ASSESSING THE ROLE OF WILDLIFE MANAGEMENT AND GOVERNANCE IN CONSERVATION AREAS IN KENYA

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Assessing the Role of Wildlife Management and Governance in Conservation Areas in Kenya

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DECLARATION

This Thesis is my original work and has not been presented a degree in any other University.

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DEDICATION

This research is dedicated to my parents the late Hezron Kihoro Kuria and Hannah Wambui Kihoro for believing in empowering their children with education. To Elvis Gichuhi, may God fulfill your purpose in this world, Juliet Wambui, Nelly Wambui, Lynette Wanjiru and Chelsea Njeri may you all attain the best in life.

To the Environment, "Who has access to environmental resources and who benefits, who bears the cost of environmental depletion and degradation, what is the impact of resource depletion on the economy and livelihoods, and where could we restore ecosystems and create economic opportunities among others" (UNEP, 2009).

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ABBREVIATION AND ACRONYMS

AOI	Area of Interest
ASC	African Safari Club
BRAAF	Biosphere Reserves for Biodiversity Conservation and Sustainable Development in Anglophone Africa
CAP	Conservation Action Planning
CBNRM	Community-based Natural Resource Management
CPT	Common Property Theory
EBM	Ecosystem-based Management
EBMS	Ecosystem-based Management System
EMS	Environmental Management System
EOH	Enhancing Our Heritage
EPA	Environmental Protection Agency
ERA	Eco-regional Assessment
ETM+	Enhanced Thematic Mapper Plus
GEF	Global Environmental Facility
GEGIS	Geo-Informatic Engineering and Geospatial Information Systems
GR	Group Ranch
HEC	Human - Elephant Conflict
HWC	Human Wildlife Conflict
IBAs	International Bird Areas
IKS	Indigenous Knowledge Systems
IUCN	International Union for Conservation of Nature
IPCC	Inter-governmental Panel on Climate Change
KCGR	Kimana Community Group Ranch
KCWC	Kimana Community Wildlife Conservancy
KCWS	Kimana Community Wildlife Sanctuary
KWS	Kenya Wildlife Service
LULC	Land use and Land cover
MAB	Man and Biosphere
MES	Mwalughanje Elephant Sanctuary
METT	Management Effectiveness Tracking Tool
MHA	Major Habitat Assessment
MHEST	Ministry of Higher Education Science and Technology

MPA Marine Protected Areas

MSS Multispectral Scanner

NAFOBEDA National Forestry and Bee keeping Database

NEMA National Environment Management Authority

NP National Park

NRT Northern Rangeland Trust

NWR National Wildlife Refuge

OPC Ol Pejeta Conservancy

PAMU Problem Animal Management Unit

PA Protected Area

PP Parks Profiles

PW Parks Watch

RCMRD Regional Centre for Mapping of Resources for Development

REDD Reduced Emissions from Deforestation and forest Degradation

RAPPAM Rapid Assessment and prioritization of Protected Area Management

RS Remote Sensing

SIAST Saskatchewan Institute of Applied Science and Technology

SM Scenery Matrix

SMEs Small, Medium and Micro-Enterprises

SPSS Statistical Package for Social Science

TEK Traditional Ecological Knowledge

TIFF Tag Image File Format

TM Thematic Mapper

TNC The Nature Conservancy's

TNP Tarangire National Park

TRA Threat Reduction Assessments

UTM Universal Transverse Mercator

WCAs Wildlife Conservation Areas

WCPA World Commission on Protected Areas

WGS World Geodetic System

WMAs Wildlife Management Areas

WRI World Resources Institute

WWF World Wildlife Fund

ABSTRACT

The negative perception to wildlife conservation areas in Kenya is as a result of increased human – wildlife conflicts, competition over diminishing resources and governance by management regimes. Communities neighboring these areas perceive conservation areas as a disadvantage to their livelihoods, safety and well being. The aim of this research was to assess the governance and management of resources and conflicts, community perception and acceptance of wildlife conservation areas. The study was carried out in five conservation areas at the Coast, Tsavo, Southern, Central Rift and the Mountain conservation areas between August 2008 and December 2010. The conservation areas were categorized into three management regimes, the state owned parks managed by the Kenya Wildlife Service (KWS), private and community conservancies.

Conservation area management was assessed using the Management Effectiveness Tracking Tool for specific variables that directly impacted on the community and the conservation area. Geographical Information Systems and Remote sensing tools were used to assess land use and land cover changes for the past twenty years (1988 to 2010) for a 5 Km buffer zone using ArcGIS, Idrisi and Erdas Imagine software. Data on community perceptions was collected using questionnaires and interviews.

All conservation areas were formally gazzetted and had capacity to enforce law. State parks and some community conservancies were in the process of implementing the management plans. The local communities at Rukinga and Ol Pejeta private conservancies received some economic benefits and they had some input in decision making.

The GIS analysis of the five conservation areas indicated a general decrease of land cover and land use in hectares. There was an overall increase in agriculture by 7,103 ha, settlements by 608 ha. grasslands by 4,229 ha. and thickets by 1,234 ha. Moreover, there was a decrease in forests by 2,536 ha.

The results for the five conservation areas indicated that farming (31.8%) was the preferred type of land use followed by farming and livestock keeping (21%), livestock keeping (18.4%), conservancies (9.2%) and commercial activities (9.8%).

The Pearson's Chi square noted a degree of association between types of resources and practiced land use, types of resources and land ownership, diminishing resources and type of resources leading to conflict of resources, means of sustaining family and disadvantages of living next to the park. There was a positive significant correlation between type of conflict and conservancy benefits ($r = 0.201$, $p < 0.000$, $n = 659$) at 0.05. Pearson's Chi square tests indicated an association of type of land use and type of resources ($x^2 = 35.905$, $df = 16$, $p = 0.003$) at 0.05, diminishing resources had an association with types of resources ($x^2 = 17.630$, $df = 16$, $p = 0.346 > 0.05$).

Communities had different perceptions of the management regimes which were largely influenced by conflict resolution and compensation for damages, economic benefits, and community involvement in decision making and sharing of resources within conservation areas.

The outcome of this research recommends an improved relationship between conservation area management and communities to promote conservation methods that protect wildlife resources. Wildlife conservation areas could be more appreciated by communities through stakeholder involvement and increased benefits. The wildlife policies and strategies should consider different socio-cultural backgrounds and land use practices of communities neighboring conservation areas.

CHAPTER ONE

INTRODUCTION

1.1 General Introduction

Wildlife conservation and management is the conservation, use and management of wild-animal populations and of the land necessary to support them to ensure that productivity and ecological balance are maintained in perpetuity, while social benefits are realized. Human activity has become one of the most significant influences on the abundance and well-being of wildlife, (Kerr and Kwasiniak, 2013). Kenya conserves its biodiversity through protected area systems in form of National Parks (NP), Reserves and Sanctuaries which cover 8% of the Kenyan landmass. According to the Kenya Gazzette, (1975), Session Paper No. 3 of 1976, on the, "Statement of Future Wildlife Management in Kenya", recognizes community wildlife conservation as a Wildlife management strategy.

Kenya Law Reports (2009) places emphasis on community wildlife conservation by giving KWS the mandate under Section 3A (i) to advice the Government, Local Authorities and land owners on the best methods of wildlife conservation and management. In this regard, KWS believes that conservation of wildlife outside protected areas cannot be achieved without addressing the needs and rights of communities co-existing with wildlife. The land outside protected areas is largely under the control of private owners and communities. Their cooperation is essential for the success of conservation activities, as the majority of these lands are subject to a multiplicity of uses, some of which conflict with wildlife conservation.

The issues that affect conservation outside protected areas include human - wildlife conflict, wildlife insecurity, space for wildlife, limited technical and financial capacity to manage wildlife, limited wildlife education and awareness and slow implementation of land use policies.

According to KWS (2010), conservancies contribute majorly to conservation and management of wildlife and serve as breeding grounds, wildlife dispersal areas and corridors, protected area buffer zones, eco-tourism and recreation facilities, habitats for wildlife and endemic species, education and research. Baldus and Hahn (2009), reiterated that general conservation initiatives do not aim at short term economic gains but rather try to optimize the use of eco-systems with minimal ecological impact.

An interdisciplinary combination of social psychology, wildlife management, and conservation biology has contributed to a younger field of study referred to as human - wildlife interactions, (Kincaid, 2003). The paradigm shift has resulted from the realization that social science is an important part of wildlife management because biology alone does not provide a holistic view of specific issues facing wildlife management personnel. Mackey *et al* (2010) asserted that among other things, a connectivity conservation approach recognizes that conservation management is needed in the lands around formal protected areas to buffer them from threatening processes originating off-reserve.

This study focuses on Wildlife conservation areas and its impact on the neighbouring communities. Whereas these conservation areas are protected either by the state, private or communal ownership, the available resources and their use dictate the relationship of the people and the wilderness. The demand for land to accommodate different livelihoods gravitates towards competition for resources such as water, grass, forests and even land between people and the wildlife. The management regimes within and outside the conservation areas informs the acceptability by the communities. In this respect the state owned parks managed by the Kenya Wildlife Service, the private and community conservancies were compared in five conservation areas to assess conservation management styles, community perception, and state of resources in wildlife conservation areas. These conservation areas were sampled out of the eight KWS conservation areas in Kenya and each had two or three conservation regimes.

1.2 Conservation Management for Wildlife Conservation Areas

Protected area management effectiveness is the degree to which protected area management protects biological and cultural resources, and achieves the goals and objectives for which the protected area was established Hockings *et al* (2006). The World Commission on Protected Areas (WCPA) has developed a framework for developing management effectiveness assessment methodologies Hockings *et al* (2006). Based on the results of management effectiveness assessments across multiple protected area sites and systems, the following are some of the most common management weaknesses; staffing, management planning, community relations, threat assessment and abatement, research and monitoring, law enforcement and natural resource management, (Hockings *et al* 2006).

1.3 Community Perception on Conservation Areas

According to the United Nations Sustainable Development (1992), Agenda 21 advocates a natural resource management approach that ensures community participation which is to be achieved through government decentralisation and devolution to local communities of the responsibility for natural resources held as commons. In the context of the community conservation approach, 'co-management' and 'collaborative management' are the newest terminologies. Other terminologies include participatory management, joint management, shared management, multi-stakeholder management or round-table agreement (Gichiah 2004).

1.4 Assessing the State of Resources in Wildlife Conservation Areas Using Geographical Systems (GIS) and Remote Sensing (RS)

As suitable agricultural areas become scarce, high population densities is increasingly shifting towards the dry lands (low rainfall regimes), (Ojwang *at el* 2010) and UNEP 2009). Kenya's increasing population, poverty and the drive for economic growth are the underlying pressures that contribute to habitat loss and fragmentation. The latest estimate puts Kenya's 2009 population at 40 million increasing the average population density to 66 persons per square kilometre. According to the World Resources Institute (WRI) (2007), "eco-system "drivers" can directly speed things up or slow them down.

In many countries, a principal driver of eco-system change refers to a change in land use such as conversion of forests to cropland and pasture or the draining of wetlands for crops and infrastructure.

Data analysis and mapping indicates that wildlife population tends to fare better in or near Kenya's parks and game reserves. However, many species especially the large grazing animals spend a significant amount of their life cycle outside the borders of these protected areas. The way people use private and communally held lands strongly affects Kenya's wildlife (UNEP, 2009).

1.5 Statement of the Problem

The role of wildlife conservation management and governance is influenced by the governance of resources by the conservation regimes and the relationship between them and the neighboring communities. Wildlife conservation areas in Kenya are threatened by increasing human population and changes in land uses. The competition for diminishing resources within conservation areas and adjacent areas has led to human - wildlife and human - human conflicts. The increased human – wildlife conflicts emanate from competition over diminishing resources, lack of stakeholder involvement in decision making and appropriate methods of conflict resolution. This investigation entailed assessing five conservation areas and three conservation regimes in form of a state park, private and community conservancy. The research was undertaken with an aim of assessing which wildlife management regime involves communities in decision making, uplifts community's livelihoods through economic and social benefits, and resolves human - wildlife conflicts amicably. In this respect a combination of Geographical Information Systems and satellite images, Management Effectiveness Tracking Tool, questionnaires and interviews were used for this research. These tools identified types of resources, types of land uses, diminishing resources, types of conflicts, benefits and costs of conservation, community perspective towards wildlife management regimes.

1.6 Rationale and Justification

The negative perception of wildlife conservation areas by communities is based on the problems experienced from wild animal attacks, the need to share resources within conservation areas and consultation with the management of conservation areas. Communities living next to conservation areas experience crop destruction, human and livestock deaths, and lose of livelihood from wildlife attacks. Competition for diminishing resources has led to a negative public perception to wildlife conservation and management. This view has been exacerbated by the encroachment of wildlife migratory corridors by communities thereof curtailing the traditional movement of wild animals. The management regime that resolves these conflicts is appreciated by the communities. The wildlife conservation areas will benefit from community appreciation of wildlife resources leading to improved conservation. Subsequently, communities will benefit from eco-tourism, reduced human-wildlife conflicts, employment and other community projects from the conservation areas. The conservation regime that appeals to communities should be replicated in other conservation areas in Kenya.

1.7 Conceptual Framework for Wildlife Conservation Areas

According to Salafsky *et al* (2010), effective conservation requires addressing three fundamental questions whose answers can only be sought in conservation practice;

- What should our goals be and how do we measure progress in reaching them?
- How can we most effectively take action to achieve conservation?
- How can we learn to do conservation better?

The conceptual framework analyses and tests the background thinking to interventions which essentially aim to influence, manipulate and change public perception and acceptance of wildlife conservation and management systems in Kenya. It focuses on the following concepts; increase in human population, type of land use practiced, state of the environment, poor resource management and conservation management regimes. The increase in human population leads to demand for food, shelter and other amenities which lead to competition for existing resources or ‘commons’ (Boggs, 2000).

The concept on the type of land use was informed by the socio-cultural and economic practices of the communities in the study areas. These were categorized as farming, livestock keeping, conservancies and commercial activities.

The state of the environment was assessed using GIS and remote sensing for the last twenty years. This is what informed on the changes of the various land use and land cover classes such as forests, grasslands, shrubs, bare ground, thickets, water, settlements and agricultural activities. The concept on poor resource management was as a result of limited use of existing indigenous knowledge and environmental awareness, low economic benefits from conservation and several disadvantages of living next to conservation areas, and lack of resource access and sharing. The community and management responses to effective conservation area management regimes indicated a need for stakeholder involvement in decision-making, use of education awareness programs management plans and recording the biodiversity in a resource inventory.

There should also be periodic assessment of land use and land cover changes and use of ecological and socio-economic indicators that could indicate the state of available resources. This could minimize conflicts over resources and enhance acceptability of the wildlife conservation areas. This conceptual framework informs the management of the ‘commons’ on how to involve the communities and give cognition to the fact that they are stakeholders as indicated by the, ‘Common Property Theory’. This was what informed the following conceptual framework, Fig.1.1

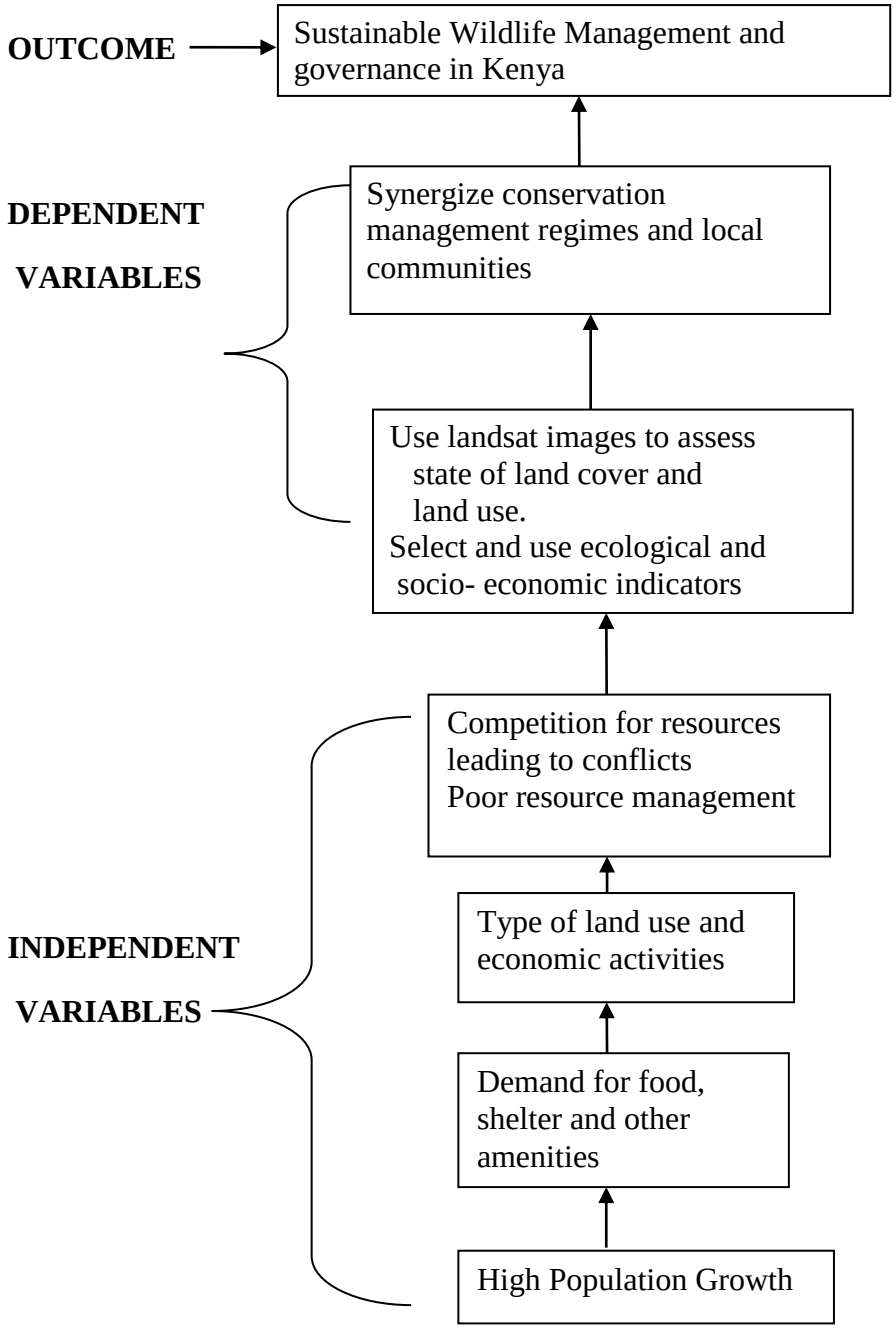


Figure1.1 Conceptual framework variables influencing public acceptance of Wildlife conservation areas in Kenya

1.8 Scope of the Study

Data collection was confined to a buffer zone of 5 Km from the conservation area boundary although most of the conflicts could be experienced beyond this zone. Five conservation areas and three management regimes were considered for the study. The conservation areas were Coast, Tsavo, Southern, Central Rift and the Mountain conservation area. The conservation regimes were the state parks, private and community conservancies.

1.9 Challenges

The landsat images from 2002 had a problem of striping and cloud cover which made it difficult to assess some of the study sites. Some conservation managers were not willing to participate in the research while household respondents wanted immediate solutions to human - wildlife conflicts.

1.10 Research Hypotheses

The following are the Null hypotheses;

H_{oa}**:** Types of conservation regimes do not influence community perception of wildlife management and governance in Kenya

H_{ob}: There is no relationship between resource access and sharing in conservation areas

H_{oc}: There are no disadvantages of living next to conservation areas

H_{od}: Stakeholder involvement is not beneficial to conservation management

1.11 Objectives

1.11.1 Main objective

To assess the management and governance of resources, conflicts and community involvement in wildlife conservation in Kenya

1.11.2 Specific Objectives

1. To assess community perception of conservation management regimes in five conservation areas in Kenya.

2. To determine the state of the environment, resource access and sharing in wildlife conservation areas.
3. To analyze the public benefits and costs associated with conservation areas.
4. To assess the degree of community involvement in conservation management

CHAPTER TWO

LITERATURE REVIEW

2.1 Wildlife Resources and Protected Areas

In his study of integrated sustainable wildlife management, Reimoser *et al* (2012) argues that in multiple-use cultural landscapes the resulting interaction between habitat requirements of wild animals, hunting interests and other land-use demands often leads to conflicts that can negatively affect sustainable conservation. Herlocker (1999), reinforced this by stating that in Eastern Africa, the various forms of *in situ* conservation include forest and nature reserves, national parks, game reserves, plant sanctuaries, designated genetic reserves for wild species and biosphere reserves. In the study of conservancies in Kenya, it is important to take advantage of indigenous institutions, environmental knowledge and traditional management practices.

The Wildlife Policy (2011) indicates that threats and challenges to wildlife conservation and management are; land use, destruction of wildlife habitats, insecure tenure to land and illegal allocation, inadequate incentives, protected area management and partnerships, management plans and management effectiveness assessment and prioritization. Others include inadequate accurate and scientific data, illegal and unsustainable off-take of wildlife and bush meat trade, human-wildlife conflict and compensation, biopiracy, pollution, climate change, conservation of shared wildlife resources and invasive alien species.

About 8% of the Kenya's land mass is protected area for wildlife conservation (KWS 2012). In Kenya, protected areas embrace various types of eco-systems namely; forests, wetlands, and savannah, marine, arid and semi-arid lands. According to KWS (2010), conservancies contribute majorly to conservation and management of wildlife and serve as breeding grounds, wildlife dispersal areas and corridors, protected area buffer zones,

eco-tourism and recreation facilities, habitats for wildlife and endemic species, education and research.

In reference to Kwale district, Wargute (2007), stated that conservation of wildlife resources will only succeed if partnership between all the stakeholders such as the government, conservation agencies and local communities is strengthened. Ochola *et al* (2010), maintained that, Indigenous Knowledge Systems (IKS) form the basis for local level decision - making in agriculture, food preparation, health care, education and training, natural resource management and a host of other activities in rural communities. Ng'ethe (1995) noted that, the Problem Animal Management Unit (PAMU) objective is to work with communities outside protected areas whose land accommodates various wildlife species with a view to protecting human life and property.

Community-Based Natural Resource Management (CBNRM) is quite simply the management of resources such as land, forests, wildlife and water by collective, local institutions for local benefit, (Roe *et al* 2009). Furthermore, Kenya affords private landowners more control of their properties than is generally the case in most African countries, with a freehold tenure structure similar to that of private properties in parts of Southern Africa. Thakkadu (2001), maintained that the involvement and participation of local communities in natural resource management and utilization will benefit conservation through; a reduction in land-use and natural resource conflicts, enhanced monitoring of the resource base, the provision of cost-effective options for management of wildlife and the linking of natural resource conservation with development.

DeGeorges and Reily (2009), reiterates that communities must sustainably manage their natural areas as "green factories" for the multitude of natural resources they contain as a means of maximizing employment and thus household incomes as well as meeting the often overlooked socio-cultural ties to wildlife and other natural resources which, may be as important as direct material benefits in assuring conservation of wildlife and its habitat.

2.2 Management of Wildlife Resources and Resource Conflicts

In his study of community based conservation Gichiah (2004), distinguished four property rights and management regimes, the purpose of which is to manage people in their use of natural and environmental resources. These regimes are arranged along a spectrum of ownership which are Private property, Common property, State property and Non-property where no defined group of users or "owners" and benefit stream is available to anyone. U.S Fish and Wildlife Service (2012), indicated that the initial vision for the proposed Rio Mora NWR and Conservation Area is to: work in partnership with the local community to conserve, protect, and manage the abundant fish and wildlife resources in a working rural landscape of Northeast New Mexico. In an examination of polar bear management in Nunavut Territory, Canada, Dowsley (2008) states that community clusters provide a forum to collect and analyze traditional ecological knowledge (TEK) over a geographic area.

The conflicts in Kwale district, Coast province, are human/Resource use conflict, and Human/wildlife conflict (HWC). Mitigation strategies are as follows: Awareness creation to the community and other stakeholders, promotion of alternative land use practices and activities in both marine and inland areas (Mwanzaga, 1998). Protected areas governance is primarily about the sharing of power that affects the management and the stakeholders (Munthali, 2007). Local resentment over property losses to Wildlife precludes discussion of other environmental issues (Treves *et a l* 2006). For example, in Apolobamba, Bolivia, crop and livestock losses to Wildlife draw more public debate in scheduled meetings than soil erosion, pollution, and watershed management.

Laikipia district has two conflict cells; one to the Eastern side of Laikipia and comprises of Lewa downs, Manyagalo, Borana, Lomarik Ranches, Kamwaki farm and Lodiga Hills (Gathitu, 1999). The other cell is the Uaso Nyiro unit conflict which lies to the Western side of Laikipia. The various conflicts as identified by Kisoyan (1998) in Lake Nakuru and the catchment area as follows; human - animal conflicts in the park neighborhood from baboons, monkeys, leopards and lions. Akama (1996), stated the cause of conflicts are numerous and include death/injury to man and his livestock, crop

damage, competition for space water and forage, destruction to property. Lewis (1992), recommends that to set up a conflict management framework, one should conduct an assessment of the conflict situation, develop and implement a conflict management strategy, monitor the situation and make adjustments as necessary.

According to Makindi (2010), the form in which benefits are shared should be in a way that provides secure livelihoods to the majority of community members as well as enough to compensate for loss in resource utilization in the protected areas and Wildlife damage. Emphasis should be on how to create more income generating opportunities that can interface with conservation initiatives and interaction with tourists. For example, the local communities using the biodiversity and landscape of protected areas can promote small, medium and micro enterprises (SMEs) related to eco-tourism facilities such as selling curios, artifacts or cultural exhibitions to tourists.

2.3 Conservancies and Protected Areas

In the community conservation program, Ntiati (1999) posited the view that different conservancies and sanctuaries have some areas of commonality since land has to be set aside for the said purpose. At the same time, Griffiths (1998), noted that in Kenya, community conservation approach is of crucial importance because a substantial proportion (> 70%) of Kenya's Wildlife is found outside protected areas, mostly in the rangelands. Community members have also been encouraged to diversify from livestock to agricultural activities, including the irrigation of land on the slopes of Mt. Kenya (UNDP, 2012). Eco-system functioning is necessary since a certain type of use may be considered as being sustainable for a relatively short time (Toxopeus, 1996). According to the Inter-governmental Panel on Climate Change (IPCC) (2001), most of the goods and services provided by wildlife are derived from their roles within systems.

The detailed planning of community conservation program depends on the potential of different areas for tourism or other uses of wildlife. Mburu and Birner (2002), supports the view that collaborative management or co- management has increasingly become important because it seeks to create negotiated agreements between state and local

communities (or any other stakeholders) and therefore, offers a possibility to conflicts over natural resource exploitation. Community conservancies represent one of several pioneering environmental governance approaches advanced by USAID/Kenya (USAID, 2013).

Lack of education, public awareness and understanding of conservation issues have been identified as some of the factors that militate against protected area systems (Makindi, 2010). Increasing human population and changing land use practices threaten the continued existence of viable population of large mammals in the Amboseli - Tsavo ecosystem, (Ellington, 2008). These two problems threaten to constrict the wildlife migratory corridor and dispersal areas within three group ranches, Mbirikani Ranch, Kimana Ranch and Kuku Ranch.

According to UNEP (2009), the park is small and relies on 4,000 Km^2 of surrounding "dispersal areas" to provide migration corridors and increase the feeding and breeding grounds for Amboseli's wildlife. Western *et al* (2010) noted that the key factor in the collapse of the large ungulate populations in the 2009 drought was the depletion of swamp grazing due to the heavy elephant concentrations. The sub division of some formerly large ranches and communal lands has resulted to habitat fragmentation and threat to the biodiversity existing outside protected areas, (Ojwang *at el* 2010).

Increasing intensive crop cultivation and loss of vegetation cover in areas adjacent to the protected areas resulted in unchecked land use conflicts. UNEP (2009), states that land degradation also threatens biodiversity. The gaps in vegetation cover caused by fragmentation can isolate populations of certain species and lead to their demise, while land and water degradation render habitats unhealthy thus threatening species survival. The institutions that have been in-charge of wildlife conservation and management of protected areas have taken little proactive approach to regularly evaluate status and threats of these areas, (Kiringe and Okello, 2007). Fisher *et al* (2005), stated that it is not conservation itself that is the problem for people whose livelihoods depend on

natural resources. Rather, conservation approaches often do not adequately take into account the adverse impacts of conservation activities on the rural poor.

2.4 Wildlife Conservation Strategy and Policy

In addressing Wildlife - human conflicts, Wildlife legislation and regulations attempt to make provisions for community participation, land use and land tenure systems, compensation, tourism development, and access to dispute resolution mechanisms (Mbote, 2005). Another potential source of conflict is revenue and other benefits sharing. There is lack of who the stakeholders are and what actually constitutes equitable distribution of Wildlife benefits.

The Community Wildlife Strategic Framework strongly indicated that the effective implementation of community Wildlife conservation requires action-oriented strategic framework, (Kireria, 2000). Moreover, Wargute (2007) recommends that there is a need for comprehensive land use and Wildlife policy and legislation to reduce human - wildlife conflicts. The National Conservation and Management policy (2012), proposes an eco-system based management approach to Wildlife conservation and management within and outside the protected areas in order to achieve ecological and economic viability. Landowners on whose land Wildlife reside and communities living adjacent to protected areas should benefit from revenue generated from the presence of Wildlife.

There is the need to support local communities to embrace conservation and draw benefits through eco-tourism activities. In its Wildlife policy objective of promoting sustainability in utilization of wildlife resources, the government of Tanzania has introduced the concept of Wildlife Management Areas (WMAs) (Wilfred, 2010). Conservation of natural resources in WMAs is therefore a shared responsibility and local communities must significantly benefit from it.

There are many definitions of management planning. It is a 'tool' to guide managers and other interested parties on how an area should be managed, today and in the future. Resources, skills and organizational systems are needed to ensure success in management planning (Lee and Middleton, (2003). DeGeorges and Reily (2009) stated that, the main goal of Project Noah is training of rural youth from Wildlife rich areas in Sub-Saharan Africa in the sustainable utilization and conservation of Wildlife and associated habitats. The Noah graduates can integrate their new found knowledge into traditional management systems in finding an African solution to conservation that integrates rural Africans into a multiple - resource use conservation model seen as an important component of the way forward.

2.5 Using Geographical Information Systems (GIS) and Remote Sensing in Wildlife and Land Management

The Geographical Information Systems (GIS) constitute a considerable expansion of the capacity of humans and organizations to manage and make use of such information (Toxopeus, 1996). The complexity of the biological, ecological, and physical processes, which comprise natural systems, makes modeling a potentially valuable tool for anticipating responses to management options. The traditional method of representing the geographic space occupied by spatial data is as a series of thematic layers (Heywood *et al* 1998).

According to Spencer *et al* (2003), GPS data when put into a GIS, gives the researcher the ability to link a spatial data to real world coordinates. Wadsworth and Treweek (1999), stated that most ecological data are collected using some form of ground survey. Remote sensing has the capability to provide synoptic views over very large areas very quickly (Jensen, 2000). Most ecological studies make use of data collected by sensors working in the visible and near-infrared parts of the spectrum. Satellite imagery is in digital form and has frequent recurrence of coverage. Image analysis can provide quantitative information about ecological properties, which cannot be easily derived from aerial photography or field studies (Johnson, 1998).

GPS for ground truthing is the collection of locations and corresponding information about features on the ground that will be used to create, correct, interpret, assess accuracy or somehow modify existing geospatial data. Two common uses for geo-referencing aerial or satellite images and classifying satellite images is by deriving land use and land cover (LULC) (Spencer *et al* 2003).

The study on Tarangire National Park (TNP), gives information on historical wooded grassland eco-system cover over the past 30 years. The research focused on detection and quantification of the amount of wooded grassland eco-system cover types as well as assessing the overall gain and loss over time. Three main land cover categories namely barren, woodland and grassland have been identified and mapped successfully using four sets of landsat images; MSS 1979, MSS 1988, ETM+ 1999 and TM 2009. The land cover feature classes were estimated to occupy; woodland 52.82% (1515 Km^2), grassland 40.24% (1154 Km^2), and barren 6.94% (199 Km^2) of the total national park area in 1979 (Deus and Gloaguen 2011).

Land cover data for the Albemarle-Pamlico peninsula was used to delineate landscape characteristics preferred by black bears and white-tailed deer (Bertwistle, 2001). Potential travel corridors were identified by ranking each land cover type (Excellent, Good, Fair, Poor, and Very Poor) according to its level of use. Data from surveys, monitors and modeling were analyzed separately and results were spatially combined. The creation of the habitat map consisted of the following two steps; defining a set of land cover classes (hereafter termed 'habitat classes') known to exist in the study area, and then using a remote sensing technique to classify the ortho- rectified imagery based on the pre-defined set of classes (Clark *et al* 2008). Five broad habitat classes were defined for the habitat map of Boulder Beach were identified as dense scrub, sparse scrub, trees, bare ground and water.

A GIS could also be useful for yellow-eyed penguin habitat restoration and tourism management. This report described how the preferred vegetation cover for nest sites can easily be determined with a GIS. This information could be valuable for

determining the type, amount and spatial layout (such as distribution and density) of vegetation that should be used in habitat restoration programs. It could also be used for predicting the potential placement or distribution of nest sites for a given year in a breeding area given the habitat types available (along with other topographical parameters) (Clark, *et al* 2008).

2.6 Protected Areas Management Effectiveness Methodologies

Several methodologies have been developed to evaluate the management effectiveness of protected areas. According to Hockings *et al* (2006), the global study has assembled and analyzed information from more than 40 different methodologies that have been applied in more than 100 countries. Assessing protected area management effectiveness is a key step in developing a protected area system master plan. The World Commission on Protected Areas (WCPA), states that while any particular assessment methodology will have an array of indicators, the framework identifies the following elements for categorizing these indicators; Context, Planning, Inputs, Processes, Outputs and Outcomes.

2.6.1 The Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) Methodology

The following are some of the protected area management methodologies (Hockings *et al* 2006); The Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) methodology is designed for broad-level comparisons among many protected areas which together make a protected area network or system. Through conducting RAPPAM assessments authorities responsible for managing systems of protected areas have been able to; analyze the range of major threats facing their protected areas system and the most pressing management issues they face, look at how the system or the group as a whole is functioning and performing and agree on corrective steps that will lead to improved system level management effectiveness (Hockings *et al* 2006).

2.6.2 Marine Protected Area (MPA) Score Card

The Marine Protected Area (MPA) Score Card is designed for marine protected areas. It consists of a data sheet to gather general information about the protected area and an assessment sheet with a total of 68 questions. It covers all elements of the IUCN/WCPA Framework.

2.6.3 Scenery Matrix Methodology (SM)

The Scenery Matrix Methodology (SM) is designed primarily for the assessment of systems of protected areas. It was developed to assess protected area management efficiency and it is appropriate for the assessment of a large number of protected areas. It was applied by the developer on 59 protected areas in the state of São Paulo (Southeast of Brazil) from the year 2000 to 2004. This methodology was tested by the author in 1998 in a total of 12 protected areas in the same state (Hockings *et al* 2006).

2.6.4 Enhancing our Heritage (EoH)

Enhancing our Heritage (EoH) project is a toolkit of methodologies detailed in the *World Heritage Management Effectiveness Workbook* (Hockings *et al* 2006), which help managers and stakeholders assess current activities, identify gaps and discuss how problems might be addressed. The assessment tools centre on identifying the main values (biodiversity, social, economic and cultural) which the World Heritage Site was set up to protect (and other important values), ensuring that appropriate objectives based on these values have been set, and then assessing the effectiveness of management in achieving these objectives (Hockings *et al* 2006).

2.6.5 Conservation Action Planning (CAP)

The Conservation Action Planning (CAP) methodology is one of three key analytical methods that support the application of The Nature Conservancy's (TNC) strategic framework for mission success, called *Conservation by Design* as cited *in The Nature Conservancy* (Leverington *et al* 2008). The basic concepts are reflected in each of the three key methods, which in addition to CAP include Major Habitat Assessment (MHA) and Eco-regional Assessment (ERA) (Hockings *et al* 2006).

2.6.6 Parks Profiles (PP)

The Parks Watch (PW) questionnaire for Parks Profiles (PP) is a detailed survey form composed of approximately 600 questions focused on managerial aspects and pressures/threats to the protected area. In 2006, a GIS component was added to the Parks Watch methodology. This is where conservation values are mapped against pressures and threats in order to determine the distribution of environmental conflicts and management needs across the protected area (Hockings *et al* 2006).

2.6.7 Environmental Management and Ecosystem-based Management System

The Environmental Management Systems (EMS) has been used by corporations to improve the environmental performance of their operations. On the other hand, Ecosystem-based Management System (EBMS) has been used by government agencies to improve management of natural resources. Although originating in different sources, both approaches merge in protected areas where there is a need to conciliate conservation objectives with economic and social concerns and needs (Mendoza *et al* 2003). The implementation processes for both management approaches follow similar steps. Parks Canada, for instance, has used an EBM approach when managing protected areas, but only recently adopted ISO 14001 as the model for an environmental management system in order to improve environmental performance on its operations and facilitate reporting (Hockings *et al* 2006).

2.6.8 Management Effectiveness Tracking Tool (METT)

The Management Effectiveness Tracking Tool (METT) is a rapid assessment based on a scorecard questionnaire. The scorecard includes all six elements of management identified in the IUCN/WCPA Framework. It is basic and simple to use and provides a mechanism for monitoring progress towards more effective management over time. The Tracking Tool has been used to survey the effectiveness of the WWF portfolio of 206 forest protected areas, in Europe, Asia, Africa and Latin America (Stolton *et al* 2007).

A questionnaire survey (Appendix 3) was undertaken to collect qualitative data and information on the perceptions of the management in the conservation regimes. The questionnaire entailed both open and close-ended questions to be able to capture different opinions about the conservation area. Follow-up questions were asked where possible to enable respondents to expand on particular topics for more understanding and information gathering (Mulonga, 2010).

The Wilderness Foundation of South Africa has promoted management effectiveness in protected areas in the Albany, Amathole-Sneeuberg and Pondoland conservation corridors through the use of the Management Effectiveness Tracking Tool, Wilderness Foundation, (2011). The East Usambara Forest landscape restoration project required a monitoring program that includes disturbance transects, the Management Effectiveness Tracking Tool, Threat Reduction Assessments (TRA), and the National Forestry and Beekeeping Database (NAFOBEDA) (Malugu *et al* 2008). Similarly protected areas which are also designated under international conventions such as the World Heritage Convention and Ramsar Convention have been asked to undertake convention specific reporting, (GEF-UNDP, 2006). According to Gachanja (2010), the assumption in the filling of the METT forms is that the forest manager and partners have information about the status of the sites and it was used to monitor the Kwale Landscape.

Every national park, marine protected area, wildlife conservancy and sanctuary shall be managed in accordance with a management plan that complies with the requirements prescribed by the Fifth Schedule. In preparing and adopting a management plan, the Kenya Wildlife Service shall consult with the county wildlife conservation committee. In the case of protected areas, the formulation and implementation of management plans shall involve the participation of neighboring communities, Wildlife Conservation and Management Act (2013).

The Management Effectiveness Tracking Tool was used for this study since it had been used to survey the effectiveness of the WWF portfolio of 206 forest protected areas in some parts of the world including the Kwale landscapes. Shimba Hills National Park

was also monitored using METT and it represents the Coast conservation area. It has also been used in Tanzania and South Africa. The tool provides a harmonized reporting system, consistent data to allow tracking of progress over time and it is suitable for replication (Hockings *et al* 2006).

The following variables were selected for assessing the management of conservation areas; international designation, legal status, protected area regulations, law enforcement, demarcation, management plan, resource inventory, education awareness program, regional planning, economic benefits assessment, park fees and biodiversity assessment. Themes and the involvement of stakeholders in the management of conservation areas informed the choice of this methodology for this research. The research questions that guided this study were;

- How can the management Effectiveness Tracking Tool be used for effective and sustainable wildlife resource management?
- Which management regime is preferred by the communities?
- How do different Wildlife management regimes rate according to the METT analysis?

2.7 Theoretical Framework for Wildlife Conservation Area Management Systems

According to Boggs, 2000 an Child *et al*, (2012), centralized and privatized control of resources has been the predominant management strategy since the early 20th century. The challenge of our generation is to internalize the costs and benefits of eco-system services in the livelihoods and land use decisions of the rural people who co-exist with biodiversity in the manner that has been attempted by wildlife. The "Tragedy of the commons theory" states that it is an economic problem where every individual tries to reap the greatest benefit from a common resource (Hardin, 1968).

However, as if in direct challenge to the theory, state managed resources have experienced frequent and chronic declines in the past several decades. The Common Property Theory (CPT) reveals several general criteria that appear critical for successful long term commonly managed resources. These include autonomy and

recognition of the community as an institution, proprietorship and tenurial rights, rights to make the rules and viable mechanisms to enforce them, and ongoing incentives in the form of benefits that exceed costs (Boggs, 2000).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Description of the Five Conservation Study Areas

In the previous chapter, conservancies and protected areas, resource conflicts, wildlife conservation strategy, planning and policy, GIS and remote sensing for wildlife and land management, and protected area management effectiveness methodologies were considered by reviewing other similar studies. The purpose of this research was to assess the public acceptance of wildlife conservation areas in Kenya. According to Kothari (2004), research comprises defining and redefining problems, formulating hypothesis or suggested solutions, collecting, organizing and evaluating data, making deductions and reaching conclusions. Quantitative and qualitative data, Management effectiveness tool and landsat satellite images were used for this study. A pilot study to test the household questionnaires was carried out in one of the study sites. The following is an outline of the study sites, data sampling, data collection and analysis procedures.

The five conservation areas for this study were Coast, Tsavo, Southern, Central Rift and the Mountain region conservation areas (Fig. 3.1). These study areas were chosen due to their unique ecosystems which influenced the habitats for Wildlife. Each conservation area had a state park managed by the Kenya Wildlife Service, a community conservancy and/or a private conservancy. The descriptive information for each conservation area is in (Table 3.1).

The following variables were used for household data collection and analysis; type of resources, diminishing resources, conservation of resources, benefits of managing resources, resource conflicts, best land use for the area and stakeholder involvement in decision making. The landsat images used were for a twenty two year period from 1988 to 2010, while the Management Effectiveness Tracking Tool was used for evaluation of the management of conservation areas.

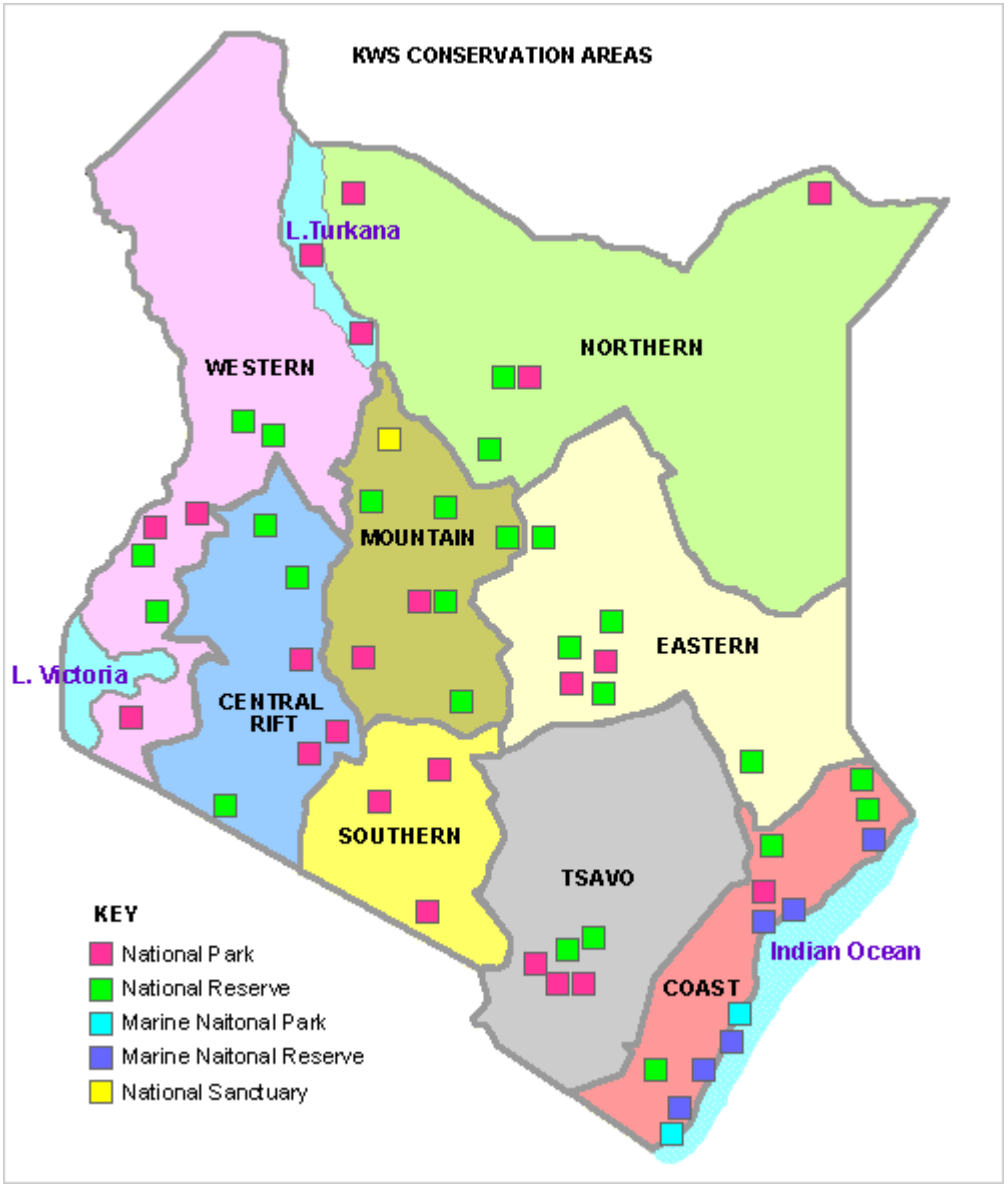


Figure 3.1 KWS conservation areas: Source, KWS, (2012).

Table 3.1 Brief Descriptions of the Five Conservation Areas in Kenya

Serial Number	Conservation Area	Flora, Fauna and Landscapes	Local communities	Socio-economic activities
1.	Coast Conservation Area i) Shimba Hills National Park ii) Mwalughanje Elephant Sanctuary	Dinosaur Cycads, Baobab trees, Sable and Roan Antelopes, African Elephants, Giraffes, Leopards (KWS,2010)	Digo, Duruma, ,Kamba, Taita and other immigrants	Farming, livestock keeping, Conservancy, Commercial activities
2.	Tsavo Conservation Area i) Tsavo East and West National Parks ii) Rukinga Wildlife Sanctuary	Forests, Shrubs, Thickets, Riverine vegetation, Deciduous woodlands, African Elephants, Mane-less Lions, Landscapes (Wijngaarden and Engelen,1985)	Taita, Taveta, Duruma, Somali, Chagga	Farming, Livestock keeping, Conservancy, Commercial activities
3.	Southern Conservation Area i) Amboseli National Park ii) Kimana Community Wildlife Conservancy	Forests, Acacia woodlands, Shrubs, Thickets and Swamp vegetation, African Elephants, Wildebeest, Zebra (McLaughlin *et at* 1973) (Makonjio,2009)	Maasai, Kamba, Kikuyu, Chagga, Meru, Taita	Farming, Livestock keeping, Conservancy, Commercial activities
4.	Central Rift Conservation Area i) Lake Nakuru National Park ii) Soysambu Conservancy iii) Malewa-Kigio Conservancy	Forests ,Shrubs, Thickets, Riverine vegetation, Flamingo, Bufallo, Zebra, Rothschild giraffe, Gazelles, (KWS,2001) Ramsar sites	Kalenjin, Kisii, Maasai, Kikuyu, Kamba, Luhya, Luo, Meru	Farming, Livestock keeping, Conservancies , Commercial activities
5.	Mountain Conservation Area i) Mt. Kenya National Park ii) Ol Pejeta Conservancy iii) Il Ngwesi Community Conservancy	Forests, Moorland, Montane, Heath, Snow,Shrubs, Riverine vegetation, African Elephant, Black Rhino, Bongo, Chimpanzee, (KWS,1992),(Graham *et al*,2009)	Meru, Kikuyu, Maasai, Samburu, Somali	Livestock keeping, Farming, Conservancy, Commercial activities

3.2 Location and Baseline Information for the Five Conservation Areas and Regimes

Protected areas are the cornerstones of biodiversity conservation, they constitute an important stock of natural, cultural and social capital, yielding flows of economically valuable goods and services that benefit society, secure livelihoods, and contribute to the achievement of Millennium Development Goals (MDGs). The existing national parks and reserves encompass only parts of the most important ecosystems and habitats that range from wetlands, savannah, forests, mountains to arid and semi -arid zones in the country (Rotich,2012). The five conservation areas were sampled out of eight conservation areas identified by the Kenya Wildlife Services. These conservation areas represent unique ecosystems and forms three quarters of the country's conservation areas. In each conservation area are several parks and reserves headed by wardens who report to the assistant directors. The conservation regimes were state parks, private and community conservancies in each conservation area. The choice of private and community conservancies for this study was purposeful and was premised on the willingness of the management to participate in the research.

The Coast Conservation area was represented by Shimba Hill National Park and Mwalughanje Elephant Sanctuary (MES). Tsavo East and West National Parks and Rukinga Wildlife Sanctuary represented the Tsavo Conservation Area (TCA). The Southern Conservation area was represented by Amboseli National Park and Kimana Community Wildlife Sanctuary (KCWS). Lake Nakuru National Park, Soysambu Conservancy and Malewa-Kigio Conservancy represented the Central Rift Conservation area. The Mountain Conservation area was represented by Mt. Kenya National Park, Ol Pejeta Conservancy and Il Ngwesi Community Conservancy (Fig. 3.2).

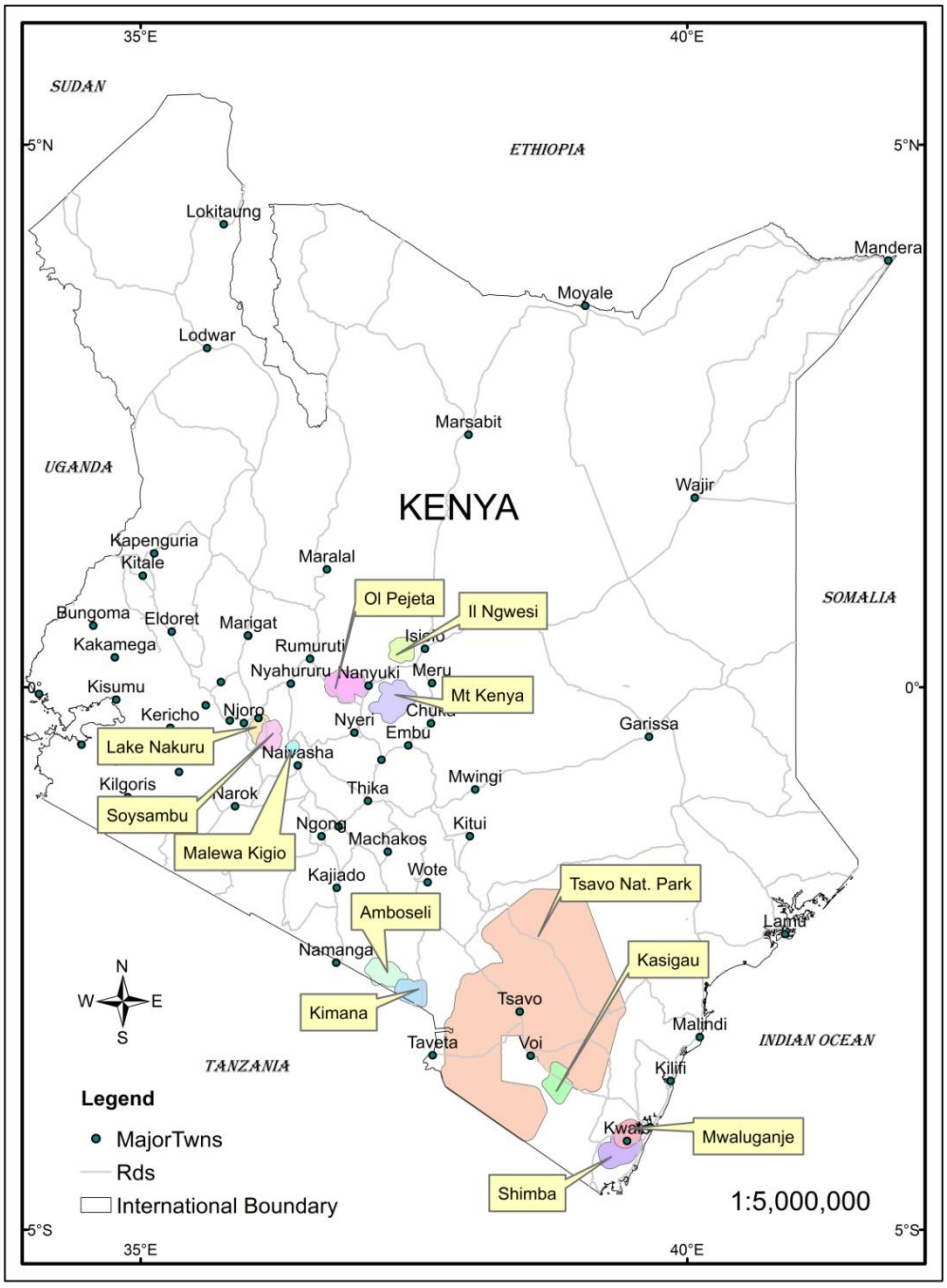


Figure 3.2. Location of the five conservation areas and regimes in Kenya: Source, Author, (2012).

3.2.1 Coast Conservation area

3.2.1.1 Shimba Hills National Park

Shimba Hills National park is located in Kwale district of Coast province and is approximately 30 Km South- West of the coastal city of Mombasa. The Park occupies 24,000 ha and is marketed as a landscape conservation area with beautiful sceneries, coastal bush land, riverine forests and coastal rainforest (Plate 3.1). The flora in the Shimba Hills eco-system has a wide variety of different plant species and several wildlife species including the endangered Sable antelope (*Hippotragus Niger*), (KWS 2010). The neighboring communities are the Digo, Duruma, Kamba and the Taita emigrants. These communities practice mixed farming.

Plate 3.1. Part of the Shimba Hills National Park ecosystem from Pengo Hill

3.2.1.2 Mwalughanje Elephant Sanctuary (MES)

Mwalughanje Elephant Sanctuary (MES) was set up to protect 2,428 ha of traditional elephant migration route. The climate is hot and moist and is cooler than at the sea level and the annual rainfall is between 855 – 682 mm and the mean annual temperature is 24.2°C. The plant bio-diversity comprises of heterogeneous habitat including forestlands, exotic plantations, woodlands and grasslands.

The migratory routes range from sea level stands of Baobab trees along the coast to moist deciduous forests on the hills and rain forests along the watercourses. The Mwalughanje Elephant Sanctuary was started as a wildlife enterprise in 1992 with 300 shareholders. Every year the landowners are compensated from the benefits accrued from the sanctuary. The Sanctuary is currently facing some challenges from members complaining that compensation is not enough due to lack of revenue (Litoroh, *et al* 2000; Kamula, 2003).

3.2.2 Tsavo Conservation Area

3.2.2.1 Tsavo East and West National Parks

Tsavo East and West National parks were established in 1948 and ten years after, concern arose about considerable changes in the vegetation, particularly in Tsavo East National Park. The original deciduous woodlands dominated by Acacia Commiphora (*Commiphora myrrha* and *Acacia spp.)* were being replaced in some areas by much more open woodlands. The major causes were thought to be over utilization of trees by elephants (Wijngaarden and Engelen1998). Tsavo West National Park is marketed as a landscape park (Plates 3.2) KWS (2008).

Plate 3.2. Shetani Lava flows in Tsavo West National Park

The Tsavo ecosystem covers over 40,000 Km² with much of it occupied by the Tsavo East and West National Parks. The two parks occupy about 21,000 Km² with the remaining area being occupied by ranches. The TCA holds significant wildlife populations, including Kenya's largest single elephant population, numbering about 12,000 animals (Ngene *et al* 2011). Some of the mammals that are found in the Tsavo eco-system are African Elephants (*Loxodonta Africana),* the Mane-less Lions (*Panthera leo*). There are about 500 recorded bird species such as the rare Somali ostrich (*Struthio camelus molybdophanes*) (Plate 3.3) (Wijngaarden and Engelen, 1998).

Plate 3.3. Somali Ostrich in Tsavo West National Park

3.2.2.2 Rukinga Wildlife Sanctuary

The sanctuary occupies 32374 ha and forms an important corridor for migration and dispersal of large mammals. It supports a significant concentration of African elephants with as many as 1500 using the corridor either as dispersal and feeding area or to move between the Tsavo East and West National Parks seasonally. There are estimated to be approx. 35,000 people within 5 Km of the ranch boundary. An investment group (Wildlife Works) eventually purchased the Rukinga ranch to use for tourism – safaris and animal observation. The dominant soil type within Rukinga Ranch is red laterite soil typical of this region of Kenya.

There are small bands of black cotton soils randomly distributed within the ranch that account for a tiny insignificant element from the standpoint of the other soils. There are also areas within the Ranch boundaries where Gneiss Islands or rocky outcrops penetrate the soils to form small rocky hills.

Rukinga Wildlife Sanctuary provides a home to several key species of interest including; an average population of African elephants (*Loxodonta africana*) estimated between 200 and 300 elephants, a wide range of other species such as the carnivores, primates, rodents, reptiles, amphibians, and over 300 avian species (Wildlife Works, 2008). According to a research by the Wildlife Works (2008), the Taita people are the local agents of deforestation since they have traditionally farmed the fertile cloud forested hills of the Eastern Arc Mountains, Kasigau, and the Taita Hills. As their population exceeded the carrying capacity of the land on the hills they moved down into the dry land where Acacia Commiphora (*Commiphora myrrha)* dominates the lower elevations of the district (Wildlife Works, 2008).

Plate 3.4. An organic greenhouse growing citrus seedlings at Rukinga Wildlife Sanctuary Source: (Wildlife works, 2011).

Wildlife Works established an organic greenhouse to grow citrus trees, which were sold at a discount to local farmers, (Plate 3.4) (Wildlife Works, 2011). The recent project involved working with the Kenya Agricultural Research Institute (KARI) to cultivate a

climate appropriate plant called Jojoba (*Simmondsia chinensis*). It provides a cash crop through its seeds and is extremely drought tolerant; non-invasive and it is not eaten by Wildlife, birds or even insects. The communities viewed it as the ultimate non-conflict crop. The sanctuary provides local farmers root stock to establish their own plants.

3.2.3 Southern Conservation Area

3.2.3.1 Amboseli National Park

The Amboseli ecosystem is known Worldwide as one of Kenya's greatest conservation areas and is recognized as a landscape where humans, livestock, and wildlife have co-existed for centuries. It was given the status of a Biosphere Reserve by UNESCO I 1991 so as to ensure the long-term conservation of biodiversity, which was under serious threat from the changing land use patterns. Amboseli National Park is located in Rift Valley Province, Loitokitok District, Kenya. It lies between latitude 2^{0}33' and 2^{0}45'S and longitude 37^{0}06 E and 37^{0}24'E. It is on the border with Tanzania, North – West of Mt. Kilimanjaro, West of the volcanic Chyulu Hills and East of Namanga (Oldonyo Orok) hill (Ministry of Education, 2011-2012).

The Longinye, Enkongo Narok and Ohukai Orok swamps and Lake Amboseli (dry except in prolonged wet seasons) in the park are fed by underground springs from Mt. Kilimanjaro (Plate 3.5). Together with Namalog Swamps located outside the park, these are the only sources of permanent sources of water in the region and constitute major watering points for animals (Ministry of Education 2011-2012). The Maasai, the Kambas, Kikuyus, Taita and other communities practice farming and livestock keeping next to the park.

Plate 3.5. Enkongo Narok swamp in Amboseli National Park

There are four types of semi-arid vegetation in the Amboseli eco-system which are the; Acacia *commiphora*, Acacia bush land (10%), saline/alkaline plains (50%) with Austral seablite (*Suaeda monoica*) and Salt bush (*Salvadora persica*), Acacia woodland with yellow-barked acacia (*A. xanthophloea)* and Acacia tortilis (*A. tortilis),* and the remaining 10% swampland, which supports Sedges (*Cyperus spp*.,) (KWS, 1991). Only swamps and riverine areas are suitable for agriculture while the entire range is suitable for wildlife and pastoralism (Makonjio, 2009). Several animals were weak and emaciated during the 2009 drought (Plate 3.6).

Plate 3.6. Emaciated Wildbeeste and Zebra in Amboseli National Park during the 2009 drought.

3.2.3.2 Kimana Community Wildlife Conservancy

Kimana Community Group Ranch (KCGR) is located within Loitoktok Division of Kajiado District with Amboseli National Park to the West and Tsavo West National Park to the East. The group owns Kimana Community Wildlife Conservancy (KCWC). The topography of the district is composed of the plains and some volcanic hills. Kimana Sanctuary is an isolated swampy area of 6,000 ha located in the dispersal areas of Amboseli and Tsavo West National Parks (Fig. 3.3). The topography is essentially flat with areas of woodlands and open grasslands. The Kimana and Isinet streams flow into the Kikaranko River. The Western area of the ranch bordering the swamp is cultivated (Mburu and Biner, 2002). Kimana group ranch has a bimodal rainfall pattern significantly influenced by its high altitude and proximity to Mt. Kilimanjaro (Ellington, 2008).

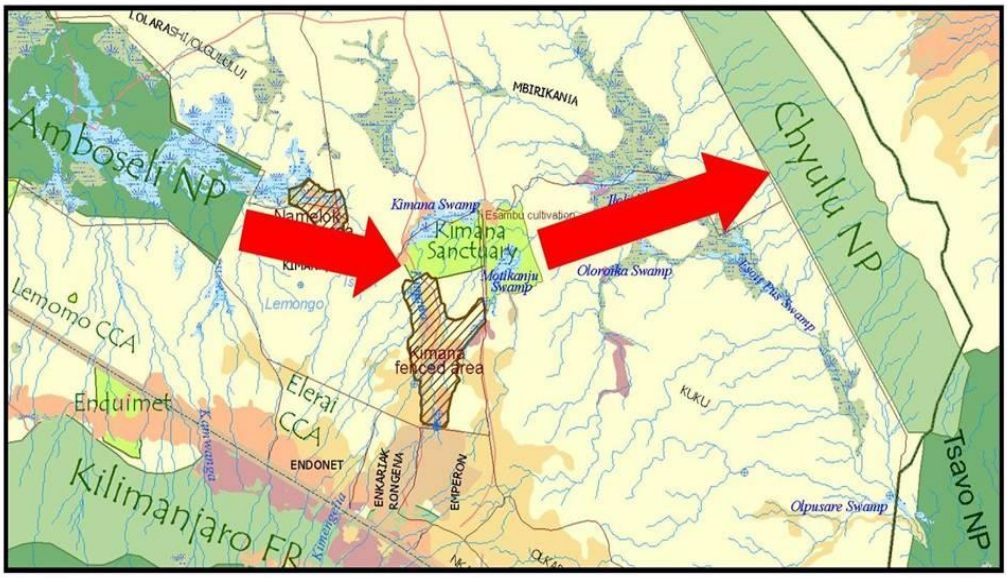


Figure 3.3. Location of Kimana Conservancy, Source: Wetlands International, 2012

The area has traditionally been used by the Maasai pastoral community to graze their livestock on a communal basis. Recently however, non-maasai migrants have established permanent agricultural fields around the Ranch's important wetland areas leading to conflict over water. The sanctuary has been leased to the African Safari Club

(ASC) to manage on behalf of the community. A few members of the group ranch committee are directly involved in collecting lease fees, managing tourist lodges and solving grazing disputes between ASC and landowners (Makindi, 2010).

3.2.4 Central Rift Conservation Area

3.2.4.1 Lake Nakuru National Park

Lake Nakuru National Park is located at 36^0 05' E and 0 24^0 S. In 1961 the Southern part of the lake was designated as a bird sanctuary under the management of the Kenya Royal National Park. In 1964, the bird sanctuary extended to cover the lake and the shoreline while in 1968, the lake and the shore covering 6,000 ha was officially gazetted as a National Park. The park lies in the Rift valley bottom or lowland and is bordered to the North by Menengai crater, to the East by Bahati escarpment, to the South by Eburru Escarpment and to the West by Mau escarpment. The lake and the catchment area, is rich in a variety of habitats and it is a Ramsar site (KWS, 2001).

In the Upland forests there are multiple land use types such as pastoralism, large-scale commercial farms and ranches in the last century. Increased farming and developments in Nakuru town and other urban centers have impacted negatively on the environment. This is through increased erosion, high silt loads, pollution from industrial, domestic wastes and agro-chemical wastes. There is also degradation, deforestation and encroachment into sensitive habitats, habitat fragmentation which contributes to drying up rivers (Plate 3.7). Thick moist upland forest covers the upper reaches of the highlands, which are the source of surface flow into Lake Nakuru. Nakuru town is a cosmopolitan town where several ethnic communities co-exist such as the Maasai, Kalenjin, Luhya, Kikuyu, Kisii and Kamba.

Plate 3.7. Buffalos and Zebras in river Njoro in Lake Nakuru NP during the dry season

3.2.4.2 Soysambu Conservancy

Soysambu Conservancy is located in the Central Rift Valley, (036°23'E 00°46'S) which is part of Africa's Great Rift Valley. Lake Elementeita is the 5th Ramsar site in Kenya enlisted as a wetland of international importance in June 2005 mainly due to its role as a refuge for threatened, vulnerable and endangered species of birds (Soysambu Research, 2008). The Conservancy was created in 2008 as an entity to conserve the flora, fauna and scenery of the former ranch and it occupies an area of 19424.9 ha (190 Km^2). The Sanctuary has wooded savannah and grasslands.

The dry season wildlife census of October 2008 indicated that the conservancy had a total of 11,697 of wild animals (Soysambu Research, 2008). Some of the wild animals in the conservancy are the Rothschild Giraffe (*Giraffa camelopardalis),* Leopard (*Panthera pardus),* Zebra (*Equus burchellii)* and Hyena (*Crocuta crocuta).* There are 46,922 water birds of 52 species which were recorded in March 2008. The Pelican (*Pelecanus erythrorhynchos)* was the largest group of the water birds with a population of 21,094 and the Flamingos (*Phoenicopteridae)* followed with 6914 bird, (Soysambu Research, 2008).

There have been attempts at all kinds of ventures including ostrich, sheep, goat and cattle farming, wheat, sorghum, hay, irrigated oranges, vegetables and potatoes, charcoal production, forestry, tourism ventures and mining around the lake. It was found that the most productive use of the land was the making of hay and the farming of hybrid Boran cattle, a rustic species indigenous to North Kenya. This is combined with wildlife resources (Plate 3.8).

Plate 3.8. A herd of cattle reared at Soysambu Conservancy

3.2.4.3 Malewa- Kigio Conservancy

Malewa - Kigio Wildlife Conservancy covers 1,416.40 ha and it is situated in the Rift Valley between Nakuru and Naivasha in Kenya. The conservancy is privately owned but it incorporates the neighboring communities in a Co-operative society. The communities are involved in sustainable environmental management. The conservancy is at the forefront of eco - tourism in the Rift Valley lakes (Lakes Naivasha, Elementaita, and Nakuru) and it is also in close proximity to Mt. Longonot, Hells Gate and Lake Nakuru National parks. There exists a wide range of habitats from riverine and euphorbia woodlands to short grass and Leleshwa shrubs or African sage

(*Artemisia tridentata*) (Plate 3.9). The conservancy holds approximately 3,500 heads of wildlife including the endangered Rothschild Giraffe, a 200 strong herd of Buffalo, Impala, Grant's and Thomson's gazelle, Eland among others and over 250 bird species (www.kigio.com, 2009).

The conservancy is protected by an electric fence on three sides and the Malewa River on the other side. There are two lodges in the conservancy; the Malewa Wildlife Lodge and Kigio wildlife lodge. These lodges are surrounded by the yellow fever tree (*Acacia xanthlopholea*) (www.kigio.com, 2009).

Plate 3.9. Leleshwa (African Sage) vegetation in Malewa - Kigio Conservancy: (March, 2009)

The conservancy started a number of projects in collaboration with the villages bordering the conservancy such as the school firewood project, community products by the Mwitumberia Women Group, handmade carpets made by the local artisans, community tours, Lamwe Organic Farm, Environmental Education, and Waste management. The Kalenjin, Maasai, Kikuyu and Meru communities occupy the conservancy neighborhoods.

3.2.5 Mountain Conservation Area

3.2.5.1 Mt. Kenya National Park

Mt. Kenya is located on the equator 180 Km North of Nairobi. It is a solitary mountain of volcanic origin with a base diameter of about 120 Km and at an altitude of 5,199 m with deeply incised u-shaped valleys in the upper parts (Plate 3.10). Mt. Kenya is a World Heritage site (Gathaara, 1999). There are twelve small glaciers remaining from the earlier glacial periods and which are receding rapidly and may disappear during the next century (KWS, 1992).

The Mountain is a water catchment area with several rivers flowing in different directions (Plate 3.11). Some of the rivers have curved deep valleys with steep gorges such as the Sirimon gorge. The Northern part of the Mountain is exceptional to this general description. The ground is more gently undulating with fewer streams. There are a number of volcanic cones and craters such as Ithanguni and Rutundu cones.

Plate 3.10. A section of Mt. Kenya National Park

Plate 3.11. River Tigithi flowing down from Mt. Kenya through the Park

The altitude variation on Mount Kenya leads to changes in climate. The wettest part of the Mountain is to the South - East which receives up to 2,500 mm of rainfall per year. The mountain is driest to the North which receives less than 1000 mm. The altitudes with the highest rainfall are between 2,700 m and 3,100 m. Rainfall decreases with altitude and above 4,500 m, most precipitation falls as snow or hail. Temperature also varies considerably with altitude but the average temperature at 4,750 m is 0°C (KWS, 1992).

Mt. Kenya National Park has the following vegetation zones, the Nival Zone lies above 4,500 m and the vegetation is mostly mosses and lichens (KWS, 1992). The afro-alpine zone lies above 3,500 m where the moorland is characterized by tussock grasses. The most notable adaptations are Giant groundsels, Cabbage groundsels, and Giant lobelia. High altitude Heath lies between 3,000 m and 3,500 m. The habitat is characterized by shrubs with small leaves. These include Heathers (*Calluna vulgaris*), African Sage (*Salvia aethiopis*), Protea (*Protea cynaroides*) and Herichrysum (*Helichrysum petiolare*). The Upper forest zone lies above the Bamboo zone and is characterized by smaller trees scattered in glades. The dominant species are East African Rosewood (*Dalbergia melanoxy*) and St. John's wort (*Hypericum perforatum*). Many of the trees are festooned with mosses and old man's beard trees (KWS, 1992).

The Bamboo zone forms a dense belt between 2,500 m and 3,200 m. The belt is thickest where it is moistest on the South - Eastern side of the mountain. It is absent entirely on the Northern side. The Montane forest descends as low as 2,000 m and the characteristic species are Pencil Cedar and Podo.

The threats and damages to Mt. Kenya forest were recorded as charcoal production, cultivation of marijuana (*Canabis sativa*), fire occurrences, Shamba (mixed farming) system practices in the forests, grazing of livestock and logging of Camphor, Wild Olive and East African Rosewood (Gathaara,1999). Mt. Kenya has a wide variety of Wildlife and six species of large mammal of international conservation interest occur within the forests. Some of these mammals are the African Elephant (*Loxodanta africana*), Black rhinoceros (*Diceros bicormis*), Leopard (*Panthera pardus*), Giant forest hog (*Hylochoerus meinertzhagen*), Bongo (*Tragelaphus eurycerus isaaci*) among others (KWS1992).

3.2.5.2 OL Pejeta Conservancy

The Ol Pejeta conservancy (OPC) is located in the Laikipia plains between the foot hills of the Aberdares and the magnificent snowcapped Mt. Kenya to the East. The conservancy covers 370 Km^2 or 36421 ha of savanna on the Laikipia Plateau, in North-Central Kenya, and at N0°.00' – E 36°.44' – 36°.59' S0°.02'. The Ewaso Ngiro River with tributaries from Mt. Kenya and the Aberdare Ranges flows through the conservancy. The vegetation is a mosaic of grassland, *Acacia drepanolobium* woodland, *Euclea divinorum* bushland, and riverine woodland dominated by *Acacia xanthophloea.* Black cotton soils dominate the conservancy.

Ol Pejeta Conservancy boasts of an astounding variety of animals including the non-indigenous chimpanzees (*Pan troglodytes*) and the big five (the endangered black rhino, leopard, elephant, buffalo and the lion). It is also the biggest Black Rhino (*Diceros bicornis)* Sanctuary in East Africa. Irrigated small-scale farming occurs on

densely settled smallholder land to the East and Southwest of OPC (Omondi, *et al* 2002).

This single conservation unit accommodates both wildlife and cattle ranching (the latter are now corralled at night in predator proof 'bomas' (Cow shed). The conservancy holds the largest single herd of pure Boran cattle in the World. It uses the integrated model of conservation where livestock and Wildlife are reared. Elephants frequently break out of the conservancy to raid crops on the surrounding smallholder land. A single live electric wire was added to the stock fence to minimize crop raids. However this was not effective and human - elephant conflict continued to be a major problem for the communities neighboring Ol Pejeta, (Omondi, *et al* 2002). There are approximately 300 to 400 elephants that live within the conservancy, (Graham, *et al* 2009). The conservancy has Community Outreach Programs focusing on health, education, water, roads, agricultural extension and community based eco-tourism. The neighboring communities are the Samburus, Merus, Maasais and the Kikuyus.

3.2.5.3 Il Ngwesi Community Conservancy

Il Ngwesi Group Ranch (GR) which is also known as (Il Ngwesi community conservancy) lies between 0º 16′ and 0º 25′ N and 37º 17′ to 37º 26′ E, (Harrison, 2001). This group ranch consists of 8,645 ha of community managed land located in Mukogondo Division, Laikipia District, North of Mount Kenya, (UNDP, 2012). Il Ngwesi meaning "People of Wildlife" in Laikipia Maasai language was among the first community- led conservation initiatives established in Northern Kenya.

The ranch was established in 1995 with the aim of producing extra income from tourism and regenerating wildlife populations with the assistance of Lewa Conservancy. Il Ngwesi Lodge sits next to the Ngare Ndare River, on the edge of the Mukogondo Hills which is mostly semi-arid or arid savannah land. The Group Ranch is split up into a settlement area and a conservation area.

The core area has a radius of 5 Km^2 while the buffer area totals 6,000 Ha. Grazing in the buffer area is regulated and is not permitted after the rains to allow good grass growth (www.nrt-kenya.org/ngwesi).

The highlands to the West are largely occupied by the upland-dry forests of the Mukogondo Forest Reserve and the grassland plains of Anadanguru. The medium altitudes of the plains are characterized by wooded grassland savanna, a mixture of grasses, dense thorn-shrub thickets (Harrison, 2001). The conservancy supports a range of large vertebrate species, both migratory and permanently resident. These include Gerenuk (*Litocranius walleri),* Reticulated giraffe (*Giraffa camelopardis*), Reedbuck (*Redunca fulvorufula*) and the African elephants (*Loxodonta africana*) are seasonal visitors. The ranch is also home to over 250 bird species, (Harrison, 2001). The cultural boma (Maasai Kraal or huts) was formed in 1997 by self-help group members from Ntalaban and Loburua clans. The lodge employs 35 people from the local community.

The conservancy employs seven community Game guards that patrol the ranch daily, especially the Northern border, where poaching and illegal grazing remains problematic, (Il Ngwesi Conservancy Area - Laikipia, 2009). Holistic land management is Central to Il Ngwesi's strategies for conservation and development. Many of its successes are based on having diversified income sources for its pastoralist communities, as well as ensuring the security of the conservation area (UNDP, 2012).

3.3 Sampling and Sample Sizes

The research data was collected between August 2008 and December 2010 at the Coast, Tsavo, Southern, Central Rift and Mountain conservation areas. The household data, Management Effectiveness Tracking Tool and landsat satellite images were used to assess the effectiveness of different management systems and public perception of wildlife conservation areas in Kenya. Purposive and simple random sampling techniques were used for getting data. Data on community characteristics and land use and land cover was confined to a 5 Km buffer zone of each of the conservation areas.

The population of people was divided into clusters according to the conservation area and regime. For each cluster a simple random technique was then applied to identify sample homesteads. Structured or semi-structured questionnaires were used to collect data from the homesteads. The different questionnaires sought information on community characteristics, resource access and sharing, public benefits and costs associated with conservation areas and community involvement in conservation management.

The Management Effectiveness Tracking Tool questionnaire from WWF was used for assessing the conservation area management in the conservation areas. The questionnaires targeted information on international designation of conservation areas, legal status, use of protected area regulations, law enforcement, demarcation of conservation areas, use of management plans and resource inventories, education awareness program for communities and incorporation into local regional plans. Other aspects were on local community involvement in decision making, charging of park entry fees, condition assessment of the bio diversity and economic benefit assessment to the local communities. The conservation management included the senior warden and senior research officers who provided information on the respective conservation areas. Landsat satellite images were used to assess the state of the environment. Data was analyzed using the Statistical Package for the Social Sciences (SPSS), ArcGis 9.3 and ERDAS IMAGINE 9.1.

3.4 Data Collection and Analysis

Primary and secondary data were used in this study. Secondary data was gathered from libraries, research institutions, journals, census data, project proposals, conservation projects and websites. Primary data comprised questionnaires and interviews from household surveys which were used to assess communities living next to conservation areas.

The Management Effectiveness Tracking Tool was used for assessing the management of conservation areas while landsat images were used to assess land cover and land use for the past twenty years. The household questionnaires included closed-ended questions on community characteristics such as gender of head of household, family set up, level of education, marital status and means of sustaining the family. Resource access and sharing was assessed based on practiced land use, land ownership, types of resources and perception on diminishing resources.

Assessment on conservation management was based on some selected variables from the WWF Management Effectiveness Tracking Tool which included these variables; type of management regimes, international designation categories, legal status, protected area regulations, law enforcement, demarcation, management plan, resource inventory, education and awareness program, local communities involvement, economic benefits, park fees and condition assessment. The landsat images were used to assess the land cover and land use changes for a twenty two year period (1988 - 2010), and they were sourced from the Regional Centre for Mapping of Resources and Development (RCMRD), Kenya.

3.4.1 Data Collection for Household Surveys

Research permits were obtained from the Ministry of Higher Education Science and Technology (MHEST) and also the Kenya Wildlife Service (KWS) to allow entry into the parks, Appendix 1 and 2. Five conservation areas were sampled out of eight conservation areas as listed by the Kenya Wildlife Service. Three conservation regimes were considered in each conservation area namely state managed parks, private conservancies and community conservancies. However, due to logistics and in some instances lack of willingness by target regions to participate in the research not all the studied areas had the three management regimes. Households were used as the basic research units and the head of the household was the main respondent.

The overall key themes identified and used for data collection on household survey were on; i) community characteristics, type of resources, diminishing resources, conservation of resources, benefits of managing resources, resource conflicts, best land use for the area and stakeholder involvement in decision making, ii) for resource access and sharing were; type of land use practiced, land ownership, types of resources, sharing of resources and diminishing resources, iii) public benefits and costs associated with conservation areas were; problems experienced from wild animals, types of conflicts, type of animal, conservation benefits and expected solutions, iv) community involvement in conservation management was assessed using conservation of resources, management of environmental resources, stakeholder input and environmental awareness.

3.4.2 Sampling of Household Data

Population data of households was obtained from the 2009 population census from the Kenya National Bureau of Statistics (KNBS) (2010). The number of persons enumerated during 2009 Population and Housing Census is 38,610,097 representing an increase of about 35 percent from the 1999 census. Of this, 19,192,458 are males while 19,417,639 are females.

Each conservation regime in the five conservation areas was referred to as a 'study site' where most households falling within the buffer zone were interviewed.

Random and purposeful sampling was used to identify and select respondents. Purposeful sampling was used where a population was represented by a cluster. Data collection techniques involved the use of questionnaires, interviews, observation and existing secondary data. The questionnaires were structured with closed ended and checklist options for household surveys, Appendix 13. Direct observations were used to clarify information from the respondents.

Research assistants from each conservation area were preferred due to their knowledge of the local area. They were subsequently trained on the contents of the questionnaires. The questionnaires were pre-tested at the Central Rift Conservation area to improve

clarity and to add new information. This provided the internal validation of the household questionnaire. The duration of administering the questionnaires was determined by the infrastructure, availability and willingness of respondents, the terrain and weather conditions in the conservation areas. The household survey was conducted from August 2008 to December 2010.

3.4.3 Sample Size Formula and Calculation

The sample size was calculated using the formula by Kothari (2004), which was derived as shown:

$$n = \frac{\frac{p(1-p)}{e^2}}{Z^2} + p(1-p)N/R$$

Where:

n = sample size required

N = number of people in the population

P = estimated variance in population, as decimal: (0.5 for 50-50)

e = Precision desired (5%)

Z = based on confidence level: 1.96 for 95% confidence

R = Estimated Response rate (75%)

Substituting these values the following is deduced:

$$n = \frac{Z^2 p(1-p)N}{e^2(N-1) + Z^2 p(1-p)}/R$$

Purposeful sampling was used along the 5 km buffer zone from the conservation area boundaries. The population and sample sizes for all study sites are herein (Table 3.2) (KNBS 2009).

Table 3.2 Household sample sizes for conservation areas and regimes in Kenya

Conservation Area	Household surveys and sampling formula; $n = \frac{\frac{p(1-p)}{e^2}}{Z^2} + p(1-p)N/R$		
	Population clusters in sub- locations	Population Size	Sample Size Used
Coast Conservation area Shimba Hills National Park	Shimba Hills (318), Kudutsi (1511) and Majimboni(345)	N = 2174	n=344 n=71 sample size used
Mwalughanje Elephant Sanctuary			
Tsavo Conservation area Tsavo East and West National Parks	Mtito Andei(3077), and Maungu(1686)	N = 4,763	n=752 n= 120,sample size used
Rukinga Wildlife Sanctuary	Marungu(402),Taita discovery center(124)	N = 526	n = 83.1 n=41, sample size used
Southern Conservation area Amboseli National Park	Namelock A and B (1245), Oloile(820),Impiron(950), Maisuati(635).	N=3650	n = 577, n=40, sample size used
Kimana Community Wildlife Sanctuary	Mashamba Mapya (1565), Kimana 'A'(800), Kimana T.C (855) and Maisuati(848).	N = 4,068	n = 642.6 n=34, sample size used
Central Rift Conservation area Lake Nakuru National Park	Mwariki(2500), Lake view (6714), Baharini(2329) and Bagaria (783)	N = 4068	n = 1,947.1, n=112,sample size used
Soysambu Conservancy	New Game (1105),Mahiga (923) and Elementaita (1309)	N = 3337	n =527.1, n=33,sample size used
Malewa –Kigio Conservancy	Naivasha Urban(445), Karunga (5355), Kampi Somali (755) and Malewa (2400),Gigil (1149)	N =10104	n=750.1,n=31,sample size used
Mountainous Conservation area Mt. Kenya National Park	Ruirie(4162), Gathiuru(4105), Kamburani(813)	N = 9080	n=1434.3, n= 110,sample size used
Ol Pejeta Conservancy	Tigithi (1,560), Matanya(2,535), Lamuria(825) Marura(541)	N = 5461	n=862.6 n= 56,sample size used
IL Ngwesi Conservancy	Mutunyi(695, Ruiri(2993), Ngare Ndare (250)	N = 1938,	n = 306.1,n=34,sample size

3.4.4 Statistical Analysis for Household Surveys in Conservation Areas

The data analysis for household surveys was to test the hypotheses that; there is no relationship between resource access and sharing; there are no disadvantages of living next to conservation areas and stakeholder involvement is not beneficial to conservation. The overall respondent data was analyzed using the Statistical Package for the Social Sciences (SPSS 9.0). The "Statistical Package for the Social Sciences" (SPSS) is a package of programs for manipulating, analyzing, and presenting data; the package is widely used in the social and behavioral sciences. The SPSS was used to perform tasks such as data entry and coding, frequencies, descriptive analysis, inferential statistics such as the Pearson's Correlation and Chi square tests and Wilcoxon Signed Ranks Test.

The process of data analysis involved checking of erroneous data and making corrections. In addition, variable types were defined, coded data was transformed and frequency tables created. This was followed by checking the quality of data using frequency counts, descriptive statistics and measures of associations and relationships.

Correlation and tests for associations, Wilcoxon Signed Ranks Test was used to test these variables; type of natural resources, diminishing resources, conservation of resources, benefits of managing resources, resource conflicts, type conflicts, type of wild animal, conservancy benefits, community view on conservation areas, disadvantages of living next to the park, conflict resolution, conservation knowledge, resource management, know benefits of managing resources sustainably, conservation of the environment, stakeholder communication, stakeholder input, community welfare, visitor facilities, environmental awareness, best land use for the area and Park management relationship with the communities. Comparisons were between the conservation areas and the management regimes.

Pearson's correlation was used to measure how variables or rank orders are related. Nominal and Ordinal variables were used for frequency counts and associations using Pearson's Correlation. The following variables were tested for correlations; type of resources and practiced land use, diminishing resources and practiced land use, type of conflicts and types of resources, type of animal and type of resources. The relationship of these variables informed on whether negative or positive changes influenced or affected the other variables.

The Pearson's Chi test square was used to assess the degree of association of the following variables; types of resources, practiced land use, land ownership, diminishing resources, means of sustaining family, problems and benefits of living next to conservation areas, type of conflict and type of wild animal attacks. The association of variables was instrumental in identifying the causes of diminishing resources and conflicts.

Wilcoxon Ranks Test was used to assess the difference between population means of paired data on community perception on conservation management, disadvantages of living next to conservation areas and the effect of practiced land use on existing resources. The one way Analysis of Variance (ANOVA) was used to compare variables between study sites and to test for significant difference between means for the four hypotheses.

3.4.5 Data Collection and Analysis for Conservation Area Management

Data for protected area management was collected using the Management Effectiveness Tracking Tool (METT) to monitor progress towards more effective management over time. The data is used to enable park managers and donors to identify needs, constraints and priority actions to improve the effectiveness of protected area management. The tool deals with design issues relating to individual sites and protected area systems, the appropriateness of management systems and processes, and the delivery of protected area objectives (Hockings, *et al* (2006). The METT questionnaire has several data sheets; Protected Area Data Sheet, Protected Area

Threats, Protected Area Management Activities, and an Assessment Form that has scores ranging from 0-3 that is from the poorest to the best. Some variables for this study were selected from the four data sheets. Maximum score is 27 for the nine variables. In this study the management representative of the given conservation area responded to management issues as indicated in the questionnaire Appendix 3 (Table 3.3).

The conservation management variables selected from the Management Effectiveness Tracking Tool (METT) used in the five conservation areas were; park management regime, international designation, legal status, protected area regulations, demarcation, law enforcement, management plan, resource inventory, education awareness, local community input in decision making, economic benefits for the communities, condition assessment and park fees Appendix 4 (Table 3.4). These variables were collated with the community variables on conservation management. The boundary demarcation and legal status was used to give an indication of well documented boundaries which could indicate any infringement into the conservation area by the communities and the movement of animals in and out of the protected areas.

The international designation status was used to identify the internationally recognized sites in the study sites and the need to preserve them. Meanwhile, the need to enforce law was gauged by the efficiency and preparedness of the staff. The management plan was used to assess the commitment by the conservation area management to manage wildlife resources effectively. The incorporation of conservation area needs into regional planning gave an indication of inclusion into the overall planning for the region. Furthermore, the economic benefits assessment was used to identify the economic benefits to the communities while education awareness programs were used to assess the level of sensitizing the communities on environmental conservation. Condition assessment and resource inventory was used to give an indication of the existing resources in the conservation areas. Finally, the park fees levied was an indicator of whether the local communities benefitted from the Wildlife Conservation Area or not. These variables were selected to evaluate the management and to give an

indication of conflict resolution, benefits to the community and overall management of the conservation area. The information was also collated with responses to household surveys which informed the perception of wildlife conservation and management systems in Kenya.

The analysis of the protected area management data was premised on the hypothesis that different types of conservation regimes do not influence community perception of wildlife management systems in Kenya. The METT score card was used to assess the management of the conservation areas on the existing values and threats, planning allocation of resources (inputs), management actions and results in impacts or outcomes. The analysis was based on the ratings from (0) which indicated poor rating to (3) for good performance (Hockings *et al* 2006). This was regarded as qualitative data.

3.4.6 Land Use and Land Cover Data in the Five Conservation Areas

In this study, landsat 5 TM and landsat 7 ETM+ images were used to analyze land use and land cover (LULC) changes using ArcGis ver 9.3, ENVI 4.7 and Erdas Imagine 9.1, (Leica Systems, 2006). The satellite images were sourced from the Regional Centre for Mapping of Resources and Development (RCMRD), in Kenya representing image captures of January 1987 and March 2010 with a 30 m resolution (Table 3.5). The Coast and Tsavo conservation areas were not analyzed using the landsat images since they were affected by cloud cover and stripping. Topographic maps and GPS points were utilized to geo-reference the images and to assess classification accuracy.

Table 3.5 Information on Landsat Images for the Study Sites

Site name	Image Title Landsat	Sensor type	Path/Row	Date of capture	Resolution
Il Ngwesi Conservancy	Mt.Kenya region	TM	P168R060	Feb1988, March2000,	30 Metres 30 Metres
Lake Nakuru National Park	Central Rift region	TM TM ETM+	P169R060	28/01/1988, 27/01/2000, 03/03/2008	30 Metres 30 Metres 15 Metres
Mt Kenya National Park	Mt. Kenya region	TM TM	P168R060	Feb1988, March2000	30 Metres 30 Metres
Amboseli National Park	Amboseli Biosphere	TM TM ETM+	P168R062	Feb1988, March1999, 31/2/2010	30 Metres 30 Metres 15 Metres
Kimana Community Wildlife Sanctuary	Amboseli Biosphere	TM ETM+	P168R062	March2000, 31/2/2009	30 Metres 15 Metres
Rukinga Wildlife Conservancy	Tsavos	TM TM	P167R062	3/3/1987, 22/01/2000	30 Metres 30 Metres

3.4.7 Image Pre-processing

The remote sensing images used were in TIFF formats which were imported to Erdas Imagine platform. The Landsat Thematic Mapper sensor has seven bands that simultaneously record reflected or emitted radiation from the Earth's surface in the blue-green (band 1), green (band 2), red (band 3), near-infrared (band 4), mid-infrared (bands 5 and 7), and the far-infrared (band 6) portions of the electromagnetic spectrum. The bands have a 30 M resolution. The Landsat Enhanced Thematic Mapper Plus (ETM+) images consist of eight spectral bands with a spatial resolution of 30 m for Bands 1 to 7. The resolution for Band 8 (panchromatic) is 15 m. The spatial resolution for Band 6 (thermal infrared) is 120 m for TM sensor and 60 Meters for ETM+ sensor, but this was re-sampled to 30m pixels. These bands were layer stacked and re-projected to UTM Projection, WGS 84 spheroid, WGS 84 Datum. The scenes were then mosaicked using two or more different scenes.

3.4.8 Landsat Image Analysis

Supervised classification was used to categorize land features where maximum likelihood classifiers were run on the images. The training sites for each study site were homogenous to avoid misclassification. The training sites were delineated from the respective false color composite images. GPS ground points and topographical maps were used for geo-referencing, to verify training sites and to create spectral signatures. Erdas Imagine 9.1 was used to create signatures for each class using AOI (area of interest) tools, color composites and carry out image classification where each site had unique feature classes. Twelve study sites were considered for image processing but only seven study sites were subjected to change detection. Using shape files for the conservation area and park boundaries a buffer zone of 5 Km was created and used to subset the respective study sites. The supervised classification analysis identified the following feature classes; Agriculture, settlements, grasslands, bare ground, thickets, shrubs, Forests, mixed forests, swamps, riverine vegetation, water and snow. All classes were assigned unique symbols for easier identification. The creation of shape files for the final map layouts was done in ArcGIS 9.3.

3.5. Data Validation

According to U.S. EPA (2002), data validation is an analysis and sample specific process that extends the evaluation of data beyond method, procedural or contractual compliance (i.e. data verification) to determine the analytical quality of a specific data set. Data validations for this research involved both content and construct validity. The content validity checked whether the questionnaires provided adequate coverage of the research problem. The construct validity was used to confirm whether the predicted correlations and associations related to theoretical propositions.

Data validation was used when entering research data in the Statistical Package for the Social Sciences (SPSS 9.0). The selected variables were assigned numeric and string variables. The value labels explained variables and numerical codes selected for missing data. The internal validity to determine cause and effect was carried out during

the pre-testing of the questionnaire at the Central Rift Conservation area. The landsat data analysis was validated using community variables in the study sites. The results of the five study areas reflect similar outcomes elsewhere in Kenya.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Results

4.1 Introduction

This chapter discusses the results of conservation management using the Management Effectiveness Tracking Tool, community perception on conservation areas, resource access and sharing, public benefits and costs associated with conservation and community involvement in conservation management Appendix 6 (Table 4.1). The results of the five conservation areas and the three management regimes are discussed herein.

4.2 Status of Conservation Management in the Five Conservation Areas

The management questionnaire was one per study site and the respondents were the senior warden and two research scientists and the total was thirteen questionnaires. Out of these study sites assessed using the METT, the response to the question on whether the boundary of the protected area is well known indicated that 81% of the management respondents noted that conservation areas were well demarcated while 5% noted that not everybody knew the boundary well (Fig. 4.1). A well known and demarcated boundary by the community was an indicator that these were well protected areas. Eight five percent of the WCAs had a clear legal status and 15% had completed the gazettment process. The typology of the WCAs in accordance with the IUCN classification of international conservation areas and the Ramsar convention indicated that two of the WCAs were designated as Ramsar Sites.

One of the conservation areas had been recognized as Biosphere reserve and the other as a World Heritage Site. In this regard majority of the WCAs were considered as national conservation areas since all wildlife found in Kenya is vested in the state on behalf of and for the benefit of the people of Kenya (Wildlife Bill, 2011).

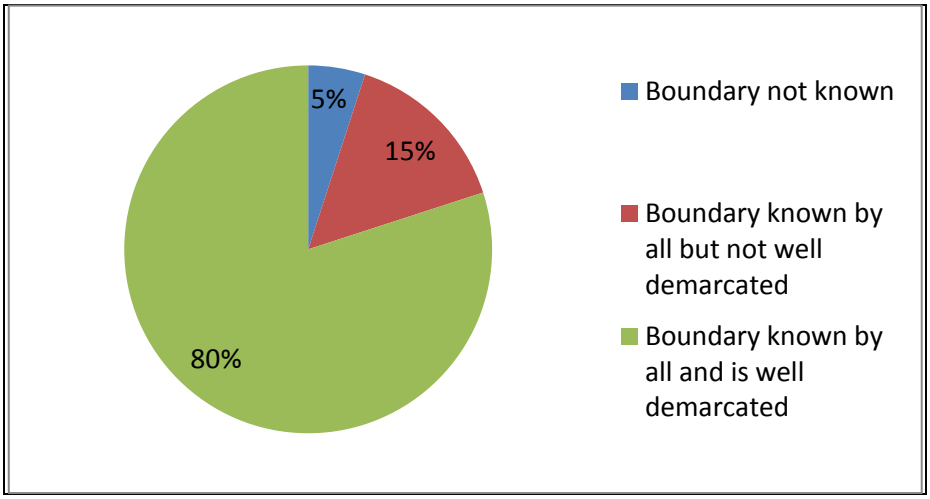


Figure 4.1. Knowledge status of conservation area boundaries by communities

The use and implementation of management plans in the WCAs areas indicated that, 64% of the management had implemented the management plans while 5% did not have one (Fig. 4.2). The management plan provides sufficient information for managers to protect and manage the heritage values. The use of protected area regulations was to control inappropriate land use activities. Sixty four percent of the protected areas had regulations for control of land use and wildlife resources within the precincts of the conservation areas while 5% had no regulations (Fig. 4.3).

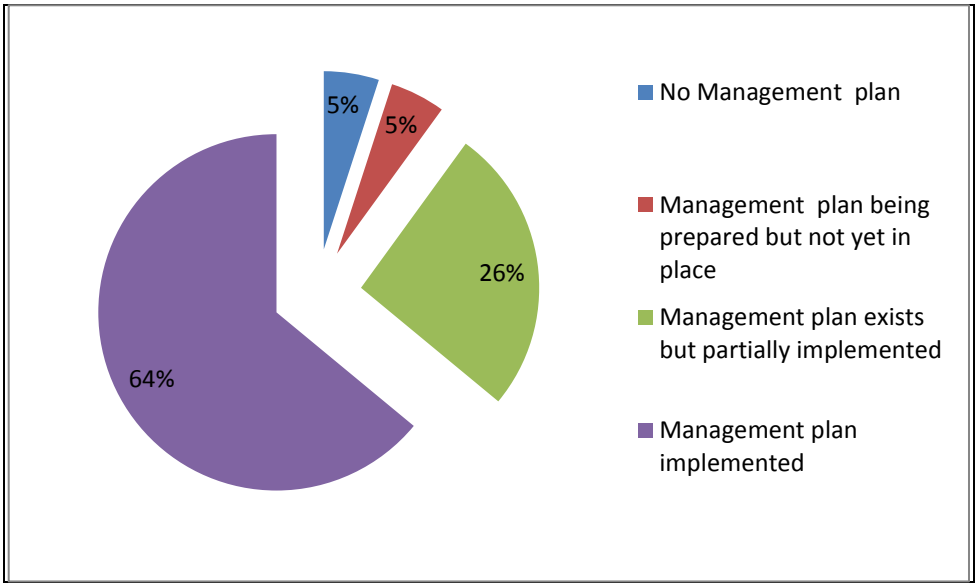


Figure 4.2. The use of Management plans in conservation areas

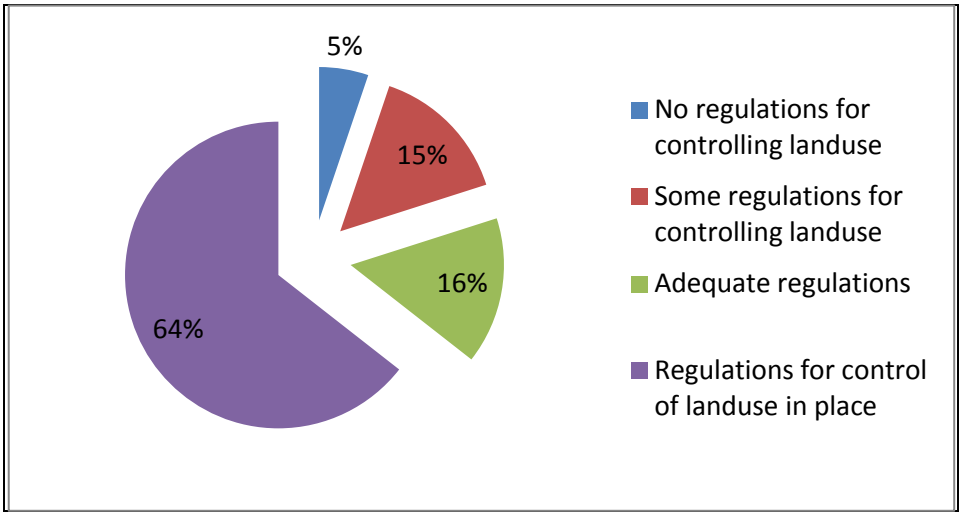


Figure 4.3. The status of regulations for control of land use in the protected areas

The question on law enforcement was to check whether staff can enforce the protected area rules well enough. About 51% of the staff working within conservation areas had acceptable capacity to enforce law while 5% had major deficiencies in staff capacity. The role of the staff was to monitor illegal entry into the conservation areas which could lead to the killing of wild animals for bush meat, poaching, illegal grazing and collection of firewood (Fig. 4.4).

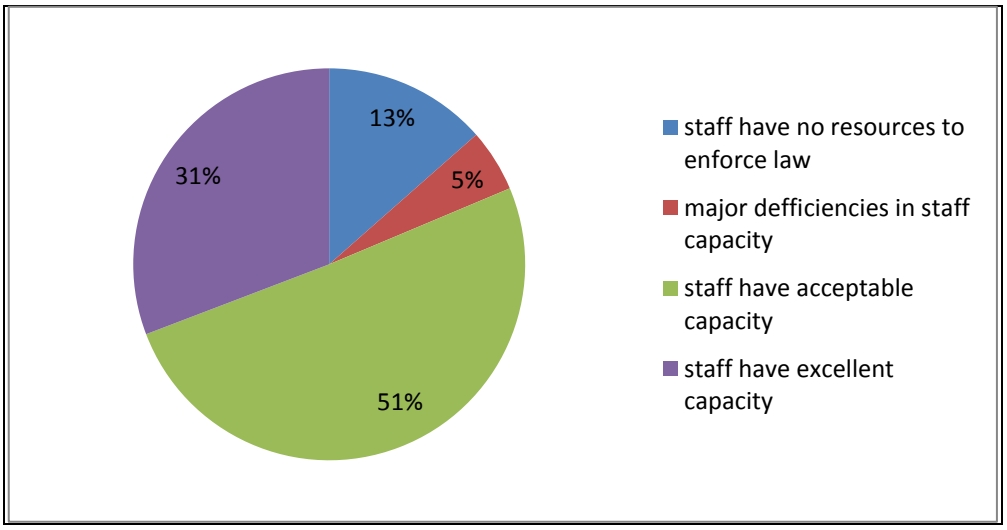


Figure 4.4. Law enforcement in conservation areas

Sixty four percent of regional plans partly recognized the protected area and provided aid towards the achievement of its objectives while 11% of the management was not consulted (Fig. 4.5). The involvement of stakeholders in decision making contributed to co-management of conservation areas which was beneficial to the community and wildlife resources. This statement has been confirmed by analyzing the question on local community involvement in decision making by the management. Forty three percent of the conservation area management involved local communities in decision making while 11% of the communities had no input (Fig. 4.6).

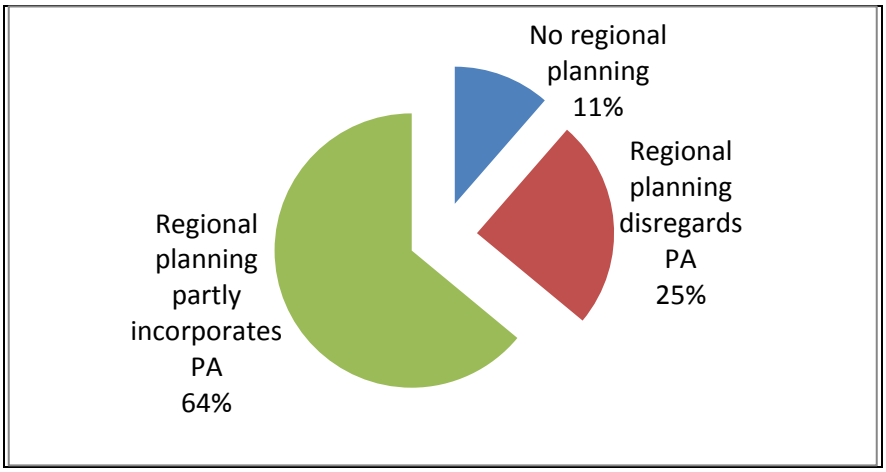


Figure 4.5. The involvement of conservation areas in regional plans

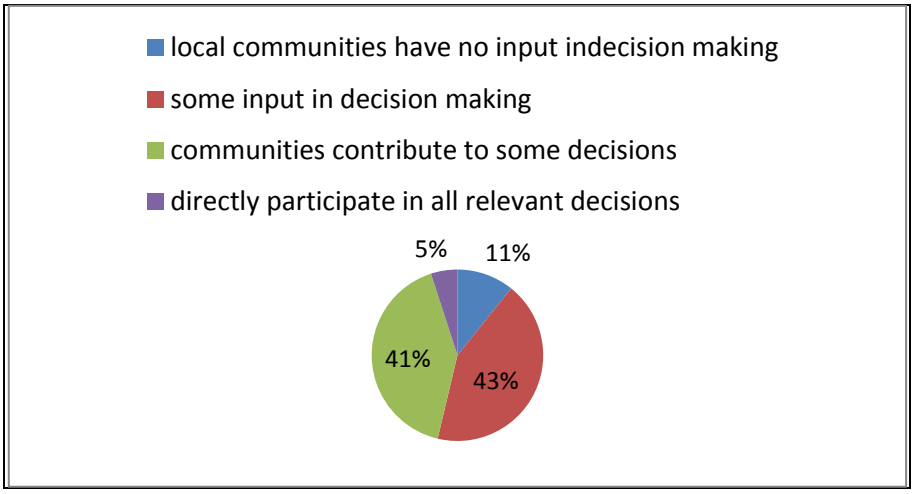


Figure 4.6. Level of community involvement in decision making under conservation management

Sixty one percent of the conservation areas provided some minor flow of economic benefits to communities while 39% had major flow of benefits. Sixty seven percent of the conservation areas had an education awareness program on environmental conservation while 5% had no educational program for the local communities (Fig. 4.7).

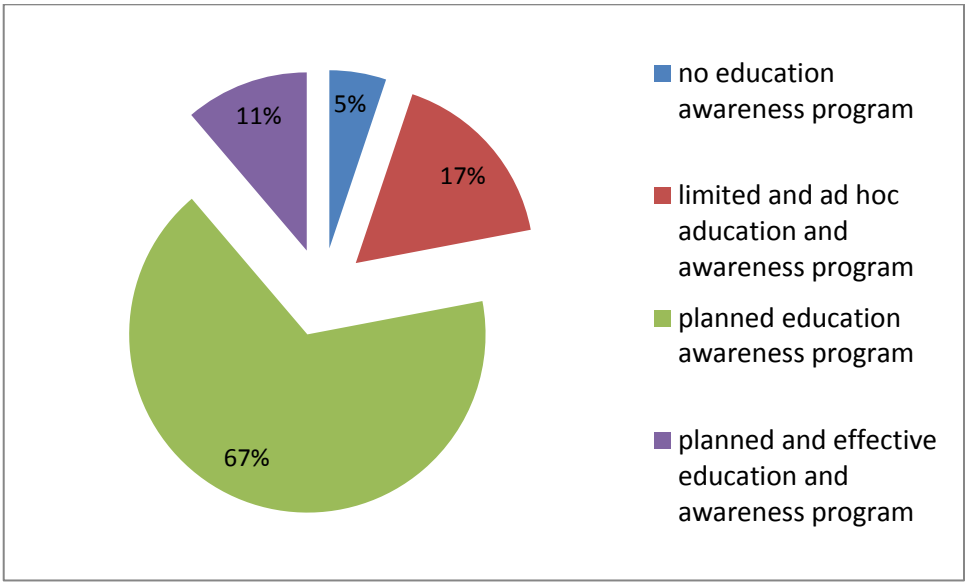


Figure 4.7. Level of education awareness program for communities in the study conservation areas

The Biodiversity assessment for conservation areas looked into whether the management was consistent with the set objectives. Forty six percent of the conservation areas was perceived to be partially degraded while 26% had some biodiversity that was severely degraded and hence the need for conservation (Fig. 4.8).

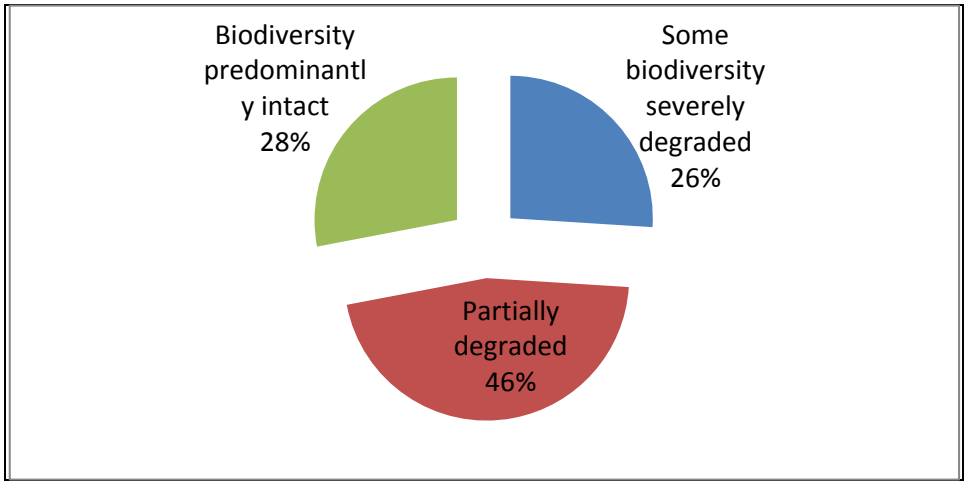


Figure 4.8. Assessment of Biodiversity status in conservation areas

Assessment on the use of park entry fees indicated that 42% collected as entry fees into conservation areas made substantial contribution to the improvement of the protected area and the local communities while 6% had no impact (Fig. 4.9).

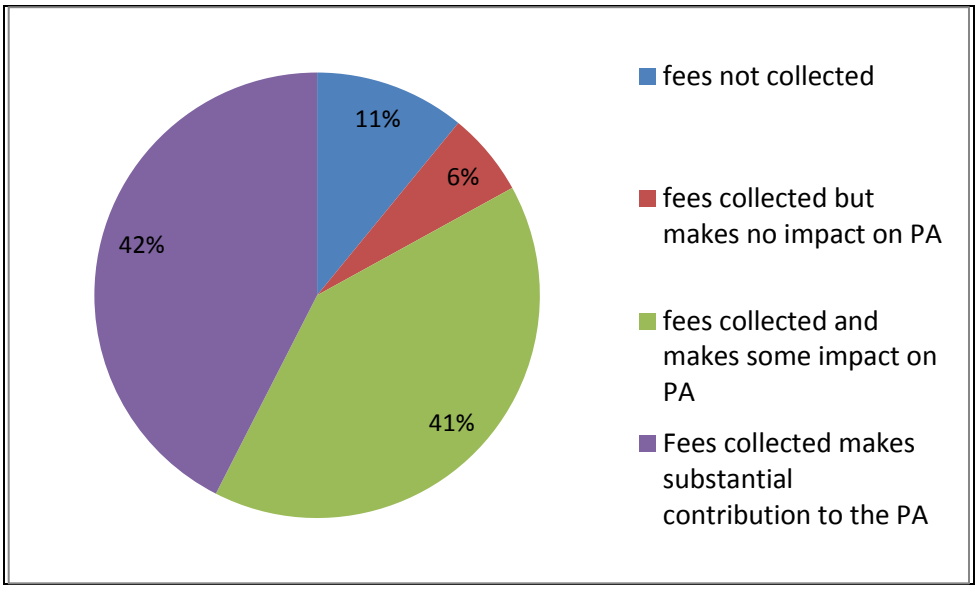


Figure 4.9. Existence of Park entry fees and its usage to improve conservation areas and its environs

4.2.1 Coast Conservation Area Management

Shimba Hills National Park and Mwalughanje Elephant Sanctuary represented the Coast conservation area. The staff working at Shimba Hills National Park had acceptable capacity to enforce law while at Mwalughanje Elephant Sanctuary there were no resources to enforce the law. The two conservation regimes at the Coast conservation area had not received international designation status but they were formally gazetted and demarcated. The staff working in the conservation area had acceptable capacity to enforce law. The management plan was not fully implemented though the management used information for key areas for planning. The two conservation regimes had a planned education and awareness program for the local communities. The management in the two conservation areas noted that regional planning partly incorporated long term needs of the protected area. The park fees collected made some substantial contribution to the protected area. The park management at Mwalughanje involved the local communities in decision making while some parts of the conservancy was severely degraded. At Shimba Hills National Park and Mwalughanje Elephant Sanctuary, 65% of the local community benefitted from community projects, 35% from infrastructure development and 30% from business activities.

4.2.2 Tsavo Conservation Area Management

Tsavo East and West National Parks and Rukinga Wildlife Conservancy represented the Tsavo conservation area. The staff working in the three conservation areas had acceptable capacity to enforce law. The Tsavo conservation area regimes had not received international designation status. The conservation areas had well demarcated boundaries which were known by the local communities. The staff working in the conservation area had acceptable capacity to enforce law while the management plan was well implemented. Information for key areas in the conservation area was available for planning. The management noted that there was a planned education and awareness program for the local communities.

The communities had received some economic benefits from the conservation area where 49% benefited from community projects. Other benefits were infrastructure development (54%) and business engagement (20%).

4.2.3 Southern Area Conservation Management

Amboseli National Park and Kimana Community Conservancy represented the Southern conservation area. The Amboseli ecosystem is recognized internationally as Biosphere reserve. Biosphere reserves are sites established by countries and recognized under UNESCO's Man and the Biosphere, as programmes to promote sustainable development based on local community efforts and sound science (MAB) (1980). The biosphere reserve was part of the UNESCO-MAB project 'Biosphere Reserves for Biodiversity Conservation and Sustainable Development in Anglophone Africa (BRAAF)' which had the objective to ensure the long-term conservation of biodiversity in including local population in its sustainable use.

Amboseli National Park is formally gazetted and it had adequate regulations for the protected area. The staff or rangers had adequate capacity to enforce law and the management plan was well implemented while information for key areas was available for planning. There was a limited and *ad hoc* education awareness program for the local communities though communities received some economic benefits from the protected area. Kimana Community Conservancy had regulations for control of land use but the staff lacked enough capacity to enforce law. The boundary was known by all communities though it was not well demarcated and there was no management plan. The local communities had some input in decision making and they received major economic benefits from the conservancy. The fees collected made some impact on the protected area and the communities and the biodiversity was predominantly intact.

The staff had acceptable capacity to enforce law and the management plans had been partially implemented. Information for key areas was available for planning and there existed a planned education and awareness program. Some sections of regional plan were incorporated in the protected area needs while part of the fees collected made some impact to the protected area. The community benefited from community projects (56%), infrastructure (32%) and business (5%).

4.2.4 Central Rift Conservation Area Management

Central Rift Conservation area was represented by Malewa - Kigio conservancy, Lake Nakuru National Park and Soysambu conservancy which were both internationally designated as Ramsar sites. Lake Nakuru National Park and Malewa - Kigio were formally gazetted and regulations for control of land use were in place. The staff had excellent capacity to enforce law in the three conservation areas and protected area regulations were in place. However, there was excessive law enforcement at Soysambu that contributed to human - human conflict. Lake Nakuru and Elmentaita had been recognized as Ramsar sites. The staff had excellent capacity to enforce law and the management plan was well implemented. Information for key areas was available for planning.

The management indicated that there was a planned education awareness program and regional planning incorporated the protected area needs. Part of the fees collected made some substantial contribution to the maintenance of the protected area. The conservation management noted that local communities had some input in decision making. Some important biodiversity areas were severely degraded. The benefits to the community were noted as community projects (66%), infrastructure development (12%) and business (54%).

4.2.5 Mountain Conservation Area Management

Mt. Kenya National Park, Ol Pejeta and Il Ngwesi conservancies represented the Mountain conservation area and were all formally gazetted. Mt Kenya National park is

a World heritage site and the regulations for control of land use were in place. The conservation area is formally gazetted, well demarcated and staff had acceptable capacity to enforce law. The management plan was not fully implemented. The management indicated that information for key areas was available for planning and there was a planned education and awareness program. Regional plans were partially incorporated into the protected area needs while park fees collected made some substantial contribution to the protected area. Local communities noted some major flow of economic benefits from the conservation area. These were community projects (80%), infrastructure development (30%) and business (20%).

4.2.6 Conservation Management at KWS Parks

The Kenya Wildlife Service Parks were represented by Shimba Hills, Tsavo East and West, Amboseli, Lake Nakuru and Mt. Kenya National Parks. Conservation management for these regimes compared the Kenya Wildlife Service Parks, Private Conservancies and Community Conservancies. All the KWS Parks were formally gazetted and well demarcated. Amboseli National Park has been internationally recognized as a Biosphere reserve, Mt. Kenya National Park as a World heritage site and Lake Nakuru National Park as a Ramsar site. The Ramsar Convention on wetlands provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

The parks were all formally gazetted, protected area regulations were in place, staff had acceptable capacity to enforce law and management plans were well implemented. The six state the parks partially incorporated regional plans into the management plans, park fees made some substantial impact on the protected area and biodiversity was partially degraded. Local communities had some input in decision making including the fact that there was education awareness program for the communities.

The local communities had little input in decision making in all the parks. There were some minor flows of economic benefits from the parks to the local communities. The bio-diversity at Tsavo West National Park is predominantly intact. Some of the bio-diversity at Lake Nakuru Park is severely degraded while the bio-diversity in the rest of the KWS parks is partially degraded as per the ratings of 0 - 3 (poor to good) (Fig. 4.10).

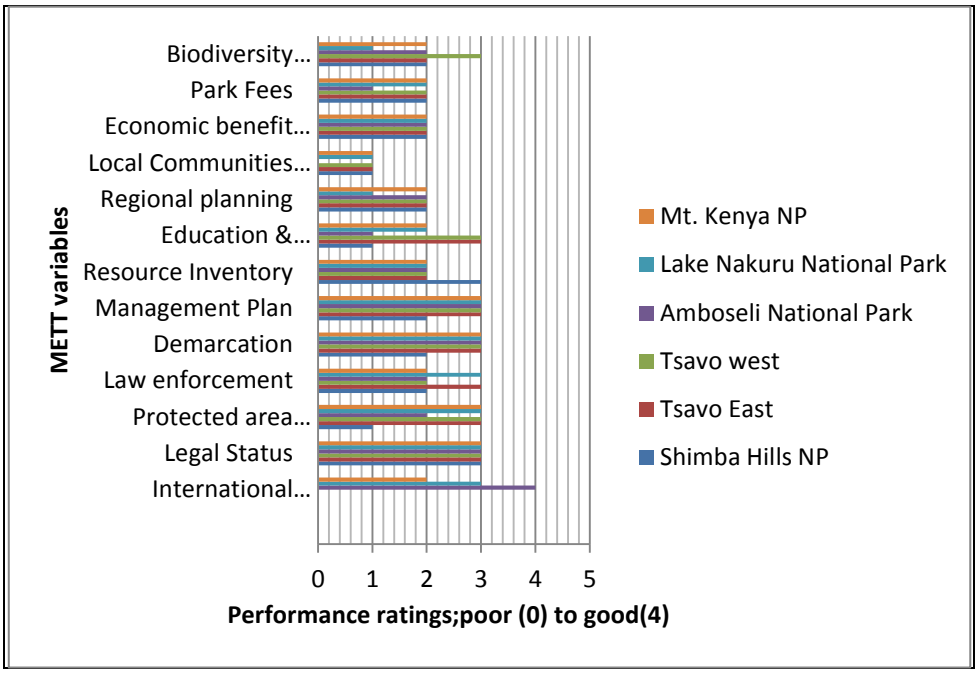


Figure 4.10. Management rating for the KWS parks based on the METT criteria

4.2.7 Conservation Management in Private Conservancies

The private conservancies were represented by Rukinga Wildife Sanctuary, Soysambu and Ol Pejeta conservancies. The private conservancies were gazetted and they were well demarcated. There was sufficient information for planning. Soysambu and Rukinga did not levy charges for entry into the park. All of the conservancies had a planned education awareness program for the communities while management plans were partially implemented. Soysambu conservancy had been designated as Ramsar sites. Some protected area regulations were in place and staff had excellent capacity to enforce laws. Local communities were involved once in a while in decision making and the bio-diversity was intact.

Conservation management at private conservancies indicated that Rukinga and Ol Pejeta conservancies were formally gazetted and well demarcated while Soysambu was in the process of being gazetted. The management plans for the three conservancies were not fully implemented. There were some major economic benefits to the communities from Rukinga and Ol Pejeta conservancies while Soysambu provided minor benefits (Fig. 4.11).

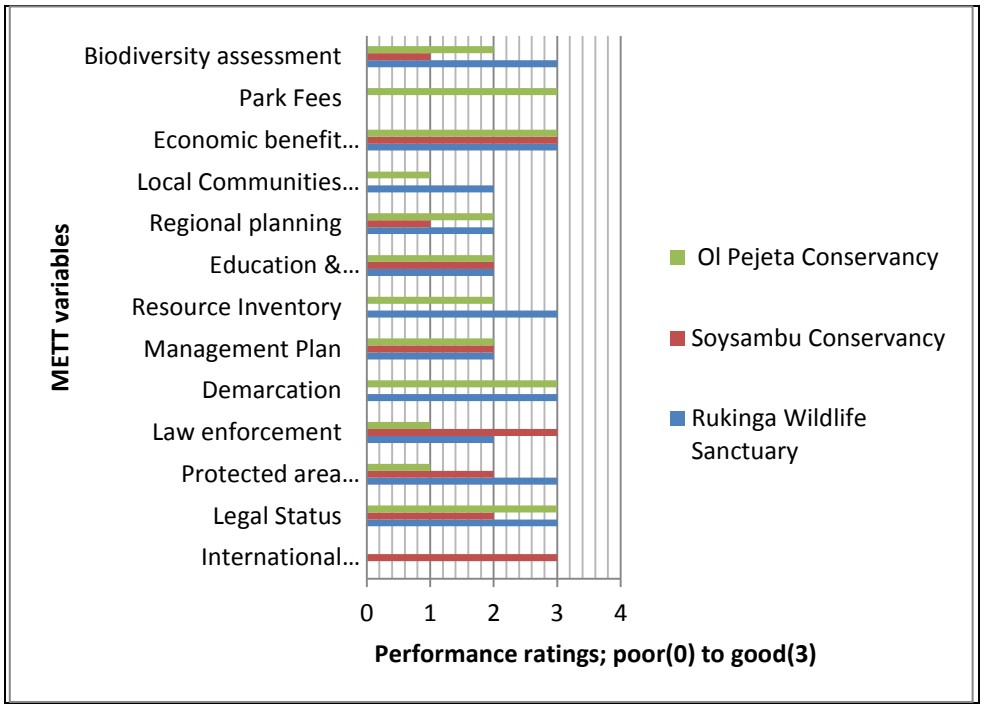


Figure 4.11. Management rating for the private conservancies based on the METT criteria

4.2.8 Conservation Management in Community Conservancies

Community conservancies were represented by Mwalughanje Elephant Sanctuary, Kimana, Malewa - Kigio and Il Ngwesi conservancies. The conservancies were formally gazetted and regulations for control of land use were in place. Twenty five percent of the conservation staff had the capacity to enforce law. The management plans for Malewa-Kigio and Il Ngwesi conservancies were well implemented and local communities were involved in decision making process.

Kimana and Mwalughanje conservancies did not have sufficient information on critical habitats while regional planning partly incorporated the needs of the protected area (Fig. 4.12).

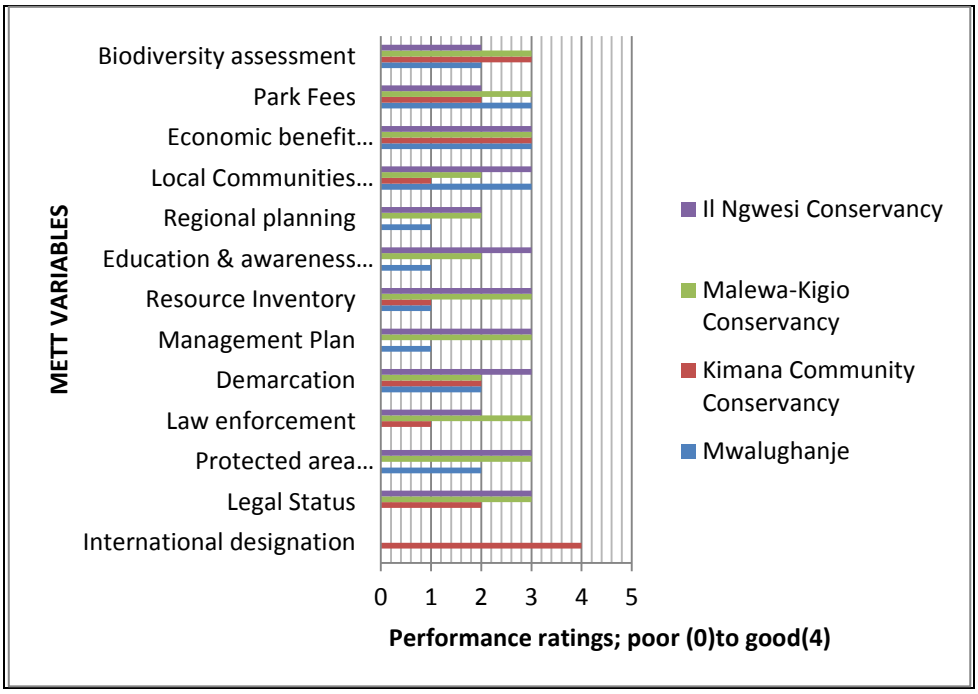


Figure 4.12. Rating of community conservancies according to METT criteria

Some of the conservation area management variables which were collated with the household variables indicated similar outcomes. Forty three percent of the five conservation areas involved local communities in decision making. This compares well with the community responses where 46% indicated that they were involved in decision making. Twenty eight percent of the household respondents benefitted from eco-tourism. Sixty percent of the the management of conservation areas provided some minor flow of econmic benefits to the communities.

4.3 Community Characteristics in Five Conservation Areas

The variables used for community characteristics were sex, family set-up, the level of education and means of sustaining family. The results indicated that 60% of all

households were headed by males while 0.3% of the respondents were widowed. About 49% of the respondents had primary level education and 10% were illiterate.

Sixty two percent of the respondents were involved in farming and 18.1% were in business related activities (Appendix, Table 4.1).

4.3.1 Coast Conservation Area Community Characteristics

The population size at Shimba Hills, Kudutsi, Kipambani and Majimboni sub-locations was 2,174. The community characteristics of the respondents sampled at Shimba Hills National Park indicated that 58% of all households and 65% at Mwalughanje were headed by males. Forty three percent of the respondents had primary level education. Sixty percent of the respondents sustained their families through farming while 20% were involved in other activities. At Mwalughanje Elephant Sanctuary, 26% of the respondents had primary level education and 48% were illiterate. Seventy seven percent of the respondents practiced farming while 16% were involved in other activities to sustain their families.

4.3.2 Tsavo Conservation Area Community Characteristics

In the Tsavo Conservation Area, the population size at; Mtito Andei, Voi, Taveta and Marungu sub-locations was 4,763. At Rukinga Wildlife Sanctuary the total population was 402. Sixty seven percent of the households at Tsavo East and West National Parks and 51% at Rukinga were headed by males. Thirty two percent of the respondents at Tsavo practiced farming while 32% used other means to sustain families. At Rukinga Wildlife Sanctuary 71% of the respondents were married while 10% were separated. The level of education indicated that 71% of the respondents had primary education. Fifty six percent of the respondents at Rukinga practiced farming and 10% were involved in other activities to sustain their families. The community characteristic that influenced community perception to Wildlife conservation areas was farming. Destruction of crops and human deaths was a disadvantage of living next to the conservation area.

4.3.3 Southern Conservation Area Community Characteristics

The total population size at Namelock A and B, Oloile, Impiron, Maisuati, Mashamba Mapya, Kimana 'A', and Kimana T.C sub-locations was 7,718. 54% of the households and 56% at Kimana were headed by males. Thirty four percent of the respondents had attended primary schools while 15% were illiterate. Fifty three percent of the respondents practiced farming to sustain their families while 27% were involved in other activities.

4.3.4 Central Rift Conservation Area Community Characteristics

At the Central Rift Conservation Area the total population size at Elementaita, Gilgil, Mahiga, Mwariki, Baharini, Bagaria, Naivasha Urban, Karunga and Miharati sub-locations was 25,767. Sixty percent of the households at Lake Nakuru National Park, 61% at Soysambu and 52% at Malewa - Kigio were headed by males. About 62% of the respondents had primary level education and 81% of the respondents were involved in farming. Sixty five percent of the respondents were farmers, 8% were involved in business and 11% were in other activities. At Malewa - Kigio Conservancy 52% of the respondents had primary school education.

4.3.5 Community Characteristics at the Mountain Conservation Area

The total population size at Ruirie, Gathiuru, Kamburani, Kahurura, Tigithi, Matanya, Lamuria, Marura, Mutunyi, Burat and Ethi sub-locations was 12,317. Sixty one percent of the households at Mt. Kenya National Park, 81% at Ol Pejeta were headed by males while 61% at Il Ngwesi were headed by females. Sixty three percent of the respondents had primary school education. 81% of the respondents practiced farming while 8% were in business related activities. Sixty two percent of the respondents at Mt. Kenya National park, 57% at Ol Pejeta and 11% at Il Ngwesi had attained primary school education.

The implication of community characteristic and conservation was clearly seen in the relationship between means of sustaining family and the practiced land use. It was observed that in areas where farming and keeping of livestock was predominant there was human –wildlife conflicts leading to crop destruction, livestock and human deaths. Il Ngwesi conservancy community was mainly involved in livestock keeping and conservancy and it experienced minimal human-wildlife conflicts. The perception towards Wildlife resources was positive where as in the farmlands, it was negative.

This was irrespective of the sex of the head of household, family set up or level of education in all conservation areas and regimes (Table 4.2).

Table 4.2 Means of Sustaining Family and Practiced Land use

Conservation Areas	**Means of sustaining family & Practiced land use**					
	Regimes	Farming	Livestock keeping	Farming & Livestock keeping	Conservancy	others
Coast	Shimba Hills NP	**52.0%**	20%	25%	0%	3%%
	Mwalughanje Elephant Sanctuary	41.9%	19.4%	9.7%	**29%**	0%
Tsavo Conservation Area	Tsavo East and West NP	**56%**	10.5%	22.3%	1.9%	8.3%
	Rukinga Wildlife Sanctuary	53.6%	21.9%	4.9%	**5.9%**	13.7%
Southern Conservation Area	Amboseli NP	**31.7%**	34.1%	20%	4.4%	**9.8%**
	Kimana Community Conservancy	29.4%	32.4	17%	5.9%	**8.8%**
Central Rift Conservation Area	Lake Nakuru National Park	20%	5%	1%	9%	**65%**
	Soysambu Conservancy	12.9%	9.7%	48%	**0%**	29.4%
	Malewa-Kigio Conservancy	35.5%	3.2%	32%	**25.8%**	0.3%
Mountain Conservation Area	Mt. Kenya NP	20%	5%	**65%**	1%	9%
	Ol Pejeta Conservancy	5.4%	12.5%	**82%**	0%	1%
	Il Ngwesi Conservancy	5.4%	**54.5%**	6.1%	**18.2%**	0%

4.4 Perception on Resource Access and Sharing by Communities Neighboring the Wildlife Conservation Areas.

In response to the null hypothesis " there is no relationship between resource access and sharing" data was analyzed based on these variables; practiced land use, land ownership, natural resource types, sharing resources, and diminishing resources for the five conservation areas and across the three conservation regimes. Land resource was analyzed using Geographical Information Systems (GIS) and Remote Sensing (RS) tools. The frequencies and descriptive data used to assess resource access and sharing in the five Wildlife Conservation Areas are discussed below.

4.4.1 The Coast Conservation Area Resource Access and Sharing by Neighboring Communities

Fifty three percent (53%) of the respondents living next to Shimba Hills National Park and 42% living next to Mwalughanje Elephant Sanctuary practiced farming. Forty three percent (43%) of the respondents living next to Shimba Hills National Park and 48% living next to Mwalughanje inherited land from their parents. Forty eight percent (48%) of the respondents living next to Shimba Hills and 32% living next to Mwalughanje identified wildlife, forests and grasslands as the main types of resources. At the same time 38% of the respondents living next to Shimba Hills and 39% living next to Mwalughanje noted a reduction in forest cover. Eighty three percent and 68% of the respondents living next to Shimba Hills National Park and Mwalughanje Elephant Sanctuary respectively were of the opinion that resources were not well distributed.

4.4.2 Tsavo Conservation Area Resource Access and Sharing

Fifty eight percent (58%) of the respondents living next to Tsavo East and West National Parks and 53% living next to Rukinga Wildlife Sanctuary practiced farming. Seventy four percent (74%) of the respondents living next to Tsavo East and West Parks and 52% living next to Rukinga Wildlife Sanctuary identified grasslands, forests and rivers as the types of resources in their locality. Thirty seven percent (37%) of the respondents living next to Tsavo East and West National Parks and 39% living next to Rukinga Wildlife Sanctuary noted a major reduction in rangeland. This could have resulted from competition for grassland by livestock, wildlife and droughts.

4.4.3 Southern Conservation Area Resource Access and Sharing

The respondents living next to Amboseli National Park 34% and 32% of the respondents next to Kimana preferred livestock keeping. Fourty eight percent (48%) of the respondents living next to Amboseli and 50% living next to Kimana owned land individually. Sixty eight percent of the respondents living next to Amboseli and 68% living next to Kimana indicated that resources were not well distributed. Thirty four percent (34%) of the respondents living next to Amboseli Park and 35% living next to Kimana noted that forest cover had significantly reduced. This could have resulted from increased cultivation by the farmers.

4.4.4 Central Rift Conservation Area Resource Access and Sharing

Twenty percent (20%) of respondents living next to Lake Nakuru National Park and 12% living next to Soysambu practiced farming as a means of livelihood. About 55% of the respondents next to Lake Nakuru and 68% next to Malewa - Kigio owned land individually. Fifty three percent (53%) of the respondents living next to Lake Nakuru National Park and 52% living next to Malewa- kigio conservancies identified grasslands, forests, and rivers as the main types of resources. Eighty three percent (83%) of the respondents living next to Soysambu and 30% next to Malewa - Kigio indicated that resources were not well distributed. At the same time 59% of the respondents living next to Lake Nakuru NP and 45% living next to Soysambu noted a reduction in forest cover. This could have resulted from increased farming and livestock keeping leading to deforestation.

4.4.5 Mountain Conservation Area Resource Access and Sharing

The respondents who practiced farming near Mt. Kenya National Park were 20% and 5% living next to Ol Pejeta conservancy. Fifty five percent (55%) of the respondents living next to Mt. Kenya National Park inherited land from the parents. Ninety percent (90%) of the respondents living next to Il Ngwesi Conservancy owned land communally. Sixty four percent (64%) of the respondents living next to Mt. Kenya National Park, and 40% living next to Ol Pejeta identified grasslands, forests and rivers as the main types of resources.

At the same time 59% of the respondents living next to Mt. Kenya National Park noted a reduction in forest cover while 55% of the respondents living next to Il Ngwesi Conservancy noted a reduction in rangeland. Eighty percent of the respondents living next to Mt. Kenya National Park and 67% living next to Ol Pejeta Conservancy indicated resources were not well distributed. Eighty four percent (84%) of the respondents living next to Il Ngwesi noted that resources were well distributed.
This was because the conservancy was managed by the community and they applied traditional knowledge of conservation.

4.4.6 Resource Access and Sharing by Neighboring Communities According to Conservation Regimes

The resource access and sharing according to the three conservation regimes indicated that 33% of the communities living next to KWS Parks practiced farming while 44% were involved in farming and livestock keeping. Twenty three percent of the respondents neighboring private conservancies were farmers and 54% practiced both farming and livestock keeping. Twenty six percent of the communities living next to community conservancies practiced farming while 23% were involved in the conservancies.

Farming and livestock keeping was the preferred type of land use in the three conservation regimes was. Twenty three percent of the communities living next to community conservancies had a high preference of conservation possibly because they owned the conservancies (Fig. 4.13). The resource access and sharing for KWS Parks, private and community conservancies indicated minimal variations in the overall conservation variables (Appendix 6, Table 4.3).

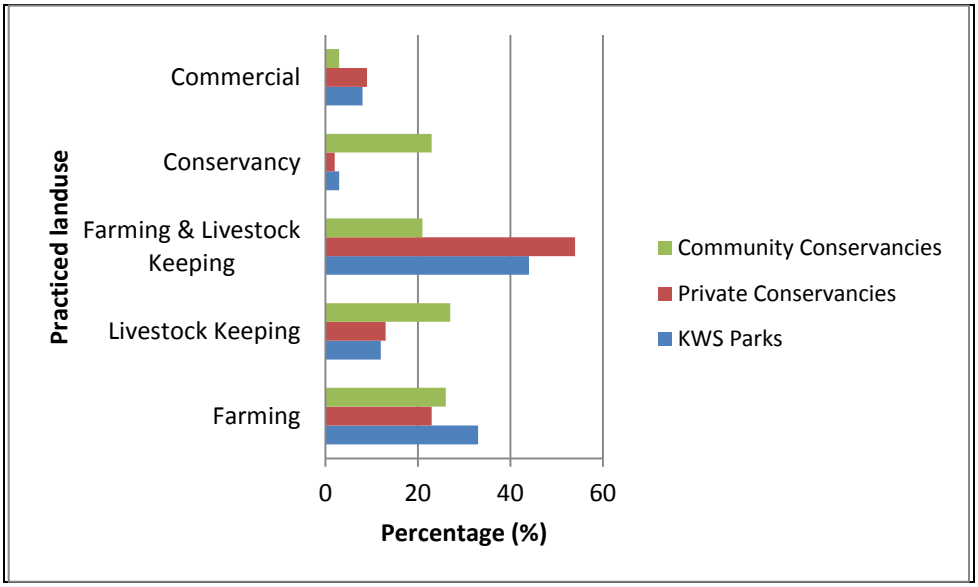


Figure 4.13. Type of land use practiced in the vicinity of the conservation regimes

Fifty two percent (52%) of the communities living next to KWS Parks owned land individually while 25% of those living next to community conservancies inherited from parents. Thirty six percent owned land communally (Fig. 4.14).

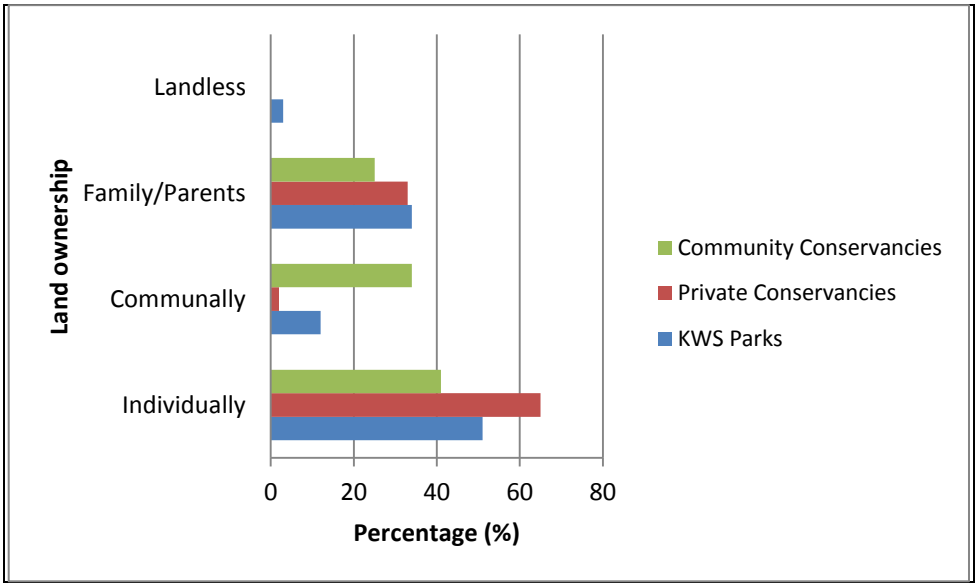


Figure 4.14. Community land ownership in the vicinity of the conservation regimes

Fifty five percent of the respondents neighboring the KWS Parks and 36% living next to community conservancies identified grasslands, forest and rivers as the main types or resources. However, those living next to community conservancies noted wildlife, forests and grasslands as the main types of resources (Fig. 4.15).

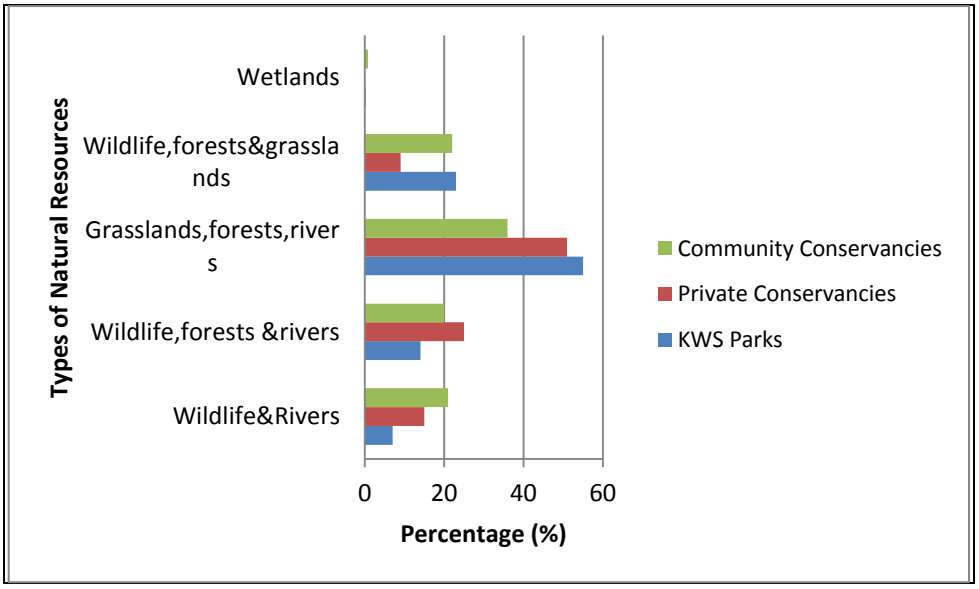


Figure 4.15. Identification of natural resources by communities in the conservation regimes

The sharing of resources in conservation areas indicated that 73% of those bordering KWS Parks and 80% of the respondents living next to private conservancies indicated that resources were not well distributed. Sixty two percent (62%) of the respondents living next to community conservancies indicated that resources were well distributed and they benefited more from the conservancies (Fig. 4. 16). These benefits were in form of managing the resources and sharing the benefits from ecotourism equally.

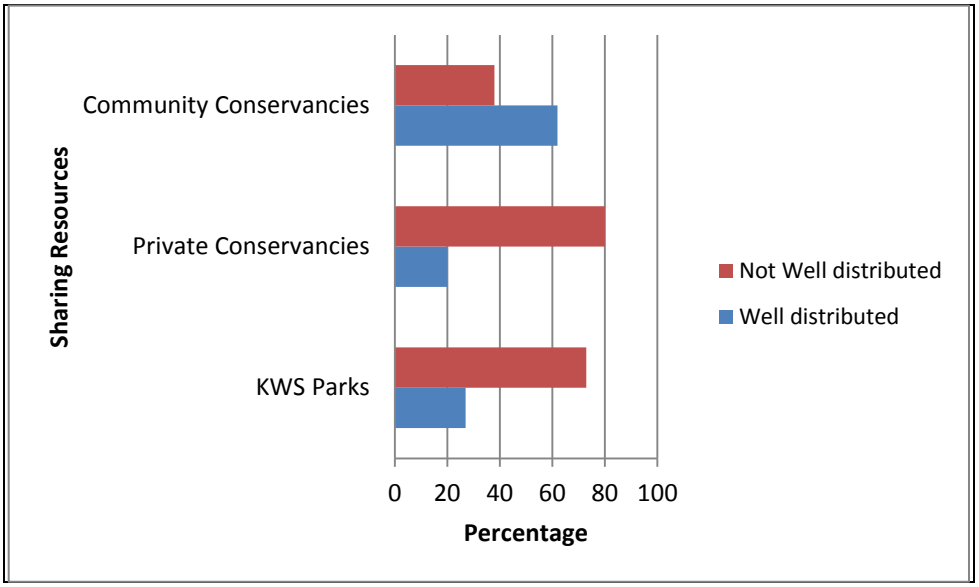


Figure 4.16. Sharing of resources among communities in conservation regimes

Forty five percent (45%) of the respondents living next to KWS Parks noted a reduction in forest resources while 42% of the respondents living next to private conservancies noted most of the rivers were drying up. Thirty six percent (36%) of those living next to community conservancies noted a reduction in rangeland. All the resources were diminishing at an alarming rate with rivers, forests and rangelands diminishing at a faster rate (Fig. 4.17). This led to competition for resources and contributed to human - wildlife and human - human conflicts.

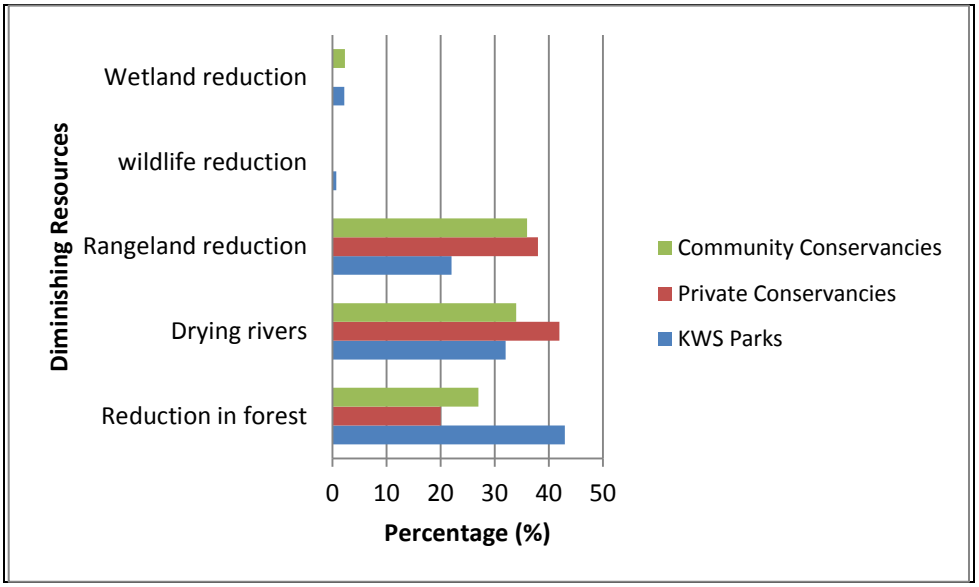


Figure 4.17. Identification of diminishing resources by communities in the conservation regimes

4.5 Land Use and Land Cover Change in Conservation Areas

The land use and land cover analysis was carried out using Landsat Satellite Images from 1988 to 2010 with a ten year interval. The analysis was on the change in size and rate of change of cover types between the years. This was then validated with the community variables such as practiced land use, diminishing resources and types of conflicts. Out of twelve study sites only seven were analyzed since the rest of the satellite images were affected by cloud cover and stripping. These study sites were Rukinga Wildlife Sanctuary, Amboseli National Park, Kimana Community Conservancy, Lake Nakuru National Park, Mt. Kenya National Park and Il Ngwesi Community Conservancy. The landsat images used were for the period between 2000 and 2009.

4.5.1 Rukinga Wildlife Sanctuary Land Use and Land Cover Analysis

Rukinga Wildlife conservancy represented the Tsavo conservation area. The landsat images used to assess land cover and land use for Rukinga Wildlife Sanctuary were for the period 2000 and 2009 (Fig. 4.18 and 4.19).

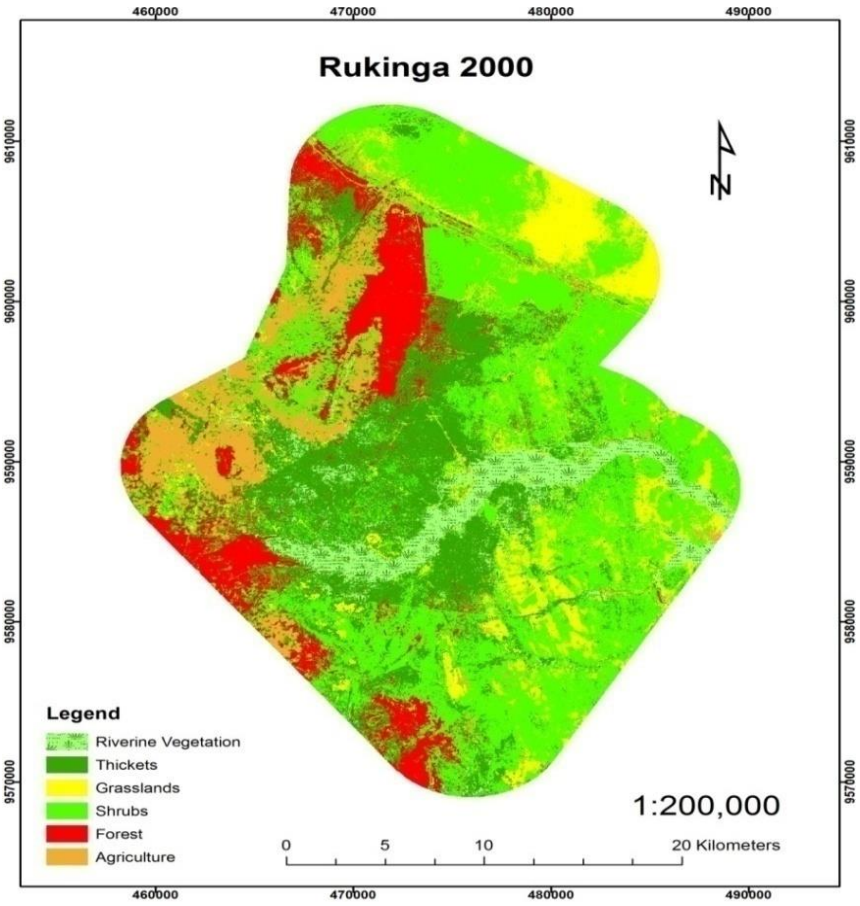


Figure 4.18. Classified image of land use / land cover types for the year 2000 within the Rukinga Wildlife Conservancy and its environs

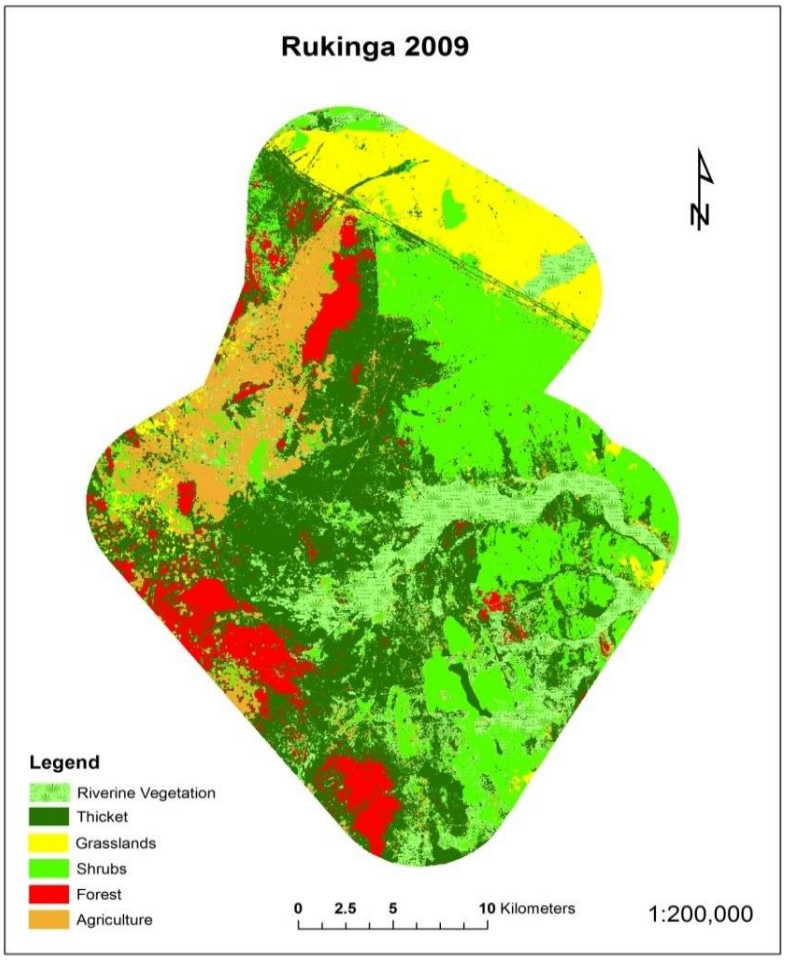
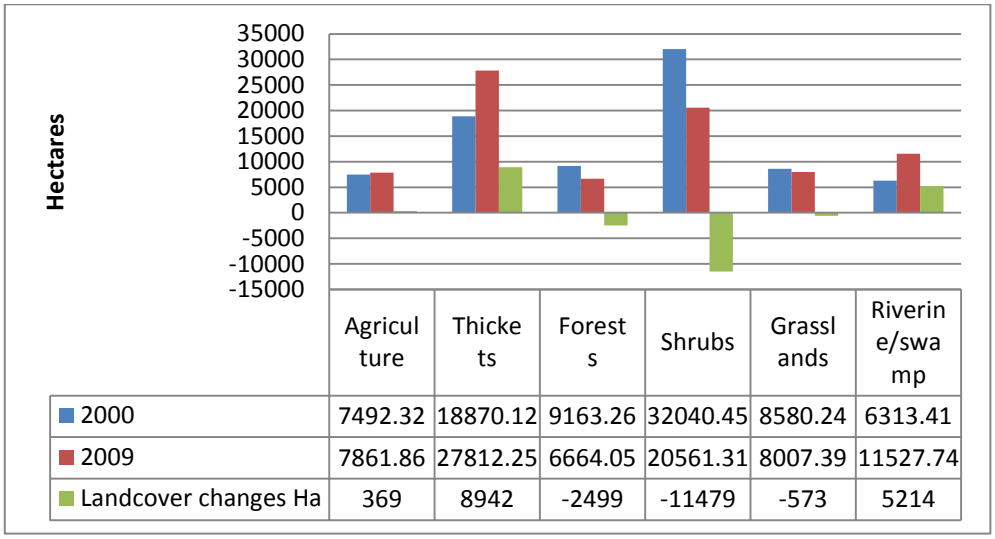


Figure 4.19. Classified image of land use / land cover types for the year 2009 within the Rukinga Wildlife Conservancy and its environs

The different types of vegetation reflect the various habitats for Wildlife and any decrease could lead to competition and death. The land use and land cover types requires conservation and management by the community and conservation area managers. The analysis of land use land cover change from the satellite images of 2000 and 2009 indicated that there was an increase of agricultral activites by 369 ha. in the neighbourhood, light forest by 8,942 ha. within the park, a decrease in forest cover by 2,499 ha., decrease of grassslands and shrubs by 11,479 ha. due to prolonged droughts and an increase in swampy area during the rainy season (Fig. 4.20). An increase of agricultural activities and a decrease in vegetation cover lead to animals moving to cultivated land which leads to resource conflicts.



	Agriculture	Thickets	Forests	Shrubs	Grasslands	Riverine/swamp
2000	7492.32	18870.12	9163.26	32040.45	8580.24	6313.41
2009	7861.86	27812.25	6664.05	20561.31	8007.39	11527.74
Landcover changes Ha	369	8942	-2499	-11479	-573	5214

Figure 4. 20 Land use / land cover chart for 2000 and 2009 images within Rukinga Wildlife Conservancy and its environs

The land cover changes were correlated with the types of land use practised where; 53.7% respondents practiced farming, 22% livestock keeping, 4.9% commercial activities and 19% farming and livestock keeping. 26% of the respondents noted a reduction in forest cover, 34.1% stated rivers were drying and 39% indicated a reduction in rangeland. This correlated with the decrease in forest cover of 2,499 ha. The decrease in land cover led to competition over resources leading to increased conflicts where; 24.4% of the respondents indicated there was human - wildlife conflict, water conflict (26.8%) and 48.8% noted there was conflict over grass.

4.5.2 Southern Conservation Area Land Use and Land Cover Analysis

The landsat images used for the Southern Conservation area were for the years; 1988, 1999 and 2010. The satellite images were used to analyze land cover and land use changes in Amboseli National Park and Kimana Community Conservancy.

4.5.2.1 Amboseli National Park, 1988, 1999 and 2010 Landsat Images.

The satellite images were used to analyze land cover and land use changes in Amboseli National Park (Figs. 4.21, 4.22 and 4.24).

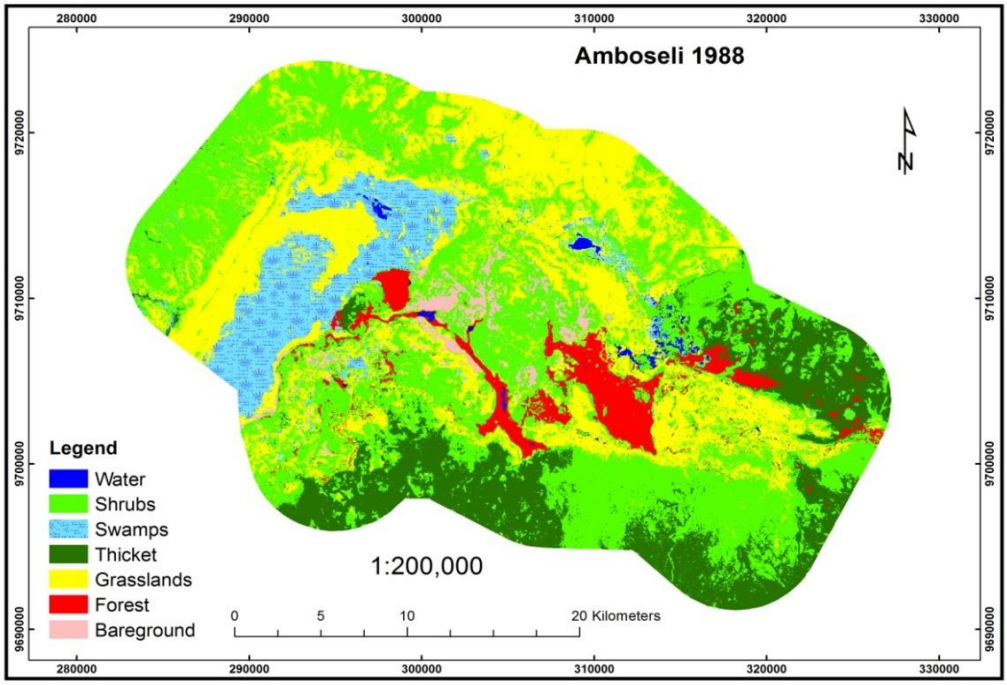


Figure 4.21. Classified image of land use / land cover types for the year 1988 within the Amboseli National Park and its environs

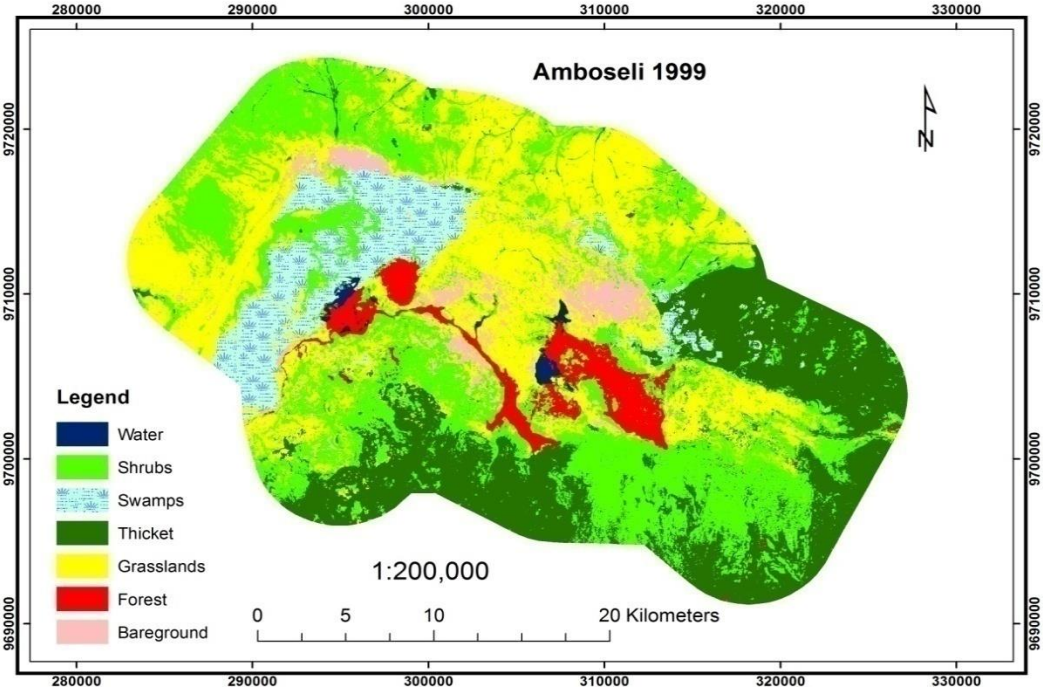
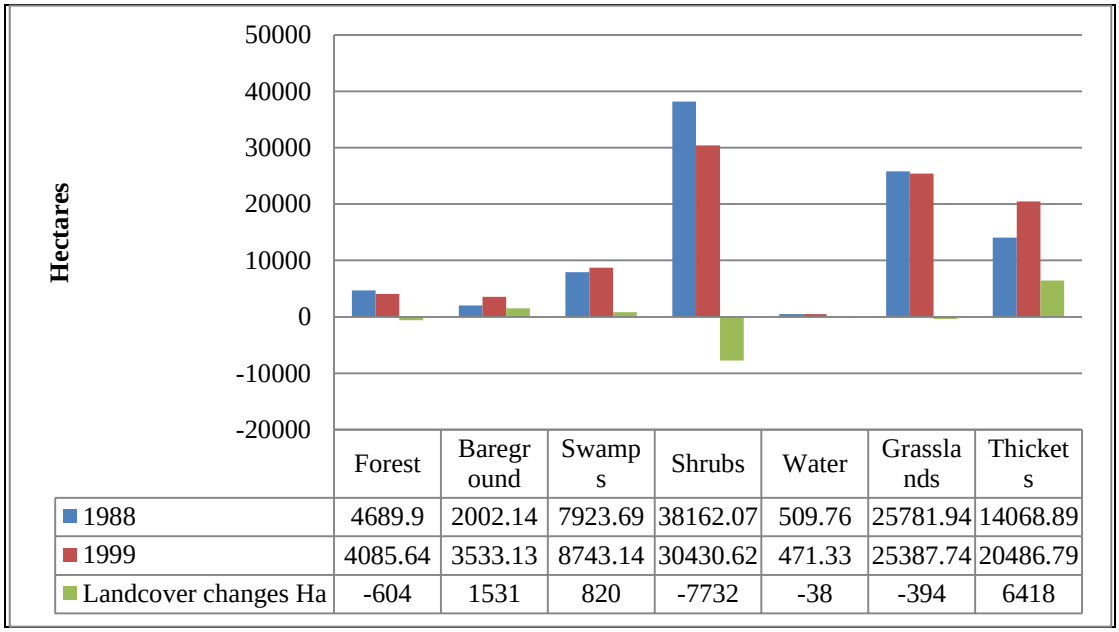


Figure 4.22. Classified image of land use / land cover types for the year 1999 within the Amboseli National Park and its environs



	Forest	Baregr ound	Swamp s	Shrubs	Water	Grassla nds	Thicket s
1988	4689.9	2002.14	7923.69	38162.07	509.76	25781.94	14068.89
1999	4085.64	3533.13	8743.14	30430.62	471.33	25387.74	20486.79
Landcover changes Ha	-604	1531	820	-7732	-38	-394	6418

Figure 4.23. Land use / land cover chart for 1988 and 1999 images within Amboseli National Park and its environs

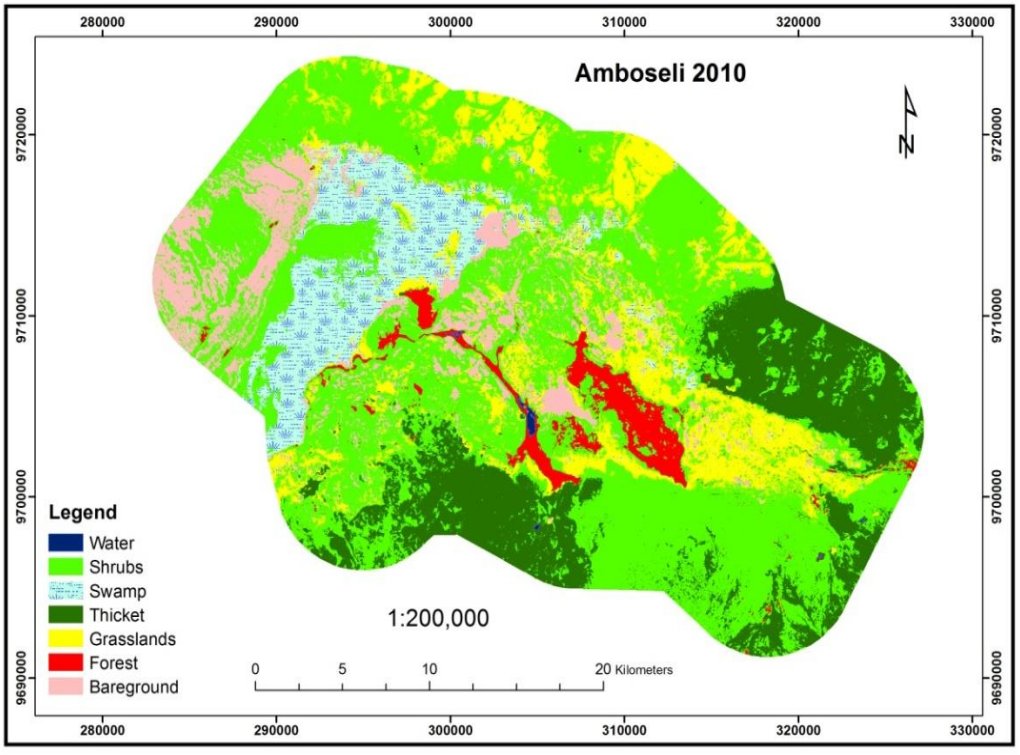


Figure 4.24. Classified image of land use / land cover types for the year 2010 within the Amboseli National Park and its environs

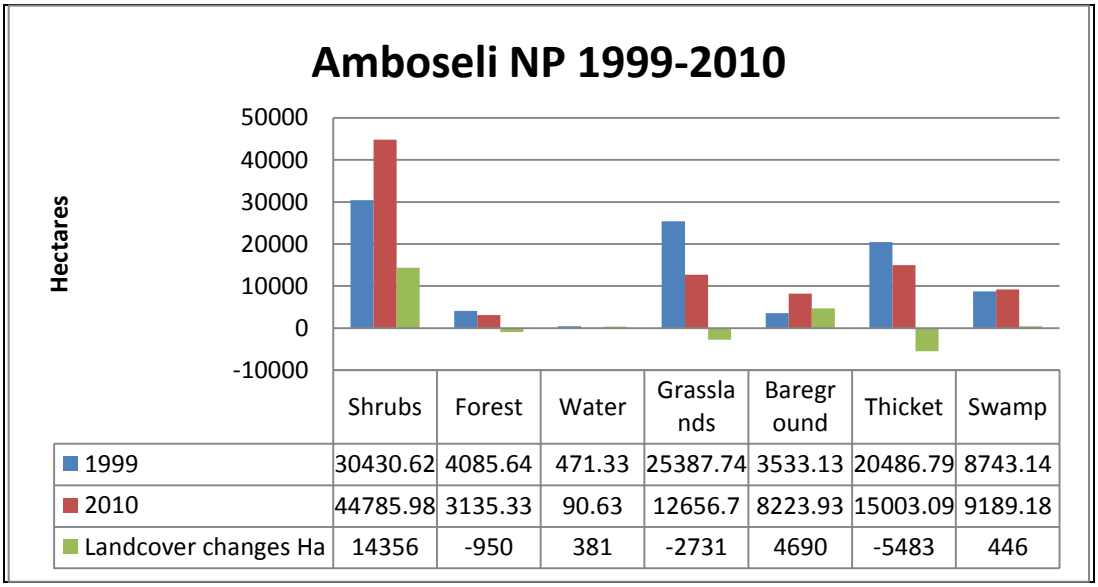


Figure 4.25. Land use / land cover chart for 1999 and 2010 images within Amboseli National Park and its environs

The land cover and land use analysis of Amboseli National Park indicated that there was a decrease in forest cover between 1988 and 1999 of 604 ha., and between 1999 and 2010 a decrease of 950 ha. within the park (Fig. 4.25). Thickets increased by 6,418 ha. between 1988 and 1999 but decreased by 5,483 ha. between 1999 and 2010. Grasslands decreased in area by 394 ha. between 1988 and 1999 and continued to decrease between 1999 and 2010 by 2,731 ha. Shrubs decreased by 7,732 ha. between 1988 and 1999 but increased by 14,356 ha. between 1999 and 2010. Bareground increased by 1,531 ha. between 1988 and 1999 and continued to increase by 4,690 ha. between 2000 and 2010. Swamps increased by 820 ha. between 1988 and 1999 and a lesser increase of 446 ha. between 1999 and 2010 (Fig. 4.25).

The land cover changes indicated a decrease in forest cover of 950 ha. and grasslands by 12,731 ha.This was correlated with community variables such as diminishing resources where 34% of the respondents noted a reduction in forest cover, 27% stated rivers were drying, 29% rangeland reduction and 9.8% noted a reduction in wetlands. The decrease in land cover led to increased conflicts where, 22% of the respondents indicated there was human-wildlife conflict, water conflict (32%), grass conflict had

44% and land conflicts (2%).The management of conservation areas should use management plans and resource inventories to resolve the conflicts,source for fodder out of the conservation areas and increase water holes to supplement water scarcity during droughts.

4.5.2.2 Kimana Community Conservancy 1988, 1999 and 2010 Landsat Images

The landsat images used to analyze land cover and land use changes in Kimana Community Conservancy were for the years; 1988, 1999 and 2010 (Figs.4.26, 4.27 and 4.28).

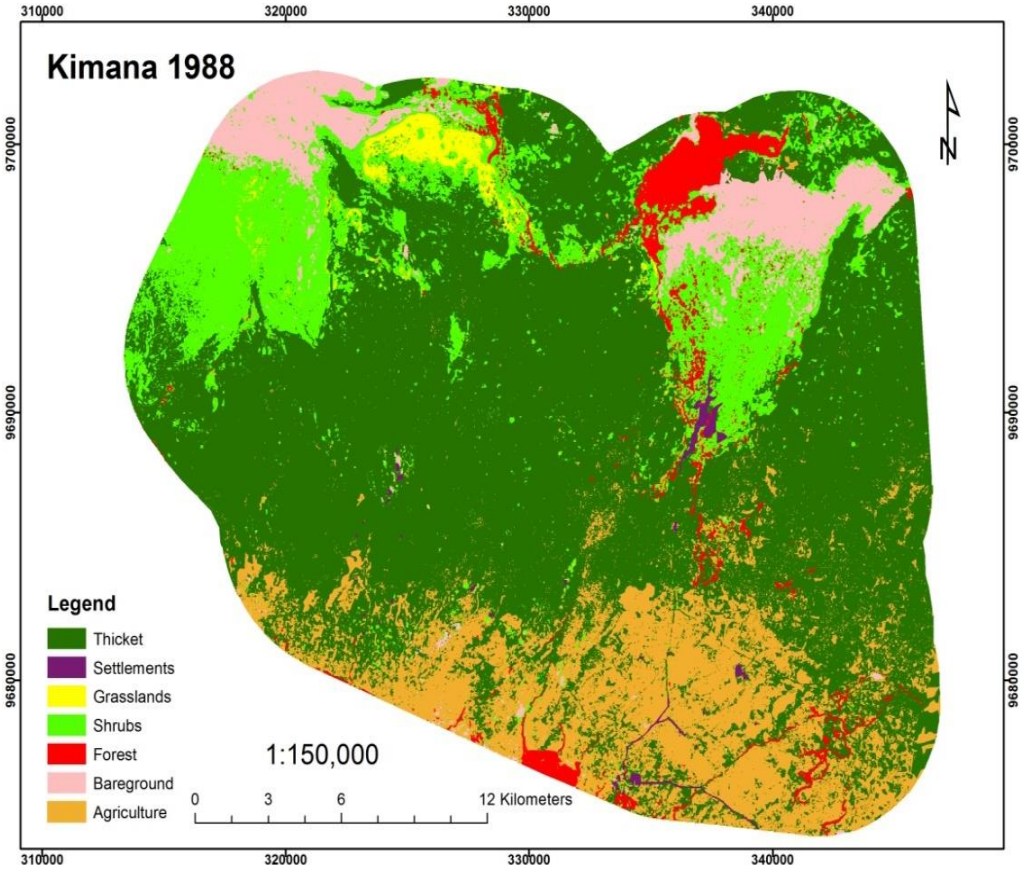


Figure 4.26. Classified image of land use / land cover types for the year 1988 within the Kimana conservancy and its environs

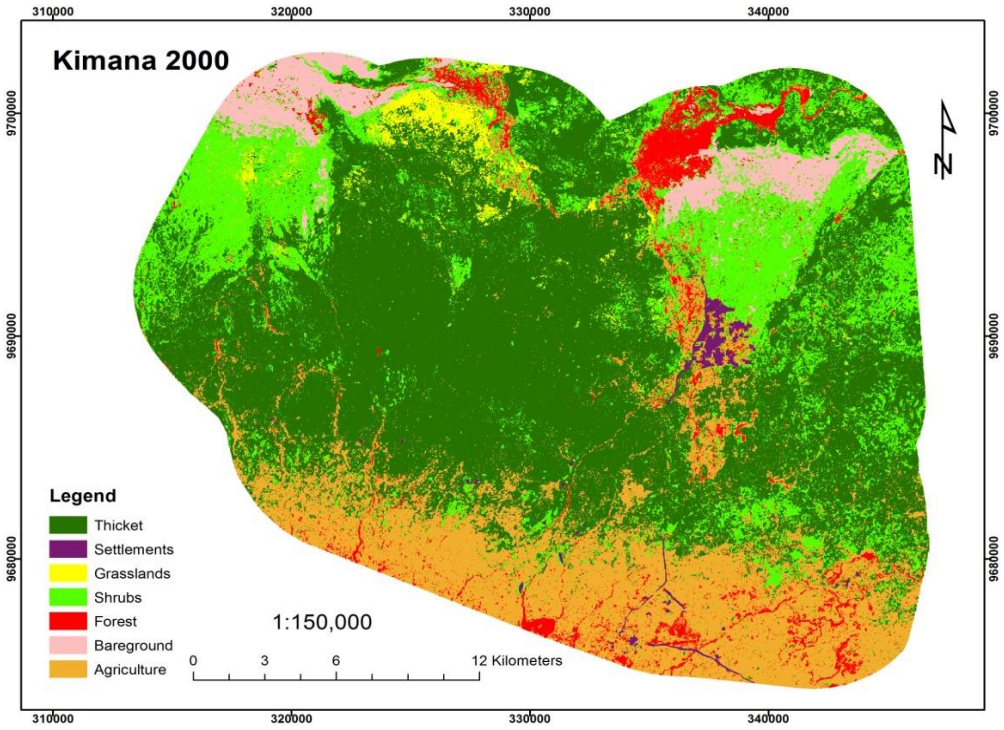
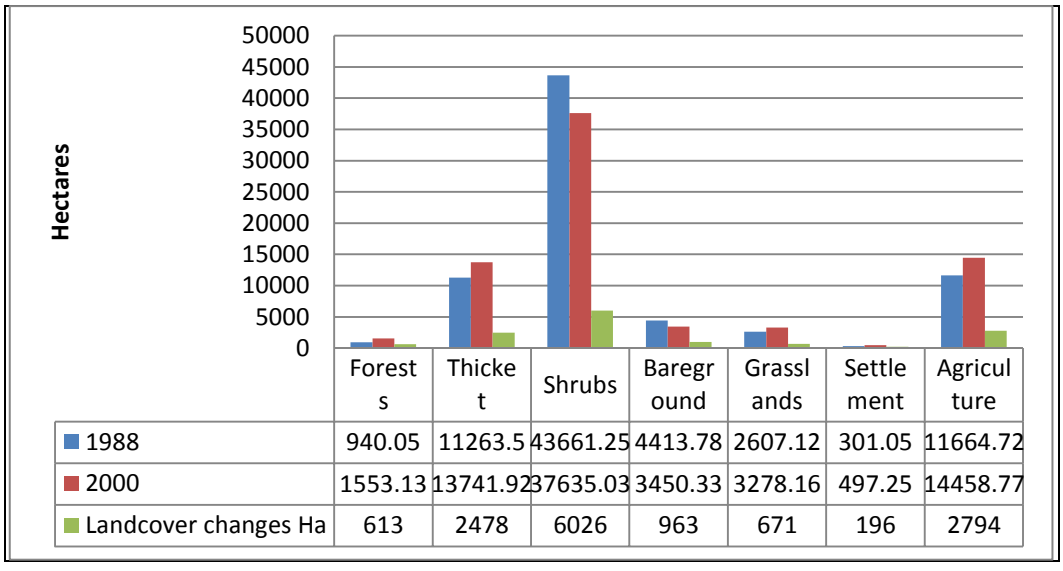


Figure 4.27. Classified image of land use / land cover types for the year 2000 within the Kimana conservancy and its environs



	Forests	Thicket	Shrubs	Bareground	Grasslands	Settlement	Agriculture
1988	940.05	11263.5	43661.25	4413.78	2607.12	301.05	11664.72
2000	1553.13	13741.92	37635.03	3450.33	3278.16	497.25	14458.77
Landcover changes Ha	613	2478	6026	963	671	196	2794

Figure 4.28. Land use / land cover chart for 1999 and 2000 images within Kimana conservancy and its environs

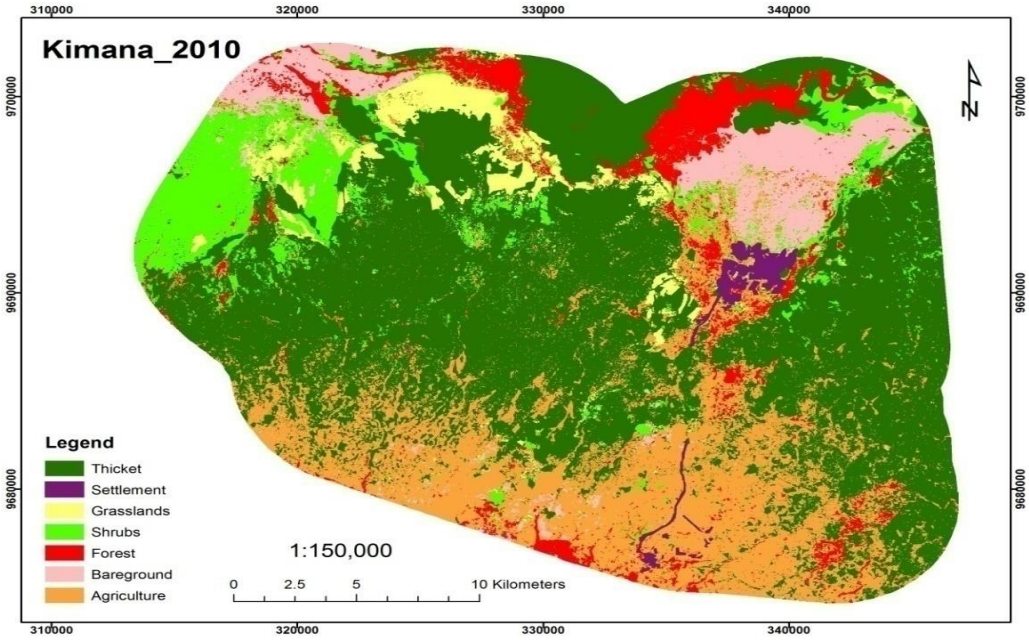
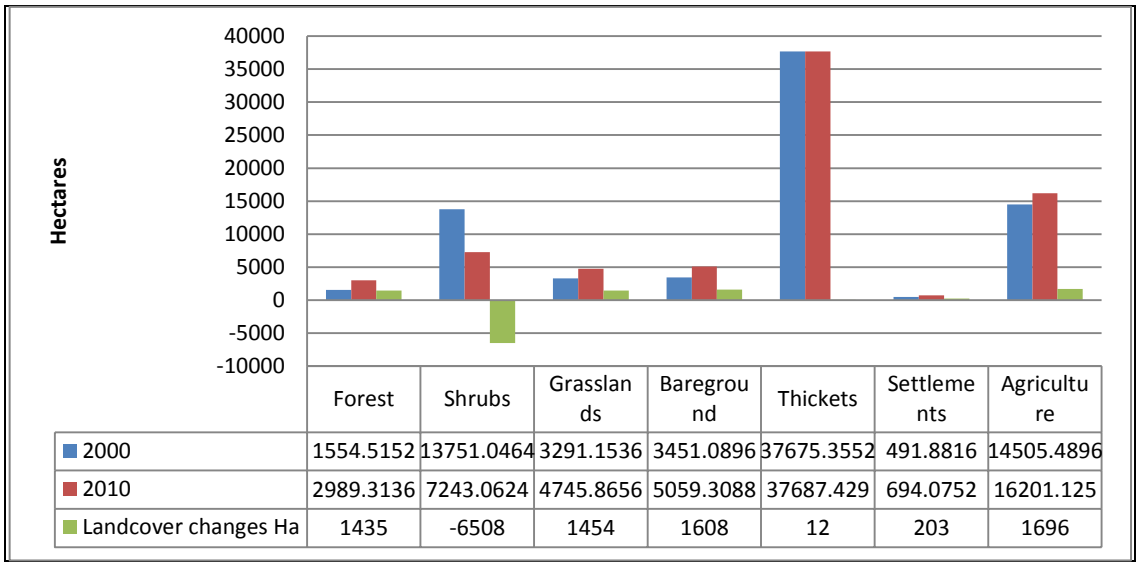


Figure 4.29. Classified image of land use / land cover types for the year 2010 within the Kimana conservancy and its environs



	Forest	Shrubs	Grasslands	Bareground	Thickets	Settlements	Agriculture
2000	1554.5152	13751.0464	3291.1536	3451.0896	37675.3552	491.8816	14505.4896
2010	2989.3136	7243.0624	4745.8656	5059.3088	37687.429	694.0752	16201.125
Landcover changes Ha	1435	-6508	1454	1608	12	203	1696

Figure 4.30. Land use / land cover chart for 2000 and 2010 images within Kimana Conservancy and its environs

The land cover and land use analysis of Kimana conservancy indicated there was an increase in forest cover between 1988 and 2000 of 613 ha. This increased to 1,435 ha. from 2000 to 2010 within the park (Fig. 4.28).

Thickets area increased by 2,478 ha. between 1988 and 2000 and had a slight increase of 12 ha. between 2000 and 2010 (Fig. 4.30). Grasslands increased in area by 671ha. between 1988 and 2000 and continued to increase between 1999 and 2010 by 1,454 ha. Shrubs decreased in area by 6,026 ha. between 1988 and 2000 and continued by decrease between 1999 and 2010 to 6,508 ha. Bareground decreased by 963ha between 1988 and 1999 but increased by 1,608 ha. between 2000 and 2010. The settlements increased by 196 ha. between 1988 and 1999 and 203 ha. between 2000 and 2010. Agricultural activities increased by 2,794 ha. between 1988 and 2000 and by 1,696 ha. between 2000 and 2010 and this led to increased human wildlife conflict and crop destruction.

The land cover changes indicated a decrease in shrubs of 6,508 ha, and an increase in bareground area by 1,608 ha. and grasslands by 1,454 ha. and agriculture by 1,696 ha. The land cover changes was linked to the type of land use practised where; 29% of the respondents practiced farming, 32% livestock keeping, 6% conservancy, 8.8% commercial activities and 24% mixed farming. 35% of the respondents noted a reduction in forest cover, 29% stated rivers were drying, 27% rangeland reduction and 8.8% Wetland reduction. The decrease in land cover led to increased conflicts where 28% of the respondents indicated there was human-wildlife conflict,29% water conflict, 41% grass conflict and 3% had land conflicts.

4.5.3 Central Rift Conservation Area Land Use and Land Cover Analysis

Lake Nakuru National Park represented the Central Rift Conservation area. The 1989 and 2000 landsat images were used for land cover and land use analysis (Figs. 4.31, 4.32 and 4.33).

4.5.3.1 Lake Nakuru National Park in 1989, 2000 and 2008 Landsat Images

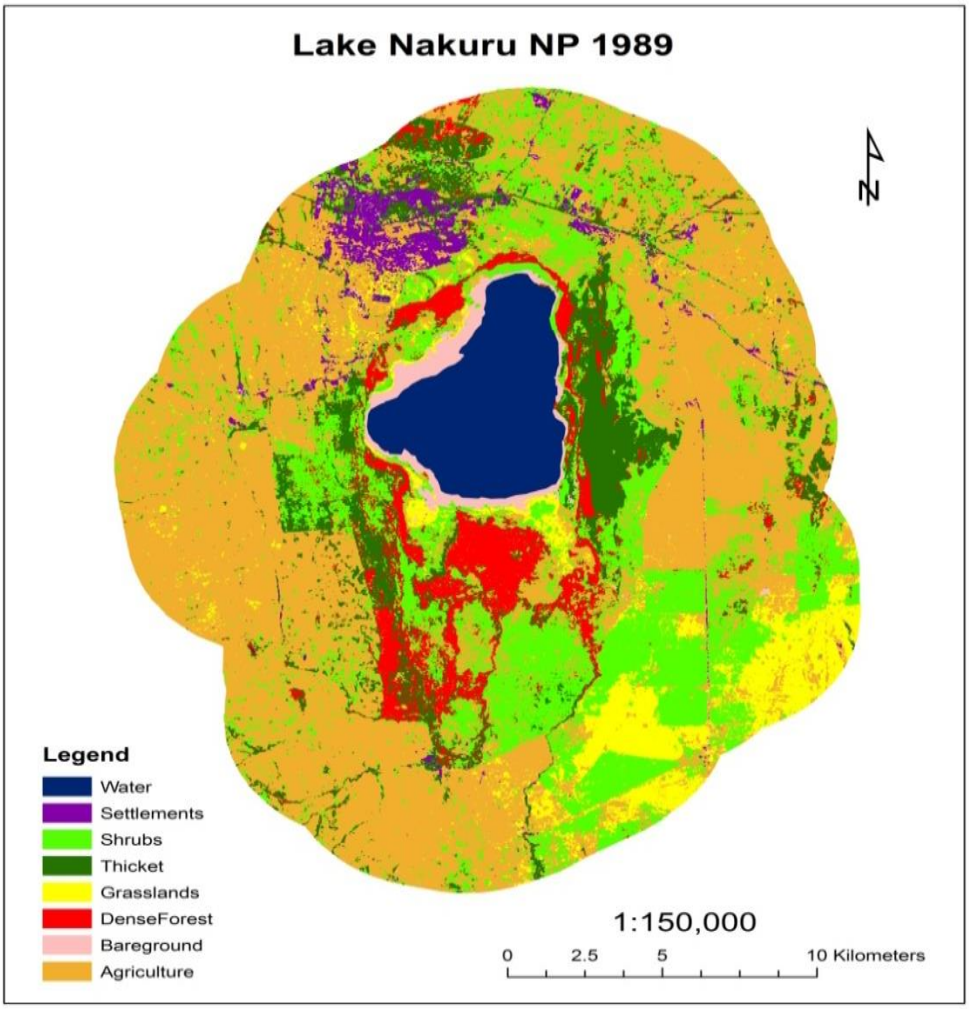


Figure 4.31. Classified image of land use / land cover types for the year 1989 within Lake Nakuru National Park and its environs

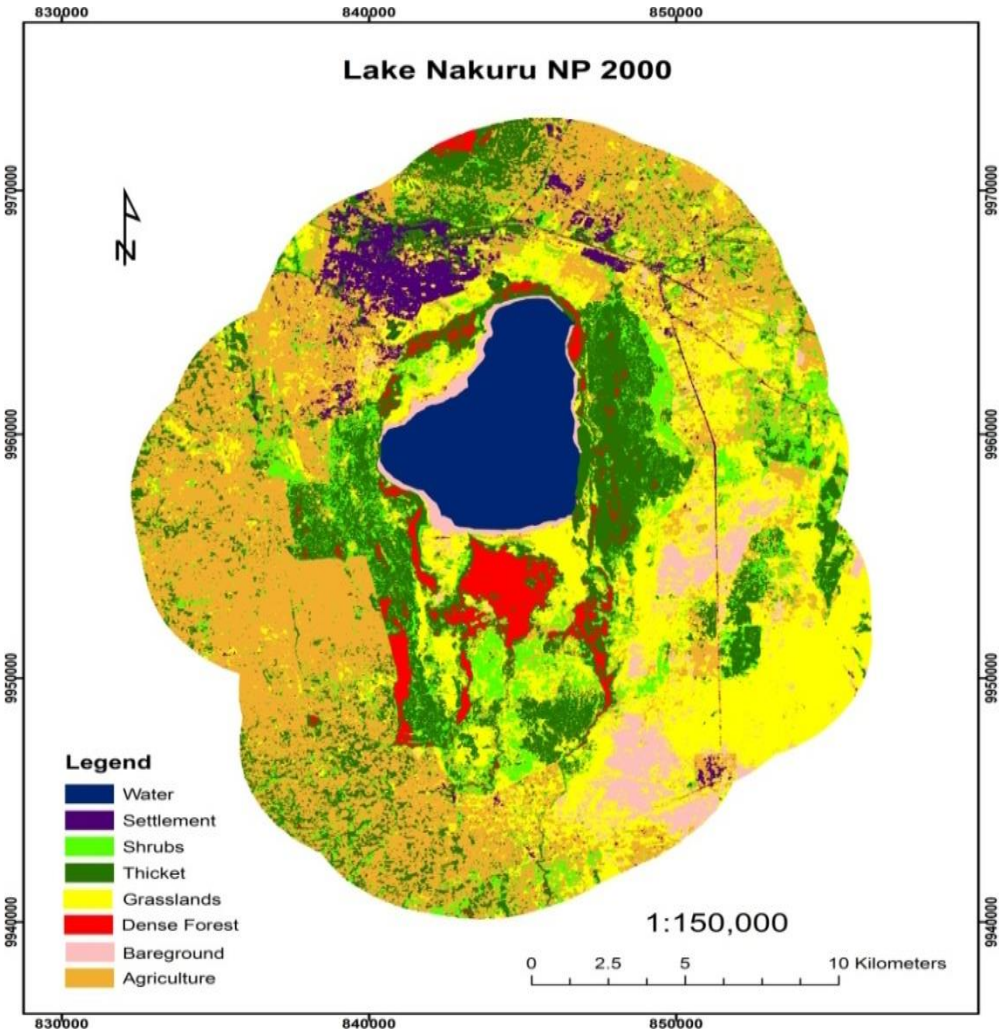
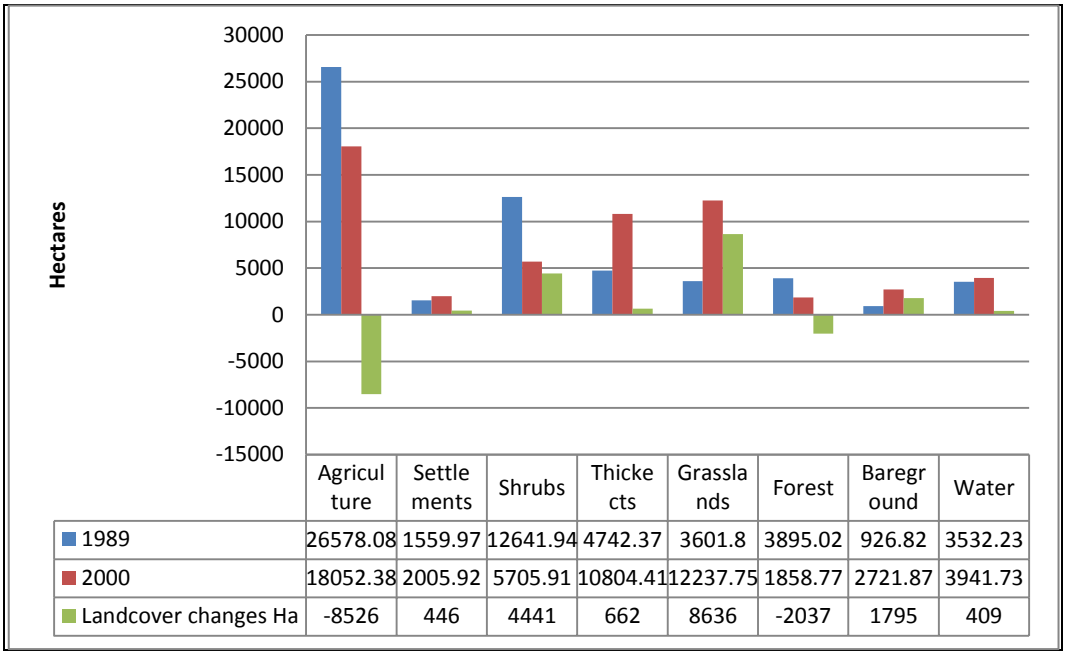


Figure 4.32. Classified image of land use / land cover types for the year 2000 within Lake Nakuru National Park and its environs



	Agriculture	Settlements	Shrubs	Thickets	Grasslands	Forest	Bareground	Water
1989	26578.08	1559.97	12641.94	4742.37	3601.8	3895.02	926.82	3532.23
2000	18052.38	2005.92	5705.91	10804.41	12237.75	1858.77	2721.87	3941.73
Landcover changes Ha	-8526	446	4441	662	8636	-2037	1795	409

Figure 4.33. Land use / land cover chart for 1989 and 2000 images within Lake Nakuru National Park and its environs

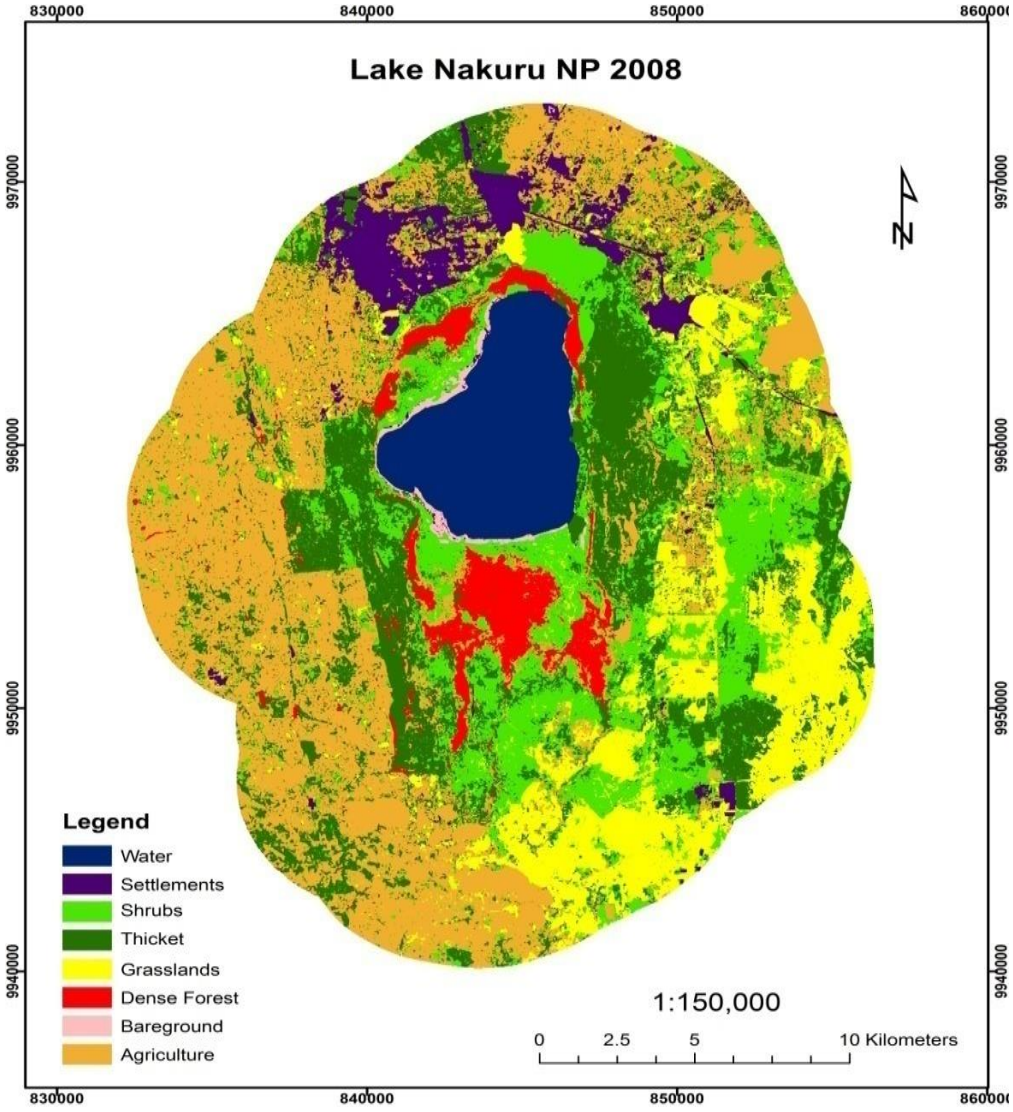
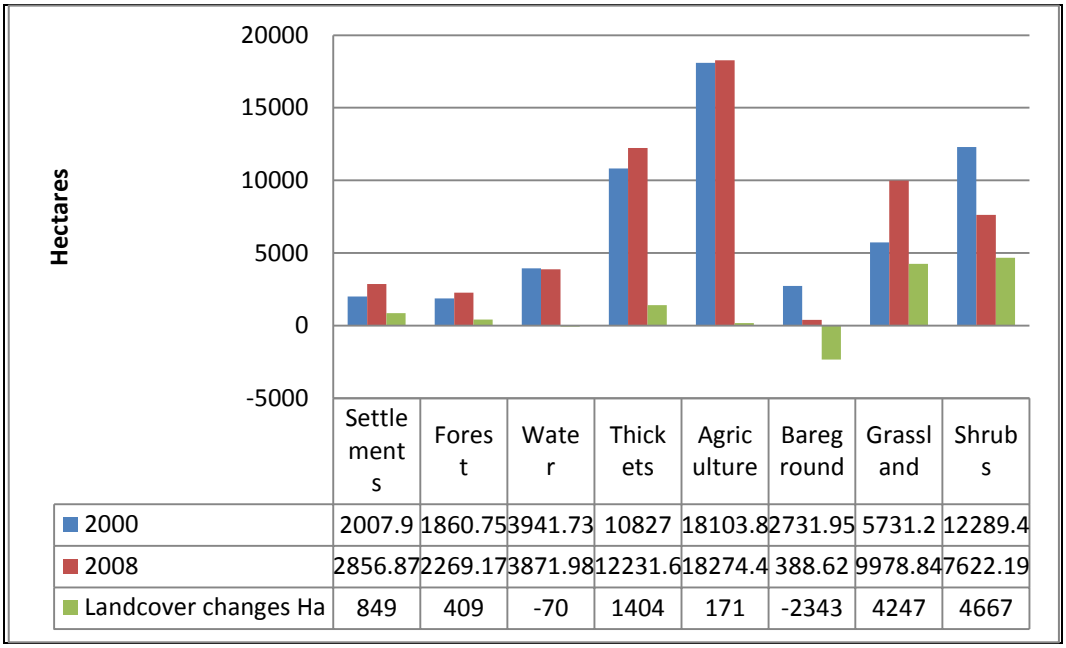


Figure 4.34. Classified image of land use / land cover types for the year 2008 within Lake Nakuru National Park and its environs



	Settlements	Forest	Water	Thickets	Agriculture	Bareground	Grassland	Shrubs
2000	2007.9	1860.75	3941.73	10827	18103.8	2731.95	5731.2	12289.4
2008	2856.87	2269.17	3871.98	12231.6	18274.4	388.62	9978.84	7622.19
Landcover changes Ha	849	409	-70	1404	171	-2343	4247	4667

Figure 4.35. Land use / land cover chart for 2000 and 2010 images within Lake Nakuru National park and its environs

The 1989 and 2000 landsat images were used to analyze Lake Nakuru National Park land cover and land use changes. There was a decrease in forest cover by 2,037 ha. (Fig. 4.33), which continued to decrease by 409 ha. between 2000 and 2008 within the park. Thickets increased by 662 ha. between 1989 and 2000 and continued to increase by 1,404 ha. between 2000 and 2008 (Fig.4.35). Grasslands increased in area by 8,636 ha. between 1989 and 2000 and continued to increase between 2000 and 2008 by 4,247 ha. Shrubs decreased by 4,441 ha. between 1989 and 2000 and continued to decrease by 4,667ha. between 2000 and 2008. Bareground increased by 1795 ha. between 1989 and 2000 but to decreased by 2,343 ha. between 2000 and 2008. The settlements increased by 446 ha. between 1989 and 2008 and 849 ha. between 2000 and 2008. Agriculture increased by 8,526 ha. between 1989 and 2000 and with only 171 ha. between 2000 and 2008. Water increased by 409 ha between 1989 and 2008 but decreased by 70 ha. in the rivers and Lake Nakuru between 2000 and 2008.

The land cover changes was linked to the type of land use practised where there was an increase in settlements of 849 ha. These changes had a correlation with the type of land use practised where; 20% of respondents practiced farming, 5% livestock keeping, 1% conservancy, 9% commercial activities and 65% mixed farming. Fifty nine percent of the respondents noted a reduction in forest cover, 41% stated rivers were drying. 36% of the respondents indicated there was human - wildlife conflict, 21% water conflict, 15% grass conflict, 14% land conflicts and 14% noted human - human conflicts.

4.5.5. Mountain Conservation Area Land Use and Land Cover Analysis

The landsat images of 1988 and 2000 were used for Mt. Kenya National Park and Il Ngwesi land cover and land use analysis (Figs. 4.36 and 4.37).

4.5.5.1 Mt. Kenya National Park in 1988 and 2000 Landsat Images

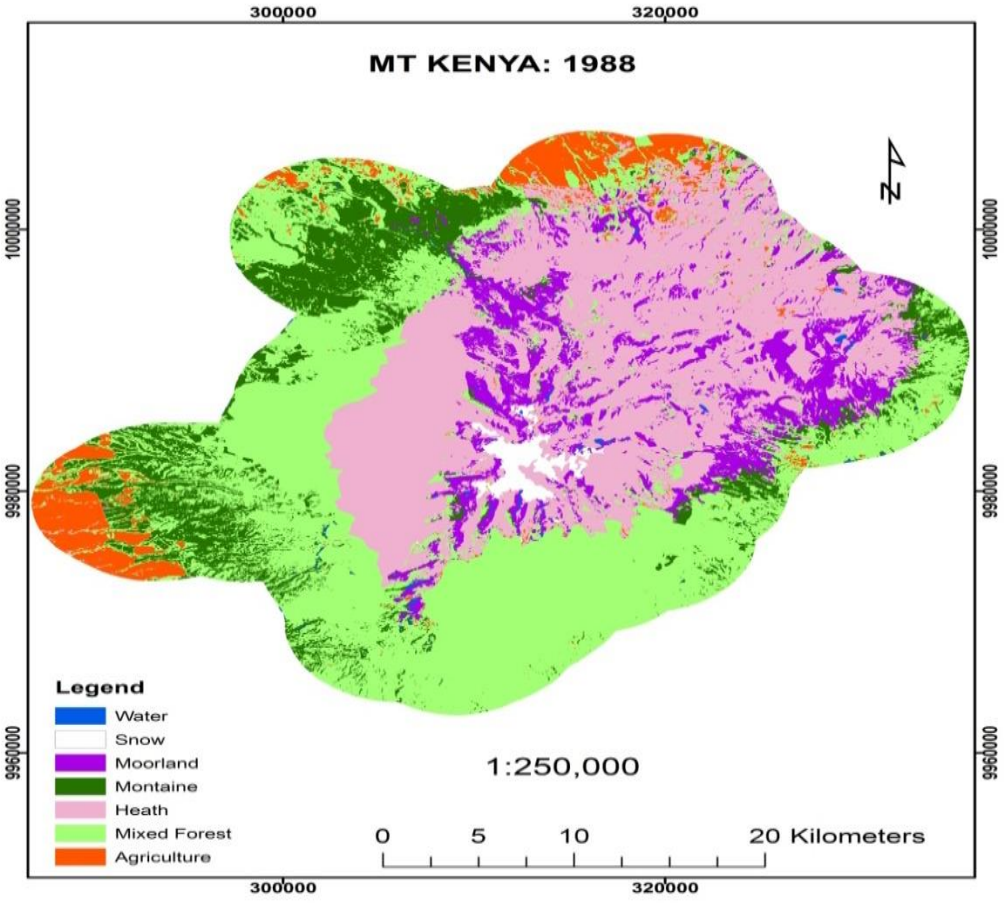


Figure 4.36. Classified image of land use / land cover types for the year 1988 within Mt. Kenya National Park and its environs

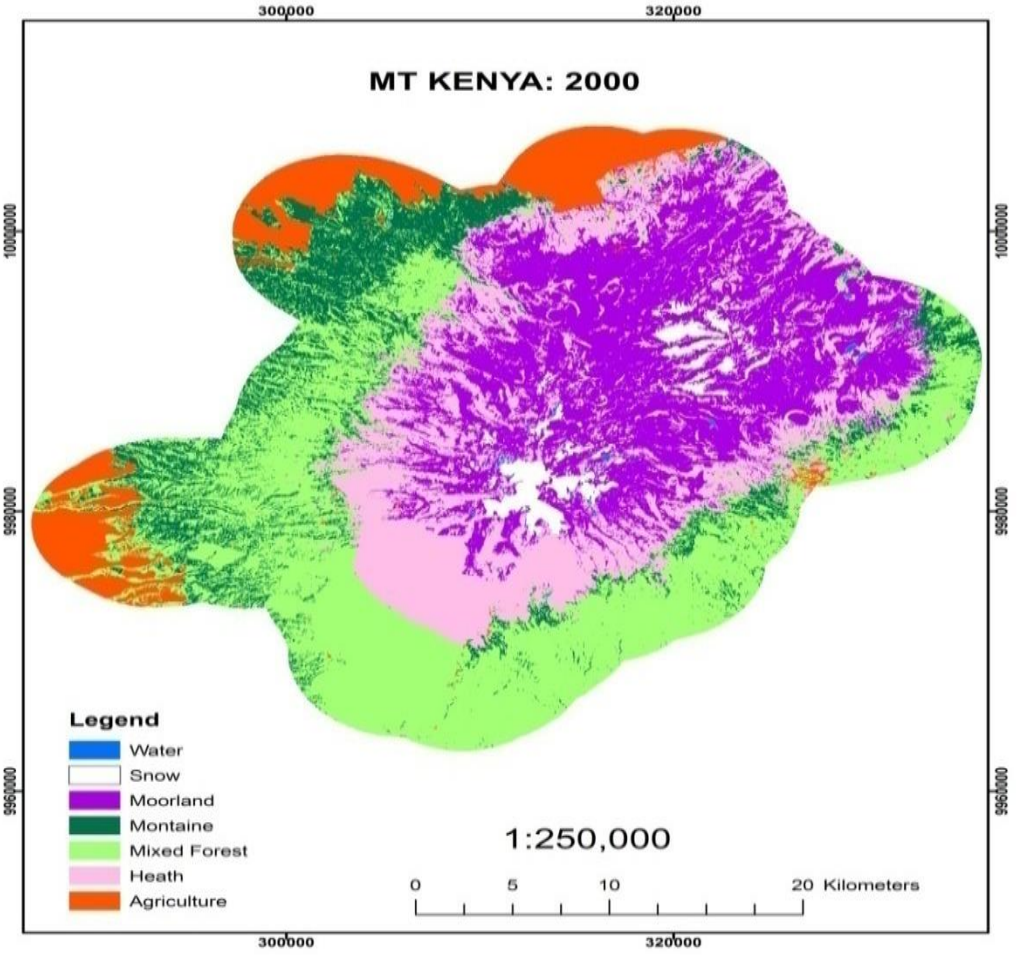
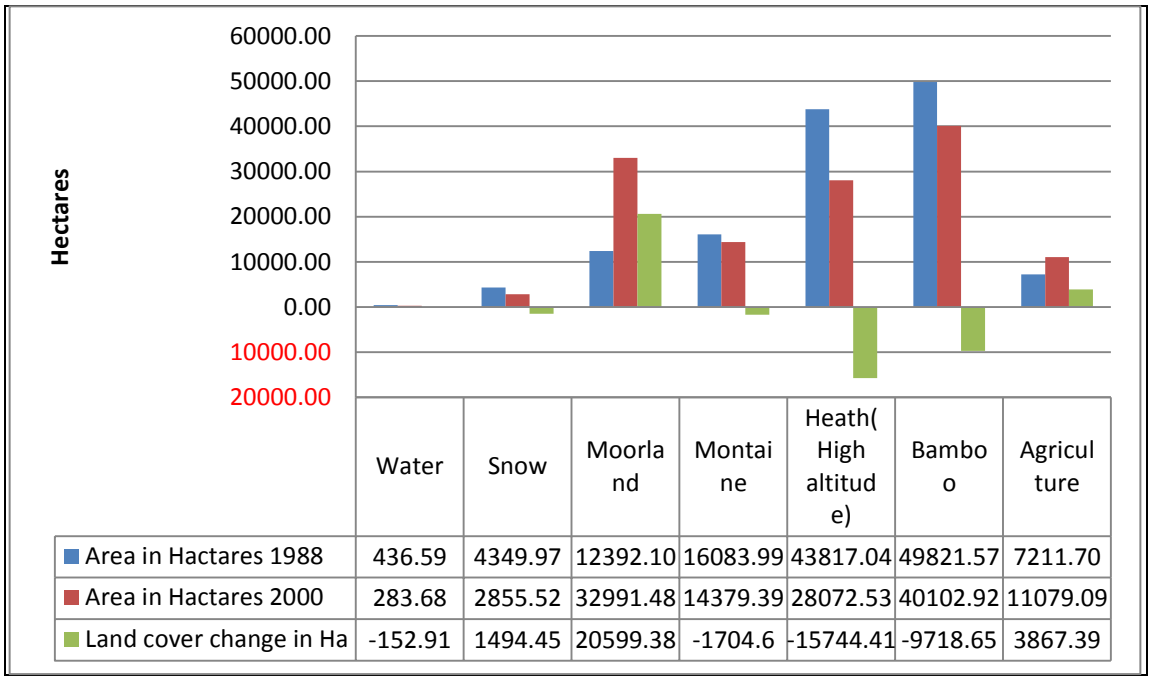


Figure 4.37. Classified image of land use / land cover types for the year 2000 within Mt. Kenya National Park and its environs



	Water	Snow	Moorland	Montaine	Heath(High altitude)	Bambo o	Agriculture
Area in Hactares 1988	436.59	4349.97	12392.10	16083.99	43817.04	49821.57	7211.70
Area in Hactares 2000	283.68	2855.52	32991.48	14379.39	28072.53	40102.92	11079.09
Land cover change in Ha	-152.91	1494.45	20599.38	-1704.6	-15744.41	-9718.65	3867.39

Figure 4.38. Land use / land cover chart for 1988 and 2000 images within Mt. Kenya National Park and its environs

Two satellite images of a ten year period were used to analyse the land use and land cover of Mt. Kenya National Park. There was a problem of cloud cover and stripping in most satellite images between 2001 and 2010. The landsat image of 1988 and 2000 indicated that, there was a decrease in water by 152.91 ha., snow decreased by 1,494.45 ha. , moorland increased by 20,599.3 ha., montane or upper forests decreased by 1,704.6 ha., bamboo decreased by 9,718.65 ha., heath or high altitude forests decreased by 15,744.51 ha., and agricultural land increased by 3,867.4 ha. There was a big increase in agricultural activities in the buffer zone due to illegal logging in the forests, forest fires and impact of climate change on the mountain vegetation (Fig. 4.38).

The correlation between land cover changes and the type of land use practised indicated that 20% of the respondents practiced farming, 9% commercial activities, livestock keeping (5%), mixed farming (65%) and conservancy (1%). Fifty nine

percent (59%) of the respondents noted a reduction in forest cover, 18% stated that rivers were drying up and 23% noted a reduction in rangelands. Twenty percent (20%) of the respondents indicated that there was human - wildlife conflict, grass conflict (42%), water conflict (5%), land conflicts (18%) and human - human conflict had 15%.

4.5.5.2 Il Ngwesi Community Conservancy 1988, 2000 and 2008 Landsat Images

The 1988, 2000 and 2008 landsat images were used for land use and land cover analysis for Il Ngwesi Conservancy (Figs.4.39, 4.40 and 4.42).

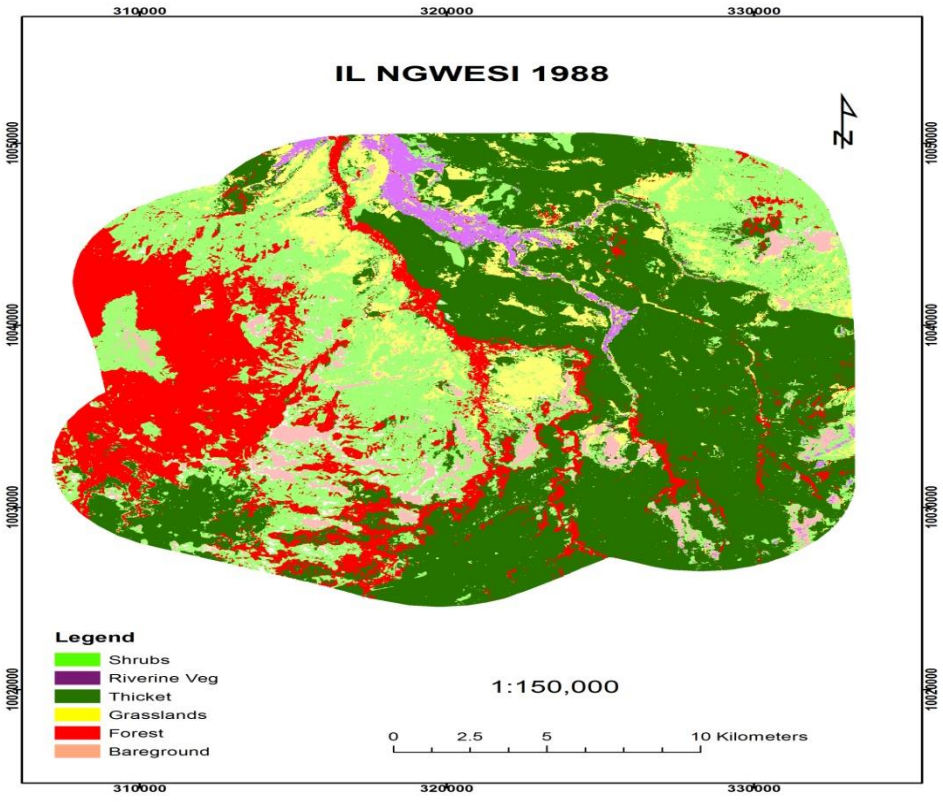


Figure 4.39. Classified image of land use / land cover types for the year 1988 within Il Ngwesi conservancy and its environs

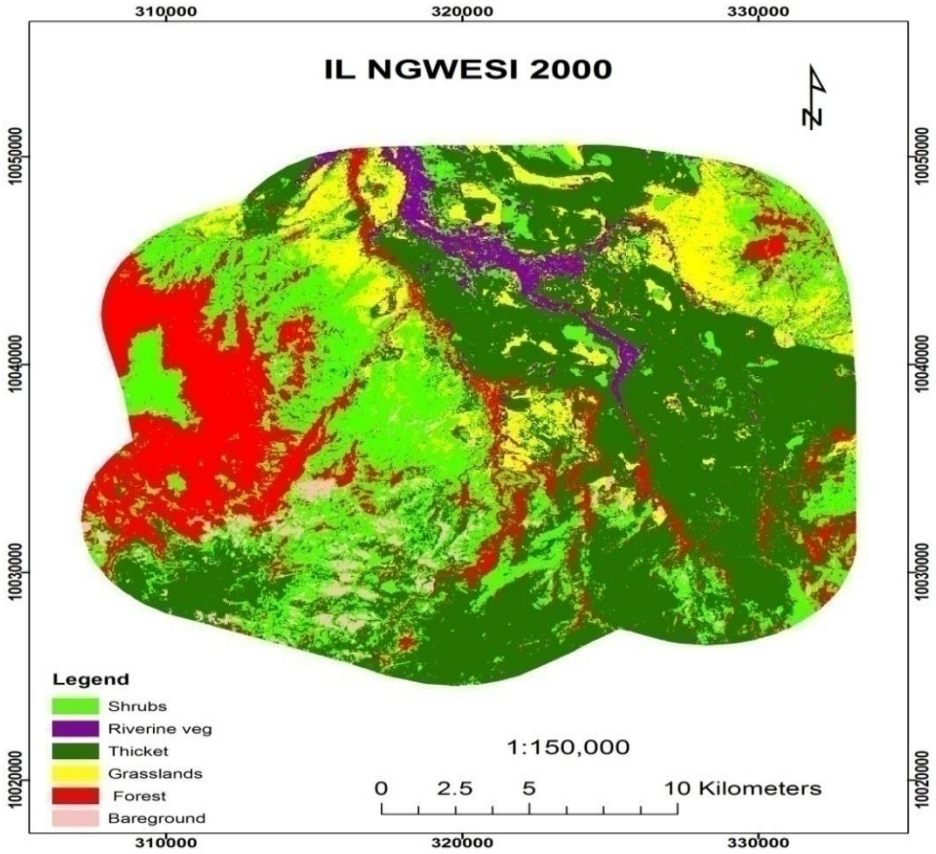
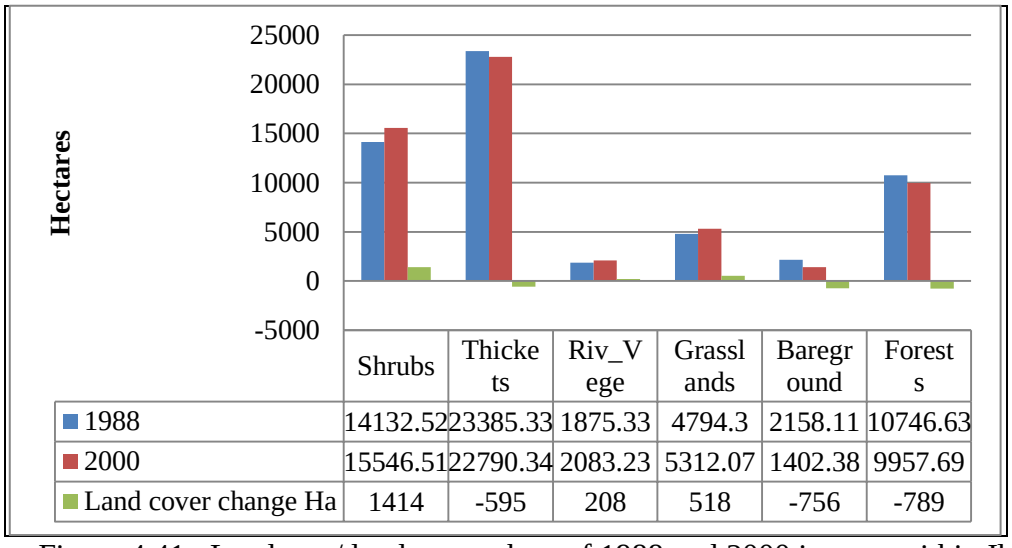


Figure 4.40. Classified image of land use / land cover types for the year 2000 within Il Ngwesi conservancy and its environs



	Shrubs	Thickets	Riv_Vege	Grasslands	Bareground	Forests
1988	14132.52	23385.33	1875.33	4794.3	2158.11	10746.63
2000	15546.51	22790.34	2083.23	5312.07	1402.38	9957.69
Land cover change Ha	1414	-595	208	518	-756	-789

Figure 4.41. Land use / land cover chart of 1988 and 2000 images within Il Ngwesi conservancy and its environs

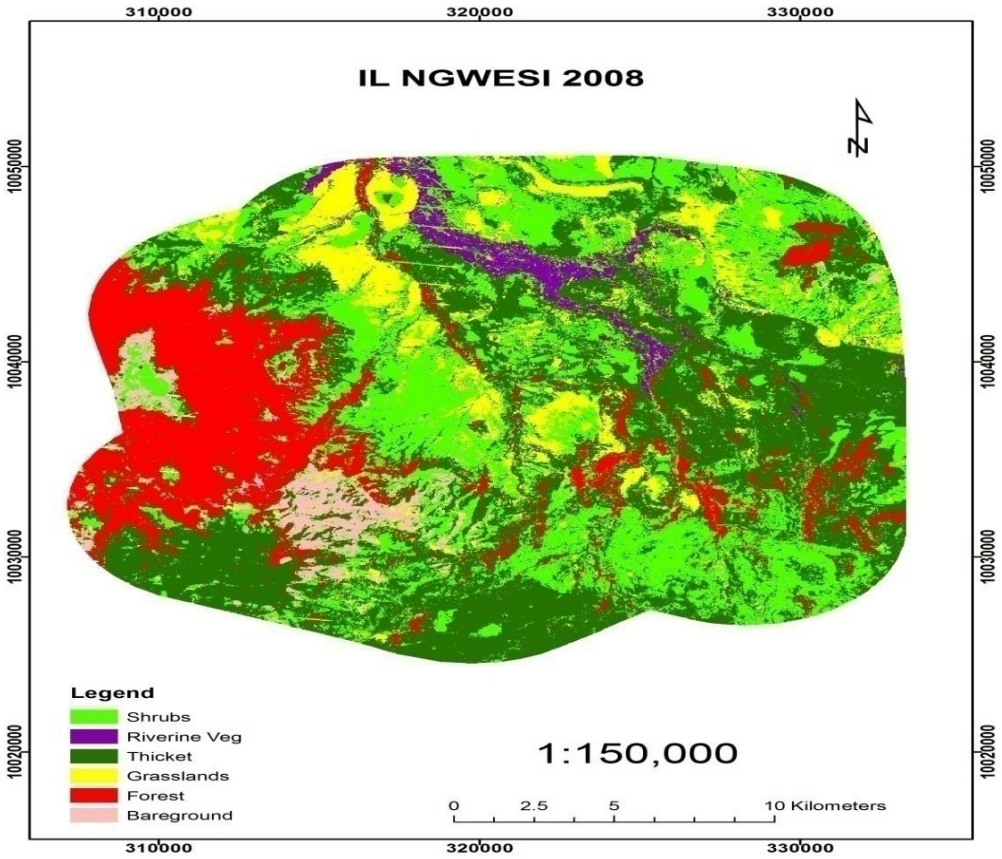
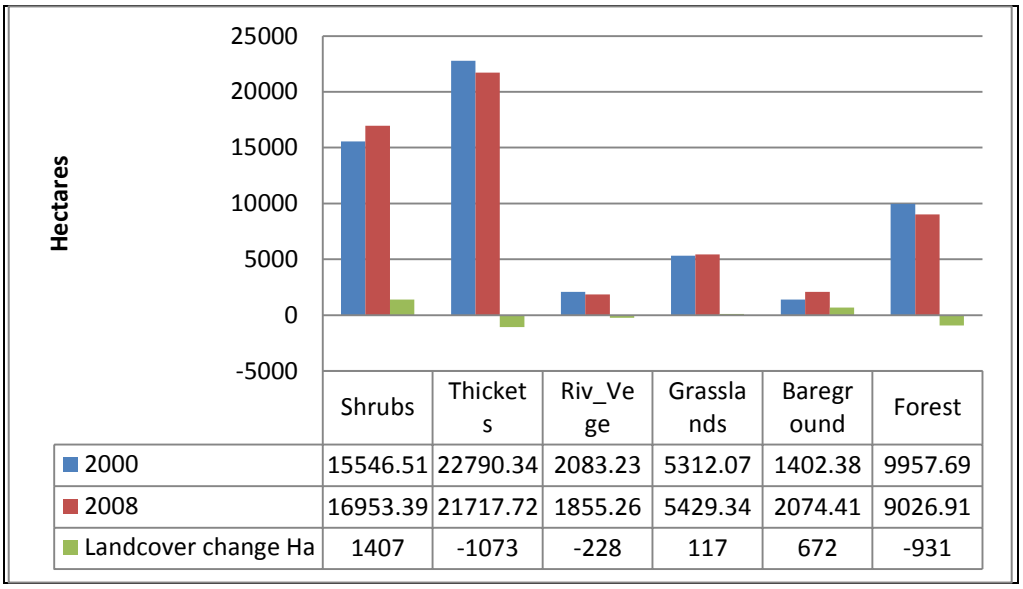


Figure 4.42. Classified image of land use / land cover types for the year 2008 within Il Ngwesi conservancy and its environs

Il Ngwesi Conservancy land cover and land use analysis (Fig.4.41), indicated that there was a decrease in forest cover between 1989 and 2000 by 789 ha. which continued to decrease by 931 ha. between 2000 and 2008 within the park. Thickets decreased by 595 ha. between 1989 and 2000 and continued to decrease by 1,073 ha. between 2000 and 2008. Grasslands increased in area by 518 ha. between 1989 and 2000 and continued to increase between 2000 and 2008 by 117 ha. Bareground decreased in area by 756 ha. between 1989 and 2000 but increased by 672 ha. between 2000 and 2008. Thickets decreased by 595 ha. and continued to decrease by 1,073 ha. between 2000 and 2008. Forests decreased by 789 ha. in1989 and 2000 and by 931 ha. between 2000 and 2008. Shrubs also increased by 1,414 ha between 1989 and 2000 and by 1,407 ha between 2000 and 2008. Riverine vegetation increased by 208 ha. between 1989 and 2000 but decreased by 228 ha. between 2000 and 2008 (Fig. 4.43).



	Shrubs	Thickets	Riv_Vege	Grasslands	Bareground	Forest
2000	15546.51	22790.34	2083.23	5312.07	1402.38	9957.69
2008	16953.39	21717.72	1855.26	5429.34	2074.41	9026.91
Landcover change Ha	1407	-1073	-228	117	672	-931

Figure 4.43. Land use / land cover chart for 2000 and 2008 images within Il Ngwesi conservancy and its environs

The land cover changes indicated that there was a decrease in forest cover by 931 ha., thickets decreased by 1,073 ha. and riverine vegetation by 228 ha. There was a correlation between the type of land use practised where 21.2% respondents practiced farming, 6.1% practiced mixed farming and Livestock keeping, 54.1% livestock keeping, and 18.2% conservancy. The respondents noted that resources were diminishing with 45.5% of the respondents noting that rivers were drying up and 54.5% noting that the rangeland had decreased. This could have led to increased conflicts where 27.3% of the respondents indicated there was human - wildlife conflict, 30.3% noted there was conflict over grass and 42.4% indicated there was conflict over water. The decrease in land cover over the years should be addressed by culling or relocating some of the wild animals to other conservation areas to reduce the conflicts.

The total hectares per feature class in the seven study sites indicated that agriculturural activities had increased by 10,036.39 ha., settlements by 608 ha, light forests by 8,942 ha. and grasslands by 4,737 ha., thickets by 1,234 ha. and moorland by 20,599.38 ha. There was a decrease in area of forest cover by 29,672 ha., shrubs by 39 ha., bareground by 1,042 ha., bamboo by 9718.65 ha., heath by 15,744.51 ha., montane

vegetation by 1,704.6 ha., water by 603.91 ha. and snow by 2,855.5 ha. The change in land cover was influenced by the type of land use practised where; 26% of the respondents practiced farming, 24% reared livestock, 39% practised mixed farming, 6% were involved in conservancies and 8.1% were in commercial activities. This notwithstanding, 35% of the respondents noted a reduction in forest cover, 35% indicated rivers were drying up, 36% noted rangeland reduction and 9% wetland reduction.

The decrease in resources contributed to the various types of conflicts where 23% of the respondents indicated there was human - wildlife conflicts, 30% noted water conflicts, 36% mentioned conflict over grass, 15% human - human conflict while 8% indicated that there was conflict over land (Appendix 8, Table 4.4). There was a relationship between resource access and sharing in the five conservation areas.

4.6 Perceived Benefits and Costs Associated with Conservation Areas

In the five conservation areas the analysis on benefits and costs indicated that 28.4% of the communities benefited from eco-tourism related activities such as sales from baskets, handmade soaps, elephant dung paper and bead works. Twenty five percent (25%) of the respondents benefitted from community projects such as schools, boreholes, tree seedlings, health centers and tour guides. However, 33% and 20% of the respondents identified crop destruction and human deaths respectively, as the main type of problems from conservation areas. Thirty one percent of the respondents identified human - wildlife conflict while 7% experienced human - human conflict.

Generally, twenty three percent (23%) of the respondents identified the elephant as the main type of animal that caused human - wildlife conflict, while 5% identified the lion. Fifty three percent (53%) identified compensation as the expected solution while 29.6% indicated sharing of benefits from conservation areas. This indicated that, even as communities benefited from conservation areas they also experienced problems emanating from conflict over resources (Appendix 7, Table 4.4).

4.6.1 Coast Conservation Area Benefits and Costs

The benefits and costs of conservation were exemplified by the type of conflict and benefits in conservation areas. Fifty percent (50%) of respondents living next to Shimba Hills National Park and 55% from Mwalughanje Elephant Sanctuary experienced crop destruction from wild animals. Twenty two percent (22%) and 55% of the respondents indicated human deaths as the main type of problem experienced respectively. Fifteen percent (15%) of the respondents living next to Shimba Hills National Park and 41.9% living next to Mwalughanje identified human - wildlife conflict as the main type of conflict. Twenty six percent (26%) of the respondents living next to Shimba Hills National Park identified eco-tourism as the main type of benefit while 23% living next to Mwalughanje benefitted from community projects. Sixty six percent (6%) and 39% of the respondents living next to Shimba hills and Mwalughanje identified compensation as the best solution to human – wildlife conflict (Fig. 4.44).

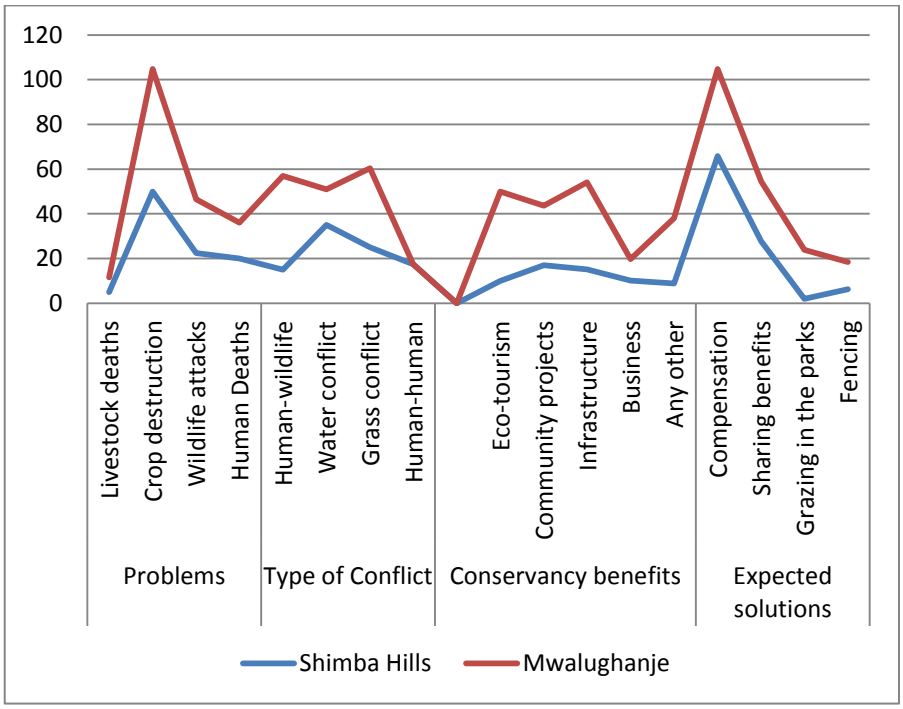


Figure 4.44. Benefits and costs associated with conservation according to respondents in the Coast conservation area

4.6.2 Tsavo Conservation Area Benefits and Costs

In respect to benefits and costs of conservation, thirty eight percent (38%) of the respondents next to the Tsavo East and West National Parks and 32% living next to Rukinga wildlife Sanctuary experienced wildlife attacks. Fifty eight percent (58%) of the respondents living next to Tsavo Parks and 24% living next to Rukinga wildlife Sanctuary suffered from human - wildlife conflicts. Thirty nine percent (39%) of the respondents living next to the Tsavo Parks benefitted from eco-tourism while 27% living next to Rukinga wildlife Sanctuary benefitted from infrastructure and community projects. Sixty six percent (66%) of the respondents living next to Tsavo East and West National Parks and 39% of the respondents living next to Rukinga wildlife Sanctuary preferred compensation as a conflict resolution measure (Fig. 4.45).

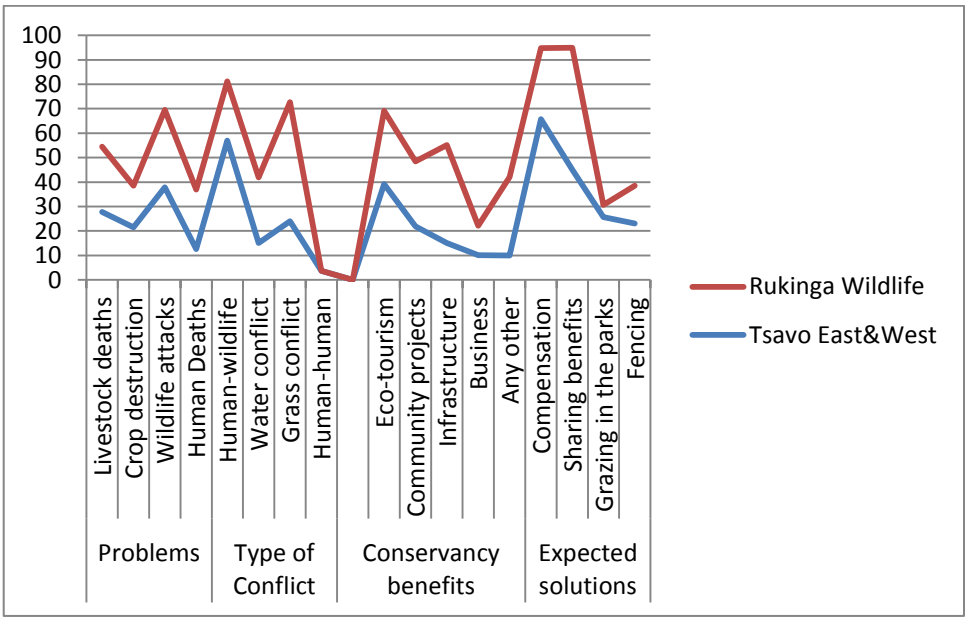


Figure 4.45. Benefits and costs associated with conservation according to respondents in the Tsavo conservation area

4.6.3 Southern Conservation Area Benefits and Costs

Forty nine percent (49%) of the respondents living next to Amboseli National Park and 44% living next to Kimana Community Conservancy experienced crop destruction from wild animals. Thirty four percent (34%) of the respondents living next to Amboseli and 29% living next to Kimana identified eco-tourism as the main

conservation benefit. Forty eight percent (48%) of the respondents living next to Amboseli National Park and 43% living next to Kimana identified compensation as the best solutions to human - wildlife conflicts (Fig. 4.46).

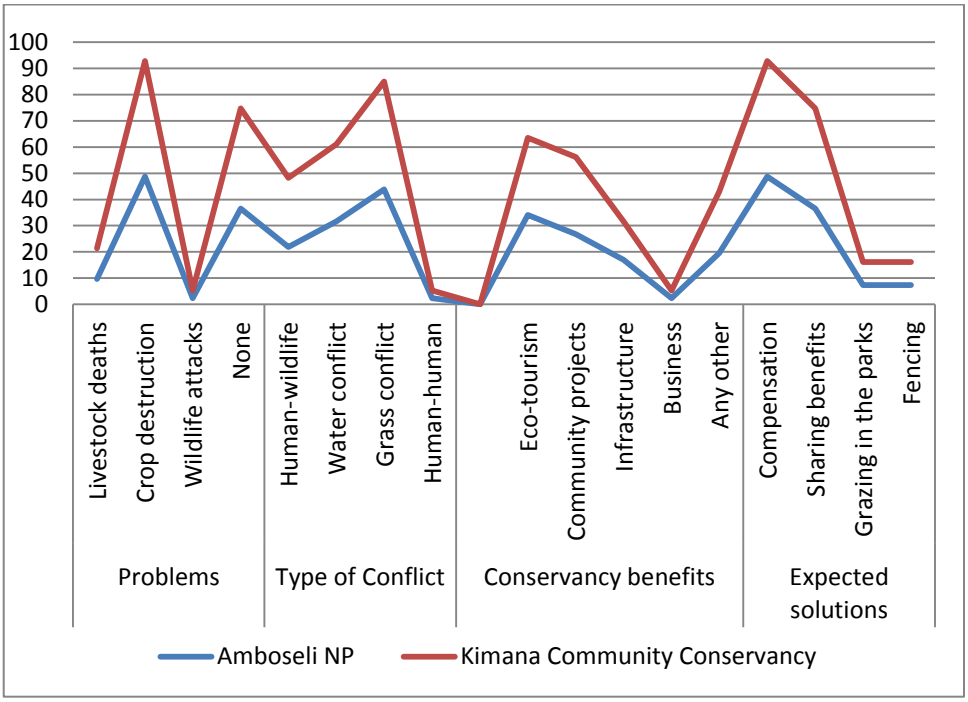


Figure 4.46. Benefits and costs associated with conservation according to respondents in the Southern conservation area

4.6.4 Central Rift Conservation Area Benefits and Costs

Thirty seven percent of the respondents living next to Lake Nakuru National park and 58% living next to Malewa - Kigio Conservancy experienced crop destruction from the wild animals. Fifty three percent of the respondents living next to Lake Nakuru National park, 55% Malewa - Kigio and 45% Soysambu Conservancy suffered from human - wildlife conflicts. Thirty eight percent of the respondents living next to Lake Nakuru National park, 52% at Malewa - Kigio, and 17% living next to Soysambu Conservancy benefitted from eco-tourism. Fifty three percent of the respondents living next to Lake Nakuru National park and 59% living next to Malewa - Kigio conservancy preferred compensation for damages caused by Wildlife attacks (Fig. 4.47).

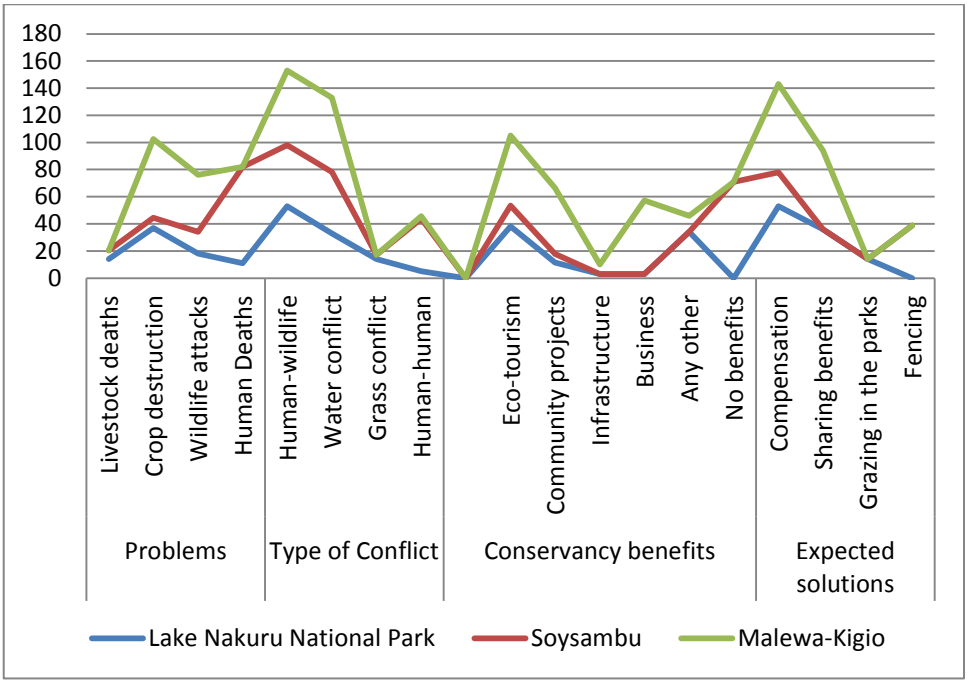


Figure 4.47. Benefits and costs associated with conservation according to respondents in the Central Rift conservation area

4.6.5 Mountain Conservation Area Benefits and Costs

Fifty eight percent of the respondents at Mt. Kenya National park experienced crop destruction from the wild animals. Twenty two percent (22%) living next to Ol Pejeta and 15% living next to Il Ngwesi Conservancies stated that their livestock were attacked by wild animals. Forty two percent (42%) of respondents living next to Mt. Kenya National Park experienced conflicts over grass while 53% of the respondents at Ol Pejeta and 42% living next to Il Ngwesi Conservancies experienced water conflicts. Thirty eight percent (38%) of the respondents living next to Mt. Kenya National Park and 76% living next to Il Ngwesi conservancy benefitted from eco-tourism. Seventy two percent (72%) of the respondents living next to Ol Pejeta benefitted from community projects. Fifty five percent (55%) and 77% of the respondents at Ol Pejeta and Il Ngwesi respectively, preferred sharing benefits from the conservation area. Sixty two percent of the respondents at Mt. Kenya National Park preferred compensation for damages caused by wild animals (Fig. 4.48).

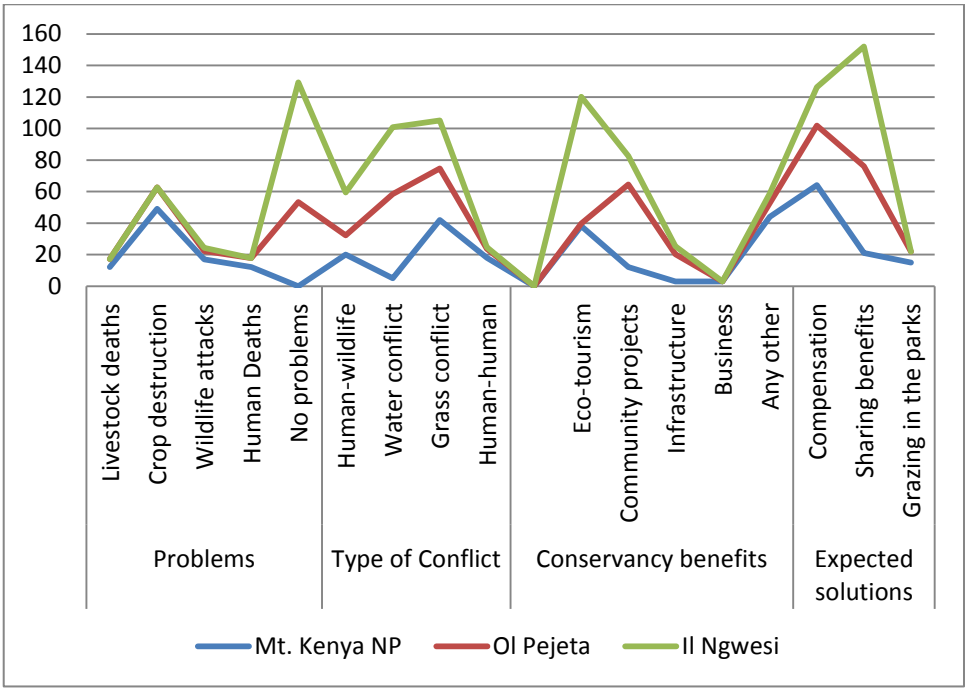


Figure 4.48. Benefits and costs associated with conservation according to respondents in the Mountain conservation area

4.6.6 Conservation Benefits and Costs in Three Conservation Regimes

The conservation benefits and costs from the three conservation regimes indicated that 31% of the respondents living next to KWS Parks benefited from eco-tourism, 18% from community projects such as schools, boreholes and health centers, 13% from infrastructure such as roads, 7% from business activities selling curios to tourists and 30.9% from other benefits such as employment. Five percent of the respondents living next to private conservancies benefited from eco-tourism, 41% benefited from community projects, 20% from infrastructure development, 6% business and 12% other benefits. Forty three percent (43%) of the communities bordering community conservancies benefited from ecotourism, 35% from community projects, 6% from infrastructure, 3% from businesses and 12% from other benefits.

The local communities experienced various problems in the three conservation regimes. The human - wildlife conflict was the main type of conflict in all conservation areas, followed by water and grass conflicts. The elephant, buffalo, lion and leopard were the main types of animal that attacked communities and affected their livelihoods across

the three conservation regimes. Most of the respondents preferred compensation by the conservation area management which is classified as death of human or livestock, injury or crop destruction. Also the sharing of benefits was considered as the best solutions to human-wildlife conflicts in the three conservation regimes.

The specific management regimes in the five conservation areas exemplified variation in the types of conflicts, conservancy benefits and expected solutions from the communities. Fifty percent, 49% and 47% of respondents living next to Shimba Hills, Mt. Kenya and Amboseli National Parks experienced crop destruction. Fifty eight percent and 46% of the respondents at Malewa and Kimana Community Conservancies also reported crop destruction as the main type of problem experienced from the conservation areas. Seventy one percent of the respondents bordering Soysambu Conservancy reported that human deaths were the main problem experienced from the conservancy. There were disadvantages and benefits of conservation areas to the communities. However, the magnitude and level of benefit was influenced by the management regime (Appendix 8, Table 4.5).

4.7 Community Involvement in Conservation Management

Sixty four percent (64%) of the respondents in five conservation areas were involved in conservation of resources. By conserving forests, 26% of the respondents living next to KWS parks benefitted from favorable weather, 35% of the respondents benefited from source of firewood while 20% benefitted from tourism. Forty six percent (46%) of the respondents indicated that the conservation area management involved them in decision making while 52% were not involved. Sixty seven percent (67%) of the respondents were aware of environmental issues while 33% were not aware (Appendix 9, Table 4.6). Thirty two percent (32%) and 45% of the respondents living next to private conservancies benefitted from favorable weather and firewood respectively. Thirty eight percent (38%) of the respondents living next to community conservancies benefitted from tourism (Fig. 4.49).

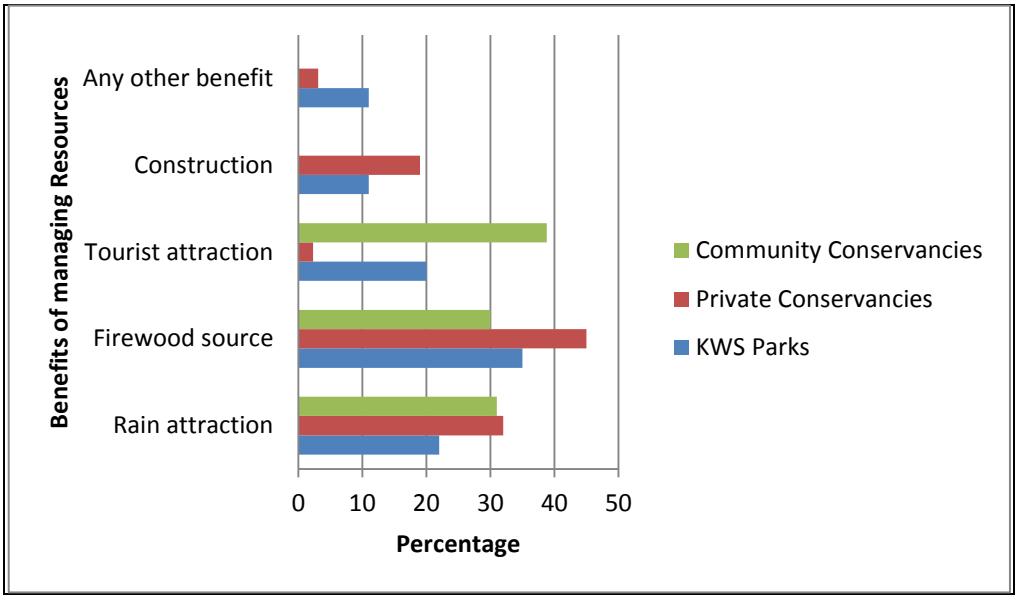


Figure 4.49 Benefits of managing environmental resources in conservation regimes

Overall, sixty two percent (62%) of the respondents living next to KWS Parks and 64% living next to private parks were not involved in decision making. Seventy nine percent (79%) of the respondents living next to community conservancies were involved in decision making. The community environmental awareness indicated that 66% of the respondents living next to KWS Parks, 54% next to private conservancies and 71% living next to community conservancies were aware of environmental issues.

4.8 Significance of Community Characteristics and Factors of Conservation Management

The Pearson's correlation and Chi square tested the relationship and association of household variables on community characteristics, resource use and sharing, benefits and costs of conservation and community involvement in conservation areas.

The Wilcoxon Ranks test was used to test the means of related samples among two or more variables in the five conservation areas, (MacDonald, 2014).

4.8.1 Inferential Statistics Using Pearson's Correlation Test

The Pearson's correlation test showed a negative correlation between conservancy benefits and disadvantages of living next to the park ($r = -0.183$, $p < 0.001$, $n = 659$) at 0.05 level. This could be due to an increase in problems from conservation areas which reduced the impact of conservancy benefits. Conservancy benefits and expected solutions has a significant correlation since the identification of conflict resolution measures could enhance benefits to communities ($r = .141$, $P < 0.000$, $n = 659$) at (0.05level) and at 95% confidence level. Type of conflict and conservation benefits has a correlation of ($r = 0.201$, $P < 0.000$, $n = 659$) at 0.05 level. There is a symbiotic relationship between communities and benefits from conservation areas where there are no conflicts. An increase in conservancy benefits such as eco-tourism, community projects and infrastructure changes community's perception to Wildlife conservation. Type of wild animal attacks and conservation benefits has a negative correlation of ($r = -0.118$, $P < 0.000$, $n = 659$) at 0.05 level.

The local communities were not motivated to conserve wildlife due to frequent attacks and they retaliated by killing the animals. The increased animal attacks on people, livestock and crops overshadow any benefits accrued from conservation areas. Conservation knowledge and environmental awareness has a significant correlation of ($r = 0.155$, $P < 0.000$, $n = 659$) at 0.05. This enhances community conservation efforts and sustainable use of resources. Stakeholder input and environmental awareness has a significant positive correlation of ($r = 0.310$, $P < 0.000$, $n = 659$) at 0.05. This indicates that community involvement in decision making improves the acceptability of environmental conservation.

4.8.2 Inferential Statistics Using Pearson's Chi Square Test

The Pearson's Chi square tested the degree of association in the following variables practiced land use and types of resources, type of resources and land ownership, diminishing resources and type of resources, means of sustaining family and conservancy benefits, type of conflict. The Chi Square results indicates that the type of land use practiced has an association with the type of resources available, ($x = 35.905$,

df = 16, P = 0.003). The type of land use preferred by the respondents such as farming, livestock keeping, conservancies or commercial activities was associated with the type of resources available. The resources available influenced the type of livelihood practiced by the communities. Diminishing resources has an association with type of resources (x = 17.630, df = 16, P = 0.346 > 0.05). This is due to competition and overuse of available resources.

Means of sustaining family also has an association with disadvantages of living next to the park (x = 34.108, df = 8, P = 0.000) which influences type of conflicts due to competition for existing resources. Stakeholder input and benefits of managing resources has an association (x = 3.095, df = 4, P = 0.542 > 0.05). Community involvement in decision making creates awareness on the benefits of Wildlife conservation. Environmental awareness has no association with conservation knowledge (x = 6.202, df = 4, P = 0.185 > 0.05). The data does not provide enough evidence on lack of association between environmental awareness and conservation knowledge. Stakeholder involvement and environmental awareness contributes to an increase in benefits of conservation.

4.9 Use of Wilcoxon Signed Ranks Test

The following study hypotheses stated in null form were tested for significance;

H_{oa}: Types of conservation regimes do not influence community perception of Wildlife management and governance in Kenya.

H_{ob}: There is no relationship between resource access and sharing in conservation areas

H_{oc}: There are no disadvantages of living next to conservation areas

H_{od}: Stakeholder involvement is not beneficial to conservation management

The Wilcoxon Signed Ranks test was used to compare the means of sample population data in the five conservation areas and regimes. The Wilcoxon test results evaluating type of land use practiced and diminishing resources in all conservation areas is significant z = - 11.993, p < 0 .001. The results indicate that the type of land use

contributes to a reduction in natural resources. Practiced land use and type of resources test was significant z = - 2.417, p < .01.

The test on sharing of resources and land ownership is significant z = - 4.078, p < .00. The null hypothesis that; "there is no relationship between resource access and sharing" is rejected and the alternative accepted. The test on type of conflict and disadvantages of living next to the conservation area was significant z = -9.654, p < .00. The result indicates that living next to conservation areas had several disadvantages to the communities. The conservancy benefits and disadvantages of living next to conservation areas was significant z = -3.576, p < .00. The type of animal and expected solutions was significant z = -19.461, p < .00. The results indicate that communities living next to conservation areas benefit but also experience problems due to the costs of human - wildlife conflicts. Therefore, the null hypothesis that, "there are no disadvantages associated with conservation areas" is rejected (H_O is rejected).

The benefits of managing natural resources and suitable economic activities are significant z = -7.556, p < .00. Stakeholder input and benefits of managing natural resources are also significant z = -14.110, p < .00. Environmental awareness and benefits of managing natural resources are significant z = - 16.728, p < .00. The results indicate that the null hypothesis, "that there was no need to involve communities in conservation management" is rejected (H_O is rejected).

The use of a management plan for conservation areas and the protected area regulations are significant z = - 4.554, p < .00. The demarcation of the conservation area and law enforcement are significant z = -14.445, p < .00. The Wilcoxon test results for local community involvement and management plan are significant z = -19.500, p <.00. Economic benefits assessment and local communities are significant z = -18.391, p < .00. The results indicate that the management of conservation areas influences community perception of conservation regimes in Kenya. The null hypothesis that; **"**types of conservation regimes do not influence community perception of wildlife conservation management in Kenya" is rejected. The Wilcoxon test results for the five

conservation areas and conservation regimes in Kenya are quite similar with very little variability, (Appendix 10 to 13, Tables 4.7. 4.8. 4.9 and 4.10)

4.10 Discussion

The Management Effectiveness Tracking Tool (METT) was used to assess the management of each conservation regime. Seventy percent (70%) of the conservation area management systems indicated that biodiversity information was available for planning. Sixty four percent (64%) of the management plans were in place but implementation was at different stages. Twenty percent of (20%) the conservation areas were designated as Ramsar sites while 81% were well demarcated. Fifty four percent (54%) of staff working in conservation areas had the capacity to enforce law. Forty six percent (46%) of the conservation areas were partially degraded. Forty two percent (42%) of the management used entry fees to improve the protected area while 39% provided economic benefits to communities. Sixty seven percent (67%) of the conservation areas had an education awareness program for communities.

The local community involvement in decision making and economic benefits received were dependent on the specific conservation areas and regimes. The Tsavo Conservation area had well implemented management plans, the staff had the capacity to enforce law, and there was an education awareness programs for the communities. Rukinga Wildlife Conservancy provided major economic benefits to the communities.
The management plans at Southern Conservation area were not fully implemented while Kimana conservancy provided major economic benefits to the communities. The Central Rift Conservation area had a planned education awareness program for communities and some parts of the management plans were implemented. Malewa - Kigio conservancy received major economic benefits and they were involved in decision making. The Mountain Conservation area involved communities in decision making. There were adequate protected area regulations and communities received major benefits.

The KWS parks had the capacity to enforce law, they were all gazetted and well demarcated, and they had information for key areas for decision making. The park fees made some impact on the local environs and there were some minor economic benefits to the local communities. Tsavo East and West National Parks had fully implemented the management plans and there were some economic benefits for the communities. The information for planning and decision making was available for use by conservation managers. There was a planned education awareness program for local communities. Among the state parks Tsavo East and West parks had an effective management program. All the private conservancies had partially implemented the management plans. Biodiversity at Rukinga Wildlife Sanctuary was predominantly intact. The local communities at Rukinga and Ol Pejeta conservancies received economic benefits and they had some input in decision making.

Most of the community conservancies involved local communities in decision making. However, they were at different stages of implementing the management plans and communities received major economic benefits. At Il Ngwesi and Malewa - Kigio conservancies the management plans were fully implemented. The protected area regulations were in place and there was sufficient information for planning and decision making. The biodiversity at Kimana and Malewa - Kigio conservancies was predominantly intact. The private and community conservancies had an effective education and awareness programs and local communities received substantial economic benefits.

The key findings for the five conservation areas indicated that farming (31.8%) was the preferred type of land use followed by farming and livestock keeping (21%), livestock keeping (18.4%), conservancies (9.2%) and commercial activities (9.8%). 51.6% of the respondents owned land individually, 16.9% of the land was owned by the community while 30% was inherited from parents. 32.8% of the respondents' noted a marked reduction in forest cover, 31.4% indicated a reduction in rangelands, 30.1% noted that rivers were drying up and 1.8% indicated that wetlands had reduced in size.

This aggravated conflicts over the resources and the need to share these resources and benefits equitably.

Farming was the predominant type of land use at Shimba Hills National park, Mwalughanje Elephant Sanctuary, Tsavo East and West National Parks, Rukinga Wildlife Sanctuary, Lake Nakuru National park, Soysambu and Malewa - Kigio Conservancies, Mt. Kenya National Park and Ol Pejeta Conservancy was farming. The respondents at Il Ngwesi mainly practiced livestock keeping. Most of the respondents bordering Amboseli National Park and Kimana Conservancy preferred livestock keeping. They also noted a major reduction in forest cover and rangelands.The types of resources identified were wildlife, rivers, forests and grasslands. However, there was a marked reduction in forest cover and rangelands. At Ol Pejeta Conservancy respondents indicated that rivers were drying up while at Il Ngwesi there was a reduction in rangelands.

The Pearson's Chi square noted a degree of association between types of resources and practiced land use, types of resources and land ownership, diminishing resources and type of resources leading to conflict of resources, means of sustaining family and disadvantages of living next to the park. The results of the Wilcoxon Signed Ranks test indicated that the type of land use contributed to a reduction in natural resources.

The GIS analysis of the five conservation areas indicated a general decrease of land cover and land use in hectares. There was an overall increase in agriculture by 7,103 ha, settlements by 608 ha. grasslands by 4,229 ha. and thickets by 1,234 ha. Moreover, there was a decrease in forests by 2,536 ha., grasslands and shrubs by 6852 ha., bare ground by 710 ha, shrubs by 39 ha., snow by 2,855 ha., water by 603 ha. montane by 1,705 ha., heath 1,5744 ha. and bamboo 9,718 ha. The diminishing resources were as a result of the types of land uses practiced and the negative effects of climate change as exemplified through floods and prolonged droughts. This contributed to increased conflicts over resources. The preferred type of land use was a combination of farming

and livestock keeping but in some areas there was the preference of farming or livestock keeping only.

There were benefits and costs of living next to conservation areas leading to various perceptions associated with conservation. There were major costs in form of human deaths, crop destruction and livestock deaths associated with Wildlife attacks. This was exemplified through resource conflicts (31%) where human - wildlife conflicts led to crop destruction (33%) and human deaths (20%). At the same time, 23% of the respondents indicated that they were attacked by elephants, 11% were attacked by buffalo, 48% by lions. 7% experienced human - human conflict, 24% had conflict over water, 31% had conflicts over grass and 6.7% experienced land conflict. These conflicts escalated during the dry seasons.

However, communities benefited through eco - tourism (28%), community projects (26%), infrastructure development (13%), business activities (6%) and 27% from other related benefits. Fifty three percent (53%) of the respondents identified compensation as a means to resolve conflicts, 30% preferred sharing benefits, 10% grazing in the parks and 8% fencing of the conservation area. The socio-economic and socio-cultural aspects influenced their livelihoods and use of available resources.

The Pearson's correlation study indicated that there was a negative correlation between conservancy benefits and disadvantages of living next to the parks. There was also a significant positive correlation between expected solutions and conservancy benefits. There was a negative correlation between type of animal and conservation benefits due to crop destruction, livestock and human attacks. There was an association between type of conflict and means of sustaining family. The benefits of managing resources had an association with conservation knowledge. The overall degree of association indicated that the type of land uses practiced in the five conservation areas and diminishing resources were the key factors that contributed to human - wildlife and human - human conflicts over resources. The Wilcoxon Ranks test results indicated that, there were several disadvantages of living next to conservation areas.

Thirty six percent (36%) of the local community benefited from source of firewood. 46% were involved in decision making by the conservation area management. 67% of the communities reported that they were aware of environmental issues. There was a significant correlation between stakeholder input and environmental awareness. The significant relationships indicated the need for community involvement in decision making and conservation of resources.

Communities living in the five conservation areas had different perspectives of the management of the Wildlife conservation regimes. The community and private conservancies were rated highly by communities due to stakeholder involvement, conflict resolution measures and economic benefits. The state owned parks that had an effective management program were Tsavo East and West National parks. Among the private conservancies, Rukinga Wildlife and Ol Pejeta conservancies were well managed. The community conservancies that were well managed were Il Ngwesi and the Malewa - Kigio conservancies.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1Conclusions

The management of conservation areas and local community perception was assessed in the five conservation areas in Kenya. These were the Coast, Tsavo, Southern, Central Rift and Mountain conservation areas. There were two or three management regimes in each conservation area represented by the state managed parks, private and community conservancies. The main objective was to assess the management and governance of resources, conflicts and community involvement in Wildlife conservation in Kenya.

Community perception towards wildlife conservation areas is premised on the economic benefits received, stakeholder involvement in decision making, sharing of resources and conflict resolution measures. Boggs (2000), suggests that attitudes towards Wildlife and natural resources are central to the relationships between people with the land and other resources. Kiringe and Okello (2007) stated that, institutions that have been in-charge of Wildlife conservation and management of protected areas have taken little proactive approach to regularly evaluate status and threats of these areas. Fisher *et al* (2005) stated that, it is not conservation itself that is the problem for people whose livelihoods depend on natural resources. Rather, conservation approaches often do not adequately take into account the adverse impacts of conservation activities on the rural poor. The following study objectives were achieved as indicated below.

5.1.2 To Assess Community Perception of Conservation Management Regimes in Five Conservation Areas in Kenya (Objective One).

The Management Effectiveness Tracking Tool (METT) was used to assess the management of each conservation regime. The Tsavo Conservation area had well implemented management plans, the staff had the capacity to enforce law, and there was an education awareness programs for the communities. Rukinga Wildlife Conservancy provided major economic benefits to the communities.

The KWS parks had the capacity to enforce law, they were all gazetted and well demarcated and information for key areas was used for decision making. The conservation areas used park fees to improve the infrastructure development of local environs. The local communities received some economic benefits from the conservation areas. Among the state parks Tsavo East and West parks had an effective management program. All the private conservancies had partially implemented the management plans. The local communities at Rukinga and Ol Pejeta conservancies received major economic benefits and they were involved in decision making process.

Most of the community conservancies involved local communities in decision making process. However, they were at different stages of implementing the management plans and communities benefitted from the conservancies. In Il Ngwesi and Malewa - Kigio conservancies, the management plans were fully implemented. The biodiversity status at Kimana and Malewa - Kigio conservancies was predominantly intact. The private and community conservancies had an effective education and awareness programs and local communities identified various benefits from the conservancies.

It is imperative to note that out of the five conservation areas, Tsavo Conservation area was well managed. Among the KWS Parks, Tsavo East and West had an effective management program. Rukinga Wildlife and Ol Pejeta conservancies were among the well managed private conservancies. Moreover, the community conservancies that were well managed were Il Ngwesi and Malewa - Kigio conservancies. This is indicates the ratings of the conservation regimes by the communities. The METT variables used for this study should be used for continuous tracking of management effectiveness within the conservation areas and adjacent areas. This could enhance sustainable Wildlife resource use and conservation.

5.1.3 To Determine the State of the Environment, Resource Access and Sharing in Wildlife Conservation Areas (Objective Two).

In addressing Wildlife - human conflicts Mbote, (2005), noted that Wildlife legislation and regulations attempt to make provisions for community participation; land use and

land tenure systems, compensation, tourism development, and access to dispute resolution mechanisms. The key findings for the five conservation areas indicated that there was a general decrease of land cover and land use in ha. The decrease was in forests, shrubs, grasslands, water and bare land. This informed the need of using GIS to assess the land use and land cover in the conservation areas.

The diminishing resources were as a result of the types of land uses practiced and the negative effects of climate change as exemplified through floods and prolonged droughts. This contributed to increased conflicts over resources. The preferred type of land use was farming and livestock keeping but in some areas there was the preference of farming or livestock keeping only. This information can be used to identify and predict variations in land use and land cover in the conservation areas.

5.1.4 To Analyze the Public Benefits and Costs Associated with Conservation Areas (Objective Three)

Reimoser *et al* (2012), states that in multiple-use cultural landscapes the resulting interaction between habitat requirements of wild animals, hunting interests and other land - use demands often leads to conflicts that can negatively affect sustainable conservation. The objective focused on the disadvantages and benefits of living next to conservation areas leading to benefits and costs associated with conservation. There were major costs in form of human deaths, crop destruction and livestock deaths associated with Wildlife attacks. This was exemplified through resource conflicts where human - wildlife conflicts lead to crop destruction and human deaths. In some conservation areas there was human - human conflict over water, forests and grass.

The socio-economic and socio-cultural aspects influenced community's livelihoods and use of available resources. There were various benefits received by communities through eco-tourism, community projects, infrastructure development and business activities. Communities that practiced livestock keeping and owned conservancies received more benefits and experienced minimal human – wildlife conflicts.

5.1.5 To Assess the Degree of Community Involvement in Conservation Management (Objective Four).

The focus of this objective was on local community's involvement in conservation and decision making by the conservation area management. According to KWS (2010), conservancies had a major contribution to conservation and management of wildlife and served as breeding grounds, Wildlife dispersal areas and corridors, protected area buffer zones, eco-tourism and recreation facilities, habitats for Wildlife and endemic species and education and research.

The findings of the study indicate that, communities living next to conservation areas had different perceptions of the three management regimes. This was influenced by the relationship between the conservation area management and local communities. This was further aggravated by how the management resolved conflicts, compensated for damages, economic benefits to communities, community involvement in decision making and sharing of resources within conservation areas. The approach to these concerns was dictated by the governance of each management regime. The state owned parks have to follow government policies, strategic plans and legislation while the private and community conservancies were governed by the specific ownership and management systems.

Community conservancies were highly appreciated since the local communities shared the monetary benefits that were received through eco-tourism and other benefits, they were involved in decision making and employment and they owned and co-managed the enterprises. The private conservancies and the KWS parks were also appreciated where the management participated in community projects, involved communities in decision making and immediate resolutions for human - wildlife conflicts.

The main objective was to assess the management and governance of resources, conflicts and community involvement in Wildlife conservation in Kenya. The inclusion of communities in the governance of Wildlife resources was noted by Kincaid (2003), who maintained that Wildlife management has shifted from an anthropocentric

biological basis to a new paradigm that includes additional social and ecological factors. The management of all conservation areas should have frequent stakeholder consultations with communities to help improve the governance of resources and increase appreciation of wildlife resources.

Therefore, Wildlife conservation was appreciated where the management immediately compensated for crop destruction, livestock and human deaths from wild animal attacks. Communities should benefit economically from conservation areas in any part of Kenya. Other conflict resolution measures such as sharing of resources could improve the ratings of conservation areas by the communities. The education awareness programs and management plans should be fully implemented. The local communities should be involved in the decision making process. The resource inventories for biodiversity should be updated frequently.

5.2 Recommendations

The use of Management Effectiveness Tracking Tool by the management, assessment of Wildlife resources using satellite images and community participation in conservation management should be used to improve the management of Wildlife resources. The Kenya government should come up with policies on land uses that would encourage communities living in arid and semi arid areas to incorporate community conservancies for sustainable use of rangelands.

Wildlife conservation policies and strategic plans should be based on community perspective and spatial analysis of conservation areas. This can be done by spatially simulating and modelling landscapes, land uses and land cover change analysis to reduce conflicts. This study used METT to assess the management of Wildlife conservation areas. Further research using other Protected Areas Management Effectiveness methodologies is encouraged. Research on Marine parks and reserves should be carried out to assess the resources, impacts and community involvement in conservation.

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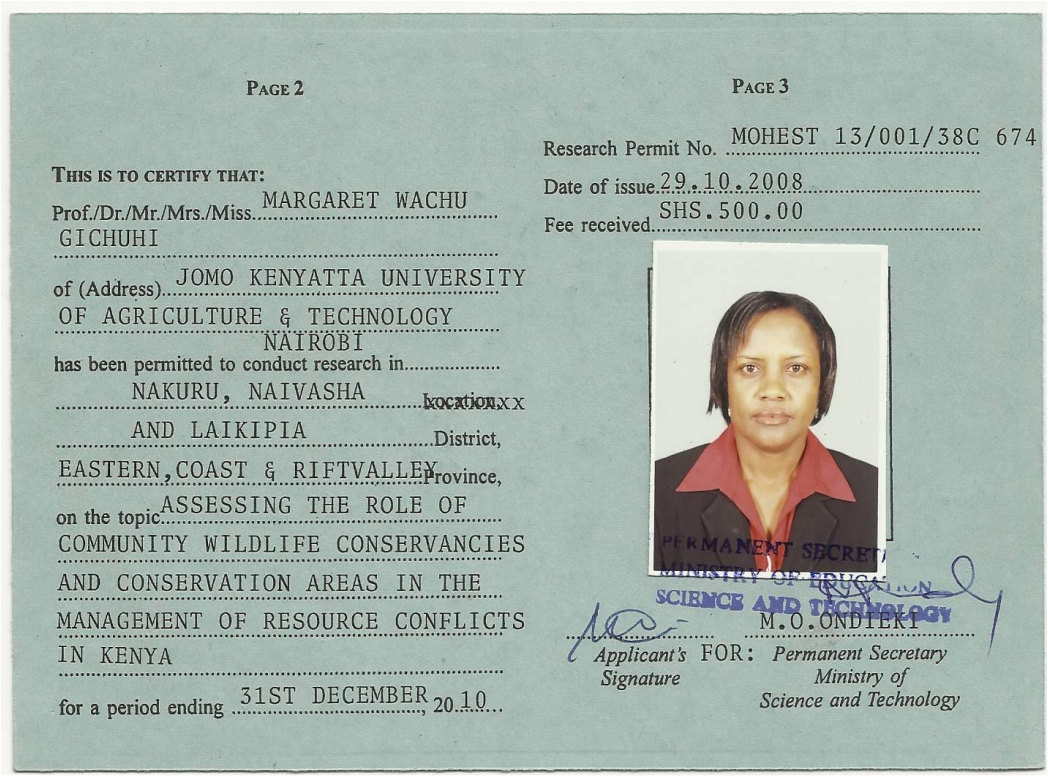
APPENDICES

Appendix 1

Ministry of Higher Education Science and Technology Research Permit



PAGE 2

THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss MARGARET WACHU GICHUHI

of (Address) JOMO KENYATTA UNIVERSITY OF AGRICULTURE & TECHNOLOGY NAIROBI

has been permitted to conduct research in NAKURU, NAIVASHA location, AND LAIKIPIA District, EASTERN, COAST & RIFTVALLEY Province,

on the topic ASSESSING THE ROLE OF COMMUNITY WILDLIFE CONSERVANCIES AND CONSERVATION AREAS IN THE MANAGEMENT OF RESOURCE CONFLICTS IN KENYA

for a period ending 31ST DECEMBER, 2010

PAGE 3

Research Permit No. MOHEST 13/001/38C 674

Date of issue 29.10.2008

Fee received SHS.500.00

PERMANENT SECRETARY
MINISTRY OF EDUCATION
SCIENCE AND TECHNOLOGY

Applicant's Signature

FOR: M.O.ONDIEKI
Permanent Secretary
Ministry of
Science and Technology

Appendix 2

Kenya Wildlife Service Research Permit

Ref: KWS/4001

25th November, 2008

Margaret Wachu Gichuhi
Jomo Kenyatta University of Agriculture & Technology
P.O.Box 62000
NAIROBI

Dear Madam,

RE: REQUEST TO VISIT KWS NATIONAL PARKS FOR RESEARCH

You have been granted free entry to the following parks to enable you conduct your research on "Assessing the role of Community Wildlife Conservancies and Conservation Areas in the Management of Resource Conflicts in Kenya". You will therefore report to the Warden in charge of each Park or Reserve before commencement of research. While in the park, you will observe all park rules and regulations. In addition, you will adhere to research guidelines for conducting research in protected areas as stipulated by KWS. In particular: You shall

- Not collect any samples of any form of material without authority from the Director KWS or the Deputy Director BR&M.
- Not release any information, other than on your research, about the National Park/Reserve to any person or authority without the Director's authority.
- Leave the park upon completion of the research work.

At the end of your study we shall expect you to submit a copy of your thesis to KWS.

We wish you a successful research.

Yours faithfully,

Catherine Wambani
Senior Warden – Parks & Reserves

C.c. DDBR&M

Appendix 3

Table 3.3 Selected Management Effectiveness Tracking Tool Variables and options; Ranked 0-3

Management Effectiveness Tracking Tool Variables and Options			
1)**Management Authority**	2)**International designation**	**3)Legal Status**	
1-KWS Parks	0-N/A	0-Not Gazetted	
2-Private Conservancies	1-IUCN	1-Gazette process not started	
3-Community Conservancies	2-World Heritage	2-Gazette process incomplete	
	3-Ramsar Site	3-Formally gazetted	
	4-Biosphere		
4)**Protected area regulations**	5)**Law enforcement**	6)**Demarcation**	
0-No regulations	0-Staff have no resources to enforce law	0-Boundary not known	
1-Some Regulations	1-Major deficiencies in staff capacity	1-Boundary known by management but not the locals	
2-Adequate regulations	2-Staff have acceptable capacity	2-Boundary known by all but not well demarcated	
3-Regualations in place	3-Adequate staff capacity	3-Known by all and is well demarcated	
7)Management Plan	**8)Resource Inventory**	**9)Education & awareness program**	**Regional planning**
0-No management Plan	0-No information on critical habitats	0-No education awareness program	0- No regional planning
1-Mangaement plan being prepared	1-Insufficient information	1-Limited and ad hoc awareness program	1-regional planning disregards PA
2-Mangement plan partially implemented	2-Information for key areas available for planning	2-Planned education awareness program	2-Regional planning partly incorporates PA
3-Mangement plan implemented	3-Information sufficient for planning and decision making	3-Planned & effective awareness program	

11)Local Communities involvement	**12)Economic benefit assessment**	**13)Park Fees**	**Condition assessment**
0-No input in decision making	0-PA reduced options for economic development for locals	0-Fees not collected	1- Some biodiversity severely degraded
1-Some input in decision making	1-PA has neither damaged nor benefited locals	1-Feees collected but has no impact on the locals	2- Partially degraded
2-Directly contribute to some decisions	2-Some minor flow of economic benefits	2-Fess makes some impact on the local environs	3- Biodiversity predominantly intact
3-Directly participate in decision making	3-Major economic benefits	3-Fess makes substantial contribution to the PA	

Appendix 4

Table 3.4 Management Effectiveness Tracking Tool variables for five conservation areas

International designation		**Legal status of the parks**		**Protected area regulations**		**Law enforcement in the parks**	
Not Applicable	47.6%	gazette process incomplete	14.6%	no regulations for controlling land use	5.2%	staff have no resources to enforce law	13.5%
World heritage site	15.1%	formally gazetted	85.4%	some regulations for controlling land use	14.9%	major deficiencies in staff capacity	5.2%
Ramsar site	19.9%	Not gazetted	N/A	adequate regulations	15.5%	staff have acceptable capacity	50.5%
Biosphere	17.3%	N/A	N/A	regulations for control of land use in place	64.5%	staff have excellent capacity	30.8%
Demarcation		**Management plan**		**Resource inventory**		**Education awareness**	
Boundary not known	4.7%	no management plan	5.2%	no information on critical habitats, species &cultural value	4.7%	no education awareness program	5.2%
boundary known by all but not well demarcated	14.6%	management plan being prepared but not yet in place	4.7%	insufficient information on critical habitats	9.9%	limited and ad hoc education and awareness program	16.8%

boundary known by all and is well demarcated		80.7%	mgt plan exists but partially implemented		25.8%	information for key areas available for planning		69.5%	planned education awareness program		66.8%
N/A		N/A	mgt plan implemented		64.3%	information sufficient for planning and decision making		15.9%	effective education and awareness program		11.2%
Regional Planning			**Local Communities involvement**			**Park fees**			**Condition assessment**		**Economic benefit assessment**	
no regional planning		11.4%	local communities have no input indecision making		10.7%	fees not collected		10.9%	some biodiversity severely degraded	25.9%	PA has some minor flow of economic benefits to communities	60.7 %
regional planning disregards PA		24.6%	some input in decision making		42.9%	fees collected but makes no impact on PA		6.1%	partially degraded	45.9%	major flow of economic benefits	39.3 %
regional planning partly incorporates PA		64%	communities contribute to some decisions		41.3%.	fees collected and makes some impact on PA		40.5%	Biodiversity predominantly intact	28.1%	N/A	N/A
N/A	N/A		directly participate in all relevant decisions		5.1%	Fees collected makes substantial contribution to the PA		42.5%	N/A	N/A	N/A	N/A

Appendix 5 Table 4.1 showing Community Characteristics for the five Conservation Areas

		Community Characteristics for the five Conservation Areas											
Community characteristics		Coast eco-region		Tsavos eco-region			South Rift		Central eco-region			Mt.Kenya Eco-region	
		Shimba Hills	Mwaluganje	Tsavo E&W	Rukinga	Amboseli	Kimana	LNNP	Soysambu	Malewa-Kigio	Mt. Kenya	Ol Pejeta	IL Ngwesi
Sex	Male	57.5	64.5	67.1	51.2	53.7	55.9	61	61.3	52	61	81	39
	Female	42.4	35.5	32.9	48.8	46.3	44.1	39	38.7	48	39	19	61
Family set up	Married	80	100	63.3	71	85.4	85.3	51	77.4	42	51	69	82
	Single	12.5	0	29.1	19.5	9.8	8.8	29	19.4	29	29	31	18
	divorced	5	0	5.1	0	0	0	6	3.2	6	6	0	0
	Separated	0	0	0	9.8	2.4	2.9	9	0	6	9	0	0
	Widowed	5	0	2.5	0	2.4	2.9	5	0	16	5	0	0
Level of education	Primary	42.5	25.8	26.6	70.7	34.1	32.4	61.6	51.6	52	61.6	57	11
	Secondary	20	22.6	45.6	19.5	36.6	35.3	35.4	45.2	19	35.4	33	10
	College	7.5	0	25.3	4.9	4.9	2.9	2.02	3.2	0	2	5.2	3.2
	Adult Education	2.5	3.2	2.5	0	9.8	11.8	0	0	13	0	3.4	0
	Illiterate	27.5	48.4	0	4.9	14.6	17.6	0	0	16	0	1.7	76
Means of sustaining family	Farming	60	77.4	31.6	56.1	51.2	52.9	81	64.5	52	81	72	27
	Business	20	6.5	36.7	34.1	21.9	20.6	8	19.4	36	8	1.7	6.1
	Any other	20	16.1	31.6	9.8	20.6	26.5	11	16.1	13	11	26	67

Appendix 6

Table 4.3 Resource access and sharing in Conservation regimes in percentage

KWS Parks						Community Conservancies				Private Concservancies			Total percentage
	Shimba Hills NP	Tsavo East& West	Amboseli NP	Lake Nakuru NP	Mt. Kenya NP	Mwalughanje Elephant Sanctuary	Kimana Community Conservancy	Malewa-Kigio Conservancy	IL Ngwesi Conservancy	Rukinga Wildlife Sanctuary	Soysambu Conservancy	Ol Pejeta Conservancy	Five conservation areas
Practised landuse %													**100%**
Farming	52.5	58	31.7	20	20	41.9	29.4	35.5	21.2	53.6	12.9	5.4	31.8
Livestock Keeping	20	12.5	34.1	5	5	19.4	32.4	3.2	54.5	21.9	0	12.5	18.4
Farming & Livestock Keeping	27.5	23.3	19.5	1	65	9.7	17.4	32.3	6.1	4.9	48.3	82.1	21
Conservancy	0	7.5	4.9	9	1	29	5.9	25.8	18.2	0	9.7	0	9.2
Commercial	0	8.3	9.7	65	9	0	8.8	3.2	0	4.9	9	0	9.8
Land ownership %													
Individually	37.5	50.8	48.7	55	55	38.7	50	67.7	9.1	63.4	90.3	53.4	51.6
Communally	15	8.3	24.3	10	10	12.9	26.5	3.2	90	0	0	3.4	16.9
Family/Parents	42.5	40.8	26.8	30	30	48.3	23.5	29	0	36.6	9.7	43.1	30
Type of Natural resources %													
Wildlife&Rivers	15	5	9.7	8	6	16.1	11.7	9.7	45.5	9.7	9.7	22.4	14

Wildlife,forests &rivers	25	10	41.5	10	10	16.1	35.3	22.5	6.1	36.6	12.9	22.4	21.5
Grasslands,forests ,rivers	12.5	73.9	12.1	53	64	35.5	11.8	51.6	48.5	51.2	70.9	39.7	43.7
Wildlife,forests& grasslands	47.5	10.9	34.1	29	20	32.3	38.2	16.1	0	2.4	6.5	15.5	21
Wetlands	0	0	2.4	0	0	0	2.9	0	0	0	0	0	0.4
Sharing resources%													
Well distributed	17.5	41.6	31.7	19	19	32.3	32.4	70.5	84.8	4.9	16.1	32.8	33.5
Not Well distributed	82.5	58.3	68.3	81	81	67.7	67.6	29.5	15.2	95.1	83.9	67.2	60.7
Diminishing resources %													
Reduction in forest	37.5	20.8	34.1	59	59	38.7	35.3	35.5	0	26.8	45.2	1.7	32.8
Drying rivers	35	35.8	26.8	41	18	29	29.4	32.3	45.5	34.1	35.5	51.7	30.1
Rangeland reduction	37.5	36.6	29.3	0	23	32.3	26.5	32.5	54.5	39	19.4	46.6	31.4
Wetland reduction	0	4.2	9.7	0	0	0	8.8	0	0	0	0	0	1.8

Appendix 7

Table 4.4 Benefits and costs of conservation from the five conservation areas in percentage

Coast Conservation area	Human deaths	Live stock deaths	Crop destruction	Wild life attacks	None	Human-wild life conflict	Water conflict	Grass conflict	Land Conflict	Human-human	Community projects	Infrastructure	Businesss	Any other	None	Compensation	Sharing benefits	Grazing in the parks	Fencing
Shimba Hills NP	22.5	5	50	22.5	0	15	35	25	7.5	17.5	20	25	20	22.5	0	80	0	12.5	7.5
Mwalughanje Elephant Sanctuary	16.1	6.5	54.8	22.6	0	41.9	16.1	35.4	0	6.5	45.2	9.6	9.6	19.4	0	61.2	29	9.6	0
Tsavo Conservation area																			
TsavoEast &West	12.6	27.8	21.5	37.9	0	56.9	15.1	24	0	3.7	26.6	15.1	10.1	8.8	0	65.8	27.8	0	6.3
Rukinga Wildlife Sanctuary	24.3	26.8	17	31.7	0	24.3	26.8	48.7	0	0	21.9	39	9.7	29.2	0	39	26.8	21.9	12.1
Southern Conservation area																			
Amboseli NP	2.4	9.7	48.7	2.4	36.5	21.9	31.7	43.9	2.4	0	26.8	17	2.4	19.5	0	48.7	36.5	7.3	7.3
Kimana Communit	2.9	11.7	44.1	2.9	38	26.4	29.4	41.1	2.9	0	29.4	14.7	2.9	23.5	0	44.1	38.2	8.8	8.8

y Conservancy					.2													
Central Rift Conservation area																		
Lake Nakuru NP	11	14	37	18	20	36	21	15	14	14	11.4	3	3	44	0	53	33	14	0
Soysambu Conservancy	70.9	6.5	6.5	16.1	0	54.8	0	6.5	19.4	19.4	6.5	6.5	0	0	70.9	45.1	58	3.2	38.7
Malewa-Kigio Conservancy	0	0	58.1	41.9	0	41.9	38.7	19.4	0	0	48.4	0	0	0	0	54.8	45.2	0	0
Mountain conservation area																			
Mt. Kenya NP	12	22	49	17	0	20	5	42	18	15	12.8	3	3	44	0	64	21	15	0
Ol Pejeta Conservancy	5.1	22.4	13.7	5.2	53.4	12.1	53.4	32.7	1.7	0	52.4	17.2	15	8.6	0	37.9	55.1	6.8	0
IL Ngwesi Conservancy	0	15.2	0	9.1	75.8	27.3	42.4	30.3	0	0	24.8	10	2	6.1	0	24.2	75.8	0	0

Appendix 8

Table 4.5 Benefits and costs of conservation from conservation regimes in percentage

KWS Parks					Community Conservancies				Private Concservancies		
Shimba Hills NP	Tsavo East& West	Amboseli NP	Lake Nakuru NP	Mt. Kenya NP	Mwalughanje Elephant Sanctuary	Kimana Community Conservancy	Malewa-Kigio Conservancy	IL Ngwesi Conservancy	Rukinga Wildlife Sanctuary	Soysambu Conservancy	Ol Pejeta Conservancy
Problems experienced in conservation areas %											
Human deaths	22.5	16.2	2.4	11	12	16.1	2.9	0	0	24.3	70.9	5.1
Livestock deaths	5	27.8	9.7	14	22	6.5	11.7	0	15.2	26.8	6.5	22.4
Crop destruction	50	27.8	48.7	37	49	54.8	48.7	58.1	0	17	6.5	13.7
Wildlife attacks	22.5	37.9	2.4	18	17	22.6	2.9	41.9	9.1	31.7	16.1	9.1
None	0	0	36.5	20	0	0	36.5	0	75.8	0	0	53.4
Type of conflicts in conservation areas											

Human-wildlife	15	56.9	21.9	36	20	41.9	26.4	41.9	27.3	24.3	54.8	12.1
Water conflict	35	15.1	31.7	21	5	16.1	29.4	38.7	42.4	26.8	0	53.4
Grass conflict	25	24	43.9	15	42	35.4	41.1	19.4	30.3	48.7	6.5	32.7
Land Conflict	7.5	0	2.4	14	18	0	2.9	0	0	0	19.4	0
Hum-human conflict	17.5	3.7	0	14	15	6.5	0	0	0	0	19.4	0
Type of wild animal causing human-wildlife conflict												
Lion	7.5	2.5	24.3	1	0	0	26.4	0	3	12.1	0	0
Elephant	35	17.7	75.6	4	23	19.4	73.5	0	0	25.8	0	8.6
Buffalo	5	11.3	0	12	17	0	0	0	12.1	12.1	8	1.7
Leopard	5	7.5	0	5	11	0	0	0	29.2	9.7	12.9	0
Hippo	0	3.7	3	0	0	0	9.7	0	0	0	0	0
Rhino	0	0	0	4	0	0	0	0	0	0	0	0
Any other	25	20.2	0	33	49	0	0	90.3	0	0	61.2	89.6
Conflict Resolution measures												

Compensation	80	65.8	48.7	53	64	61.2	44.1	54.8	24.2	39	45.1	37.9
Sharing Benefits	0	27.8	36.5	33	21	29	38.2	45.2	75.8	26.8	58	55.1
Grazing	12.5	0	7.3	14	15	9.6	8.8	0	0	21.9	3.2	6.8
Fencing	7.5	6.3	7.3	0	0	0	8.8	0	0	12.1	38.7	0
Conservancy benefits to the local communities												
Ecotourism	12.5	39.2	34.1	38	38	16.1	29.4	51.6	75.8	0	16.1	1.7
Community projects	20	26.6	26.8	11.4	12	45.2	29.4	48.4	18.2	21.9	6.5	72.4
Infrastructure	25	15.1	17	3	3	9.6	14.7	0	0	39	6.5	17.2
Business	20	10.1	2.4	3	3	9.6	2.9	0	0	9.7	0	0
Any other	22.5	8.8	19.5	44	45	19.4	23.5	0	6.1	29.2	0	8.6
None	0	0	0	0	0	0	0	0	0	0	70.9	0

Appendix 9

Table 4.6 Community involvement in conservation management in percentage

Conservation areas	Conservation Knowledge		Benefits of conservation					Stakeholder input		Environmental awareness	
	Traditional knowledge	Conservation	Rain attraction	Firewood source	Tourist attraction	Construction	Any other	Yes	No	Yes	No
Shimba Hills NP	37.5	62.5	15	27.5	22.5	17.5	17.5	67.5	32.5	75	25
Mwalughanje Elephant Sanctuary	54.8	45.2	19.4	19.3	61.3	0	0	64.5	35.5	83.9	16.1
TsavoEast&West	36.7	63.3	12.7	34.2	11.4	17.7	24.1	53.2	46.8	55.7	44.3
Rukinga Wildlife Sanctuary	51.2	48.8	12.2	53.6	7.3	17.1	9.8	34.1	65.9	53.7	46.3
Amboseli NP	46.3	53.7	43.9	31.7	24.4	0	0	51.2	48.8	75.6	24.4
Kimana Community Conservancy	50	50	44.1	29.4	26.5	0	0	58.2	41.2	73.5	26.5
Lake Nakuru NP	22	78	22	29	17	14	18	24	76	69	31
Soysambu Conservancy	26.2	73.8	61.3	22.6	0	16.1	0	32.3	67.7	32.3	67.7
Malewa-Kigio Conservancy	32.3	67.7	51.6	38.7	9.7	0	0	100	0	74.4	22.6
Mt. Kenya NP	22	78	28	41	31	0	0	24	76	69	31
Ol Pejeta Conservancy	72.4	27.6	29.3	50	0	20.7	0	39.7	60.3	52.6	47.4
IL Ngwesi Conservancy	100	0	9.1	33.3	57.6	0	0	93.9	6.1	48.5	51.5

Appendix 10

Table 4.7 Wilcoxon test for resource access and sharing in the five conservation areas in Kenya

Coast Conservation area			
Test Statistics	Identify diminishing resources - Practiced Land use	Sharing Resources - Land ownership	Type of resources - Practiced Land use
Z	-2.2250962	-3.119035	-1.9866965
Asymp. Sig. (2-tailed)	0.02607478	0.00181444	0.04695604
Tsavo Conservation area			
	Identify diminishing resources - Practiced Land use	Sharing Resources - Land ownership	Type of resource - Practiced Land use
Z	-0.7891043	-2.254451	-3.6436529
Asymp. Sig. (2-tailed)	0.43005106	0.02416781	0.0002688
Southern Conservation area			
	Diminishing resources - Practiced Land use	Sharing Resources - Land ownership	Types of resources - Practiced Land use
Z	-1.893517	-0.7807137	-1.2947358
Asymp. Sig. (2-tailed)	0.05828915	0.43497092	0.19541138
Central Rift Conservation area			
	Identify diminishing resources - Practiced Land use	Sharing Resources - Land ownership	Types of resources - Practiced Land use
Z	-9.7592611	-0.3472176	-5.0080247
Asymp. Sig. (2-tailed)	1.6838E-22	0.72842789	5.4991E-07
Mountain Conservation area			
	identify diminishing resources - Practiced Land use	Sharing Resources - Land ownership	Types of resources - Practiced Land use
Z	-9.960494	-2.8996289	-7.3727832
Asymp. Sig. (2-tailed)	2.2693E-23	0.00373605	1.671E-13

Appendix 11

Table 4.8 Wilcoxon test for benefits and costs of Conservation areas

Coast Conservation area				
Test Statistics	Type of conflict - Disadvantages of living next to the park	Disadvantages of living next to the park - Conservancy benefits	Type of animal - Expected Solutions	Type of conflict - Conservancy benefits
Z	-1.51225	-0.83	-6.86997	-2.98643
Asymp. Sig. (2-tailed)	0.13047	0.406538	6.42E-12	0.002823
Tsavo Conservation area				
Test Statistics	Type of conflict - Disadvantages of living next to the park	Disadvantages of living next to the park - Conservancy benefits	Type of animal - Expected Solutions	Type of conflict - Conservancy benefits
Z	-4.81929	-0.80593	-8.54745	-5.66891
Asymp. Sig. (2-tailed)	1.44E-06	0.420281	1.26E-17	1.44E-08
Southern Conservation area				
Test Statistics	Type of conflict - Disadvantages of living next to the park	Disadvantages of living next to the park - Conservancy benefits	Type of animal - Expected Solutions	Type of conflict - Conservancy benefits
Z	-5.95961	-4.03148	-0.1549	-1.21557
Asymp. Sig. (2-tailed)	2.53E-09	5.54E-05	0.876904	0.22415
Central Rift Conservation area				
Test Statistics	Type of conflict - Disadvantages of living next to the park	Disadvantages of living next to the park - Conservancy benefits	Type of animal - Expected Solutions	Type of conflict - Conservancy benefits
Z	-4.09391	-0.16561	-10.765	-3.44699
Asymp. Sig. (2-tailed)	4.24E-05	0.868461	5.04E-27	0.000567
Mountain Conservation area				
Test Statistics	Type of conflict - Disadvantages of living next to the park	Disadvantages of living next to the park - Conservancy benefits	Type of animal - Expected Solutions	Type of conflict - Conservancy benefits
Z	-5.04818	-4.515	-11.5637	-0.44887
Asymp. Sig. (2-tailed)	4.46E-07	6.33E-06	6.29E-31	0.653528

Appendix 12

Table 4.9 Wilcoxon test for community involvement in conservation management

Coast Conservation area			
Test Statistics	Know benefits of managing resources - Suitable economic activities	Stakeholder input - Know benefits of managing resources	Environmental Awareness - Know benefits of managing resources
Z	-0.72496	-8.34951	-8.95785
Asymp. Sig. (2-tailed)	0.468474	6.85E-17	3.31E-19
Tsavo Conservation area			
Test Statistics	Know benefits of managing resources - Suitable economic activities	Stakeholder input - Know benefits of managing resources	Environmental Awareness - Know benefits of managing resources
Z	-0.72496	-8.34951	-8.95785
Asymp. Sig. (2-tailed)	0.468474	6.85E-17	3.31E-19
Southern Conservation area			
Test Statistics	Know benefits of managing resources - Suitable economic activities	Stakeholder input - Know benefits of managing resources	Environmental Awareness - Know benefits of managing resources
Z	-2.28832	-2.91043	-4.9824
Asymp. Sig. (2-tailed)	0.022119	0.003609	6.28E-07
Central Rift Conservation area			
Test Statistics	benefits of managing resources - Suitable economic activities	Stakeholder input - benefits of managing resources	Environmental Awareness - benefits of managing resources
Z	-6.70107	-5.87164	-7.49027
Asymp. Sig. (2-tailed)	2.07E-11	4.32E-09	6.87E-14
Mountain Conservation area			
Test Statistics	know benefits of managing resources - Suitable economic activities	Stakeholder input - know benefits of managing resources	Environmental Awareness - know benefits of managing resources
Z	-5.27286	-6.77356	-8.41045
Asymp. Sig. (2-tailed)	1.34E-07	1.26E-11	4.08E-17

Appendix 13

Table 4.10 Wilcoxon test for Conservation area management effectiveness in the five conservation areas

Coast Conservation area					
Test Statistics	management plan - Protected area regulations	Park demarcation - Law enforcement	Condition assessment - Resource inventory	Local communities - management plan	Economic benefit assessment - Local communities
Z	-1.0681	-7.56936	-1.0681	-6.32456	-7.56936
Asymp. Sig. (2-tailed)	0.285474	3.75E-14	0.285474	2.54E-10	3.75E-14
Tsavo Conservation area					
Test Statistics	management plan - Protected area regualtions	Demarcation - law enforcement	Condition assessment - Resource inventory	local communities - management plan	Economic benefit assessment - local communities
Z	-6.40312	-10.9545	-8.88819	-10.9545	-12.6886
Asymp. Sig. (2-tailed)	1.52E-10	6.33E-28	6.21E-19	6.33E-28	6.84E-37
Southern Conservation area					
Test Statistics	Management plan - Protected area regulations	Demarcation - law enforcement	condition assessment - Resource inventory	Local communities - Management plan	Economic benefits assessment - Local communities
Z	-6.40312	-8.66025	-5.83095	-4.52739	-8.66025
Asymp. Sig. (2-tailed)	1.52E-10	4.71E-18	5.51E-09	5.97E-06	4.71E-18
Central Rift Conservation area					
Test Statistics	management plan - PA area regulations	Law enforcement - Legal status	Condition assessment - Resource inventory	Local communities - management plan	Economic benefit assessment - Local communities
Z	-5.56776	0	-10.5458	-9.76548	-11.4455
Asymp. Sig. (2-tailed)	2.58E-08	1	5.31E-26	1.58E-22	2.48E-30
Mountain Conservation area					
Test Statistics	management plan - Protected area regulations	law enforcement - Legal status	Condition assessment - Resource inventory	local community - management plan	Economic benefit assessment - local community
Z	-7.54983	-12.5423	-5.74456	-12.53	-7.54983
Asymp. Sig. (2-tailed)	4.36E-14	4.38E-36	9.22E-09	5.12E-36	4.36E-14

Appendix 14

Community Questionnaires

This survey was carried out to find out the involvement of communities in the management of resources in conservation areas, identify types of resources, practiced land uses, diminishing resources, stakeholder involvement and other socio- economic factors.

Conservancy or Conservation area:

Head of Household:1) Male 2) Female

Marital Status: 1) Married 2) single 3) Separated 4) Divorced 5) Widowed

Q1. Have you been to school? If yes, what level?

i) Primary ii) Secondary iii) university/College iv) adult education

Q2. What is the type of land use practiced in this area?

i) Farming ii) Livestock Keeping iii) Conservancy IV) Commercial activities

Q3. How do you sustain yourself or your family?
i) Farming ii) Business iii) any other

Q4. Do you own land i) individually ii) communally iii) Family/ Parents?

Q5. What are the benefits of living next to the park or protected area?

i) Eco-tourism ii) Community projects iii) Infrastructure iv) Business iv) Any other

Q6.Identify the types of resources found here?

i) Wildlife, Rivers, forests

ii) Wildlife, forests and grasslands

iii) Grasslands, forests and rivers

iv) Wildlife, forests and grasslands

v) Wetlands

Q7. How are these resources shared among human beings and the animals? Please specify below:

i) Well distributed

ii) Not well distributed

Q8. Which economic activities are the best suited for this area?

i) Livestock keeping

ii) Farming

iii) Livestock keeping and farming

iv) Commercial activities

v) Any other

Q9. Are there any conflicts over resources in this area?

i) Human- wildlife conflict

ii) Grass conflict

iii) Water conflict

iv)Human – human conflict

Q10. How can these conflicts be resolved?

i) Dialogue

ii) Resource sharing

Q11. Which type of animal has ever attacked you?

i) Lion ii) Elephant iii) Leopard iv)Hippo v) Rhino vi) Hyena vii) any other

Q12. Which are your neighboring communities?

i) Maasai,Kamba ii) Kikuyu iii) Chagga, Somali iv) Taita v) Duruma, Digo, Kamba vi) Meru vii) Kalenjin, Luhya, Kisii, Luo viii) Any other

Q13. How do you relate with each other?

i) Well

ii) No Well

Q14. How does your community identify and conserve resources?

i) Modern conservation methods

ii) Traditional conservation methods

Q15. How do you pass this knowledge to your children?

i) Traditional education ii) Elders iii) Community iv)Community v) Parents

Q16. What are the benefits of managing resources sustainably?
i) Rain attraction ii) Firewood source iii) Tourist attraction iv) Construction iv) Any other

Q17.Could you identify any type diminishing resources due to mismanagement or overuse?

i) Reduction in forest cover ii) Drying rivers iii) Rangeland reduction iv)Wetland reduction
v) Wildlife reduction

Q18 What type of land use would you consider best for this area?
i) Livestock keeping ii) Framing iii) Livestock keeping and farming iii) Livestock keeping, farming and tourism iv) Any other

Q19 What are the disadvantages of living next to the conservation area?
i) Human deaths ii) Crop destruction iii) iv) Livestock deaths v) Wildlife attacks iv) Any other

Q20 What are the expected solutions?
i) Compensation ii) Sharing benefits iii) Grazing in the parks iv) Tour guides v) fencing the park boundary

Q21. Is there communication between stakeholders and park/conservancy managers?
i) Yes ii) No iii) Once in a while

Q22. Do stakeholders have meaningful input to management decisions?
i) Yes ii) No

Q23. Have education activities been developed for stakeholders?
i) Yes ii) No

Q24. Does the conservation area have sufficient visitor facilities?

i) Yes ii) No iii) could be improved

Q25. Has Community welfare improved?

i) Yes ii) No iii) slightly

Q26. Has community environmental awareness improved?

i) Yes ii) No