains unchecked, it may lead to the encroachment of the protected areas and hence increasing the human-wildlife conflicts in the area. This corresponds with Bamford et al (2014) who found that people migrated into the villages around Kilombero Valley, the largest wetland in Tanzania to acquire land and seek for employment. The increasing pressure on land for different purposes has been mentioned to have fuelled a growing number of conflicts between the different land users. For instance, the study by Hariohay and Røskaft (2015) in Tarangire Ecosystem revealed one of the causes of HWC resulted from the encroachment of the residents to the borders of the PAs and destruction of wildlife habitats. Similarly NLUPC (1998) ascertains that, population increase has lead to the

expansion of settlements, agricultural areas, livestock grazing, tree cutting for fuel wood etc. Kami et al (2016) ascertained that, amongst the land uses which have become conflicting, are agriculture and wildlife.

Table 4. 2: Duration of Stay and Reasons for Immigration

Description	**Responses**	**Village names (%)**		**Average (%)**
		Natta Mbisso (n=40)	Makundusi (n=53)	
Born in village	Yes	72.5	62.3	66.7
	No	27.5	37.7	33.3
	Total	**100.0**	**100.0**	**100.0**
Duration of stay	< 20 years	10.0	34.0	23.7
	20 years and above	90.0	66.0	76.3
	Total	**100.0**	**100.0**	**100.0**
Reasons for immigration	Land for agriculture	12.5	17.0	15.1
	Pasture for livestock	7.5	3.8	5.4
	Marriage	7.5	5.7	6.5
	Employment	2.5	5.7	4.3
	Business	0.0	5.7	3.2
	Total	**30.0**	**37.9**	**34.5**

Source: Field data Survey, (2017).

4.3 Trend of Human-Wildlife Conflicts

This part presents the results of the first specific objective of the study, which required to identify the trend of the conflict before and after the implementation of the village land use plan. However, the objective starts by introducing the human-wildlife conflicts types, their causes and other mitigation measures in the study area. Furthermore, this part gives the results of linear regressions on the trends of human-wildlife conflicts before and after

VLUP implementation, and lastly, this part gives the results on multiple regressions on the prediction of conflicts after ten years from now (2037).

4.3.1 Human Wildlife Conflicts in the Area

Respondents were asked whether communities had been experiencing conflicts in the past 10 years. The results revealed that 100.0% of the respondents said to have conflicts with wildlife. The overall average results on the types of conflicts were crop raiding (100.0%), livestock depredation (49.5%), property destruction (32.3%) and 14.1 % of the respondents said some people were killed and injured by wild animals.Wild animals species involved in conflicts were elephants (*Loxodanta africana*), wild pigs (*Patomochoerus porcus*), baboon (*Papio hamadryas*), hyenas (*Crocuta crocuta)* and lions (*Panthela leo*) (Table 4.3).

Table 4. 3: Types of Human-Wildlife Conflicts and Wild Animals Involved

Types of conflicts and wild animals involved		**Village name (%)**		**Average (%)**
		Natta Mbisso (n=40)	Makundusi (n=53)	
Conflicts	Crop raiding	100.0	100.0	100.0
	People injured/killed	15.0	13.2	14.1
	Livestock depredation	50.0	49.1	49.5
	Property destroyed	37.5	28.3	32.3
	Total	**202.5**	**190.6**	**195.9**
Wild animals	Elephants	90.0	98.1	94.6
	Bush pigs	52.6	56.6	54.9
	Baboons	15.0	15.1	15.1
	Hyenas	72.5	64.2	67.7
	Lions	25.0	22.6	23.7
	Total	**255.1**	**156.6**	**156.0**

***Multiple responses

Source: Field data Survey, (2017).

4.3.1.1 Types of Human-wildlife Conflicts

The results on types of human-wildlife conflicts and the involved wild animals were further studied and the results were as follows:

i. Crop raiding:

Crop raiding was said to affect all the village communities, and the mostly affected crops were maize, millet, cassava, sweet potatoes, cotton, sisal and rice. The main wild animals involved in crop raiding were elephants (*Loxodanta africana*), wild pigs (*Patomochoerus porcus*) and baboons (*Papio hamadryas*).

During the focus group discussions and key informants, it was found that most of the crops raiding were occurring during the wet season at night time. The data collected from Serengeti district Game office revealed that, the estimate of crops damage caused by wild animals in the area were 495.5 acres valued to Tshs 30,950,000 from 2012 to 2016. As a result of this, the central government through wildlife division and Tanzania Wildlife Management Authority (TAWA) paid Tshs 222,658,000 as consolation to the people in Serengeti district. This corresponds with Mariki et al., (2015) who found also in 2009 that about 901 acres were raided in three villages in SihaMagharibi. In Ethiopia, Amaja et al. (2016) revealed that 50% of HWC was crop raiding in Gera district. Similarly, inNepal, the study by Acharya et al., (2016) revealed that villages adjacent to protected areas (PAs) depended mainly on agriculture and due to that, communities were in conflicts with wild animals as a result of crop raiding, livestock depredation and increasing risk of some livestock diseases.

ii. Livestock Depredation

Livestock depredation was reported the second conflict after crop raiding in the area (Table 4.3). During focus group discussions, goats and sheep were found to be attacked

more than other livestock. Data from the District Game Office (DGO) show that from 2006 to 2016, about 657 livestock were attacked and killed by wild carnivores. Out of that number, 550 (83.7%) were goats and sheep. Wild carnivore species involved in livestock depredation were mentioned to be hyenas (*Crocuta crocuta)* and lions (*Panthela leo*). Unlike crop raiding, the invasion of livestock did not depend on seasons and most of the incidents occurred during night.

During the interview with District Game officer, it was hinted that livestock are easier prey because they are kept in enclosures that they cannot run away and they are physically weaker compared to wild herbivores which have developed evolutionary adaptations against predations from the wild carnivores.

Data obtained from District Game office in 2016 indicated about 35 cases of livestock depredation whereby 49 livestock were reported to be killed by wild carnivores from the study area and the government spent Tshs 3,345,000.00 as consolation payment for the loss caused by wild carnivores (TAWA, 2017). These results agree with the study done in Ethiopia by Acha and Temesgen (2015) in villages surrounding Chebera-Churchura National Park who found that for the period of 2007-2011, about 30.48% of the livestock were depredated. In Kenya, the study by Manoa and Mwaura (2016) in Loitokitok sub-county around Amboseli National Park indicated that in 2015, the economic loss resulting from livestock depredation was Ksh 3,225,000.

iii. Human attacked and killed by wild animals

Human attack from wild animals has been causing injuries and death. Data from the Serengeti District Game office revealed that29.4% of human mortalities and injuries caused by wild animals in the district were from the study area. For example, 17 deaths of people were reported in a period of 10 years from 2006 to 2016, of which 5 cases were

found in the study area. Most of the attacks were said to occur during evening hours and night. Wild animals involved in attack and killing of the people were elephants, lions, hippos and crocodiles. These incidents were said to occur when the wild animals got out the PAs to look for food in the villages and when people were fetching water from Grumeti and Rubana Rivers.

This corresponds with the study by Mwakatobe et al., (2014) in villages surrounding Serengeti National Park, Ikorongo Game Reserve and Lake Victoria in Tanzania that one of the conflicts involved between wildlife and humans was threats to local peoples' lives. The study by Acha and Temesgen (2015) in Ethiopia revealed that from 2007 to 2011 about 23 people were attacked by wild animals in villages surrounding Chebera-Churchura National Park, while inIndia the study by Habib et al., (2015) revealed that the number of human mortalities and injuries increased from 186 in 2010 to 252 in 2012 in Kashmir region. Nyirenda et al., (2011) argue that the interactions between human and wildlife have a wide array of negative impacts including deaths caused by wild animals.

iv. Poaching

During the interview with key informants, poaching was revealed to be among other conflicts despite of being mentioned by the households. Data obtained from the District Game Office show that for the period of ten years (2007-2016), 65 wild animals that is 20elephants; 7lions; 2giraffes; 3hippos; 20wildebeest; 10baboons and zebra 3, were killed in IKONA-WMA. Also data obtained from the District court show that cases registered on poaching from 2005 to 2016 were 1,062. Of which 20.5% (218) were from the Makundusi and Natta Mbisso villages.

During the interview with the Village Officials, it was found that poachers were using guns, traps and poisons to kill wild animals. The reasons for these killings were said to be

revenge for the loss that had been caused by wild animals, business of bush meat and ivory. Wilfred (2010) argues that, among the challenges facing many WMAs in Tanzania is wildlife poaching. This corresponds with the studies done by other scholars. For instance, in Tanzania, the study by Sogoseye (2011) in Wami Mbiki WMA for the period of ten years (2002-2011), 910 wild animals were killed. In Kenya, the study done by Manoa and Mwaura (2015) indicated that 4.0% of people had nothing to stop them from killing wild carnivores as revenge in Amboseli ecosystem. In Brazil, the study by Nogueira-Filho and Petit (2011) shows that farmers pursue traps and kill wild animals.

4.3.1.2 Wild Animals involved in the HWCs

The results show that 37.1% of the respondents mentioned elephants (see Figure 4.1) as the most problematic wild animals due to high negative impacts they caused especially on crop raiding. Hyenas were mentioned after elephants by 26.6% of the respondents. Together with lions (9.3%) hyenas had negative impacts on livestock depredation due to frequent attacks. Other wild animals which were affecting the residents were bush pigs (21.11%) and baboons (5.9%) were said to be problematic by the respondents during the field survey.

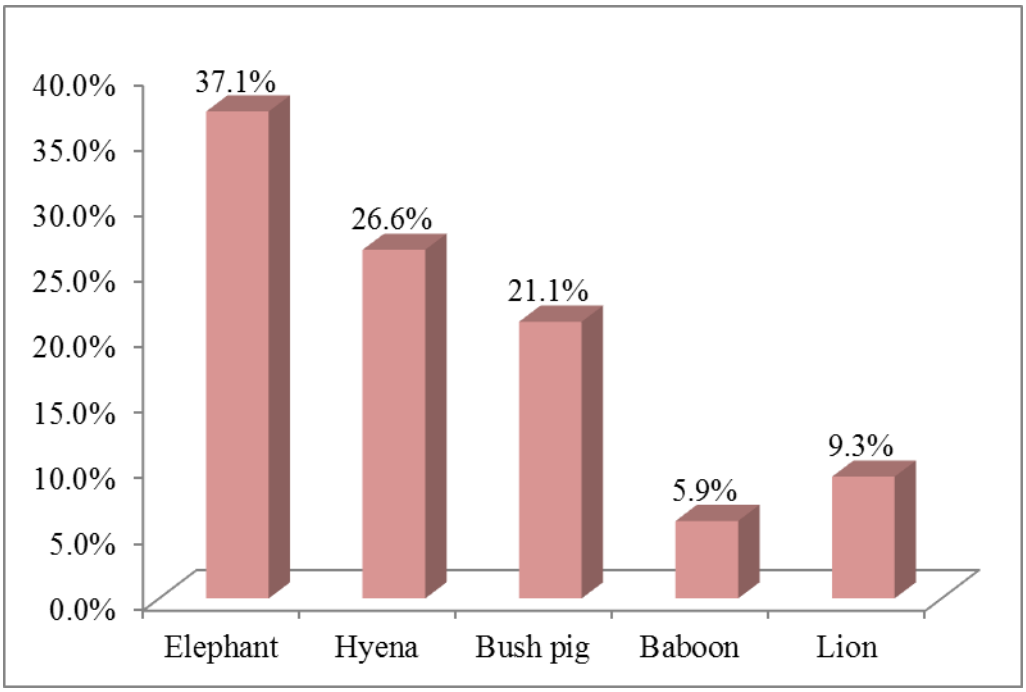

Figure 4. 1: Wild Animals involved in HWCs

Source: Field data Survey, (2017).

This implies the most problematic herbivores on crop raiding were elephants, bush pigs and baboons, while hyenas and lions were found to be problematic carnivores on livestock depredations. This is in line with the studies conducted by other scholars like Mwakatobe et al., (2014), Mariki et al., (2015) and Makindi et al.,(2016) who found that elephants, hyenas, baboons and lions as the major problem animals which were causing different negative impacts on human life, properties, crops and livestock loss.

4.3.1.3 Causes of Human-Wildlife Conflicts in the study area

The main causes of human-wildlife conflicts identified during the key informants' interview and focus group discussions include increase of human population, increase of livestock numbers, increase of wild animals in protected areas; human activities and their proximity to the protected area and drought as the result of rainfall variability.

i) Increase of human population

Data on human population obtained from District Planning office show that for the period of 20 years (1997-2016), human population in the area increased from 3,748 people in 1997 to 8,008 people in 2016(SDC, 2016). The reason for the population increase included natural growth rate of 2.8 % and migration. The main reasons for immigrants included looking for land for agriculture and pasture for livestock (see Table 4.2). Population increase in the area has lead to the increasing pressure on land for different uses. If this situation remains unchecked, numbers of conflicts will continue to grow. This is not far from studies done by other scholars. For instance, Sogoseye (2011) in Wami Mbiki WMA in Tanzania found that human population growth contributed to growth of human-wildlife conflicts. Acharya et al., (2016) in Nepal, Makindi et al., (2014) in Kenya and Nyirenda et al., (2011) in Zambia also argued that human–wildlife conflicts were caused by increased human population.

ii). Increase of livestock numbers

Data obtained from District Livestock Development office show that for the past 20 years livestock in the study area has increased from 7,899 in 1997 to 15,045 in 2016 with the growth rate of 2.5%. These livestock include cattle, sheep and goats only. The area supports livestock keeping and hence it has become attractive for immigrants who seek pasture. As a result, the increased livestock have led to competition on grazing land and pasture, water and space between livestock and wild animals in the area. Similar results on livestock population increase were revealed by Makupa (2013), in Robanda village within IKONA WMA. In the same vein, Distefano (2010) revealed that one of the driving forces for HWCs to the village close to protected area included increasing livestock populations.

iii). Increase of wild animal numbers in PAs

Data obtained from TAWIRI revealed that wild animals have increased for the period of the past 10 years (2007-2016) since the implementation of WMA in 2006. The conservation initiatives taken by IKONA-WMA and Grumeti Reserves have been mentioned to contribute to the growth of wild animals in the area (IKONA, 2015). For example, the population of elephant has increased from 3,680 in 2010 to 6,087 in 2015 within the Serengeti ecosystem (TAWIRI, 2015). Likewise, the animal count conducted by Grumeti Reserves to the protected areas adjacent to the study areas indicated that the population of elephants had increased from 355 in 2003, 744 in 2004, 892 in 2006, 770 in 2008 and 743 in 2010 (see Figure 4.2).

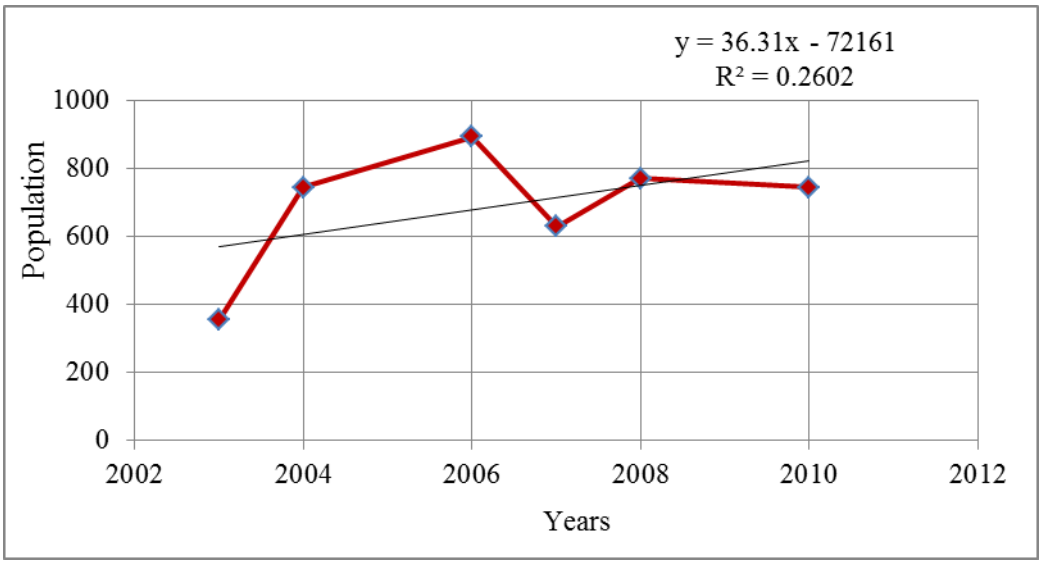

Figure 4. 2: Elephant Population Growth

Source: Study Findings, (2017).

Despite the fluctuations of the numbers reported, the results still indicate that elephant population doubled from 355 in 2003 to 743 in 2010 (See figure 4.2). According to Goodman (2010) the variation could be as the result of animal moving in response to resources availability. Furthermore, he found that the overall elephant population has grown by 7% per annum since 2003. Goodman, (2010) asserted that there is absolutely no

doubt that the current management efforts and law enforcement in the study area have been successful in reducing the impacts of poaching to the extent that such efforts have allowed the population of large herbivores to grow.

This is in line with Sogoseye (2011) and, Ringo and Kaswamila (2014) who revealed that the increase of the wild animals in Wami-Mbiki WMA resulted from conservation initiatives including the implementation of GMP. Particularly, the study by Sogoseye (2011) revealed that for the period of fourteen years the wild animals in Wami Mbiki WMA increased from 5000 in 1997 to 33,000 in 2010.

iv). Human activities close to the protected areas

Human and livestock populations growth have led to the increment of the human activities near the protected areas (PA). This was mentioned by both key informants and focus group discussion to be among the reason leading to human-wildlife conflicts in the area. During focus group discussion one of the participants said:

> "*This problem is sometimes caused by people who cultivate close to the protected areas. By doing this, it looks like we are calling these wild animals from their bushes*".

Respondents were also asked to give the average distance from their home and farms to protected areas and where they were getting pasture for their livestock. Answers were limited to less than 0.5Km to more than 3 Km from the protected area. The results indicated that overall, 63.4% of the homes were located at the distance of more than 3Km. The results at the village level show that in Makundusi village, 45.3% of the respondents their homes were within 1-3Km from the protected area compared to 22.5% of the respondents in Natta Mbisso village(Table 4.4).

Table 4. 4: Average Distances of Human Activities from the Protected Areas (PAs)

Average distance		Village names (%)		Average (%)
		Natta Mbisso (n=40)	Makundusi (n=53)	
Home to PAs	< 1Km	2.5	0.0	1.1
	between 1-3 Km	22.5	45.3	35.5
	>3 Km	75.0	54.7	63.4
	Total	**100.0**	**100.0**	**100.0**
Farms to PAs	< 0.5 Km	10.0	3.8	6.5
	> 0.5 Km	90.0	96.2	93.5
	Total	**100.0**	**100.0**	**100.0**
Grazing to PAs	< 0.5 Km from PAs (buffer zone)	10.0	7.5	8.6
	< 1Km from PAs	30.0	11.3	19.4
	From village land > 3 Km from the PAs	42.5	41.5	41.9
	Total	**82.5**	**60.3**	**69.9**

Source: Field data survey, (2017).

Results on average distance from farms to protected areas indicated that 93.5 % of the respondents their farms were found more than 0.5 Km from the protected areas. However, at the village specific level, the study findings in Natta Mbisso show that 10.0% of the respondents said that their farms were located within a distance of less than 0.5Km from the protected areas. Results on grazing and pastures indicate that overall, an average of 41.9% of the respondents who owned livestock were getting pasture in the village land located more than 3 Km from the protected areas (Table 4.4).

According to URT (2011) any human activities taken within a distance of 0.5 Km from the protected area shall not be entitled for payment in course of the damage caused by wild animals. This implies that, homes, farms and livestock which are found within less

than 0.5Km from the protected area (2.5% homes in Natta, farms 6.5% and 8.6% grazing) are not entitled to any payment on loss caused by wild animals. These results are in line with the study conducted by Mashalla (2013) in villages adjacent to Mpanga/Kipengere Game Reserve (Tanzania) where farms located less than 1 Kilometer from the Game Reserve's boundary were not compensated in the event of loss caused by wild animals.

The study's findings also correspond with the studies done by Habib et al., (2015) in Kashmir region (India) and Makindi et al (2014) in Tsavo Conservation Area (Kenya) that the rise of HWCs was accompanied by subsequent encroachment on wild land. Amaja et al (2016) argues that the major cause of human-wildlife conflict in Gera district (Ethiopia) was habitat disturbance due to expansion of subsistence agriculture around forest edge, particularly coffee plantation near the natural forest.

v). Rainfall Variability

Distefano (2010) argues that, climatic trends are an important cause of HWC. Secondary data on rainfall were obtained from Tanzania Meteorological Agency (TMA) at Mugumu weather station covering the period of 20 years (from 1997 to 2016). The rainfall in the study area has been fluctuating over years as shown in Figure 4.3. The trend shows decrease in rainfall with a=-12.7. Unreliable amount of rainfall received in the study area was also mentioned as a significant cause of human-wildlife conflicts.

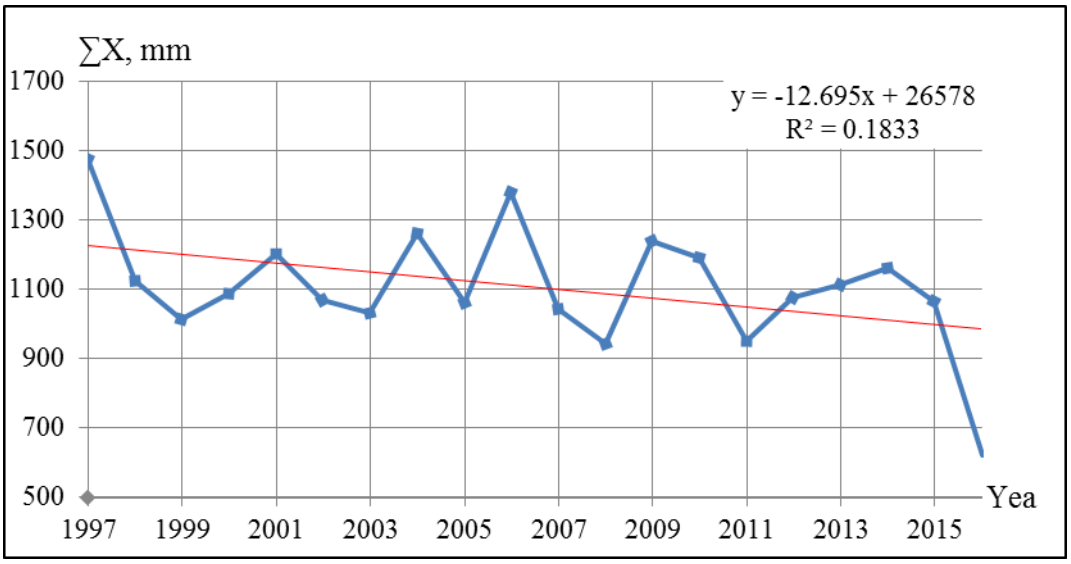

Figure 4. 3: Sums of annual rainfall (∑X, mm) for Mugumu Weather Station with trend line for period 1997-2016

Source: Study Findings, (2017).

During the survey, one of the reasons mentioned by respondents when asked what was forcing wild animals to move out of the protected areas was that wild animal were getting out PAs in search for water and food. Drought as one of the causes for human-wildlife conflicts has been mentioned by different scholars like Mariki et al. (2015) in other parts of Tanzania. In Kenya, Okello et al (2016) identified the issues of climate change as one of the drivers to the persistent of human – elephant conflicts to the villages within Amboseli ecosystem. When protected areas (PAs) become dry, wild animals including elephants, tend to migrate to human settlements and farms in search of water and pasture, a factor that leads to human-wildlife conflicts.

4.3.1.4 Measures for Human-Wildlife Conflicts Mitigation

Local communities in the study area have developed and adopted different strategies to protect themselves, their farms, livestock and properties against wild animals. This is because they realised that no single strategy was completely enough to deter the wild animals from causing loss to human beings. The results show that 28.8% of the

respondents said they were making noises, banging tins and other making noises objects to scare wild animals. 23.1% of the respondents said they were throwing stones, 13.0% of the respondents said disturbance shooting was used particularly for the problem animals like elephants. 12.7% of the respondents were using flash lighting with high intensity. Other measures were consolation schemes paid by the central government as relief for the loss caused by wild animals (8.2%), use of chilli method (5.7%), and application of used oils from engines (4.4%), destruction or killing of the problem animals (3.5%) when such wild animals became notorious and threatened the human life. Other 0.6% of the respondents said they were using beehive fences (Table 4.5).

These results correspond with different scholars who reported that strategies were being used by communities bordering PAs to scare animals like stone throwing, banging of tins, shooting warning shots (Parker et al., 2007; Hedges & Gunaryadi, 2010; Graham et al., 2009; Mwamidi et al., 2012; Hoare, 2012; Harich et al., 2013; Mwakatobe et al.,2014). However, all these methods were not said to solve the problems with animals completely, due to other factors. For example bees were said to be active during the day time and not at night while most of the damages especially crops occurred. This agrees with Sennett, (2013) that most of these methods are short term due to their ineffectiveness during the night as well with heavy rain.

Table 4. 5: Other Mitigation Measures

Mitigation measure	Frequency, (N**)	Percentages (%)
Disturbance shooting	41	13.0%
Destruction/ killing of the problem animals	11	3.5%
Chilli methods	18	5.7%
Application of used oil from vehicle engines	14	4.4%
Making noise, banging of tins and using other noise making objects	91	28.8%
Stone throwing	73	23.1%
Beehive fencing	2	0.6%
Flash lighting	40	12.7%
Consolation scheme	26	8.2%
Total	**316**	**100.0%**

N** multiple responses

Source: Field data Survey, (2017).

4.3.2 Trend of Human-Wildlife Conflicts

4.3.2.1 Conflicts Before the VLUP

Secondary data on numbers of human-wildlife conflicts were obtained from the Serengeti district game office and district court. The results of secondary data presented in Table 4.6 show that for the period of ten years, from 1997 to 2006 the numbers of HWCs in the area were 1,095 with the overall average of 109.5 conflicts per year. The conflicts included crop raiding (822); poaching (248); human injured and killed by wild animals (3) and number of cases reported on livestock depredation (22). Missing data were due to poor recording keeping both at the villages and district levels.

Table 4. 6: Number of Human-Wildlife Conflicts Before VLUP (1997-2007)

Year	Cr	Hi/k	Ld	Poaching	Total number of conflicts
1	2	3	4	5	6
1997	95	m.d.	m.d.	18	113
1998	80	m.d.	7	23	110
1999	93	m.d.	m.d.	15	108
2000	65	m.d.	m.d.	23	88
2001	73	m.d.	m.d.	31	104
2002	93	m.d.	m.d.	30	123
2003	76	m.d.	m.d.	22	98
2004	82	m.d.	m.d.	18	100
2005	95	2	m.d.	36	133
2006	70	1	15	32	118
Total	**822**	**3**	**22**	**248**	**1095**
Average number of HWC 1997-2006					**109.5**

Cr - crop raiding; Hi/k - human injured/killed; Ld - livestock depredation; m.d- missing data.

Source: Serengeti District Game Office (2017) and District Court (2017).

Furthermore, the analysis presented in Figure 4.4 shows that the trend line with positive slope indicates that numbers of conflicts had been on the increase before the implementation of VLUP (1997-2006). The total number of conflicts in the study area from 1997 to 2006 was found to be 1,095. Distribution of the conflicts against the years shows that it has not been stable and has been varying from year to year (Figure 4.4). Some long-term fluctuations could be ordinary and do not demonstrate any tendencies. Others could show the different slope in the trend line. In order to differentiate between ordinary fluctuations and fluctuations with significant slope, the value of 10% was used. That percentage could help to differentiate standard fluctuations of any parameter from the existing trend. If the difference at the beginning and end of studied period would be more than 10%, it would correspond to the “significant” trend.

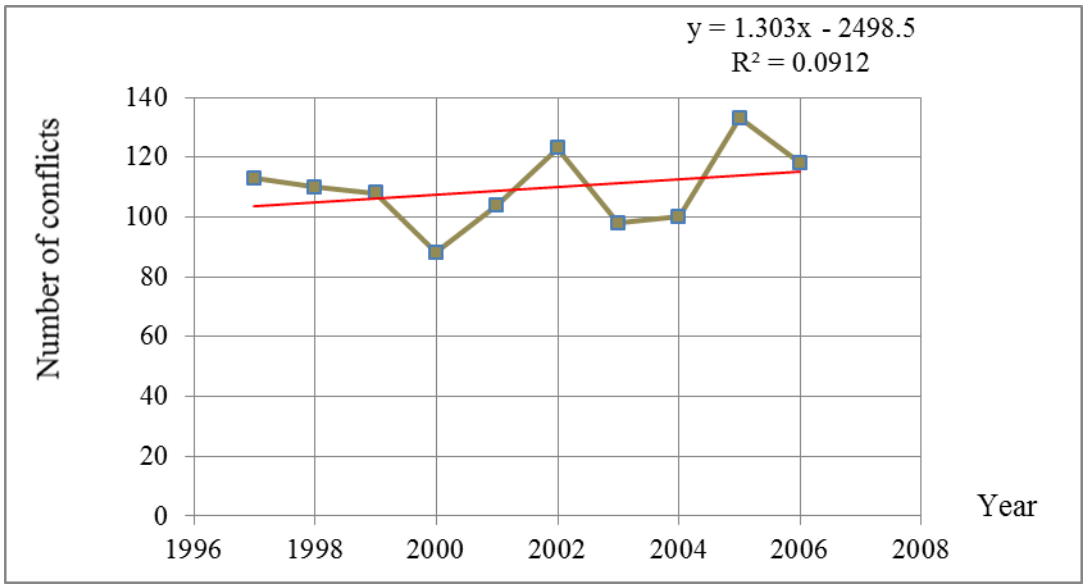

Figure 4. 4: Trend of Human-Wildlife Conflicts Before VLUP (1997-2006)

Source: Study Findings, (2017).

The difference could be calculated between first year and last year of the study period ($\Delta N_{1)}$. In that case, it would reflect the maximal increment or reduction in number of conflicts. It could also be calculated for the difference between average number of conflicts in first 3 years and last 3 years (ΔN_2). Such difference could show more appropriate results as it based on averaged data for some years at the beginning and end of the study period.

For evaluation of the trend, significance was used following strategy. That is, if the difference between data in first year and in last year was more than ±10% the trend would be "significant"; if that difference was less than ±10% the trend would be "insignificant". Difference (ΔN_1) between data in first year and in last year was calculated under formula (9).

$$\Delta N=P_2-P_1 \quad (9)$$

Where ΔN – is the difference in number of conflicts; P_2– is the number of conflicts at the end of studied period; P_1- is the number of conflicts at the beginning of the studied period.

Table 4. 7: HWC Trend Evaluation before VLUP (1997-2006)

Period	Number of conflicts
Value for first year (P_1)	104*
Value for last year (P_2)	115*
Difference in number of conflicts (ΔN_1)	+12
Percentage (%)	**+11**
Average for first 3 years(P_1)	105*
Average for last 3 years(P_2)	114*
Difference in number of conflicts (ΔN_2)	+9
Percentage (%)	**+9**

* calculated on regression equation from figure 4.4.

Source: Study Findings, (2017).

Results of the trend evaluation (Table 4.7) show that before the VLUP establishment, the trend of the HWC was in between "insignificant" and "significant" (9% to 11%) and had an upward direction that demonstrated increase in the number of conflicts. Due to this tendency, in years after 2006 the number of conflicts shall increase and affect more local residents if the situation remains the same and no any strategy will be implemented.

Furthermore, the analysis of the factors impacting on the number of conflicts was done. The impacts of the factors as rainfall variability, human population growth, livestock growth and increase of wild animals in the study area (Figure 4.5) were investigated. The study revealed high correlation between human-wildlife conflicts and their associated factors of human population growth, livestock and wild animals increase.

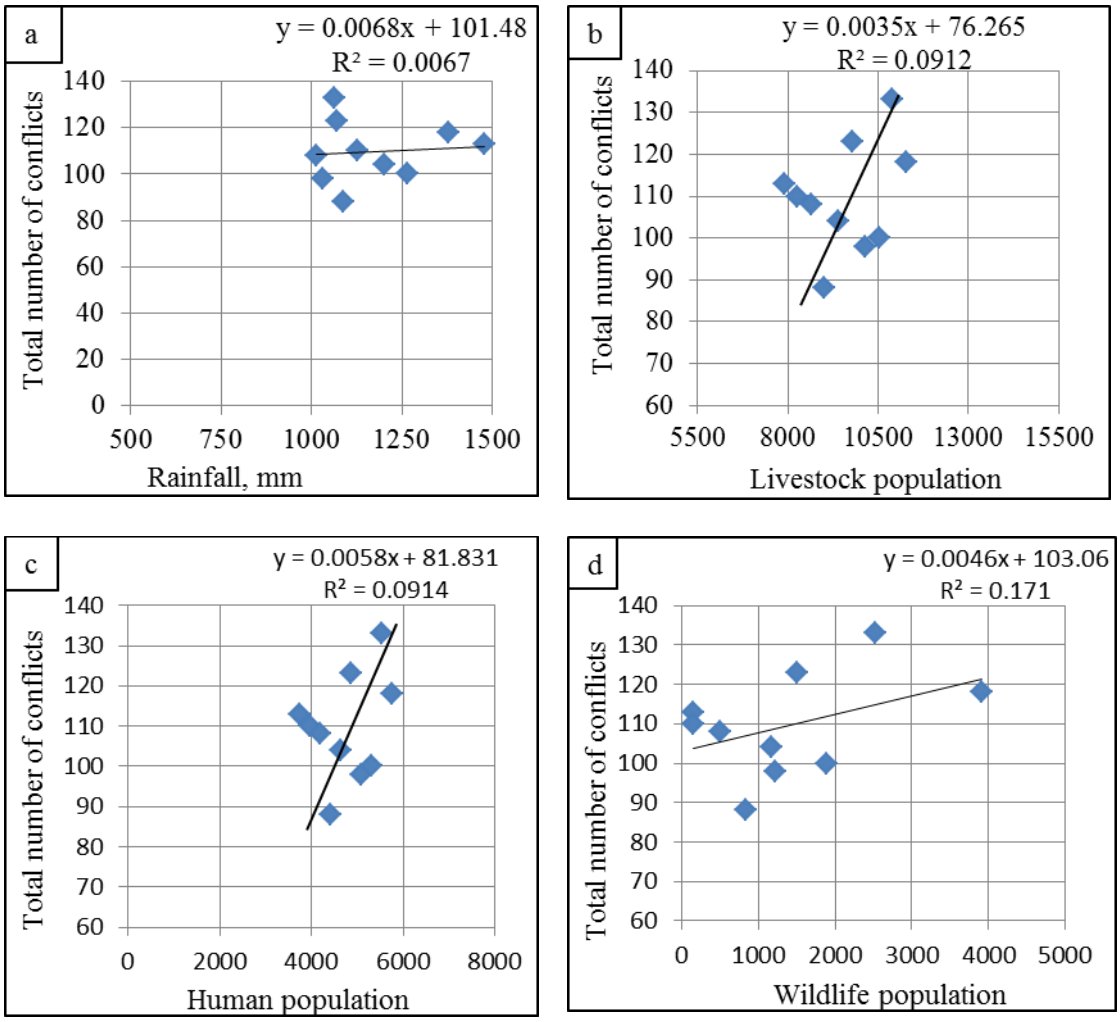

Figure 4. 5: Correlation of the total number of conflicts with rainfall (a), livestock population (b), human population (c) and wildlife population (d) before (1997-2006) the establishment of VLUP

Source: Study Findings, (2017).

Figure 4.5 shows that all factors have direct relations with the number of conflicts and show that if the number of human population, livestock population and wildlife population will increase, the number of conflicts will increase as well. The human population, livestock population and wildlife population increase have better correlations (R^2=0.0912÷0.171) compared to rainfall (R^2=0.0067) which has poor correlation to the reported number of conflicts in the study area. This could suggest that the rainfall is not a determinant factor of the human-wildlife conflicts.

The findings above imply that among the causing factors for human-wildlife conflicts in the study area before the implementation of VLUP; were the increase of human population, increased livestock as well wild animals increase in protected areas and rainfall fluctuation. These findings are not far from the study done by Sogoseye (2011) who asserted that the human-wildlife conflicts in Wami Mbiki were caused by both human population increase and wild animal increase.

4.3.2.2 Conflicts After VLUP (2007-2016)

Results on numbers of human wildlife conflicts after the VLUP indicated that for the period of ten years (2007-2016) there were973conflicts with the average of 97.3 conflicts per year. These conflicts include crop raiding 672; human injured and killed by wild animals 7; numbers of cases on livestock depredation 151 and poaching cases 143.Unlike before the VLUP (1997-2006), after the implementation of VLUP and WMA, records keeping of incidents of HWCs have improved at both levels (Table 4.8).

Table4. 8: Number of Human-Wildlife Conflicts after VLUP (2007-2016)

Year	Cr	Hi/k	Ld	Poaching	Total number of conflicts
1	2	3	4	5	6
2007	85	1	18	30	134
2008	77	1	20	23	121
2009	83		19	20	122
2010	75	1	12	13	101
2011	80		16	14	110
2012	43		19	10	72
2013	52	2	12	8	74
2014	74	1	18	6	99
2015	40	1	11	7	59
2016	63		6	12	81
Total	**672**	**7**	**151**	**143**	**973**
Average number of HWC 2007-2016					**97.3**

Cr=crop raiding; Hi/k=human injured/killed; Ld=livestock depredation

Source: Serengeti District Game Office (2017) and District Court (2017).

Furthermore, the results on linear regression analysis presented by Figure 4.6indicated decreasing of human wildlife conflicts in the area after the implementation of VLUP. The downward trend line with negative slope indicates decrease of human-wildlife conflicts. In 2016, the number of conflicts in the area was 81 compared to 134 in 2007.

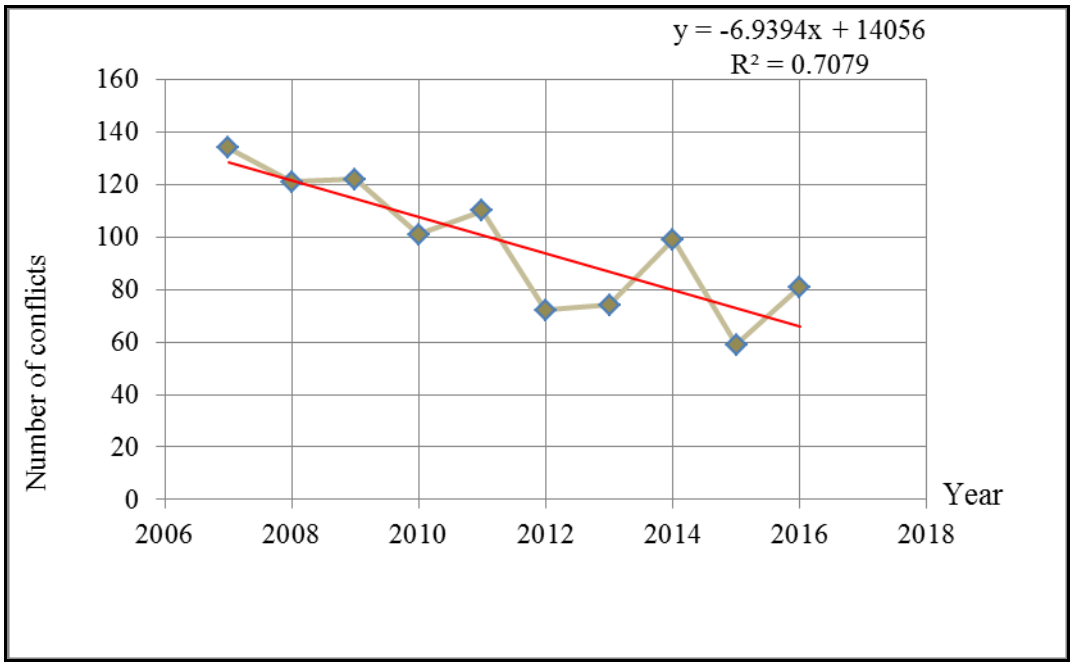

Figure 4. 6: Trend of Human-Wildlife Conflicts After VLUP (2007-2016)

Source: Study Findings, (2017).

Table 4. 9: HWC Trend Evaluation after VLUP (2007-2016)

Period	Number of conflicts
Value for the first year (P_1)	129*
Value for the last year (P_2)	66*
Difference in number of conflicts (ΔN_1)	-62
Percentage (%)	-49
Average for the first 3 years (P_1)	122*
Average for the last 3 years (P_2)	73*
Difference in number of conflicts (ΔN_2)	-49
Percentage (%)	-40

* calculated on regression equation from Figure 4.6.

Source: Study Findings, (2017).

Results of the HWCs trend evaluation (Table 4.9) after the VLUP establishment show that there was "significant" (-40% to -49%) reduction in number of conflicts. This reduction was observed since the beginning of the VLUP establishment at the study area. Hence it demonstrates the improvement of the situation with the human-wildlife conflict

in the area. Therefore, the strategies of land management through the VLUP have contributed to reduction of the number of conflicts. Despite the increase in livestock, human population and wildlife as presented in figure 4.7 (b, c and d) the number of conflicts were reduced.

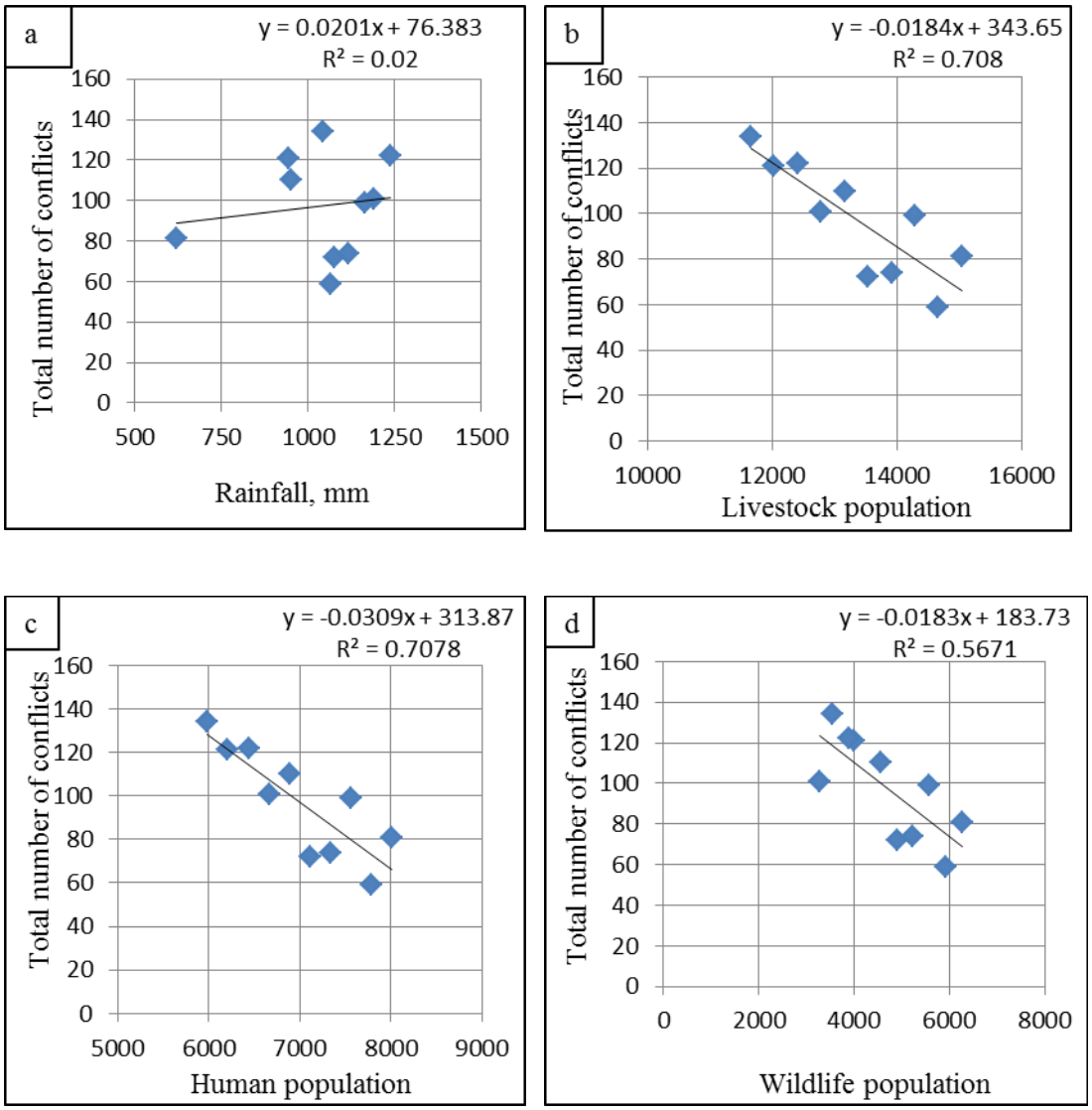

Figure 4. 7: Correlation of the total number of conflicts with rainfall (a), livestock population (b), human population (c) and wildlife population (d) after (2007-2016) the establishment of VLUP

Source: Study Findings, (2017).

This implies that the VLUP has played a role in reducing the interactions between human activities and wildlife, and hence has led to decrease of human-wildlife conflicts incidents

in the study area. However, when data from the survey were examined further, the analysis revealed increased number of human wildlife conflicts to the hamlets closely bordered by PAs. This corresponds with other scholars who revealed that HWCs differed along the distance from the PAs and the closest communities were the mostly affected (Mashalla, 2013; Mwakatobe et al., 2014; Hariohay & Røskaft, 2015).These findings closely reflect the study done by Ringo and Kaswamila (2014) in Wami-Mbiki which revealed that human-wildlife conflicts decreased after the implementation of GMP.

4.3.2.3 General trend of Human-Wildlife Conflicts (1997-2016)

The results on human-wildlife conflicts for the period of 20 years (1997-2016) have indicated that the main types of conflict in the area were crop raiding 1494(72.2%), poaching 391 (18.9%), livestock depredation 173(8.4%) and human injured or killed 10(0.5%).Furthermore, the results indicate that the average number (109.5) of HWC was higher before VLUP compared to the number after the VLUP 97.3 (See Tables 4.6and 4.7) despite the missing data (Table 4.6 columns 3-4).

Figure 4.8 presents the linear regression analysis on the trend of HWC for the period of 20 years (1997-2016). The results indicated that the number of conflicts was decreasing in the area although the conflicts were changing over time. Furthermore, the overall results revealed that the conflicts decreased by 18.6 % in the area for the period of 10 years (2007 to 2016) after the implementation of VLUP.

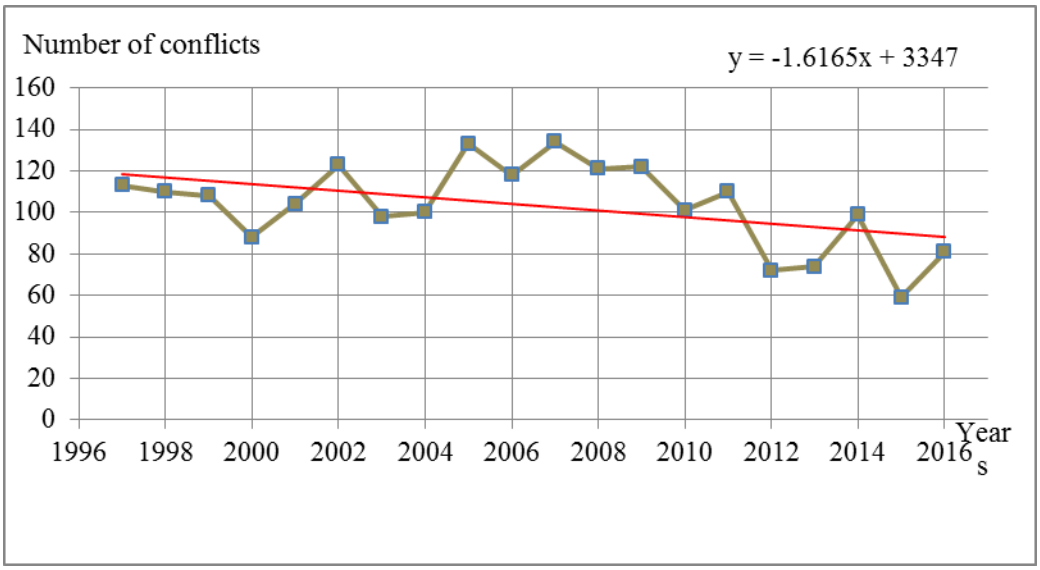

Figure 4. 8: Trends of Human-Wildlife Conflicts (1997-2016)

Source: Study Findings, (2017)

The decrease of HWCs could have been due to the establishment of wildlife management area through implementation of VLUP. This result implies the reduction of human wildlife conflict in the study area after VLUP. Generally, the overall results of this study agree with study done by Ringo and Kaswamila (2014) which showed the decrease of human-wildlife conflicts in Wami-Mbiki after the implementation of GMP.

4.3.2.4 Multiple Regression

Multiple regression analysis was conducted to determine the relationship between the factors causing human-wildlife conflict after the implementation of VLUP in the study area. Four independent factors namely rainfall, livestock population, human population and wildlife population were used (Table 4.10).

Table 4. 10: Data used in Multiple Regression

Year	Total number of conflicts	Rainfall, mm	Livestock population	Human population	Total wildlife population
2007	134	1043	11660	5990	3554
2008	121	942,9	12036	6214	4011
2009	122	1238,3	12412	6438	3883
2010	101	1190,8	12788	6663	3285
2011	110	952,3	13164	6887	4562
2012	72	1076,6	13541	7111	4901
2013	74	1114,6	13917	7335	5240
2014	99	1162,9	14293	7560	5579
2015	59	1064,8	14669	7784	5918
2016	81	620,3	15045	8008	6257

Source: Field data Survey, (2017).

On the wildlife population, the researcher was interested in the problem animal species in the study area which were elephants (*Loxodanta africana*), wild pigs (*Patomochoerus porcus*), baboon (*Papio hamadryas*), hyenas (*Crocuta crocuta)* and lions (*Panthela leo).* The total number of that species was used. The R square (coefficient of determination) was used to show how human-wildlife conflicts (N) varied with combination of amount of rainfall (X, mm), human population (Ph, residents), livestock population (Pl, livestock) and wildlife population (Pw, wildlife) (Table 4.10).Formula for such type of regression is as follows:

$$N = a_0 + a_1X + a_2Ph + a_3Pl + a_4Pw \quad (10)$$

Where N– is the annual number of human-wildlife conflicts in IKONA-WMA; X– is the annual rainfall at Mugumu weather station, mm; Ph–is the total population in Natta-Mbisso and Makundusi villages; Pl –is the total population of livestock in Natta-Mbisso

and Makundusi villages; Pw –is the total population of wildlife in protected areas IKONA-WMA, Ikorongo game reserve and Grumeti game reserve; a_0, a_1, a_2 – are coefficients calculated by the Ordinary Least Squares (OLS).

The results presented in the Table 4.11 show that the multiple regression results of the annual number of conflict were based on data for 10 years (2007-2016).

According to Robin (2012) the coefficient of correlation can change from 1 which corresponds to direct relation and to 0 which corresponds to absence of any relationship. Different values also correspond to different quality of regression.

If $r > 0.8$ the correlation is high; $0.5 < r < 0.8$ the correlation is moderate and $r < 0.5$ the correlation is weak. Due to that, obtained coefficient of correlation is 0.90 which testifies about high correlation, and hence shows suitability of the established regression for projection in future (Equation 11).

Table 4. 11: Multiple Regression Results for the period after VLUP Implementation

Parameter	Value
Correlation coefficient	0.90
Coefficient of determination (R^2)	0.81
Norm R^2	0.66
Standard deviation	14.5
Number of years (n)	10
Value p	0.0467
Y-intercept (constant)	22656,6163
Variable 1 (Rainfall, mm)	-0,012309
Variable 2 (Livestock population)	-13,791348
Variable 3(Human population)	23,0790351
Variable 4(Wildlife population)	0,01532118

Source: Study Findings, (2017).

The results explain that 81% of the factors causing human-wildlife conflicts in the study area are as denoted by R^2 (coefficient of determination). This implies that 19% of other factors causing human-wildlife conflicts were not studied.

The significance of the established regression model is with the value of $p<0.05$. The researcher was interested in predicting the future tendency of the human-wildlife conflicts number and how it could change if the factors (rainfall, human population, livestock population and wildlife population) would fluctuate. The results presented in Table 4.9, show that the regression model has "p" value of 0.0467 ($p<0.05$) likelihood in giving good results of prediction. This implies that the model has 95% confidence of the results. While the obtained results were as follows:-

$$N = 22656.616 - 0.012 \cdot X - 13.791 \cdot Pl + 23.079 \cdot Ph + 0.015 \cdot Pw \quad (11)$$

Where N– is the annual number of human-wildlife conflicts in IKONA-WMA; X– is theannual rainfall at Mugumu weather station, mm; Ph– is the total population in Natta-Mbisso and Makundusi villages; Pl – is the total population of livestock in Natta-Mbisso and Makundusi villages; Pw – is the total population of wildlife in protected areas IKONA-WMA, Ikorongo game reserve and Grumeti game reserve.

4.3.3.5 Prediction of Human-Wildlife Conflicts for Future

The multiple regression analysis was used to predict the numbers of human-wildlife conflicts in the area for the next 10 years (2017-2027). Human population and livestock population in the area had the growth rate of 2.8% and 2.5% respectively. The values of that parameter were calculated on a base of their growth rates. Likewise, the rainfall data for the last three years revealed that they were decreasing and that was assessed through its line trend for the year 2027. In contrast, the populations of wild animals were increasing as a result of conservation management strategies through the establishment of

WMA through implementation of VLUPs. Its future population through the trend line was estimated as well.

Results from analysis indicate that in 2027 the area is expected to receive 842mm of rainfall, while the number of livestock will be 19,276, the human population is expected to be 10,537 and wild animals will increase to 9990 units.

Furthermore, the results from multiple regression analysis indicate that the predicted number of human-wildlife conflicts in the next 10 years (2017-2027) will be 144in 2027 in the study area. The results indicate the increase in numbers of HWCs in the near future. This implies that VLUP prepared in 2006 will not address the issues of HWCs in the area and hence this calls for planners and other stakeholders mainly on wildlife conservations and local communities to review the VLUP. Review of VLUP should be done through community participation and conducting land evaluation. Land evaluation should consider the aspects land use types, suitability and capability; land units, quality and characteristics as well land use types and land use requirements in order to accommodate the human land needs and wildlife.

4.4 Evaluation of the VLUPs Implementation and Monitoring

NLUPC (1998) and NLUPC (2006) identified six steps of establishing, implementing and monitoring of VLUP. However, in order to evaluate the VLUP, the researcher adopted two indicators, one indicator for management and establishment (IME); and indicator for monitoring (IM). As pointed out by Holzapfel (2014), the implication of indicators is firstly to provide information in summary form and reduce the information need that would normally be required to paint a precise picture of a situation, and secondly, to communicate complex phenomena in simplified form to different stakeholders.

Both indicators of management and establishment (IME) and monitoring (IM) were established and their score results were obtained by summing up the averages of their elements to offer an overview of the indicator (See Paragraph 3.6.1.3). Two categories of likert scales were used. First likert scale was for IME with the minimum scale of 5 to the maximum scale of 21.The second likert scale was for IM with the minimum scale of 2 to the maximum scale of 10.

Indicator of management and establishment was built up by five elements: - community participation (CP); establishment of borders for different land uses (EB); public disclosure (PD); enforcement (E) and capacity building through public training (PT) at the village level. While indicator of monitoring was built by two elements: - monitoring entity (ME) and regular visit (RV). In order to obtain the overall results for each indicator, all elements from indicator were scaled and measured at the likert scale. Elements measured with the likert scale from score of 1 to 5 were as follows: - for IME were community participation; public disclosure and enforcement, while for MI, they were monitoring entity and regular visit. Likewise, elements measured with likert scale from score of 1 to 3 were establishment of borders and public training, both under the indicator for Management and establishment (IME). Respondents were asked to evaluate these elements basing on their given expressions.

Furthermore, based on the score, scale intervals were established by using the range for each category by grouping into five groups from “very poor” to “very good” (Tables 4.12). The base being the minimum score of 1and its percentage ranges from 0% to 20% for each category. Based on the average score results obtained from likert scale, each element was checked in order to identify the position of it and its interpretation as presented in Table 4.12.

Table 4. 12: Scale Intervals

Scale intervals from 1 to 5 (1 minimum : 5maximum)	**Percentage**	**Comments/interpretation**
Evaluation of Community Participation, Public Disclosure, Enforcement, Monitoring Entity and Regular Visit		
1.0-1.8	0%-20%	Very poor
1.9-2.6	21%-40%	Poor
2.7-3.4	41%-60%	Average
3.5-4.2	61%-80%	Good
4.3-5.0	81%-100%	Very Good
Evaluation of Establishment of Borders and Public Training		
Scale intervals from 1 to 3 (1 minimum : 3 maximum)	**Percentage**	**Comments/interpretation**
1.0-1.4	0%-20%	Very poor
1.5-1.8	21%-40%	Poor
1.9-2.2	41%-60%	Average
2.3-2.6	61%-80%	Good
2.7-3.0	81%-100%	Very good

Source: The Researcher, (2017).

Finally, the Indicator for Management and Establishment (IME) and the Indicator for Monitoring (IM) were calculated based on the average score results obtained from likert scale for each component/element. These indicators were calculated by summing up the averages of each elements or components to its respective indicator so as to offer an overview of the indicator. The scale for IME was from 5 as minimum to 21 as maximum, while the scale for MI was from 2 as minimum to 10 as maximum. In the way, the base was the minimum score of 5and its percentage ranged from 0% to 20% for IME, while the minimum score for MI was 2 and its percentage ranged from 0% to 20%.

4.4.1 Indicator of Management and Establishment (IME)

The index of management and establishment of VLUP was designed through assessing five elements. The five elements were: Community Participation (CP); Establishment of Borders for different land uses (EB); Public Disclosure (PD); Enforcement (E) and capacity building through Public Training (PT) at the village level. Those elements were expressed by two types of scales. The first scale was from 1 to 5 which composed Community Participation, Public Disclosure and Enforcement of VLUP, and the second scale was from 1 to 3 comprising of the two elements; Establishment of Borders and Public training. Their average score results of each element (see 4.4.1.1- 4.4.1.5) were presented as shown in figure 4.9.

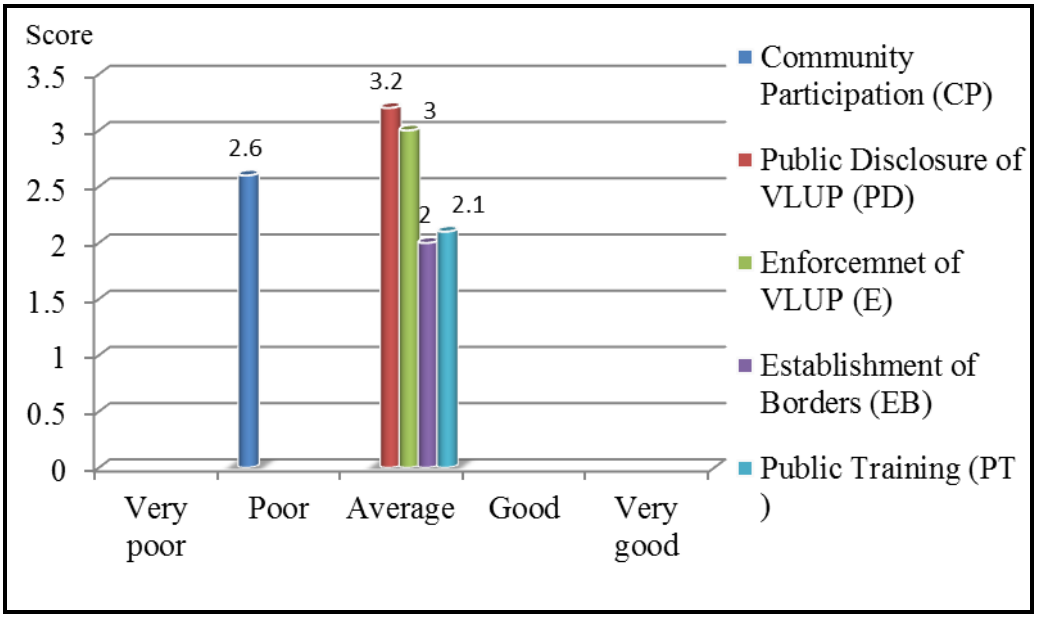

Figure 4. 9: Results of the Average Scores

Source: Field data survey, (2017).

The final index of management and establishment (IME) was calculated by summing the average of all elements. In this case, the minimum scale was 5 and the maximum scale was 21. The scale was divided into 5 groups which were “Very poor”, “Poor”, “Average”,

"Good" and "Very good". Indicator of management and establishment (IME) was measured and calculated by summing the averages of each element as follows:

$$IME = CP + EB + PD + E + PT$$

Where: ME – is an Indicator of the Management and Establishment of VLUP; CP- is Community participation; EB- is Establishment of the borders; PD –is Public disclosure; E –is Enforcement; PT - is Public trainings.

The average score results for each element was as follows; CP = 2.6; EB = 2.0; PD = 3.2; E= 3.0 and PT =2.1. Therefore, the result obtained for the Index of Management and Establishment (IME) after summing the average of all elements was found to be 12.9. The result was interpreted basing on the criteria given by the minimum scale of 5 to maximum scale of 21 as shown in Table 4.13.

Table 4. 13: Scale Intervals for Index of Management and Establishment

Scale intervals from minimum of 5 to maximum of 21	***Percentage range***	***Interpretation/comment***
5.0-8.2	0%-20%	Very poor
8.3-11.4	21%-40%	Poor
11.5-14.6	41%-60%	Average
14.7-17.8	61%-80%	Good
17.9-21	81%-100%	very good

Source: The Researcher, (2017).

The results for the index of management and establishment (IME) with the score of 12.9 lies between the intervals 11.5 of 14.6 and its percentage lies, in the range of 41%- 60%. This implies that the VLUPs in the two villages under the study were moderately established and managed. These results are similar to Kaswamila and Songorwa (2009) study on participatory land use planning and conservation to the village communities

around Tarangire and Manyara National parks (in Tanzania).Where it was study revealed that, the majority (83%) felt that preplan level of conflicts was low to moderate(acceptable situation). However, Kami at el (2016) found that there was still low capacity amongst village councils, VLUM and village land committees to administer and manage village land thus resulting in poor enforcement and therefore capacity building needed further attention.

4.4.1.1 Community Participation

Community participation was established and assessed in line with NLUP (1998) through reflection of different socio-economic groups with their interests, expectations and powers. Community participation was measured by asking the selected households to evaluate responses limited to the likert scale from 1 (very poor) to 5(very good).

The results obtained show that majority of the respondents 39 (41.9%) evaluated the community participation in VLUP at the scale of 3(average). While 20 (21.5%) of respondents evaluated at the scale of 2 meaning that the community participation were poor, 17(18.3%) of the respondents evaluated at the scale of 1 meaning community participation during the VLUP were very poor, while 16 (17.2%) of the respondents evaluated at the scale of 4 having the views that community participation was good, and only 1(1.1) % of the respondents evaluated the community participation with the scale of 5 with the view that community participation during the VLUP establishment and management was very good (Table 4.14). Furthermore, the results indicated the overall evaluation of community participation and it was found at the average scale of 2.6. This result was simply interpreted based on the criteria given from the Table 4.12 with the minimum value of 1 and the maximum value of 5 ranging from very poor to very good.

Results indicated that the overall evaluation of community participation during the VLUP was at the average of 2.6. The 2.6 lies to the interval of 1.9-2.6 and its percentage lies in the range of 21%- 40%, and therefore indicating poor community participation.

Table 4. 14: Evaluation of Communities' Participation in VLUP

Scale	**Response**	**Village names**		**Total**
1 to 5		Natta Mbisso (n=40)	Makundusi (n=53)	
1	Very poor	7	10	17
2	Poor	9	11	20
3	Average	13	26	39
4	Good	10	6	16
5	Very good	1	0	1
	Total	**40**	**53**	**93**

Source: Field data Survey, (2017)

These findings imply that community participation was poor during the VLUP establishment and management. This could be due to poor involvement of the stakeholders of different groups, and reflection of their interests during establishment of VLUP. This is not far from studies in villages of Kaloleni, Mwidu and Visakazi in Wami-Mbiki WMA and Esilalei, Vilima Vitatu and Sangaiwe villages in Tarangire-Manyara ecosystem, where villagers were not fully involved during the GMP and VLUP preparation (Ringo, 2013; Kaswamila & Songorwa, 2009). Kami et al (2016) argue that the aim of participation is to enable or empower the people so that they may obtain greater control over the planning process, resources and their lives. Poor community participation in VLUP could lead to more conflicts among different stakeholders in utilization of land resources.

4.4.1.2 Establishment of the borders

To make successful implementation of VLUP, the boundaries of different categories of land uses like crop cultivation, grazing, residential, wildlife, forest and water sources must be demarcated and their boundaries be clearly known to the villagers and other stakeholders (NLUPC, 1998; NLUPC,2006). The researcher was interested to know whether the boundaries for different land uses were fixed on ground according to the approved village land use plans. Establishment of borders was assessed through the key informant interviews of the respective officers and were measured on a scale from 1 to 3. Where scale 1 represents (descriptive boundaries i.e. only on text document); scale 2 (document and map) and scale 3 (full surveyed boundaries i.e. document, map and erection of beacons on the ground).

The results show that 11 (84.6%) key informants evaluated the establishment of borders of the VLUP at the scale of 2, and 2(15.4%) evaluated at the scale of 3 meaning that the demarcations and surveys of different land uses were done. However, we cannot conclude that there were no established borders of VLUP scaled with 1 (descriptive boundaries). Because mapping and surveying of VLUP depends on clearly described boundaries, therefore we can confidently conclude that of borders for VLUPs, were also established at the scale of 1 (description).

The overall average obtained from the evaluation of establishment of borders was at the scale of 2. The result was further interpreted by using the criteria stipulated in Table 4.12. From the Table, the minimum given value was 1 and the maximum value was 3 ranging from very poor to very good respectively. The findings indicated that the overall, average of 2 as given by key informants when evaluating the establishment of borders of the VLUP. From the Table, the average of 2 is subject to the interval of 1.9-2.2 and its

percentage lies in the range of 41%- 60%. Therefore, we can conclude that the establishment of borders of the VLUP was averagely done.

This implies that the existing borders of VLUP for the different land uses were only based on descriptive boundaries and maps. The absence of beacons to demarcated land uses did not give clearly known boundaries to the villagers and other stakeholders. This agrees with Kaswamila (2006) who argued that absence of beacons or sign boards for different land-use zones could have failed the plan implementation.

4.4.1.3 Public Disclosure

For the implementation and management of VLUP to be effective, it requires transparency among all stakeholders. The researcher firstly asked the respondents whether there were public disclosure of VLUPs within communities, and the answers were limited "yes" or "no". The results indicated that 93.5% of the respondents agreed that VLUP were publicly disclosed in their areas, 6.5% of the respondents said the plans were not publicly disclosed. VLUP were said to be available in Village offices, District Lands and Natural resources Office and WMA offices and on notice boards. The findings imply that VLUPs were disclosed in both villages. The results were supported by the signboards found in Makundusi village and WMA offices showing village land use plans from the five villages under WMA (See Plate 4.1).

Plate 4. 1: Signboard in Makundusi Village with the village land use plans for villages under IKONA-WMA

Source: Photo by Researcher, (2017).

The disclosure of the VLUP was evaluated by selected households on the scale ranging from 1 (very poorly disclosed); 2 (poorly disclosed); 3 (averagely disclosed); 4 (highly disclosed) and 5(very highly disclosed). In this case, the minimum score was 1 and the maximum score was 5.

The evaluation results of Public disclosure show that 47 (50.5%) of the respondents evaluated the VLUP disclosure with the score of 3, while 27 (29.0%) of the respondents evaluated it with the score of 4; 7(7.5%) of the respondents evaluated it with the score of 1; 6(6.5%) of the respondents and the other 6(6.5%) evaluated VLUP with the score of 2 and 5 respectively (see Table 4.15).

Likewise, the overall average of the public disclosure evaluation was found with the score of 3.2. This result was further tested and interpreted using the criteria stipulated in Table 4.12 where the minimum given score was 1 and the maximum score was 5 ranging from

very poor to very good. These results indicated the overall average score of 3.2 for the disclosure of VLUP in the two villages. From Table 4.12 the average score of 3.2 is subject to the interval of 2.7-3.4 and its percentage lies in the range of 41%- 60%.

Table 4. 15: Evaluation of VLUP Disclosure

Scale 1 to 5	Response	Village names		Total
		Natta Mbisso (n=40)	Makundusi (n=53)	
1	Very poorly disclosed	4	3	7
2	Poorly disclosed	5	1	6
3	Moderately disclosed	17	30	47
4	Highly disclosed	12	15	27
5	Very highly disclosed	2	4	6
	Total	**40**	**53**	**93**

Source: Field data Survey, (2017).

In this regard, we can ascertain that the VLUPs in both villages were moderately disclosed. This implies that almost half of the stakeholders in these communities were aware of VLUP in their respective villages and hence transparency was achieved. This findings agree with NLUPC (1998) and NLUPC (2006) which require VLUPs to be publicly disclosed in relevant languages, as they tune with higher level plans, interests and policies, and that planners and decision makers at all levels are sufficiently informed about the priorities identified by the villagers.

4.4.1.4 Enforcement

The management entity has the roles to enforce the VLUP, and be responsible for instances of noncompliance. The enforcement actions may include warnings, fines, suspension or cancellation of land use contracts, or arbitration which are addressed by the available by-laws (NLUPC, 1998; Kami et al, 2016). Evaluations of the enforcement of

VLUP for both of the two villages were done through the selected households in their respective villages. Firstly, respondents were asked whether by-laws were in place, and the answers were limited to “yes” or “no’’. Majority of the respondents, 93.5% agreed that the by-laws were in place in both villages and 6.5% of the respondents said there were no by-laws to enforce the VLUP in both villages. Likewise, respondents were asked to evaluate the enforcement of these by-laws. The answers were limited on the scale from minimum 1 (very poorly enforced) to maximum 5 (very highly enforced).

These results are presented in Table 4.16.The evaluation results of VLUP enforcement in both villages indicate that 51 (54.8%) of the respondents evaluated the enforcement of VLUP with the score of 3; 17 (18.3%) of the respondents evaluated with the score of 4; 15(16.6%) of the respondents evaluated VLUP with the score of 2; 8(8.6%) of the respondents evaluated it with the score of 1 and only 2(2.2%) of the respondents evaluated VLUP with the score of 5. The results indicated that the minimum score during the evaluation was 1 and the maximum score was 5. The analysis indicated the overall average of 3.0 scores. Furthermore, the overall average was interpreted by using the descriptive statistical table for evaluation of VLUP enforcement (see Table 4.12), the average score of 3.0 lies at the interval between 2.7 and 3.4, and its percentage lies in the range of 41%- 60%.

These findings imply that the enforcement of VLUPs in both villages was moderate. Lack of involvement of stakeholders in planning process could be among the reasons that affected the enforcement of the plans. According to Kaswamila (2006), the presence of implementation strategies, institutional coordination and sufficient planning skills are very important to VLUP to be enforced properly.

Table 4. 16: Respondents' Evaluation of VLUP Enforcement

Scale 1 to 5	Response	Village names		Total
		Natta Mbisso (n=40)	Makundusi (n=53)	
1	Very poorly enforced	3	5	8
2	Poorly enforced	9	6	15
3	Moderately enforced	19	32	51
4	Highly enforced	8	9	17
5	Very highly enforced	1	1	2
	Total	**40**	**53**	**93**

Source: Field data Survey, (2017).

4.4.1.5 Public Trainings

Participatory Land Use Management (PLUM) team had the duty to improve the capacity of village institutions, enable them to take responsibility, and become better organised to manage village land resources and deal with land-use issues affecting their lives (NLUPC, 1998). Because PLUM team members were no longer present in the village, it was important to build capacity at the village level through training Village Technicians (VTs) and the Village Land Use and Management Team (VLUM).

Public training was assessed through the evaluation done by key Informants on a scale from minimum scale of 1 to maximum scale of 3. Where scale 1 represents (no training); scale 2 (training conducted to VTs or VLUM) and scale 3 (training conducted to both VTs and VLUM). The findings show that 10 (76.9%) of the key informants evaluated the public training at the scale of 2, while 2(15.4%) of the key informants evaluated it at the scale of 3 meaning that trainings were conducted to both VTs and VLUM team, and only 1 (7.7%) of the respondents said there were no public training conducted to either VTs or VLUM. Key informants were further probed on which team was given the training. It

was reported that most of the members were village council members and VLUM team members. The assessment indicated the average score for the public training to be 2.1 and these results were interpreted by using Table 4.12.

From the Table, the overall average of 2.1 as the results for the evaluation of public training at the village level lies to the interval between 1.9 and 2.2 and its percentage lies in the range of 41%-60%. These findings imply that public training was averagely conducted. However, as stated earlier, most of the trained people were VLUM and Village council members. Likewise, the implication was that there were no specific trainings conducted to Village Technicians (VTs enable) who were meant to assist their fellow villagers to implement the VLUP accordingly. This could also be contributed by the challenges of lack of funds, human resources and tools. During the establishment of VLUP, there were no land experts at the district level, and Frankfurt Zoological Society (FZS) hired one Town Planner from Tabora to prepare the VLUP. Majority of the PLUM members at the district level were non-land staff who could train the VTs to implement the VLUP. This finding is not far from Kaswamila (2006) who found most of PLUM team members at district level were lacking land professional skills and expertise.

4.4.2 Indicator of Monitoring (IM)

The main purpose of monitoring is to trace as early as possible any shortcoming with regard to VLUP implementation and compliance (NLUPC, 2006). Therefore, monitoring should be integrated in the process of VLUP establishment in order to allow the identification of problems and taking corrective measures as soon as possible. In this study, the indicator of the monitoring was established by two components which were monitoring entity (ME) and regular visiting (RV). Both components were measured at the scale from minimum score of 1 to maximum score of 5. Their average score results of

each element were presented as shown in figure 4.15. Results on the individual components were presented as shown in section 4.4.2.1 and 4.4.2.2.

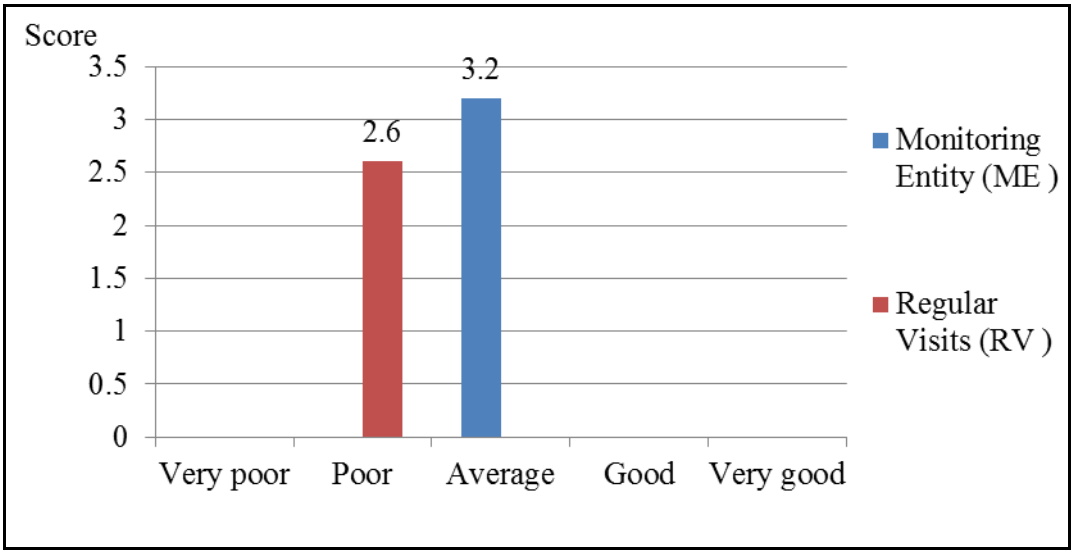

Figure 4. 10: Results for the Average Score for each Component (ME and RV)

Source: Field data survey, (2017).

The final index of monitoring (IM) was calculated by summing the average of two components. In this case, the minimum scale was 2 and the maximum scale was 10. Like in IME, the scale for IM was also divided into 5 groups which were "Very poor", "Poor", "Average", "Good" and "Very good". Indicator of Monitoring was measured and calculated by summing the averages of the two components as follows:

IM= ME +RV

Where: IM – is an Indicator of the monitoring of the VLUP; ME – that is, the presence of the monitoring entity; RV –is regular visits variable.

The average score results for each component was as follows: ME = 3.2 and RV = 2.6 (see section 4.4.2.1 and 4.4.2.2.). Therefore, the result obtained for the Index of Monitoring (IM) after summing the averages was found to be 5.8. The result was also interpreted basing on the criteria given with the minimum scale of 2 to maximum scale of 10.From the Table, the results for the Index of monitoring with the score of 5.8 were

found between the interval 5.3 and 6.8; and its percentage lies in the range of 41%-60%(Table 4.17).

Table 4. 17: Scale Intervals for Index of Monitoring of VLUP

Scale intervals from minimum of 2to maximum of 10	*Percentage range*	*Interpretation/comment*
2.0-3.6	0%-20%	Very poor
3.7-5.2	21%-40%	Poor
5.3-6.8	41%-60%	Average
6.9-8.4	61%-80%	Good
8.5-10	81%-100%	Very good

Source: The Reseacher, (2017).

This implies that the monitoring of VLUPs in the two villages under the study was average. This suggests that Village land use planning should not stop with the development of a VLUP, but would be required to undergo ongoing investment of time and resources. For effective monitoring of VLUP, it is important to have monitoring action plan and monitoring reports be available in a language that the stakeholders can easily understand. SRMP, (2013) sees monitoring be required to consider the effectiveness of the VLUP and related by-laws, as are regular consideration and any updating needed. In addition, Kaswamila (2006) sees other factors which need to go parallel with the VLUP implementation and monitoring are long action plan, availability of reports in a user friendly language and presence of boundary demarcations for different land use zones.

4.4.2.1 Monitoring Entity

Monitoring of VLUP requires an entity to trace as early as possible any shortcoming with regard to its implementation and compliance. The type of monitoring entity may include the Village Government (VG), Participatory Land Use Management team (PLUM),

Village Land Use Management committee (VLUM) or both of them. The types of monitoring entity present in the village were assessed through interviews with the key informants.

The presence of monitoring entity were measured depending on the type of entity on the scale from minimum score of 1 (no entity responsible) to maximum score of 5(PLUM, VLUM and VG). The results obtained from evaluation were further grouped into five groups “Very poor”, “Poor”, “Average”, “Good” and “Very good”. The results from the interview show that 8 (61.5%) of the key informants evaluated the monitoring entity at the scale value of 2, saying the entity responsible for the monitoring of VLUP were village governments, and 5(38.5%) of the key informants evaluated the monitoring entity at the scale of 5 meaning both PLUM, VLUM and VGs are the monitoring entity of VLUP in the study area (see Table 4.18).

The results for the type of monitoring entity indicated the average score of 3.2 and were interpreted by using Table 4.12. From the Table, it is clear that the results for the monitoring entity with the average score of 3.2 lies between the interval 2.7 of 3.4, and its percentage lies in the range of 41%- 60%.

Table 4. 18: Evaluation of Monitoring Entity of VLUP at the Village Level

Scale from 1 to 5	Response	Frequency, (N)
1	No entity	0
2	Village Government(VG)	8
3	PLUM or VLUM	0
4	PLUM and VLUM	0
5	Both PLUM, VLUM and VG	5
Total		**13**

Source: Field data Survey, (2017).

This reveals that, the monitoring entities of VLUP to all villages were dominated by village government members. Involvement of village government in monitoring indicates the failure of other institutions such as VLUM committee to monitor VLUPs in both Villages. This is not far from Kushoka (2011) who found that monitoring of VLUP in Mvomero was being done by Village Executive Officers (VEOs).Active monitoring entity could have helped to monitor the VLUP through conducting regular visits. However, it was found that there were no trainings conducted to the monitoring entity on how they could monitor the prepared plans. This was similar to Kaswamila (2006) who found plans were left after being prepared without providing necessary plan implementation strategies.

4.4.2.2 Regular Visits

The PLUM and VLUM teams were supposed to have regular visits to undertake monitoring to the villages with plans to verify if decisions on action were taken in line with the VLUP. The researcher assessed the regular visits through interview with key informants of the respective villages. The answers on "regular visits variable" were expressed in percentages on a continuous scale going from minimum score of 1 (0%, no visit) to maximum score of 5(100%, quarterly). Likewise, these results were further grouped into five groups "Very poor", "Poor", "Average", "Good" and "Very good".

Table 4.19 presents the evaluation of regular visits from the key informants. The results show that 8 (61.5%) of the key informants were evaluated at the scale of 2, meaning that regular visits were done once a year, 2 (15.4%) of the key informants were evaluated at the scale of 5 arguing that regular visits were conducted every after three months.

Table 4. 19: Evaluation of Regular Visits Conducted by Monitoring Entity

Scale from 1 to 5	Response on the number of visits	Frequency, (N)	Percentage, (%)
1	0%- No visit	1	7.7
2	25%- Once a year	8	61.5
3	50%-Twice a year	1	7.7
4	75%- Thrice a year	1	7.7
5	100%,- Quarterly	2	15.4
Total		**13**	**100.0**

Source: Field data Survey, (2017).

The rest 3(23.1%) key informants had different observation, the first scaled 1 implying that no visits had been conducted, the second scaled 3 meaning regular visits were conducted twice a year and the third scaled 4 arguing regular visits were being conducted three times a year . The overall average for regular visits after analysis was 2.6. From the scale interval table (see Table 4.12), these results lie between the interval 1.9 of 2.6 and its percentage lies in the range of 21%- 40%.

The implication of these results reveals “poor regular visits” in monitoring of the VLUP. This situation if left unattended, can lead to failure of the implementation of the VLUP and hence failure to achieve its desired objectives. Lack of regular visits to monitor VLUP was also related to failure of the monitoring entity and low capacity of the institutions both at district and village levels to monitor VLUP. This corresponds with Kaswamila (2006) who asserted that lack of action plan, reports and by-laws to guide the VLUPs were factors behind failure of implementing the village land use plans in the protected areas of bio-networks in northern Tanzania.

4.5 Perception of the Local Communities on the VLUP Contributions into HWC Mitigation

Respondents were asked to give their perception on the Village Land Use Plans how they had contributed to the Human-Wildlife Conflict mitigation after their implementation since 2006. The questions asked were limited to gauge awareness of VLUP as a tool in mitigating HWC, trend of HWC after implementation of VLUP, ranking VLUP against the other mitigation measures and the perception of the VLUP initiatives in mitigating HWC.

4.5.1 Communities' Awareness on VLUP in Mitigating HWC

To find out awareness of the communities, respondents were asked whether they were aware on the implemented VLUP as a measure in mitigating HWC in the study area. The answers were limited to yes or no. Majority 83.9% of the respondents were aware of VLUP as mitigation tool towards mitigating HWC, and 16.1 % of the respondents were not aware (Table 4.20).

Table 4. 20: Communities' Awareness on VLUP in Mitigating HWC

Awareness	**Village names (%)**		**Average (%)**
	Natta Mbisso (n=40)	Makundusi (n=53)	
Yes	80.0	86.8	83.9
No	20.0	13.2	16.1
Total	**100.0**	**100.0**	**100.0**

Source: Field data Survey, (2017).

The findings imply that during the initial stage of introduction of Wildlife Management Area (WMA) and the establishment of the VLUP, awareness creation among the

stakeholders was very important. This is very important especially when arranging various HWC management strategies to be effective, and be agreed among all stakeholders. Similarly, Ringo and Kaswamila (2014) argue that community awareness is very important for strengthening the performance of the plan. VLUP also facilitates informed decision-making in the course of allocating land for various uses and needs which require prior informed consent, negotiations and consultation between all stakeholders (ECA, 2005; NLUPC, 2006).

4.5.2 Communities' Perception on HWC After VLUP

Respondents were further probed to give their perception on the status and trend of HWC. Answers were limited to significantly decreased, slightly decreases, remained constant, slightly increased and significantly increased. The overall average, results in both village revealed that, 31.2 % of the respondents perceived HWCs were slightly decreased, 18.3% of the respondents claimed HWCs slightly and significantly increased. 17. 2% of the respondents viewed HWC to have significantly increased and 15.0 % of the respondent said HWC remained constant (Table 4.21).

Table 4. 21: Respondents Perception of HWC After Implementation of VLUP

Response	**Village names (%)**		**Average (%)**
	Natta Mbisso (n=40)	Makundusi (n=53)	
Significantly decreased	12.5	20.8	17.2
Slightly decreased	37.5	26.4	31.2
Remained constant	15.0	15.0	15.0
Slightly increased	17.5	18.9	18.3
Significantly increased	17.5	18.9	18.3
Total	**100.0**	**100.0**	**100.0**

Source: Field data Survey, (2017).

Overall results indicate the reduction of the human wildlife conflict in both villages for the period of ten years. This implies the VLUP has contributed to the reduction of the human-wildlife conflicts. These results are in line with the findings by Ringo and Kaswamila (2014) in Wami Mbiki which revealed reduction of human wildlife after the implementation of General Management Plan (GMP) in Wami Mbiki WMA. The results support Muruthi (2005) who argues that the long-term solution to human-wildlife conflict often lies in better planning of land-use in problem areas.

4.5.3 Communities' Ranking of VLUP

Respondents were asked to rank the VLUP compared to other strategies. Other mitigation strategies ranked together with VLUP, included disturbance shooting, killing problem wild animals, use of chilli, use of oils, making noises, throwing stone, use of beehives fences, flash lights, and consolation scheme(see Table 4.5). The answers were limited to low, moderate and high.

The results in Table 4.22show that, overall average, 66.7% of the respondents ranked VLUP moderate compared to other mitigation strategies while 23.7 % of the respondents ranked low, and 9.6% of the respondents ranked high.

Table 4. 22: Ranking VLUP against other Mitigation Strategies

Response	**Village names (%)**		**Average (%)**
	Natta Mbisso (n=40)	Makundusi (n=53)	
Low	27.5	20.8	23.7
Moderate	62.5	69.8	66.7
High	10.0	9.4	9.6
Total	**100.0**	**100.0**	**100.0**

Source: Field data Survey, (2017).

These findings imply that communities have perceived VLUP as one of the strategies to mitigate HWCs in the study area. Communities ranking perceptions were not far from Shemweta and Kideghesho, (2000) and Muruthi, (2005) who consider as well Land Use Plans (LUPs) as the best human-wildlife management strategy which offers best chance and long-term success because it tackles the root of problems. Similarly, Kaswamila (2006) considers the village land use planning as a panacea for minimizing land use conflicts and increasing productivity of natural resources.

4.5.4 Communities' Perception of VLUPs Initiatives in Mitigating HWCs

Perception of communities on VLUPs initiatives towards mitigating HWCs was assessed by asking the respondents in the study area. The VLUP has been in place since 2006, this time it is quite enough to give their views. Respondents were asked to give how they perceive VLUPs in mitigating HWCs; answers were limited to "useful", "not useful" and "not known". The results show that on average, majority of the respondents 68.8% perceived the VLUPs were useful in mitigating human wildlife conflicts, 23.7% of the respondents perceived that the plans were not useful, and 7.5% of the respondents didn't know whether the VLUP was useful or not in mitigating HWCs (see Figure 4.11).

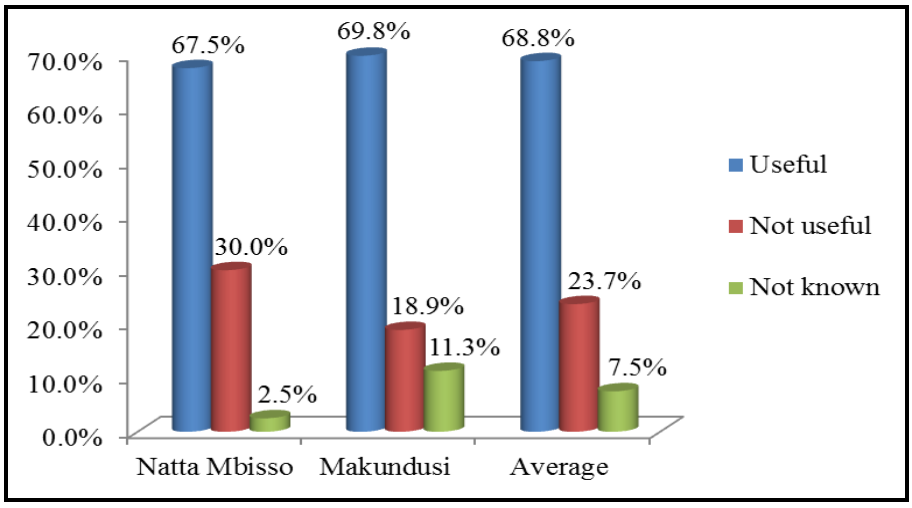

Figure 4. 11: Communities' Perception on VLUP Initiatives for HWC Mitigation

Source: Field data Survey, (2017).

This implies that majority of the people in Natta Mbisso and Makundusi villages had a perception that VLUPs are useful tools in mitigating HWC. The key informants also agreed that VLUPs had minimized the direct contact between human and wildlife after the area for WMA-IKONA was set aside, hence reducing the incidents caused by wild animals. These results correspond with a study in Wami Mbiki by Ringo and Kaswamila (2014) who found that communities perceived the decline in HWCs after seven years was facilitated by the implementation of GMP.

4.5.5 Challenges Facing the Implementation and Monitoring of VLUP

Key informants were probed on the challenges facing implementation and monitoring of the VLUP at the district and village levels. Among the challenges facing the implementation and monitoring of VLUP were poor enforcement of by-laws, weakness of village leaders to manage and monitor VLUP, absence of clear land uses boundaries, lack of funds, lack of awareness on VLUP among the villagers and lack of human resources (Table 4.23).

Table 4. 23: Challenges Facing VLUP Implementation and Monitoring

Challenges	Frequency, (N**)	Percentage, (%)
Lack of funds	7	17.5%
Lack of human resources	4	10.0%
Poor enforcement of by-laws	8	20.0%
Lack of awareness on VLUP among the villagers	6	15.0%
Weakness of villages leaders to manage and monitor VLUP	8	20.0%
Absence of clear land use boundaries	7	17.5%
Total	**40**	**100.0%**

N** Multiple responses

Source: Field data Survey, (2017).

4.5.5.1 Weakness of Village Leaders to Manage and Monitor VLUP

Results show that among the challenges facing the implementation and monitoring of the VLUP were the weakness of village leaders to manage and monitor the VLUPs. It was further argued that, the village governments ignored to use VLUM committees while, themselves had a lot of duties and responsibilities to do and this led to poor implementation and monitoring of the VLUP. This is contrary to (NLUPC 1998; NLUPC, 2006) which stressed that the Village Council has the executive powers and responsibilities for land-use planning and may have to delegate some of its tasks concerning land matters to the Village Land Use Management (VLUM) committee. Therefore, in order to achieve the intended VLUP objectives, it is important for the village government to collaborate with VLUM committees and delegate some duties to them so as to improve the management and monitoring of the VLUP.

4.5.5.2 Poor By-Laws Enforcement

Interview with key informants revealed that weakness of village leaders to manage and monitor VLUP had resulted to poor enforcement of the by-laws. According to NLUPC (1998) by-laws provide the legal basis and are considered as powerful tools to enforce specific local level agreements concerning the natural resources management and village land use plans. The implications of poor enforcement of by-laws would result to no actions being taken to control and penalize any individual who does not respect the VLUP. For better enforcement of the VLUP, the management and monitoring shall work together with the enforcement of the by-laws.

4.5.5.3 Absence of Clear Boundaries for Different Land Uses

Absence of clear boundaries of different land uses was one of the challenges facing VLUP management and monitoring mentioned by key informants. Demarcation and surveying of borders for different land uses were not done both in the two villages.

Kaswamila (2006) argues that, absence of beacons for different land-use zones is the sign of failure of VLUP implementation. Therefore it is of great importance to avoid unnecessary conflicts among different land users through having clear known boundaries for different land uses.

4.5.5.4 Lack of Funds

Results in Table 4.22 have also indicated that the lack of funds was a challenge during implementation and monitoring of the VLUPs in both villages. Issues related to VLUP management and monitoring were likely to receive less attention during the budgeting, particularly when amount of funds had to be set for monitoring activities of VLUP. Dalal-Clayton et al., (2000) asserted that, there has been a tendency only to address problems prevailing at the community level; institution issues such as land and management of naturals were initially rare addressed.

During the interview with IKONA-WMA officials it was found that only the demarcated area with surveyed beacons was the WMA. Additionally, the DGO commented by saying:

> *"The funds to facilitate the establishment and implementation of VLUPs for the villages forming IKONA-WMA were fully donated by Frankfurt Zoological Society and their interest was to meet criteria of establishing the WMA which requires VLUP".*

The implication of lack of funds, lack of human resources and lack of survey tools indicates existence of low capacity in terms of financial and human resources both at district and village levels. This corresponds with Kami et al (2016) who observed that the capacity at local levels to implement effective programme like land use planning is closely tied to the availability of funds, man power and capacity building. Financial resources to facilitate the management and monitoring of the VLUPs are very important to be set aside during budgeting. Therefore, the village governments have to set their

priorities for allocating the limited funds available to VLUP management and monitoring activities as proposed by land committees.

4.5.6 Suggestions to Improve the Implementation and Monitoring of VLUP

Respondents were asked on suggestion required to improve the implementations and monitoring of VLUPs in their respective villages. Most of the suggestions given were strengthening of VLUP committee, improving education campaign on VLUP, improving and reviewing of the existing by-laws, Reviewing VLUPs, demarcating and surveying the land uses, and to have regular meetings on VLUP implementation (see Table 4.24).

Table 4. 24: Suggestions to improve implementation and monitoring of VLUP

Suggestions	**Village names (%)**		**Average (%)**
	Natta Mbisso (n=40)	Makundusi (n=53)	
Review of VLUP	17.5	15.1	16.1
Improve education campaign on VLUP	20.0	20.8	20.4
Strengthen VLUP committee	20.0	26.4	23.7
Improve and review the existing by-laws	17.5	20.7	19.4
Organize regular meetings on VLUP implementation	10.0	5.7	7.5
Perform demarcation and surveying of land uses	15.0	11.3	12.9
Total	**100.0**	**100.0**	**100.0**

Source: Field data Survey, (2017).

4.5.6.1 Strengthening of Village Land Use Committees

Strengthening VLUP committees and in particular at the village level (VLUM and VTs) is very important for the VLUPs to be effectively managed and monitored by the villagers themselves without high support from the high levels. Training activities can be directed

to build the local capacity through training the Village Technicians and Village Land Use Management committees so as enable them take responsibility, and become better organised to manage village land resources and deal with land-use issues and those of HWC which affect their lives.

4.5.6.2 Improving Education Campaign on VLUP

Improving education campaign on VLUP was another suggestion given by the respondents. During the focus group discussion in Natta Mbisso participants argued that there is a need to increase education campaign on VLUP because ten years now is a long period and people could have forgotten some issues.FAO (2009) states that efforts towards sustainability at local level it is importance that forums be set up to promote information sharing on human wildlife conflicts issues. Therefore, awareness creation on VLUP among the villagers is very important and could lead for strengthening the performance of VLUP in mitigating human-wildlife conflicts.

4.5.6.3 Review of the Existing By-laws

It was revealed that the villages in the study area had by-laws, however these were considered to be outdated and needed to be reviewed and improved in order to meet the current situation. VLUP processes require local institutional building and may involve many issues such as: land allocation for different communal and private uses; settling land disputes; formulation of by-laws (NLUP, 1998). The review of by-laws to enforce the VLUP effectively should be done through involvement of local people so as get accepted by the majority and be known by the local people. This will increase the villagers' awareness and the sense of ownership and hence support for their implementation.

4.5.6.4 Review of the VLUP

Reviews of VLUPs to mitigate HWC in the study area were suggested by the respondents arguing that the available VLUPs did not reflect the current situation as they were prepared ten years ago. The need to review these plans were due to human population growth, increased livestock and wildlife in the area as the results there was a need to review the VLUP in order to sustain both human, livestock and wildlife. This is in line with the NLUPC (1998) which suggests the review of VLUP to be done after ten years. Therefore, the review of VLUP is very crucial and it should be done in a participatory manner in order to bring the sense of ownership among the villagers and be known by stakeholders.

4.5.6.5 Demarcation and Surveying of Land Uses

The results show that demarcation and surveying of land uses were not done provided the VLUPs were in place. Absence of clear boundaries of different land uses was one among the challenges facing VLUP management and monitoring. Both respondents and key informants suggested demarcation and surveying of borders for different land uses in order to avoid unnecessary conflicts among the land users in the area. Muruthi (2005) sees LUPs as the best HWC mitigation as it tackles the root of the problem. Furthermore, the application of village land use planning is seen by many as a panacea for minimizing conflicts (Kaswamila, 2006; Shemweta & Kideghesho, 2000). Therefore, the demarcations of boundaries for different land uses are very important because they give clear boundaries of different land uses and hence minimize conflicts among the land users.

4.5.6.6 Regular Meetings the VLUP

Regular meetings on VLUP implementation and monitoring are very important to meet and achieve the VLUP objectives. According to NLUP, (1998) meetings of village

assembly are opportunities whereby stakeholders at the village and sub-village levels may forward their interests, negotiate and ultimately come to a compromise. These agreements can be formalized through minutes or other written documents, leading to land use plans, by-laws, etc. attributing to improved VLUP and a more efficient use and development of land resources.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study findings based on the specific objectives, conclusion and the recommendations for improving the use of the village land use plans in mitigating human-wildlife conflicts. Finally, the study suggests areas for further studies.

5.2 Summary of the Findings

The study focused on assessing the contribution of village land use plan in mitigating human-wildlife conflicts in IKONA-WMA within Serengeti district. The study was conducted in Makundusi and Natta Mbisso villages forming IKONAWMA, which bordered by other protected areas. Specifically, the study examined the trend of human-wildlife conflicts, evaluated the village land use plans implementation and monitoring, and examined the perceptions of the local communities on the VLUP in mitigating HWCs. In this line, the study came up with the following findings.

5.2.1 Trend of Human-Wildlife Conflicts Before and After Implementation of the Village Land Use Plan

The study revealed that 18.6% of the HWCs were reduced after the VLUP implementation. However before VLUP the results indicated 1,095 numbers of human wildlife conflicts in both villages from 1997-2006. The overall average numbers of conflicts before VLUP were 109 and the trend of conflicts was increasing at the rate of 9%-11%. On the other hand, after VLUPs, the number of conflicts was decreased to 973 (2007-2016) with the average numbers of conflicts 97a year and the trend of conflicts were decreasing at the rate of -40% to-49%. Factors for human wildlife conflicts were:

increasing of populations both human, livestock and wildlife, increased human activities closely to protected areas and rainfall fluctuations in the study area thus leading to drought. The study has revealed that in the next 10 years (2027) human-wildlife conflicts could increase to from 81 to 114 in 2027 as the results of population growth in the area. Possibly, the VLUP strategy after 10 years will be not enough to overtake the growth of the human, livestock and wildlife populations. Hence the number of conflicts could start to rise. The main types of human-wildlife conflicts were crop raiding, livestock depredation, human death and injury, poaching and destruction of property. While elephants (*Loxodanta africana*), wild pigs (*Patomochoerus porcus*), baboon (*Papio hamadryas*), hyenas (*Crocuta crocuta)* and lions (*Panthela leo*) were the main wild animal species involved in conflicts.

5.2.2 Evaluation of the VLUPs Implementation and Monitoring

The results revealed that the implementation and monitoring of VLUPs in the study area were moderate. Furthermore, the study found that community participation were poor, demarcation of the borders for different land uses in the area were not done. Also the study revealed that regular monitoring visits during the implementation and monitoring of the VLUPs in both villages were poor. The main challenges were lack of funds and lack of trainings to the monitoring entities particularly for the Village Technicians who were meant to assist their fellow villagers in the implementation and monitoring of the VLUP at the village level.

5.2.3 Perception of the Local Communities on the VLUP Contributions into HWC Mitigation

The study results found that 68.8% of the respondents perceived the VLUP as a useful tool in mitigating human wildlife conflicts, and 83.9% of the respondents were aware of the VLUP as the measure towards mitigating HWC. The results also indicated that 46.2%

of the respondents perceived that the reduction of human-wildlife was a result of implementing VLUP. As for ranking VLUP with other mitigations, 66.7% of the respondents ranked VLUP as moderate.

5.3 Conclusion

The results of this study revealed that since the beginning of implementing VLUPs, HWCs have been decreased in the area. The VLUPs have managed to reduce the number of conflicts in the area. Despite the achievements of VLUP in mitigating human-wildlife conflicts, the study found that communities were not fully involved in the process of VLUP management and establishment. Also the study revealed that, demarcations of zoned land uses were not done, and hence leading to unclear boundaries for different land uses on the ground. While predicting the trend of conflicts in future, the study has revealed the increase of HWCs in the next 10 years from 81 to 114 in 2027 as the results of population growth which the current VLUPs cannot accommodate.

Measures required to address the challenges involve strengthening the villages land use committees through training, reviewing the VLUP and its binding by-laws, demarcating the different land uses to have clear boundaries for land users and to have regular meetings to enable the VLUPs be known by villagers.

5.4 Recommendations

The major findings of this study have shown that VLUPs have contributed to the reduction of HWCs in the study area. However, in order to improve the contribution of the VLUP towards mitigating human-wildlife conflicts in the area, the study has the following recommendations:

i. To strengthen the capacity building at the village level by providing trainings to village land use committees in order to enable them undertake their duties and other responsibilities.

ii. To set aside funds to facilitate the VLUM on managing and monitoring of VLUP at the village levels, as well as for following up at higher levels of the district and national level.

iii. To have forums and education campaign to promote information sharing on HWCs issues and village land use management among all stakeholders.

iv. To effect demarcation and surveying of borders for different land uses according to the approved VLUPs to have clear known boundaries on the actual ground.

v. To review the VLUPs prepared in 2006 to reflect the current environmental settings in all villages forming IKONA-WMA. The reviews of VLUPs should be done through conducting land evaluation and must have to involve full community participation at all stages.

5.5 Areas for further research

The study covered two villages forming IKONA-WMA in the country. It is in this line that the findings from this study reflect the contribution of VLUP towards mitigating human wildlife conflicts for the villages forming Wildlife Management Areas. Further research should be conducted to assess the capacity of local authorities to enforce laws related to land use planning and natural resources in mitigating human wildlife conflicts.

REFERENCES

Abend, G. (2008), *Sociological Theory*, Northwestern University, Washington, DC.

Acha, A, and Temesgen, M. (2015), "Approaches to Human-Wildlife Conflict Management in and around Chebera-Churchura National Park, Southern Ethiopia", *Asian Journal of Conservation Biology*, Vol. 4 No. 2, 136-142.

Acharya K.P., Paudel P.K., Neupane P.R and KöhlM. (2016), "Human-Wildlife Conflicts in Nepal: *Patternsof Human Fatalities and Injuries Caused by Large Mammals"*, PLoS ONE 11, 9.

Adams, W.M and Hulme, D. (2001), "*If community conservation is the answer in Africa, what is the question?*, Oryx35, 193-200.

Ader, H.J. (2008), *Advising on Research Methods*, Johannes van Kessel Publishing, Netherlands.

Alexander, L., Simon, R. M., Lobora, C, and Foley, T. (2010), "*Tanzania Elephant Management Plan 2010/2015*", TAWIRI annual Conference in Arusha.

Amaja L. G., Feyssa, D. H and Gutema T. M. (2016), "Assessment of types of damage and causes of human-wildlife conflict in Gera district, south western Ethiopia", *Journal of Ecology and the Natural Environment*, Vol. 8, No 5, 49-54.

Ansari, S. (2004), Teaching Note: *Systems Theory and Management Control*.

Aronson, D .(1996), "System thinking Theory" [Accessed from www.thinking.net on 15.01.2017].

Asimopoulos S. (2016),"Human-Wildlife Conflict mitigation in Peninsular Malaysia: *Lessons learnt, current views and future directions"*, Swedish University of Agricultural Sciences, Sweden.

Babbie.E. (1989), *Survey Research Methods (2nd edn)*, Belmont, CA, Wadsworth.

Baker, S. L. (2006), Multiple Regression Theory [Accessed on web.site http://hspm.sph.sc.edu/Courses on 12.01.2017].

Balme, G.A., Slotow, R and Hunter, L.T.B. (2010), "Edge effects and the impact of non-protected areas in carnivore conservation: leopards in the Phinda-Mkhuze Complex, South Africa", *Animal Conservation*, 13, 315–323.

Bamford, A.J., Ferrol-Schulte, D and Wathan, J. (2014), "Human and wildlife usage of a protected area buffer zone in an area of high immigration", *Oryx*, 48, 1– 10.

Bhattacherjee, A. (2012), Social Science Research:*Principles, Methods, and Practices*, USA, University of South Florida.

Bhola, N., Ogutu, J.O., Piepho, H.P., Said, M.Y., Reid, R.S., Hobbs, N.T. and Olff, H. (2012), "Comparative changes in density and demography of large herbivores in the Masai Mara Reserve and its surrounding human-dominated pastoral ranches in Kenya", *Biodiversity and Conservation*, 21, 1509–1530.

Blackburn, S., Grant, C., Hopcraft, J., Ogutu, J, O., Matthiopoulos, J and Laurence, F. (2016), "Human–Wildlife Conflict, benefit sharing and the survival of lions in pastoralist community-based conservancies", *Journal of Applied Ecology*,53, 1195–1205.

Card, Noel A. (2012), *Applied meta-analysis for social science research*, the Guilford Press, New York London.

Chaudhary, A.K and Israel, G.D. (2014), "The Savvy survey Number 8: *Pilot testing and pretesting Questionnaire*", University of Florida Institute of Food and Agricultural Sciences, Florida, USA [Accessed from http://edis.ifas.ufl.edu on 24.01.2017].

Cohen L., Manion L, and Marisson, K. (2007), *Research Methods in Education*, 6th edition; Routledge, Taylor and Francis Group, London.

Cohen, D. Manion, L and Morrison, K. (2000), *Research Methods in Education*,London: Routledge Falmer.

Creswell, J.W. (2007), Qualitative Inquiry and research design: *choosing among five approaches, 2nd ed*. Sage Publication Inc. New Delhi, India.

Dalal-Clayton B, David D, and Olivier D. (2000), Rural Planning in the Developing World with a Special Focus on Natural Resources: *Lessons Learned and Potential Contributions to Sustainable Livelihoods*, Environmental Planning, Issues No. 20, IIED.

Datiko D, and Bekele, A. (2011), "Population status and human impact on the endangered Swayne's hartebeest (Alcelaphusbuselaphusswaynei)in Nechisar plains, Nechisar national Park, Ethiopia, *African Journal of Ecolology*, Vol. 49, 311-319.

Delorme, P. and Chatelain, O. (2011), Policy steering: *The role and use of performance measurement indicators*. [Accessed on web site http://www.dochas.ie on 07.01.2017].

Distefano, E. (2010), Human-Wildlife Conflict Worldwide Collection of Case Studies: *Analysis of Management Strategies and Good Practices*, SARD Initiative Report, Rome, Italy.

Economic Commission for Africa (ECA). (2005), *Management of Land-based Resources for sustainable development: Policy Recommendations*, fourth meeting of the Committee on Sustainable Development (CSD-4), Addis Ababa, Ethiopia.

Ellis EC, Klein Goldewijk K, Siebert S, Lightman D, Ramankutty N. (2010), "Anthropogenic transformation of the biomes, 1700 to 2000". *GlobalEcology*, Biogeogr. Vol. 19, 589-606.

Fairet, Emilie, Maguy and Melanie (2012), Vulnerability to crop-raiding: *an Interdisciplinary investigation in Loango National Park*, Gabon, Durham thesis, Durham University.

Food and Agriculture Organisation (FAO). (2009), "*Human-wildlife conflict in Africa Causes, consequences and management strategies*", Food and Agriculture Organization of the United Nations, Rome Italy.

Gasva, D. and Moyo, W. (2016), Introduction to Conflict Management*: A guide for Beginners*, GCBD, Lambert Publications.

Graham M. D., Hamilton I. D., Adams W. M and Lee P. C. (2009), "The movement of African elephants in a Human dominated Land use Mosaic", *Animal Conservation*, Vol. 12(5), 445-455.

Graham M.D., Notter B, Adams W.M., Lee P.C., Ocheing T.N. (2010), "Patterns of crop-raiding by elephants, Loxodonta africana, in Laikipia, Kenya, and the management of human-elephant conflict", *Systematics and Biodiversity*, Vol. 8 , no.4, 435–445.

Granados, A. and Weladji, R. B. (2012), Human–elephant conflict around Bénoué National Park, Cameroon: influence on local attitudes and implications for conservation. *Human Dimensions of Wildlife*, Vol.17 no.2, 77-90.

Greener, S.(2008), Business Research Methods [Access on web. Site http//:www.bookboom.com on 08.01.2017].

Habib A, Nazir I, Fazili MF, Bhat BA. (2015), "Human-wildlife conflict - causes, consequences and mitigation measures with special reference to Kashmir", *Journal of Zoology Studies*, Vol. 2 No. 1, 26-30.

Harich, F. K., Treydte, A. C., Sauerborn, J., & Owusu, E. H. (2013), "People and wildlife: Conflicts arising around the Bia Conservation Area in Ghana", *Journal for Nature Conservation*, Vol.21, no.5, 342-349.

Hariohay, K .M and Røskaft, E. (2015), "Wildlife Induced Damage to Crops and Livestock Loss and how they affect Human Attitudes in the Kwakuchinja Wildlife Corridor in Northern Tanzania", *Environment and Natural Resources Research*, Vol. 5, No. 3, 72-79.

Hariohay, K. M. (2013), *Impacts of human settlements and land use changes in Kwakuchinja wildlife corridor, Northern Tanzania*, Norwegian University of Sciences and Technology, Norway.

Hedges, S and Gunaryadi, D. (2010), "Reducing human–elephant conflict: *Do* chillies help deter elephants from entering crop fields*?",Oryx*, 44(01), 139-146.

Hoare, R. (2012), "Lessons from 15 years of human-elephant conflict mitigation: Management considerations involving biological, physical and governance issues in Africa", *Species Survival Commission*, 59.

Holzapfel, S. (2014), "The Role of Indicators in Development Cooperation, *An Overview Study with Special focus on the Use of Key and Standard Indicators*", The German Development Institute, Bonn.

International Institute for Environmental and Development (IIED) (2000), "Rural Planning in the Developing World with a Special focus on Natural Resources: *Lessons Learned and Potential Contributions to Sustainable Livelihoods an Overview*", Environmental Planning Issue no.20, (IIED).

Israel, G.D. (2009), Determining *Sample Size*, Florida.

IUCN.(2005), Benefits Beyond Boundaries, Proceedings of the 5th IUCN World Parks Congress, IUCN, Gland, Switzerland and Cambridge.

Kami, J., Deus .K, Victor, M., Fiona, F and Harold, L. (2016), making village land use planning work in rangelands: *The experience of the sustainable rangeland management Project, Tanzania.* Paper prepared for presentation at the "2016 world bank conference on land and poverty*"* the World Bank – Washington DC, March 14-18, 2016.

Kasiki, S.M and Smith R.J. (2014), "*A Spatial Analysis of Human-Elephant Conflict in the Tsavo Ecosystem, Kenya*". African Elephant Specialist Group IUCN.

Kaswamila, A.L. (2006), "*Evaluation of rural land use plans in protected areas Bio-networks in north eastern Tanzania*", PhD thesis, University of Greenwich.

Kaswamila, A.L and Songorwa, A. N. (2009), "Participatory Land-Use Planning and Conservation in northern Tanzania rangelands", Blackwell Publishing Ltd, *African Journal of Ecology,* Vol. 47, No.1, 128–134.

Kate, K. (2012). "Possible strategies/practices in reducing wild animal (Primate) crop raids in unprotected areas in Hoima, District, conducted in two Sub-Counties in Hoima District, Uganda".

Kombo, D.K and Tromp D.L.A. (2006), *An introduction of proposal and thesis writing,* Pauline's press, Nairobi.

Kothari, C. R. (2004), *Research Methodology, Methods and techniques, 3rd edition,* Prakarashan press, New Delhi, India.

Kothari, C. R. (2007), Research Methodology*: Methodand Technologies 2nded*. Ansari Road, Daryaganj, New Delhi: New age Internationa (P) L.t.d.

Kumar, R. (2011), Research Methodology: *A Step by Step guide for beginners,* 3rd ed. SAGE, New Delhi, India.

Kushoka, N.A.(2011), Land Use Plan and Farmers-Pastoralists Conflict in Mvomero District: *it's implications on household food production,* Sokoine University of Agriculture, Morogoro, Tanzania.

Kweka, D. (2010), "Establishing Wildlife Management Areas: *Impacts of Community Based Natural Resources Management on Biodiversity and Communities in Tanzania*", Tanzania Elephant Management Plan Workshop Report 25-28 May 2010; TAWIRI, Arusha.51-53.

Lamarque F, Anderson J, Fergusson R, Lagrange M,Osei-Owusu Y, Bakker, L.(2009), "*Human-wildlife conflict in Africa cause, consequences and management strategies:* Food and Agriculture Organization of the United Nations (FAO) *No. 157.*

Madden, F. (2006), "Human-wildlife conflict: a case for collaboration", *Nat. Faune* Vol.21, No.2, 8-9.

Magige, F.J. (2012), "Human-wildlife interaction in Serengeti and Ngorongorodistricts of Tanzania: case study on Small mammals in Tanzania", *Tanzania Journal of Science Volume 38, No.1, 95-103.*

Makindi S. M, Mark N. M, Nicholas K.W. O, Wilson L. O, Abdillahi A. A. (2012), "Human-Wildlife Conflicts: Causes and Mitigation Measures in Tsavo Conservation Area, Kenya"**,** *International Journal of Science and Research (IJSR*) ,Vol 3, No. 6, 1025-1031.

Makupa, E. E. (2013), "Conservation efforts and local livelihoods in Western Serengeti, Tanzania: *Experiences from IKONA Community Wildlife Management Area*", PhD thesis, University of Victoria.

Manoa, D.O. and Mwaura, F. (2016), "Predator-Proof Bomas as a Tool in Mitigating Human-Predator Conflict in Loitokitok Sub-County, Amboseli Region of Kenya", *Natural Resources*, **7**, 28-39.

Mariki, S. B. Svarstada, H, and Benjaminsen, T. A. (2015), Elephants over the Cliff: *Explaining Wildlife Killings in Tanzania*. Elsevier Ltd.

Mashalla, A. W. (2013), "*Status of human wildlife conflicts in villages adjacent to Mpanga/Kipengere Game Reserve",* University of Dodoma, Tanzania.

Munuo, W. (2016), "*Distribution Patterns of Human Elephant Conflict in areas adjacent to Rungwa Game Reserve, Tanzania"*, Norwegian University of Science and Technology, Norway.

Muruthi, P. (2005), Human-Wildlife Conflict: *Lessons Learned From AWF's African Heartlands, AWF Working Papers,* African Wildlife Foundation, Nairobi.

Mwakatobe, A, Nyahongo, J, Ntalwila, J and Røskaft, E. (2014), "The impact of crop raiding by wild animals in communities surrounding the Serengeti National Park Tanzania", *International Journal of Biodiversity and Conservation*, Vol. 6, No.9, 637-646.

Mwamidi, D., Nunow, A and Mwasi S, H. (2012), "The Use of Indigenous Knowledge in Minimizing Human-Wildlife Conflict: The Case of Taita Community, Kenya. Int. J. Curr. Res. Vol. 4, No.2: 26-30.

Mwangi G.N. (2015), "Effectiveness of using Indigenous Knowledge in HumanWildlife Conflict Management in Sagala, TaitaTaveta", The Technical University of Kenya, Kenya.

National Land Use Planning Commission (NLUPC), (2006), *The Guideline for Preparation of District Land Use Framework Plans in Tanzania*, Ministry of Lands, Housing and Human settlement Development, Dar es Salaam, Tanzania.

National Land Use Planning Commission (NLUPC).(1998), *Guidelines for Participatory Village Land Use Management in Tanzania*, Ministry of Lands and Human settlement, Peramiho Printing Press, Tanzania.

Neuman, L.W. (2006), "Basics of Social Research, *Qualitative and Quantitative Approches*", Pearson Education Inc. Boston.

Newmark W.D., Manyanzza, D.N., Gamasa D.G.M and Sanko H.I.(1994), "The conflict between wildlife and local people living adjacent to PAs in Tanzania: Human density as predictor", *Conservation Biology* Vol.8, No.1, 249-255.

Noa P.W. (2012), "Human–Elephant Conflict in Africa: The Legal and Political Viability of Translocations, Wildlife Corridors, and Transfrontier Parks for Large Mammal Conservation", *Journal of International Wildlife Law & Policy*, 15 No.2, 152-166.

Nogueira-Filho, S. L. G and Petit Lobão .É, De Sa. (2011), "*Human-wildlife Conflicts in the Brazilian Atlantic Forest*", Suiform Soundings Vol. 10, No.20, 14-22.

Nyirenda V. R, Willem J. M and Brian K. R. (2012),"Predicting environmental influencing crop raiding by African elephants (*Loxodonta africana*) in the Luangwa Valley, eastern Zambia", *African Journal of Environmental Science and Technology*, Vol. 6, No.10,391-400.

O'Sullivan, E and Rassel, G. R. (1989), *Research Methods for Public Administrators*, New York and London, Longman.

Ocholla, G.O., Koske, J., Asoka, G.W., Bunyasi, M.M., Pacha, O., Omondi, S.H. and mireri, C. (2013), "Assessment of Traditional Methods Used by the Samburu Pastoral Community in Human Wildlife Conflict Management", *International Journal of Human and Social Science*, Vol 3, 292-302.

Okello, M .M, John W.K, Stephen J. N and James I. (2016), "Prevalence of Human Elephant Conflicts in Amboseli ecosystem, Kenya: Current opinions of local community", *International Journal of Biodiversity and Conservation*, Vol. 8, No.3, 60-71.

Organisation for Economic Co-operation and Development (OECD) (1993), *Core set of indicators for environmental performance reviews*, Paris.

Organisation for Economic Co-operation and Development (OECD), (2008),"Handbook on constructing composite indicators: methodology and user guide"[accessed on web site http://www.oecd.org on 08.01. 2017].

Parker, G.E., Osborn, F.V., Hoare R.E and Niskanen, L.S., eds.(2007), "Human-Elephant Conflict Mitigation: *A Training Course for Community-Based Approaches in Africa*, Participant's Manual, Elephant Pepper Development Trust, Livingstone, Zambia and IUCN/SSC AfESG, Nairobi, Kenya.

Rawlings, J. O., Sastry G. P, David A. D. (1998),"Applied Regression Analysis": *A Research Tool. 2nd ed* , Springer-Verlag New York.

Ringo J. E and Kaswamila A. (2014), "Effectiveness of a General Management Plan in Mitigating Human-Wildlife Conflicts and Enhancing Conservation", A Case Study of Wami-Mbiki Wildlife Management Area, Tanzania,*International Journal of Environment and Bioenergy*, Vol. 9, No.1, 44-55.

Ringo, A.J. (2013), "Effectiveness of a general management plan in mitigating human wildlife conflicts and enhancing conservation: A case of Wami –Mbiki wildlife management area", University of Dodoma, Tanzania.

Robin B. (2012), An introduction to statistics correlation. [Accessed on web site *http://www.robin-beaumont.co.uk.*on 06.06.2017].

Roe D, Nelson F, Sandbrook, C. (eds.). (2009), "Community management of natural resources in Africa: *Impacts, experiences and future directions"*, Natural Resource Issues No. 18, International Institute for Environment and Development, London, UK.

Saris W.E and Gallhofer I.N. (2007), *Design, evaluation and analysis of questionnaires for survey research*, John Wiley and Sons, Inc., Hoboken, New Jersey.

Saunders, M. Lewis, P. Thornhill, A. (2004), *Research Methods for Business Studies*, Pearson education, New York.

Sennett, R. (2013), "*Common Grounds: Understanding Patterns and Perceptions of human-elephant conflicts and identifying mitigation Strategies for North Luangwa, Zambi*a", Master thesis and Diploma of Imperial College London, UK.

Serengeti District Council (SDC). (2014), *Serengeti District development Profile 2014-2019*, Mugumu, Serengeti.

Serengeti District Council (SDC). (2016), *Serengeti District Physical plan and Budget FY 2016/2017*, Mugumu, Serengeti.

Shemwetta, D.T.K. and Kideghesho, J.R (2000), Human-Wildlife Conflicts in Tanzania: *What research and extension could offer to conflict resolution*, Proceedings of the 1st University Conference, 5th-7thApril, 2000, Sokoine University of Agriculture, Morogoro, Tanzania, 1-9.

Sinclair, A.R.E., Mduma, S.A.R., Hopcraft, J.G.C., Fryxell, J.M., Hilborn, R. and Thirgood, S. (2007), "Long-term ecosystem dynamics in the Serengeti: lessons for conservation", *Conservation Biology*, 21, 580–590.

Singh, K.Y. (2006), *Fundamental of Research Methodology and Statistics*; New Age International (P) Ltd, New Delhi.

Sitati, N. W and Walpole, M. J. (2006), "*Assessing farm-based measures for mitigating human-elephant conflict in Transmara District, Kenya*", Oryx, Vol.40, No.03, 279-286.

Smith, H. W. (1991), *Strategies of Social Research (3rdedn)*, Orlando, FL, Holt, Rinehart and Winston, Tanzania, Unpublished report.

Sogoseye, A.(2011), "human and wildlife population growth as drivers of human-wildlife conflicts: the case of Wami-Mbiki-WMA, Tanzania", University of Dodoma, Tanzania.

Stolla, F. (2005), "Wildlife Management Areas*: A Legal Analysis*," Arusha: Tanzania Natural Research Forum.

Sustainable Rangeland Management Project (SRMP) (2013), "Village land use planning in rangelands in Tanzania*: good practice and lessons learned*," The International Land Coalition, Paper No.3.

Tanzania Wildlife Management Authority (TAWA). (2017), *Consolation payment for damage been caused by wild animals in Serengeti District* № ED/KDU/SRT/VC/VOL. III/304.

Thomas, A. and Mohan, G. (2007), "Research skills for policy development; How *to find out fast,"* SAGE, Publications Ltd, London.

Trochim, W. (2006), *The research Methods Knowledge Base*, 2nd Edition, Atomic Dog Publishing, Cincinnati, OH.

United Republic of Tanzania (URT). (2009), *The Wildlife Conservation Act No. 5 of 2009*, Ministry of Natural Resources and Tourism, Dar es Salaam, Tanzania.

United Republic of Tanzania (URT).(2013), 2012 Population and housing census population distribution by administrative areas, *National Bureau of Statistics,* Ministry of Finance, Dar es Salaam.

United Republic of Tanzania (URT) (1999), *The Village Land Act. No.5*, Dar es Salaam, Tanzania.

United Republic of Tanzania (URT).(2003), *Reference Manual for Implementing Guidelines for the Designation and Management of Wildlife Management Areas (WMAs) in Tanzania*, The Wildlife Division, Ministry of Natural Resources and Tourism, Dar es Salaam, Tanzania.

United Republic of Tanzania (URT). (2007a), *Land Use Planning Act. No.6,* Dar es Salaam, Tanzania.

United Republic of Tanzania (URT).(2007b), *The Wildlife Policy of Tanzania, Ministry of Natural Resources and Tourism,* Government printer, Dar es Salaam, Tanzania.

United Republic of Tanzania(URT).(2011b), *Consolation Regulations of 2011,* Ministry of Natural Resources and Tourism, Dar es Salaam.

United Republic of Tanzania (URT). (2012), *Wildlife Conservation (Wildlife Management Areas) Regulations of 2012,* Ministry of Natural Resources and Tourism, Dar es Salaam.

United Republic of Tanzania (URT). (1977), *The Constitution of the Republic of Tanzania,* Dar es Salaam.

United Republic Tanzania(URT). (2011a), *Ikona Wildlife Management Area - Resource Management Zone Plan 2011-2015, Serengeti District,* Ministry of Natural Resources and Tourism, Dar es Salaam.

Vijayan S. and Pati, B. P. (2002), "Impact of Changing Cropping Patterns on Man-Animal Conflicts Around Gir Protected Area with Specific Reference to Talala Sub-District, Gujarat, India", *Population and Environment,* Vol 23, No.6, 541-559.

Visser, E., Holleman, L., and Caro, S. (2009), Survey Research. [accessed on web.site *http://www.Amstat.org/section/srms/pamphlets*on 30.11. 2016].

Walliman, Nicholas S. R. (2011), Research methods: *the basics*, Oxford Brookes University, UK.

Wildlife Division (2015), *Annual Reports of Wildlife Division*, Ministry of Natural Resources and Tourism, Tanzania.

Wilfred, P. (2010), "Towards sustainable Wildlife Management Areas in Tanzania", *Tropical Conservation Science*, Vol.3, No.1, 103-116 [Accessed on web site *http://www.tropicalconservationscience.org]*.

Worldwide Fund for Nature (WWF). (2014), *Tanzania's Wildlife Management Areas*, a 2012 Status Report, WWF, Dar es Salaam.

WSRTF (1995), A Review of the Wildlife Sector in Tanzania Volume 1: *Assessment of the Current Situation*, Ministry of Natural Resources and Tourism, Dar es salaam.

Yamane, T. (1967), Statistics: *An introductory analysis*, 2nd edition, New Harper.

APPENDICES

Appendix 1: QUESTIONNAIRE FOR HOUSEHOLDS SURVEY

Date:.....

No.

Village:.....

A: Demographic Characteristics of Respondents

1. Sex of the Respondent 1= Male ( ) 2= Female ( )

2. Age of Respondent 1= 38-49years ( ) 2 =Above 50 ( )

3. Marital status of respondent 1= Married ( ) 2=Not married ( )

3=Divorced () 4=Widow(er) ( )

4. Level of Education of Respondent

1=Primary school ( ) 2=Secondary school ( )

3=College / University ( ) 4= Informal

5. Number of members in your household:
1= 1 to 6( ) 2 = Above 6 ( )

6. For how long have you been living in this area?
1= Less than 20 years ( ) 2= More than 20 years ( )

7. Are you born in this village? 1= Yes ( ) 2= No ( )

8. If immigrated to this village, what were the reasons?

1= Land for agriculture ( ) 2= Pasture for livestock ( )
3= Marriage ( ) 4= Employment ( )
5= Income generating activities ( )

9. What is your main occupation?

1= Cultivation ( ) 2= Livestock keeping ( )

3= Civil servant ( ) 4= Business ( )

10. Mention the types of crops which you grow
.....

B: Human-Wildlife Conflicts Before and After the Implementation of the Village Land Use Plan

1. Have you ever experienced conflicts with wild animals in your village in the past 10 years? 1= Yes ( ) 2=No ( )

2. If "yes", what were the types of conflicts with Wild animal that occurred in the past 10 years?

1= Crop raiding ( ) 2 =People attacked and killed ( )

3= Livestock depredation ( ) 4= Property destroyed ( )

5= Poaching ( )6= others (specify).....

3. Which type of conflict does occur more frequently in your area? (*Select only one*)

1=Crop raiding () 2= People killed/ injured ( )

3= Livestock depredation ( ) 4= Property destroyed ( )

5= Poaching ( )

4. Is crop raiding seasonal? 1= Yes ( ) 2= No ( )

5. If yes, please specify?

.....

.....

6. At what time do most of HWC incidents occur?

1= Day ( ) 2= Night ( ) 3= All time ( )

7. Give reasons as to why do HWCs still persist in the area

.....

.....

8. What reasons do force the wild animals to move out of PAs

.....

.....

9. What is the average distance from your home to PAs?

1= <1Km ( ) 2= Between 1-3 Km ( ) 3= >3 Km ( )

10. Was any of your family members killed/ injured by wild animals?

1= Yes ( ) 2= No ( )

11. Can you recall the average damage of crops (in acres) caused by wild animals for the past12 months?

S/N	Type of crop	Acres cultivated	Acres damaged	Animals responsible
1				
2				
3				
4				
5				
6				

12. Could do you estimate the damage cost of crops for the past12 months?
_____(Tsh)

13. What is the average distance from your farms to PAs?

1= <0.5Km ( ) 2= >0.5km ( )

14. What are the most problematic wild animals? Rank them

1= Elephant ( ) 2= Hyena ( ) 3= Bush pig ( )

4= Baboon ( ) 5= Lion ( )6= Others (Specify).....

15. Do you face problems with other wild animals in your area?
1= Yes ( ) 2= No ( )

16. Do you have any the livestock? 1= Yes ( ), 2= No ( )

17. If yes, how many livestock do you own? (Number.....)
1= Cattle..... 2= Sheep.....3= Goat.....

18. Do wild animals prey on your livestock? 1= Yes ( ), 2 = No ( )

19. If is yes, what are the wild animals involved and the livestock preyed?
.....

20. Could you estimate the damage cost of lost livestock for the past12 months?
.....(Tsh)

21. Where do you get pasture for your livestock?

1= from PAs ( ) 2= from the buffer zone <0.5Km from PAs ( )

3= from the village land which is >1 Km from PAs ( )

4= from the village land which is <3 Km from the PAs ( )

5= Others (Specify).....

C: Evaluation of the VLUPs Implementation and Monitoring

1. Do you have Village land use plan in your village? 1= Yes ( ) 2= No ( )

2. Did the community participate in the process of VLUP establishment?
1= Yes ( ) 2= No ( )

3. How did you participate in VLUP?
1= through meeting ( )2= Workshop ( )3= Decision-making( )

4= Representative ( ) 5= other specify.....

4. How were your interests reflected in VLUP?

1= very low reflected ( )2= low reflected ( )

3= moderate reflected ( ) 4= high reflected ( )

5= very high reflected ( )

5. How do you evaluate the community participation in VLUP?
1= very poor ( )2= poor () 3= average ( )

4= good ( )5= very good ( )

6. Were the VLUPs publicly disclosed in your area?
1= Yes ( )2= No ( )

7. How do you evaluate the means used to disclose VLUP?

1= Very poorly disclosed ( )2= Poorlydisclosed ( )

3= Moderately disclosed ( )4= Highly disclosed ( )

5= Very highly disclosed ( )

8. Give comment for your answer above
.....
9. Do you have by-laws to enforce VLUP in your area? 1= Yes ( )2= No ( )

10. If yes, how do you evaluate their enforcement?
1= very poorly enforced ( ) 2= poorly enforced ( )

3= moderately enforced ( ) 4= highly enforce ( )

5= very highly enforced ( )

11. What do you suggest in order to improve the implementation and monitoring of VLUP?
.....

D: Perception of the Local Communities on the VLUP Contributions into HWC Mitigation

1. In your experience, what is the trend of HWC in the area after VLUP implementation?

1= significantly decreased ( )2= slightly decreased ( )

3= remain constant ( )4= slightly increased ( )

5= significantly increased ( )

2. Give reasons for the trend of HWC from your answer above

.....

3. What are the current mitigation measures in place for the control of HWC?

1= Disturbance shooting ( ) 2= Destruction/killing of the problem animals ( )

3= Chili methods ( ) 4= Application of used oils from vehicle engines ( )

5= Making noise bybanging tins and other noise making objects ( )

6= Stone throwing ( ) 7= Beehives fence ( ) 8= Flash light ( )

9= Consolation scheme ( ) 10= Others (Specify)_____

4. Are you aware of VLUP as a mitigation measures that have been applied to control HWC? 1= Yes ( ) 2 = No ( )

5. If the answer is YES for the question above, how do you rank VLUP compared to other measure to mitigate HWC?

1= Low ( ) 2= Moderate ( ) 3= High ( )

6. How do you perceive the initiative of the VLUP for HWC mitigation?

1= Useful ( ) 2= Not useful ( ) 3= Not known ( )

7. What are your comments related to HWC, and VLUP as the mitigation measure in your area?

.....
.....

Appendix 2: INTERVIEW GUIDE FOR KEY INFORMANTS

Date: _____

Designation _____Institution: _____

A: Trends of human-wildlife conflicts before and after the implementation of the Village Land Use Plan

1. For how long have you been in this position?
   1= Less than 5 years( ) 2= 5-10 years ( ) 3= More than 10 years ( )

2. In your experience, what is the trend of HWC in the area after VLUP implementation?
   1= Decreased ( ) 2= Constant ()3= Increased ( )

3. What do you think are the main causes of HWC in your in the area?
   .....
   .....

4. Mention wild animal species which are reported frequently to be involved in HWC
.....
.....

5. In which season do you receive more claims of the HWC?
.....

6. What measures are you taking to mitigation the HWC?
   .....
   .....

B: Evaluation of the VLUPs implementation and monitoring

7. Are you aware of the VLUP as mitigation measure for HWC?
   1= Yes ( ) 2= No ( )

8. If yes, how are the borders for different land uses are established?

1=Descriptive boundaries ( )2=Sketched boundaries (document and map)()

3= Demarcation of Land uses borders ( )

9. Do you have any entity to implement the VLUP in your area?

   1=Yes ( ) 2=No ( )

10. If yes, mention the entity responsible for VLUP implementation in your area
    .....
    .....

11. Was the capacity building conducted at the lower level to assist VLUP implementation and Monitoring?
    1=Yes ( ) 2=No ( )

12. If yes, please mention

.....

.....

13. Which entity is responsible for Monitoring VLUP in the village?

1 = No entity responsible ( ) 2= VG( )

3 = PLUM or VLUM Teams( ) 4 = PLUM and VLUM Teams( )

5= Both PLUM, VLUM and VG ( )

14. How regularly does the monitoring entity conduct visit with regard to the VLUP?

1 = 0%, no visit ( ) 2 = 25%, once a year ( )

3 = 50%, twice a year ( )4 = 75%, thrice a year ( )

5= 100%, quarterly( )

15. What are challenges facing the implementation of the VLUP in your area?

.....

.....

.....

16. What are challenges facing the monitoring of the VLUP in your area?

.....

.....

.....

17. Give suggestions to improve the implementation and monitoring of the VLUP in your area?

.....

.....

Appendix 3: DISCUSSION GUIDE FOR FOCUS GROUP DISCUSSION (FGD)

Date: _____ Place/ Village: _____

1. How real is Human-Wildlife conflict?

2. At what frequency are human-wildlife conflicts available?

3. What particular wild animals are involved in the conflict?

5. How can the use of VLUP contribute towards HWC mitigation?

6. Do you have meetings with staff /officials to discuss VLUP as mitigation for HWC?

7. What role does the community play in the use of VLUP to mitigate this conflict?

8. How is VLUP perceived by the community?

9. What is your perception of VLUP in mitigating HWC in your area?

Appendix 4: CLEARANCE LETTER

THE UNIVERSITY OF DODOMA
DEPUTY VICE CHANCELLOR ACADEMIC, RESEARCH & CONSULTANCY
OFFICE OF GRADUATE STUDIES AND CONTINUING EDUCATION
P.O. BOX 259, DODOMA, TANZANIA.
Tel: +255 26 23 10173; Fax: +255 26 23 10005; Email: udomgsce@yahoo.com; website: www.udom.ac.tz

REF: UDOM/GSR/2016/65 Tuesday, 31 January 2017

To Whom It May Concern:

RE: INTRODUCING MR. NESTORY, JONAS M.

The above named candidate is enrolled at the University of Dodoma for the degree of Master of Science in Natural Resources Management (MSc NRM) with registration number HD/UDOM/340/T.2015

As an essential requirement of the study programme, each candidate is required to submit a dissertation report on a research undertaken within an industry and supervised by a member of the University's academic staff. Where possible the research should relate to a practical situation in an organisation or firm selected by the candidate. Candidates are expected to use their own initiative to identify a possible research and negotiate access with a local firm or organization.

The above named candidate has developed the proposal titled **"CONTRIBUTION OF VILLAGE LAND USE PLAN IN MITIGATING HUMAN WILDLIFE CONFLICTS IN IKONA- WMA, SERENGETI DISTRICT."** which has been approved for data collection. The work may take the form of a survey, ethnography, case studies, etc. Where the research may contain confidential information and its publication could be harmful to the organization, confidentiality is assured by the University. Such reports will be seen only by the Supervisor and Examiner for examination purposes.

I would be grateful if you would provide the candidate with this opportunity to facilitate his studies while at the same time gaining some useful inputs for your own organization through the results of the research report.

Sincerely,

Waziri, A.
For: Director, Graduate Studies and Continuing Education

C.c: Director, GS&CE

Appendix 5: CORRECTION FROM EXTERNAL EXAMINER

Issue	Amended pages	Action
Merging section 4.3.2.4	Page numbers 76 and 77	Done