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Factors influencing the nature and motivation of illegal practices in a protected area in a rural African context

Moses Muhumuza



A thesis submitted to the Faculty of Science, University of the Witwatersrand, in fulfillment of the requirement for the degree of Doctor of Philosophy.

Johannesburg, May 2014

DECLARATION

I declare that this thesis is my own, unaided work. It is being submitted for the **Degree of Doctor of Philosophy** in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any University.



…….....

Moses Muhumuza

22nd day of May 2014

OVERVIEW OF THE THESIS

This thesis describes research that was conducted to investigate the causes of problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park. The Rwenzori Mountains National Park faces conservation problems such as illegal harvesting of park resources, encroachment on the park boundary, and poor relationships between the local people and the managers of the park. These problems triggered this study because despite attempts such as intensifying park rules and regulations, implementing community-based conservation initiatives, and providing environmental education to local people to address the problems, they have persisted. This study was conducted on the premise that before a solution to these problems can be found, their nature and extent, and possible cause, need to be understood.

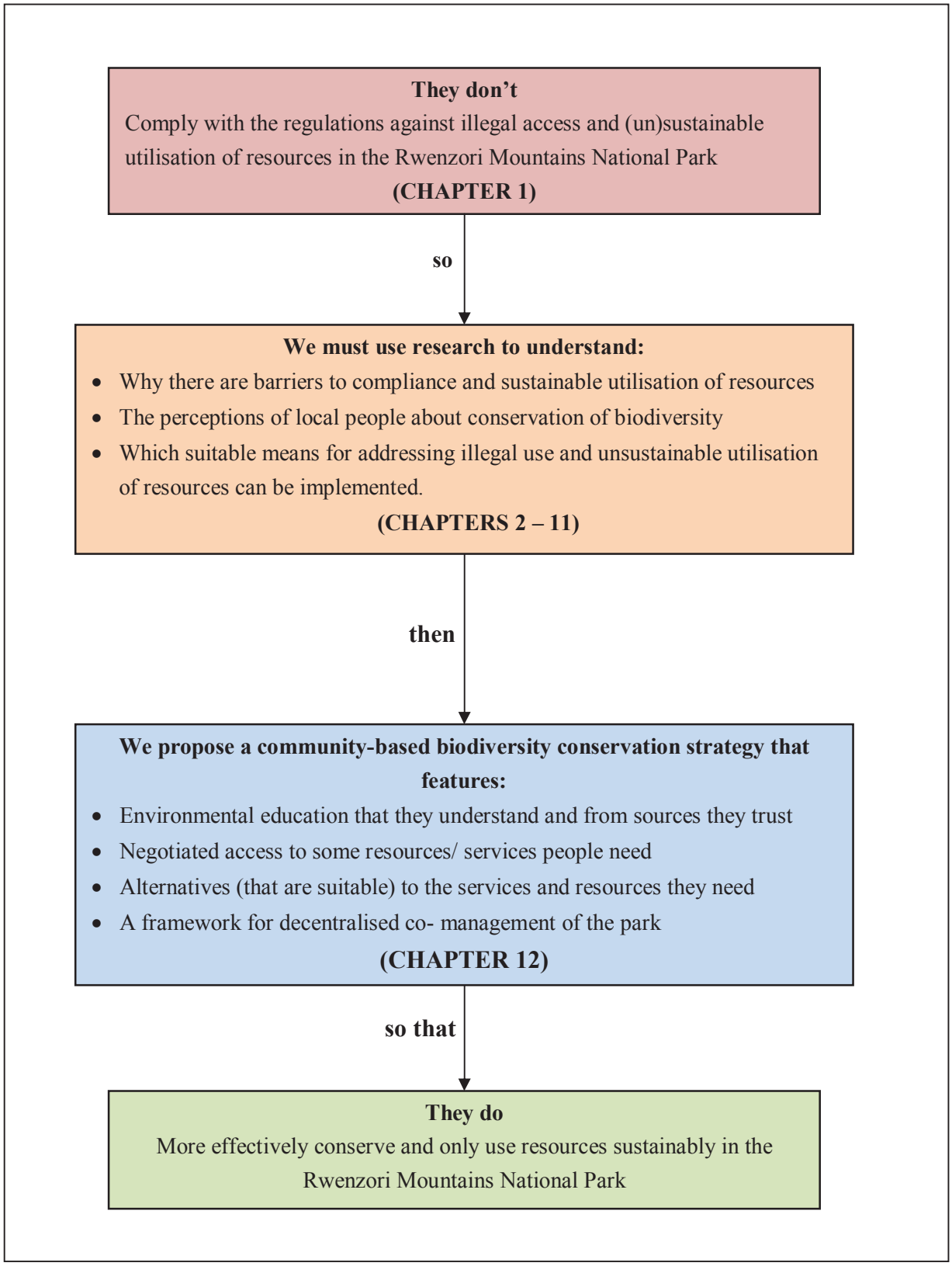
The study involved: a) an extensive review of the relevant literature to identify factors that affect successful conservation of biodiversity in national parks in Africa, b) a critical analysis of the role of traditional ecological knowledge in the conservation of biodiversity in national parks in Africa, c) the development of a theoretical framework that could guide an investigation into problems associated with the conservation of biodiversity in national parks using the case study of the Rwenzori Mountains National Park, d) field investigations on how local people in the Rwenzori Mountains depended on the park, and what factors influence their dependence on the park, e) investigations into the environmental education provided to influence people to support conservation of the Rwenzori Mountains National park, f) the development of a generalisable scheme of factors that influence local people to illegally access and use the Rwenzori Mountains National Park, and g) preparation of a model that could serve as a framework for developing holistic community-based biodiversity conservation plans in a rural African context.

The review of the literature was done through meta-data analysis of publications systematically selected from various web search engines on the internet. This was followed by field investigations. In order to have an in-depth and holistic understanding of the issues investigated, a mixed-methods approach to data collection was used. Semi-structured individual interviews were conducted with 163 randomly selected respondents from households in villages within 5 km of the Rwenzori Mountains National Park boundary. The study also involved content analysis of the formal environmental education syllabus documents, and documents on the Rwenzori Region Environmental Education Strategy and its implementation.

It was found that factors responsible for both the success and failure of conserving biodiversity in national parks were socio-cultural and economic in nature. Although there was an increasing number of studies in the literature advocating for the consideration of traditional ecological knowledge in the conservation and management of national parks in Africa, most of those studies are theoretical, based on logical accounts and contestable historical reviews. In the Rwenzori Mountains, the local community illegally accessed the park to harvest 87 plant species, hunt 46 species of animals, and to conduct various activities. Illegal access to the park was influenced by a range of factors which interacted in myriad ways. Some of the factors (such as traditional beliefs) were situated inside mindsets of individuals and others (such as unpredicted weather conditions, lack of alternative means of livelihood and survival, commercial benefits, and bureaucratic procedures for legally accessing resources) were external to the individual. Previous attempts by the park staff to address illegal access to the park, and the associated resource harvesting problems, were judged to have been unsuccessful because the interventions did not target the underlying factors.

This thesis argues for the use of holistic frameworks in investigating and addressing problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park and has demonstrated how such frameworks could be developed. An adaptable model which could enhance more effective community-based biodiversity conservation has been proposed and recommended for future interventions in the management of national parks in a rural African context.

MAIN ARGUMENT CONTAINED IN THE THESIS



DEDICATION

To those who have nourished, guided, and inspired me over the years, my family, colleagues, mentors, and students under my guidance. And to the people in the Rwenzori Mountains who “fend” to survive in a terrain considered intricate by many.

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LIST OF ACRONYMS

APA	American Psychological Association
DRC	Democratic Republic of Congo
IBSS	International Bibliography of Social Science
ISI	International Science Index
IUCN	International Union for Conservation of Nature
PMC	Park Management Committee
RMNP	Rwenzori Mountains National Park
TRA	Threat Reduction Assessment
UNESCO	United Nations Education and Scientific Cultural Organization
UWA	Uganda Wildlife Authority
WCPA	World Commission on Protected Areas
WWF	World Wide Fund for Nature

CHAPTER 1

INTRODUCTION AND BACKGROUND TO THE THESIS



Figure 1.1 Interface between the community and the Rwenzori Mountains National Park. (Photo by M. Muhumuza, March, 2009**).**

This study was triggered by the problems affecting the conservation of biodiversity in protected areas (specifically national parks) in rural Africa. This chapter gives the reader a general view of the background of the study and the study reference site, the problems investigated, and the objectives that the study sought to achieve.

1.1 BIODIVERSITY, BIODIVERSITY LOSS, AND BIODIVERSITY CONSERVATION

1.1.1 The meaning of biodiversity

The term "biodiversity" is a contracted word from the phase "biological diversity" which refers to the range of life forms (Anne, 2004). Biodiversity includes all things that have "life". Life is something that distinguishes living organisms from nonliving organisms. The concept of biodiversity is broad and encompasses variations in species, and across ecosystems (United Nations Environment Programme, 2006). Biodiversity is *"the variety and variability among living organisms and the ecological complexes in which they occur"* (Anne, 2004, p.3). The complexes that constitute ecology are relationships that occur among organisms that coexist (Noss, 1990). Given a variation of what constitutes life, biologists look at biodiversity in three categories: genetic diversity, taxonomic diversity, and functional diversity (McCann, 2007: Noss, 1990).

Given the various perspectives of biodiversity, it is difficult to quantify biodiversity and to determine the amount that exists on earth. Various studies that measure biodiversity do so at different levels (McNeely, Miller, Reid, Mittermeier & Werner, 1990), quantifying frequencies of:

- biomes,
- ecosystems,
- species, and,
- genetic variation.

However, the most common way (presumably the easiest way but not necessarily the most accurate) in which biodiversity is measured is counting the number of species available in a particular locality. A sum of species collected from various locations on earth is used as an indicator of the state of biodiversity on earth. According to the International Union for Conservation of Nature (2010), there are approximately 1,740,330 species (including invertebrates, vertebrates, plants, lichens, mushrooms, and brown algae) on Earth. Other estimates indicate that there are over 7,227,130 species (Chapman, 2009).

Studies on the number of species in various ecosystems indicate that biodiversity is decreasing. The population index of all marine and invertebrates has reduced from 100 to below 80 between 1970 and 2006, and that of fresh water species have dropped as low as 40 in the same period (Chapman, 2009).

1.1.2 The importance of conserving biodiversity

The decrease in biodiversity is not the sole factor that necessitates its conservation. The reasons for conserving biodiversity are based on the resources (called biological resources) which constitute things that are directly or indirectly derived from biodiversity (Fiedler & Subodh, 1992) with value for humans (United Nations Environmental Programme, 1992). A range of components that constitute biodiversity are vital to people because they underpin a variety of ecosystem services on which human societies depend. Ecosystem services are the processes by which the environment produces resources utlilised by humans such as clean air, water, food and materials (Millennium Ecosystem Assessment, 2011). In addition to the provision of the essential ecosystem services, biodiversity provides tangible goods and services, upon which humans depend (Devall, 2006). Furthermore, biodiversity enriches many people's lives. Humans derive spiritual, cultural and aesthetic satisfaction through the manifold forms of life (Holsinger, 2007). Biodiversity forms a basis for motivation for inquiry, from school children to scientists.

Losing the essentials of biodiversity results into less resilient ecosystems and diminishing of their services. This affects the survival and livelihood of humans. In developing countries in Africa, biodiversity loss is a great concern because studies show that rural people depend on biological resources for livelihoods and survival (Tumusiime, 2006). Throughout the continent, living things are a source of an enormous range of products for trade such as pharmaceuticals, soaps, starches, rubber, oils, dyes, and fabrics (Mugisha, 2002). In developing countries, especially in sub-Saharan Africa, local people depend directly on biological resources more than in industrialized nations (Holsinger, 2007). Sub-Saharan Africa's massive reliance on biological resources makes it economically and ecologically vulnerable to biodiversity loss.

1.1.3 Strategies used to conserve biodiversity

Some scholars state that strategies to prevent biodiversity loss have been in place since time immemorial in the form of traditional conservation strategies (Adams, 2003; MacKenzie, 1988). Forexample, some places were set aside for the conservation of natural resources in India over two thousand years ago (Holdgate, 1999). Nearly 1000 years ago, some areas were protected in Europe as hunting grounds for the affluent (MacKenzie, 1988). The strategy of protecting places (such as sacred groves) and their resources also occurs among traditional communities in Africa (MacKenzie, 1988). It has been argued by some scholars that within indigenous communities worldwide, there are traditional strategies for preventing loss of biodiversity which enable sustainable utilisation of diverse resources. Sustainable utilisation of biological resources involves utilisation of resources in a way that does not compromise future generations of humans from utilising these resources.

Whether or not traditional communities conserved natural resources is still an issue for debate. What is obvious is that within the past century, two major strategies (the preservation strategy and the community-based conservation strategy) have been the dominantly used approaches to stave off

biodiversity loss globally and in Africa. These strategies are referred to in this thesis as "contemporary conservation strategies" because they are not only deviant from the traditional conservation strategies but they are currently the most popular and widely used. Contemporary conservation strategies trace back to the last quarter of the 19th century in Europe where places devoid of human activity were set aside (Adams, 2003; MacKenzie, 1988). The idea of creating areas free from exploitative human interference became dominant in the 20th century thinking, drawing in the idea of national parks as wilderness areas. The strategy of setting aside areas free from human activities is called the "preservation strategy". Other researchers call it "fortress conservation strategy" or the "fences and fines strategy" (Brockington, 2002; Neumann, 1998; Wells and Brandon, 1992). For consistency, the term used in this thesis is "preservation strategy". The preservation strategy involves the establishment of protected areas, the barring of people as occupants, the prevention of exploitative use of resources, and keeping other forms of human activity to a minimum (Brockington & Schmidt-Soltau, 2004).

The International Union for the Conservation of Nature (IUCN) defines a protected area as:

> *"An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means".* (IUCN, 1994, p. 15).

The creation of protected areas has a long history and is still very influential globally. From the time the creation of the first protected area (Yellowstone National Park) in America in 1872 the number of protected areas has increased exponentially. By the year 2008 there were over 120,000 marine and terrestrial protected areas worldwide, occupying an area of more than 18,000,000 square kilometres which was more than twelve percent of the total global land area (Coad, Campbell, Miles, & Humphries, 2008).

The establishment of protected areas by almost every nation on earth (Terborgh, Van Schaik, Davenport, & Rao, 2002) indicates that protected areas are a core component of global conservation efforts. Protected areas are widely recognized as a major approach for the preservation of species and ecosystems (International Union for Conservation of Nature, 1994). Protected areas are classified into six different categories based on the purpose of their protection (Table 1.1).

Table 1.1 Types of protected areas and categorisation criterion. (International Union for Conservation of Nature, 1994 p.24**).**

Category	Description
I	Strict nature reserve, wilderness protection area or wilderness area managed mainly for science or wilderness protection.
II	National park, managed mainly for ecosystem protection and recreation.
III	National monument, managed mainly for conservation of specific natural features.
IV	Habitat/species management area, managed mainly for conservation through management intervention.
V	Protected landscape/ seascape, managed mainly for landscape/seascape conservation or recreation.
VI	Managed resource protected area, managed mainly for sustainable use of natural resources.

The focus of this thesis is on protected area national parks (category II) and their establishment, conservation and management in Africa, most especially in sub-Saharan Africa.

Sub-Saharan Africa has a long history (starting from the colonial game reserves) of national park creation (Neumann, 1998). The Parc National established in 1925 in the Belgian Congo, the Kruger National Park established in 1926 in the Transvaal in South Africa, Nairobi National Park established in 1946 in Kenya, Tsavo National Park established in 1948 in Kenya, and Queen Elizabeth National Park established in Uganda in 1951, are examples of the earliest national parks created in Africa (Adams, 2004; Neumann, 1998).

Initially, the creation of national parks emphasized the intrinsic values especially those associated with species richness and endemism. These values dictated how conservation was done in Africa (Adams, 2004). By 1985, the preservation strategy was no longer dominant either in Africa or globally. Some researchers believe that development theory in early 1980 propelled the suggestions that local communities should benefit from national parks (Adams, 2004). Consensus emerged at the 1982 World Parks Congress in Bali that national parks in developing countries will exist only when they address human needs (Adams, 2004). It was realised that national park managers should allow local communities which once depended on the national park area resources to have access to resources or benefit from those parks in terms of economic development. Delegates made a number of proposals on how to support local people neighbouring national parks. These suggestions marked the beginning of the "community-based conservation" strategy.

Community-based conservation is derived from the word "conservation" which according to International Union for the Conservation of Nature (1994) is the management of the biosphere for the benefit of the present and future generations. Thus "conservation" involves sustainable utilisation of resources of the natural environment. Some of the common phrases used to refer to "community-based conservation" include "community-based natural resource management" and "collaborative management". For consistency, the phrase "community-based conservation" is used in this thesis.

Community-based conservation requires that local people be involved in the conservation efforts. It advocates for the inclusion of local people in the process of conserving national parks (Adams & Hulme, 2001; Western & Wright, 1994). As a result, since the 1990s, the objectives of national park managers in most countries have expanded from biodiversity conservation and tourism to include human welfare (Adams & Hulme, 2001). Many national park managers in Africa and globally currently include diverse initiatives in their national park management plans. Some of the common initiatives of community-based conservation that have been implemented in Africa include: community wildlife management, integrated conservation and development programmes, collaborative or co-management of resources, state/community co-management, multiple resource use, benefit sharing, and payment for ecosystem services (Barrow & Murphree, 2001). However,

there are also many cases of national parks where community-based conservation initiatives have not been implemented (Secretariat of the Convention on Biological Diversity, 2010).

1.1.4 The effectiveness of the community-based conservation strategy

In 2002, the presidents of various countries of the world agreed to significantly reduce the rate of loss of biodiversity by 2010 (Secretariat of the Convention on Biological Diversity, 2010). To evaluate progress towards the 2010 target, several indicators were put in place against which success or failure would be judged. The indicators covered a broad range of measures, which among others included the area covered by protected areas in various countries.

In 2010, after reviewing all the available evidence, the third edition of the Global Biodiversity Outlook (a report on the state of the world's biodiversity produced by the secretariat of the Convention on Biological Diversity) concluded that the target had not been met (Secretariat of the Convention on Biological Diversity, 2010). Moreover, the report warned that the pressures influencing the loss of biodiversity were intensifying. Not a single government of the 193 governments that are party to the Convention on Biological Diversity showed that the 2010 biodiversity target had been met completely at the national level. One of every five governments stated explicitly that the target had been missed, and that biodiversity loss had persisted not only outside, but also inside national parks (Secretariat of the Convention on Biological Diversity, 2010).

The Secretariat of the Convention on Biological Diversity (2010) concluded that the community-based conservation strategy aimed at preventing and reducing biodiversity loss has been ineffective although some strategies had partially worked at the national or local levels.

1.2 MOTIVATIONS FOR THIS THESIS

Many protected areas in Africa still face problems associated with biodiversity conservation despite implementing community-based conservation strategies in those areas. The Rwenzori Mountains National Park (RMNP) is a typical example of a protected area that faces biodiversity conservation problems despite various strategies to prevent them.

1.2.1 The Rwenzori Mountains National Park

Much of the content presented in this section about the Rwenzori Mountains National Park, its conservation importance, past and current attempts to manage the park, and problems associated with the conservation of biodiversity in the park has been published in a technical report prepared by the author of this thesis on behalf of Flora and Fauna International and Uganda Wildlife Authority, and in an article in *Langscape* volume 2 issue 11, 2012, which can be obtained from http://sacrednaturalsites.org/items/current-status-ownership-and-management-of-sacred-sites-in-the-

rwenzori-mountains/ and http://sacrednaturalsites.org/items/terralingua-langscape-volume-2-issue-11/ respectively.

1.2.1.1 Geographical location of the Rwenzori Mountains National Park

The Rwenzori Mountains National Park lies on the border between Uganda and the Democratic Republic of Congo on the east side of the Western Rift Valley in East-Africa (see Figure 1.2). It is located between 0°06' and 0°46' North and 29°47' and 30°11' East, neighbouring lakes Albert and Edward within the Albertine Rift (Howard, 1991). The Rwenzori Mountains include the third, fourth and fifth highest mountain peaks on the African continent (Howard, 1991). The Rwenzori Mountains National Park traverses three districts (Kasese, Bundibugyo and Kabarole) that form part of the seven districts which collectively constitute what is politically known as the Rwenzori region (Figure 1.3).

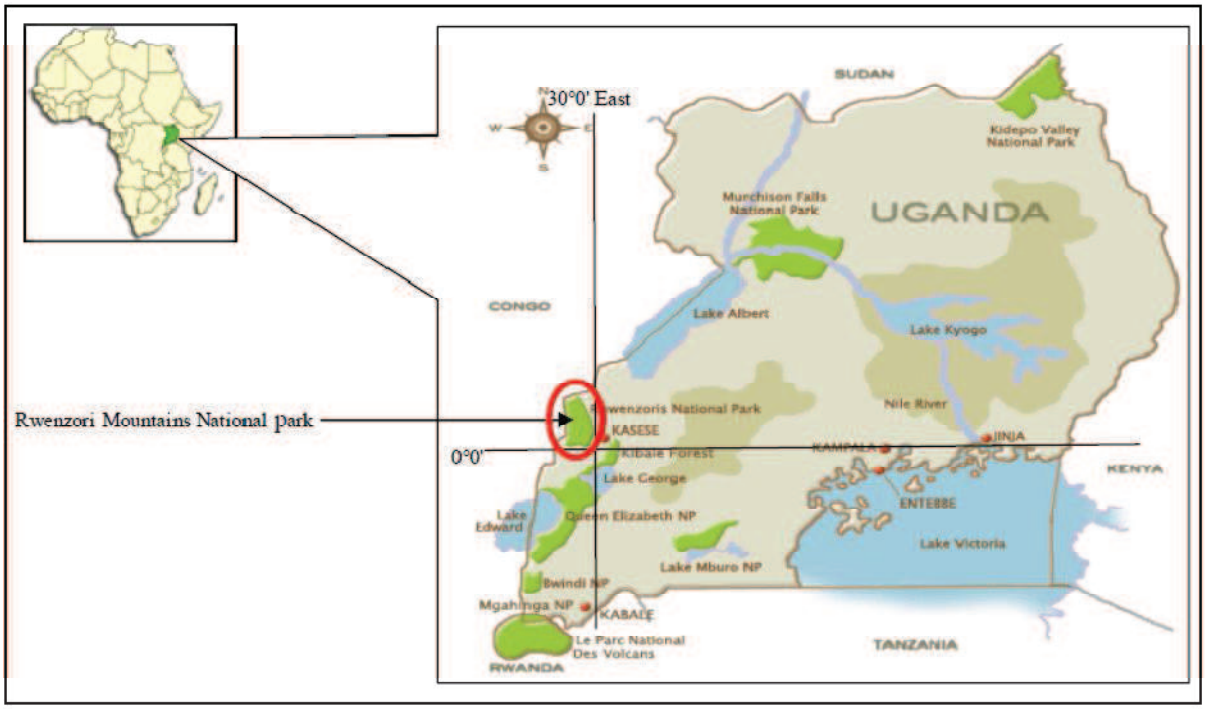

Figure 1.2 Location of the Rwenzori Mountains National Park. (adapted from Cultural Values and Conservation Project Report, 2007**).**

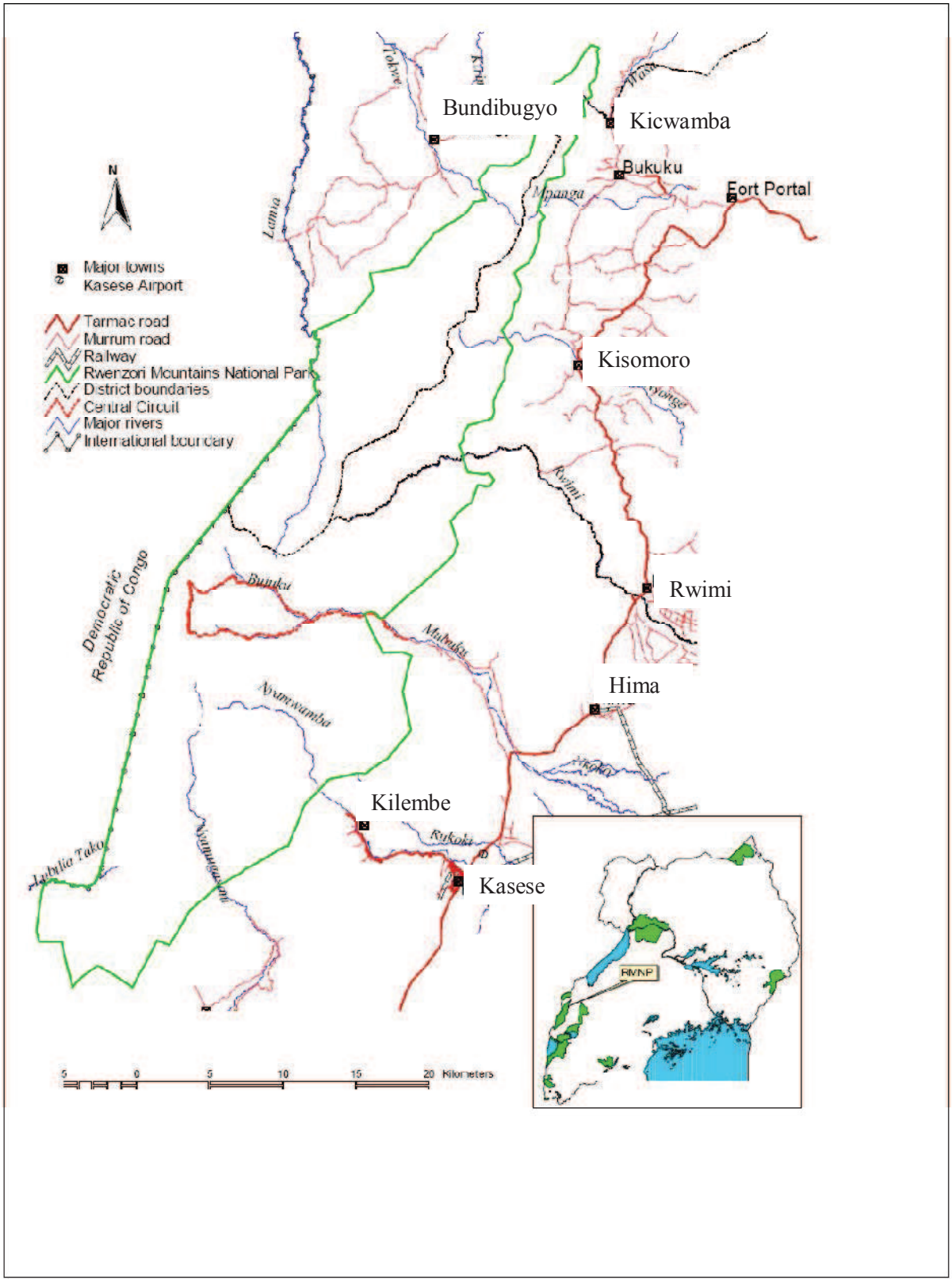

Figure 1.3 Map of the Rwenzori Mountains National Park and its neighbouring areas. (Uganda Wildlife Authority, 2004**).**

The total human population in villages near the Rwenzori Mountains National park was estimated to be nearly two million people a decade ago when the last housing and population census was conducted in Uganda (Uganda Bureau of Statistics, 2002).

1.2.1.2 Conservation importance of the Rwenzori Mountains National Park

To maintain biodiversity

The Rwenzori Mountains National Park is worthy of conservation because of its rich and unique biodiversity. It is home to a variety of plant and animal species, many of which are endemic, rare or globally threatened (see Table 1.2). Its uniqueness is attributed to species richness, number of endemics and range of habitats (Howard, 1991; Wilson, 1995).

Table 1.2 Some of the endemic, rare and globally threatened flora and fauna found in the Rwenzori Mountains. (adapted from Howard, 1991**).**

Plants	
Hypericum bequaertii *Schefflera polysciadia*	Endemic species
Erica kingaensi *Phillippia johnstonii* *Vernonia* sp .aff *ladolfi-friderici* *Ficalhoa laurifolia.* *Ocotea usambarensis*	Rare species (also occur in other montane forests of western Uganda)
Mammals	
Colobus angolensi ruwenzorii *Panthera pardus ruwenzorii*	Endemic species
Loxodonta africana *Pan troglodytes* *Cercopithecus l'hoesti*	Globally threatened species
Cercopithecus mitis stuhlmanii *Cephalophus sylvicultor* *Tragelophus spekei* *Hylochoerus meinertzhageni* *Potomochoerus porcus* *Dendrohyrax arboreus ruwenzorii* *Micropotamogale ruwenzorii*	Rare species
Birds	
Musophage johnstoni	Endemic species
Bradypterus alfredi *Cryptospiza shelleyi*	Rare species

In the afro-alpine zone, 81% of the 278 woody plant taxa are endemic to the East African region (Hedberg, 1963; Lush, 1993). The Rwenzori Mountains National Park has at least 177 species of forest birds which constitute 17.6% of the total forest birds in the country, including 19 birds which are found only in the Albertine Rift (Wilson, 1995). In the Rwenzori Mountains National Park there are also 15 species of butterfly which constitute 22% birds in the country (Howard, 1991). A survey

carried out in 1948 found 60 species of invertebrate and 25 of them had previously not been known (Salt, 1987).

It is a fragile ecosystem

The mountainous landscape of the Rwenzori Mountains National Park makes it an ecologically fragile area prone to biological and physical degradation, induced by both natural and human factors. To prevent such degradation requires putting in place conservation measures.

It is a cultural symbol of the local people

Conservation of biodiversity in the Rwenzori Mountains is also necessary because the Rwenzori Mountains are inhabited by Bakonzo, Baamba, Banyabindi and Basongora people whose cultural practices are closely associated to the mountains (Stacey, 1996). A variety of superstitions, tales and folklore about the Rwenzori Mountains are embedded within the cultural beliefs of the Rwenzori Mountain people (Stacey, 1996). The cultural beliefs may lead to traditional practices which may affect the harvest of natural resources in the Rwenzori Mountains.



Figure 1.4 A fetish called “”eshendekere” in one of over 100 locally known sacred sites in the Rwenzori Mountains. (Photo by M. Muhumuza, March, 2012**).**

1.2.1.3 History of conservation of the Rwenzori Mountains

Some historians claim that in most African traditional communities there were traditional biodiversity conservation strategies (Holgate, 1999). It was unclear at the beginning of this study whether prior to 1941, local people in the Rwenzori Mountains had traditional strategies of conserving biodiversity. One of the motivations for conducting this study was therefore to explore whether people in the Rwenzori Mountains traditionally had biodiversity conservation strategies. From 1941, various attempts have been made to conserve the Rwenzori Mountains (Figure 1.5).

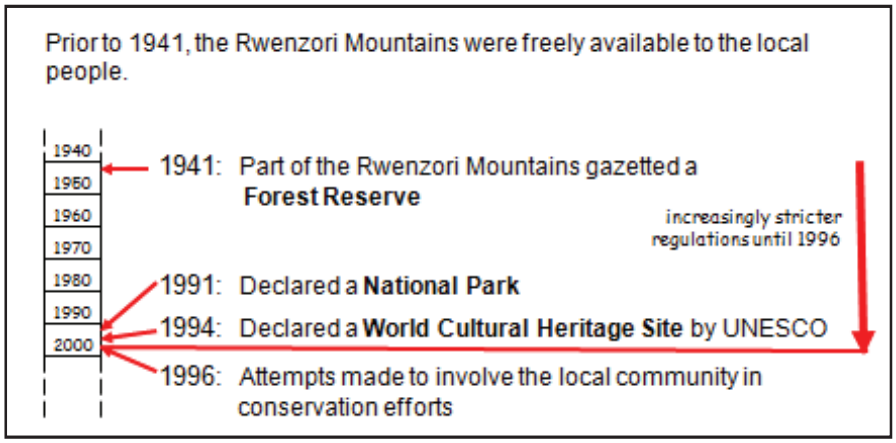

Figure 1.5 A timeline of attempts to conserve the Rwenzori Mountains.

The first formal attempts to conserve the Rwenzori Mountains

The need to conserve the Rwenzori Mountains and their natural resources was formally recognised in 1941, when part of the mountain was gazetted a forest reserve. Rules governing the exploitation of the resources within the forest reserve were as follows (McCall, 1996):

- Hunting was totally prohibited.
- Forest products (such as timber, firewood, bamboo and honey) inside the reserve could be taken for personal domestic use without a permit or payment of fees.

A senior forest officer was empowered to issue permits at his discretion to individuals to allow them to fell trees, take forest produce, reside, cultivate or graze livestock within the reserve.

Establishment of the national park

In 1991, 996km^2 of the mountain was gazetted a national park, under the management of Uganda National Parks. More stringent regulations on its use were put in place (McCall, 1996). Many activities and resource harvesting were totally forbidden in the park (see Table 1.3).

Table 1.3 Activities and resource gathering that were forbidden in the park.

Activities forbidden within the park	Resources that were forbidden to be gathered from the park
• Carrying weapons • Making walking sticks • Hunting/trapping • Grazing of livestock • Beehive construction • Shelter construction • Pit sawing • Ground fires	• Soil • Mushroom • Honey • Fuel wood • Thatch • Poles • Minerals

Traditional rituals were permitted provided all other regulations were adhered to, and fishing was allowed upon payment of an established fishing fee (McCall, 1996).

However, the Uganda National Parks experienced severe problems because local people continued engaging in the prohibited activities (Mutebi, 2005). Attempts by the park managers to prevent these activities from taking place in the park were futile. Park staff experienced harassment and death threats from the local people[1].

Due to the ecological significance of the Rwenzori Mountains and the problems encountered in conserving biodiversity in the Rwenzori Mountains National Park, the park was declared a World Heritage Site in 1994 by the United Nations Education, Scientific and Cultural Organisation. This elevated the conservation importance of the Rwenzori Mountains National Park to the international level.

Community-based conservation proposed and implemented

In 1996, the management of national parks and other protected areas in Uganda was shifted from Uganda National Parks to Uganda Wildlife Authority (UWA), a newly created body (Fumihiko, 2007). Resulting from the conservation challenges encountered by the Uganda National Parks, the Uganda Wildlife Authority recommended that community-based conservation of not only the Rwenzori Mountains National Park but all national parks in Uganda be a priority if more effective conservation was to be realized (Fumihiko, 2007).

[1] Pers. comm. with World Wide Fund staff in charge of community conservation in the Rwenzori Mountains National Park. March 2008.

Cognizant of the need for community-based conservation in all national parks in Uganda, the mission statement of the Uganda Wildlife Authority was, and currently is,

> *"to conserve and sustainably manage the wildlife and protected areas of Uganda in partnership with neighbouring communities and other stakeholders for the benefit of the people of Uganda and the global community*" (Mutebi, 2005 p.5).

Under the community-based conservation strategy, agreements would be reached between local people and the Uganda Wildlife Authority (Mutebi, 2005). In line with the mission of Uganda Wildlife Authority, the Rwenzori Mountains National Park administration proposed the following (Oryema, 1996):

- **Revenue sharing:** Twenty percent of the all gate collections from tourists should go to the communities neighbouring the park.
- **Representation of the local people on the park management committee:** The local community would select some of its members to represent them on the Park Management Advisory Committee.
- **Employment opportunities for local community members**: Local people would be given priority whenever there were any job vacancies.
- **Regulated access to the park:** Some members of the community, after obtaining a permit, could access restricted resources in specific areas of the park.

All these proposals have been implemented in the Rwenzori Mountains National Park since 1996 (Mutebi, 2005). These proposals were made in anticipation that the local people would be motivated to support conservation and ensure sustainable use of natural resources in the park, under the control of the Uganda Wildlife Authority.

1.2.1.4 Problems associated with the conservation of the Rwenzori Mountains National Park

Despite the conservation efforts in the Rwenzori Mountains National Park, resources have continued to be illegally harvested (Loefler, 1997) and the park boundary encroached (Muhumuza, 2006). The effect of illegal activities of the people on the park is evidence by a difference in vegetation in and around the Rwenzori Mountains National Park. There is a noticeable difference in vegetation cover between the community land and the land currently protected as part of the park (Figure 1.1). There is land degradation and soil erosion in the villages neighbouring the park (National Environment Management Authority, 2006). Generally, there was a decrease in natural vegetation cover between 1955-1999 (in each district traversed by the Rwenzori Mountains National Park) and 2001-2005 in the entire Rwenzori region (Figures 1.6 and 1.7).

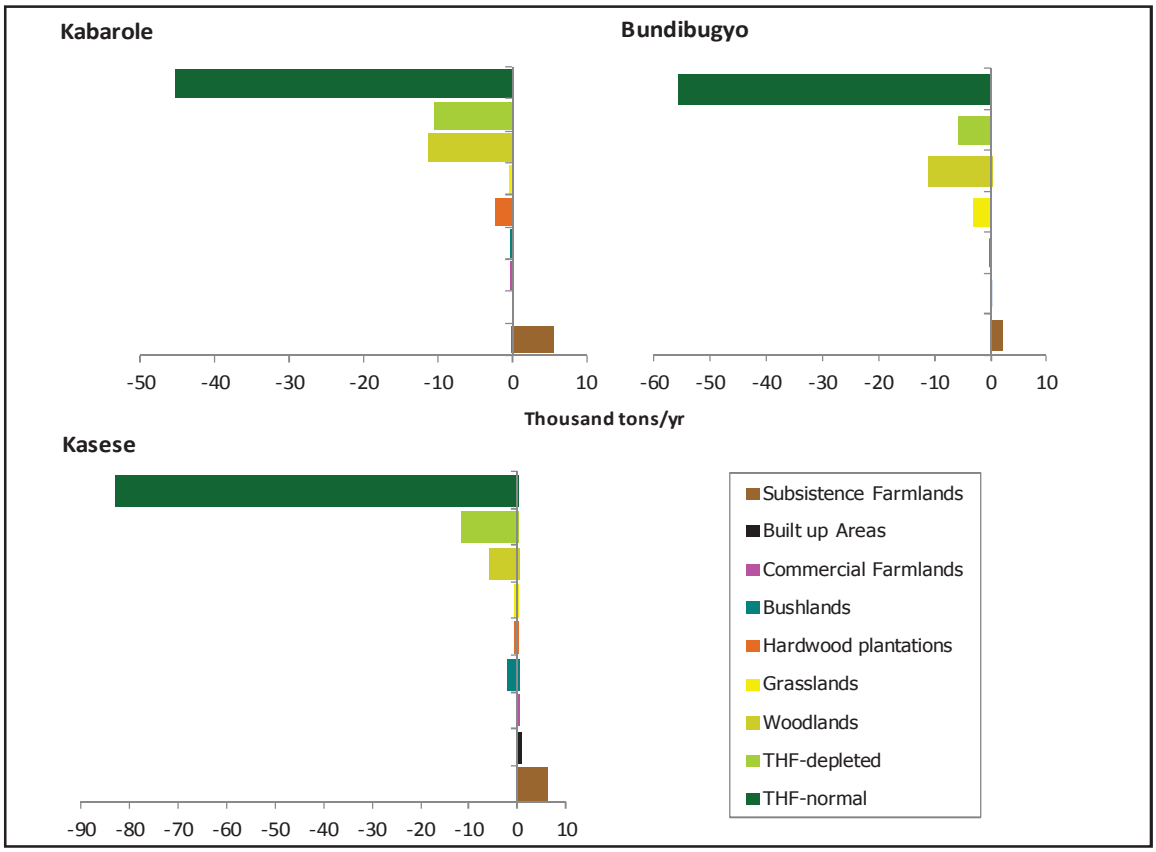

Figure 1.6 Changes in landcover in the Rwenzori region between 1995-1999. (Source: Lara, Cruz, & Anderson, 2013**). THF = Tropical High Forest**

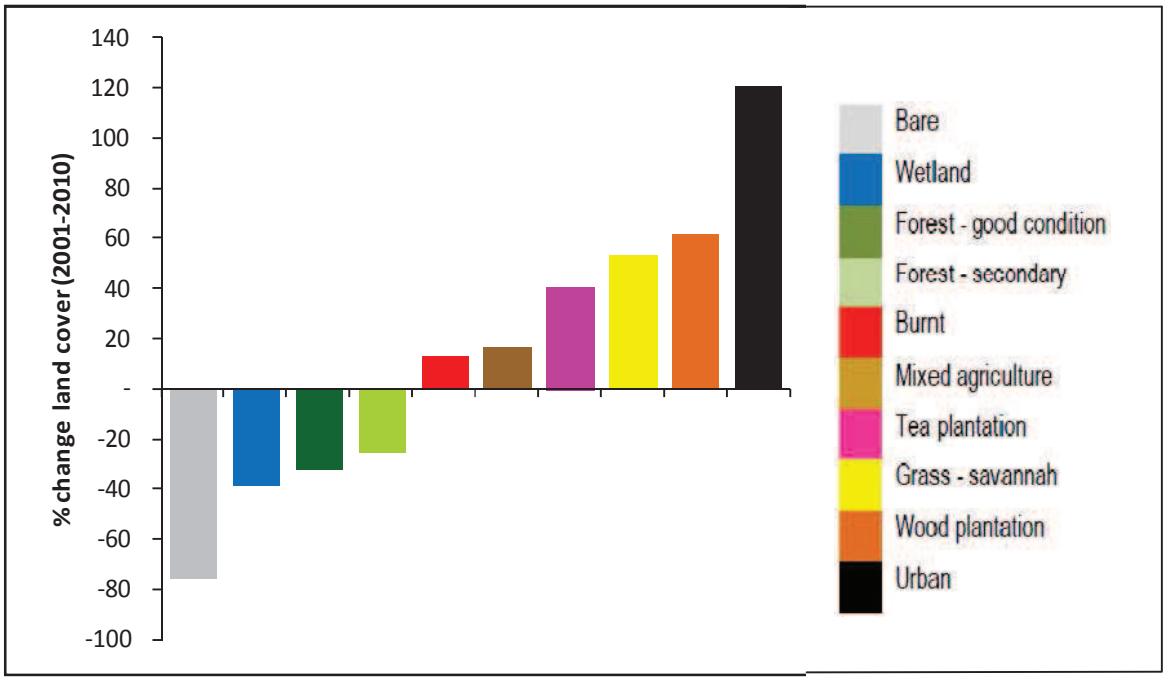

Figure 1.7 Changes in land cover in the Rwenzori region between 2001-2010. (Source: Lara, Cruz, & Anderson, 2013**).**

Many species formerly abundant in the mountains, such as the wild buffalo are now rare as a result of anthropogenic activities (Loefler, 1997). Biodiversity loss and resource degradation at the hands of the local people have persisted since the early 1990's up to present (Rwenzori Mountains Environmental Conservation Education strategy, 2004).

There is conflict of interest between the local community for the need to have access to the park resources and the Uganda Wildlife Authority for conservation and tourism activities (Nkonya, John and Pamela, 2002). Their needs could explain why the local communities still carry out illegal activities such as poaching, accessing restricted areas without permits, and harvesting of resources. Although the extent to which the illegal activities occurred had not been documented prior to this study, it was stated in the Rwenzori Mountains Conservation Education Strategy (2004) that on several occasions game rangers found animal traps in the park, came across cut trees and tree stumps, and encountered trespassers.

Bids by the park administration to prevent the illegal activities from occurring have met with resistance from the local people (Rwenzori Mountains Environmental Conservation Education Strategy, 2004). The communities bordering the park have developed negative attitudes to the existence of the park. Such attitudes involved setting some areas of the park ablaze and killing stray animals without any intended benefit. Such attitudes were shown especially when some of the community members were caught in the park involved in illegal extraction of resources or when the park authorities enforce the by-laws (Tamale and Nzirambi, 1996). Local people in villages that neighbour the Rwenzori Mountains National Park say that they are being regarded by Uganda Wildlife Authority staff as less important than the monkeys and baboons in the park (Tamale and Nzirambi, 1996).

Many natural calamities such as floods, landslides, soil erosion and erratic seasonal changes are common phenomena in the Rwenzori region (BBC Online, 2010; Majungu and Basalirwa, 1996; Muhumuza, Muzinduki and Hyeroba, 2011; Protos-Directorate of Water Resources Management, 2012; Rwenzori African Development Foundation, 2010) and the local community blames this on the park administration for failure to allow them into the park to evoke and appease the spirits that had for decades protected them (Cultural Values and Conservation Project report, 2007).

It is these problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park that triggered this study.

1.2.1.5 Possible causes of the problems associated with the conservation of the Rwenzori Mountains National Park

From the literature on the Rwenzori Mountains National Park, it appears that there are a number of causes that could have contributed to problems associated with the conservation of the Rwenzori

Mountains National Park. These causes can be grouped in two categories: 1) causes related to park management, and 2) causes related to contextual issues in the Rwenzori Mountains.

Causes related to park management

- When part of the Rwenzori Mountains was gazetted a forest reserve and then consequently a national park, the local people were not consulted and yet they are an important stakeholder group which traditionally owned the area (McCall, 1996). It is not a guarantee that they would have simply accepted transfering ownership and management of the area to the central government but most likey they could have expressed alternative views about access and use rights of the area and the resources therein. Community consultations prior to establishment of national parks have been found elsewhere to be among the factors that influence successful conservation of biodiversity in protected areas (see Chapter 2).
- The local people were not sensitized about the benefits of biodiversity conservation through the establishment of the park. The establishment of the Rwenzori Mountains National Park must have thus been considered by the local people as "anathema" because it threatened their welfare since majority of them depended on the resources in the area where the park was established for survival and livelihood (Cultural Values and Conservation Project report, 2007).
- The legislation governing the park was not clear to the people (Muhumuza, 2006) and enforcement of the law was weak because of low numbers of game rangers and lack of financial investment in the management of the park (National Environmental Action Plan, 1995). The nature of the mountain terrain also posed problems in patrolling all areas of the park and its boundary.
- When community involvement in conservation was eventually considered in 1996, it was not well grounded in research. For instance, the suggested strategies of allowing the local community members limited access to the park resources lacked information about the extent to which the local community depended on the park and the actual resources they needed from the park.
- The revenue generated out of tourism is very small and the 20% allocated to the community cannot meet the needs of every community member let alone be a direct substitute for the resources that the local people previously obtained from the park (United Nations Education Scientific and Cultural Organisation, 2002).
- Job opportunities are not available regularly, and when they are available they benefit only a few individuals in the community[2].

[2] World Wide Fund for Nature community worker, *pers. comm.*, May 2008.

- Local representation on the Park Management Committee (PMC) was implemented, but the representatives seem to have no popular authority among the local people[3].

Causes related to contextual issues in the Rwenzori Mountains

- There was breakdown of law and order and rebel activities from the 1960's to mid-1990's. The infrastructure for park administration was vandalized by the local communities because the park buildings were used as refugee camps and the park conservation and management plans stalled during the period of civil strife for lack of monitoring in the war-torn area (United Nations Environment Programme, 2006).
- The human population density in villages neigbouring the park has increased drastically. In 1969, the human population in the three districts traversed by the park (Kasese, Kabarole and Bundibugyo districts) was 571,514, in 1980 it was 909,734 and by 1991 it had reached 1,206,967 (Tukahirwa, 1995). The population density a decade ago had reached between 150 and 430 persons/km^2 and is still increasing (United Nations Education Scientific and Cultural Organisation, 2000). The annual human population growth rate, especially in Bundibugyo, and Kasese, is very high and above the national growth rate of 3.3%. In Bundibugyo it is 5.16%, in Kasese 3.76% and in Kabarole 1.56% (The Uganda Bureau of Statistics, 2002). The growing human population continues to increase the problem of resource extraction from the park.
- In the Rwenzori region, over eighty percent of the local people depend on subsistence agriculture for livelihood (Tenywa, 1996). Diminishing arable land available due to soil erosion, poor farming systems and human population increase and climate change (Tenywa, 1996) has prompted the local people to claim land belonging to the park.

Causes of problems associated with biodiversity conservation may change with time. At the time of conceptualization of this study it was not clear to what extent these causes were responsible for the problems associated with the Rwenzori Mountains National Park. Some causes of the problems affecting the Rwenzori Mountains were only documented in early years when the park was created (Ogwang and DeGeorges, 1992). This study was motivated by the need to investigate the nature and extent of the problems associated with the Rwenzori Mountains National Park and their possible causes in the current context. Also it was necessary to investigate possible causes of the problems in the Rwenzori Mountains National Park from the local people's perspective. The problems of

[3] World Wide Fund for Nature community worker, *pers. comm.*, May 2008.

conserving biodiversity in protected areas are often associated with, and are better articulated by, the people who neighbour those protected areas (Newing, 2011). From the claims made by the people in the Rwenzori Mountains, some of the causes of the problem appear to be cultural and are connected to the local people's beliefs, attitudes and traditional knowledge. Such potential causes of the problems had not been investigated prior to this study. Similarly, there could have been other factors responsible for the underlying causes of the problems that had not been explored in the Rwenzori Mountains National Park. This necessitated understanding the problems from the local community perspective and the mindset of individuals, and how they interlink with causes documented in literature, so as to have a more holistic perception of the direct and indirect causes of these problems. It was anticipated that such an understanding could form a basis for planning and proposing improvements in the community-based conservation strategy.

1.3 AIM AND OBJECTIVES OF THE STUDY

1.3.1 Aim

This study was proposed with the aim of understanding the nature and extent and possible causes, of the problems associated with illegal practices in the Rwenzori Mountains National Park. The ultimate goal of the study was to provide information considered useful in developing a more integrative and effective community-based conservation strategy not only in the Rwenzori Mountains but also in the management of protected areas in rural Africa where similar problems occur.

1.3.2 Specific objectives

The study intended to achieve the following specific objectives.

1. To review current biodiversity conservation strategies in national parks in Africa and identify factors that influence their success or failure.
2. To critically analyze the role of traditional ecological knowledge in conserving biodiversity in national parks in Africa.
3. To develop a conceptual framework to facilitate an investigation of the causes of problems associated with biodiversity conservation in the Rwenzori Mountains National Park.
4. To investigate factors influencing illegal access and utilisation of resources in the Rwenzori Mountains National Park by local people, including:

   4a) resources that local people need from the Rwenzori Mountains National Park.

   4b) traditional beliefs, knowledge, and practices associated with utilisation of resources in the Rwenzori Mountains National Park.

   4c) the nature and extent of environmental education received by the local communities around the Rwenzori Mountains National Park and how it targets the factors identified in objectives 4a and 4b.

5. To develop a generalisable model that can facilitate an understanding of factors underlying illegal access to, and utilisation of, resources in the Rwenzori Mountains National Park by local people neighbouring the park.

For each objective, the problem, research questions, knowledge gap, and assumptions made are described separately (Tables 1.4 to 1.9). A summary of the purpose, data needed, instruments used and the source of data for each objective are also presented in the tables.

Table 1.4 (Objective 1) To review current biodiversity conservation strategies in national parks in Africa and identify factors that affect their success or failure.

Research question

What are the factors influencing the success or failure of conserving biodiversity in national parks in Africa?

The problem	Knowledge gap	Assumptions	Purpose	Information needed	Instruments	Source of data
The current biodiversity conservation strategies have failed to sustain biodiversity in national parks.	Absence of consolidated data on the factors that affect the success of biodiversity conservation strategies in national parks.	Better conservation strategies in national parks can be proposed if factors that affect the success of current conservation strategies are known.	To identify factors that affect the success of current biodiversity conservation strategies to sustain biodiversity in national parks.	Empirical studies that assess the causes of success or failure of biodiversity conservation in national parks in Africa.	A spreadsheet	Publications from online sources

Table 1.5 (Objective 2) To critically analyze the role of traditional ecological knowledge in conserving biodiversity in national parks in Africa.

Research question

In what way is African traditional ecological knowledge said to sustain biodiversity and how applicable is it in the current African context?

The problem	Knowledge gap	Assumptions	Purpose	Information needed	Instruments	Source of data
The current biodiversity conservation strategies have failed to sustain biodiversity.	The role of African traditional ecological knowledge in biodiversity conservation has not been explored or considered in current community-based conservation practices in national parks.	If African ecological knowledge that is said to have sustained biodiversity is explored, it could contribute to the current biodiversity conservation strategies, especially in national parks.	To analyse how African traditional ecological knowledge has been used in the past and the extent of current usage.	Case studies on African traditional ecological knowledge and biodiversity conservation.	A spreadsheet	Publications from online sources.

Table 1.6 (Objective 3) To develop a conceptual framework to facilitate an investigation on the causes of problems associated with biodiversity conservation in the Rwenzori Mountains National Park.

The problem	Knowledge gap	Assumptions	Purpose	Information needed	Source of information
It is often difficult to locate a suitable conceptual framework to investigate a complex socio-ecological problem such as the problems associated with conservation of biodiversity in the Rwenzori Mountains National Park	In natural sciences (a branch of science where the biodiversity conservation discipline is situated) the dominant approach to research is to break down a complex phenomenon into its components and propose hypotheses and design ways to test each of them as if they operate independently in the natural world. Such an approach is not effective for studies that require holistic investigations into complex problems.	The use of a conceptual framework which integrates several constructs, theories and relationships facilitates a more holistic investigation of complex socio-ecological problems.	To develop a conceptual framework to facilitate a holistic investigation into the nature and causes of problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park.	Literature on how to develop a suitable framework to investigate a complex problem.	Published literature

Table 1.7 (Objective 4a) To identify resources that local people need from the Rwenzori Mountains National Park.

Research questions
What is the nature and extent of usage of the park and its resources?
How has the usage of the national park and its resources changed with time?

The problem	Knowledge gap	Assumptions	Purpose	Data needed	Instruments	Source of data
The resources from the Rwenzori Mountains National Park have been indiscriminately harvested.	Absence of research-based data on the nature and extent of usage of the park and its resources by the local people and whether the situation has changed.	People are less likely to accept conservation strategies if the strategies conflict with what people require from the park.	To obtain information from local people around the park about the nature and amount of resources being harvested from the park	• Types and extent of usage of resources that people obtain from the park and activities they conduct in the park. • Past and present usage of the park and its resources.	Interview schedule	Local community members (one respondent per sampled household)

Table 1.8 (Objective 4b) To investigate traditional beliefs, knowledge and practices associated with the utilisation of resources in the Rwenzori Mountains National Park by local people.

Research question
What traditional beliefs, knowledge, and practices influence the utilisation of resources in the Rwenzori Mountains National Park?

The problem	Knowledge gap	Assumption	Purpose	Data needed	Instrument	Source of data
• People claim that the park authorities undermine cultural rituals which they used to carry out in the park. • Traditional beliefs, knowledge and practices were left out of the conservation plans and yet they may be useful in conservation.	• Traditional beliefs knowledge and practices that may have an impact on conservation are not documented. • There is a lack of information about the current popularity and support of traditional beliefs, knowledge, and practices among the local people.	• Some traditional beliefs, knowledge and practices may be counter-conservation so they need to be addressed in the management of the park. • Some of the traditional beliefs, knowledge and practices may be pro-conservation, so they need to be encouraged. • If pro-conservation traditional beliefs, knowledge and practices are integrated in the general park management plan, more effective conservation could be achieved.	To record the traditional beliefs, knowledge and practices and how they influence the usage of resources in the park.	• Traditional beliefs, knowledge and practices that are pro-conservation. • Traditional beliefs, knowledge and practices that that are counter-conservation. • Current extent of support of pro-conservation and counter-conservation elements of traditional beliefs, knowledge and practices by the local people.	Interview schedule	Local community members (one respondent per household)

Table 1.9 (Objective 4c) To investigate the nature and extent of environmental education in local communities around the Rwenzori Mountains National Park.

Research question
What is the nature and extent of environmental education programmes in communities neighbouring the Rwenzori Mountains National Park?

The problem	Knowledge gap	Assumption	Purpose	Data needed	Instruments	Source of data
• Local people have negative attitudes to the park. • The local people resist park conservation strategies.	Nature and extent of formal and informal environmental education programmes for the local people are not known.	Environmental education, if well provided, can influence people's beliefs and attitudes towards conservation behaviours.	To investigate the nature and extent of formal and informal environmental education programmes in the community.	What the curriculum states about environmental education and what informal programmes are offered.	Spreadsheet	Curriculum statements for education and documents on informal environmental programmes.

Table 1.10 (Objective 5) To develop a model that will facilitate understanding of factors that affect the use of Rwenzori Mountains National Park resources by local people.

Research question
How can the factors that influence illegal access and unsustainable utilisation of resources in the Rwenzori Mountains National Park by local people be presented holistically in a conceptual model?

The problem	Knowledge gap	Assumption	Purpose	Data needed to answer research question	Source of data
Analysis of each factor that affects use of resources from the Rwenzori Mountains National Park leads to a poor understanding of why local people continue to go against rules governing the park.	Holistic models that show interaction among factors that influence local people access and utilisation of national park resources in rural Africa are rare.	• If a model is developed showing factors that affect the use of resources by local people in the Rwenzori Mountains National Park and how those factors are interlinked, it could lead to a better understanding of the complex and multiple causes of problems associated with conservation of biodiversity in the Rwenzori Mountains National Park and hence provide an informed basis for improvements to the community-based conservation strategy. • Such a model could be applied in other areas where similar problems occur.	To develop a comprehensive model of factors that affect the utilisation of park resources by people near the Rwenzori Mountains National Park.	The factors that were found to conceptually and empirically influence the use of park resources by local people near the Rwenzori Mountains National Park.	Results of objectives 4a), 4b) and 4c) of this study.

1.4 THE STRUCTURE OF THE THESIS

This thesis consists of 12 chapters. Following this introductory chapter, the second and the third chapters put the study in a wider context by drawing upon existing literature about biodiversity conservation, more especially on community-based conservation. The second chapter discusses factors that affect the success of biodiversity conservation in national parks and the third chapter presents a review of various case studies on the role of traditional ecological knowledge in the conservation of biodiversity in Africa. Such a review was important because although traditional African societies are said to have sustained biodiversity using traditional custodianship systems, there are questions about whether people in African traditional societies were indeed conservationists (and whether they needed to be) and whether their knowledge is relevant in the current African context. A review of the literature presented in Chapter 2 and Chapter 3 provided insights into how investigations into the problems facing the Rwenzori Mountains National Park could be conducted.

In the fourth chapter a theoretical framework that guided the field investigations is presented. In this chapter, the content presented extends beyond discussions on the importance of theoretical frameworks in research to show how a theoretical framework that guided this study was developed. Three key aspects that were investigated empirically in the field are presented and the reasons why they were investigated are discussed. These are: 1) resource needs of the people, 2) traditional beliefs knowledge and practices, and 3) nature and extent of the provision of environmental education programmes.

Local people's plant resource needs are presented and discussed in Chapter 5, animal resource needs in Chapter 6, and other resource needs such as land for cultivation of crops in Chapter 7. Findings on how traditional beliefs, knowledge, and practices influence access and utilisation of resources in the Rwenzori Mountains National Park by the local people are presented and discussed in Chapter 8. In Chapter 9, efforts toward the integration of traditional beliefs, knowledge and practices in the management of the park are described and the experiences and lessons learned are discussed. The nature and extent of environmental education programmes in communities neighbouring the Rwenzori Mountains National Park, and how they address the factors that influence illegal access to resources in the park, are presented and discussed in Chapters 10 and 11 for formal and informal education respectively.

The thesis culminates with Chapter 12 which synthesizes the results, discussion and conclusions of the study. Also, it is in this chapter that a scheme aimed at facilitating an understanding of factors that underlie illegal access and utilisation of resources in the Rwenzori Mountains National Park by local people (objective 5), and a model that could serve as a basis for proposing and implementing a holistic community-based biodiversity conservation strategy, are presented.

1.5 NEW AND ORIGINAL INSIGHTS THAT THE THESIS CONTRIBUTES

This thesis explores a phenomenon, biodiversity-supporting behaviour, which is relevant in current conservation practices that attempt to link conservation biology with anthropology. The thesis has pioneered the "behavioural conformity or deviation" concept in biodiversity conservation literature.

The concept formed a basis for the development of a scheme showing factors which influence illegal access and utilistion of resources from a national park by local people. The thesis shows that the factors that influence behavioural comformity or deviation of local people towards national park rules and regulations are interlinked and some are situated inside and outside mindsets of individuals.

The thesis proposes a holistic framework for community-based conservation in form of a model (refered to as the "ENAD" model) that could address the factors identified. The model comprises environmental education, negotiated access to some resources, alternative sources of livelihoods, and decentralised co-management of the park. The model provides an important step towards improved understanding of what needs to be done to enable local people, leaders and other stakeholders to engage in an effective coalition towards the conservation of biodiversity in protected areas in a rural African context.

CHAPTER 2

FACTORS AFFECTING THE SUCCESS OF CONSERVING BIODIVERSITY IN NATIONAL PARKS: A REVIEW OF CASE STUDIES FROM AFRICA

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Figure 2.1 A signpost with directions to two remotely located protected areas in mid-western Uganda. (Photo by M. Muhumuza. June, 2009**).**

INFORMATION ON AUTHORSHIP OF THIS CHAPTER

- The first author is the primary author responsible for the largest contribution in terms of intellectual content.
- The first author was the co-ordinating author for the whole research output and takes responsibility for record-keeping regarding the output.
- The first author conceptualised the original idea upon which the output was based.
- Both authors contributed in the design, execution, analysis, and interpretation of the research output.
- The first author drafted the entire article and the second author contributed in making the critical revision of the manuscript for important intellectual content.
- Both authors participated in the approval of the version to be published.
- Generally, in the preparation and publication of the output, the guidelines on authorship appoved by the Research Committee of the University of the Witwatersrand on 16th March 2004 were followed.

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Review Article

Factors Affecting the Success of Conserving Biodiversity in National Parks: A Review of Case Studies from Africa

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National Parks are a cornerstone for biodiversity conservation in Africa. Two approaches are commonly used to sustain biodiversity in National Parks. Past and current studies show that both approaches are generally ineffective in conserving biodiversity in National Parks in Africa. However, there are a handful of cases where these approaches have been successful at conserving biodiversity in National Parks. The question this paper attempts to answer is why in some cases these approaches have been successful and in other cases they have failed. A metadata analysis of 123 documents on case studies about conservation of biodiversity in National Parks in Africa was conducted. A series of search engines were used to find papers for review. Results showed that all factors responsible for both the success and failure of conserving biodiversity in National Parks in various contexts were socioeconomic and cultural in nature. The highest percentage in both successful case studies (66%) and unsuccessful cases studies (55%) was associated with the creation and management of the park. These results suggest that future conservation approaches in National Parks in Africa should place more emphasis on the human dimension of biodiversity conservation than purely scientific studies of species and habitats in National Parks.

1. Introduction

National Parks are the most extensive type of protected areas in Africa and globally. They are classified under category II of the IUCN categories of protected areas [1]. National Parks are created to (1) protect the ecological integrity of one or more ecosystem for present and future generations; (2) exclude exploitation or occupation detrimental to the purposes of designation of the area; and (3) provide a foundation for spiritual, scientific, educational, recreational, and visitor opportunities, all of which must be environmentally and culturally compatible [1]. National Parks comprise the highest percentage (23%) of the total area covered by protected areas worldwide [1]. For instance, according to estimates by Colchester [2], Africa has more than 1,812 National Parks covering a total 3,112,027 km^2 of the continent. In Sub-Saharan Africa alone, over 1 million km^2 of land out of 23 million km^2 (constituting approximately 4%) has been set aside as National Parks [2].

Conservation of biodiversity in National Parks is done through two main approaches: one approach is the preservation approach, which aims at setting aside National Parks to exclude human activities except for tourism. Through this approach, direct use of natural resources in the park for commercial or subsistence purposes is prohibited [3]. This type of approach is often referred to as the "protectionism approach" or "the fines and fences" approach [3]. For consistency, the term "preservation approach" is used in this paper. The preservation approach aims at excluding human activities considered inimical to the objectives of conserving biodiversity in National Parks. The preservation approach was the most dominant approach until the 1980s, but in some National Parks, it has now been substituted by the second approach called the community-based conservation approach that allows people (especially those that neighbour National Parks) to benefit socially or economically from parks [4]. The community-based conservation approach was proposed to address the problems associated with excluding

human activities from the park. A detailed description of the development of the two approaches can be found elsewhere [4, 5].

The community-based conservation approach involves initiatives aimed at conserving biodiversity in the park but also letting local people benefit from the park [6]. Some of the initiatives involved in the community-based conservation approach include signing of resource use agreements such as in the Rwenzori Mountains National Park which allow local people who neighbour National Parks to have access to specific resources from the park for subsistence use [7]. In other cases, local people are given money for infrastructural development, such as in Integrated Conservation and Development Initiative in Korup National Park in Cameroon [8]. And in other National Parks such as Pendjari National Park in Benin, local people are given a percentage of revenue generated from tourism activities in the park [9].

Despite the implementation of these approaches, the Global Outlook 3 which is a recent report by the Secretariat of the Convention on Biological Diversity [9] shows that biodiversity loss from protected areas has persisted. The report revealed that the targets agreed upon by leaders of different countries in the world in 2002 to significantly reduce the rate of biodiversity loss at global, regional, and national levels had not been met by 2010. Threats to biodiversity such as habitat loss, climate change, pollution, unsustainable use of resources, and invasive alien species have intensified [9]. According to Butchart et al. [10], despite the many efforts taken around the world to conserve biodiversity and use it sustainably, approaches and strategies so far have not been adequate to address the scale of biodiversity loss or reduce the pressures.

Although none of the twenty-one subtargets accompanying the overall target of significantly reducing the rate of biodiversity loss by 2010 was achieved globally, there are some that had been locally achieved [11, 12]. de Oliveira [13] had earlier noted that for every profitable and successful protected area, there may be hundreds that are not successful.

There are a number of suggestions that have been made since the publication of the Global Outlook 3 by the Secretariat of the Convention of Biological Diversity. For instance, Rands et al. [12] suggested that beyond the year 2010, successful conservation approaches need to be reinforced and adequately financed. Rands et al. [12] opine that a more radical change is required to recognize biodiversity as a global public good and integrate biodiversity conservation into policies and decision frameworks. However, before any suggestion about effective conservation of biodiversity in National Parks is implemented, the current scenario necessitates an understanding of the underlying factors for success and failure of the existing biodiversity conservation approaches.

Although many studies have been conducted on threats that protected areas face, there is a scarcity of literature that assesses why those threats have persisted. In addition, there is a scarcity of published literature that analyzes why some strategies aimed at preventing biodiversity loss succeed in some instances and fail in other instances. In the absence of such literature, it becomes difficult to propose other strategies or to have a basis upon which new ones can be improved.

Although the Secretariat for the Convention on Biological Diversity [11] identified underlying causes to biodiversity loss such as demographic change, economic activity, levels of international trade, per capita consumption patterns linked to individual wealth, cultural and religious factors, and scientific and technological change, these factors were not discussed in specific detail in the context of conserving biodiversity in National Parks in Africa. In this paper, the aim is to identify and analyze factors that affect the success of conserving biodiversity in National Parks in Africa.

2. Methods

A literature review of biodiversity conservation in National Parks in Africa was conducted. The literature that was reviewed was systematically selected from the internet using search engines shown in Table 1. Web searches were conducted between May 2009 and March 2011. The search terms used separately or in combination included "*National Park management*," "*evaluation of success of National Parks*," "*effectiveness of National Parks*," "*community based conservation of National Parks*," "*community based natural resource management*," and "*effectiveness of community based conservation approach*". For ScienceDirect, the search was conducted on the first three hundred articles.

The web search resulted in 227 journal articles, books, technical papers, working documents, and theses which are collectively called "publications" in this paper. The title of each publication was read to determine if it met the criteria for inclusion. If the title and abstract of the publication indicated that it might meet the inclusion criteria, the full text was viewed and the publication was saved on a personal computer. A publication was selected for review if it met the following criteria:

(1) was written in English,

(2) reported on establishment, management, and effectiveness of a National Park in Africa,

(3) reported on implementation, monitoring, and effectiveness of any aspects of community-based conservation in or around a National Park in Africa,

(4) assessed performance of any biodiversity conservation approach in and around a National Park in Africa,

(5) discussed actual reasons for success or failure of the approach in a National Park in Africa.

Attention was first given to publications that were in peer-reviewed journals, project reports, and working articles. Because much grey literature (such as unpublished Masters and Ph.D. theses) in conservation is of high quality and could be valuable for evaluating and understanding factors affecting the success or failure of conserving biodiversity in National Parks, grey literature publications were also included in the review. Publications that had a conceptual or theoretical significance to justify the argument in this paper were also

Table 1: Web search engines from which the literature for review was obtained.

Source of data	Description of the source
CBNRM Net	CBNRM Net is an integrated and adaptable knowledge management tool. It has over 200 case studies on community-based natural resource management collected from various countries around the world.
Khup.com	Khup.com is a search engine, which provides updated and quality results for e-books, books, magazines, user's guides, and references in pdf format in various fields including biodiversity conservation.
Advancing conservation in the social context reference library	Advancing conservation in the social context reference library is an interdisciplinary research initiative designed to generate knowledge and promote potential solutions about the tradeoffs that characterize complex ecological and social relationships. Registered users access and download materials from advancing conservation in the social context library.
ScienceDirect	ScienceDirect is an online collection of published scientific research. It contains nearly 10 million articles from over 2,500 journals and over 6,000 e-books, reference works, book series, and handbooks issued by Elsevier.
Google Scholar	Google Scholar is a freely accessible web search engine that indexes full text of scholarly literature across an array of publishing formats and disciplines. It indexes most peer-reviewed online journals from scholarly publishers especially in Europe and America.

Table 2: The number of subfactors in each category.

Category of factors	Number of factors in unsuccessful cases sub	Number of factors in successful cases sub
Creation and management of the park	19	14
Local community neighbouring the park	10	7
The area where the park is located	3	2
National policy governing the park	2	0
Financial resource base of the park.	3	1

included in the review. Publications that reported on transboundary National Parks were also included in the review.

Publications that reported case studies in Africa as well as other continents were only included in the review if they reported specific results on African case studies. Publications that reported multiple case studies from Africa were included in the review even when the case study results were generalised. Publications that reported threats or lack of threats in National Parks without giving reasons for the observations were not included in the review.

Of the 227 publications, 123 met the criteria for selection and inclusion in the review. These publications are shown in the reference list and in Supplementary Material available online at http://dx.doi.org/10.1155/2013/798101.

The procedure of reviewing the publications followed guidelines recommended by Randolph [14]. Deductive coding of text as explained by [15] was conducted on each of the selected publications. A case study was considered "successful" if the publication reviewed stated that there was staving off of biodiversity loss in a National Park or if there was a reduction in threats to the park. If an approach such as community-based conservation succeeded in giving local people incentives or attracting tourists to the park but failed to stave off biodiversity loss or to reduce threats to biodiversity in the park, it was categorized as a failure. The categorization of factors as responsible for success or failure was based on what was reported by the authors of the publications. Case studies and examples referred to in the body of the paper were selected based on their relevance to the presentation and discussion.

3. Results

Various factors that affected conservation of biodiversity in National Parks in Africa were identified. The identified factors were grouped into five categories which included the creation and management of the park, local community neighbouring the park, the area where the park is located, national policy governing the park, and financial resource base of the park. Table 2 shows the number of sub-factors in each of the five categories. For instance, in the category of creation and management of the park, there were 19 sub-factors and 14 sub-factors associated with unsuccessful cases and successful cases, respectively.

One category (the creation and management of the park) constituted an overlap of sub-factors that affected the conservation of biodiversity in National Parks positively and negatively in different contexts.

3.1. Creation and Management of the Park. Creation of a National Park involves placing a caveat on the use of a particular area often more than 100 km^2. How this is done influences how that area will be managed and how effective biodiversity conservation in that area will be. Table 3 shows the number of publication in which the sub-factors that were associated with the creation and management. Some of the factors were responsible for success in some situation and for failure in other situations.

3.1.1. Displacing Local People in Order to Establish National Parks. That the displacement of people from their traditional

Table 3: The number of publications in which the subfactors associated with the creation and management of the park were reported.

Subfactors	Number and percentage of publications reporting the factor to be responsible for success	Number and percentage of publications reporting the factor to be responsible for failure
Subfactors responsible for success and failure in different contexts		
The creation of the park led to displacement of local people from the land they occupied.	2 (1.6%)	35 (28.5%)
The local people neighbouring the park were restricted from accessing resources in the park.	20 (16.3%)	48 (39.0%)
The local people who initially obtained resources in the area were not adequately compensated for no longer accessing resources in the park.	39 (31.7%)	39 (31.7%)
Subfactors responsible only for success		
The park administration had conflict resolution mechanisms and implemented them in case of any conflict.	11 (8.9%)	0
The park's administration possessed documents for legal establishment of the park.	4 (3.3%)	0
The park's administration gave harsh punishments to people who contravened park rules.	13 (10.6%)	0
The park's administration provided education, awareness, and outreach programmes to local communities neighbouring the park.	26 (21.1%)	0
The management of the park was effected through the leadership structures of the local community.	20 (16.3%)	0
The park had a monitoring and evaluation system.	15 (12.2%)	0
Subfactors responsible only for failure		
The local people neighbouring the park were asked to pay fees to access resources in the park.	0	17 (13.8%)
The local people neighbouring the park were not consulted before the park was created.	0	58 (47.2%)
A feasibility study to account for the local context was not conducted before creating the park.	0	12 (9.8%)
The park administration did not give the promised incentives to local people in the case of community-based conservation approach.	0	5 (4.1%)
The park was created in an area with high biodiversity and not degraded.	0	10 (8.1%)
The creation of the park did not take into account the past and current human ecology of the area.	0	13 (10.6%)
There were no clear communication channels between park staff and leaders at the local and national level.	0	20 (16.3%)
The policies governing the park were not enforced.	0	12 (9.8%)
The park staff were not skilled and were paid a low salary.	0	25 (20.3%)
Previous initiatives to conserve biodiversity in the park had failed.	0	6 (4.9%)
The park had been newly created.	0	9 (7.3%)

lands led to unsuccessful conservation of biodiversity in National Parks was reported in 35 (28.5%) publications (for instance [16–18]). Displacement involves the involuntary physical removal of people from their historical or existing home as a result of actions by governments or other organisational actors. Displacement of people from their traditional lands caused a negative attitude among local residents towards the existence of the park, and negative attitudes were responsible for conflicts between local people and the park staff. A study by Kideghesho et al. [17], among communities neighbouring the Serengeti National Park, found that people who had been evicted when the park was created more strongly opposed the existence of the park than those who were not evicted. Similar findings were reported in studies by Hoole and Berkes [18] that described how Herero communities were ousted from Etosha National Park. Creation of protected areas not only causes conflicts between park managers and local people [19], but also results in killing highly prized wildlife species by local people as a way of protesting the approach [20, 21]. These case studies

suggest that the loss of biodiversity from National Parks is as a result of people feeling no longer accountable for those resources.

Although displacement of people during creation of National Parks was one of the factors affecting successful conservation of biodiversity in parks [17], in 2 publications, success of conserving biodiversity in National Parks was attributed to evicting local people who occupied the area. This indicates that in some instances, it is appropriate to evict local people from their traditional lands for biodiversity conservation especially when supported by national policy. This makes the displacement of local people in order to establish parks a debatable issue.

3.1.2. Restriction of Local People against Access to Resources in Parks. In 48 (39%) of the publications, unsuccessful conservation of biodiversity in National Parks was attributed to restricting local people neighbouring the park from accessing resources in the park. This was reported for instance in [9, 17, 22, 23]. For example, Shackleton et al. [23] attribute the failure of conserving biodiversity in three National Parks in Uganda to restricted access to park resources. Restricted access caused negative attitudes amongst local communities towards the existence of the park and resulted in some people conducting the prohibited activities illegally in the park. For instance, negative attitudes towards the protected areas in Western Serengeti correlated with restrictions over access to pasture and water for livestock [17]. Similarly, a study by Vodouhê et al. [9] found that 92% of the people (mainly farmers) who were asked about their attitudes towards the conservation of Pendjari National Park said that the decision of the park management staff to ban agricultural activities within the park boundaries generated a strong negative opinion of the park management. In the same study, 98% of people involved in livestock production commented negatively on the Pendjari National Park staff's decision to ban animal rearing within the park [9].

Although restricting local people from accessing park resources was reported as a factor that led to the failure of conserving biodiversity in parks, in 20 (16.3%) of the publications reviewed, authors attributed successful conservation of biodiversity in National Parks to restriction over resource use by constantly patrolling and physically guarding the park. A study by Bruner et al. [24] found that park effectiveness at conserving biodiversity correlated most strongly with density of guards. They found that the median density of guards in the 15 most effective parks was more than eight times higher than in the 15 least effective parks (3 guards per 100 km^2 in the 15 most effective parks compared with 0.4 guards per 100 km^2 in the least effective). However, enforcement capacity (a function of training, equipment, and salary) was not found to correlate with effectiveness, suggesting that these characteristics are less important than the presence of guards, contradicting some cases where it was reported that those factors hindered the successful conservation of biodiversity in National Parks.

This indicates that in some cases, it is necessary to restrict access to National Parks for more effective conservation of biodiversity. However, successful conservation through restricted access was supported by presence of a clearly demarcated border [24, 25]. Roe et al. [25] suggest that with the presence of a clearly demarcated border, park resources can be clearly segregated and agreed upon by users, although they note that the mobility of animals frustrates this especially under game cropping arrangements. Similarly, findings [26] in Tanzania, which linked success of biodiversity conservation with different levels of protection, found that biodiversity in strictly guarded areas was more conserved than in less guarded areas.

3.1.3. Lack of Adequate Compensation, or Failure to Take into Account the Needs, of Local People Who Initially Depended on Resources in the Area Occupied by the Park. In 39 (31.7%) of the publications, unsuccessful conservation of biodiversity was attributed to the failure of the park staff to adequately compensate local people who initially depended on resources in the area where the park was created [9, 27, 28]. This compelled local people to go against park rules and to harvest resources in the park. A study by Vodouhê et al. [9] showed that nearly 37% of the people neighbouring Pendjari National Park said that 30% of total revenues generated through hunting activities distributed to the population were insufficient to compensate for having no access to resources in the park that they initially depended on. For this reason, it was said that some people continued going into the park to harvest resources so as to meet their livelihood needs. Also a study by Holmern et al. [28] on hunting in Serengeti National Park showed that providing adjacent villages with incentives to abstain from illegal hunting indicated that the incentives given did not lead to economically sustainable activities and they made only a minor economic contribution compared to illegal hunting.

However, where the park administration took into account the needs of the community neighbouring the park, there was successful conservation of biodiversity in those parks. This was reported in 39 (31.7%) of the publications. For example, Archabald and Naughton-Treves [22] found that 22% of respondents living near three National Parks in Uganda thought that tourism revenue sharing had improved their attitudes towards conservation of biodiversity in those National Parks. Also in the same study, 53% of the respondents thought that tourism revenue sharing was more important than illegally harvesting nontimber forest products from the parks. Similarly, a study by Roe et al. [25] concluded that the value of wildlife assets greatly affects the incentives for community-based conservation and hence its chances of success. They, however, cautioned that benefits should be shared in a way that is commensurate with the varying sacrifices and contributions made or the damages incurred by the local people. Similarly, in one case study in South Africa, it was found that to be effective, benefit sharing schemes need to be seen to be transparent and accountable, with well-defined principles and practices that are understood, agreed, and accepted by all stakeholders. A study by Dudley et al. [29] in the forest surrounding Lobéké National Park among two groups of Cameroonian people (the Baka pygmies and the Bagando) concurs with these findings.

Similarly, Kremen et al. [30] attribute successful conservation of the Masoala National Park to the design considering the economic and cultural benefits of the local people. Successful conservation of wildlife and forest biodiversity conservation in Taita Kenya was also as a result of recognizing the needs of local people [31]. Various studies such as [32, 33] show that traditionally, local people in African communities depend on environmental resources directly for survival. People hunt animals, collect wild fruits, and their culture revolves around resources in the environment. A lack of this recognition was a fault on the side of conservationists who established the first protected areas in Africa. It is a greater fault on the side of current conservationists to establish protected areas without taking into account that local people depend on those resources for livelihood and survival. Conservationist must realize that the biodiversity that parks are designed to protect is a social good. More than 80% of the people in eastern and South Africa depended on the immediate forest resources for livelihood and survival [33].

People who depend on the immediate environmental resources are said to have traditional practices informed by traditional ecological knowledge that they use to conserve those resources [34]. So it should not be assumed that dependence on environmental resources automatically leads to biodiversity loss. In other words, there is a possibility that traditional communities have traditional conservation strategies which have been ignored by National Park managers. This issue has been explored further in Muhumuza et al. (in prep.). The point that is being made here is that conservation of National Parks in the current African context should not be based on knowledge, assumptions, and demographics of the 19th century.

3.1.4. Conflict Resolution Mechanism and Direct Compensation Schemes. When there are conflicts resulting from the eviction of people from their traditional lands, in some publications, it was emphasized that the park administration must put in place conflict resolution mechanisms. In 11 (8.9%) of the publications reviewed, the authors highlighted the importance of dispute resolution for conservation of biodiversity in parks. For instance, Bruner et al. [24] showed that park administrators that had conflict resolution mechanisms and implemented them when conflict arose more effectively managed conservation of biodiversity in parks than those that did not. Conflict or dispute resolution mechanisms are therefore likely to be an essential component of successful initiatives of conserving biodiversity in National Parks. Some of the conflict resolutions involve compensation for loss of property, for instance, when vermin from National Parks destroyed local people's crops. Bruner et al. [24] found that the existence of direct compensation programmes to local communities correlated significantly with management effectiveness of National Parks.

3.1.5. Possession of Legal Documents for the Establishment of Parks. In 4 (3.3%) publications reviewed, more successful conservation of biodiversity was attributed to the possession of documents for legal establishment of the park. Legal creation of the park was fundamental in effective park management and was proven to be a critical factor in deterring land use changes, particularly in areas of development frontiers [29]. Legal creation of protected areas seems to provide some immediate guarantees of protection under certain conditions. For instance, it serves as a deterrent to significant land use changes and habitat conversion even in the absence of other management actions [29]. Legal establishment of National Parks is also linked to government support because it gives government a legal mandate to have control over National Parks [25, 35–38]). Derman [36] attributed the initial success of the Communal Areas Management Program for Indigenous Resources (CAMPFIRE) program to official support of the Zimbabwean government.

3.1.6. Punishing Contraveners of Park Rules. In 13 (10.6%) of the publications, successful conservation of biodiversity in National Parks was ascribed to harsh punishments given to people who contravened park rules. Harsh punishments are a product of the probability of apprehending violators when guards detected a violation (either in progress or after the act) and a probability of the violator receiving a significant sanction if apprehended [24]. Effectiveness of the park to conserve biodiversity significantly correlated with the level of punishments of illegal activities in the park [24]. However, Bruner et al. [24] found that punishments against clearing and logging correlated with park effectiveness, whereas deterrents against hunting did not. Dudley et al. [39] in their study in Cross River National Park and Okomu National Park recommend that punishments or some aspects of the decree governing operation of protected areas may require modification to reflect contemporary developments, including possibly harsher punishments for illegal activities and conversely greater access to protected area benefits for local communities.

3.1.7. Provision of Education, Awareness, and Implementation of Outreach Programmes. In 26 (21.1%) of the publications, authors found that provision of education, awareness, and outreach programmes to local communities neighbouring the park was responsible in some cases for successful conservation of biodiversity [29, 37, 40]. A study by Ormsby and Kaplin [40] in Masoala National Park in Madagascar found that 93% of residents living near the park were aware of the existence of the park and expressed positive opinions about the park, attributing this to the education and awareness programmes that the park administration had provided. Dudley et al. [29] also ascribed success of the Sustainable Forest Management and Conservation Project in Botswana, Malawi, Mozambique, and Namibia to the provision of awareness programmes. They attributed provision of environmental education to the reduction in deforestation from 1.6% in 1997 to about 1.4% in 2004. Also the forest stocking density positively changed from 548 stems per hectare in 1998 to 793 in 2004, which is an increase of 31% [29]. Provision of awareness programmes was linked to sensitization of the community on the need for conservation. A study in Bwindi Impenetrable National Park in Uganda also confirmed that environmental education enhanced management effectiveness in the parks.

Education and awareness activities play a vital role in building support for protected areas in general and for particular management actions. Sensitization is highly significant in terms of future interventions [29].

3.1.8. Effecting Park Management through Local Structures. In 22 (17.9%) of the publications, it was reported that conservation of biodiversity was successful because the management of the park was effected through the leadership structures of the local community [9, 25, 38]. A study by Vodouhé et al. [9] found that conservation of biodiversity in Pendjari National Park was successful among other reasons because the park staff recognized a local organization made up of members of local communities who were mandated to inform park staff about each activity that local people intended to conduct in the park. Recognizing the local community organization not only reinforced local people's positive perception about the park management, but also increased the awareness of the local people about biodiversity conservation. Community institutions such as social structures, rules, processes, and arrangements are the building blocks of community organization and collective action and so have a major influence on the efficacy of biodiversity conservation [25].

3.1.9. Presence of a Participatory Monitoring and Evaluation System. Effecting conservation of the park through the existing leadership system also enhanced participatory monitoring of resource use in parks. In 15 (12.2%) of the case studies, effectiveness of conserving biodiversity in National Parks was because of the presence of a participatory monitoring and evaluation system [25, 29, 41–45]. For instance, successful conservation of Miombo woodlands was attributed to a community-based monitoring system that focuses on natural resource use and forest quality in montane evergreen forest and Miombo woodland areas which was developed and implemented in 23 villages in 2002 as part of a participatory forest management regime in Iringa district, Tanzania [45]. A study by Dudley et al. [29] suggested that a good monitoring and evaluation system is closely correlated to those protected areas where biodiversity is being best conserved. Conservation effectiveness of protected areas in Tanzania was attributed to establishing clear management and monitoring objectives in advance [41]. Stuart-Hill et al. [44] reported a detailed discussion on the success of using an "Incident Book" system as a monitoring tool for effective conservation of National Parks in Namibia.

In other publications (for instance [9, 17, 38, 46, 47]), successful conservation of biodiversity in National Parks was associated with local community members monitoring the use of resources in the park In Uganda, for instance, Uganda Wildlife Authority signed resource use agreements with local communities which included that local people participate in monitoring of resources. Fisher and Jackson [46] reported that this venture was behind the success in reducing anthropogenic pressure around Kibale National Park in Uganda. Similar findings were reported in the western part of Serengeti National Park [17, 47] and in Zimbabwe's CAMPFIRE programme. Successful conservation of National Parks was also attributed to cooperation between the local community and the park staff [9, 25, 38, 48]. Cooperation allows mutual agreements between protected area staff and the local community to be reached and compromises to be struck with regard to protected area resource use. This is important as it underscores the need for park managers to provide livelihood and employment opportunities and involvement in park governance processes, regardless of the state of any land claims that were in process or completed [48, 49]. In some National Parks where the local community had the autonomy to make rules and regulations governing access to resources in the park, success was registered [25, 49]. A case in point was in Namibia where members of the conservancy committee were democratically elected and were given the mandate of making rules and regulations to govern resource use [25]. However, in that case, the success of devolving power to local communities to make rules required culturally appropriate competence in legitimacy and accountability. Roe et al. [25] warn that representativeness and legitimacy do not always go hand in hand.

3.1.10. Asking Local People to Pay Fees to Access Resources in the Park. In 17 (13.8%) of the publications, it was reported that the local people neighbouring the park were asked to pay fees to access resources in the park. This hampered successful conservation because local people could not see the point of asking them to pay for resources that they thought belonged to them [48]. For instance, negative attitudes towards Kgalagadi Transfrontier National Park in South Africa were as a result of neighbouring indigenous groups being required to pay regular access fees to the park unless they were entering for a cultural purpose [48]. This led some local people to feel that they were being treated like tourists [48].

3.1.11. Lack of Consultation with, and Involvement of, the Local People before Establishing the Park. Lack of consultation with the local people before the park was created was reported in 58 (47.2%) of the publications (for instance, in [50, 51]) as responsible for unsuccessful conservation of biodiversity in parks. According to Mbile et al. [51], Korup National Park was created without any form of prior negotiations with any of the local people and for that reason, access to resources remained a *de facto* reality. Also Gibson and Marks [50] reported that in many National Parks in Africa, local people have been neglected in the processes of negotiations regarding the use of the resources within National Parks. This resulted in people not taking up the conservation objectives of the park. For instance, Vodouhé et al. [9] found that the former management of the Pendjari National Park in Benin did not include communities living adjacent to it and this caused local people to have a feeling of injustice and they thought that the central government had stolen their resources. This resulted in frequent conflicts between the park staff and local communities who defied the rules against accessing the park to hunt animals or to do agriculture. In some cases, due to lack of involvement of the people, local people who were expected to implement some of the project activities did not know much about some projects that the park was implementing to conserve biodiversity. For instance, a study by Wainwright and Wehrmeyer [52] about Luangwa Integrated Resource

Development Project in Zambia found that only 10% of the residents interviewed claimed to have a good understanding of the program implemented by the project in coordination with the park, despite 47.5% of respondents having known Luangwa Integrated Resource Development Project for more than three years. These studies concluded that if local people were not involved in decisions over management of resources in National Parks, then they cannot support the objectives of the park administration. This conclusion is supported by evidence from other case studies which reported that when local people neighbouring the park agreed on the objectives of conserving the park (8, 2.2%) and comanagement arrangements were arrived at through a consensus manner between the park staff and the local community (11, 3.0%), there was successful conservation in those parks. For instance, conservation was more successful when local people neighbouring the park agreed on the objectives for establishing the park [9]. Allowing local communities neighbouring the Pendjari National Park to agree on conservation objectives led to the creation of a participatory management strategy which allowed them to harvest medicinal plants and useful fruits through the authorization from the Village Associations for the Management of Wildlife Reserves (VAFMWR) [9].

In some cases, consultations with the local people led to joint formulation of policy. In Zanzibar, according to a study by Williams et al. [53], new policy and legislation were piloted through the joint formulation of hunting by-laws with each village. The by-laws set out the rules for resource control and revenue generation mechanisms to promote community management and financial viability. Joint efforts between the government agency responsible for the wildlife resource and partner villages were simultaneously made to improve the implementation of an annual closed hunting season. All these arrangements led to more effective conservation of biodiversity in National Parks. Kremen et al. [30] also reported success in Masoala National Park as a result of arriving at comanagement arrangements in a consensus manner. In South Africa, the Makuleke agreement, whereby the community gained ownership of more than 25,000 hectares of valuable conservation land in the Kruger National Park, is the result of almost three years of negotiations. The agreement came about because both key role players (the community and the South African National Parks Board) were prepared to redefine their objectives over time. The end result enhanced biodiversity conservation because 4,000 ha of new land was added to the park and an agreement reached against change of land use on the restituted portion. Also the community benefited because they were mandated to establish their own tourism lodges, with the help of commercial partners, inside the park [25].

From these examples, it appears that involving the community requires constant support of the community involved. Strong project stewardship by the local government with backing from the national government was also attributed to the success of the Sustainable Forest Management and Conservation Project in Botswana, Malawi, Mozambique, and Namibia [37]. A study on the community-based conservation project in Mahenye, Zimbabwe, suggested that even in apparently successful conservation and development projects, local participatory decision-making institutions are fragile and require continuing external support [35]. They caution against full devolution of authority to the community level without safeguards to maintain good governance and adequate capacity. Based on a study on community-based natural resource management and development in Botswana it was concluded that local communities cannot achieve the goals of sustainable development on their own, hence suggesting external support [38].

3.1.12. Establishing a Park without First Conducting a Feasibility Study. In 12 (9.8%) of the publications, unsuccessful biodiversity conservation in National Parks was ascribed to the failure of conducting a feasibility study to account for how the local context would influence the outcome of initiatives of conserving biodiversity in National Parks [50]. According to Malleson [8], among other factors for the failure to sustain biodiversity in Korup National Park in Cameroon was the failure of park managers and the staff of the Korup project (that was implemented to solve some existing problems associated with biodiversity conservation in the park) to understand the existing needs of the local people, the socioeconomic and political factors, and the complex historical processes which underpin the use of natural resources in Korup. To highlight this point, Malleson [8] points out:

> *"without a firm grasp of the ecological, sociopolitical and economic complexities of the Korup forest area, Korup project management continued to base the design and implementation of its rural development component on a number of misguided assumptions" (p. 245).*

Similarly, Gibson and Marks [50] using game theory and a case study from Zambia found that failure of initiatives to prevent hunting in National Parks in Africa was as a result of implementing these initiatives without an understanding of some of the economic, political, and social benefits of local hunting. As a result, Gibson and Marks [50] argue that community-based wildlife management schemes may succeed in protecting some of the larger mammals only by virtue of their increased enforcement levels, not their ability to distribute socioeconomic benefits to the local people.

3.1.13. Failure to Give the Promised Incentives to Local People and Failure of Local People That Received the Incentives to Change Their Behaviour. In 5 (4.1%) of the publications, failure to conserve biodiversity in National Parks especially where the park was implementing community-based conservation initiatives was attributed to not giving the promised incentives to local people that were meant to keep them from going to the park [28, 37, 50]. In that situation, local people saw no benefit in their engagement with the park administration and continued going against park rules to access resources in the park [37]. For instance, in the analysis of the effectiveness of the Sustainable Forest Management and Conservation Project in Botswana, Malawi, Mozambique, and Namibia, Kasparek [37] attributed the relatively low performance of the project in Mozambique to the project

failing to deliver the promised incentives that were meant to motivate people against charcoal burning in protected areas.

In some cases, where the incentives were given to the people, they did not cause the expected positive change amongst local people to prevent them from accessing resources in the park. This was because the differences in age, gender, and wealth of local communities neighbouring the park were not taken into account while implementing the community-based conservation approaches [8, 37, 52]. Wainwright and Wehrmeyer [52], for instance, attribute the failure of Luangwa Integrated Resource Development Project in Zambia to the exclusion of women from the project activities, and yet women play an important role in resource harvesting from National Parks. Kasparek [37] in the assessment of the effectiveness of Sustainable Forest Management and Conservation Project in Botswana, Malawi, Mozambique, and Namibia observed that natural resource management, and specifically forest management, is quite gender sensitive, an aspect that was not considered in the project. Men and women do not benefit to the same extent from forest products, and yet gender issues were not treated by the project team either as a separate output or as a cross-cutting issue [37]. Similarly, Malleson [8] attributed the failure of conserving biodiversity in the Korup National Park to the failure of the Korup project officers to realize that communities in Korup Forest area consist of socially heterogeneous groups of people. Most settlements in Korup Forest area were socially diverse, and communities consisted of a very complex mesh of different types of institutions, households, and individuals whose rights of access to land and forest resources were differentiated along the lines of political power, wealth, ethnicity, gender, and marital status [8]. Such diversity leads to a failure in consensus and in providing incentives to satisfy every member of the community.

3.1.14. Creation of the Park in an Area with High Levels of Biodiversity and Not Degraded. In 10 (8.1%) of the publications, failure to stave off biodiversity loss in protected areas was ascribed to creating the park in an area that had high biodiversity and was not degraded. Because of this, local people perceived the creation of the park as unwarranted claiming that their good practices concerning resource use had kept the area undegraded, and that is why it attracted the attention of conservationists. However, Bruner et al. [24] and Dudley et al. [29] also noted that in the communities where people were claiming that creation of the park was unwarranted, local communities kept on encroaching on park land because of lack of a buffer zone. In this case, local people (especially) those near the park claimed that they did not know where the border between their gardens and the park was [29]. This was because the biodiversity on the private land was relatively homogenous with that in the park. This means that the park needed a clear boundary.

3.1.15. Lack of Consideration of Ecological Factors in the Area Where the Park Was Created. The failure to conserve biodiversity in National Parks was also attributed to the lack of consideration of the past and current human ecology of the area before the park was created. This factor was reported in 13 (10.6%) of the publications reviewed. Mbile et al. [51] for instance argue that in Africa, human ecological interactions are important in shaping forest health. Hunters in the Korup Forest area are said to have evolved with wildlife and shaped the ecosystem there, so eliminating them from the area when the park was created meant disrupting the ecological balance [51]. Related to the human ecological factor is the size of the park. According to some studies [25, 39], if the size of the park created was small, there cannot be successful conservation of biodiversity in that park. Roe et al. [25] claimed that the manageable scale of National Parks needed to be sufficiently large to warrant collective action and revenue generation to sustain them. Dudley et al. [39] attributed the failure of National Parks in Kwazulu-Natal in South Africa to inadequate design. According to them, over half of Kwazulu-Natal protected areas were not designed to optimize biodiversity conservation, were surrounded by landscapes that did not enable effective park management, or were too small to maintain viable populations. Dudley et al. [39] made a similar observation on Kyabobo Range National Park in Ghana.

3.1.16. Lack of Clear Communication Channels between Park Staff and Leaders. Lack of clear communication channels between park staff and leaders at the local and national level was also attributed to failure of conserving biodiversity in National Parks in 20 (16.3%) of the publications. For instance, Mallya [54] found that miscommunication amongst stakeholders of the Serengeti National Park coupled with the conflicting laws and regulations from local and national leaders and park staff led to improper investment agreements that resulted in inadequate benefits from investors to local communities. Similar findings were also reported where rural district councils, the local people, and park staff debated how tourism revenue should be shared [36]. Local people wanted local communities at the village or village development committee level to benefit from wildlife management programs, yet the park staff and district councils argued for the district at large to benefit.

3.1.17. Failure to Enforce Policies Governing the Park. In 12 (9.8%) of the publications, the failure of conserving biodiversity in National Parks was ascribed to not enforcing policies governing the park. Although enforcement of policy shows one of the strongest relationships to management effectiveness, the assessment carried out by Dudley et al. [29] in various National Parks from 11 African countries showed that policies were not enforced in all the National Parks surveyed. This resulted in a number of problems such as failure to monitor illegal resource use in the park, contested ownership of park land, and other problems associated with the mismanagement of the park [29]. Based on the findings by Dudley and colleagues [29], many of the problems already presented in this paper that hindered effective conservation of biodiversity in National Parks were indirectly linked to failure to enforce policies governing the park.

3.1.18. Limited Number of Park Staff and Paying Park Staff Low Salaries. Related to limited enforcement of policies

Table 4: Subfactors associated with the local community neighbouring the park that were responsible for successful and unsuccessful conservation of biodiversity.

Subfactors	Number and percentage of publications reporting the factor
Subfactors responsible for failure	
The local people dependency on the park resources for their livelihood and survival.	21 (17.1%)
Local people lacked land, secure land tenure, and contested ownership of land in the park.	29 (23.6%)
There were economic and cultural differences and variation in expectations among community members.	27 (22.0%)
The benefits local people derived from the park did not lead to change in their behavior.	3 (2.4%)
There was corruption amongst community leaders.	13 (10.6%)
There was a cultural attachment to the park by local people.	23 (18.7%)
Subfactors responsible for success	
The local people neighbouring the park engaged in other economic activities.	15 (12.2%)
The local people neighbouring the area had secure land tenure.	4 (3.3%)

governing parks was a factor of unskilled park staff [29, 43]. A study by Dudley et al. [29] reported that many National Parks in Africa had staff that faced serious shortfalls of skills and capacity to effectively perform. In addition to limited skills, the park staff was paid low salaries. For example, a study by Archabald and Naughton-Treves [22] in three National Parks in Uganda reported that wardens in charge had revealed that park staff were not only getting a low salary but had frequently gone without pay for months. Under such circumstances, park staff found it difficult to share money accruing from tourism revenue with the community in the implementation of benefit sharing schemes.

3.1.19. Failure of Previous Conservation Initiatives. Another factor that caused failure of the conservation of biodiversity in National Parks was that previous initiatives to conserve biodiversity in a particular park had failed [25, 40, 55]. This factor was reported in 6 (4.9%) of the publications reviewed. Ormsby and Kaplin [40] found that in Masoala National Park in Madagascar inconsistency in past and present park management goals led to confusion among the community regarding the park programme. The community was aware of the existence of the park but was unfamiliar with its goals. Ormsby and Kaplin [40] also reported that the park staff had raised high and unrealistic expectations among some communities which were not met. Similar findings are reported in a study that investigated the attitude of communities adjacent to the Chobe National Park in Botswana and the South Luangwa National Park in Zambia [55]. After two decades of implementing the programme, there appeared to be confusion among communities regarding community-based natural resource management. They also attributed this to unfulfilled expectations and frustrations [55]. These factors highlight inadequacies in implementation with regard to outreach and inclusion of local people in conservation programmes.

3.2. Whether the Park Was Old or Was Newly Created. Failure to conserve biodiversity was also associated with how long ago the park was created. Conservation of biodiversity was more unsuccessful in newly created parks than parks that were established long ago [17, 29, 37]. This factor was reported in 9 (7.3%) of the publications. For instance, in a study by Dudley et al. [29] about the Sustainable Forest Management and Conservation Project in Botswana, Malawi, Mozambique, and Namibia, it was reported that older protected areas tended to score slightly higher in successful conservation than newer ones.

The reason why old National Parks were found to be more successful than newly created parks could be associated with the difference in support that the two categories of park receive from the community. Kideghesho et al. [17] observed disparity of support between old and new parks and interpreted that disparity is to mean that the young generation were less likely to oppose a park that was created when they were not yet born (citing Serengeti National Park created in 1951) than protected areas, that were created in early 2000 (citing Ikorongo, Grumeti and Kijereshi National Parks).

3.3. The Local Community Neighbouring the Park. There were various subfactors associated with the local community neighbouring National Parks that influenced the conservation of biodiversity in those parks (Table 4).

3.3.1. Dependence on Park Resources for Livelihood and Survival by Local People. In 21 (17.1%) of the publications reviewed, it was reported that the dependence of local people on National Park resources for their livelihood and survival affected biodiversity conservation in those parks [8, 56]. Dependence on the park resources meant that people had access to the resources in the park. For instance, failure to sustain biodiversity in Korup National Park was partly as a result of local people neighbouring the park obtaining a wide range of livelihood opportunities upon which communities in the densely populated areas surrounding the park relied in varying degrees, to make a living [8].

3.3.2. Lack of Land, Lack of Secure Land Tenure, and Contested Ownership of Land in the Park. Connected to the factor of dependence on park resources by local people for livelihood and survival by the local people was a factor of lack of land and secure land tenure. For example, in the case of Korup National Park, the local people neighbouring the park had little and others no land for other activities and as a consequence were compelled to harvest park resources. This also explains why in 14 (11.4%) of the publications, it was reported that local people contested the ownership of the park because they wanted to have access to resources therein due to lack of land.

3.3.3. Economic and Cultural Differences and Variation in Expectations among Community Members. In 13 (10.6%) of the case studies, economic and cultural differences among community members curtailed successful conservation of biodiversity in parks. In a study in the Korup National Park, Malleson [8] reported that wealthy, self-interested and politically powerful individuals were in a strong position to take control of the exploitation of the most profitable forest-related enterprises, such as timber exploitation, ivory, and game meat trades, and to acquire prime land for agricultural production usually associated with community-based conservation programmes. The majority who were poor could not engage in such enterprise and hence did not feel that they were benefiting from the park. These imbalances made it difficult for marginalised and politically weak communities on the forest edge to contest the appropriation of forest resources by politically powerful elites from the same area or by conservation projects. Cultural differences among community members also led to failure of conserving biodiversity in National Parks because initiatives such as benefit sharing were not satisfactory to all members of different cultural backgrounds in the community. Vodouhê et al. [9] found that people who perceived that they benefited from the Pendjari National Park were from tribes whose traditional activities like hunting were associated with the park contrary to those who lived far away from the park whose economic activities were not linked to the park resources. A study by Shackleton et al. [23] also reported similar findings. This indicates that people who benefit and are aware of how they benefit from parks are more likely to support the conservation of parks than those who do not or are not aware of how they benefit.

Other than the economic and cultural differences, there was variation in expectations among different community members for the benefits from the park that led to failure in conserving biodiversity in National Parks. This was reported in 22 (3.4%) of the case studies reviewed. For instance, a study by Archabald and Naughton-Treves [22] in three National Parks in Uganda found that there were numerous stakeholders with differing priorities on how to put tourism revenue to use. For example, some respondents including implementers and beneficiaries at all levels argued that individuals who suffered direct costs from conservation, such as eviction from park land or high levels of crop raiding should receive a larger share of revenue-sharing benefits.

3.3.4. Inability of Local Communities to Appreciate Incentive Obtained by Supporting Conservation of the Park. Other than variation in expectations of various individuals, the benefits local people derived from the park did not lead to change in their behavior, and hence they continued to unsustainably utilize resources from National Parks. This factor was reported in 3 (2.4%) of the publications reviewed. Malleson [8], for instance, attributes the failure of the Korup project to conserve biodiversity in Korup National Park to a lack of linking conservation goals and the introduction of new alternative income-generating activities. Some people obtained incentives from community-based conservation schemes and continued illegal use of park resources. Malleson [8] cited an example of a participant in her study who was employed by the Korup project on a part-time basis but which did not make him feel that his employment was an adequate incentive to stop him from hunting in his spare time in the Korup National Park. This means that people weighed the incentives obtained from community-based initiatives and the costs they incurred by giving up their activities in protected areas. This indicates that local people did not appreciate the incentives they obtained in order to support conservation of biodiversity in National Parks.

3.3.5. Corruption among Community Leaders. Corruption among community leaders was another factor that indirectly resulted in failure to conserve biodiversity in the park. This factor was reported in 13 (10.6%) of the publications reviewed. For example, a study by Archabald and Naughton-Treves [22] found that in one parish bordering Bwindi National Park, a local council chairman was corrupt which limited the success of a tourism revenue scheme because he had embezzled the tourism revenue sharing funds. Similarly, in Mgahinga, a community neighbouring Mgahinga National Park, one community refused to contribute to their project because they thought that the local representative to the park protection committee was corrupt. These studies are indicative of the problem of corruption that could hinder successful conservation of biodiversity in National Parks.

3.3.6. Strong Cultural Association of the Local People with the Park. Although some case studies such as [9] reported that tribes whose traditional activities were linked to National Parks were more positive about conservation of the park; in 23 (18.7%) of the publications, authors reported contradictory findings. For instance, Mbile et al. [51] found that cultural attachment to the park by local people was also a strong hindrance to effective conservation of biodiversity. Mbile and colleagues [51] found that because some villagers were more culturally and historically attached to some or all the area in the National Park, they felt more obliged to use resources in a culturally appropriate manner regardless of whether that manner was proconservation or counter-conservation.

3.3.7. The Local People Neighbouring the Park Engaged in Other Economic Activities. However, in 15 (12.2%) of the publications reviewed, it was reported that there was successful conservation of biodiversity in National Parks where

Table 5: Subfactors associated with the characteristics of the area where the park was located.

Subfactors	Number and percentage publications
Subfactors responsible for failure	
The park was located in an area of high human population density.	23 (18.7%)
The park was located in an area that was politically unstable.	5 (4.1%)
Subfactor responsible for success	
The park was located in a remote area with low human density.	35 (28.5%)

the local people neighbouring the park engaged in other economic activities. Availability of alternative sources of income is essential in relieving anthropogenic pressure on forest resources. However, Kasparek [37] suggests that this should not be taken for granted because livelihoods vary and their influence in motivating people to conserve resources in the park has to be tested in practice.

3.3.8. The Local People Neighbouring the Area Had Secure Land Tenure. In 4 (3.3%) of the publications, it was reported that in communities neighbouring parks where local people had secure land tenure and land for agriculture, there was successful conservation of biodiversity in those parks. For instance, Roe et al. [25] found that lack of arable land in rural areas in Africa compels local people to access land in National Parks.

3.4. Characteristics of the Area Where the Park Was Located. Three factors associated with the characteristics of the area where the park was located were reported to be responsible for successful and unsuccessful conservation of biodiversity in National Parks (Table 5).

3.4.1. Location of the Park in an Area of High Human Population Density. According to some studies reported in 23 (14.1%), it was difficult to conserve biodiversity in parks that were located in an area of high human population density [16, 57, 58]. For instance, increase in human populations along the western boundary of the Serengeti ecosystem led to negative consequences for wildlife populations [57]. Similarly, rapid population growth in Kenya led to conversion of "wildlands" to agricultural lands [57, 58]. Also, a study by Kiringe et al. [16] found that people living in villages located in National Parks put pressure on park resources.

3.4.2. Location of the Park in a Politically Unstable Area. In 5 (3.1%) of the publications, unsuccessful conservation of biodiversity was reported to be as a result of the parks being located in a politically unstable area. For example, Hamilton et al. [59] found that Uganda Wildlife Authority faced challenges of conserving biodiversity in Bwindi National Park in the late 1990s, because of rebel activities that were taking place in the park. Political instability in National Parks was reported to have affected successful biodiversity because no patrols were conducted in the park to check illegal activities and also few tourists visited the park. In the absence of park patrols, local people would sneak into the park and illegally extract resources unnoticed [59]. Tourism is a main source of revenue in many National Parks in Africa [60]. According to Hamilton et al. [59], low tourist numbers visiting Bwindi National Park during the time of political instability in the area resulted in low revenue generation which affected the management of the park.

3.4.3. Remoteness of the Area Where the Park Was Located. Other studies attributed the success of conserving biodiversity in National Parks to the fact that those parks were located in remote areas. This factor was reported in 13 (10.6%) of the publications reviewed. Characteristics of a remote area described by Hockings [61] included lack of infrastructure such as roads and limited provision of services such as medical and education services. In remote areas, people were said to be more subsistence than commercial in practice. Their subsistence practices enabled them to live in balance with the environment.

Remote areas were also characterized by low human population density, a factor that 22 case studies attributed to successful conservation of biodiversity in National Parks. Due to limited infrastructure and provision of services, people were not often attracted to remote areas; hence, the number of people remains low. Also, in such areas due to limited provision of services, the mortality could have been higher than in towns where life support services were more available.

People are often attracted to places where they think they can conduct economic activities and develop or get better services. For instance, Hockings [61] found that conservation of biodiversity was more successful in National Parks located in areas of low agricultural potential. This meant that people would not be attracted to settle in areas where the soil is infertile. Hockings [61] suggests that it should not be taken for granted that people in remote areas have conservation practices; it is just that National Parks remain secure by virtue of their remoteness, a situation that is likely to change as infrastructural development and high population densities set in.

3.5. The National Policy Governing the Park. Two factors (political interference and lack of national policies to support management decisions of the park) were associated with national policy that affected the conservation of biodiversity in National Parks.

3.5.1. Political Interference. In 8 (6.5%) of the publications, authors attributed failure to sustain biodiversity in National Parks to political interference in the management of the park. For example, Kasparek [37] in a study assessing the effectiveness of a Sustainable Forest Management and Conservation Project that was implemented in four African countries (in Botswana, Malawi, Mozambique, and Namibia) reported that in Malawi, the effectiveness was limited by political interference in the project activities. Funds given to

local people as an incentive for alternative livelihoods were suspended for that reason. Also in some cases (for instance, in Uganda), government officials were reported to have allowed local communities to access park resources in exchange for votes.

3.5.2. Lack of National Policies to Support Management Decisions of the Park. In 26 (21.1%) of the publications, lack of national policies to support the management decisions of the park staff was reported to be responsible for unsuccessful conservation of biodiversity. According to Malleson [8] in the absence of national policies, local people challenged the actions of the park staff. For example, in Cameroon, the Korup Project team worked with six villages around the Korup National Park to establish natural resource management committees to facilitate effective conservation of the park; however, these committees are not legally recognized under Cameroon's new forest law [8]. Such a situation had earlier been reported by Williams et al. [53] pointing out that policy constraints and bureaucracy resulted in some by-laws agreed upon amongst local people and park staff to remain unapproved and therefore impossible to implement. In Uganda, a study by Archabald and Naughton-Treves [22] showed that unclear revenue sharing policy and institutional support resulted in some park wardens using preservation approaches in parks where they were supposed to implement community-based initiatives. Also, Mallya [54] in a study conducted in Serengeti National Park reported that due to conflicting laws and regulations, there were investment agreements that resulted in inadequate benefits given to local communities.

3.6. The Financial Resource Base of the Park. The financial resource base of the park was also found to be responsible for the success or failure of conserving biodiversity in National Parks.

In 16 (13%) of the publications, authors reported that failure to conserve biodiversity in National Parks was as a result of lack of finances by the administration of the park to implement its management plan. In 20 (13%) of the publications, the lack of finances in National Parks was associated with lack of reliable sources of funding. In South Africa, the effective management of parks was partly curtailed by unreliable sources of funding [39]. A similar scenario was reported in Nini Suhien National Park in Ghana [39]. These were affected by low fees collected from tourism. The major source of income in many National Parks in Africa is tourism, an activity that is seasonal [39].

Lack of finances hindered the conduct of research to inform policy and management decisions [22], the development of park infrastructure [62], the acquisition of equipment [62], the training of staff and the employment of skilled personnel [42, 58], and the monitoring and evaluation programmes [42, 63]. In a study by Archabald and Naughton-Treves [22] in three National Parks in Uganda, senior level park staff are said to have expressed concern that the amount of income generated in each park was inadequate to cover basic costs. This resulted in local people not getting incentives, suspension of park patrols, delayed and low salary payment of park staff, and failure to implement compensation schemes [22].

Also in a study by Ervin [42], major staffing weaknesses across four protected area systems that were studied were linked to lack of sufficient finances. The levels of investment in protected area management were below what is required to pay the recurring costs to effectively conserve the biodiversity contained within protected area systems. Similar findings were reported by Wilkie et al. [58]:

> *"expanding the present system by creation of additional protected areas without commensurate increases in funding for management will merely establish "paper parks" and will fail to improve the level of biodiversity conservation in the region" (p.703).*

Wilkie et al. [58] claimed that on average, African nations spend 0.19% of their national budgets on protected area management and concluded that if governments of those nations continue to underfinance protected areas then most, if not all, protected areas will continue to exhibit reductions in the biomass of individual species and risk the extirpation or extinction of large, slow reproducing species, and rare endemics.

How lack of finances affected infrastructural development was explored in more detail by Dudley et al. [39] and Malleson [8]. For instance, in Korup National Park, limited revenue generated by park admission fees from tourists visiting the park went to the central government coffers and little or no finances were left for infrastructural development of the park [8]. A study by Dudley et al. [39] also found that in South Africa nearly 70 percent of field staff working in National Parks felt that equipment to facilitate them in their work was inadequate and hence prevented them from effective monitoring and managing of parks.

In 2 (1.6%) of the publications, authors reported that successful conservation of biodiversity in National Parks occurred because local councils and the community mobilized funds for the conservation of biodiversity in parks. For example, in a study by Kasparek [37] that evaluated the Sustainable Forest Management and Conservation Project in Botswana, Malawi, Mozambique, and Namibia, it was reported that local people mobilized funds from fees generated from licensing, fines, and sales of trees and poles from the park and contributed to the Community Development Fund. These funds sustained the community-based biodiversity conservation projects, and hence more successful conservation of biodiversity occurred.

However, it is imperative to note that availability of funds does not guarantee that the issues pointed out will be addressed or that biodiversity conservation will be better. As some of the cases in this review have shown, corruption amongst community members and park staff may hinder biodiversity conservation funds from being utilized appropriately. For instance, at the time of writing this paper (in July 2011), the board of directors and the executive director of Uganda Wildlife Authority (responsible for all the protected areas in Uganda) and the executive director of Uganda National Forest Authority (responsible for all forests

in Uganda) had been suspended for misappropriating funds and corruption-related cases. Funds to a tune of 800,000 USD meant for the USAID funded programme called Protected Areas Management for Sustainable Use had been misused by Uganda Wildlife Authority officials [64]. Similarly, the Uganda National Forest officials misused funds from timber harvesting [65]. Such cases are indicative that even when finances are available, they may not be used to conserve biodiversity.

4. Discussion

There are three points of view and perceptions that emerge from this review. These perceptions and points of view are associated with three factors; displacement of people in order to establish National Parks, provision of "poor" people with economic incentives with an assumption that they will not illegally extract park resources, and high human population density as a driver of biodiversity loss.

A synthesis of the results of this review has been structured around these factors because they dominate the literature on conservation. Firstly, various conservationists believe (as this review has shown) that the interaction of humans with natural resources is a threat to biodiversity. They perceive "genuine nature" to be devoid of humans and this forms a foundation for the idea of displacing people in order to establish National Parks. In this section, differing points of view about the benefits associated with not displacing people in order to establish National Parks is presented.

Secondly, in contemporary conservation practice, it is assumed that poor people mostly depend on natural resources and hence are responsible for biodiversity loss and environmental degradation. For instance, in the community-conservation approach, poor people are often targeted so that when they are given economic incentives, they can develop and hence reduce pressure on natural resources. Contrary to this perception, in some cases, the rich are actually more responsible for biodiversity loss from National Parks than the poor.

Thirdly, this review has shown that high human population density is one of the main factors underlying biodiversity loss. In this section, it is shown that this factor has often been ignored or not properly taken into consideration in implementing biodiversity conservation strategies. Different human population scenarios in the context of biodiversity conservation are presented and recommendations made on how to deal with them in the current milieu especially in National Parks in Africa.

The next subsection delves into these three issues.

4.1. Arguments against Displacement of Local People in Order to Establish National Parks. Various authors have advocated against the creation of parks by displacing people. Agrawal and Redford [34] argue that empirical studies that establish the relationship between the displacement of humans from protected areas and the marginal gain that such displacement confers on biodiversity conservation are lacking.

In a critical review using a case study of three National Parks (Serengeti National Park, Mkomazi Game Reserve, and Arusha National Park), Nelson [66] claims that the creation of the first National Parks in Africa was at a time when wildlife populations were recovering from a population decline that had occurred a decade earlier caused by diseases (Rinderpest plague) introduced by immigrants from Europe. At that time, Africa was flourishing with wildlife and vegetation, and European colonialists quickly set aside those areas as protected areas thinking that they were of no use to the indigenous people whose population was also still recovering having declined because of small pox [67]. These arguments suggest that strict preservation may not be an effective strategy of conserving biodiversity even when there is no anthropogenic threat.

Although in this study the negative consequences to biodiversity conservation due to displacement of people when creating National Parks and restricting them from accessing resources those parks were social, Ghimire and Pimbert [68] provide an ecological explanation against such approaches of biodiversity conservation. The authors argue that purely protected areas such as strictly preserved National Parks are not good for sustaining biodiversity because they reduce the functionality of the ecosystem due to restricted interaction. Ghimire and Pimbert [68] claim that in remote parts of Africa indigenous humans are part of the forests and they coevolved with wildlife. Therefore, removing them from forests and creating National Parks destabilizes the functioning of the ecosystem. Wild and Mutebi [69] in earlier studies had expressed a similar point of view. With the disappearance of the forest elephants, they argue that some pit sawing could be beneficial to the gorillas by opening up the forest and providing the luxuriant vegetation they need for food. Creation of National Parks that exclude humans could thus lead to change in the behaviour of the wild animals. Given that the population of megafauna in most African forests has reduced, contrary to what most people think, human activities in forests could be critical in ensuring forest health [69].

Hutton and Dickson [70] use evidence from bush meat trade in Central Africa to link ecology and economics of protected areas and resources therein. They argue that while many conservationists conventionally think that either consumptive use of National Park resources must be stopped or heavily regulated, commercial use of wildlife is not in itself incompatible with conservation. They exemplify that elephants do not magically maintain static numbers and that, unless controlled hunting carefully regulates their numbers, they increase and ultimately are responsible in confined conditions for destroying their own environment and drive some plant species to extinction. Between 1992 and 1993 during a drought in Zimbabwe, it was difficult to distinguish the wasteland in parks caused by elephants from the wasteland outside caused by people and cattle confined in a small area.

In a situation where animal populations increase in number and exceed sustainable levels to the detriment of their habitats, some conservationists recommend culling game or cropping animals. This issue has often caused a lot of heated debate; for instance, the suggestion to cull elephants in Kruger National Park to control their numbers caused a lot of debate amongst the public and conservationists [71, 72]. The debate

turned political and economic and the proposal for culling was suspended. It is necessary to first have thorough research conducted to inform any ecological decisions that are to be taken. Each case has its unique characteristics that must be taken into account.

Another ecological point of view against strict preservation of National Parks is that strict protection of National Parks isolates them from their surroundings. Isolation of protected areas is said to result in serious threats to the long-term viability of many wildlife populations and migrations in Africa [73]. Ecologists have debated the impact of isolation on wildlife populations in parks. The primary drivers of isolation of protected areas are habitat loss. Naughton-Treves et al. [74] conducted a study in 49 tropical protected areas which showed that deforestation within park boundaries and surrounding areas was isolating those areas. Deforestation for instance restricts the movement of wildlife into and out of protected areas. To address that problem, a multipronged conservation strategy is often recommended that involves creating corridors for wildlife connecting different protected areas [73]. Mountain and lowland gorillas survived in a region of political instability because Bwindi National Park was connected to Ituri forest, forests in the Rwenzori Mountains and Virunga in Democratic Republic of Congo [59]. Although this is commendable, it may not be feasible in many National Parks in Africa given the current settlement patterns in most areas in Africa.

In addition, protected areas face many ecological risks both natural and human created. An example is when the entire remaining protected habitat of the golden lion tamarin (*Leontopithecus rosalia*) was almost wiped out by fire in 1992 (Castro, 1995 in 75). Shaffer [75] presents four broad categories of natural risks that isolated protected areas face. These include ecological uncertainty (resulting from random events in the survival and reproduction of individuals), environmental uncertainty (due to random, or at least unpredictable, changes in weather, food supply, and the populations of competitors, predators, and parasites and natural catastrophes such as floods, fires, or droughts, which may occur at random intervals, and genetic uncertainty or random changes in genetic make-up due to genetic drift or inbreeding that alter the survival and reproductive probabilities of individuals.

A consideration of these ecological factors and social factors is identified as being important in this study for effective biodiversity conservation when creating and managing National Parks.

4.2. Pitfalls of Providing Local People with Economic Incentives as a Strategy for Biodiversity Conservation in National Parks. Although some case studies in this review underscored the need for community involvement in the management of parks in Africa and commend community-based conservation initiatives, it is argued that simply involving them is not enough to solve problems that face National Parks. Similarly involving people or giving them incentives as is usually done in community-based conservation projects does not automatically lead to good conservation practices as the findings of this review have shown.

Various people may be motivated to protect the environment for different reasons [76]. Similarly, people may be motivated to conserve biodiversity in National Parks for different reasons. Integrated conservation and development projects are good examples to use to illustrate this point because according to Mogaka et al. [77], they are among the most common projects implemented among local communities neighbouring National Parks in Africa. A common assumption in integrated conservation and development projects is that if local people develop (i.e., acquire better income alternatives), they will be prompted to access park resources less. This may not always be the case; it depends on human social factors.

According to Alpert [78], development may increase consumerism, make people less reliant on the immediate natural resources and hence less sensitive to local resources, and weakens some cultural institutions that are tailored to management of natural resources in a traditional way. For example, it is common in integrated conservation and development projects to give a certain amount of money or a certain percentage of the revenue (usually ranging between 20% and 30%) to local people neighbouring a park for infrastructural development such as construction of roads. Such a venture may actually lead to more unsustainable use of resources from the park. A study by Barrett and Arcese [79] revealed that improvement in roads and transport facilities enabled markets that trade in resources acquired illegally from protected areas to thrive.

These studies explain findings of this review that even when local people were given incentives, that on its own did not change their behaviour. Therefore, provision of services and incentives to the rural poor in order to encourage them to change their behaviour so that they can conserve resources might be a wrong assumption. Adams and Hutton [80] suggest that development and conservation of biodiversity are two distinct objectives which need to be looked at differently in different contexts. For instance, rural development that is often espoused to be associated with conservation in integrated and conservation development projects could depend on conservation in the long term but not in the short term. Noss [81] projected that rural development that is based on conservation cannot be attained in less than fifty years. Fifty years far exceeds the average life span of most rural inhabitants in Africa. The ten countries with the lowest life expectancies are from Sub-Saharan Africa. The life expectancy of people in most African countries ranged between 25.9 years and 49.9 years [82].

Although sustainable development relies on ecosystem services such as nutrient cycling, preservation of water supplies, and enhancement of soil formation [78] such things might not matter, to poor rural farmers in remote areas of Africa in a situation where they struggle to attain basic needs. However, this does not mean that the affluent are more likely to exhibit proconservation behaviour. Although, a study by Newmark and Hough [83] in Uganda, South Africa and Tanzania reported that well-off individuals tended to be more pro-conservation than poor individuals, it is argued that even when individuals have attained a certain level of development or amassed a certain amount of wealth, it not a guarantee that

they will conserve biodiversity. Africa is currently operates with a capitalistic economy, and many people are becoming materialistic and striving to attain exceptional levels of development. For example, in Tanzania, a study focusing on utilitarian perception of resources in protected areas by local people living outside Katavi National Park [84] found that people from well-off households were often the ones who resented the "conservation and development" concept because the development of other individuals interfered with their small scale business enterprises. In addition, evidence provided by Marcus [85] from his evaluation of four Integrated Conservation and Development projects in Madagascar suggests that there is no guarantee that people of high social economic status have a more positive perception of protected areas than the poor people. It is only in some circumstances that wealthier people suffer less as a result of reduced access to natural resources and as a consequence are not often seen to conflict with protected area managers. These socioeconomic issues need to be taken into account in the management of National Parks.

4.3. Human Population Density, Ecological Dynamics of Africa, and Establishment of National Parks: Past and Present Scenarios. Trends of human population increase show that at the time the first National Parks were created in Africa, the numbers of people were ecologically limited. Given diseases, and hostile environments, there was a low human population depending on a huge amount of resources in a vast environment (suggesting a low human population density). Statistics show that at the beginning of 1900 when the first protected areas were created in Africa, the human population was approximately 13.3 million people but currently, the population is 92.3 million people. Before the beginning of the 20th century, the human population was low, people in Africa were not yet materialistic and their way of life was still controlled by ecology. Therefore, in that case, resource availability far exceeded resource use and for these reasons, there were no reports of environmental degradation. Establishing protected areas at that time could have been easy given that it involved little social and economic cost [86]. This was also reflected in the results of this review that protected areas located in areas with a low human population density were more successful at conserving biodiversity than those located in areas with high human population densities.

The factor of human population needs to be taken into account in the current process of creating and managing protected areas. This is because, presently, Africa is the second most populated continent [87], with high female fertility rates [88] and with a high rate of population growth [87]. The human population factor affects biodiversity conservation in various ways. Firstly, high human population limits the enactment of by-laws. A study by Nkonya et al. [89] that aimed at assessing compliance to natural resource by-laws in Uganda reported that initial increase in population density reduces the likelihood of enacting by-laws. Enactment and compliance to natural resource management policies were more effective in areas where the population density was below 1000 people/km^2 [89] indicating a strong influence of human population to compliance to resource use policies. Secondly, high human population densities necessitate that people will be displaced when creating protected areas. This often results in limited access to land for agriculture and confining them into smaller areas. This has various implications; one implication is that people will degrade the smaller area where they are confined and indiscriminately harvest the resources therein (such as in Bwindi National Park in Uganda). The second implication is that people may increase pressure, demanding access to the resources in the National Parks, and illegally access the park resources. For instance, Semuliki National Park is located in a remote area and was created when the population of the surrounding area was relatively low but faces similar problems associated with demand for access to resources by local people as the case is in other National Parks such as the Rwenzori Mountains National Park in Uganda, Lake Nakuru National Park in Kenya, and Chobe National Park in Botswana. These two implications lead to unsustainable utilization of biodiversity in and outside National Parks. The third implication is that the establishment of the National Parks builds social tensions amongst local communities over resource use because they are not able to develop at the same pace as other regions where National Parks have not been created [90]. Some authors claim that social tensions and desperation to attain higher levels of development lead to migration of local people to cities in search of a "better life" [91]. This point also confirms that people in Africa are becoming materialistic; unlike in the past, they no longer need just to survive but desire to attain higher standards of living. This has an implication for conservation of biodiversity in National Parks because according to Averbeck [92], after failing to attain wealth from cities, out of desperation, they return to the rural areas to forcefully access and extract resources from protected areas.

Allowing restricted access to park resources where National Parks are surrounded by high population densities may also lead to the harvest of resources in an uncontrolled manner. In such a case, strict preservation may be the solution in the short term. As shown in the results of this review, in some cases, conservation of biodiversity was more successful in protected areas where local people were evicted from the area, denied access to the parks and measures to constantly patrol, and guard the area put in place. This suggests that a balance between strict preservation and community-based conservation should be considered as the situation dictates. In Kenya, there was indiscriminate harvesting of resources, which led to 44% percent loss in wildlife between 1977 and 1995, and that when part of the area was gazetted into a National Park, wildlife loss reduced to 31% in protected areas but the loss in unprotected area increased to 48% [93]. This indicates that creation of protected areas can reduce species loss in areas where there was previous indiscriminate harvesting. This concurs with the research in Bwindi National Park [94]. Increase in human populations along the western boundaries of the Serengeti ecosystem has led to negative consequences within the protected area on wildlife populations, as indicated by trends in the buffalo population [57]. These suggestions concur with studies which suggest that where some demographic characteristics dictate, National Parks should be protected strictly [95, 96]. However, this

does not mean that those areas should be strictly protected indefinitely. The results of this review suggest that both strict preservation and community-based conservation approaches are useful depending on the demographic situation of the National Park. The demographic factors of the areas also need to be placed in the past and current ecological context of the area.

5. Conclusion

The aim of this paper was to review the existing literature on conservation of biodiversity in National Parks in Africa and identify factors that affect the success of biodiversity conservation. The review has found that biodiversity conservation in National Parks is affected by various factors associated with the creation and management of the park, the local community neighbouring the park, the area where the park is located, the national policy governing the park, and the financial resource base of the park. These factors are socioeconomic and cultural in nature involving the management of local communities that neighbour National Parks as much as the resources in parks. This indicates that future strategies of conserving biodiversity in parks should focus as much on the socio-economic human dimension of biodiversity conservation as the scientific study of species and habitats in National Parks.

Limited attention to the socioeconomic and related aspects of culture had previously been blamed for failure of community-based conservation approaches [97, 98]. Studies on the social dimension of biodiversity conservation and how various socio-economic and cultural factors affect park resource use and biodiversity conservation in various contexts are recommended.

As this investigation has shown, factors that affect biodiversity were not uniform across all successful or unsuccessful case studies. In each case study, there were specific underlying causes that influenced each of the identified factors. Future studies that investigate how and why local people neighbouring National Parks interact with resources therein ought to be integrative in nature to include the psychological, socioeconomic, and cultural factors and not only emphasize the economic aspects as is often done in Integrated Conservation and Development Programmes and Projects [99] or the traditional ecological knowledge as is done in studies that link local people's culture and biodiversity conservation [100, 101].

This investigation has also revealed that biodiversity in National Parks depends on the relations between local people and park staff. This necessitates training park staff in community social relations and development in addition to scientific managing of plant and animal species and their habitats.

References

[1] S. Chape, S. Blyth, L. Fish, P. Fox, and M. Spalding, *The 2003 United Nations List of Protected Areas*, IUCN and UNEP-WCMC, Cambridge, UK, 2003.

[2] M. Colchester, "Salvaging nature: indigenous peoples, protected areas and biodiversity conservation," in *World Rainforest Movement*, International Secretariat, Maldonado, Uruguay, 2nd edition, 2003.

[3] W. Adams, *Against Extinction: The Story of Conservation*, Earthscan, London, UK, 2004.

[4] S. Stolton, S. Mansourian, and N. Dudley, *Valuing Protected Areas*, The International Bank for Reconstruction and Development, Washington, DC, USA, 2010.

[5] R. A. Schroeder, "Geographies of environmental intervention in Africa," *Progress in Human Geography*, vol. 23, no. 3, pp. 359–378, 1999.

[6] K. A. Galvin, P. K. Thornton, J. R. de Pinho, J. Sunderland, and R. B. Boone, "Integrated modeling and its potential for resolving conflicts between conservation and people in the rangelands of East Africa," *Human Ecology*, vol. 34, no. 2, pp. 155–183, 2006.

[7] D. M. Tumusiime, P. Vedeld, and W. Gombya-Ssembajjwe, "Breaking the law? Illegal livelihoods from a Protected Area in Uganda," *Forest Policy and Economics*, vol. 13, no. 4, pp. 273–283, 2011.

[8] R. C. Malleson, *Forest livelihoods in southwest province, Cameroon: an evaluation of the Korup experience [doctoral thesis]*, University College London, 2000.

[9] F. G. Vodouhê, O. Coulibaly, A. Adégbidi, and B. Sinsin, "Community perception of biodiversity conservation within protected areas in Benin," *Forest Policy and Economics*, vol. 12, no. 7, pp. 505–512, 2010.

[10] S. H. M. Butchart, M. Walpole, B. Collen et al., "Global biodiversity: indicators of recent declines," *Science*, vol. 328, no. 5982, pp. 1164–1168, 2010.

[11] Secretariat of the Convention on Biological Diversity, *Global Biodiversity Outlook 3*, Secretariat of the Convention on Biological Diversity, Montréal, Canada, 2010.

[12] M. R. W. Rands, W. M. Adams, L. Bennun et al., "Biodiversity conservation: challenges beyond 2010," *Science*, vol. 329, no. 5997, pp. 1298–1303, 2010.

[13] J. A. P. de Oliveira, "Implementing environmental policies in developing countries through decentralization: The case of protected areas in Bahia, Brazil," *World Development*, vol. 30, no. 10, pp. 1713–1736, 2002.

[14] J. J. Randolph, "A guide to writing the dissertation literature review," *Practical Assessment, Research & Evaluation*, vol. 14, no. 13, pp. 1–13, 2009.

[15] J. Fereday and E. Muir-Cochrane, "Demonstrating rigor using thematic analysis: a hybrid approach of inductive and deductive coding and theme development," *International Journal of Qualitative Methods*, vol. 5, no. 1, pp. 1–11, 2006.

[16] J. W. Kiringe, M. M. Okello, and S. W. Ekajul, "Managers' perceptions of threats to the protected areas of Kenya: prioritization for effective management," *Oryx*, vol. 41, no. 3, pp. 314–321, 2007.

[17] J. R. Kideghesho, E. Røskaft, and B. P. Kaltenborn, "Factors influencing conservation attitudes of local people in Western Serengeti, Tanzania," *Biodiversity and Conservation*, vol. 16, no. 7, pp. 2213–2230, 2007.

[18] A. Hoole and F. Berkes, "Breaking down fences: recoupling social-ecological systems for biodiversity conservation in Namibia," *Geoforum*, vol. 41, no. 2, pp. 304–317, 2010.

[19] N. Salafsky, H. Cauley, G. Balachander et al., "A systematic test of an enterprise strategy for community-based biodiversity conservation," *Conservation Biology*, vol. 15, no. 6, pp. 1585–1595, 2001.

[20] D. Lewis, G. B. Kaweche, and A. Mwenya, "Wildlife conservation outside protected areas&lessons from an experiment in Zambia," *Conservation Biology*, vol. 4, no. 2, pp. 171–180, 1990.

[21] R. A. Mugisha, *Evaluation of community-based conservation approaches: management of protected areas in Uganda [Ph.D. thesis]*, University of Florida, 2002.

[22] K. Archabald and L. Naughton-Treves, "Tourism revenue-sharing around national parks in Western Uganda: early efforts to identify and reward local communities," *Environmental Conservation*, vol. 28, no. 2, pp. 135–149, 2001.

[23] S. Shackleton, B. Campbell, E. Wollenberg, and D. Edmunds, *Devolution and Community-Based Natural Resource Management: Creating Space for Local People to Participate and Benefit*, Natural Resource Perspectives. ODI, 2002.

[24] A. G. Bruner, R. E. Gullison, R. E. Rice, and G. A. B. Da Fonseca, "Effectiveness of parks in protecting tropical biodiversity," *Science*, vol. 291, no. 5501, pp. 125–128, 2001.

[25] D. Roe, J. Mayers, M. Grieg-Gran, A. Kothari, C. Fabricius, and R. Hughes, *Evaluating Eden: Exploring the Myths and Realities of Community-Based Wildlife Management*, Evaluating Eden Series No. 8, 2000.

[26] M. McDuff, "Needs assessment for participatory evaluation of environmental education programs," *Applied Environmental Education & Communication*, vol. 1, no. 1, pp. 25–36, 2002.

[27] C. Boyd, R. Blench, D. Bourn, L. Drake, and P. Stevenson, *Reconciling Interests Among Wildlife, Livestock and People in Eastern Africa: A Sustainable Livelihoods Approach*, Resource Perspectives: ODI, 1999.

[28] T. Holmern, E. Røskaft, J. Mbaruka, S. Y. Mkama, and J. Muya, "Uneconomical game cropping in a community-based conservation project outside the Serengeti National Park, Tanzania," *Oryx*, vol. 36, no. 4, pp. 364–372, 2002.

[29] N. Dudley, A. Belokurov, O. Borodin, L. Higgins-Zogib, M. L. L. Hockings, and S. Stolton, *Are Protected Areas Working? An Analysis of Forest Protected Areas*, WWF International, Gland, Switzerland, 2004.

[30] C. Kremen, V. Razafimahatratra, R. P. Guillery, J. Rakotomalala, A. Weiss, and J. S. Ratsisompatrarivo, "Designing the Masoala National Park in Madagascar based on biological and socioeconomic data," *Conservation Biology*, vol. 13, no. 5, pp. 1055–1068, 1999.

[31] J. G. Njogu, "Community-based conservation in an entitlement perspective," Research Report 73, African Studies Centre, 2004.

[32] R. J. Shrivastava and J. Heinen, "A microsite analysis of resource use around Kaziranga national park, India: implications for conservation and development planning," *Journal of Environment and Development*, vol. 16, no. 2, pp. 207–226, 2007.

[33] A. L. Wily and S. Mbaya, "Land, people and forests in eastern and southern Africa at the beginning of the 21st century," in *The Impact of Land Relations on the Role of Communities in Forest Future*, p. 313, IUCN-EARO, Nairobi, Kenya, 2001.

[34] A. Agrawal and K. Redford, "Place, conservation, and displacement," *Conservation Society*, vol. 7, pp. 56–58, 2009.

[35] P. J. Balint and J. Mashinya, "The decline of a model community-based conservation project: governance, capacity, and devolution in Mahenye, Zimbabwe," *Geoforum*, vol. 37, no. 5, pp. 805–815, 2006.

[36] B. Derman, "Environmental NGOs, dispossession, and the state: the ideology and praxis of African nature and development," *Human Ecology*, vol. 23, no. 2, pp. 199–215, 1995.

[37] M. Kasparek, "Sustainable forest management and conservation project evaluation of pilot measures in Botswana, Malawi, Mozambique and Namibia," Research Report, Sustainable Forests Management and Conservation Project FANR/SADC - GTZ, 2008.

[38] M. Samson and L. Maotonyane, *Community-Based Natural Resource Conservation and Development the Experience of Botswana*, The World Bank/WBI's CBNRM Initiative, 1998.

[39] N. Dudley, J. Hurd, and A. Belokurov, Eds., *Towards an Effective Protected Areas Network in Africa. Experience in Assessing Protected Area Management Effectiveness and Future Proposals*, WWF International, Gland, Switzerland, 2005.

[40] A. Ormsby and B. A. Kaplin, "A framework for understanding community resident perceptions of Masoala National Park, Madagascar," *Environmental Conservation*, vol. 32, no. 2, pp. 156–164, 2005.

[41] T. Caro, T. A. Gardner, C. Stoner, E. Fitzherbert, and T. R. B. Davenport, "Assessing the effectiveness of protected areas: paradoxes call for pluralism in evaluating conservation performance," *Diversity and Distributions*, vol. 15, no. 1, pp. 178–182, 2009.

[42] J. Ervin, "Rapid assessment of protected area management effectiveness in four countries," *BioScience*, vol. 53, no. 9, pp. 833–841, 2003.

[43] J. Ervin, "Protected area assessments in perspective," *BioScience*, vol. 53, no. 9, pp. 819–822, 2003.

[44] G. Stuart-Hill, R. Diggle, B. Munali, J. Tagg, and D. Ward, "The event book system: a community-based natural resource monitoring system from Namibia," *Biodiversity and Conservation*, vol. 14, no. 11, pp. 2611–2631, 2005.

[45] E. Topp-Jørgensen, M. K. Poulsen, J. F. Lund, and J. F. Massao, "Community-based monitoring of natural resource use and forest quality in montane forests and miombo woodlands of tanzania," *Biodiversity and Conservation*, vol. 14, no. 11, pp. 2653–2677, 2005.

[46] R. J. Fisher and W. J. Jackson, "Action Research for collaborative management of protected areas," in *Proceedings of the Workshop on Collaborative Management of Protected Areas in the Asian Region*, Sauraha, Nepal, 1998.

[47] R. Taylor, "Community based natural resource Management in zimbabwe: The experience of CAMPFIRE," *Biodiversity and Conservation*, vol. 18, no. 10, pp. 2563–2583, 2009.

[48] J. A. Timko and T. Satterfield, "Seeking equity in National Parks: case studies from South Africa and Canada," *Conservation & Society*, vol. 6, no. 3, pp. 238–254, 2008.

[49] J. A. Timko and J. L. Innes, "Evaluating ecological integrity in national parks: case studies from Canada and South Africa," *Biological Conservation*, vol. 142, no. 3, pp. 676–688, 2009.

[50] C. C. Gibson and S. A. Marks, "Transforming rural hunters into conservationists: an assessment of community-based wildlife management programs in Africa," *World Development*, vol. 23, no. 6, pp. 941–957, 1995.

[51] P. Mbile, M. Vabi, M. Meboka et al., "Linking management and livelihood in environmental conservation: case of the Korup National Park Cameroon," *Journal of Environmental Management*, vol. 76, no. 1, pp. 1–13, 2005.

[52] C. Wainwright and W. Wehrmeyer, "Success in integrating conservation and development? A study from Zambia," *World Development*, vol. 26, no. 6, pp. 933–944, 1998.

[53] A. Williams, T. S. Masoud, and W. J. Othman, *Community-Based Conservation: Experiences from Zanzibar*, Gatekeeper Series No. 80, International Institute for Environment and Development, 1992.

[54] A. B. Mallya, *An Evaluation Community Conservation in Western Serengeti*, African Conservation Foundation, 2006.

[55] M. M. Musumali, T. S. Larsen, and B. P. Kaltenborn, "An impasse in community based natural resource management implementation: The case of Zambia and Botswana," *Oryx*, vol. 41, no. 3, pp. 306–313, 2007.

[56] Parcs Nationaux Madagascar, *Madagascar Protected Area System Management Plan 200-2006*, Ministry of Environment Water and Forests, 2001.

[57] K. L. Metzger, A. R. E. Sinclair, R. Hilborn, J. G. C. Hopcraft, and S. A. R. Mduma, "Evaluating the protection of wildlife in parks: The case of African buffalo in Serengeti," *Biodiversity and Conservation*, vol. 19, no. 12, pp. 3431–3444, 2010.

[58] D. S. Wilkie, J. F. Carpenter, and Q. Zhang, "The under-financing of protected areas in the Congo Basin: so many parks and so little willingness-to-pay," *Biodiversity and Conservation*, vol. 10, no. 5, pp. 691–709, 2001.

[59] A. Hamilton, A. Cunningham, D. Byarugaba, and F. Kayanja, "Conservation in a region of political instability: bwindi impenetrable forest, Uganda," *Conservation Biology*, vol. 14, no. 6, pp. 1722–1725, 2000.

[60] E. Rutagarama, "Protected area management effectiveness, the case study of Rwanda in Africa," in *Proceedings of the Annual Meeting of the International Congress for Conservation Biology*, November 2010.

[61] M. Hockings, "Evaluating protected area management: a review of systems for assessing management effectiveness of protected areas," Occasional Paper, WWF, 2000.

[62] P. S. Goodman, *South Africa: Management Effectiveness Assessment of Protected Areas in KwaZulu-Natal Using WWF's RAPPAM Methodology*, WWF, Gland, Switzerland, 2003.

[63] P. S. Goodman, "Assessing management effectiveness and setting priorities in protected areas in KwaZulu-Natal," *BioScience*, vol. 53, no. 9, pp. 843–850, 2003.

[64] G. Tenywa, "UWA suspends 4 top officials," New vision article, 2011, http://www.newvision.co.ug/D/8/13/758605.

[65] E. Anyoli, *Ex NFA Boss Akankwasa Out on Bail*, East African News, 2011.

[66] R. H. Nelson, "Environmental colonialism: "Saving" Africa from Africans," *Independent Review*, vol. 8, no. 1, pp. 65–86, 2003.

[67] R. P. Neumann, "Primitive ideas: protected area buffer zones and the politics of land in Africa," *Development and Change*, vol. 28, no. 3, pp. 559–582, 1997.

[68] K. B. Ghimire and M. P. Pimbert, "Social change and conservation: an overview of issues and concepts," in *Social Change and Conservation, Environment Politics and Impacts of National Parks and Protected Areas*, K. B. Ghimire and M. P. Pimbert, Eds., pp. 1–45, Earthscan, London, UK, 1997.

[69] R. G. Wild and J. Mutebi, "Conservation through community use of plant resources. Establishing collaborative management at Bwindi Impenetrable and Mgahinga Gorilla National Parks, Uganda," in *People and Plants*, Working Paper No. 5, UNESCO, Paris, France, 2005.

[70] J. Hutton and B. Dickson, "Conservation out of exploitation: a silk purse from a sow's ear?" in *Conservation of Exploited Species*, J. D. Reynolds, G. M. Mace, K. H. Redford, and J. G. Robinson, Eds., pp. 440–461, Cambridge University Press, Cambridge, UK, 2002.

[71] W. Cadman, *The Debate on Elephant Culling in South Africa: An Overview*, IFAW, 2005.

[72] P. O. Camara, *Analysis of Nutritional Practices of the Communities in Upper Niger National Park*, The World Bank/WBI's CBNRM Initiative, 1998.

[73] W. D. Newmark, "Isolation of African protected areas," *Frontiers in Ecology and the Environment*, vol. 6, no. 6, pp. 321–328, 2008.

[74] L. Naughton-Treves, M. B. Holland, and K. Brandon, "The role of protected areas in conserving biodiversity and sustaining local livelihoods," *Annual Review of Environment and Resources*, vol. 30, pp. 219–252, 2005.

[75] M. L. Shaffer, "Minimum population sizes for species conservation," *BioScience*, vol. 31, no. 30, pp. 131–134, 1981.

[76] P. Coulibaly-Lingani, *Appraisal of the participatory forest management program in southern Burkina Faso [Ph.D. thesis]*, Acta Universitatis Agriculturae, 2011.

[77] H. Mogaka, G. Simons, J. Turpie, F. Karanja, and L. Emerton, *Economic Aspects of Community Involvement in Sustainable Forest Management in Eastern and Southern Africa*, The World Conservation Union, Eastern Africa Regional Office, Nairobi, Kenya, 2001.

[78] P. Alpert, "Integrated conservation and development projects: examples from Africa," *BioScience*, vol. 46, no. 11, pp. 845–855, 1996.

[79] C. B. Barrett and P. Arcese, "Are integrated conservation-Development Projects (ICDPs) Sustainable? On the conservation of large mammals in sub-Saharan Africa," *World Development*, vol. 23, no. 7, pp. 1073–1084, 1995.

[80] W. M. Adams and J. Hutton, "People, parks and poverty: political ecology and biodiversity conservation," *Conservation and Society*, vol. 5, pp. 147–183, 2007.

[81] A. J. Noss, "Challenges to nature conservation with community development in Central African forests," *Oryx*, vol. 31, no. 3, pp. 180–188, 1997.

[82] WHO, "Human development index," *Bulletin of the World Health Organization*, vol. 78, no. 8, pp. 981–994, 2000.

[83] W. D. Newmark and J. L. Hough, "Conserving wildlife in Africa: integrated conservation and development projects and beyond," *BioScience*, vol. 50, no. 7, pp. 585–592, 2000.

[84] C. M. Holmes, "Assessing the perceived utility of wood resources in a protected area of Western Tanzania," *Biological Conservation*, vol. 111, no. 2, pp. 179–189, 2003.

[85] R. R. Marcus, "Seeing the forest for the trees: integrated conservation and development projects and local perceptions of conservations in Madagascar," *Human Ecology*, vol. 29, no. 4, pp. 381–397, 2001.

[86] K. Brandon, K. H. Redford, and S. E. Sanderson, Eds., *Parks in Peril. People, Political, and Protected Areas*, Island Press and The Nature Conservancy, Washington, DC, USA, 1998.

[87] W. Adams and M. Infield, "Park outreach and gorilla conservation: Mgahinga Gorilla National Park, Uganda," in *African Wildlife and Livelihoods: The Promise and Performance of Community Conservation*, D. Hulme and M. Murpree, Eds., pp. 131–147, James Currey, Oxford, UK, 2001.

[88] E. Barrow and M. Murphree, "Community conservation: from concept to practice," in *African Wildlife and Livelihoods: The Promise and Performance of Community Conservation*, D. Hulme and M. Murphree, Eds., p. 2437, James Currey, Oxford, UK, 2001.

[89] E. Nkonya, J. Pender, E. Kato, S. Mugarura, and J. Muwonge, *Who Knows, Who Cares? Determinants of Enactment, Awareness and Compliance With Community Natural Resource Management By-Laws in Uganda*, Working Paper no. 41, CAPRi, Washington, DC, USA, 2005.

[90] S. Ernst, "Uganda: consequences of the establishment of Rwenzori Mountains National Park," *Geographische Rundschau*, vol. 63, no. 2, pp. 57–63, 2011.

[91] P. Blaikie and S. Jeanrenaud, *Biodiversity and Human Welfare*, United Nations Research Institute for Social Development, Geneva, Switzerland, 1996.

[92] C. Averbeck, "Incorporating local people through economic incentives at Lake Mburo National Park, Uganda," in *Stakeholder Dialogues in Natural Resources Management*, pp. 325–343, Heidelberg Publishers, Berlin, Germany, 2006.

[93] M. Norton-Griffiths, "The economics of wildlife conservation policy in Kenya," in *Conservation of Biological Resources*, E. J. Milner-Gulland and R. Mace, Eds., p. 279, Blackwell, Malden, Mass, USA, 1998.

[94] W. Olupot, A. J. McNeilage, and A. J. Plumptre, *An Analysis of Socioeconomics of Bushmeat Hunting at Major Hunting Sites in Uganda*, WCS Working Papers, 2009.

[95] A. H. Harcourt, S. A. Parks, and R. Woodroffe, "Human density as an influence on species/area relationships: double jeopardy for small African reserves?" *Biodiversity and Conservation*, vol. 10, no. 6, pp. 1011–1026, 2001.

[96] G. Wittemyer, P. Elsen, W. T. Bean, A. C. O. Burton, and J. S. Brashares, "Accelerated human population growth at protected area edges," *Science*, vol. 321, no. 5885, pp. 123–126, 2008.

[97] J. Igoe, *Conservation and Globalization: A Study of National Parks and Indigenous Communities from East Africa to South Dakota*, Wadsworth Press, Belmont, Calif, USA, 2003.

[98] S. R. Kellert, J. N. Mehta, S. A. Ebbin, and L. L. Lichtenfeld, "Community natural resource management: promise, rhetoric, and reality," *Society and Natural Resources*, vol. 13, no. 8, pp. 705–715, 2000.

[99] C. B. Barrett and P. Arcese, "Are Integrated Conservation-Development Projects (ICDPs) Sustainable? On the conservation of large mammals in sub-Saharan Africa," *World Development*, vol. 23, no. 7, pp. 1073–1084, 1995.

[100] C. Antons, "The role of traditional knowledge and access to genetic resources in biodiversity conservation in Southeast Asia," *Biodiversity and Conservation*, vol. 19, no. 4, pp. 1189–1204, 2010.

[101] F. Berkes, J. Colding, and C. Folke, "Rediscovery of traditional ecological knowledge as adaptive management," *Ecological Applications*, vol. 10, no. 5, pp. 1251–1262, 2000.

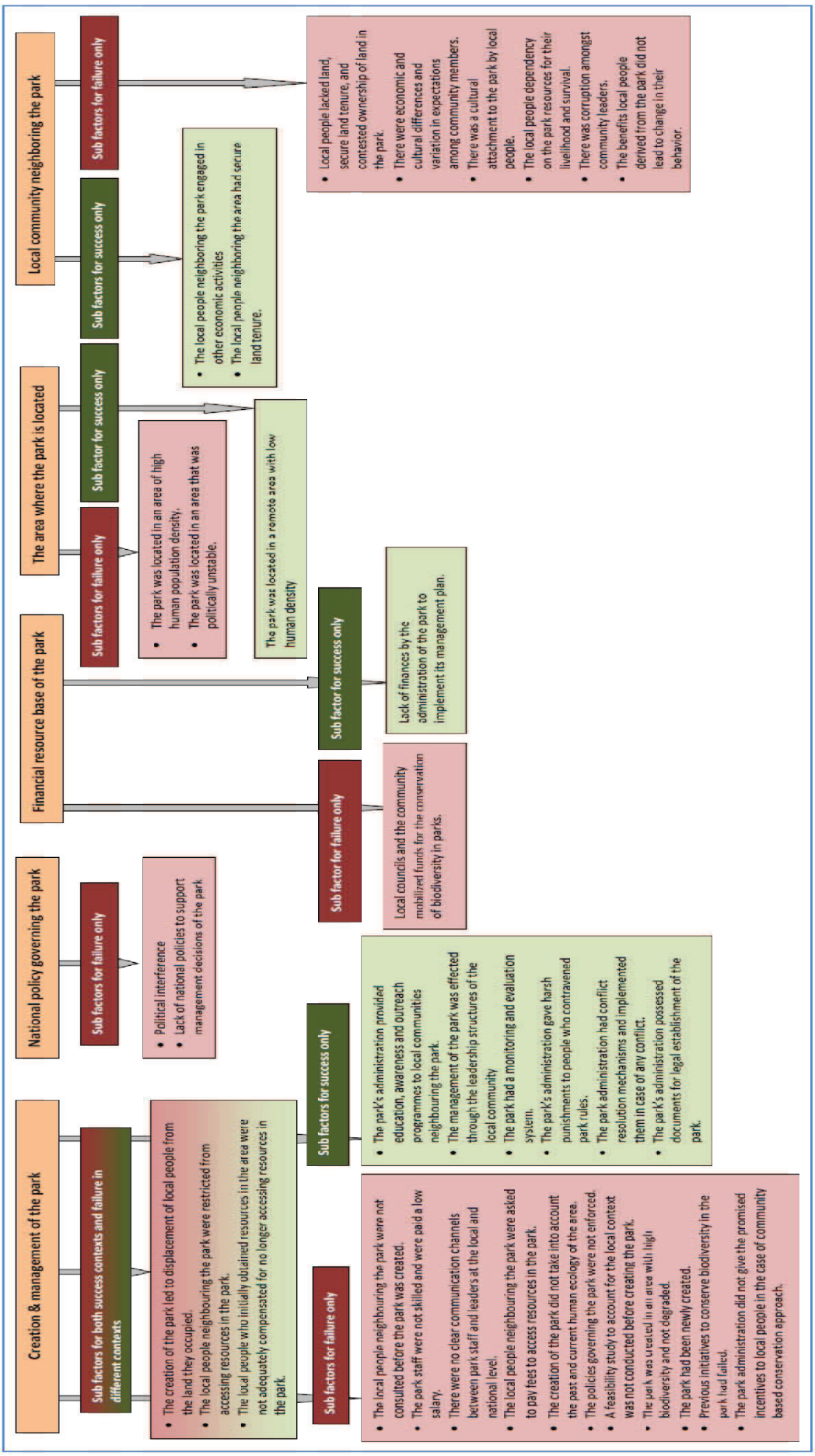

Figure 2.2 A visual presentation of the factors and sub factors that influence the success and failure of conserving biodiversity in national parks in Africa

CHAPTER 3

BIODIVERSITY CONSERVATION THROUGH TRADITIONAL ECOLOGICAL KNOWLEDGE: A REVIEW OF CASE STUDIES FROM AFRICA



Figure 3.1 One of the traditionally designated resting places (locally known as "ekyiko") in the Rwenzori Mountains. (Photo by M. Muhumuza, March, 2009**).**

OVERVIEW OF THE CHAPTER

This literature review aimed to synthesize how traditional ecological knowledge facilitates the conservation of biodiversity in national parks in Africa. Prior to this investigation, a critical analysis of literature on the contribution of traditional ecological knowledge to the conservation of biodiversity in national parks in Africa was lacking. This chapter presents a meta-analysis of 191 case studies extracted from 102 publications on traditional ecological knowledge and traditional strategies of sustaining biodiversity in Africa. The results show that traditional ecological knowledge was used in various ways which include; planned mobility, totemism, taboos, customary rules and regulations, traditional religious beliefs, and technical understanding of resources and the environment to sustain biodiversity. However, in 66.7% of the case studies, authors argued for the role of traditional ecological knowledge in sustainable utilisation of biodiversity without basing their arguments on empirical evidence. In these case studies, authors based their arguments on historical accounts and "logical reasoning" about how people in traditional communities could have sustainably used biodiversity resources. There is currently a lack of understanding of how traditional ecological knowledge is linked to biodiversity conservation and more specifically in the already established national parks in Africa.

Much of the content in the introduction section contributed to literature review of a technical report on current status ownership and management of sacred sites in the Rwenzori Mountains prepared by the author of this thesis for Flora and Fauna International, and Uganda Wildlife Authority. The report can be found at http://sacrednaturalsites.org/items/current-status-ownership-and-management-of-sacred-sites-in-the-rwenzori-mountains/

3.1 INTRODUCTION

National parks are a cornerstone of biodiversity conservation worldwide (Carruthers, 1989). National parks are classified under category II of the International Union for Conservation of Nature classification of protected areas (Naughton-Treves, Margaret & Brandon, 2005). They are managed by national governments through formally established authorities, mainly for ecosystem protection and recreation (Naughton-Treves *et al*., 2005). Africa has more than 1,812 protected areas occupying 3,112,027 km^2 of the continent. In Sub-Saharan, Africa there is over 1,000,000 km^2 of land that has been gazzeted as national parks (Colchester, 2003).

However, most national parks in Africa face various problems such as illegal harvesting of park resources, grazing of animals in the park, conversion of part or all of park land into agricultural fields (Mung'ong'o, 2009), and violation of rules governing the national park (Conte, 2002). Many of these problems originate from local communities that neighbor those parks (Hulme and Murhree, 2001). It has been argued in various studies that in most cases, local people in communities that neighbour national parks have no alternative sources of livelihoods other than the park resources (Neumann, 1998). Therefore, ways through which local people could support the conservation of biodiversity in national parks, and meet their needs without entirely depending on national park resources, have continually been sought.

Before discussing the potential role of traditional ecological knowledge in the conservation of biodiversity in national parks, it is important to first present the current attempts and short-comings of involving local communities in the conservation of biodiversity.

3.1.1 Involvement of local communities in the conservation of biodiversity in national parks

It has progressively become recognized that the success of national parks in conserving biodiversity depends largely on the support of rural communities that neighbour those parks (Igoe, 2004, Western & Wright, 1994). Consequently, participatory community-based conservation approaches have been suggested as a way of mitigating conflicts between local people and managers of national parks and to make biodiversity conservation and development compatible (Child, 1993; Fiallo & Jacobson, 1995; Gadgil, 1992; Hill, 1983; Matowanyika, 1989; Nepal and Weber, 1995; Newmark, Leonard, Sariko, & Gamassa, 1993; Western, 1982; Western, 1994; Western and Wright, 1994). Participatory community-based conservation approaches are aimed at compensating the local communities for the costs they incur because of limited access to protected area resources. The assumption behind such approaches is that if local communities derive economic benefits from protected areas and have a stake in the management of those areas, their attitudes towards conservation will be positive (Campbell, 1998; Lewis, Kaweche & Mwenya, 1990; Lewis & Phiri, 1998).

Community-based conservation approaches are implemented in various ways. In some national parks local communities are allowed to have access to the park resources after paying a fee (Marks, 2001; Moore, 1998). In other national parks, local people are allowed restricted access to park resources after signing resource use agreements. In other cases, local communities are called upon to seasonally harvest some resources under supervision of park staff (Barrow and Murphree, 2001). Also, there are cases where local people are not allowed to have access to the park resources at all but are given 20% of gate collections for infrastructural development in their communities. In rare cases, local communities receive funds or incentives to facilitate the initiation of alternative economic activities. In other national parks a programme combining some or all of these initiatives is implemented.

3.1.2 Short-comings of current community-based conservation approaches

Although community-based conservation approaches appear commendable for attempting to reconcile biodiversity conservation and the development interests of local people (Matowanyika, 1992), and despite some registered successes of these efforts (see for instance Lewis *et al*., 1990), community-based approaches have been criticized by various authors (for instance, Adams & Thomas, 1996; Barrett & Arcese, 1995; Campbell, 2000; Emerton, 1998; Igoe, 2003; Kellert, Mehta, Ebbin & Lichtenfeld, 2000; Oates, 1995) because of their simplistic assumptions. Firstly, in practice, the "participation" of local community members in community-based conservation approaches has been claimed to be merely symbolic (Alpert, 1995; Gibson & Marks, 1995; Parry & Campbell, 1992; Songorwa, 1999; Wells & Brandon, 1993; Pretty, 1995), or used by local elites to further their own interests (Gibson & Marks, 1995; Gillingham & Lee, 1999; Kellert *et al*., 2000). Secondly, economic benefits do not automatically yield positive attitudes which would be helpful in the conservation of

biodiversity (Gillingham & Lee, 1999; Igoe, 2002; Langholz, 1999; Parry & Campbell, 1992). Development of positive attitudes toward conservation depends on various factors such as the nature of economic benefits given to the local people (direct benefits versus indirect benefits and communal benefits versus individual benefits), which people in the community get the benefits, and how the benefits are distributed among the community members (Songorwa, 1999).

One fundamental short-coming of community-based conservation approaches is that the basic economic hypothesis underlying community-based conservation that the provision of economic benefits to local people will fuel their willingness to live sustainably near protected areas is yet to be proved. Community-based conservation projects are founded on untested and false economic and even biological assumptions (Barrett & Arcese, 1995). The argument that community development can be used as a means to attain biodiversity conservation goals cannot hold in practice (Kellert *et al*., 2000). Conservationists have persistently grappled with how to address the short-comings of community-based conservation strategies.

3.1.3 Implementing community-based conservation approaches through traditional ecological knowledge

In Africa, traditional ecological knowledge is part of African epistemology that dates as far back as 4000 B.C. (Berkes, 1989). Berkes (1999) describes traditional ecological knowledge as ingrained in the relationship of living organisms with one another and their environment and it is sometimes referred to as traditional environmental knowledge. Traditional ecological knowledge represents experience acquired over thousands of years of direct human contact with the environment (Christie, 1991).

Although the term ‘traditional ecological knowledge’ came into widespread use in the 1980s (Agrawal, 1995), some researchers (such as Conklin, 1957; Lewis, 1975; Wyman, 1964) claim that the practices in ancient cultures were based on that knowledge. Although anthropologists made the earliest systematic studies of indigenous knowledge, traditional ecological knowledge was first studied as ethno-ecology (which was derived from ethno-science and folk-science) by ecologists (Hardesty, 1977). Ethno-science and folk-science involve the study of systems of knowledge developed in a given culture to classify the objects, activities, and events that define it (Agrawal, 1995).

As a result of the shortcomings of the current community-based conservation approaches, some authors (for instance Abrams, Anwana, Alison, Delali & Ajagbe, 2009; Darkoh, 2009; Usher, 2000) have advocated the implementation of community-based conservation through traditional ecological knowledge. This has particularly been suggested in understudied regions (Chalmers & Fabricius, 2007). Various authors have claimed that people in traditional communities conserved biodiversity through traditional ecological knowledge (Agrawal, 1995; Berkes, Colding & Folke, 2000; Byers, Cunliffe & Hudak, 2001; Western, 1994). Although much of African history had been passed down

by oral traditions, there are many scripts that give clues to ancient African epistemology and evidence of biodiversity conservation through traditional ecological knowledge (Nelson, 1983).

Some recent studies have attempted to show examples of how biodiversity conservation has been effected through traditional ecological knowledge of local people. For instance, Maffi and Woodley (2010) documented 45 projects around the world (six of these from Africa) that attempt to link conservation of biodiversity with traditional ecological knowledge. Successful indigenous protected area programmes based on traditional ecological knowledge of Aboriginals in Australia have also been reported (Gilligan, 2006). The contribution made by traditional communities to conserving biodiversity in Community Conserved Areas (CCAs) has also been cited as evidence of biodiversity conservation by applying traditional ecological knowledge (the Secretariat of the Convention on Biological Diversity, 2010). Community conserved areas are voluntarily conserved by indigenous and local communities through traditional ecological knowledge (Porter-Bolland *et al*., 2011; Shahabuddin & Rao, 2010). In 18 developing countries with the largest forest cover, over 22% of forests are conserved by local communities through traditional ecological knowledge (Secretariat of the Convention on Biological Diversity, 2010). Some authors claim that levels of protection accorded to some community conserved areas by local communities using indigenous means of management are higher than in government established and managed protected areas (Porter-Bolland *et al*., 2011; Secretariat of the Convention on Biological Diversity, 2010). By examining case studies involving bowhead whales, beluga whales, and herring, Huntington (2000) has also pointed out some benefits of using traditional ecological knowledge in the management of natural resources.

Although the role of traditional ecological knowledge in the conservation of biodiversity is increasingly recognized, there are various studies that argue that traditional ecological knowledge has no application in the conservation of biodiversity. This argument constitutes what is commonly known as the "*the ecologically noble savage*" debate (Posey, 1985). Those that think that traditional ecological knowledge has no application in the conservation of biodiversity claim that in traditional communities there were no strategies in place to conserve biodiversity (Alvard, 1993; Diamond, 1986). These authors claim that biodiversity conservation involves restraint or motive for meticulous planning for availability of resources for future generations and that these attributes are not found amongst traditional people (Diamond, 1986). They argue that local people did not even have the knowledge necessary to effect biodiversity conservation.

3.1.4 Knowledge required to effect conservation of biodiversity vis-a`-vis traditional ecological knowledge

The aim of conserving biodiversity is to protect species, their habitats, and ecosystems from extinction (Fiedler & Subodh, 1992). Conservation of biodiversity is of two types, ex-situ conservation (which involves conserving biodiversity outside its natural habitat) and in-situ conservation (which involves conserving biodiversity in its natural habitat, which also includes defending a species from predators).

Broadly, there are two categories of knowledge required to plan for and implement biodiversity conservation in both. One is knowledge about the status of species. This comprises knowledge of the species ecology in its broadest sense, which includes, but is not limited to, species populations, species reproductive behaviour, species life forms, species feeding behaviour, species activity patterns (for animal species), species survival strategies, and the role of the species in the ecosystem (such as keystone species, indicator species and umbrella or flagship species) (Secretariat of the Convention on Biological Diversity, 2010). The second type of knowledge is about pressures that lead to biodiversity loss and how species respond to the pressures (Secretariat of the Convention on Biological Diversity, 2010). For instance, knowledge about how plant species are harvested and how those species respond to the harvest is important for planning and implementing conservation of those species.

These broad types of knowledge emerge from research on risk, threat and vulnerability of species, their habitats, and ecosystems (Given & Norton, 1993). In the synthesis of the role of traditional ecological knowledge in this investigation, reference is made to the knowledge identified in scientific literature that is needed to effect conservation of biodiversity in order to assess how traditional ecological knowledge measures up to that knowledge. Some studies (for instance Chalmers & Fabricius, 2007) caution the practice of integrating scientific knowledge in traditional ecological knowledge in a way that co-opts local knowledge for scientific purposes.

3.1.5 The purpose of this literature review

The controversy about whether traditional ecological knowledge has been used in the conservation of biodiversity necessitated a critical analysis of current literature on traditional ecological knowledge. The analysis was considered important in order to inform protected area managers on the possibility of implementing community-based conservation in national parks based on traditional ecological knowledge. This review thus included published studies on traditional ecological knowledge and conservation strategies with a focus on communities in Africa. The aim was to synthesize how traditional ecological knowledge was linked to biodiversity conservation in Africa. In particular, the interest was to find out how, in theory and in practice, traditional ecological knowledge helped to conserve biodiversity and how applicable traditional ecological knowledge might be in established parks, given the factors that affect the success of conserving biodiversity as described in Chapter 2.

3.2 METHODS

3.2.1 Literature search

Published literature on traditional ecological knowledge formed one source of information for this review. The literature was systematically selected from the internet using the following search engines: Community Based Natural Resource Management (CBNRM) Net, Khup.com, advancing conservation in the social context reference library, ScienceDirect, and Google Scholar. Details of these search engines are provided in Table 1 in Muhumuza and Balkwill (2013).

Web searches were conducted between May 2009 and March 2011. The search terms used separately or in combination included; "*African traditional ecological knowledge"*, "*traditional conservation strategies in Africa*", "*African traditional communities and resource use*" and "*indigenous knowledge and conservation in Africa*".

3.2.2 Inclusion and exclusion criteria of publications for review

In this review, the term "*publications*" is used to mean the papers, articles, and theses that were downloaded and reviewed. The phrase "*case studies*" means actual cases reported in these publications. The criteria for including a publication in this review were the following: 1) it was written in English, 2) the author argued for traditional ecological knowledge or traditional strategies of biodiversity conservation in Africa, or, 3) reported on empirical studies where biodiversity was conserved through traditional ecological knowledge in Africa.

Based on these criteria 102 relevant publications were obtained for review (listed in Appendix 3.1). The examples of case studies cited in the results and discussion section of this chapter were not selected based on any criteria but on how relevant the point was under discussion.

3.2.3 Variables coded for in each publication

For each of the publications reviewed, five thematic areas were coded (Table 3.1).

Table 3.1 Thematic areas coded for each of the publications reviewed.

Thematic area coded	Meaning
Type of study	Empirical or theoretical studies. Empirical studies were based on observations or experiences rather than on theory or logic alone. Theoretical studies were concerned with or involved theoretical rather than practical application of traditional ecological knowledge.
Year of publication	When the study was published. In cases of grey literature such as theses and reports, the year of submission or the year when the study was conducted.
Type of conservation strategy	This variable explains the type of traditional conservation strategy reported in publications reviewed.
What was conserved	What resource the strategy was reported to have conserved.
What strategy was used	The strategy that was used to conserve what was reported to have been conserved.

3.2.4 Year of publication of the documents reviewed

The publications reviewed were published between 1955 and 2010 (see Figure 3.2). Eight publications were undated.

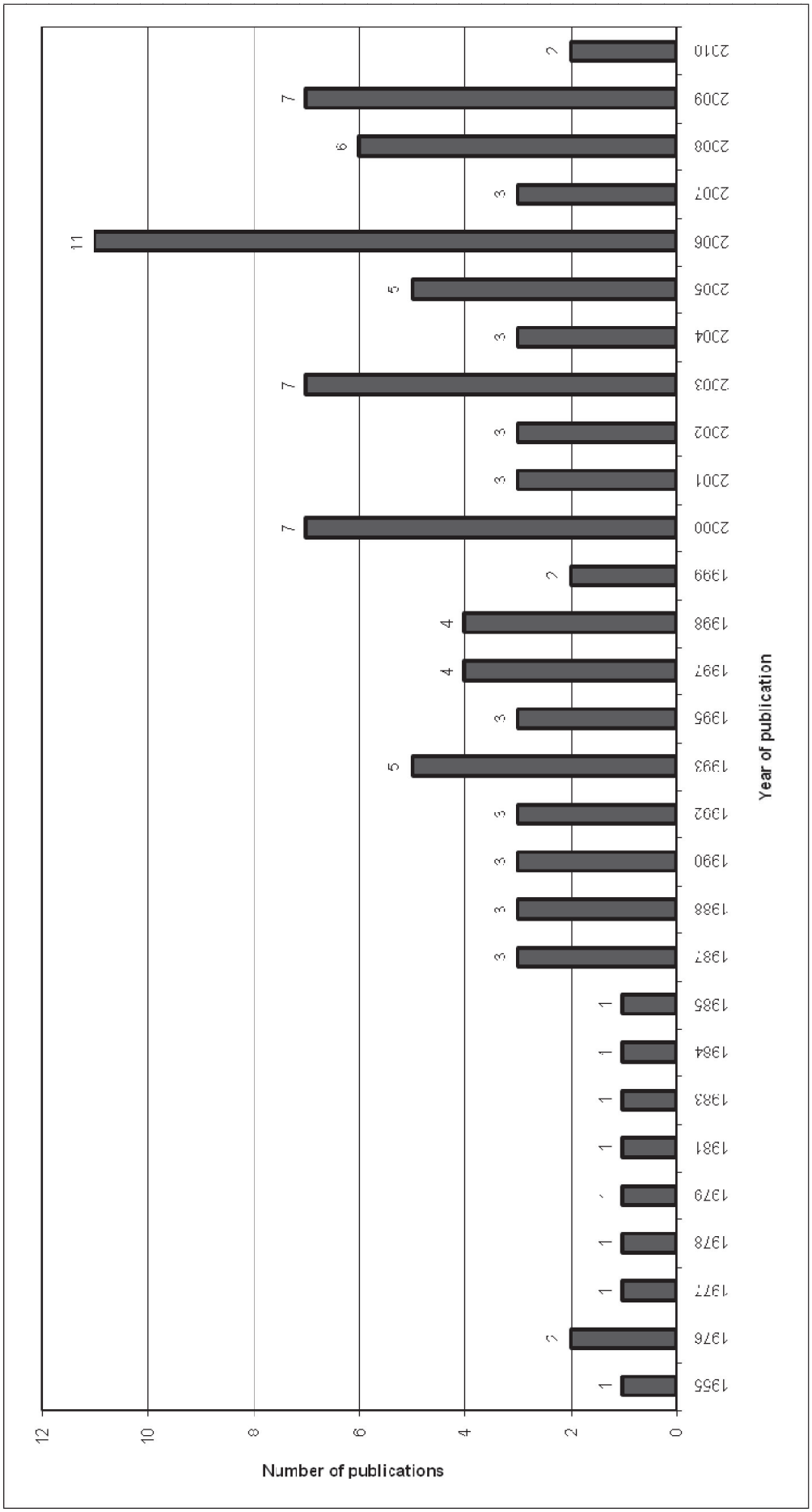

Figure 3.2 Year of publication of the documents reviewed.

3.3 FINDINGS AND DISCUSSION

3.3.1 Traditional strategies of conserving biodiversity

The review of literature revealed six strategies which people in traditional communities are said to have used to conserve biodiversity. These strategies include; planned mobility, following customary rules and regulations, applying technical understanding of resources and the environment, following traditional religious beliefs, totemism, and taboos (Figure 3.3).

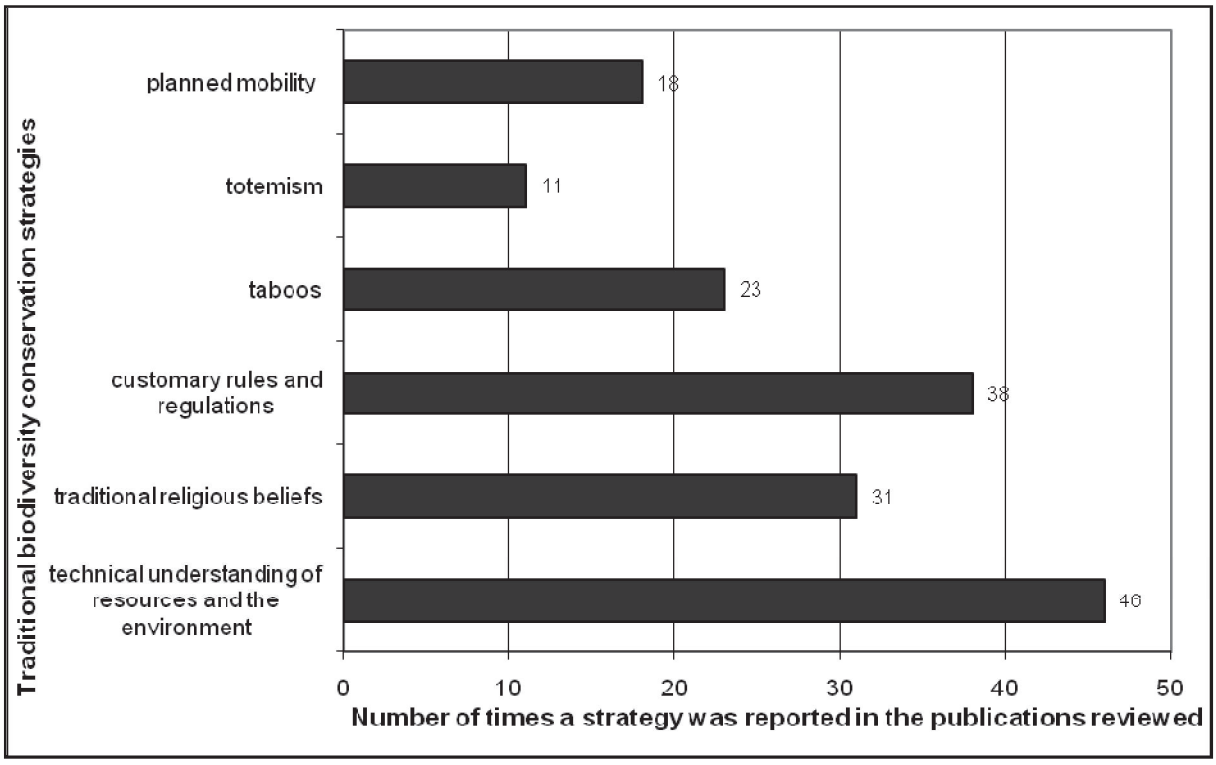

Figure 3.3 Traditional strategies of conserving biodiversity in Africa.

In majority of the case studies (66.7%), the authors did not demonstrate empirically how the strategies facilitated the conservation of biodiversity. The authors simply based their arguments on historical accounts and "logical reasoning" about how people in traditional communities could have sustainably used biodiversity resources. It was only in a few case studies that the identified strategies were empirically linked to the conservation of biodiversity (Figure 3.4). This indicates that current literature and ideas on the role traditional strategies of conserving biodiversity is yet to be demonstrated practically.

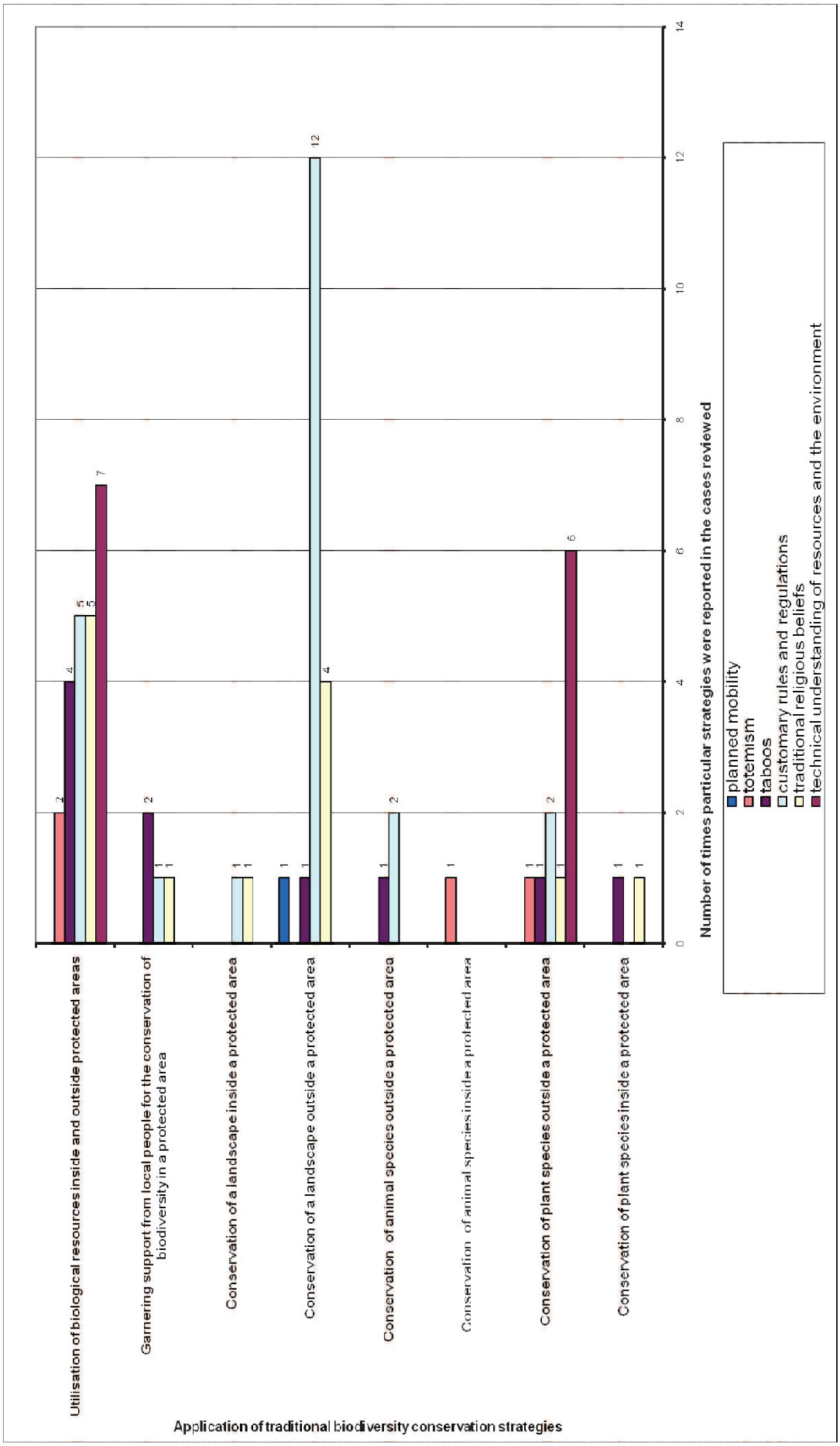

Figure 3.4 How various strategies were linked to biodiversity conservation in empirical studies.

3.3.1.1 Planned mobility

Mobility in the context of this chapter means the movement of part of or the entire human population from one location to another. Planned mobility occurs for a particular purpose as opposed to roaming. In the context of biodiversity conservation, 18 of the cases studies reviewed revealed that people in African traditional communities used planned mobility as a resource conservation strategy.

However, out of the 18 case studies, only one case study empirically linked planned mobility to biodiversity conservation. In the empirical case, successful conservation of a landscape outside a protected area was ascribed to planned mobility. The rest of the case studies that argued for planned mobility as a conservation strategy were based on historical accounts. For instance, when availability of resources reduced due to increased human populations, whole populations moved to new un-colonised and resource abundant areas (DeGeorges and Reilly, 2008; Hitchcock, 2002). Migrations of the Mfecane and Luba-Lunda in the 18th century from central Africa to southern Africa and back is an example of planned mobility as a traditional strategy of conserving biodiversity (DeGeorges & Reilly, 2008).

In some communities, instead of migration being from one region to another, there was "in-territory" mobility. The Ik of Uganda, for example, practiced planned mobility in defined territories in Kidepo Valley. The idea behind planned mobility as a biodiversity conservation strategy was that if hunting or resource collection stayed in one territory for too long, game and other resources could be exhausted (Hitchcock, 2002).

Planned mobility as a biodiversity conservation strategy in African traditional communities seems to be supported by archeological evidence. For example, using multi-proxy analysis of microfossils from sedimentary records in western Uganda, Lejju (2009) found that deforestation occurred 920 years ago (in the period 1027-1207 AD). This happened during a wet period hence suggesting a human induced deforestation (Lejju, 2009). Therefore, planned mobility could have been triggered by high human population increase in traditional African communities. Evidence shows that people in Africa traditionally have a tendency to produce many children for security in their old age (Hays, 1975). This could also be as a result of a popular notion amongst human behaviour ecologists that biological reproductive success in a situation of high mortality rate is necessary so that some offspring survive. Such a strategy of reproductive success often leads to exponential and unsustainable growth of populations (Audesirk and Audesirk, 1996). These points of view suggest that planned mobility could have occurred as a result of human population exceeding sustainable levels and the people were forced to move off the land to other locations.

When people move away from land they had occupied, it enables resources they had exploited on that land to recover. For instance, forests in western Uganda started recovering 200 years ago (1647–1952 AD), as a result of abandonment of the site as suggested by archaeological evidence (Lejju, 2009). It is a known ecological principle that when some plants are disturbed and abandoned for a while, they

regenerate and re-sprout to increase their abundance and resilience. For example, disturbance and abandonment of *Dioscorea* species in Bwindi National Park increased their regeneration and reproductive capacity (Byarugaba, 2004). Does this suggest that people in African traditional communities could have planned to move from one location to allow the resources they had exploited to regenerate?

Although planned mobility seems to be a sound ecological principle of resource use and recovery, it leaves some questions unanswered, especially in African traditional communities. For instance, beyond which level of use were resources in the African tradition left to regenerate? How long did it take for the resources to regenerate? Which species of plants or animals were involved? Which other species of plants or animals depended on the same resources? This information is missing in the literature reviewed. Even in the case where planned mobility was linked empirically to the conservation of a landscape outside a protected area these questions were not addressed. Scientific evidence shows that some species may not regenerate after disturbance beyond a certain level (Vít, Stanislav & Jitka, 2008). Also extreme harvest of resources means that other organisms that depend on the same resources will be affected. Other species take a very long time to regenerate. Thus such information is needed in studies that attempt to link biodiversity conservation and planned mobility.

If planned mobility as a conservation strategy was to be implemented in the currently established national parks in Africa, it would mean allowing people to use some areas of the park and when resources are exhausted in that area, then they would move to another area and do the same before moving to another area. The feasibility of such a practice in the current context of biodiversity conservation in parks is doubtful for two reasons. Firstly, people in African communities are no longer leading a subsistence life style (DeGeorges & Reilly, 2008), so allowing them to access resources in the park could easily result into resource harvest for commercial purposes. Secondly, there is a high human population density neighbouring parks in Africa. Many people, if allowed access to some area in the park, would harvest resources and exhaust them in a short time even when they are using the resources for subsistence purposes because of the growth in human population density. The issue of past and current human population scenarios in the context of biodiversity conservation is very important (Chapter 2).

Based on these reasons, it would be impractical to apply the planned mobility strategy in the conservation of national parks. A cultural values and conservation project that attempted to re-introduce cattle grazing in Lake Mburo National Park in Uganda failed because the socio-economic,

cultural and ecological factors were different from those of traditional Bahiima communities who used to graze in the area before the park was created. A pilot study re-introducing the cattle in Lake Mburo National Park found that, unlike traditional communities that grazed in the area following certain traditional norms, current Bahiima communities no longer followed those norms (Ankole Cow Conservation Association, 2012[4]). For instance, the Bahiima traditionally grazed in the Lake Mburo area as a group of households. They would mix their cattle and graze them in a collection of herds. But the pilot study found that currently each household preferred to graze its herd in different locations in the park and at different times. This is an indication that due to changes in the demographic and economic expectations, planned mobility as a traditional conservation strategy may no longer be relevant in the current African context.

3.3.1.2 Following customary rules and regulations

Customary rules and regulations are administrative legislations that constitute and constrain rights on conducting activities in traditional communities. Customary rules and regulations are developed from within a local community, unlike rules and regulations imposed on a community from an outside authority.

In the context of biodiversity conservation, 38 case studies in this review reported that in African traditional communities, there was administrative legislation that constituted and constrained rights on natural resource access, use and management. The customary rules and regulations could have resulted in sustainable utilization of resources which could have led to biodiversity conservation. Out of these studies 23 were empirical, linking customary rules and regulations to: 1) the utilization of biodiversity resources from inside and outside a protected area [5 case studies], 2) the conservation of landscapes outside protected areas [12 case studies], 3) the conservation of plant species outside a protected area [2 case studies], 3) the garnering of support from local people for the conservation of biodiversity in a protected area [1 case study], 4) the conservation of animal species outside a protected area [2 case studies], and 5) the conservation of a landscape inside a protected area [1 case study].

Traditional African societies had customary rules and regulations that governed land so as to limit the resource use (Cullis and Watson, 2005). Rules and regulations over access to resources were based on

[4] A letter from the office of Chairperson of Ankole Cow Conservation Association was written to the Chairman of the Steering Committee for Cultural Values and Conservation Project trying to contest the findings and recommendations of BIMCO Consult Limited that had conducted the impact assessment.

social class. For instance, in various communities in Africa, kings and chiefs were responsible for the enforcement of customary rules and regulations governing access and utilization of resources (DeGeorges and Reilly, 2008). Kings, chiefs, and other powerful families laid claim to an area and ensured that only a small *coterie* of privileged persons was allowed to access it. Several examples of rules governing resource use can be found in Hitchcock (2000), MacKenzie (1987), and Ritter (1955).

Generally, resources were meant to be used for subsistence and not commercial purposes (including barter trade) in traditional communities (Mariko, 1981; Marks, 1976; Marks, 1984). Also the rule of communal ownership of resources was emphasized. Resources are said to have been owned by all, for the good of all because resource use practices were an integral part of the identity of the group, and being a member of the group implied having access rights to those resources (DeGeorges & Reilly, 2008). Such rights were highly regulated through a flexible balance of individual and "common property" entitlements. An example is provided by the *Tuula* wells in *Borana* where no person was allowed to own private land which was perceived to give an individual freedom to use or misuse land, which in the latter case would be detrimental to all (Bassi, 2006). Big animals, when killed, were shared by all households in a village so that people were not tempted to clandestinely go into the forest to harvest collectively owned resources (DeGeorges & Reilly, 2008). All the people communally owned the resources and therefore every one had an interest in the behavior of others. Punishment for violating traditional rules and regulations were extremely severe and people feared contravening them (Mackenzie, 1988; Masona, 1987).

Currently, community conserved areas and community protected areas show similar arrangements except they are not based on social class. The 1997 constitutional law of Burkina Faso, for instance, allows subsistence or traditional hunting by local communities provided that they follow local regulations (Berkes *et al*., 2000). In Cameroon, traditional hunting within protected areas is allowed on condition that specific regulations are followed (Ndoye & Kaimowitz, 1998). One of the regulations governing hunting in Cameroon is that animals obtained from traditional hunting grounds should not be used for commercial purposes (Ndoye & Kaimowitz, 1998). Customary rules and regulations are said to have helped sustain biodiversity in both Burkina Faso (Berkes *et al*., 2000) and Cameroon (Ndoye & Kaimowitz, 1998).

Although the case studies reviewed in this investigation attributed conservation of biodiversity to customary rules and regulations, the link was not clear even in the empirical case studies. The case studies found in the publications reviewed were more concerned with rights of access to resources than protection or conservation of biodiversity. Rights of access ensure that only specific people access specific resources and do not go beyond that to ensure how those resources are harvested. Species of plants and animals can be threatened by poor harvesting methods even when they are harvested by few people (Alvard, 1994).

The application of customary rules and regulations in biodiversity conservation in the established parks would only work in communities that neighbour parks where these rules still exist. In Africa,

cases where traditional customary rules and regulations structures are still functioning are rare. For instance, among all the kingdoms and monarchies that existed before the colonial era in Africa, only Swaziland still retains an absolute monarchy rule by King Mswati III. Most of the kingdoms in various African countries were abolished between 1950 and 1970, except in the Congo Free State which was annexed by Belgium in 1908. Some of the kingdoms that were later re-instated, such as Tooro and Rwenzuru in Uganda, Ashanti in Ghana, Zululand in South Africa, Barotseland in Zambia, and Kano in Nigeria, are sub-national monarchies with less influence on the country's or region's natural resources than the political leaders.

In most countries customary rules and regulations have been replaced by national regulations over the exploitation of resources in and outside protected areas. Although international organizations applaud local examples of community conserved areas (the Secretariat of the Convention on Biological Diversity, 2010), the power to manage resources is vested in governments at the national level and not traditional groups at the local level (Porter-Bolland *et al*., 2011).

In this literature review, no example was encountered of a functioning traditional community leadership structure in a community neighbouring a national park. The young generation in most African communities no longer respects the traditional leadership structures and customary rules (Giles, Makoni & Dailey, 2005). This aggravates the problem of implementing such a strategy in the conservation and management of park resources. It thus becomes difficult for local traditional leaders to effect customary rules and regulations.

However, local leadership structures (not necessarily traditional in nature) have facilitated more effective conservation of biodiversity in national parks where they have been involved (Chapter 2). In national parks where rules and regulations governing the park were enforced through existing local leadership structures, there was more successful conservation of biodiversity than in national parks where rules and regulations were enforced by an authority outside the community (Vodouhê, Coulibaly, Adégbidi & Sinsin, 2010). Therefore, where some forms of traditional structures exist and are respected, they could be used as management structures or communication channels for conservation of national parks. However, the success of this recommendation may depend on knowledge, ownership and power of the leaders at the local level and on how long such structures will continue to be in place.

3.3.1.3 Application of a technical understanding of resources and the environment

Technical understanding of resources and the environment constitutes knowledge that ordinary people have about the environment and the ecology of the resources therein. Effective conservation of biodiversity requires knowledge of the status of species and the pressure that lead to biodiversity loss and the response of the species to that pressure (see section 3.1.4).

In 46 case studies identified in this review, authors reported that local people in traditional African communities had technical knowledge about resources and the environment that would have enabled them to conserve biodiversity. Application of technical understanding of resources and the environment as a conservation strategy was one of the highly recorded strategies in the cases reviewed. Thirteen of these case studies were empirical, linking the application of technical understanding of resources and the environment to: 1) the utilization of biodiversity resources from inside and outside protected areas (7 case studies), and 2) the conservation of plant species outside protected areas (6 case studies). Some of the authors that reported on this strategy include; Johannes (1978), Lewis and Alpert (1997), and Williams and Baines (1993). Technical understanding of how to harvest medicinal plants by the toddy-tapper caste of Malabar is cited as an indicator of knowledge that led to conservation of those medicinal plant species (Anderson and Grove, 1987; DeGeorges and Reilly, 2009; Stevens, 1997; Worster, 1990). The toddy-tapper caste of Malabar had a criterion for harvesting medicinal plant species that was non destructive. The criterion involved careful selection of plant parts so that the entire plant did not dry after harvest. There was also a way of quantifying how much of a particular part of a plant would be harvested each time.

Technical understanding of resource use by breeding of local crop varieties of plant species for improved production was reported among the traditional communities in Sierra Leone (Lamola, 1992; Richards, 1985). Other examples include: farmer-based agricultural research and extension systems in Niger (McCorkle & McClure, 1992), integration of traditional values, scientific research and practical management in Andringitra Mountains in Madagascar (Rabetaliana, 1999), the management of the Forest of the Lost Child by the Masaai in Kenya based on Loita ethnobotany (Maundu *et al*., 2001), the domestication of plants and animals among tribes in Cameroon and Zimbabwe (Betti, 2006; McGregor, 2003; Shiho, 2006), and the seasonal grazing rotations on particular types of grasses by the Barabaig in Tanzania (Lane, 1990).

Technical understanding of resources and the environment in traditional communities was enhanced by the ability of the people to read clues from their environment so that the depletion of local species could be prevented (Clay, 1988). For example, in the management of the Forest of the Lost Child by the Masaai in Kenya, when the Loita observed flowers on particular species of plants, they would not extract any resources from those plants until the flowers withered (Maundu *et al*., 2001). This practice ensured that people did not destroy these plants before pollination (Maundu *et al*., 2001). Pollination is an important process for plant reproduction. Based on knowledge of ecological status of the resources, people in traditional communities were able to find means for sustainable resource utilization appropriate to their communities.

Technical understanding of resources and the environment seems to be supported by other studies outside the list of publications reviewed in this investigation. For instance, the Honey Bee project documented more than fourteen hundred innovative practices in dry regions of some African countries to prove that local people have rich knowledge in resource use and conservation (Gupta, 1999). Also various studies in other countries outside Africa such as America (Kidwell, 1991; Leon-Portilla, 1980;

Turner, 1991; Pinkerton, 1989), India (Meilinda, 2006), Indonesia (Emsley, 1991; Heeds, 1991; Hoddy, 1991; Kuhnlein and Turner, 1991; Warren, 1997), and Australia (Davis, 1988; Johannes, 1993; Miyako, 2006) have demonstrated successful integration of local people's knowledge in contemporary conservation approaches. The project that was tried in Rodna Mountains National Park, Romania, for instance, involved school children in documenting local and traditional knowledge and use of the national park (Lawrence, Higgins & Lockie, 2001).

Although the examples and case studies described in this review indicate a relationship between understanding of resources and the environment and biodiversity conservation, an alternative point of view shows that understanding of resources and the environment does not in itself guarantee prudent use of natural resources (Kay, 1990; Kay, 1992). Possession of environmental knowledge or knowledge about the ecology of plants and animals does not necessarily mean behavioural modification of an individual or a group of people to conserve biodiversity (Kay, 1992). Knowledge can sometimes lead to unsustainable exploitation. There are various examples which support these arguments. In New Guinea, pollen analysis by Powell 1970 cited in Golson (1977) showed that agricultural practices by traditional people who are said to have had understanding of the environment, destroyed forests and degraded the land. In Madagascar, until about 1500 years ago, there were various species of lemur. These, according to Middleton (1999), are not found there anymore because local people, acclaimed by Dewar (1984) and Tattersall (1982) to have had understanding of the environment hunted them to extinction (Middleton, 1999).

Other examples from outside Africa also show that traditional communities believed to have understanding of resources and the environment never the less showed unsustainable use of resources. For instance, after examining over 500 archeological sites in and around Yellowstone National Park, elk bones were found to account for 3% of 52,000 bones that were unearthed (Kay, 1992). These results were interpreted to mean that over-hunting by traditional American communities who were reported in Kay (1990) to have had knowledge of resources and the environment, reduced the populations of elk to very low levels (Kay, 1992). The Maoris from New Zealand acclaimed by Steadman and Olson (1985) to have had an understanding of the environment led to extinction 34 species of birds approximately 1000 years ago due to over hunting (Olson, 1989; Steadman & Olson, 1985).

These examples suggest that it is important to investigate the traditional knowledge of resource use and management before implementing community-based conservation schemes based on their traditional knowledge. It requires an understanding of the harvesting methods, the frequency, and the amount harvested each time, and the number of people involved in the use of the specified resources and the impact of each on sustainability.

3.3.1.4 Following traditional religious beliefs in resource use and conservation

Religious beliefs are notions which people have about supernatural powers from gods and deities. Traditional religious beliefs are those beliefs which are generated from within a particular community where people in that community believe that certain things animate or inanimate, physical or non-physical have powers that control their destiny (Mbiti, 1988).

In the context of biodiversity conservation, 31 case studies in this review showed that traditional religious beliefs may have facilitated biodiversity conservation in traditional communities in Africa. Thirteen of the case studies were empirical, linking traditional religious beliefs to, 1) the utilization of biodiversity resources from inside and outside protected areas [5 case studies], 2) the conservation of landscapes outside protected areas [4 case studies], 3) the conservation of plant species outside a protected area [1 case study], 4) garnering of support from local people for the conservation of biodiversity in a protected area [1 case study], 5) the conservation of a landscape inside a protected area [1 case study], and 6) the conservation of plant species inside a protected area [1 case study].

Religious beliefs in traditional African societies were said to have generated elaborate cosmologies and ritual practices that ensured indigenous peoples' commitment to the protection of some natural resources (Reichel-Dokmatoff, 1971; Schoffeleers, 1979). Traditional religions are said to have been used to preserve some important resources through the high regard of religious sacredness in them. Sacred groves and sacred pools which are associated with forests and wetlands, and whose access was governed by ritual, myth, knowledge and regulations, are mentioned as one way in which conservation could have been affected (Stewart, 1977; Nelson, 1983). There were also places which presented hidden spiritual forces on which people depended for their existence (Mbiti, 1988). Such places included pools, hills, caves, imposing trees, rapids, falls and streams which were believed to be associated with some invisible beings hence deserved protection and veneration (Mbiti, 1988).

In African traditional societies, all living things were traditionally believed to have a "conscious" spirit with power to bless or to punish (Corsiglia & Snively, 1995). Tragedy would befall any person who accessed resources without following religious norms. For instance, in Zimbabwe, it is claimed that local people belived that Mhondoro (an invisible spirit) watched what ever they did. Those who engaged in perverse behaviour risked provoking various misfortunes or natural disaster that would end up affecting the whole community (Murombedzi, 2003). Even in recent times, people believe that Mhondoro has powers over their welfare (Murombedzi, 2003).

Although this review showed cases where biodiversity conservation was associated with traditional religious beliefs, currently there are limited cases where it can be applied. In most African communities, traditional religions and beliefs have been replaced by imported religions (Mbiti, 1988). When Christians arrived in Uganda in 1879, they preached against African traditional religious beliefs; by the year 1950 African traditional religious beliefs had vanished in most communities (Magesa, 1989). Traditional religions and imported religions had differing perspectives of nature and

natural resources. For example, unlike the African traditional religions, Christianity does not proclaim sacredness of nature (Hackett, 1994). Christian missionaries in the late 19th century chopped down what African people regarded as sacred groves (Hawkins, 1998). Christian missionaries thought that the people who called trees sacred were being idolatrous (Callicott and Roger, 1989). Arguably, this was done to show indigenous people that trees do not have any spirit and hence there was not any punishment that one would suffer by cutting those trees. Therefore, the harmonious co-existence between nature and Africans based on religious beliefs was disenfranchised and traditional religious beliefs are no longer accepted in many African societies. For instance, Christians and Moslems in South Burkina Faso in Kalinga and Nobere villages and in Ashanti region in Ghana in Jachie and Kegyase villages currently disrespect sacred groves and yet those sacred groves were revered as sacred places of their gods in the African traditional societies (DeGeorges and Reilly, 2008). Also in Cote d'Ivoire and Mali, animist beliefs constituted the cosmology of the Senoufo people whose centre of their life was the community (Callicott & Roger, 1989). For centuries, Senoufo people practiced collective hunting guided by traditional beliefs (Callicott & Roger, 1989). Recently, Senoufo people are reported to have converted to Islam and Christian religions and are more individualistic in their hunting practices (DeGeorges & Reilly, 2008). This is attributed to conversion to modern religions (DeGeorges and Reilly, 2008).

Some studies, especially from West African countries, indicate that there are some communities that have preserved their traditional religious beliefs and are coincidentally using these beliefs in the conservation of biodiversity (DeGeorges & Reilly, 2008). In the coastal countries and Sahelian part of West Africa, despite the changes introduced by modernity, the majority of the people kept their traditional perceptions of nature (DeGeorges and Reilly, 2008). Initiatives like the traditional hunting associations in Mali, Guinea, Burkina, Gambia and Senegal and the Sacred Groves Project in Ghana have worked because they are built on traditional religious beliefs (DeGeorges & Reilly, 2008). Protected area managers may benefit from this reality, if they pay attention to traditional values and knowledge. Protected area managers could take advantage of traditional religious beliefs of local people because it does not need knowledge of writing and reading in order to incorporate them in natural resource management especially if the incorporation is based on the "cosmo-vision" of the people who believe in them (DeGeorges & Reilly, 2008). For example, despite local people neigbouring Gashaka Gumti National Park in Nigeria and Mamunta-Mayoso wildlife sanctuary in Sierra Leone being illiterate, they were trained very well based on their religious beliefs in techniques for curbing hunting (DeGeorges & Reilly, 2008). However, long term integration of traditional beliefs in protected area management will depend on how long people in some African traditional communities will still hold those beliefs.

3.3.1.5 Totemism

A totem is any natural object such as a plant or animal which people traditionally believe to be related to them as a family or a clan (Mariko, 1981). Totems are found among different clans and tribes in various African communities. For example, in Zimbabwe, the Shona people have 25 different totems

(Murombendzi, 2003). Literature reviewed provides various examples of plant and animal species regarded as totems in many African communities. For example, in Botswana, the Bakwena tribe is named after "*Kwena"*, the crocodile, and Batloung people are named after "*Tlou"*, the elephant (Murombendzi, 2003). People respect totems because they are believed to be related to them spiritually.

In the context of biodiversity conservation, in 11 case studies authors attributed biodiversity conservation to the respect that people had for their totems. Out of these case studies, four case studies empirically linked totems to: 1) the utilization of biodiversity resources from inside and outside protected areas [2 case studies], 2) the conservation of plant species outside a protected area [1 case study], and 3) the conservation of animal species inside a protected area [1 case study].

From the literature reviewed, it was found that in some African traditional societies it was unlawful to hurt or kill totems. It was also unlawful for a relative such as a husband, from a different tribe to hurt the totem of a wife. The Bakwena people of Kalahari protected the crocodile as their totem, so antelopes that the crocodile preferred as food were never hunted. It was feared depriving their totem its food (Murombendzi, 2003). Although the totem of the Batloung people of Botswana was an elephant, they regarded the rhinoceros and the hippopotamus as cousins of the elephant and protected them as well (Murombendzi, 2003). Totems were viewed as family members, and traditionally people believe that they shared ancestral blood of the kindred. Hurting a totem was like hurting the ancestors of the community (Magelah *et al*., 2007). Based on beliefs against killing or hurting totems, it is said (Murombendzi, 2003) that totems played a significant role in biodiversity conservation.

Before implementing community-based conservation of biodiversity in national parks through totems, investigations are required on various issues. Some of the questions that were not answered in the literature reviewed but would need critical analysis and answering include;

(a) Are totems still popular and respected among community members today? Based on changes that have occurred in African communities, some totems may no longer be popular or respected in many Africa communities. Conservation through totems may not be possible in some communities because those communities, especially where traditional practices are perceived as backward, would fear impoverishment and marginalization (Dikirr, 2008).

(b) Do people (especially the young generation) in various African communities know their totems and totems of their close relatives? For example, non-hunters in a situation where meat is purchased from the butchery or consumed in hotels may not know whether the meat is of their "totemic" animal or not. For instance a totem of one clan called "*abacweezi*" in western Uganda is called "*Obusito*" (which means a pregnant cow). People from that clan are neither supposed to kill a pregnant cow nor eat meat from that cow. If such a cow is killed by people who do not regard "*Obusito*" as their totem and take its meat to a butcher, it is unlikely that buyers will first ask whether the cow was pregnant or not. Therefore, since bush meat hunting in Africa is also for commercial purposes, hunters may continue killing animals which are not

their totems, or even kill and sell meat from their totemic animals if the totem only prevents eating the meat of a totem but not killing it.

(c) Are totemic plants and animals still available in communities where they were respected? Some totems may be among animal or plant species that are extinct, rare or threatened. In Ghana, for example some of the totems such as the Crested Porcupine, the elephant, and the leopard are very rare (DeGeorges and Reilly, 2009). This may make the implementation of community-based conservation schemes based on totems difficult.

(d) How could biodiversity be conserved based on totems that are not plants or animals? In Uganda, the "*Bagahi"* clan has a totem called "*Amalegyo*" (rain water dropping from the roof of a grass thatched house). Such a totem may not be a basis for proposing community-based conservation of biodiversity since it does not involve respecting a plant or an animal.

These points of view suggest areas for empirical research into how totems could be incorporated in the conservation of biodiversity among communities that still cherish those totems. Possibly, such research could assess how plant and animal totems in communities where they are still respected could form "totemic groups" (groups formed by people with similar totems) and how as a group they could protect their totems and the habitats of totems. This, however, will not protect non-totemic plants and animals.

3.3.1.6 Taboos

The term "taboo" originated from a word "*tabu"*, in a language called Tongan, which is spoken on the island of Tonga by aboriginal populations (Radcliffe-Brown, 1965; Zavaleta, 1999). "Taboo" refers to interdictions or prohibitions on particular types of behavior and situations (Durkheim, 1965).

In the context of biodiversity conservation, 32 case studies provided various examples of taboos that they believed could have facilitated biodiversity conservation in traditional communities. Ten of these case studies were empirical, linking taboos to: 1) the utilization of biodiversity resources from inside and outside protected areas [4 case studies], 2) the conservation of a landscape outside a protected area [1 case study], 3) the conservation of plant species outside a protected area [1 case study], 4) the garnering of support from local people for the conservation of biodiversity in a protected area [2 case studies], 5) the conservation of animal species outside a protected area [1 case study], and 6) the conservation of plant species inside a protected area [1 case study].

Some examples of taboos found in the literature reviewed were reported among Kung Bushmen. It was a taboo for a Kung Bushman to eat or sleep with his wife a day before hunting because this would make his "poison" (on his arrows) become cold (Hinz, 2003). When an unmarried boy went to hunt, it was a taboo for his mother to engage in sexual activities until he had killed an animal (Hinz, 2003). It was also a taboo for wives of hunters to quarrel or sweep the house or do needle work a day before

their husbands went to hunt until they returned. Among the Uukwambi of Namibia, killing female animals or killing more than two animals per hunting group were taboos (Hinz, 2003).

Apart from taboos that governed hunting, African traditional communities are said to have had taboos that governed access to other resources. DeGeorges and Reilly (2008) provide over twenty taboos that governed resource access and utilization in northwestern Congo Brazzaville and Southeastern Cameroon by the Baka Pygmies.

The examples of taboos found in the literature reviewed show that taboos were prescriptive and prohibitive measures on resource use. For example, it would be unlikely for all wives of all hunters who wanted to go for hunting not to quarrel or sweep the house or do needle work a day before their husbands went to hunt until they returned. This means the number of hunters going to hunt at a particular time would reduce and hence ease pressure on animas to be hunted. Also a taboo among the Uukwambi of Namibia against killing female animals could have served to reduce the likelihood of killing particular animals. In the empirical example by Saj, Mather & Sicotte (2006), taboos associated with hunting successfully conserved two species of monkeys (the Campbell's monkey and the ursine black and white colobus monkey) in Central Ghana in Boabeng-Fiema Monkey Sanctuary because all the hunters respected those taboos. Some taboos were only broken during famine. Given that taboos were broken during famine, they might have served to conserve resources for emergencies (Shipton, 1990).

There are various concerns about the applicability of taboos in the conservation of biodiversity in the current African context. The protection that taboos may accord to biodiversity is often to just one species and does not extend to other species and their habitats. This was observed in a study by Saj *et al*. (2006)**.** Taboos are more likely to be applied successfully in the conservation of biodiversity in communities where there is a range of taboos extending to every species and their habitats than in communities where there are few taboos which protect only a few species.

Secondly, taboos are not accepted in conservation because conservationists view them as outside the realm of conservation science. Scientists regard taboos as spiritually based, superstitious and fatalistic (Snively & Corsiglia, 2001) and yet some taboos could have a scientific foundation. For example, one hunting taboo in Zimbabwe prohibited hunting to be done at particular times of the year. Those particular times of the year were October and November, and they coincided with the period immediately after the mating season of those animals (DeGeorges & Reilly, 2008). Therefore, hunting during those periods was restricted to prevent killing animals that could have been pregnant but not yet visibly so. Another example is based on the legend of Nyaminyami (DeGeorges & Reilly, 2008). In Nyaminyami, a type of fish with a serpent-like head was believed to control the flow of the Zambezi River and people were thus allowed to fish only what they could carry. Fishing more than what one needed resulted in fish rotting before the person got home. Therefore, people fished from Nyaminyami the exact amount that they needed at a particular time. This ensured that the over exploitation of resources would be prevented which allows the regeneration of Nyaminyami. These

two examples described are in line with the ecological concept of "sustainable resource use" to ensure a continuous supply of resources as it is known in the conventional conservation approaches.

3.4 ANALYSIS OF CHARACTERISTICS OF AFRICAN TRADITIONAL COMMUNITIES IN THE CONTEXT OF BIODIVERSITY CONSERVATION

In this review there were 24 case studies in which authors described the characteristics of traditional African communities and how these characteristics were likely to influence biodiversity use and management. These characteristics included simple life style, limited technology, and low human population densities.

3.4.1 Simple life style

Traditional African communities lived a lifestyle that put light demands on natural resources and hence left biodiversity relatively intact (DeGeorges and Reilly, 2008). Resource exploitation in traditional societies fulfilled immediate consumption needs and was not commoditized (Carruthers, 1995). Wildlife products were for barter trade and not cash trade that would have otherwise depleted wildlife populations.

From the publications reviewed there was no evidence that living a simple life style and relying on subsistence means to survive in African traditional communities was deliberately intended for conservation of biodiversity. Prior to the industrial revolution, people's life styles not only in Africa but also in Europe were dictated by the conditions of the time. For instance, transport systems were underdeveloped, and so it was difficult to move from place to place to engage in activities such as tourism and trade that impact on life style. There was no cash trade (for example agriculture was mainly for subsistence purposes) and barter trade was also limited. Goods produced by local people were distributed within the locality in which they were produced.

Changes in traditional life style in Africa occurred following the industrial revolution. Although the industrial revolution happened in Europe, the effects of that revolution affected Africa through European colonialists because most of the countries in Africa were still under imperialism. Currently, conservation of biodiversity is driven by both political and capitalistic factors (Collinson, 2006; Durning, 1991). The conservation agenda of governments and local communities are currently driven by capitalism (Economic Commission for Africa, 2001). Resource harvest and use is not any more entirely for subsistence purposes but largely for development and economic prosperity. It is doubtful whether change from current modern life style back to traditional African societies is possible in most Africa communities. Unlike people in traditional African communities, currently local people in African rural villages are subsumed into materialism and exhibit differing individualistic development motivations (Durning, 1991).

3.4.2 Use of limited technology

The application of limited technology in African communities prevented over exploitation of resources. The application of limited technology in this context means using simple tools such as spears and not guns for harvesting resources. Traditional African hunting gear such as poison, crossbows, bows and arrows, spears, nets, traps, snares, pitfalls, assegais, axes, and clubs compared to technologically advanced firearms were relatively inefficient (Mackenzie, 1988). People in traditional communities did not use guns to hunt, did not have electric saws to cut trees and they did not use graders to clear land for agriculture (Mackenzie, 1987). Resources were not extracted extensively due to use of limited technology.

Evidence from the publications reviewed does not support the view that limited technology was deliberately used in African communities to limit extensive harvesting of resources. Prior to the invention of machines, much of the work was done manually. In order to ease work, people in traditional communities invented simple tools, but this was not likely to have been dictated by the need to conserve. Evidence shows that kings in African traditional societies exchanged guns from early explorers in Africa for land. Also on the advent of the industrial revolution, people adopted more sophisticated technology (Basil, 1994). This indicates that there was a desire more sophisticated tools among people in traditional communities, which could have had unintended consequence for conservation of biodiversity.

Although advancement in technology is commendable for enabling conservationists to study species and propose biodiversity conservation options, it also poses risks to biodiversity. Some of the major environmental global concerns are global warming, ozone layer depletion, and pollution. These global environmental concerns are directly or indirectly linked to advancement in technology. Technology, has, for instance, led to manufacture of machines which are often used to clear vast areas for commercial agriculture, and production of waste that causes environmental pollution.

Advancement in technology is often an indicator of economic development of countries. Currently as a strategy for sustainable development, some African countries such Senegal, Morocco, Madagascar, Egypt, South Africa and Tunisia have initiated technology parks programmes. Countries therefore may not be willing to deliberately halt advancement in technology for the sake of biodiversity conservation. Discussion about reconciling advancement in technology, sustainable development and biodiversity conservation is contentious. A general agreement among conservationists is that there cannot be advancement in technology, development and conservation on the same area at the same time.

3.4.3 Low human population

None of the 24 case studies provided empirical evidence linking low human population with biodiversity conservation. It remains doubtful whether people in African traditional communities

maintained a low human population deliberately to conserve biodiversity. Before 1940 human population in the whole world, not only in Africa, was lower. Before 1940 the human population was one billion but by the year 1995, the population was over 5 billion (Lomborg, 2001). Low human population in Africa could have been as a result of a high mortality rate due to a number of factors.

Prior to 1940, there was a lower income, higher prevalence of various diseases, higher incidence of famine and many natural calamities (Lomborg, 2001). These factors could have restricted human population increase, suggesting that a low human population was not a result of deliberate effort by people in African traditional communities to conserve biodiversity. Trends show that the human population started increasing in the 1950s. In 1900 the average life span both in the developing and the developed world was 30 years but with improved living conditions, medicine, sanitation and general economic prosperity the death rate fell, which has resulted in an exponential increase in human population (Lomborg, 2001).

Population ecologists demonstrate that population size is a function of birth rate, death rate and the number of individuals in the original population (Audesirk & Audesirk, 1996). Population size is regulated by a number of factors such as the age at which individuals reproduced, the average frequency with which reproduction occurred, the average number of offspring produced by an individual, the reproductive life span of people (Audesirk & Audesirk, 1996), and the average death rate of people in the African traditional societies would be required. A convincing case about traditional biodiversity conservation through deliberate efforts to keep the human population low requires information on these factors. Could traditional communities have put these factors into account to deliberately maintain a low human population?

Low human population could more parsimoniously account for the equilibrium between people and natural resources in some African traditional communities than deliberate intentions to conserve biodiversity. This is because few people lived amongst abundant resources. In such a situation, equilibrium between resource gatherers and resources could occur without resource users being motivated towards conservation. Winterhalder, Baillargeon, Cappelletto, Daniel & Prescott (1988) used computer simulations of human predator and prey interactions to show that foragers and their resources can reach population equilibrium in the absence of any conservation behaviour. They argue that conservation involves motivation and restraint for resource use. They concluded that low human populations living among profuse resources do not appear to overexploit these resources, but that this is not evidence of deliberate conservation practices.

Low human populations could harvest in a wasteful, yet sustainable, way providing resources are abundant (Alvard, 1994). As long as hunters are killing animals at a rate that is less than the net productivity of the prey they are hunting, they appear to be hunting unrestrainedly in a sustainable manner. Such a type of conservation is described as "*epiphenomenal conservation"* (Hunn, 1982).

Even if people in African traditions had deliberately maintained a low population in order to conserve biodiversity, the *status quo* of Africa shows that such a strategy is no longer feasible for the conservation of biodiversity in national parks. According to the United States Census Bureau, Africa is the second most populous continent in the world, with 840 million people representing 12% of the world's population. Africa is the continent with the highest rate of population increase at 2.7 percent per annum (Economic Commission for Africa, 2001). At the turn of the twentieth century, the human population in Africa was only 118 million people but by 1999 it had reached 778.4 million people and is expected to increase to 14.53 billion by the year 2025 (Economic Commission for Africa, 2001). The average human population density in Africa in 1950 was 7 people per km^2 but in 1995 it had increased to 24 people per km^2 and by 2050 it is projected to be 46 people per km^2 (Economic Commission for Africa, 2001). Population growth and density are expected to continue increasing exponentially especially in central Africa.

Human population dynamics coupled with change in people's attitudes, and cultural values affect land tenure and use of natural resources in Africa (World Health Organisation, 2004). The settlement type of a particular community can have an influence on the demographic behaviours such as fertility; mortality; migration; and nuptiality of community members (Collinson, Kok & Ganenne, 2006). Currently, high human population densities near protected areas account for the persistence of threats to biodiversity conservation (Metzger, Sinclair, Hilborn, Grant & Mduma, 2010; Warui, Makonjio & Ekajul, 2007; Wilkie, Carpenter & Zhang, 2000).

From these points of view, it is unlikely that people surrounding national parks in Africa can deliberately keep a low human population, live a subsistence life style and use simple tools to harvest resources from parks, in an effort to conserve biodiversity.

3.5 CONCLUSION

In this chapter, the aim was to review current literature on the role of traditional ecological knowledge in biodiversity conservation in Africa. The review has revealed that most of the current literature that links traditional ecological knowledge and biodiversity conservation in Africa is not empirical. It is based on historical accounts and "*logical*" arguments about how people in traditional communities could have sustainably used natural resources. Such arguments cannot be relied upon to propose strategies in sustaining biodiversity in national parks. There are demographic changes in African communities which make traditional ecological knowledge and traditional biodiversity conservation strategies inapplicable even if they are intentionally implemented for conservation purposes. A few of the case studies that attempt to demonstrate the relationship between traditional ecological knowledge and biodiversity conservation did not indicate whether traditional ecological knowledge led to sustainable utilization of resources or not.

Based on this investigation, it can be concluded that there is currently a lack of understanding of how traditional ecological knowledge is linked to biodiversity conservation, and more specifically in the

already established national parks. Research into how traditional ecological knowledge influences resource use by local people neighbouring national parks is recommended. Key issues that require further understanding on the role of traditional ecological knowledge include:

a) Is traditional ecological knowledge of the local people adequate to effect biodiversity conservation? Biodiversity conservation requires knowledge about status of the species and the threats that species face (Section 3.1.4). For example, do local people who respect certain totemic plants and animals understand the link that their other activities may indirectly affect their totemic animals and plants?

b) What is the source of knowledge about biodiversity that local people have? Is it acquired through experience and can it be documented? Knowledge acquired through research and documentation is recommended for making decisions about biodiversity conservation (Given & Norton, 1993). This is because such knowledge can be verified by independent experts.

c) Does traditional ecological knowledge lead to pro-conservation behaviour? Knowledge about the environment and its resources does not guarantee prudent use of resources. Traditional knowledge could be a driver of unsustainable use of resources from protected areas (Kay, 1990) as much as it could inform national park managers on the ecology of some resources in the park (Henn, Ostergren & Nielsen, 2011).

d) For how long will traditional beliefs and structures said to effect biodiversity conservation be sustained in African communities in the face of modernity?

The information obtained by investigating such issues could be a basis for proposing better community-based conservation programmes in national parks in Africa. More specifically, the investigation of such aspects in the Rwenzori Mountains National Park that faces problems as explained in Chapter 1 is important to identify the underlying causes of the problems. A theoretical foundation for investigating these problems is presented and discussed the next chapter (Chapter 4).

CHAPTER 4

A CONCEPTUAL FRAMEWORK FOR INVESTIGATING PROBLEMS ASSOCIATED WITH THE CONSERVATION OF BIODIVERSITY

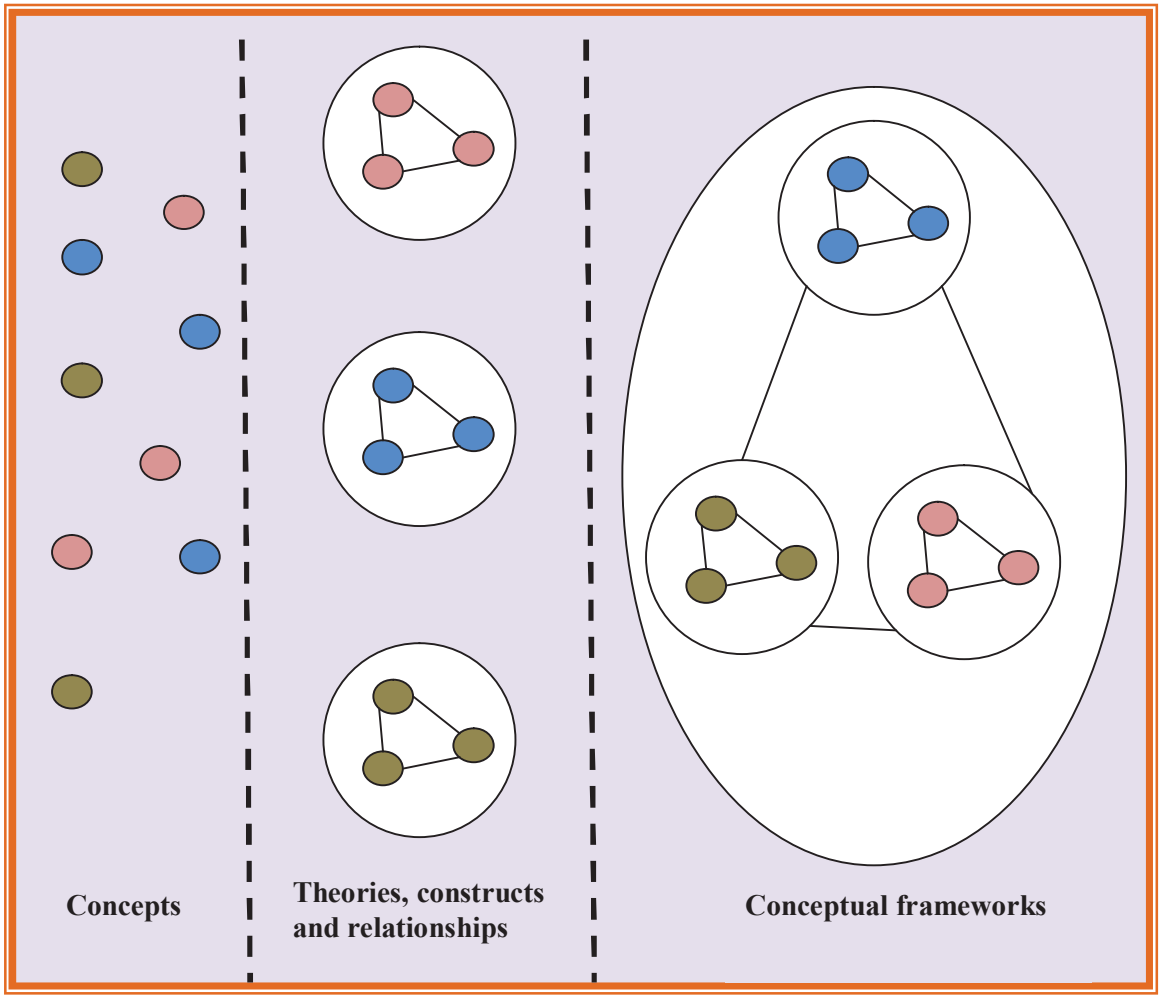

Figure 4.1 A diagrammatic presentation of the link between concepts, theories, constructs, and conceptual frameworks.

OVERVIEW OF THE CHAPTER

Conceptual frameworks play a vital role in research, spelling out the constructs important in the research area, and the relationships between the constructs. An understanding of the constructs which underpin the research provides researchers with a framework which enables them to understand when, how and why particular phenomena occur. Depending on the type of research, this either allows them to make reasoned predictions which can be empirically tested during the research or gives direction for the research if it is open-ended and exploratory. Such frameworks not only guide the questions asked and the design of the research but also help to interpret the data. If the situation being investigated is very complex, involving numerous interlinked variables, it is often difficult to identify a single conceptual framework that is suitable for a particular study. This chapter uses the case of human behavioural problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park to show how a conceptual framework to investigate a complex situation was developed.

4.1 THE IMPORTANCE OF CONCEPTS, THEORIES, AND CONCEPTUAL FRAMEWORKS IN ACADEMIC RESEARCH

Researchers cannot begin their work without an understanding of the concepts being investigated, or an understanding of the generalizations which have emerged from previous research. Researchers usually start their research projects by thoroughly reading the literature about the concepts relating to the research and how these concepts are interlinked to form bigger ideas called constructs. Such constructs and their interrelationships may be presented in the form of a theory, which Kerlinger (1986, p. 9) explains as "a set of interrelated constructs, definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting the phenomena". Maxwell (2005) argues that all research designs require "some" theory or conception of the phenomena under study even if it is based on commonsense, to guide decisions on the design researchers make which is put together as a conceptual framework for the study.

Researchers often identify with a particular view point which influences the research they conduct (Ingelse, 1997). Although conceptual frameworks provide a new way of seeing things, their purpose goes beyond just understanding the issues being investigated (Wellington, 2000). They provide explanations, allowing for understanding, prediction, and analysis of issues emerging from research (Kerlinger, 1986). Such frameworks influence what researchers notice, coloring their perceptions and hence their decisions. Researchers use conceptual frameworks to provide a rationale for their work, and, according to Caliendo and Kyle (1996), this is what distinguishes scholarly work from journalism. More importantly, according to Maxwell (2005), one of the four sources that researchers use to develop conceptual frameworks are concepts found in the existing literature and research.

A conceptual framework is defined as "a visual or written product, one that explains, either graphically or in narrative form, the main issues to be studied, the key factors, concepts, or variables and the presumed relationships among them" (Miles & Huberman, 1994, p. 18). The terms "conceptual frameworks" and "theoretical frameworks" are often used synonymously in literature

(Jabareen, 2009; Maxwell, 2005.). For consistence, the phrase "conceptual framework" is used in this chapter.

The importance of conceptual frameworks in research has been extensively documented in literature. Conceptual frameworks enable researchers to form a foundation for their points of view and to critique other researchers when reviewing literature (Tuckman, 1999). Conceptual frameworks also influence the steps researchers go through while investigating a particular problem (Sekaran, 2000), and in guiding the choice of a suitable research design (Camp, 2001). In addition to their explanatory power, conceptual frameworks have predictive value, which helps researchers to make logical predictions and thus ask appropriate research questions (Wellington, 2000). Conceptual frameworks are also vitally important in providing direction for interpretation of the data (Elliott, 2005; Radhakrishna, Yoder & Ewing, 2007). A well articulated conceptual framework allows readers to see the assumptions which underpin the research, as well as whether the subsequent links between questions, design, and analysis of data are logical and cohesive (Caliendo & Kyle, 1996), hence enabling readers to judge the quality of the work.

4.2 LOCATING A SUITABLE CONCEPTUAL FRAMEWORK

When research involves a situation that is complex, a multitude of interlinked variables in the problem that researchers are investigating often make it difficult for them to find a single theory or conceptual framework to underpin their particular study (Abd-El-Khalick & Akerson, 2007). In such a situation these authors claim that researchers take varying options depending on the type of research. Some researchers simply describe a number of disconnected concepts or theories which are relevant to their research. Other researchers link various concepts or theories together into a single but multifaceted web of ideas in an effort to form a unified framework to guide their study. And other researchers choose a theory that is not entirely appropriate or adequate, and build on it until it is a satisfactory framework to guide their research (Abd-El-Khalick & Akerson, 2007). However, a number of steps need to be taken to develop a single concept or theory into a satisfactory framework.

4.3 AIM OF THIS CHAPTER

In addition to discussing the importance of constructs and conceptual frameworks in research, the aim in this chapter is to describe how constructs relevant to the work were identified and tied into a coherent conceptual framework and used to investigate a complex problem associated with biodiversity conservation in the Rwenzori Mountains National Park.

4.4 THE CONTEXT IN WHICH THE CONCEPTUAL FRAMEWORK WAS DEVELOPED

In order to understand why a conceptual framework needed to be developed, the complexity of the situation, and the resulting number of constructs which have to be incorporated into the framework, need first to be understood.

The context of the study was discussed in Chapter 1, but highlights are reviewed here because they are important for the conceptual framework. In 1941 the central forest reserve under the jurisdiction of the forest department of Uganda deemed the conservation of the Rwenzori Mountains important because the mountains have a rich biodiversity, including rare, globally threatened, and endemic species of plants and animals (Howard, 1991). The area is a fragile ecosystem prone to degradation due to increase in human population in the mountains (Plumptre *et al*., 2003) (Chapter 1).

Prior to 1941 the entire Rwenzori Mountain area was accessible to the local people. Whether or not local people had a mechanism for conserving biodiversity in the Rwenzori Mountains is a matter for debate and an issue beyond the scope of this chapter. It has been presented and discussed in Chapters 8 and 9. In 1941 part of the Rwenzori Mountains was designated as forest reserve (McCall, 1996). Hunting of animals and harvesting of timber in the reserve were prohibited, but traditional activities such as medicine collection, use of footpaths in the reserve, and performance of traditional rituals in some areas of the reserve were permitted (McCall, 1996). In 1991 the conservation status of the forest reserve was upgraded to a national park, and the boundaries of the forest reserve were extended to create the Rwenzori Mountains National Park. More stringent controls over the use of the resources in the park were put in place. Access to resources in the park was declared illegal, and the use of footpaths in the park that enabled local people to access different areas in the mountains was prohibited (Tumusiime, Vedeld & Gombya-Ssembajjwe, 2011).

Despite these rules, a number of practices, although now illegal, continued to occur which countered efforts to conserve the park. Some of the illegal practices included the harvest of park plant resources by the local people (Loefler, 1997). Communities bordering the park resisted the attempts by the administration of the park to prevent the illegal activities in the park (Rwenzori Mountains Environmental Conservation Education Strategy, 2004; Tamale & Nzirambi, 1996). The resistance was caused by a conflict of interests between the local community for the need to access resources in the park and the administration of the park for the need to conserve biodiversity in the park.

In order to address these problems the Rwenzori Mountains National Park administration implemented community-based conservation initiatives. These initiatives included implementing environmental education programmes, giving 20% revenue from tourism to the local people for infrastructural development, giving jobs to poachers who voluntarily surrendered to the park staff, and allowing some local leaders to be part of the Park Management Committee (Rwenzori Mountains Environmental Conservation Education Strategy, 2004). Collaborative resource use agreements were also implemented in some parishes neighbouring the Rwenzori Mountains National Park (Tumusiime *et al*., 2011).

However, recent studies (Ernst, 2011; Tumusiime *et al.*, 2011) have reported that despite these initiatives local people have continued to oppose rules governing access and utilisation of resources in the park and have clandestinely conducted illegal activities in the park. Local people have encroached on the park land for cultivation (Ernst, 2011). There are some social tensions among ethnic tribes in

the area that arose as a consequence of establishing the Rwenzori Mountains National Park (Ernst, 2011). The establishment of the national park has led to income disparity among the people neighbouring the park and those in faraway areas, and limited attainment of development goals by the majority of the people close to the park (Ernst, 2011). These and other problems explained in Chapter 1, mean that the biodiversity in the Rwenzori Mountains National Park could be at risk. Before the problems can be addressed, their nature, extent, root causes and the context in which they occurred needed to be fully investigated.

A conceptual framework to guide an investigation into these problems was therefore needed. This is because the problems associated with biodiversity conservation in the Rwenzori Mountains are multifaceted and associated with interactions and relationships among people, in this case the local community and the park staff. As explained in Chapter 2, factors responsible for the success and failure of conserving biodiversity in national parks in Africa in various contexts were found to be socio-economic and cultural in nature. Despite this, the conservation of biodiversity in national parks has been the domain of scientists who aim to understand the biology of species and habitats they wish to conserve, and yet the sustainable use of resources is a confluence of socio-cultural, economic, and ecological factors (Figure 4.2).

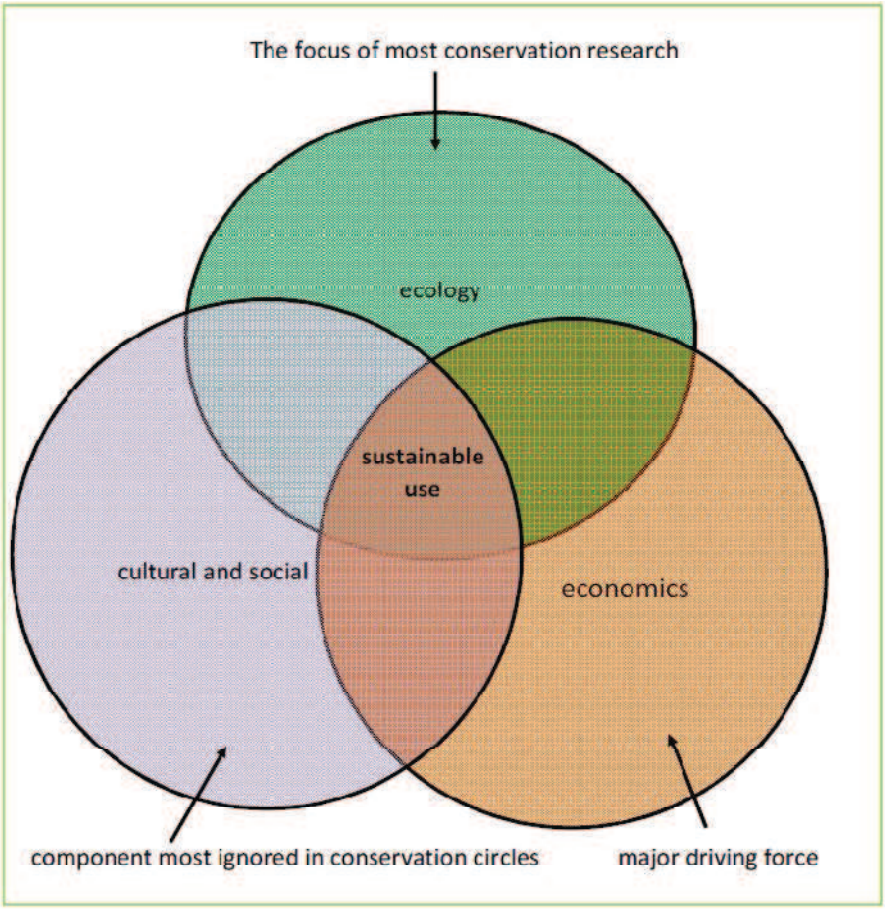

Figure 4.2 The confluence of socio-cultural, ecological and economic factors in sustainable resource use. (adapted from Martin, 1994**).**

Although it is essential to understand habitats and species, this understanding alone is not enough for successful conservation, given that problems associated with conservation of biodiversity in many national parks are social rather than ecological (Newing, 2011). In conservation theory and practice, social issues in biodiversity conservation are fragmented and not well understood (Newing, 2011). Approaches often used in biology to investigate problems associated with biodiversity conservation may not be feasible in investigating social problems impacting on biodiversity conservation initiatives in national parks."*The dominant approach in natural sciences is to come up with a hypothesis and then design a way to 'prove' (or at least 'test') it"* (Newing, 2011, p. 5). Although hypothesis testing encourages clear thinking and understanding of a situation by breaking complex phenomena into their components, it may not be feasible in research that involves social issues. It is impossible to break the "*social world*" into a set of discrete, tightly defined elements which will behave in predictable ways. In the social world, things are interlinked and if they are to be understood, they must be studied in that way (Blaikie, 1993). This makes the investigation of problems in the Rwenzori Mountains complex, necessitating a holistic approach. That is why developing a conceptual framework that would direct an appropriate investigation into these problems was important.

4.5 THE PROCESS OF DEVELOPING THE CONCEPTUAL FRAMEWORK

Due to the complex nature of problems in the Rwenzori Mountains National Park, it was not possible to locate a suitable existing conceptual framework to guide the research into the identified problems and to facilitate adequate explanation of the data. However, because the conservation problems in the Rwenzori Mountains National Park were social and closely associated with human behaviour, psychological theories explaining factors that influence human behaviours were considered to be useful as a starting point to develop a conceptual framework to guide the investigation into these problems.

Various psychological theories attempt to identify and explain factors that influence human behaviour. Some of the commonly encountered theories include; the environmental citizenship behavioural model (Hungerford & Volk, 1990), the value belief norm model (Stern, 2000), the reasonable person model (Kaplan, 2000), systems thinking, described by Checkland (1993), significant life experiences (Chawla, 1998), the theory of planned behaviour[5] (Ajzen & Madden, 1986), the elaboration likelihood model of persuasion (Petty & Priester, 1994), motivational theories such as Maslow's hierarchy of needs described in Decker, Brown & Siemer (2001), stages of change

[5] The use of the spelling "behavior" rather than behaviour as used else where in the thesis is consistent with what Ajzen and Madden (1986) used when referring to direct quotes in the theory of planned behavior.

(Prochaska, DiClemente & Norcross, 1992), diffusion of innovations (Rogers, 1995), and social learning theory (Bandura, 1997). There is no single best theory among these theories, and different situations may dictate the suitability of one theory over the other.

Because the problems in the Rwenzori Mountains National Park involved anti-conservation behaviours, an understanding was required of the reasons for the choices made by the local communities, and the factors that underpin these choices. From the history of the Rwenzori Mountains and the Rwenzori Mountains National Park, local people's behavioural choices and their intention to behave the way they do are products of traditional beliefs and people's attitude towards the existence of the park as well as cultural attachment to some places in the park. This makes the theory of planned behaviour (discussed in detail in the next section) the most suitable not only as a starting point to develop the conceptual framework to guide the research, but also as a basis for identifying factors influencing conservation choices made by individuals in the Rwenzori Mountains. The suitability of the theory of planned behaviour is supported by Chao (2012) who found that the predictors in the theory of planned behaviour holistically explained variance in behavioural intentions of individuals. The theory of planned behaviour has also been used as a framework in other studies in various contexts (Borzekowski, 2011; Chen & Chao, 2011; Mahmud & Osman, 2010; Norman, 2011). In the context of this study, if the factors influencing the behavioural intentions are identified, they could be the logical targets of conservation strategies that aim to promote pro-conservation behaviour amongst local people living near the Rwenzori Mountains National Park.

4.5.1 The theory of planned behaviour

The theory of planned behaviour (Ajzen & Madden, 1986) is a theory for systematically identifying the determinants of people's behaviours. There are important terms used in the description of the theory of planned behaviour (Table 4.1).

Table 4.1 Definition of key terms used in the theory of planned behaviour. (Source: *Concise Oxford English Dictionary 11th Edition*)**.**

attitude	*A settled way of thinking or feeling.*
behaviour	*The way in which an animal or person responds to a situation or stimulus.*
belief	*An acceptance that something exists or is true, especially without proof, or a firmly held opinion or conviction.*
intention	*Conceptions formed by directing the mind toward an object.*
knowledge	*Information acquired through experience or education.*
norm	*A required or accepted standard in a particular context.*

According to the theory of planned behaviour (Figure 4.3), the immediate determinant of behaviour is the individual's intention to perform or not to perform that behaviour. Intentions are, in turn, influenced by three factors (attitudes, subjective norms, and perceived behavioural control) and each of the three factors is affected by a set of beliefs (Ajzen & Madden, 1986).

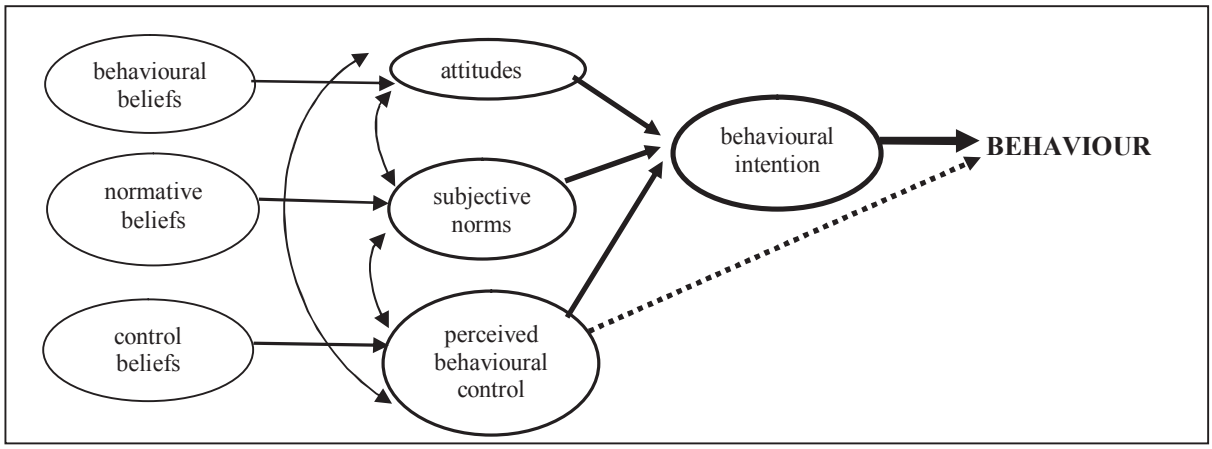

Figure 4.3 Representation of the theory of planned behaviour. (Source: Ajzen & Madden, 1986**).**

The factors specified in the theory of planned behaviour and how they are relevant to the situation in the Rwenzori Mountains National Park have been elaborated below:

- **attitudes about the behaviour** (favourable or unfavorable evaluations of the behaviour), are affected by **behavioural beliefs** (what people believe about the behaviour) (Ajzen, 1991). Attitudes and beliefs seem to be important factors to investigate to understand why individuals show particular behaviours. In the context of the problems in the Rwenzori Mountains National Park, beliefs held by individuals could affect their attitude towards the Rwenzori Mountains National Park. In this study, special focus was given to "indigenous beliefs"[6] that might affect attitudes towards the use of resources in the park. In the Rwenzori Mountains peole have strong indigenous beliefs associated with the mountains (Ogwang & DeGeorges, 1992). "*Much of their folklore revolves around the 'old man of the mountain' and his son the one legged 'Shepherd' to whom sacrifices must be made prior to the hunt*" (Ogwang and DeGeorges, 1992, p 40). People who dwell in the Rwenzori Mountains believe that resources in the mountains are owned and controlled by the mountain gods (Stacey, 2003). Such beliefs may be related to the real or perceived outcome of how resources are to be used by an individual as well as others not being in a position to make rules about collection of resources. If the

[6] The use of the phrase "***indigenous beliefs***" in the context of this chapter is based on a definition by Lindsay (1998) which refers to assumptions, theories, explanations and conclusions which local people in a specific area traditionally use as frameworks to help make sense of their experiences. Beliefs often become so ingrained, due to repeated situations that seem to "prove" their legitimacy, that people may confuse them with knowledge (Sentwali, 1997).

outcomes are unfavourable and do not satisfy the needs of the individual, then the individual is not likely to follow park rules. In this case, how the individual uses the resources is a result of the individual's beliefs about the expected benefits accruing from use of resources in a particular way.

- **subjective norms** (perceptions of social pressures to perform or not to perform a behaviour), are affected by **normative beliefs** (typical beliefs of the community or of the people important to the individual) (Ajzen, 1991). Individuals may have beliefs about the norms of their community in the Rwenzori Mountains and how the community will judge anyone harvesting resources from the park. In this context, normative beliefs are beliefs of individuals about whether people important to them or the Rwenzori Mountains National Park community in which they live approve or disapprove of them using park resources in a particular way. For example, one aspect that may influence resource use is the gender of the resource user. Men and women collect and control resources differently (Agrawal, 1997). Hunting of animals in the West African forests was, for instance, done by males and not females (Leach, 1991). Therefore, a female may not engage in hunting if hunting by a female is against the norms and values of the community in which she lives. In such a case, how an individual uses the resources is a function of social pressures on his or her way of using the resource. Therefore, if an individual in the Rwenzori Mountains believes that the community or people important to him or her approve the way he or she uses the resource, the individual is more likely to use the resource in the park in that particular way.
- **perceived behavioural control** (perceptions of whether individuals can control the behaviour), are affected by **control beliefs**, provided that individuals do have actual control**.** Individuals who feel that they are in control are more likely to perform a behaviour than those who believe that outside factors control their behaviour. In the context of the Rwenzori Mountains, beliefs of individuals about whether they are in control of the way they choose to use the resources in the park may affect how individuals use resources. Such beliefs influence the perceptions of individuals on whether they are in control of the way they use resources in the park. For instance, communities in the Rwenzori Mountains believe that before a hunt sacrifice must first be offered to the god of animals (Ogwang & DeGeorges, 1992). In such a situation the capacity of individuals to hunt is beyond theire control but controlled by a god.

4.5.2 Limitations of single theories in guiding complex investigations: A case of the theory of planned behaviour

Using existing theory as the basis for a conceptual framework has both advantages and pitfalls in research, depending on how the theory is applied. According to Maxwell (2005), one of the risks associated with using existing theory as a framework is relying too heavily, and often uncritically, on one theory. For instance, although the theory of planned behaviour is extremely useful in guiding the investigation into the problems associated with biodiversity conservation in the Rwenzori Mountains National Park, it was limited as a single theory in adequately explaining some of the conservation-

related behaviours of people in the Rwenzori Mountains. Firstly, beliefs are not the only factors that affect an individual's attitude. Knowledge acquired by individuals may also influence their attitude about a particular behaviour. For instance, when an individual acquires knowledge about the environment, that knowledge may influence that individual's attitude toward environmental protection (Jacobson, McDuff & Monroe, 2006). Relying on only one theory (the theory of planned behaviour) would mean excluding the factor of knowledge. Secondly, the theory of planned behaviour is a psychological model dealing with attitudes and beliefs in the minds of individuals (referred to in my framework shown in Figure 4.4 as the "internal milieu"). An individual's beliefs, attitudes and perceptions may not match reality, and even if they do they may not necessarily translate into behaviour. Thirdly, the theory of planned behaviour does not consider external factors (factors in the environment, referred to in Figure 4.4 as the "external milieu") which might affect behaviours. These three shortcomings mean that the theory of planned behaviour as a single theory was inadequate as a framework to guide investigations of problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park. Therefore, other concepts, factors and relationships were introduced to make a suitable conceptual framework to guide the investigation.

4.5.3 How the conceptual framework for this study was developed

In order to construct a satisfactory conceptual framework to guide the study, other factors were added to the theory of planned behaviour (Figure 4.4). Secondly, the factor of knowledge and its effect on behaviour was introduced. Individuals make decisions that govern behaviour, based on the knowledge they have (Kaplan, 2000). Knowledge acquired by individuals may affect their beliefs and thus their attitudes toward natural resource use and conservation. Knowledge of the environment and natural resources might lead to pro-conservation or anti-conservation behaviours. It would be logical to assume that if people know about the threats of degradation they would be less likely to behave in ways which result in environmental degradation. However, Levin (1993) opines that in some cases the more knowledge people have about environmental issues (especially when they know that environmental degradation has intensified), the more helpless they may feel resulting in them giving up doing anything to protect the environment. A form of knowledge that could influence behaviours of individuals in local traditional communities such as the Rwenzori Mountains could be contemporary scientific knowledge (acquired in a formal school context) or traditional ecological knowledge (acquired informally out of the school context) from the community.

Various studies (both theoretical and empirical), have shown that traditional ecological knowledge among traditional communities influences the way they use natural resources (Antons, 2010; Iaccarino, 2003; Scoones & Thompson, 1993; Watson, Alessa & Glaspell, 2003). Through traditional ecological knowledge people make empirical observations about the environment which enable them to interpret and predict it (Iaccarino, 2003).

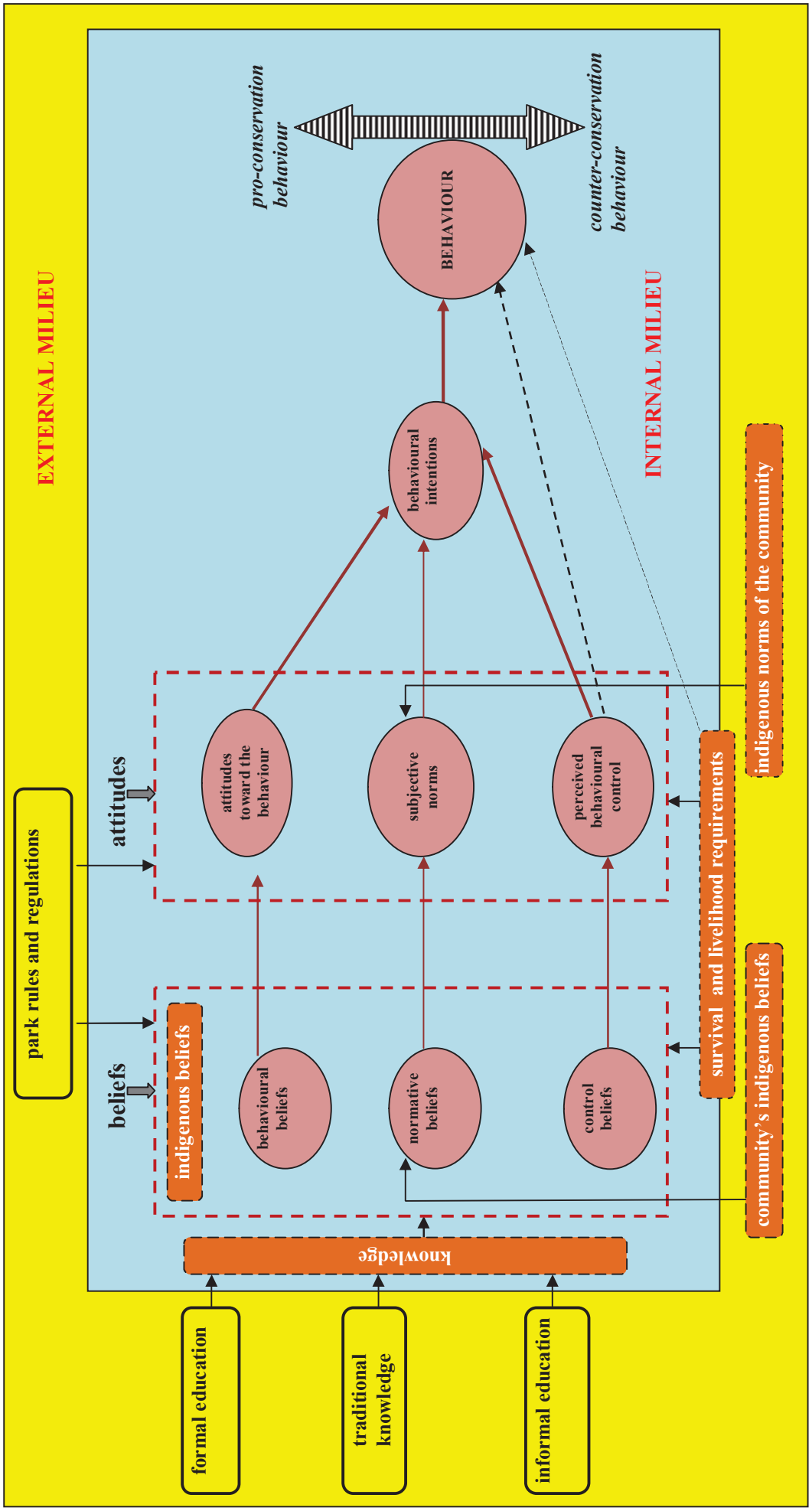

Figure 4.4 A conceptual framework for guiding an investigation into problems associated with conservation of biodiversity

Although some authors who have lived amongst the Rwenzori Mountain people (Kabananukye, 1996; Ogwang and DeGeorges, 1992; Stacey, 1996) claim that local people in the Rwenzori Mountains have traditional ecological knowledge that influences the way they use resources, I was unable to find any studies investigating the connection between knowledge and pro-conservation or counter-conservation behaviour of people living near the Rwenzori Mountains National Park. An investigation of the relationship between traditional ecological knowledge and conservation behaviour could inform conservationists about why local people use natural resources in particular ways (Foltz, 2003). Therefore, it was necessary to introduce traditional ecological knowledge into the conceptual framework.

As a next step toward constructing the conceptual framework, two factors that could potentially influence the conservation behaviours of people in the Rwenzori Mountains were added. One of the factors is the livelihood and survival requirements of the local people from the park. Various studies show that people neigbouring protected areas depend on protected resources for livelihood and survival (Fisher, 2004; Mamo, Sjaastad & Vedeld, 2007; Vedeld, Angelsen, Sjaastad & Kobugabe, 2007). However, dependence on resources from protected areas varies among individuals and communities (Velded *et al*., 2007). For instance, a study by Coulibaly-Lingani, Savadogo, Tigabu & Oden (2011) demonstrated that particular resources people obtained from forests in Burkina Faso influenced their participation in forest management programmes. Different communities and individuals have varying reasons for their dependence on protected area resources. In the Rwenzori Mountains, some local people obtain resources from the park for livelihood and survival (Tumusiime *et al*., 2011). However, the actual resources people get from the park and the reasons why people get those resources, and what factors other than lack of assets and alternate sources of income influence people's dependence on the Rwenzori Mountains National Park were not specified. For this reason, it was necessary to include the aspect of survival and livelihood requirements of local people in the conceptual framework.

The second external factor that was added to the framework was environmental education. The essence of environmental education is that people are educated about the environment. Jacobson *et al*. (2006) belive that when the people know about the environment and the services that ecosystems provide they may use the environment in a sustainable manner. Local people neighbouring the Rwenzori Mountains National Park have received environmental education (Rwenzori Mountains Environment Education Strategy, 2004). However, given that people continued to conduct illegal activities and actively resisted park rules necessitated an investigation into the nature and extent of environmental education the people had received. Based on the assumption of Jacobson *et al*. (2006), it would be expected that people in the Rwenzori Mountains would show pro-conservation behaviours toward the Rwenzori Mountains National Park staff if they had adequate environmental education. Therefore, it was also important to find out why, despite provision of environmental education to people in the Rwenzori Mountains, many still persistently conduct clandestine activities in the park that were considered illegal by the park administration.

4.6 CONCLUSION

Conceptual frameworks play a vital role in research. They help researchers to spell out "*constructs*" important in research and the relationships between the constructs. However, when the situation being investigated is complex, researchers often face a problem of locating a suitable existing conceptual framework. In such circumstances, a conceptual framework to guide the study can be constructed based on existing concepts or theories. How this was done using the theory of planned behaviour (Ajzen & Madden, 1986) as a starting point has been described in this chapter using the example of problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park.

CHAPTER 5

EXTENT OF ILLEGAL PLANT RESOURCE EXTRACTION FROM THE RWENZORI MOUNTAINS NATIONAL PARK



Figure 5.1 Some bamboo stems extracted from the Rwenzori Mountains National Park. (Photo by M. Muhumuza, June, 2009**).**

OVERVIEW OF THE CHAPTER

Studies that investigate plant resource use often target groups, and not individual resource users. In many cases, such studies do not contribute valuable information for plant resource conservation because they ignore that communities neighbouring national parks are not homogenous but composed of different people with different social statuses, different levels of development and hence with difference resource needs. Using the case of Rwenzori Mountains National Park, this chapter presents a holistic but individuated approach of assessing the extent of plant resource use by the local community. The extent of plant resource use and its implication for biodiversity conservation was analyzed by drawing on individual resource needs and the factors that influence resource use. It was found that local people extracted resources from 87 different plant species in the park. The species belonged to 41 families, and the highest percentage of species (11.5%) belonged to family Mimosaceae. The majority of the plant species (64 plant species, 73.6%) were used for both commercial and subsistence purposes. However, time trends showed that there was a gradual shift from subsistence to commercial use of resources as a result of changes in people's needs and preferences towards charcoal, timber and firewood. Eight species were found to be in high demand and considered most important by local people, and ten species were reported to be decreasing in availability in the park. Of the 21 species that were in resource use agreements signed between local people and Uganda Wildlife Authority, only 2 species were found to be among resources in demand and those considered most important by local people. Although the two species were in resource use agreements, local people did not harvest them as stipulated in the agreements. None of the species that were in high demand or considered most important or said to be decreasing in the park were found in national reports and international data bases of species of conservation concern. The implications of these findings to community-based biodiversity conservation in the Rwenzori Mountains National Park have been discussed. Information emanating from this study can be used as a basis for proposing more effective community-based plant resource conservation in a rural African context.

5.1 INTRODUCTION

Many studies have been conducted about how local people depend on national parks for plant resources (Mamo, Sjaastad, & Vedeld, 2007; Reddy & Chakravarty, 1999; Tumusiime, 2006). These studies underscore that plant resources contribute to the livelihood and survival of people who neighbour national parks. Plant resources from national parks are used for subsistence and commercial purposes (Scherl *et al*., 2004).

For subsistence purposes, plant species are used for local medicine to treat various illnesses (Frei, Baltisberger, Sticher, & Heinrich, 1998; Leduc, Coonishish & Haddad, 2006). This is important because in many rural areas there are no medical facilities (Cavendish, 2000). Plant resources from national parks also serve as food and in cases of famine they are used as a fall back for local people (Scherl *et al*., 2004). In addition to subsistence purposes, most tropical forests in national parks contribute over 50% of income to households (Vedeld, Angelsen, Sjaastad, & Berg, 2004). People living near national parks in rural areas harvest resources, such as timber for commercial purposes (Vedeld *et al*., 2004).

Local people's dependence on plant resources in national parks is often regarded by conservationists as unsustainable (Stræde & Treue, 2005). Various empirical studies (for instance Hedge and Enters, 2000; Karanth, Curran, & Reuning-Scherer, 2006) have reported that local people near national parks in rural areas, especially in the tropics, indiscriminately harvest park plant resources. In some cases, the use of resources from national parks exceeds sustainable levels (Karanth *et al*., 2006; Vedeld *et al*., 2004). Some conservationists are concerned that exploitation of resources by local people may lead to the extinction of some plant species (Mamo *et al*., 2007; Vedeld *et al*., 2004).

Although the concerns raised by conservationists are genuine, there is evidence (in some situations) to show that exploitation of resources by local people does not always lead to biodiversity loss. For instance, resource use in traditional societies and in some community conserved areas is said to be sustainable (Maffi & Woodley, 2010). There are instances where agro-forestry, even when conducted illegally in protected forests has proved to be a sustainable way of utilising protected area resources (Leb3, 2008). The presumed effect of illegal access to park resources by local communities should not be generalized but needs to be assessed on a case by case basis.

5.1.1 Plant resource extraction, extent of utilization, and planning for conservation

Plant resource extraction and utilisation has been studied by various researchers (Belcher, Cunningham, & Campbell, 2005; Freese, 1997; Mahapatra & Mitchell, 1997; Neumann & Hirsch, 2000). All these authors state that there are various factors that must be studied in order to plan for sustainable utilisation of plant species, especially those in protected areas. Ecological and social factors that affect sustainable utilisation are important determinants of successful community-based conservation (Coomes, 1995; Cunningham, 2001; Neumann and Hirsch, 2000; Ticktin, 2004). These factors have been grouped by Turner (2007) into two categories. One category comprises factors affecting availability of the plant species (which includes *population factors* such as local population density of the species, regional distribution of the species, frequency of occurrence of the species, size class distribution of the species, and external pressure on the species, and *life history factors* such as habitat specificity, age of reproductive maturity, reproductive rate, flower and fruit phenology, out-crossing, breeding system, pollination, seed dispersal, seed germination, and sprouting capability). The second category comprises factors affecting the rate of loss (which includes *the harvest* such as plant part harvested [leaf, flower, fruit, exudates, bark, root, stem, or whole plant]), the demand for the part harvested, single or multiple parts harvested, and conservation practices associated with the species harvested, and *the harvesting community* such as the number of people who harvest and the level of access that people have to various species.

This study mainly focuses on the second category of factors because they form a benchmark for community-based conservation strategies. In such strategies, it is important to first identify the species harvested by people and then investigate the factors affecting the rate of loss before studying the factors affecting the availability (which are mainly biological factors) of the identified species (Turner, 2007). Various studies (such as Lykke, 1998; Marshall & Newton, 2003; Russell-Smith,

Karunaratne, & Mahindapala, 2006) that have successfully investigated sustainable utilisation of plant species started with the identification of factors affecting the rate of loss.
The factors that affect illegal plant resource extraction and utilisation from national parks may vary with context depending on the location of the park, the nature of the surrounding population, and the economic activities of the people neighbouring the park (Marshall & Newton, 2003). This means that an assessment of plant resource use and its implication for conservation is context specific and depends on the known information about plant resource use.

In the Rwenzori Mountains National Park, various strategies such as benefit sharing schemes, and resource use agreements have been implemented in an attempt to prevent local people from accessing park plant resources (Chapter 1). However, studies show that despite these strategies, local people neighbouring the park continue to extract plant resources illegally. Although recent studies conducted in communities neighbouring the park (Tumusiime, 2006; Tumusiime, Vedeld, & Gombya-Ssembajjwe, 2011) found a correlation between environmental incomes that people obtained from resources in the park and their household assets, the specific plant resources that people obtained, the factors affecting the availability of the plant species, and the factors affecting the rate of extraction of plant resources were not documented. Without that information, it becomes difficult to propose more effective community-based conservation strategies in the Rwenzori Mountains National Park.

5.1.2 The purpose of this investigation

This investigation was aimed at identifying the plant species people obtained from the Rwenzori Mountains National Park, and determining the factors influencing the extraction of resources of those species. More specifically, parts of the plants harvested, the demand for plant parts (quantity and frequency), alternatives to the plant species harvested, the number of people who harvest resources from particular species, the level of access to the plant species, and the species that people consider most important were investigated.

The identification of species of plants harvested by local people and the factors affecting loss of those species are important for conservation because they help in planning for community-based conservation (Luoga, Witkowski, & Balkwill, 2000). Although factors affecting rate of loss of species harvested also include conservation practices associated with the species harvested (Turner, 2007), in this investigation, all the species identified were regarded as species associated with a conservation practice since they are found in a protected area. However, the species that local people are allowed to extract after signing resource use agreements and following the conditions of those agreements were pointed out.

5.2 CONCEPTUAL UNDERPINNINGS FOR THE STUDY

A person's need for resources is one of the antecedents to pro-conservation or counter conservation behaviour of that individual (Chapter 4). Various studies have demonstrated the influence of resource

needs on illegal access to national parks by local people (Malleson, 2000; Parcs Nationaux Madagascar, 2001). On the basis of the relationship between resource needs and illegal access, community-based conservation interventions have been proposed as discussed in Chapter 3. In such interventions the aim is to provide alternatives from outside parks which could be used to satisify their needs (Kasparek, 2008).

Although some community-based conservation schemes have been successful in staving off illegal access to national parks by local people (Secretariat of the Convention on Biological Diversity, 2010), in many cases, they have not worked (Butchart *et al.*, 2010). Many of the community-based strategies fail to prevent biodiversity loss from national parks because they target groups of resources users and not specific individuals (Chapter 2). Local communities neighbouring national parks in Africa are not homogenous but are composed of different people with diverse social statuses and resource needs. The new dimension that this investigation contributes to ethno-botanical studies is an assessment of the extent of resource extraction and its implication for biodiversity conservation by drawing on resource needs of individuals and the factors that influence their resource use. An investigation of this nature facilitates a better understanding of the problems associated with plant resource use and forms a basis for proposing strategies that could potentially mitigate the problems.

There is a confluence of factors that could lead to sustainable or unsustainable plant resource utilisation by individuals neighbouring national parks. For instance, species harvested, parts of the plant extracted (such as leaves, roots, and the bark), and uses of the resources obtained (such as for medicine, food and art and craft) are a function of two main factors. One factor is the local people's resource needs. For example, a herbalist could harvest the bark of *Prunus africana* for medicinal use and a craftsman may harvest the stem of *Milicia excelsa* to make a drum. The second factor is associated with a person's experiences in using particular resources. For instance, the Batwa people that initially lived in Bwindi Impenetrable Forest in south western Uganda, had experiences of preparing and consuming leaves of the wild yam and yet such knowledge was not found among the Bakiga people who lived near the forest (Byarugaba, 2010). Also, if an individual believes that a particular species of a plant has curative abilities, the individual is more likely to harvest that species of plant.

The focus in this chapter is on the influence of plant species, parts of plants extracted and the use of the resources extracted on the sustainable utilisation of plant resources by the local community. Information on species harvested, the part of the plant harvested and the use of the plant resources harvested is important for biodiversity conservation. For example, the effect of harvesting on individual plants varies with the part of the plant harvested. Harvesting of leaves, fruits or flowers has far less impact on individual plants than the harvesting of roots, bark, stems or removal of the whole plant (Cunningham, 2001). Also havesting does not necessarily lead to unsustainable use. Whether or not plant resource use is sustainable has to be analyzed beyond an individual resource user. The factors at individual level are important but sustainable or unsustainable use of resources is a composite of activities of various individual resources users (Turner, 2007). The demand for plant

resources from particular species is influenced by the amount of resources, the frequency of harvest of the resources, the number of people harvesting the resources, the purpose for harvesting the resources and whether the resource is harvested for commercial or subsistence purposes. If a particular resource is harvested for commercial purposes, there is a higher possibility that the resource is unsustainably utilised than if it was harvested for subsistence purposes (Coulibaly-Lingani, 2011). In many rural African areas, commercial resource use is triggered by a high market demand to trade in those resources or their products (Belcher, Cunningham & Campbell, 2005). The demand is related to the value that people attach to particular resources including those in national parks (Coulibaly-Lingani, 2011).

The factors that affect the level of demand for resources are fickle and not uniform across different socio-cultural and economic contexts. For instance, resource use in African traditional communities could have been sustainable because the human population was low, people lived a subsistence lifestyle, and the amount and frequency of harvest was regulated through traditional norms, beliefs and practices (Chapter 3).

In the perspective of this investigation, it was necessary that these factors are investigated. This could facilitate an understanding of problems of illegal plant resource use and the factors influencing those problems in order to plan for a more effective community-based strategy for plant resource use. The success of community-based conservation strategies is influenced by myriad interconnected factors that need to be investigated holistically (Chapter 1). In this study, the aim was to find what plant resources people need from the Rwenzori Mountains National Park and how the need influenced illegal access to the park resources.

5.3 METHODS

5.3.1 Study area

The study was conducted in villages neighbouring the Rwenzori Mountains National Park in Western Uganda. The area has a diversity of plant species associated with Afro-montane tropical environment (Chapter 1).

5.3.2 Data collection

5.3.2.1 Sampling

The focus of this investigation was on households within 5 km of the Rwenzori Mountains National Park boundary from the southwestern edge which is adjacent the Democratic Republic of Congo (DRC) border to the northern tip. Fifteen major trails traversing villages neighbouring the Rwenzori Mountains National Park and leading to the park were identified. The area between one trail and another and households therein constituted a cluster. This stratification criterion resulted in 14 clusters. Registers from offices of parish chiefs were obtained and cross-checked by local residents to

identify all the households in each cluster. The smallest cluster comprised 50 households and the largest cluster comprised 250 households. Every household was assigned a number so that all households had an equal chance of being selected. From each cluster, 10% of the households were selected using a table of random numbers. This procedure resulted in a total of 163 households. Each of the selected households was visited and respondents selected. At the household, the first chance for interview was given to the household head. If the household head was absent, the next most senior person was interviewed. This criterion of selecting respondents yielded male and female respondent of various ages (Figure 5.2), ranging from 15 to more than 75 years old. The highest number of the respondents sampled was between 46 and 50 years old. Although males were the majority (107, 65.6%), the presence of both male and female respondents in the sample addressed a concern that females are often absent and are rarely interviewed in ethno-botanical studies (Dovie, Witkowski, & Shackleton, 2008).

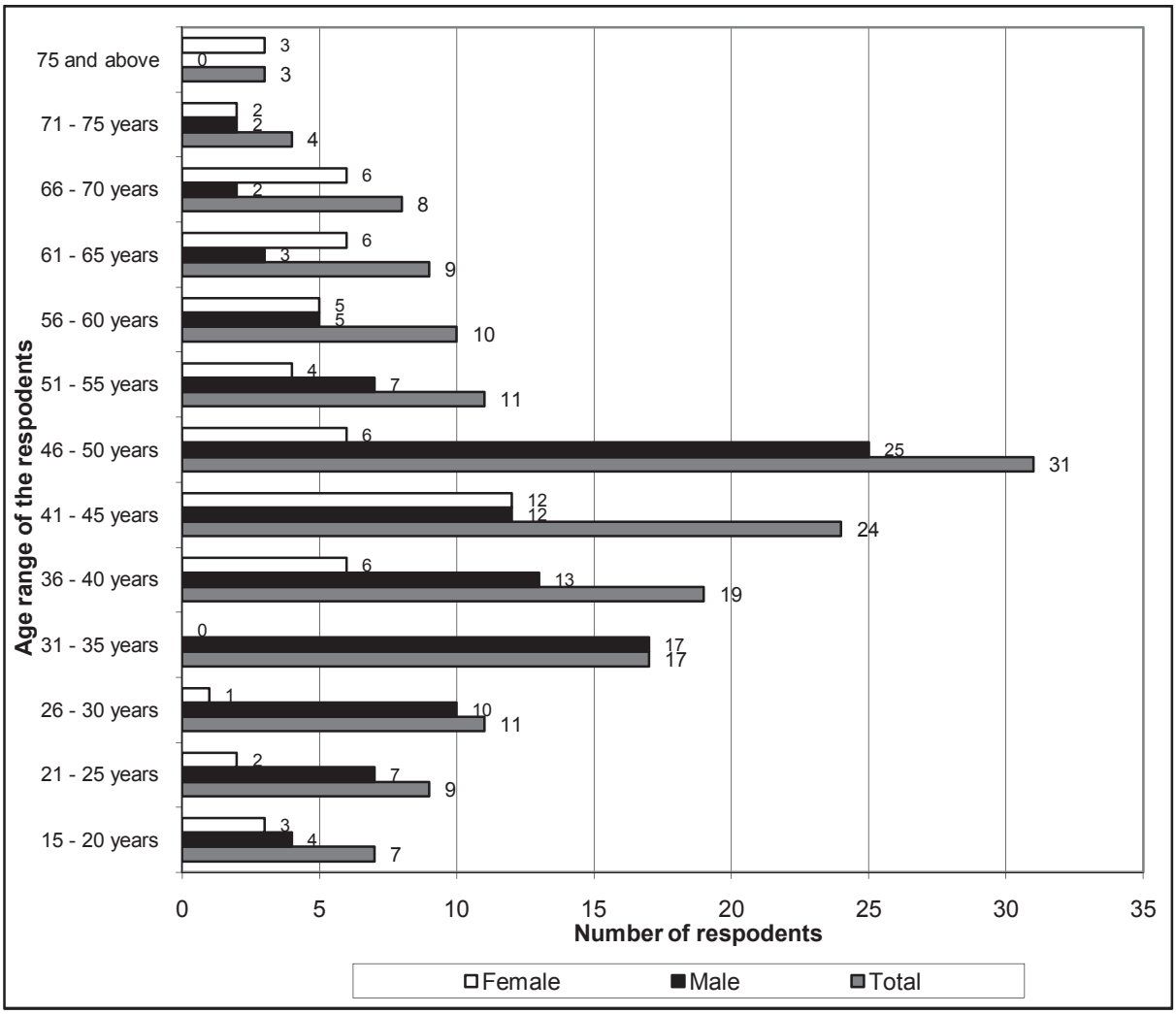

Figure 5.2 Age and gender of the respondents

The entire process of sampling and collection of data was conducted between October 2009 and June 2010.

5.3.2.2 Data collection instruments

Data were collected from respondents using a semi-structured interview schedule (Appendices 5.1 and 5.2). The use of a semi-structured interview enabled the interviewer to modify the questions during the interview to facilitate conversation, to request more explanations, and to construct more follow up questions hence enabling in-depth probing and eliciting of further information from respondents. All interviews were audio-recorded.

The respondents were asked about the species of plants they collected from the Rwenzori Mountains National Park, how often they collected those species, which specific parts of the plant species they collected, whether they collected the species alone or with other people, why they collected those species from the park, and the constraints they faced in collecting those species. Since the species were mentioned in the local language, a reference document by Katende *et al*. (1995) was used in their identification. The species that were not described by Katende *et al*. (1995) were collected by local respondents with the permission of Uganda Wildlife Authority and identified by a professional plant taxonomist at a Botanical Herbarium at Makerere University.

The plant species mentioned by respondents were grouped into families. Studies in ethno-botany often use familial value analysis to indicate which families of plants are important for subsistence or commercial uses (Phillip & Gentry, 1993). Familial values are also important in setting priorities for conservation of families of plant species (Phillip & Gentry, 1993; Prance, Ballee, Boom, & Carnaria, 1987).

It is normal to expect local people to be unwilling to divulge their illegal use of plant species but because of the way this study was introduced, the respondents were apparently comfortable and felt free to talk about their clandestine access to the park. The willingness of local people to divulge how they illegally extract resources from protected areas especially when good rapport has been established prior to interview and when people are assured of anonymity and confidentiality has been reported in other studies (Gibbi, Linkie, & Leader-Williams, 2008; Tumusiime *et al*., 2011).

In addition to the information gathered from respondents, national and international data bases and reports were consulted to obtain information about the conservation status of plant species harvested by local people from the Rwenzori Mountains National Park. The reports and data bases consulted include:

- The Uganda Biodiversity and Tropical Forest Assessment Report.
- The State of Environment Reports for Uganda for the years 2006, 2007 and 2008.
- The State of Uganda's Biodiversity Report.
- The International Union for Conservation of Nature Data Base.
- The Wood Explorer Data Base.
- The World Forest Resources Data Base.

Determining the extent of dependence (demand) of local people on the park plant resources

Most studies on dependence of local people on protected resources (Guthiga & Mburu, 2006; Shrivastava & Heinen, 2007; Shylajan, 2001; Stedman, Parkins, & Beckley, 2005) employ a Micro-site Analysis (MSA) technique to investigate park resource use by the [local] people in a specific area. These studies examine the extent and nature of dependence on protected areas by communities in relation to varying socio-economic status, ethnic diversity, high human population densities, and other demographic and geographic characteristics. The Micro-site Analysis technique was not considered suitable for this study for three reasons. Firstly, studies show that resource extraction from protected areas does not depend on the socio-economic status of households (Holmes, 2003; Marcus 2001; Newmark & Hough, 2000). Affluent household may extract protected area resources to the same extent as poor households. Therefore, it is inappropriate to determine the extent of plant resource extraction from the protected area based on the socio-economic status, which according to Newmark & Hough (2000) is itself a complex issue. Secondly, a study in the Rwenzori Mountains (Olupot, McNeilage, & Plumptre, 2009) indicated that ethnic diversity, population densities, demographic and geographic characteristics of people neighbouring the Rwenzori Mountains National Park were generally uniform across villages, parishes and sub-counties. It would therefore be unsuitable to determine the extent of plant resource extraction from the Rwenzori Mountains National Park by local people based on such characteristics. The third reason is that the Micro-site Analysis (MSA) technique helps to identify varying socio-economic factors that influence resource use but does not lead to information about the actual resources extracted from the protected area and the quantity extracted. Yet, in this investigation, the focus was on actual resources harvested and the factors influencing the harvest of particular plant resources.

Other studies that investigate resource use from protected areas by local people employ pre-determined mathematical techniques or guidelines. Some of the common mathematical techniques include: computation of the Present Worth (PW) of forest products to local people, Household Income (HI) that people accrue from forest products (Shylajan & Mythili, 2003), economic valuation of forest products and other natural resources extracted by local people (Godoy & Lubowski, 1992), and relative income from park resources as a proxy for measuring household dependence on park income (Olupot *et al*., 2009; Vedeld *et al*., 2004). Such formulae aim to examine the economic incentives or to estimate the economic value of resources from protected areas but not to determine the extent of use of particular resources, which was one focus of this study.

In Rapid Vulnerability Assessment (RVA) of plant species, the extent of dependence on plant species is often determined from the frequency of harvest of resources from species and the quantity of the resource harvested (Cunningham, 1996: Wild & Mutebi, 1996). When combined, these two variables give the extent of, or the demand for, plant resources (Wild & Mutebi, 1996).

The demand for plant resources from particular species was therefore determined using the quantity of the resources harvested of each species and frequency of harvest of resources. The quantity of the species was determined by asking people how much of each part of the plant they harvested. Categories were devised based on the quantities that people reported. The average quantity (QA) for each category was determined by adding the different quantities and dividing the total number by the number of categories of each of part extracted. The number of people (NP) that obtained the range of quantities was also determined. The weight for each category was determined by multiplying the average quantity (QA) with the number of people (NP) that obtained that quantity. The species in each category of the plant part with the highest weight for quantity were noted.

The frequency of harvest of plant species was determined by asking people how often they harvested different parts from plant species. The frequency in each category was accorded a rank (RA) (Table 5.1).

Table 5.1 Criterion for ranking frequency of harvest of plant species.

Frequency	Rank (RA)
The plant part was harvested annually	1
The plant part was harvested monthly	12
The plant part was harvested weekly	52

The number of plant species from which several parts were harvested by a given number of people (NP) was also determined. The weight for the frequency of species harvested was calculated by multiplying the rank (RA) by the number of people (NP) that obtained resources in a specified period. The species in each category of the plant part with the highest weight for frequency were noted.

The species in demand were determined by identifying the species that had high values for both Weight for Frequency and highest Weight for Quantity.

5.3.2.5 Ethical considerations

Ethics approval (Appendix 5.3) was obtained under protocol number H100303 from the human research ethics (non-medical) committee of the University of the Witwatersrand. All the participants were first informed about the purpose of the research before they were invited to voluntarily participate (Appendix 5.4). Those who agreed to participate were requested to sign or put a thumb print on the informed consent form as an indication that their consent was obtained. A potential risk that the study could bring to the participants was that if the participants were identified they could be prosecuted by the park authorities. However, confidentiality of the respondents was ensured though the use of a coding system where interviewees cannot be identified, because the code “key” was only known to the researcher.

5.4 RESULTS

The needs of local peoples determined the type of plant species they harvested from the Rwenzori Mountains National Park, the part of the plant they harvested and the uses of the resources they harvested and consequently had implications for biodiversity conservation.

5.4.1 Species of plants in the park from which resources were illegally extracted

Respondents revealed 87 plant species belonging to 41 families from which they illegally extracted resources (Figure 5.3). Sixty-four plant species (73.6%) were used for both commercial and subsistence purposes, and 23 plant species (26.4%) were used for subsistence purposes only. English names, scientific names and local names of the species extracted and uses of those species were recorded (Appendix 5.5). The resources that respondents harvested constituted both timber and non-timber forest products. Family Mimosaceae contributed the highest number of species harvested (10 species) followed by family Meliaceae (9 species) and family Euphorbiaceae (8 species) (Appendix 5.5).

Twenty one respondents revealed that they sometimes did not obtain resources from plant species in the park but from 9 species located on their private land. The 9 species included: *Acacia sieberiana, Aningeria adolfi-friedericii, Cordia africana, Entandrophragma utile, Faurea saligna, Khaya anthotheca, Macaranga kilimandscharica, Olea capensis,* and *Parkia filicoidea*.

Some people harvested plant resources individually (Figure 5.4) and others in a group. For example, 33 respondents said that they individually harvested stems of 12 different species of plants. Also, 21 respondents said that as a group of 3, they harvested leaves from 20 species of plants.

Some reasons given as to why some respondents harvested in a group and others individually were cultural (associated with people's beliefs) as explained in Chapter 8 and other reasons were based on the amount of the resource required. For instance, leaves for fodder were required in higher amounts so their harvest was mainly done collaboratively.

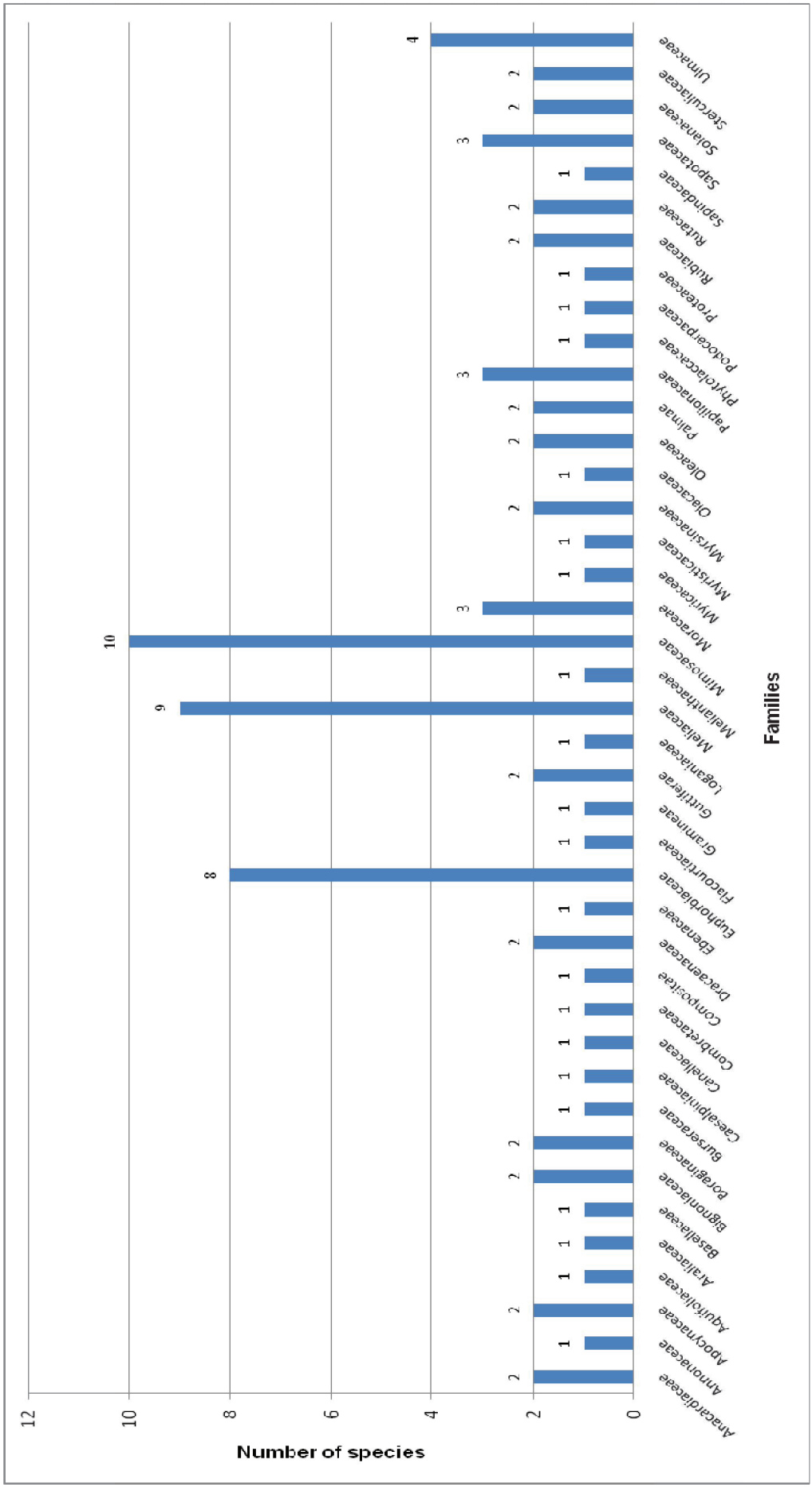

Figure 5.3 Families of plant species from which resources were extracted by the people and the number of species in each family.



Figure 5.4 A local resident carrying a trunk from the Rwenzori Mountains National Park that he individually harvested. (Photo by M. Muhumuza, June, 2012**).**

5.4.2 Parts of the plants harvested and their uses

Respondents harvested stems from 58 species of plants, leaves from 36 species, and inner wood from 1 species (Figure 5.5). Multiple parts were harvested from some species. For example five different parts (the stem, root, bark, fruit, and leaf) were harvested from *Tamarindus indica*.

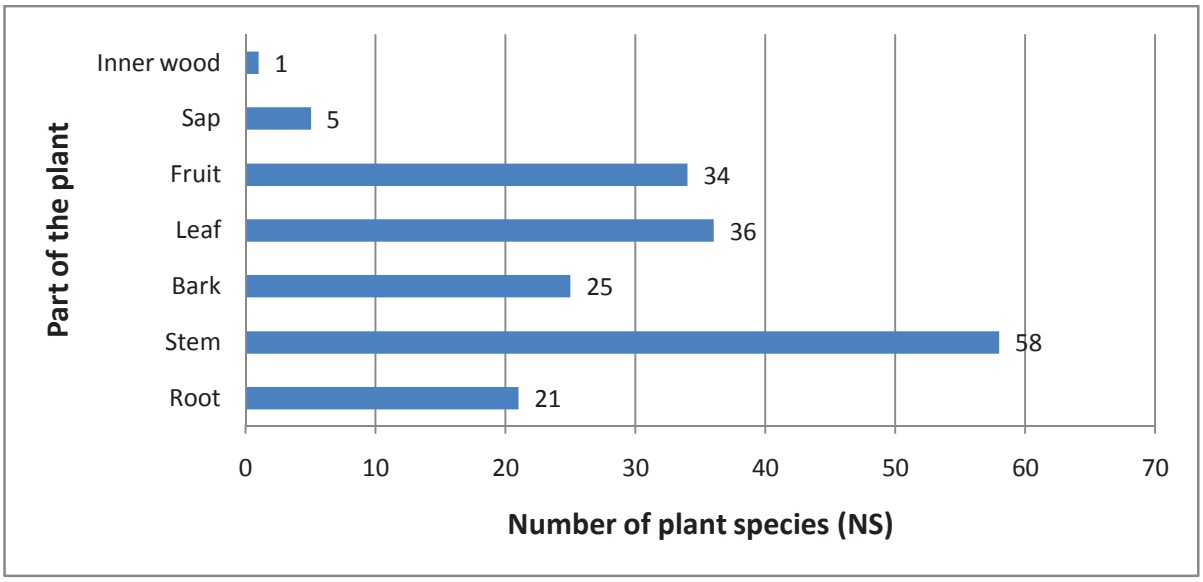

Figure 5.5 Parts of the plant and number of plant species from which they are harvested

The parts were harvested for various uses. The highest number of species was harvested for firewood and the least for toothbrushes, banana ripening, bark cloth, and sand paper (Table 5.2).

Table 5.2 Uses of the resources extracted from plant species in the park.

Use	Number of plant species	Percentage number of species
Firewood	72	83%
Charcoal	65	75%
Timber	61	70%
Medicine	33	38%
Food	23	26%
Fencing	20	23%
Art and Craft	19	22%
Fodder	14	16%
Building	14	16%
Ornamental	12	14%
Shade for crops	4	5%
Mulching	3	3%
Bee forage	3	3%
Ropes	2	2%
Toothbrushes	1	1%
Banana ripening	1	1%
Barkcloth	1	1%
Sand paper	1	1%

There was a difference in the number of species that respondents harvested more than fifty years ago and presently (at the time of conducting this investigation in 2009). More than 50 years ago, 2 species were harvested for stems but the number had increased to 58, in the last nine years (Figure 5.6).

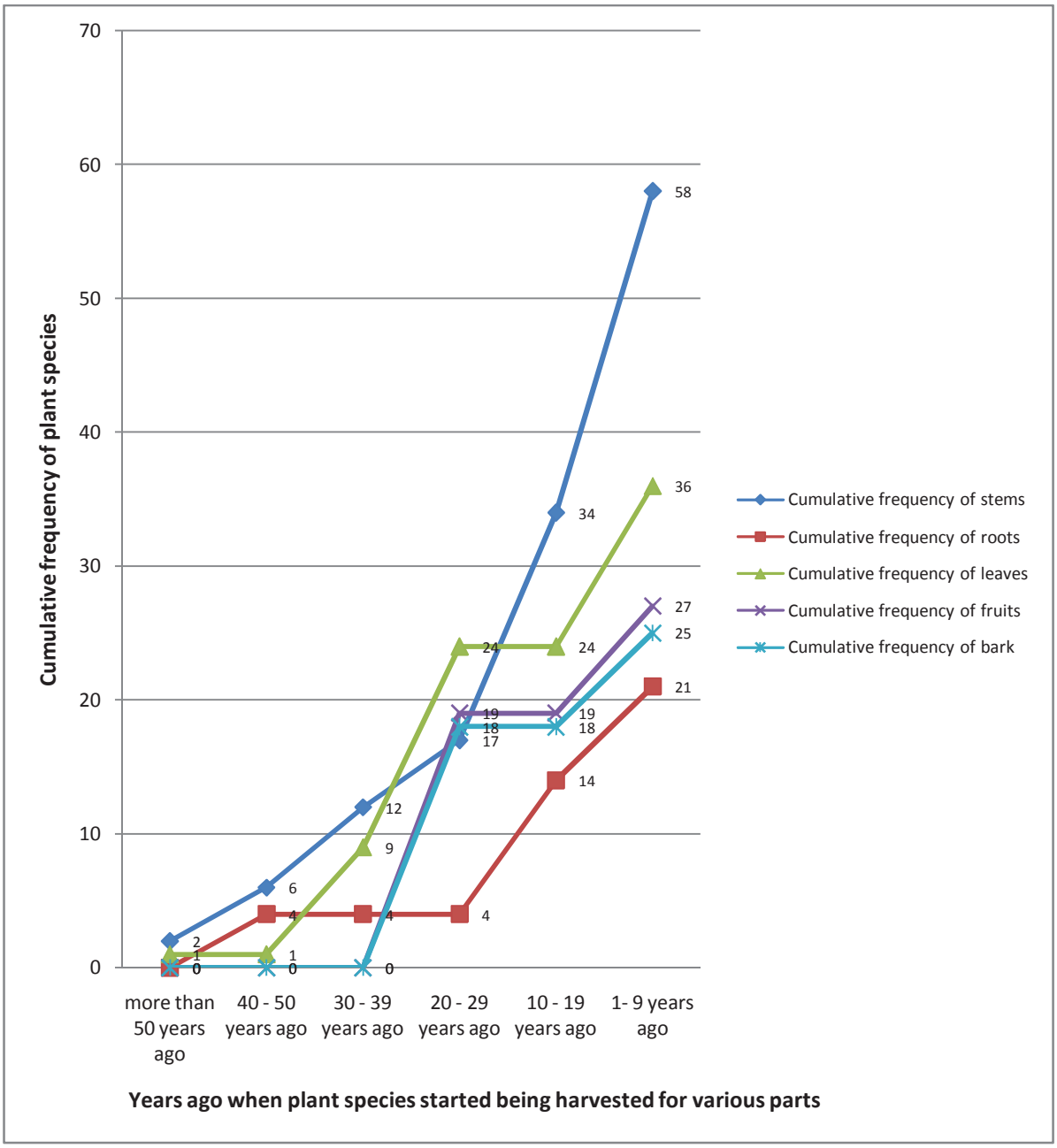

Figure 5.6 When plant species started being harvested by respondents for various parts

A comparison of the uses of resources from plant species in the past and present showed that 64 species were used in the same way they were used in the past, and 13 plant species were used for different purposes (Figure 5.7). Of the 13 species, 12 were not previously used for firewood but currently are, and 11 out of the 13 species are currently used for charcoal unlike in the past.

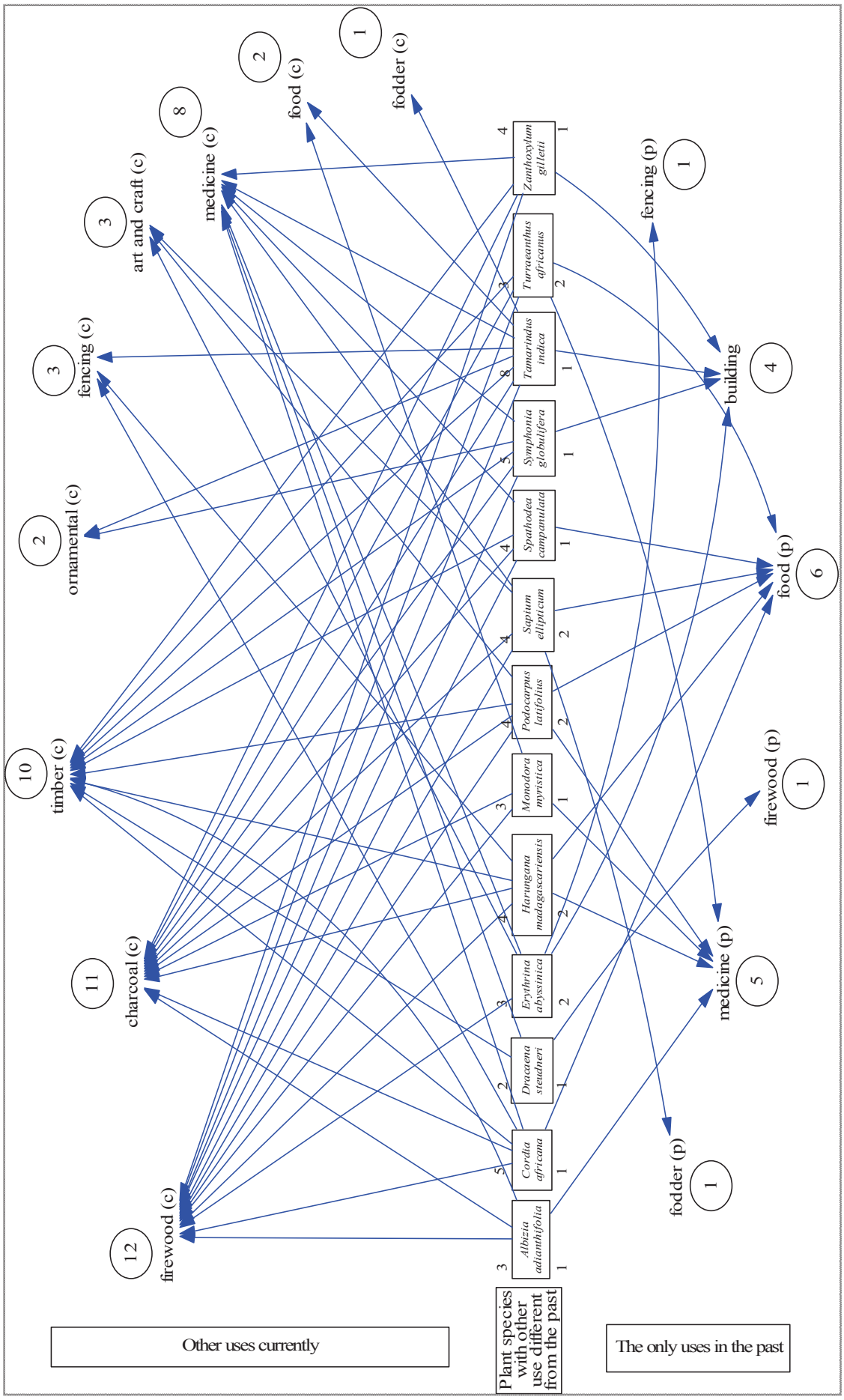

Figure 5.7 Uses (in the past and currently) of various plant species illegally obtained by local people from the Rwenzori Mountains National Park.

5.4.3 The extent of demand for plant species by local people

Calculations of the Weight for Quantity (WFQ) and Weight for Frequency (WFF) (Appendix 5.6) revealed that 59 species were highly demanded (Table 5.3).

Table 5.3 Extent of demand for plant species by local people

Plant species	Highest quantity					Highest frequency				
	Stems	Roots	Leaves	Fruit	Bark	Stem	Roots	Leaves	Fruits	Bark
Acacia hockii										
Acacia sieberiana										
Albizia adianthifolia										
Albizia coriaria										
Albizia glaberrima										
Albizia grandibracteata										
Albizia gummifera										
Albizia zygia										
Aningeria adolfi-friedericii										
Aningeria altissima										
Antiaris toxicaria										
Arundinaria alpina										
Basella alba										
Bersama abyssinica										
Blighia unijugata										
Bridelia micrantha										
Canarium schweinfurthii										
Carapa grandiflora										
Carissa edulis										
Celtis africana										
Celtis durandai										
Chrysophyllum albidum										
Cordia africana										
Croton macrostachyus										
Croton megalocarpus										
Cyphomandra betacea										
Diospyros abyssinica										
Dombeya kirkii										
Dovyalis macrocalyx										
Dracaena fragrans										
Dracaena steudneri										
Euphorbia tirucalli										

Erythrina abyssinica									
Faurea saligna									
Ilex mitis									
Kigelia africana									
Maesa lanceolata									
Mangifera indica									
Millettia dura									
Monodora myristica									
Myrianthus holstii									
Newtonia buchananii									
Parkia filicoidea									
Phoenix reclinata									
Physalis peruviana									
Phytolacca dodecandra									
Pseudospondias microcapa									
Pycnanthus angolensis									
Raphia farinifera									
Sapium ellipticum									
Senecio hadiensis									
Spathodea campanulata									
Symphonia globulifera									
Tamarindus indica									
Terminalia brownii									
Trema orientalis									
Vangueria apiculata									
Warburgia ugandensis									
Zanthoxylum gilletii									

Some species such as *Acacia hockii*, *Bridelia micrantha* and *Tamarindus indica* were in demand for multiple parts (more than two parts). Twenty seven species were in high demand for one part (mainly the stem). Some species that were in high demand were not necessarily the species that local people considered among the three most important. Respondents considered thirty one species to be the most important (Table 5.4).

Table 5.4 Plant species that local people considered the most important

Most important plant species	Number of people that considered the species the most important out of 163 respondents	Percentage of people that considered the species most important
Acacia hockii	89	56%
Acacia sieberiana	98	60%
Albizia adianthifolia	111	68%
Albizia coriaria	125	77%
Albizia glaberrima	121	74%
Albizia grandibracteata	141	87%
Albizia gummifera	78	48%
Albizia zygia	76	47%
Bersama abyssinica	72	44%
Blighia unijugata	113	69%
Bridelia micrantha	102	63%
Celtis durandaii	66	41%
Chrysophyllum albidum	23	14%
Croton macrostachyus	102	63%
Croton megalocarpus	112	69%
Dovyalis macrocalyx	83	51%
Dracaena fragrans	51	31%
Erythrina abyssinica	83	51%
Ficus exasperata	32	20%
Ilex mitis	33	20%
Lovoa swynnertonii	98	60%
Macaranga kilimandscharica	41	25%
Neoboutonia macrocalyx	9	6%
Phytolacca dodecandra	26	16%
Polyscias fulva	25	15%
Pseudospondias microcapa	13	8%
Spathodea campanulata	12	7%
Strombosia scheffleri	20	12%
Symphonia globulifera	66	41%
Tamarindus indica	41	25%
Terminalia brownii	56	34%

Respondents considered some plant species most important because resources from these species had multiple uses. For example resources from *Acacia hockii* were used for firewood, charcoal, medicine,

ropes, fencing, building and forage. Other species such as *Blighia unijugata*, *Dovyalis macrocalyx, Macaranga kilimandscharica, Spathodea campanulata* and *Neoboutonia macrocalyx* were rare, which made obtaining resources from them difficult, and they were consequently considered most important. Species such as *Acacia hockii*, *Albizia glaberrima*, *Bersama abyssinica*, *Chrysophyllum albidum*, *Strombosia scheffleri*, *Erythrina abyssinica*, *Ilex mitis*, *Dovyalis macrocalyx* and *Dracaena fragrans* were considered most important because resources from those species provided essentials such as firewood and medicine on which livelihood and survival depended.

Eight species: *Acacia hockii*, *Acacia sieberiana*, *Albizia coriaria*, *Albizia gummifera*, *Chrysophyllum albidum*, *Ilex mitis*, *Pseudospondias microcapa* and *Tamarindus indica* which were in high demand overlapped with species that people considered the most important. Also, the availability of ten species (*Albizia grandibracteata, Bersama abyssinica, Carapa grandiflora, Entandrophragma cylindricum, Khaya anthotheca, Millettia dura, Physalis peruviana, Schrebera arborea, Teclea nobilis,* and *Vangueria apiculata*) was said to be decreasing. None of the species that was reported to be alternatively available outside the park was said to be decreasing in availability in the park. All respondents who mentioned that these species were decreasing did not mention the time when they started noticing the change. They only found that they had to walk longer to collect those species.

5.5 DISCUSSION

Although names of plant species that are illegally extracted from national parks are important for community-based biodiversity conservation, more important are the factors that influence illegal access to these species. These are the factors that ought to be targeted in community-based interventions. Based on this study, four factors that influence illegal access to these species can be distinguished (Figure 5.8).

1. The need for plant resources.
2. The use to which resources are put.
3. The extent of demand for resources.
4. The purpose of harvesting resources (commercial or subsistence).

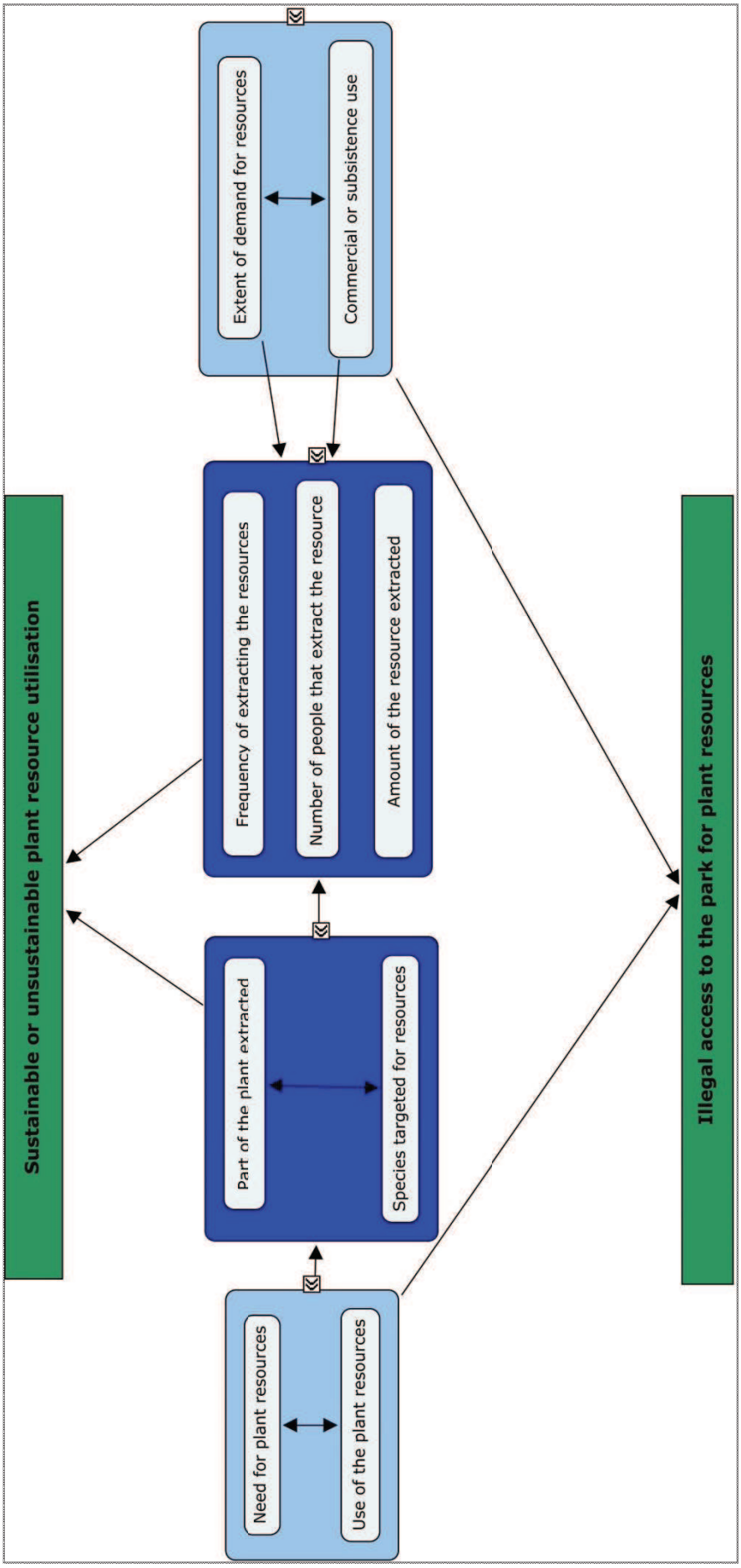

Figure 5.8 A scheme showing factors that influence illegal access that could lead to unsustainable utilisation of plant resources in the Rwenzori Mountains National Park.

Plant resources are considered crucial for survival and livelihood of the local people who neighbour national parks (Hegde and Enters, 2000; Karanth *et al*., 2006; Kumar and Shahabuddin, 2005; Mamo *et al*., 2007; McShane, 1990). The identified factors (especially the need and use of resources) are often considered as a basis for planning and implementing community-based biodiversity conservation in order to meet the needs of the people and conserve biodiversity in tandem. Provision of alternatives to park plant resources, encouraging and assisting the local community to propagate park plant species on private land, and signing resource use agreements that allow restricted access to some plant resources in the park, are common components of most community-based conservation strategies (Chapter 1).

However, evidence has shown that despite such interventions, the objectives of community-based conservation have not been met in Africa's national parks (Vodouhê, Coulibaly, Adégbidi, & Sinsin, 2010). This is also the case in the Rwenzori Mountains National Park, where illegal access to park resources has persisted despite the implementation of a community-based conservation strategy (Chapter 1). Before proposing a more effective community-based conservation strategy for plant resources in national parks in Africa, analysis of the underlying causes for the limited success of the current strategy is necessary. In this discussion, focus of the analysis is on three interventions: 1) provision of alternatives to park resources, 2) propagation of seeds and seedlings on private land, and 3) signing resource use agreements between the park administration and the local community. These interventions are also analyzed in the context of commercial and subsistence extraction of resources.

5.5.1 Provision of alternatives

It is a common assumption in community-based biodiversity conservation programmes that a lack of alternative sources from where to obtain resources is a driver of illegal access to park resources (Shova & Hubacek, 2011). The amount, frequency and likelihood of plant resource collection depend upon availability or lack of alternative resource collection areas (Shova & Hubacek, 2011). Quite often, in community-based biodiversity conservation strategies, the aim is to provide alternatives to resources that are illegally extracted from the park. In the Rwenzori Mountains National Park, given that the highest number of plant species was harvested for firewood and charcoal (Table 5.2), one would apparently recommend provision for local people of alternative energy sources. Such a recommendation has often been made in many protected areas but has not succeeded and is unlikely to succeed in the Rwenzori Mountains National Park for two main reasons. Firstly, although the majority of the species are harvested for charcoal and firewood, there are many other species that are harvested for other uses. Providing local people with alternative energy sources might only partly address the problem, if it does not address other resource needs such as medicine, and building materials. In the case of the Rwenzori Mountains National Park, allowing a few people to access some and not all resources needed by the community has led to the persistence of illegal access to park resources by the community. Secondly, some alternatives may not be afforded by the people. For instance, various organizations in partnership with the government have implemented energy saving cooking stoves as a way of mitigating deforestation for fuel wood in the Rwenzori region. However,

recently, it has been found that the level of adoption of energy saving cooking stoves was low because their price could not be afforded (Rwenzori African Development Foundation, 2010).

Similarly, an alternative to resources extracted from the park for medicinal purposes is the construction of clinics and health centers where people can access alternative treatment for ailments. However, the medicine in the clinic is not free and sometimes particular medicines are lacking (Cavendish, 2000). Rural African communities are characterized by various health problems attributed to lack of health services (Cavendish, 2000). This situation is typical of health facilities in communities neighbouring the Rwenzori Mountains National Park including the health centers that have been constructed using 20% of the money collected at the gate of the national park from tourists which is meant to be given to the neighbouring community to mitigate illegal access to the park.

Even if the medicine in health centers was affordable, it is not automatic that people will opt for that medicine instead of medicine from plant resources in the park. It will depend on whether a person believes that the medicine in the hospital shall treat the illness more effectively than medicine from plant resources extracted from the park. In rural Africa, people tend to use drugs which they used in the past and cured illnesses than attempting new ways of treatment (Leduc *et al*., 2006).

Generally, the success of provision of alternatives to address illegal resource extraction from protected areas will depend on whether the alternatives are suitable, address the actual need, are affordable, and acceptable by the community.

5.5.2 Provision of seeds or seedlings for propagation on private land

The practice of obtaining resources from plant species found on private land is often cited in conservation literature as one way that reduces anthropogenic pressure on particular park resources (Vodouhê *et al*., 2010). Providing local people neighbouring protected areas with tree seedlings or other vegetative structures of plant species that they wish to obtain from protected areas has in some cases been used as a strategy to curb illegal access to park resources (Galvin, Thornton, Roque, Sunderland & Boone, 2006). This strategy has been applied in the Rwenzori Mountains National Park but has not addressed illegal access to the park. This could be as a result of three factors: 1) availability of land on which to plant these species, 2) willingness of the local community to commit time and resources in managing the trees planted, and 3) patience of the local people to wait until the species reach maturity.

Land (more especially arable land) is gradually getting scarce in Africa as a result of increase in human population and more demand for food (Vodouhê *et al*., 2010). Therefore, availability of private land where people can plant these species will determine whether or not they do. With high human population increases in the Rwenzori Mountains and diminishing arable land (Rwenzori African Development Foundation, 2010), local people are less likely to devote land which could be used for other activities such as building or farming to propagation of wild plant. Although the local

community in one of the districts in Western Uganda often accepted seedlings of some trees to plant them as a way of mitigating climate change, they did not always plant these seedlings because they did not have land on which to plant them (Muhumuza, Muzinduki & Hyeroba, 2011).

In areas where provision of seedlings is implemented, first it is necessary to determine the area of land available for planting trees before implementing the intervention. In case land is not available, the alternative would be to engage in agro-forestry. Agro-forestry is one of the strategies of agro-biodiversity conservation because it enables different land use practices (for agriculture and conservation) to take place on the same area (Leb3, 2008). For example, *Parkia filicoidea* (one of the plant species that local people said they illegally obtained from the Rwenzori Mountains National Park) can be planted along side coffee, cocoa and bananas (Katende, Birnie, & Tengnäs, 1995).

Also consideration could be made of propagating seedlings in non-arable land. For example *Cordia africana* is a colonizer and tolerates a variety of soils including soils that are unfavourable to crops. Also, *Khaya anthotheca* can withstand seasonal flooding and it could be planted in areas in the foothills of the Rwenzori Mountains that have recently been reported to be susceptible to flooding and have been abandoned by the local community (Protos-Directorare of Water Resources Management, 2012). This suggestion, if taken into account, could not only reduce illegal access to the Rwenzori Mountains National Park but also enhance biodiversity conservation outside the park. For example, some of the tree species such as *Aningeria adolfi-friedericii* that are currently found in the foothills of the Rwenzori Mountains and which some people think are part of the natural forests, were actually deliberately planted in those areas and other previously degraded montane forests of western Uganda (Katende *et al*., 1995).

The willingness of the local community to commit time and resources to managing seeds, seedlings and trees planted also influences whether or not the intervention of propagating seeds and seedlings will succeed. Propagation of seedlings is often labour intensive (Katende *et al.*, 1995) and probably requires more technical skills than to clandestinely harvest national park resources. Some species require seed preparation (for example the seeds of *Symphonia globulifera* have to first be immersed in hot water, allowed to cool and re-soaked overnight) to break the dormancy, and after the seeds have germinated, the seedlings and the plants require coppicing, lopping and pollarding at particular stages of growth (Katende *et al.*, 1995). Therefore, even when local people are freely provided with seedlings or seeds, some of them may not be willing to engage in such labour intensive plant management practices and may opt to illegally extract plant resources from the park.

The slow growth of some species might hinder the success of propagating plant species on private land. For instance *Entandrophragma cylindricum* and *Celtis durandii* are slow growing and are only ready to be harvested for timber after 80 years (Katende *et al*., 1995). Therefore, propagation of these species on private land may not ease pressure from the park resources. Careful selection of species that are important to the people but are also fast growing is necessary prior to providing the communities with seedlings. Even among the 9 species located on people's private land from which

some respondents said they extracted resources, four species which included; *Acacia sieberiana*, *Aningeria adolfi-friedericii* and *Olea capensis* are slow growing (Katende *et al*., 1995). There is a possibility that after resources from these species have been exhausted, these people will resort to resources from species in the park.

Therefore, in consideration of propagating of species (in case land is available), the species should require little labor, be fast growing, be among the species required by people, and should have multiple uses.

5.5.3 Resource use agreements and disagreements

Signing of resource use agreements between Uganda Wildlife Authority and the local people in order to mitigate illegal plant resource extraction from the park has been done (Uganda Wildlife Authority, 2008). This is a common strategy in many national parks in Africa but which has not been successful, even in the Rwenzori Mountains National Park given the current use of plant resources.

Two reasons could account for the limited success of this intervention. Resources stated in the agreements are not necessarily those that local people need (most especially those in high demand). For instance, of the 21 plant species specified in the resource use agreements there were only 2 species (*Albizia gummifera* and *Ilex mitis*) that overlapped with the species that were in high demand (Table 5.3) and species mentioned by local people as most important (Table 5.4). Also, although the resource use agreements stipulated that the resource users should harvest only leaves from *Ilex mitis*, people harvested the stem and bark rather than leaves from this species. Therefore, despite the existence of collaborative resource use agreement, local people are compelled to sneak into the park and get resources they need that are not in the resource use agreements. Monitoring the quantities of resources extracted under resource use agreements might mislead Uganda Wildlife Authority staff into thinking that local people are sustainably using the park simply because it could reveal a low rate of extraction of those resources.

Secondly, resource use agreements put restrictions on the people to harvest resources. For instance, a species such as *Albizia gummifera* was allowed to be harvested only by traditional herbalists (Wildlife Authority, 2008). This prompts other users who are not traditional herbalists to illegally access the species.

If resource agreements are to address illegal access, their implementation should be based not on the species that the park staff think are abundant but on the species that people actually need. This should also depend on the other factors already discussed and on whether the extraction is for subsistence or commercial purposes.

5.5.4 Subsistence or commercial use

Plant resources are illegally extracted from national parks not only for subsistence use but also for commercial purposes (Omeja, Cunningham & Obua, 2005). However, current community-based biodiversity conservation strategies permit negotiated extraction for subsistence purposes only. This means such strategies attempt to address only a part of the problem of illegal access. In order to tackle the entire problem, it would be necessary to also consider commercial extraction of resources as well.

Commercial and subsistence needs have and influence on the level of demand and impacts on resources. For instance, while making drums for local subsistence use is unlikely to have negative ecological impacts, the same cannot be said for large-scale commercial trade in musical instruments (Omeja *et al*., 2005). Musical instruments are often used as souvenirs and are highly demanded by tourists and in export markets (Omeja *et al*., 2005). This leads to over exploitation of plant materials for drum making. In Zimbabwe, change from subsistence to commercial extraction of plant resources in Nyaminyami led to abuse of rules and legislation governing trade in protected area plant resources (Standa-Gunda & Braedt, 2005).

The success of addressing illegal access to park resources using interventions described in previous section depends on commercial or subsistence extraction of plant resources. For example, through the provision of alternatives, people may afford low-energy cooking stoves for subsistence purposes but continue to engage in plant resource extraction for charcoal and firewood for commercial purposes.

Understanding and integrating trade networks in community-based biodiversity conservation strategies is important for mitigating illegal access to park plant resources especially in rural areas in Africa (Cunningham *et al*., 2005). Analysis of plant resources and their products that are traded provides a rich source of information for resource management programmes, rural development and conservation by protected area managers (Cunningham, Campbell, & Belcher, 2005). If demand for a species or a resource category such as fuel wood, basketry, fibre and herbal medicine is high and supplies are still available, then it is likely that these species or resource categories will be extracted illegally. Conversely, species or categories of plant use in low demand would be less extracted. On that basis, protected area managers can decide on which species to put a caveat on and which ones can be permitted to be harvested.

Rural people in transition from a subsistence life style to a cash economy (as is the case in the community neighbouring the Rwenzori Mountains National Park) have relatively few options for generating income other than relying on natural resources in their immediate environment (Cunningham, 2005). Rural people without land (especially arable land) or livestock but striving to attain a higher socio-economic status are more likely to opt for the harvest of plant resources from protected areas (Cunningham, 2005). A shift from subsistence to commercial use can have significant implications for resource management since it results in higher intensity and frequency of harvesting and larger volumes being harvested which affects resource tenure (Cunningham, 2005).

Additionally, local people's choices and preferences for resources may change with socio-economic changes. For instance, Timber Forest Products are more adaptable and can easily be used for other purposes in case of any socio-economic changes (Cunningham *et al*., 2005). Also in the Rwenzori Mountains, contrary to Cunningham *et al*. (2005) argument that it is not easy to put Non Timber Forest Products such as medicinal leaves or fruits to other use, many Non Timber Forest Products such as *Albizia adianthifolia* were used for other purposes. Changes in use of plant resources from other uses to firewood (12 species), charcoal (11 species), timber (10 species) and medicine (8 species) indicate an increasing demand for energy for cooking in households, building materials, and medicine. Changes in choices and preferences as a result of change in socio-economic status should be taken into account by protected area managers when deciding on the alternatives to provide to local people.

In other cases (Chapter 3), changes in resource use undermines customary controls of resource use and weakens resource tenure. Therefore, a change in resource use is a factor that has led to loss of biodiversity from national parks in Africa. Although plant species in traditional communities were used only for subsistence purposes (Berkes, Colding, & Folke, 2000; Kaya & Masoga, 2005), plant species are now used for both subsistence and commercial purposes as a result of socio-economic pressures (Mati & de Boer, 2011). Trading in plant resources illegally extracted from the Rwenzori Mountains National Park is likely to increase with time given that the Rwenzori Mountains are prone to climate change which may affect crop yields (Muhumuza *et al*., 2011) and hence people who engage in farming are likely to turn to plant resources in the park for their livelihood. Also, with an increase in inflation coupled with an increase in prices of goods in Uganda (Uganda Bureau of Statistics, 2011), more extraction of plant resources from the park for commercial purposes is anticipated.

Commercialization or trade of forest products is catalyzed by a demand from urban areas which leads to drawing in resources from rural areas to towns and cities. It is common that people in cities and towns especially those that express disapproval of deforestation provide market for forest products such as charcoal (Cunningham, 2005). The construction of roads especially as a compensation for the lost access to protected area resources and as a way of enabling the local community economically benefit by marketing their products made through alternatives means of livelihood might also strengthen the link between rural resource extraction and demand in urban markets. As roads reach further into remote but resource rich regions, settlement and clearing of areas for commercial harvest and trade of resources usually increases.

This scenario could also be happening in the Rwenzori Mountains National Park. Charcoal from the Rwenzori Mountains National Park (Figure 5.9) could end up on the road side market where it is bought and loaded on vehicles to urban areas (Figure 5.10). Surprisingly, among the people who buy such charcoal are Uganda Wildlife Staff whose duty is to protect park resources (Figure 5.10).



Figure 5.9 A resource user (on the right) carrying a sack of charcoal from the Rwenzori Mountains National Park. (Photo by M. Muhumuza, June, 2012**).**



Figure 5.10 A charcoal seller on Bundibugyo road loading a sack of charcoal onto a Uganda Wildlife Authority vehicle heading to Fort-Portal town. (Photo by M. Muhumuza, June, 2012**).**

Although commercial uses have been found to be exploitative and could generally lead to indiscriminate use of resources, in some cases it strengthens resource tenure. For example commercial use of wild fruits maintains incentives to conserve wild fruit-bearing trees in parts of Africa (Cunningham *et al*., 2005). This happens when wild fruit collectors derive sustainable income from the fruits (Cunningham *et al*., 2005).

This means that in planning community-based plant conservation in rural Africa, the socio-economic context of resource use must be taken into account.

5.5.5 Illegal access and sustainable or unsustainable utilisation of plant resources

Repeated biomass harvesting for human livelihood and survival needs can cause significant changes in forest structure, composition and diversity (Shova & Chapman, 2010). Resource use and extraction are important components of rural livelihoods but at the same time a source of concern for park management (Brown, 1997; Saetre, 1994). The implementation of current community-based biodiversity conservation is based on the assumption that illegal access to plant resources in the park leads to unsustainable use. As a result, many community-based conservation interventions focus on allowing limited access to a few resources with an assumption that full access to resources will lead to unsustainable utilisation.

Illegal access to plant resources in the park does not necessarily mean unsustainable utilisation of resources. Sustainable or unsustainable utilisation depend on five factors: 1) the species targeted, 2) the part of the plant extracted, 3) the frequency of extracting the resources, 4) the amount of the resource extracted, 5) the number of people involved in resource extraction.

Currently, in the Rwenzori Mountains National Park, planning for community-based conservation is solely based on the plant species targeted and yet all the factors must be considered holistically because they are linked (Figure 5.6). For instance, local people's choice of species they illegally extract from the park is influenced by the resources they derive from these species. Most of the species from families such as Mimosaceae, Meliaceae and Euphorbiaceae (which provide the highest number of species from which resources are extracted) are trees (for example *Parkia filicoidea*) and woody herbs (for example *Carapa grandiflora*). Trees and woody herbs from tropical montane forests are known to have a variety of uses for local people (Cunningham *et al*., 2005).

The part of the plant harvested is directly associated with the use of that part. Resource users make choices and preferences of plant parts they extract based on the intended use of those parts (Cunningham *et al*., 2005). For example, the need for food could directly influence the harvesting of fruits but not inner wood. Similarly, leaves or fruits cannot be used for timber or for poles for construction. Although it has been noted in literature that it is rare to find tree species with all the varied qualities required by resource users (Belcher, Ruíz & Achdiawan, 2005), in this investigation,

it was found that some species had multiple uses. For example *Bridelia micrantha* had ten uses (firewood, charcoal, medicine, fencing, timber, food, fodder, art and craft, building, and mulching). The use of one species for various purposes has also been recorded elsewhere such as in Peru (Kvist, 2001), in South Africa (Dovie, Witkowski & Shackleton, 2006), in Iraq (Mati & de Boer, 2011) and in Nepal (Shova & Hubacek, 2011). This means that in planning resource use and management, conservationists should not only pay attention to the species preferred by resource users but also the different parts of the plant they harvest and their uses.

The uses of plant parts extracted gives an indication of the resource needs of the people which protected area managers could potentially address by providing suitable alternatives if they are to mitigate illegal resource use (Wild & Mutebi, 1996). For example, it was found that the stem was harvested from the majority of the plant species. Studies on timber and non timber forest products show that the stem is often used for firewood, charcoal, timber, poles and crafts (Belcher *et al*., 2005). Similarly, it was found that respondents used the resources extracted from the majority of the plant species for firewood, charcoal, and timber (Table 5.2).

This suggests that community-based conservation of plant species should not only focus on species harvested but also the actual part harvested. The part harvested gives indications on whether sustainable or unsustainable extraction whether legally or illegally is occurring (Belcher, Cunningham, & Campbell, 2005). The part of the plant harvested has implications on the conservation of the individual plant. Information on the parts harvested can be useful in making evaluation of consequences of plant resource harvesting on individual plants. In this part of the discussion, analysis of the effect of harvesting particular parts of plants on plant species has been discussed only with reference to species that were found to be in high demand.

5.5.5.1 Fruits

Although Cunningham (2005) pointed out that harvesting of reproductive structures such as fruits has less impact on individual plant species than other parts, critical analysis of the context of fruits harvest indicate that it can also have significant detrimental impact on the plant. Analysis of various factors associated with the harvest of fruits can lead to a prediction about whether destructive fruit harvest is occurring or not. Fruits can be harvested through any of the following ways (Phillips, 1993):

1) Ground collection: Collection of shed fruits from the ground.
2) Picked: Fruits are picked by hand from the plant.
3) Pole: A hooked pole is used to knock or pull off fruits from the plant.
4) Climb: The tree is climbed and fruits cut or shaken off.
5) Cut: Whole tree is cut down for fruits.

Each of these ways of harvesting fruits has various effects on the plant, some effects are severe and others are mild. For instance, tall plants bearing inaccessible fruits such as *Acacia sieberiana Tamarindus indica, Newtonia buchananii, Pseudospondias microcapa, Vangueria apiculata* and

Warburgia ugandensis are likely to be climbed and fruits picked. Other species such as *Chrysophyllum albidum* and *Trema orientalis* are likely to be felled or branches cut to obtain fruits because they are weak to be climbed.

Although climbing trees and picking fruits might have less destructive impact on the plant than felling a tree for fruits (Philips, 1993), both (climbing trees and picking fruits and felling a tree for fruits) are likely to have a more destructive impact than harvesting fruits using a pole with a hook (such as in the case of harvesting fruits from *Kigelia africana*) or picking fruits from the ground (such as in the case of harvesting fruits from *Carissa edulis*). Tree height therefore partly affects fruit harvesting behaviour of resource users.

In addition to tree height, fruit phenology also influences how fruits are harvested especially where resource users wait for fruits to be shed and they collect them from the ground. In some species where there is slow release over a period of time (such as weeks or months) such that the rest of the fruits are displayed to potential dispersers (such as birds and primates) and hence leading to their propagation through natural processes, the harvest of such fruits might not be destructive compared to species such as *Acacia sieberiana* whose fruits respondents said are eaten fresh and do not wait for them to dry and fall on the ground. Also in serotinous species where seeds are held for 1 to 30 years there is a high possibility of cutting the tree to collect the seed containing fruits. This has an added negative impact of destroying metabolically active leaves (Philips, 1993).

Another factor to consider in the analysis of fruit harvest is whether fruits are from dioecious or monoecious tree species. When destructive harvest of fruits takes place in dioecious species, it is selective of female parts. At a plant population level, over exploitation of female parts which carry flowers that attract pollinators can results in disruption of breeding systems (Philips, 1993). The dioecious species found in this investigation to be in high demand for fruits deserve more attention when negotiating resource use agreements because the harvest of fruits from those species is more disastrous than the species that are monoecious.

5.5.5.2 Leaves

The impact of leaf harvest in terms of plant growth and life span is based on selective removal of young leaves (Figure 5.11) which are often removed for food or medicine and old fibrous leaves (for basketry, thatching and twine) (Joyal, 1996). However the effect of leaf harvest is influenced by factors such as plant physiology, the intensity and frequency of harvest of the leaves and the plant habitat (Cunningham, 2005). The only species found to be in high demand in this study was *Basella alba* which might be less tolerant to leaf removal and hence of conservation concern because it is non-woody. Woody plants have higher tolerance to leaf removal than non-woody species (Trilica, Buwai, & Menke, 1977; Lay, 1965). Although *Basella alba* tolerates a range of soils (Katende *et al*. 1995) it might be vulnerable as a result to leaf harvest because it was not reported in this investigation that it is palatable to animals. Research from other studies (Rutherford, 1979) has shown that plant species

palatable to animals are more tolerant to leaf removal. This means that feeding on leaves by animals and extraction of the same quantity of leaves by humans for other use might have differing conservation implications to the plant species from which the leaves are removed.



Figure 5.11 A local herbalist extracting young leaves from a non-woody (unidentified species) along a trail to the Rwenzori Mountains National Park. (Photo by M. Muhumuza, July, 2010**).**

5.5.5.3 Bark

Bark protects plants against fire and against attack by fungi and insects and its removal can have serious consequences for the plant (Cunningham, 2005). The effects of bark removal on the plant depend upon plant physiology, bark chemistry and exudate, intensity and frequency of bark removal as well as season, habitat and microclimate of the plant (Picton & Mack, 1989).

Additionally, the effect of bark harvest is dependent on family, genera and qualities of the species. For example, many species in Proteaceae and Podocarpaceae are highly susceptible to fungal infection and attack by wood boring insects after bark removal because the inner wood remains exposed (see for instance, removal of the bark all round the stem [often called ringing], Figure 5.12.



Figure 5.12 One of the poor methods of resource harvest in the Rwenzori Mountains National Park. (Photo by M. Muhumuza. April, 2009**).**

Plant species in Euphorbiace, Moraceae and Canellaceae are resilient to bark removal because the cambium is protected by exudates after bark removal (Fischer, 1981). A species that is in high demand and could be resilient to bark removal is *Euphorbia tirucalli* of family Euphorbiace. The rest of the species such as *Ilex mitis (*family Aquifoliacae*)*, *Kigelia africana* (family Ignoniaceae), and *Pseudospondias microcapa* (family Anacardiaceae) that were found to be in high demand might be at risk due to bark removal and hence need careful attention.

The vulnerability of these species due to bark removal could be as a result of nutrient and moisture loss. Even though loss of nutrient and moisture might not kill the plant in the short term, they reduce the tree's growth rate and life span (Cunningham *et al*., 2005). Bark removal is often associated with the removal of sap from some species. This also has detrimental effects on the plant and could lead to plant species extinction. *Betula* species tapped for an aromatic medicinal gum for trade from North Africa to the Roman Empire is one of the earliest examples of plant extinction through sap extraction (Cunningham *et al*., 2005). This is because most of the saps are harvested by deliberately damaging the bark of the tree or shrub. Removal of sap affects the individual plant species especially when nutrient-rich exudates are removed and leads to slow growth of the plant and sometimes not fruiting at

all (Peters, 1994). Further studies on growth rates of species such as *Symphonia globulifera, Croton macrostachyus* and *Canarium schweinfurthii* from which sap is extracted in the Rwenzori Mountains are recommended.

5.5.5.4 Stem

The effects of stem harvest on a plant depend on a number of factors. The effects depend on whether the plant is single or multiple stemmed, what the selection criteria of the resource user is (such as the size, age and diameter of the stem cut), whether the plant regenerates after stem cutting, and whether the plant species has multiple uses which affect recruitment by exploiting different stem size classes within the same population (Cunningham *et al*., 2005).

In some plants stem removal can lead to resprouting which adds resilience to the individual plant and plant population. The removal of the stem from a single stemmed plant results into reduction in the reproductive output of the plant but which does not occur in plants with multiple stems which remain due to rapid resprouting or selective harvesting.

The species found to be in high demand for stems in this investigation (*Albizia coriaria* and *Acacia hockii*) are multi-branched and have the capacity to resprout (Katende *et al*., 1995). Despite this, cutting the "mother" (on which the branches are attached) stem (Figure 5.13) has negative impacts on the plant because it involves removal of the whole plant.



Figure 5.13 A stump of a multi-branched tree cut for timber in the Rwenzori Mountains. (Photo by M. Muhumuza, May, 2009**).**

5.5.5.5 Roots

Roots anchor the plant in the soil, or on host plants in the case of epiphytes or parasitic plants (Cunningham *et al*., 2005). Roots also absorb water and minerals from the soil and in some plants, they store some food (Cunningham *et al*., 2005). Therefore, removal of roots from the plant has detrimental effects on the plant.

The impact of root removal depends on various factors such as the type of roots removed, plant physiology, root depth, and the intensity and frequency of root removal. For example, removal of lateral roots has less negative impact than removal of tap roots. In some cases (such as in the removal of bulbs or corms), root removal means removal of the whole plant because the plant is dug out.

In some species especially those where reproduction occurs through the formation of clonal structures, a high plant population density per clone is an important factor that can buffer the effects of root removal. Also based on the physiology of the plant, root removal can stimulate regeneration in some plants but lead to fungal infection in others. Members of Proteaceae and Lauraceae are susceptible to infection by fungus (Cunningham, 2001). Neither *Albizia gummifera* family Mimosaceae nor *Warburgia ugandensis* family Canellaceae are from the families that are susceptible to fungal infection.

The anchorage of the plant to the ground (which is associated with root depth and length), and the root type not only influences how roots are removed but also the effect of their removal on the plant. Removal of lateral roots might not be as detrimental as removal of tap roots. For the two species found to be in high demand in this investigation, only lateral roots are extracted. Removal of lateral roots has less detrimental impact on the plant than removal of tap roots (Cunningham, 2001).

The effects of root removal on the leaf, flower, and fruit are less obvious and less known (Cunningham *et al*., 2005). Root pruning in apple trees for instance reduces fruit yield, growth and leaf production (Schupp, 1992) and yet in apple orchards, it is used to reduce fruit drop and improve the colour and the quality of the remaining fruits.

Generally, community-based conservation planning and implementation in national parks in Africa should put into account the potential detrimental effects of harvesting particular plant parts on individual plant species. For instance extraction of 50% of leaves from a plant species has less impact on growth of the plant than extraction of 50% of roots from the same plant species (Poffenberger, McGean, Khare, & Campbell, 1992). This should be linked to the number of people harvesting particular resources, amount harvested and the frequency of harvesting the parts.

Also, it is important to consider that the amount and frequency of resource use might be low but the species from which they are harvested are of conservation concern. For the Rwenzori Mountains

National Park, the considerations on the conservation status of the species that need to be taken into account are discussed in the next section.

5.5.6 Conservation status of the species harvested

Traveling further for resources is one of the several typical resource supply-based responses and gives an indication of resources being depleted (Cunningham *et al*., 2005). With reference to wood carvers, Cunningham *et al*. (2005) show that as resources get depleted, users extend their network further and further afield to source for the most favoured carved wood timber species (rather than substitute). As resources get further depleted, transport is needed hence creating a niche for traders that can access wood from more remote sources. In the case of the Rwenzori Mountains National Park, resource users are less likely to put in place transport facilities in the park to help them access resources in far areas. This is because the park is a protected area and also the mountainous terrain makes it difficult to construct roads there. This could partly explain why some respondents said some species were used differently from the past.

Although information from respondents about species that are decreasing is important, the conservation of species should not focus only on the ones which are frequently cited by respondents but also on rare species which may not have been cited by the respondents (Belem *et al*., 2006). Although all plant species that have been reported by respondents deserve sustainable use and protection, in this discussion, focus has been put on the national and global status of the species in high demand, species mentioned by respondents as most important and species said to be decreasing in the Rwenzori Mountains National Park.

None of the plant species that people considered most important, or species they said were decreasing, or species that were in high demand were nationally or internationally recorded in databases on status of species. None of these species were found recorded as globally threatened, endangered or rare in the Iinternational Union for Conservation of Nature, the Wood Explorer, and the World Forest Resources data bases on ecology and conservation status of plant species.

Species may be vulnerable in a particular location but not globally recognized as threatened. For instance, a comparison of national lists of threatened species from four countries (Colombia, Philippines, Brazil and China) with the Iinternational Union for Conservation of Nature red list revealed that in each of the four countries, 20% of the species were listed as threatened at the national level but were not yet to be globally recorded by International Union for Conservation of Nature (Brito *et al*., 2010). A data base at a protected area level that could lead the prediction of risk, vulnerability and threat of the species in demand, those said to be decreasing as well as those most important to the people is recommended. That database can contribute to national and international data bases of status of species.

A comparison between species reported by respondents and those recorded to be of conservation concern reveals that although the first and only report on the conservation of biodiversity in Uganda which was published in 1998 listed *Chassalia ugandensis, Sedum churchillianum*, *Lobelia stuhlmanii,* and *Alchemilla roccati* in the Rwenzori Mountains National Park as critically endangered, none of these species were reported by the respondents in this investigation. Also none of the species listed as endemic or rare species in the Rwenzori by Howard (1991) were reported by respondents in this investigation. This indicates that either those species are not extracted by people or they have declined to a level where they are no longer accessible by people. It is also possible that they may now be extinct in the Rwenzori Mountains.

Although two species, *Entandrophragma utile* and *Turraeanthus africanus* were listed in the first report on the conservation of biodiversity in Uganda (1998) among species that are commercially exploited and among highly utilised species, based on the results of this investigation they were neither among the most important species, nor among species in high demand. Of the 16 species recorded in the first report on the conservation of biodiversity in Uganda (1998) as vulnerable, only *Lovoa swynnertonii,* was recorded as most important in this investigation but not necessarily in high demand. One of the species (*Albizia coriaria*) that overlapped between species most important and species in high demand was reported by Tabuti & Mugula (2007) as a multipurpose species in Bwindi, and whose density was decreasing. The ecology of this species in the Rwenzori Mountains requires urgent study. When plant species become rare or locally extinct, they might not appear in a data base of plant resource use.

5.5.7 The role of ethno-botanical knowledge for sustainable resource use

Ethno-botanical knowledge is rarely and sometimes poorly documented in many studies of local people plant resource use (Abrams, Anwana, Alison, Delali, & Ajagbe, 2009; Agrawal, 1995; Byarugaba, 2010; Johnson, 2000; Posey, 1993; Usher, 2000), yet such knowledge if well investigated, documented and recognized could be helpful in the conservation of biodiversity in and outside protected areas (Maffi, 2006; Maffi &Woodley, 2010; Shiho, 2006; Dovie *et al*., 2008).

Botanical methods alone may not justify adequately the assessment of the status of particular plant species for conservation purposes (Dovie *et al*., 2008). Ethno-botanical knowldge related to indigenous uses of plant resources often adds value to the understanding of ecology and traditional conservation of those species (Letsela, Witkowski, & Balkwill, 2002; Lado, 2004). For instance matching the use of plant species identified by people with the scientific information about the ecology of the identified species provides a very powerful tool for vulnerability assessment of these species (Martin, 1995). Information from vulnerability assessment could for instance be used to determine which species require monitoring by conservationists (Wild & Mutebi, 1996).

Knowledge of resource users especially on the species harvested and those that they notice to be decreasing provide a starting point for discussing possible options for mitigating loss with the

community. When well facilitated, such a discussion could lead to sharing with the community and making them appreciate potential effects of illegal access and utilisation of resources in the wider context than they are able as individuals to recognize.

5.5.8 Collaborative plant resource use

Although the use of different parts of the same species for diverse purposes by various people shows rich ethno-botanical knowledge among the community, it could lead to conflicts in resource use among resource users and also to unsustainable use of resources. Rural communities are not homogenous entities but rather a compound of geographically heterogeneous subgroups with different needs and interests for natural resources and therefore often engage in resource use conflict (Dovie *et al*., 2006). Conflicts in resource use are often influenced by differences in priority needs of resource users (Dovie *et al*., 2006). For instance some people may be in need of roots of *Maesa lanceolata* but other people may be in need of leaves of the same species, a situation that might result in resource use conflict. Resource use conflicts often lead to unsustainable use of resources. Conflict in resource use results in unsustainable utilisation of resources because none of the resource users take responsibility for conservation of resources (Dovie *et al*., 2006). In the example of *Maesa lanceolata* neither those harvesting the roots nor those harvesting leaves may take responsibility for unsustainable use of the species.

When different people utilising various parts of the same plant species do not agree on who is responsible for the perpetuity or destruction of the species, a situation that Hardin (1968) referred to as the "tragedy of the commons" results. When people act independently based on their own self-interests, they ultimately deplete a shared resource even when it was not in their long term interest for depletion of the resource to happen (Hardin, 1968).

Collaborative extraction of resources has some important implications for biodiversity conservation and could mitigate Hardin's "tragedy of the commons". An understanding of collaborative resource use in local communities could facilitate better implementation of community-based conservation approaches in communities neighbouring parks. For example, some people may not go to extract resources when others with whom they extract resources are not present. This happens when a group of people agreed on how and when to harvest a common resource. Such a practice could be useful in the context of biodiversity conservation especially when the decisions of the group enhance sustainable use. Group harvest and collaborative use of resources is described as an example of a traditional strategy of resource use and management (Bassi, 2006) (Chapter 3). Putting this into consideration in the current resource use agreements between the park administration and the local people could improve the current community-based plant resource conservation strategies in the Rwenzori Mountains National Park.

5.6 CONCLUSION

Despite the implementation of a community-based plant conservation strategy in the Rwenzori Mountains National Park, illegal plant resource extraction still occurs. Such a situation is common in many other national parks in Africa (Shrivastava & Heinen, 2007; Mogaka, Simons, Turpie, Karanja, & Emerton, 2001; Wily & Mbaya, 2001). The factors responsible for such a situation are myriad and interlinked. In the Rwenzori Mountains National Park, the factors are directly associated with resource needs, the intended use of the resources extracted, the demand for resources and whether the resources are extracted for commercial or subsistence purposes. The current community-based interventions only attempt to address the need for resources through provision of alternatives. This is partly why illegal access to the park for plant resources has persisted. Future interventions should take into account the identified factors and the socio-economic context of the local community neighbouring the park. Such interventions should not only consider the species that people obtained illegally from the park but also the parts extracted, the amount, the uses, the number of people and the frequency of harvest.

CHAPTER 6

EXTENT OF POACHING IN THE RWENZORI MOUNTAINS NATIONAL PARK, UGANDA: TOWARD A COLLABORATIVE HUNTING STRATEGY



Figure 6.1 Some poachers in the Rwenzori Mountains National Park surrendering their poaching gear to the warden in charge of community conservation. (Source: New Vision news paper, 29 March, 2010).

OVERVIEW OF THE CHAPTER

Despite regulations restricting access to the Rwenzori Mountains National Park, local people continue to poach animals from the park. Although poaching in the Rwenzori Mountains National Park was previously documented, no studies had been conducted to identify the actual species of animals poached and the factors influencing poaching. This investigation therefore aimed to identify the animal species poached, the uses of the different body parts of the animals poached, the number of people involved in poaching, the quantities of animals poached, the frequency of poaching, the trends in poaching, the availability of alternatives to the animal species poached, and poachers' views about the availability of the animal species they poach. This information was important for determining the extent of poaching and proposing a community-based strategy for wildlife management. The investigation found that local people near the Rwenzori Mountains National Park poached 46 species of animals from the park. The species belonged to 20 families with the highest number of species belonging to family Bovidae. The species poached were confined to the park only and none was found outside the park. Thirty five different parts were extracted from the poached animals which were used for food, medicine, cultural practices, art and craft, and dog food. Parts from 15 species were used for both commercial and subsistence purposes, and those from 31 species were used for subsistence purposes only. Parts from three species (Cercopithecus aethiops, Loxodonta africana, and Procavia capensis) were used differently from the way they were used in the past. Four species (Cercopithecus aethiops, Colobus angolensis, Mungos mungo and *Rattus ratus) were in highest demand, 18 species were considered by poachers as the most important, and the availability of 8 species in the park was said to be decreasing. Some of the species poached from the park had previously been listed among species of conservation concern in Uganda. The implications of these results to the conservation and management of animal species in the Rwenzori Mountains National Park through a community-based wildlide conservation strategy have been discussed.*

6.1 INTRODUCTION

Hunting was a common activity in many African traditional communities (Olupot, McNeilage & Plumptre, 2009). People hunted different animal species for various reasons (Amum & Eves, 2009). Bush meat for instance is a delicacy among communities living in or around wildlife habitats (Nielsen, 2006; Robinson & Bennett, 2004). Animals provide raw material for making products which are used for subsistence and commercial purposes (Caspary, 1999; Olupot *et al*., 2009). Hunting is also done as a sport and hence plays vital function in the tourism industry (Chardonnet, des Clers, Fischer, Gerhold, Jori, & Lamarque, 2002; Lindsey, Roulet, & Romanache, 2007).

Setting aside some areas as national parks has restricted hunting in many communities. In national parks and other protected areas, hunting is an illegal activity which is referred to as poaching (Redmond, Aldred, Jedamzik, Westwood, 2006). In many national parks globally, there are regulations which prohibit poaching or which allow restricted and guided hunting of animals (Yasuda, 2011).

Despite rules in various national parks against poaching, many studies have reported incidents of poaching in national parks (Holmern, Muya, & Røskaf, 2007; Redmond *et al.,* 2006; Yasuda, 2011). For instance, in Africa, one in every four species of mammal is considered threatened as a result of poaching (International Union for Conservation of Nature, 2008). In Korup National Park, in Cameroon, Linder and Oates (2011) found that hunting was driving to local extinction some of

Africa's most threatened primate species (such as Preuss's red colobus and the drill). Related findings were reported in Budongo Forest in Uganda (Tumusiime, Eilu, Tweheyo & Babweteera, 2010), in other various sites in Uganda (Olupot *et al*., 2009), and in the Republic of the Congo (Mbete *et al*., 2011).

6.1.1 Poaching in the Rwenzori Mountains National Park

The Rwenzori Mountains National Park is a typical example of a protected area in Africa that faces a problem of poaching despite strict regulations against the practice. Many species formerly abundant in the Rwenzori Mountains National Park were rare (Loefler, 1997). Game rangers often find animal traps and remains of trapped animals in the park (Rwenzori Mountains Conservation Education Strategy, 2004). Although some poachers have voluntarily surrendered their hunting gear to the Rwenzori Mountains National Park (such as those in the photo on the cover of this chapter), poaching is still prevalent (Tumusiime, Vedeld, & Gombya-Ssembajjwe, 2011).

Several studies have been conducted about poaching in the Rwenzori Mountains National Park (Loefler, 1997; Olupot *et al*., 2009; Rwenzori Mountains Conservation Education strategy, 2004). However, the actual species of animals hunted and information on various aspects of hunting were lacking. Lack of information on such aspects could partly account for the limited success of interventions against poaching (Chapter 1). Without information on which species people poached most and which species poachers considered most important, it is difficult to develop collaborative and participatory strategies that could mitigate poaching in the park.

6.1.2 The purpose of this investigation

The purpose of this investigation was to identify animal species poached from the Rwenzori Mountains National Park, the number of people involved in poaching, the frequency of poaching, the uses of animals poached, the animals that poachers considered the most important, and local people's views about the availability of the animals they poached and identify the factors underlying poaching. The information generated not only helped to determine animal species in high demand by poachers but also to propose a community-based wildlife conservation strategy.

6.2 CONCEPTUAL UNDERPINNINGS FOR THE STUDY

Poaching is generally considered incompatible with biodiversity conservation. However, hunting of animals from protected areas should not always be assumed to be unsustainable as the case is currently in national parks in Africa. There are a number of factors such as the species hunted, the body part extracted from the animal hunted, and the level of demand for animal body parts that should be considered before making hunting illegal in national parks.

The need for animal resources influences the choice of the animal species that an individual poaches and the body part an individual extracts from the animal. For instance, an individual in need of cultural regalia (such as the skin of a leopard on the lap of a woman in the front row on Figure 6.2) will influence the individual to kill a leopard to obtain its skin.



Figure 6.2 The skin of a leopard on the lap of the woman in the front row is one of the cultural regalia of the Rwenzori Mountain people. (Source: Muhumuza et al., 2009**).**

The uses associated with particular parts of animals influence whether animals are poached for commercial or for subsistence purposes. Poaching for commercial purposes is more common among animal species that offer products that have high market demand than among species which offer products that are used culturally. For instance, rhinos have been hunted from most African savannas because they offer horns which have a high market value (Lindsey *et al*., 2007).

In terms of conservation, a species is more at risk when poached for commercial purposes than for subsistence purposes (Lindsey *et al*., 2007). Subsistence or commercial use of animals and their products influences the number and quantity of animals poached in a specified period by an individual and consequently the level of demand for animal products.

From the socio-economic perspective, these factors determine the extent of poaching and are important in proposing collaborative wildlife management in national parks. Other biological factors

such as the ecology and reproductive rates of the animal species poached are also important determinants of sustainable poaching but are beyond the scope of this study. This study only focuses on the socio-economic and cultural aspects of poaching because these factors are often ignored or given less attention in planning collaborative wildlife management. Investigating these factors provides information for better understanding the problem in the Rwenzori Mountains National Park and its underlying causes so that intervention to mitigate the problem can be proposed.

6.3 METHODS

Data were obtained through semi-structured interviews with local people who poached animals from the park. The process of data collection was similar to that previously described (Chapter 5), except that in this part of the study, questions to respondents were not focused on the plant species extracted but on the animal species poached from the park. The animals species stated were identified based on technical reports (such as Olupot *et al*., 2009) describing the species in the Rwenzori Mountains National Park.

Although information on the factors that affect survival of animal species and criteria for ranking can be obtained through short term and long term scientific studies, some of the information can be more quickly obtained through interviews from local people who interact in various ways with animal species in a given environment. Poachers for instance may have information on the ecology, habitat, number and trends of species in a particular location which they can divulge through interviews when approached cautiously and after winning their trust (Lindsey *et al*., 2007).

The choice of the method used in this study was also motivated by the point of view that studies in zoology are quite often based on the knowledge of local people which is later interpreted scientifically (Harcourt, 1995). For example, information about how socio-cultural and economic factors affect hunting of animals is important for setting priorities for the scientific management of species (Mace & Lande, 1991). Information on such factors can be obtained from local informants when involved in in-depth interviews (FitzGibbon, Mogaka, & Fanshawe, 2000).

Therefore, in-depth interviews used in this study helped to generate information on the actual species hunted, the extent of the problem of poaching, the species that could be at risk, and the species that need further study. In addition, through in-depth interviews, the underlying causes of poaching were identified.

It was also noted that when conducting ethno-zoological studies, it is important to realize that although the number of times a species is cited by the informants may indicate its level of demand and help to assign it a certain level of conservation priority, if a species is heavily hunted and rare, it may not be mentioned by informants and yet its conservation priority would be higher (Wilkie, 2003). Also, some species may be of conservation concern but have no or few uses, and hence may not be mentioned by informants (Wilkie 2003).

Therefore, in addition to interviews with respondents, national and international data bases and reports were consulted to obtain information about the conservation status of the animal species poached by local people from the Rwenzori Mountains National Park. The reports and data bases consulted include:

- The Uganda Biodiversity and Tropical Forest Assessment Report.
- The State of Environment Reports for Uganda for the years 2006, 2007 and 2008.
- The State of Uganda's Biodiversity Report.
- The IUCN Data Base.

6.3.1 Determining the extent of poaching and species in highest demand by poachers

The criterion of determining the animals in greatest demand was based on the quantity/ number of animals poached and the frequency of poaching of animals.

6.3.1.1 Quantity/ number of animals poached

The quantity of poached animals was determined by asking people how many animals they poached at a given time. The number of animals (NA) that a specified number of people (NP) poached from the park was determined for each category. The species from which the number of animals (NA) was hunted were also indentified for each category. The weight for the number of animals hunted was obtained by multiplying (NA) and (NP). The highest weight among the categories was noted and the number of species in that category identified.

6.3.1.2 Frequency of poaching

The frequency of poaching was determined by asking people how often they poached various animals. The frequency in each category was accorded a rank (RA) (Table 6.1).

Table 6.1 Criterion for ranking frequency of poaching animals

Frequency	Rank (RA)
Animals poached annually	1
Animals poached monthly	12
Animals poached weekly	52

The number of animals poached by a given number of people (NP) was also determined. The weight for the frequency of poaching was calculated by multiplying the rank (RA) by the number of people (NP) that poached animals in a specified period. Animal species in the category of the highest weight of the frequency were noted.

The animal species in demand were determined by identifying the species that overlapped between those found under the highest weight of quantity/ number and those under the highest frequency.

6.4 RESULTS

6.4.1 Animals species poached from the Rwenzori Mountains National Park

Forty six animal species were poached from the Rwenzori Mountains National Park (Appendix 6.1). The species poached belonged to 20 different families. The highest number of species (11 species) was from family *Bovidae* (Figure 6.3). None of these species was said to be hunted from private land outside the park.

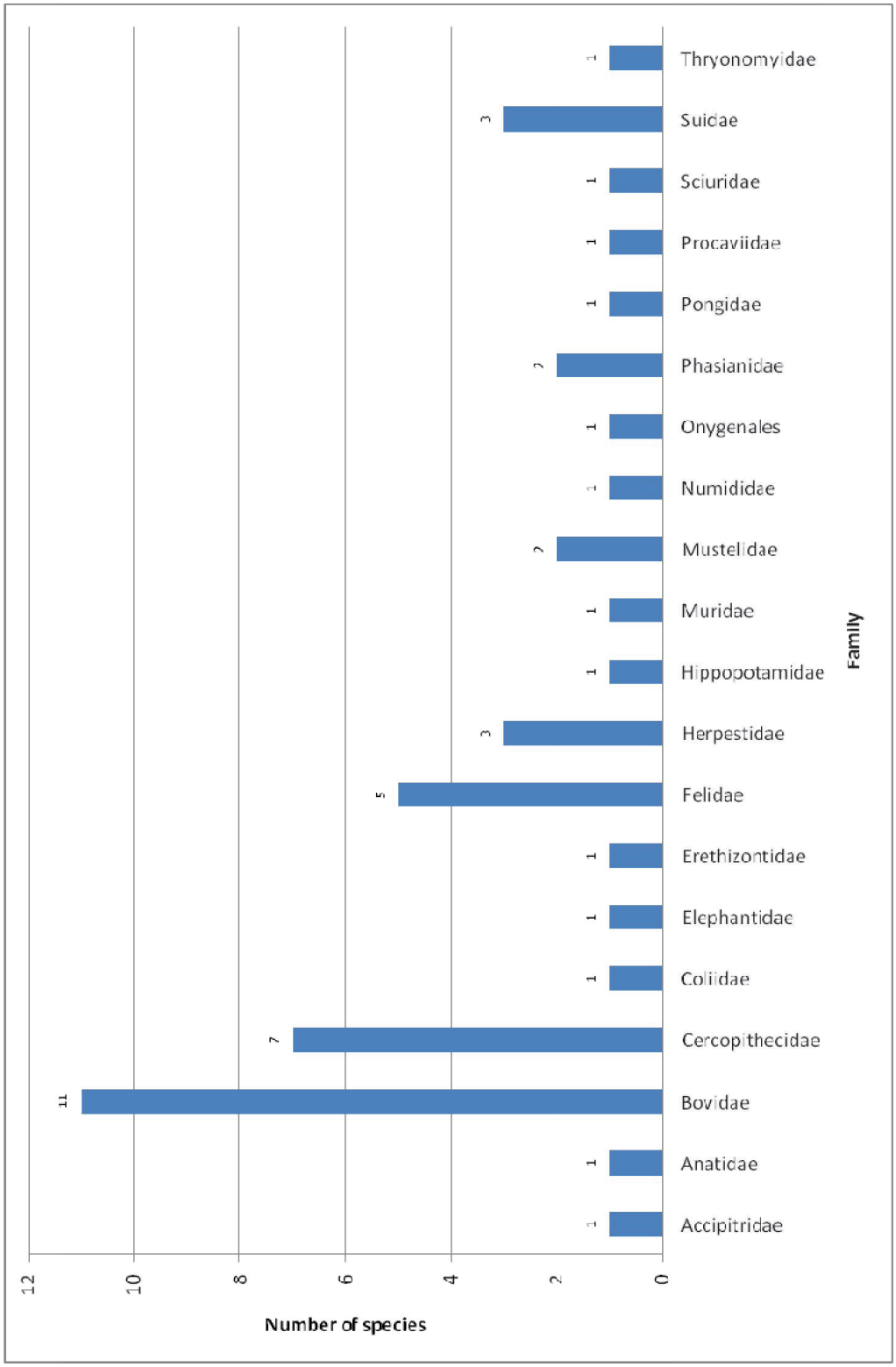

Figure 6.3 Families of animal species hunted and the number of species in each family

Respondents sampled started poaching animals from the park between 20 years ago and 1 year ago (Figure 6.4). Generally, the number of species hunted increased over time. For instance, the number of respondents started poaching 5 animal species 20 years ago and the number had accumulated to 42 species 5 – 9 years ago.

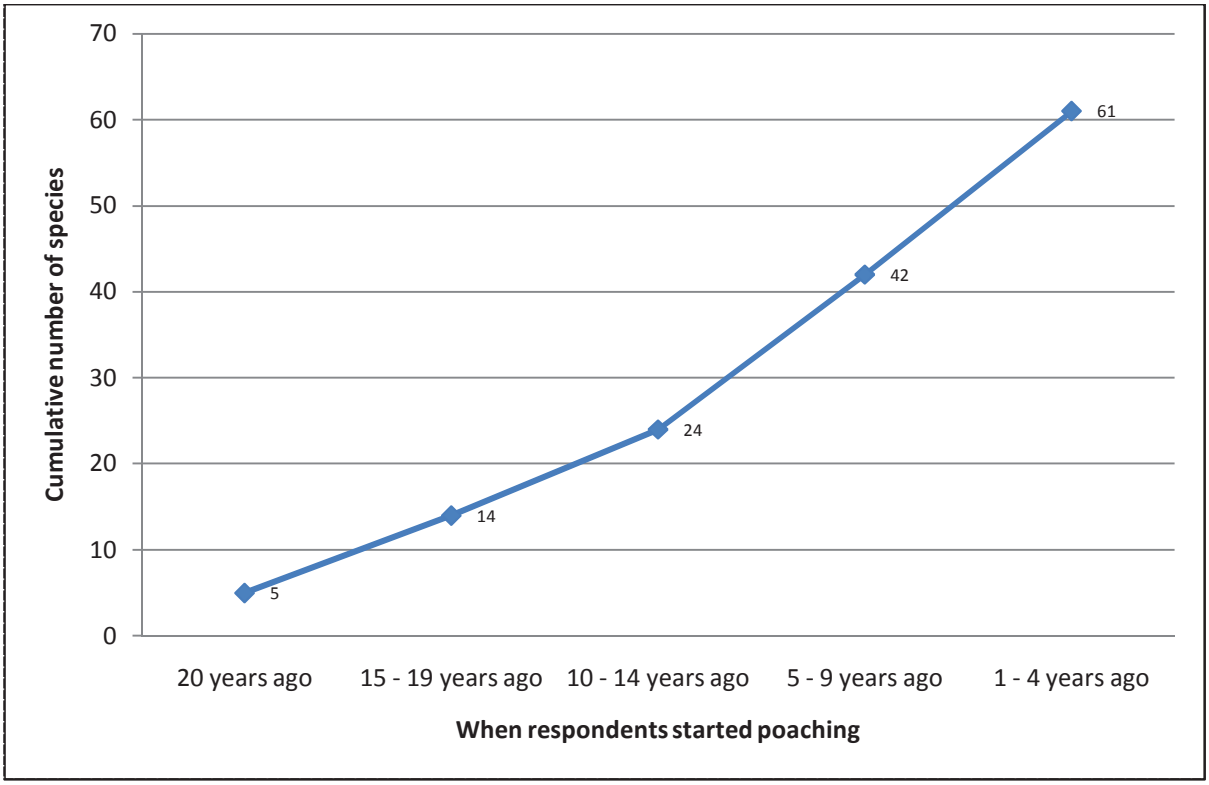

Figure 6.4 Cumulative frequency of animal species poached since 20 years ago.

The total number of species at the end of the curve is more than 46 species because there were multiple responses recorded. For example, a respondent started poaching species *Genetta genetta* 15 – 19 years ago but also started poaching *Damaliscus topi* 1 – 4 years ago.

6.4.2 Extent of poaching and species in high demand in the Rwenzori Mountains National Park

Species were poached by varying numbers of people. Some respondents poached as a group and others individually. *Procavia capensis* was poached by the highest number of people (36 individual people) and *Loxodonta africana* was poached by the least number of people (2 people).

There was no relationship between the number of people that poached particular species and the size and family of the species they poached. Three out of six species poached by the highest number of people were monkeys (genus *Cercopithecus*).

The number of animal species poached for a particular purpose at a given time varied. For example, 3 animals per 8 species (*Cercopithecus aethiops*, *Colobus angolensis*, *Hystrix africaeaustralis*, *Mungos*

mungo, *Piliocolobus tephrosceles*, *Plectropterus gambensis*, *Rattus ratus* and *Thryonomys swynderianus*) were hunted for food by 51 people. These constituted the highest quantity / number of the animals poached for a particular purpose.

Also there was a variation in the number of times in a given period that particular species of animals were poached by a certain number of people. For example, 8 species (*Cercopithecus aethiops*, *Rattus ratus*, *Colobus angolensis*, *Felis serval*, *Ichneumia albicauda*, *Mungos mungo*, *Papio anubis* and *Cercopithecus ascanius*) were poached weekly for food by 51 people. These species contributed to the highest weight for frequency of animal species poached.

Four species (*Cercopithecus aethiops, Colobus angolensis, Mungos mungo* and *Rattus ratus)* overlapped between those poached in highest quantity and the ones hunted most frequently.

Three species (*Cercopithecus aethiops*, *Colobus angolensis* and *Mungos mungo*) out of the four species were considered the most important among 19 species revealed by respondents (Table 6.2).

Table 6.2 Species that poachers considered the most important

Species name	Number of poachers that considered a species important	Number of poachers who poached the species	Percentage number of poachers who poached the species they considered important	Percentage number of total respondents who poached
Canis mesomelas	17	23	73.9	10.4
Cercopithecus aethiops	20	33	60.6	12.3
Cercopithecus ascanius	16	25	64.0	9.8
Colius striatus	12	21	57.1	7.4
Colobus angolensis	9	9	100.0	5.5
Damaliscus topi	7	10	70.0	4.3
Felis serval	15	23	65.2	9.2
Heliosciurus rufobrachium	10	14	71.4	6.1
Hippopotamus amphibius	9	14	64.3	5.5
Madoqua kirkii	12	16	75.0	7.4
Mungos mungo	14	21	66.7	8.6
Otocyon megalotis	23	25	92.0	14.1
Panthera pardus	5	5	100.0	3.1
Papio anubis	13	15	86.7	8.0
Piliocolobus tephrosceles	23	26	88.5	14.1
Plectropterus gambensis	19	25	76.0	11.7
Procavia capensis	27	36	75.0	16.6
Thryonomys swynderianus	19	24	79.2	11.7
Tragelaphus spekii	8	12	66.7	4.9

All the people who poached *Colobus angolensis* and *Panthera pardus* considered these species most important species.

These species were considered important for various reasons. Some of the species such as *Panthera pardus*, *Damaliscus topi* and *Plectropterus gambensis* were considered important because they were rare and yet their products were very important culturally and for other uses. Species such as *Mungos mungo*, *Felis serval*, and *Colobus angolesis* were considered important because they were frequently needed for food especially during special occasions such as marriage, baptisms and funerals.

Weighted scores of highest impact on poaching show that *Colobus angolensis* is the species in highest demand and *Mellivora capensis* is the species in least demand (Table 6.3).

Table 6.3 Extent of demand of species poached from the Rwenzori Mountains National Park

Name and body size of animal species poached			Weighted score of species poached															Total weighted scores
Scientific names	Common names	Body size	1 animal (QA) poached monthly (RA) for food by 60 people (NP)	2 animals poached annually for food by 42 people	3 animals poached weekly for food by 51 people	1 animal poached annually for medicine by 74 people	1 animal poached monthly for cultural purposes by 30 people	1 animal poached monthly for cultural purposes by 16 people	1 animal poached annually for cultural purposes by 4 people	1 animal poached annually for cultural purposes 3 people	2 animals poached annually for cultural purposes by 5 people	2 animals poached annually for cultural purposes by 6 people	1 animal poached monthly for art and craft by 22 people	2 animals poached monthly for art and craft by 16 people	2 animals poached monthly for art and craft by 1 person	3 animals poached annually for art and craft by 11 people	1 animal poached monthly for dog food by 16 people	2 animals poached monthly for dog food by 10 people	3 animals poached monthly for dog food by 8 people	4 animals poached monthly for dog food by 6 people	
Colobus angolensis	Rwenzori colobus	M	720	84	1836		360														3000
Thryonomys swynderianus	Cane rat	S	720		1836	74												240			2870
Rattus ratus	Rat	S	720		1836	74															2630
Cercopithecus aethiops	Vervet monkey	M	720		1836										24						2580
Plectropterus gambensis	Duck	S	720		1836										24						2580
Mungos mungo	Banded Mongoose	M		84	1836	74									24				288		2306
Piliocolobus tephrosceles	Red Colobus monkey	M			1836				4				264								2104
Hystrix africaeaustralis	Porcupine	M			1836								264								2100
Felis serval	Serval cat	M	720	84			360												288		1452

Alcelaphus buselaphus jacksoni	Hartebeest	M	720			74			4				264				240			1302
Procavia capensis	Rock Hyrax	L	720	84				192					264							1260
Felis silvestris	Wild cat	M	720					192										288		1200
Hippopotamus amphibius	Hippopotamus	L	720			74	360													1154
Ichneumia albicauda	White tailed mongoose	M	720									12		384						1116
Stephanoaetus coronatus	Crown Hawk eagle	S	720				360								24					1104
Heliosciurus rufobrachium	Squirrel	S	720			74													288	1082
Loxodonta africana	Elephant	L	720				360													1080
Pardofelis temminckii	Golden cat	S	720				360													1080
Tragelaphus spekii	Sitatunga	L	720				360													1080
Numida meleagris	Guinea Fowl	S	720										264							984
Cercopithecus mitis	Blue monkey	M	720									12					240			972
Cercopithecus ascanius	Red tailed monkey	M	720					192							24					936
Canis mesomelas	Jackal	M	720								10					192				922
Pan troglodytes	Chimpanzee	L	720			74				3					24					821
Enhydra lutris	Otter	S	720			74						12								806
Colobus guereza	Black and white Colobus monkey	M	720			74														794
Hylochoerus meinertzhageni	Giant Forest Hog	L	720			74														794
Madoqua kirkii	Dikdik	L	720			74														794
Otocyon megalotis	Fox	L	720			74														794
Tragelaphus scriptus	Bushbuck	L	720			74														794
Papio anubis	Baboon	M	720												24					744
Sycerus caffer	Buffalo	L	720						4											724
Kobus kob thomasi	Uganda kob	L	720							3										723
Genetta genetta	Civet cat	M							4										288	292

Ourebia ourebi	Oribi	M		84		74															158
Colius striatus	Mouse bird	S				74			4												78
Galerella sanguine	Slender mongoose	M				74				3											77
Panthera pardus	Leopard	L				74				3											77
Cephalophus monticla	Duiker	L				74															74
Damaliscus topi	Topi	L				74															74
Kobus ellipsiprymnus defassa	Waterbuck	L				74															74
Phacochoerus africanus	Warthog	L				74															74
Potamochoerus larvatus	Bush pig	L				74															74
Redunca fulvorufula	Reedbuck	L				74															74
Pternistis swainsonii	Francolin	S															33				33
Mellivora capensis	Ratel	S							4												4

Key: S = Small, M = Medium, L = Large

6.4.3 Parts extracted from the animals poached and their uses

Thirty five different parts were extracted from the animals poached (Figure 6.5). Some animals were poached for multiple parts. For example *Panthera pardus* was poached in order to extract five parts which included: gut stone, skin, bone, teeth, and whiskers.

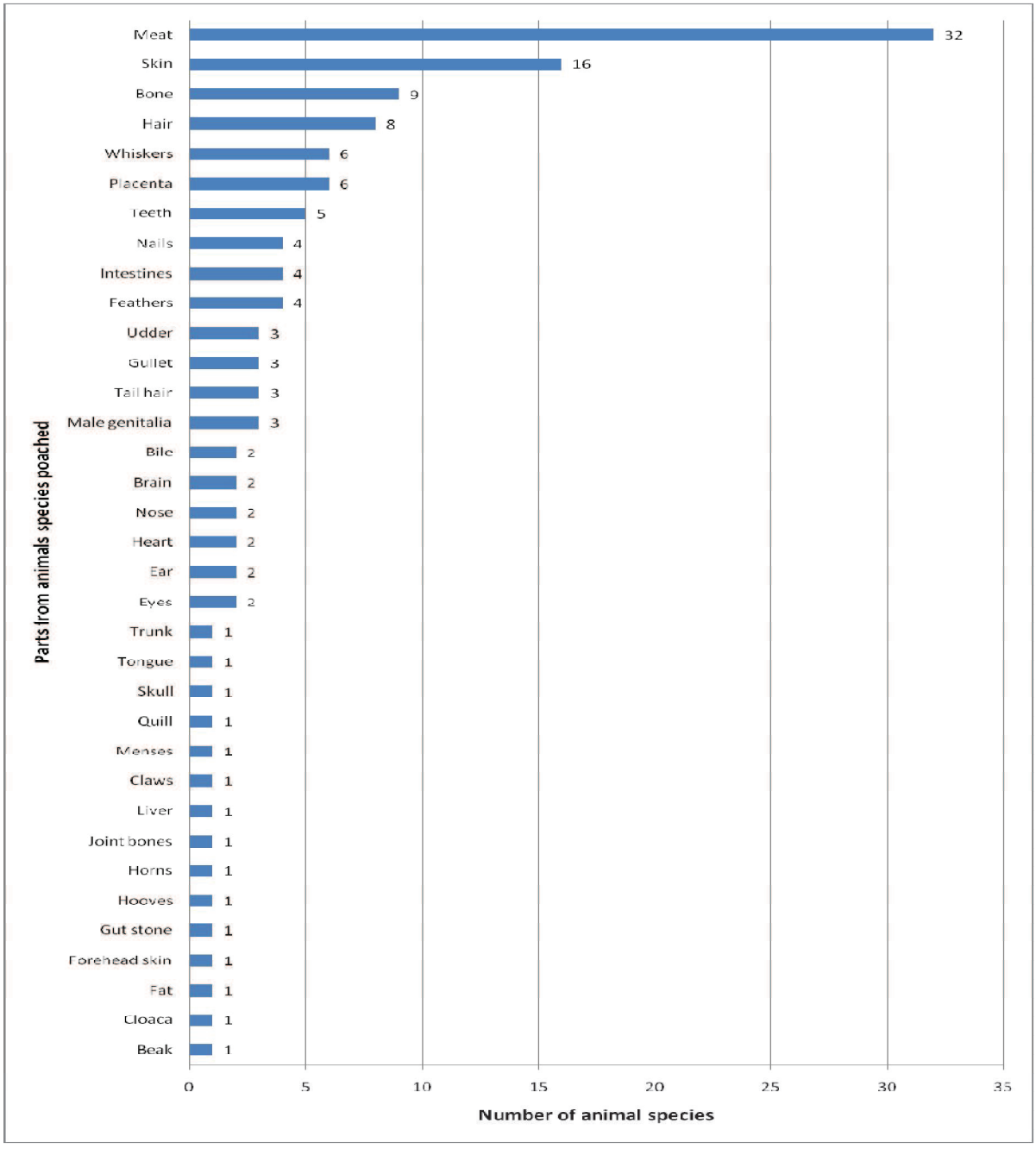

Figure 6.5 Body parts extracted from animals poached from the Rwenzori Mountains National Park by the local people.

The diversity of body parts extracted from animals poached is also closely associated with the uses of those parts. It was found that the parts extracted were for 5 main uses; food, art and craft, dog food,

medicine, and culture. The cultural uses are distinguished from medicinal uses because the former involve witchcraft, traditional rituals, and religious functions and are based on traditional beliefs unlike the latter which are used to treat illnesses based on practical experience. For instance, culturally, it was believed that since *Colobus guereza* fed on herbs, its meat improves blood circulation especially if smoked and mixed with groundnut stew. Skins of animals such *Colobus guereza* and *Piliocolobus tephrosceles* were used to make bags and dressing on the traditional music flute. Skins from those species were also used as bags in which goods such as seeds, and passion fruits were carried. Sexual organs of a male *Loxodonta africana* were believed to be charms that could help men seduce women into sexual intercourse. *Procavia capensis* is known to stay under rocks and its skin was used as an incubator for premature babies so as to survive the cold months in the snowcapped mountain ridges. The skin of the rock hyrax was also used to make blankets and coats. For medicine, fats of *Panthera pardus* were used in the treatment of boils, backache, diseases of blood vessels as well as for treating general body weakness. Eye balls of *Loxodonta africana* tied around the wrist or waist of a malnourished child will help it get better

Fifteen species (32.6%) were used for both commercial and subsistence purposes, and 31 species (67.4%) were used exclusively for subsistence purposes (Appendix 6.1). However, over time, there were changes in use of body parts extracted from poached animals. Parts from the majority of the species (43 species) were used in the same way at present as in the past (prior to the establishment of the park). The parts from three species were currently used differently from the past (Figure 6.6).

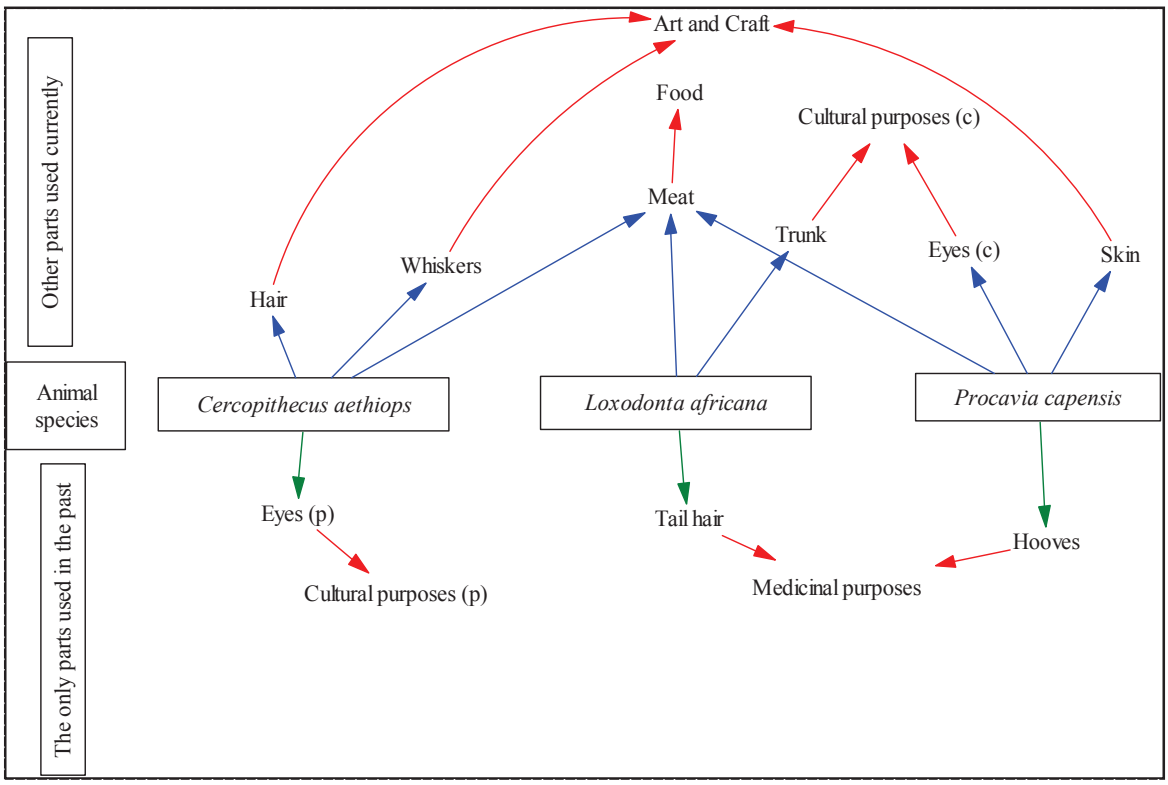

Figure 6.6 Illustration of the changes in use of different body parts of three animal species
Legend: 'c' denotes current use and 'p' denotes past use of similar body

Respondents revealed that changes in uses of resources were as a result of provision of alternatives for those resources. For instance, change from medicinal use of tail hair and hooves from *Loxodonta africana* and *Procavia capensis* respectively to other uses because they could access the clinic for medicines that can treat ailments that those parts are used to treat.

Change in use was also associated with a decrease in availability of some of the species. Testimonies from poachers indicate that they had noticed a decrease in the availability of 8 species (*Cercopithecus aethiops, Colius striatus, Felis serval, Hylochoerus meinertzhageni, Madoqua kirkii, Plectropterus gambensis, Procavia capensis* and *Thryonomys swynderianus*) they poached from the park. Poachers did not know when the availability of those species started to reduce. They only found that their traps took longer than before to trap some of those animals. They thought that perhaps those animals could have migrated to the neighbouring forests of Congo. They believed that those animals migrate and return before or after 3 to 5 years. They associate such beliefs to gods and how gods control the availability of animals in the park (Chapter 8).

6.5 DISCUSSION

The finding that all respondents could poach the animal only from the park indicates that creation of the park offered protection to the animal species in the mountains. The establishment of the park could have facilitated conservation of suitable habitats for the animal species that people poach. Outside the park the habitats have been destroyed and the animal species hunted out. The establishment of national parks that limit local people's access to resources therein may be more necessary in situations where there is unsustainable resource exploitation than community-based conservation (Wittemyer, Elsen, Bean, Burton & Brashares, 2008). In the case of the Rwenzori Mountains, perhaps if the national park was not established, the area would be devoid of the animal species that people currently hunt from the park.

Meat was a main driver of poaching in the Rwenzori Mountains National Park. This has also been previously reported in Tanzania (Nielsen, 2006), Botswana (ODI, 2006); Kenya (Fitzgibbon, *et al.,* 2000); the Congo Basin (Eves, 2006; Wilkie and Carpenter, 1999); West Africa (Owusu, Ntiamoa-Baidu & Ekpe, 2006), and Uganda (Tumusiime *et al*., 2010). Hunting for meat is often attributed to the need for protein intake, especially amongst hunters who rarely obtain proteins from crops since they are not agriculturalists (Eves, 2006). However, the majority of the people neighbouring the Rwenzori Mountains National Park are agriculturalists and mainly grow crops such as legumes (like beans and peas), grains, and vegetables (Olupot *et al*., 2009). Legumes, grains and vegetables when eaten in combination provide complete protein similar to what can be found in meat (as animal protein) (Young & Pellett, 1994). This suggests that poachers in the Rwenzori Mountains National Park can easily access alternative protein sources from cultivated crops. Thus, poaching is not always driven by the need for protein intake. There are other factors that influence poaching and its sustainability that require exploration.

6.5.1 Factors influencing poaching and its sustainability

Despite the implementation of policies against poaching in the Rwenzori Mountains National Park, the vice has persisted. Although the names of the species poached are important for providing clues about species preferred by poachers, more important are the factors influencing poaching if the problem is to be mitigated. Just like illegal extraction of plant resources (Chapter 5), poaching is directly influenced by the need, the use of the part extracted, the purpose (commercial or subsistence extraction), and the extent of demand (Figure 6.7).

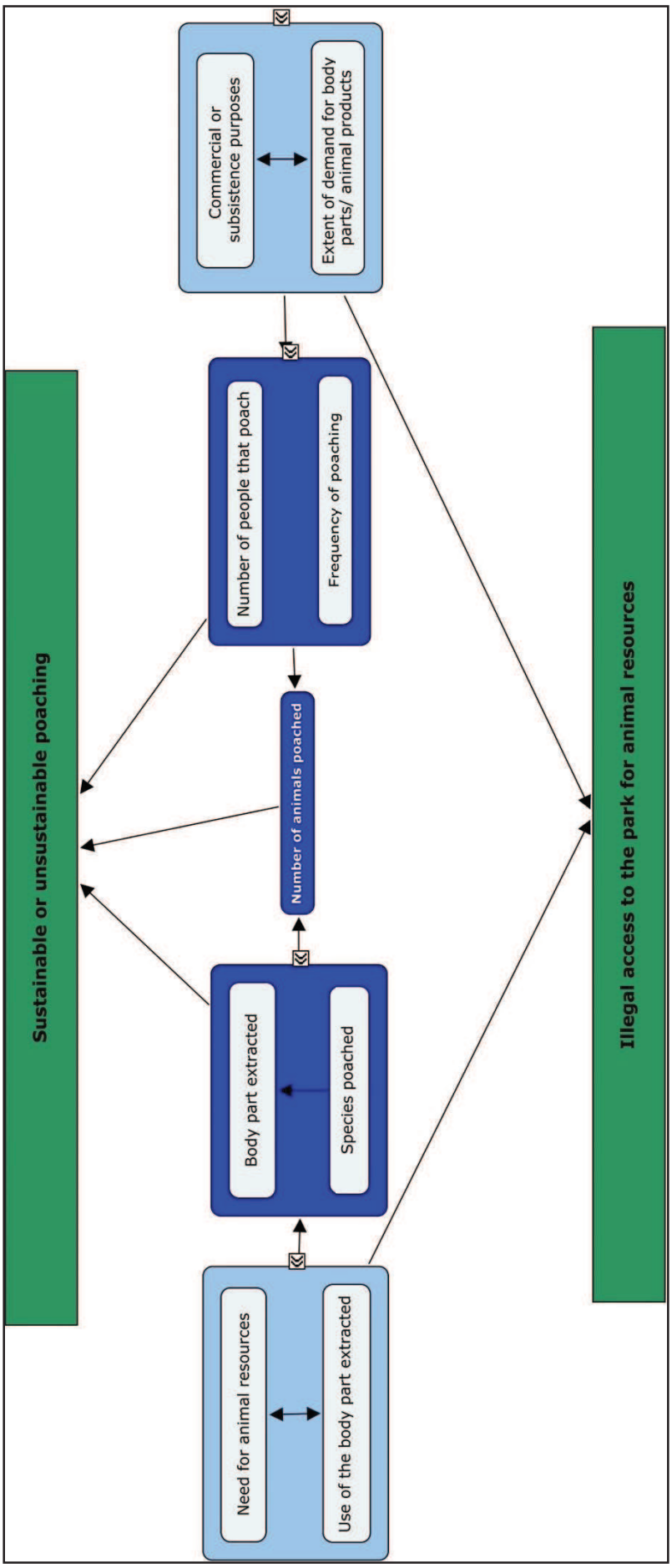

Figure 6.7 A scheme of factors that influence poaching and its sustainability in national parks.

Although there is community-based biodiversity conservation (especially collaborative wildlife management) in some national parks in Africa, in the Rwenzori Mountains National Park, poaching is totally illegal. Current community-based strategies do not consider collaborative wildlife management. In many cases, poaching is assumed to automatically lead to unsustainable use and that is why negotiated limited access to animals in national parks by local people is not permitted.

Whether poaching is sustainable or unsustainable depends one a number of factors. Based on this study, five factors were identified: 1) the species poached, 2) the body part extracted (internal or external), 3) the frequency of poaching, 4) number of people that poach, and 5) the number of animals poached (Figure 6.5). These factors must be taken into account for more effective wildlife management. For instance, the part extracted is not only important for ascertaining resource needs but also a basis for planning mitigations.

In Uganda and other neighbouring countries like Kenya, Tanzania and Democratic Republic of Congo the method used in monitoring animal trafficking and poaching is by checking people's luggage for game meat (Fitzgibbon, *et al.,* 2000; Nielsen, 2006; Tumusiime *et al*., 2010). Usually check points are placed along main roads leading to and from protected areas to check for game meat. There is a possibility that people who poach for parts such as the skin, whiskers, hair, and hooves may not be discovered at the check points.

In many community-based biodiversity conservation interventions, the aim is to find alternatives to the uses of animals poached. In the Rwenzori Mountains National Park, animals were poached for food (human and dog food), art and craft, medicine, and cultural purposes. Mitigation of commercial poaching through provision of alternative sources could partly be a practical solution in the Rwenzori Mountains National Park. Change from medicinal use of animal parts to the use of drugs from clinics is an indication that provision of goods and services that directly substitute those that people get from protected areas can lessen the extent of poaching. It has been reported from elsewhere that provision of alternatives for protected area resources could reduce pressure for demand of protected area resources (Barrow and Murphree, 2001; Lewis, Kaweche & Mwenya, 1990; Lewis & Phiri, 1998). However, the successes of strategies that are aimed at providing alternatives to protected area resource users largely depend on whether these alternatives are acceptable and suitable (Chapter 2).

For instance, human and dog food from the poached animals is meat which accordingly could be obtained from domestic animals. However, domestic animals even if freely given to the local people may not be used for food but for payment of bride price or sold to meet other economic demands. Additionally, meat from wild animals has been said to taste better than meat from domestic animals and is often preferred to domestic animals (Young and Pellett, 1994). Some people poached animals for food weekly; the provision of alternative meet at this rate might not be possible. Also, unlike plant species that could potentially be propagated on private land, it might not be possible to rear wild animals of species preferred by poachers on private land. Different animal species prefer diverse

habitats which can neither be found nor created on private land due to scarcity of land and increasing human population.

These limitations suggest that approaches for community-based wildlife management and conservation should continually be sought. Based on the current extent of poaching and the underlying factors it is necessary to explore a collaborative anti-poaching strategy.

6.5.2 Collaborative hunting strategy: A proposal for community-based wildlife management and conservation and factors to consider in its implementation

Contrary to available literature suggesting that poaching individually or in a group is only influenced by the type of method used in poaching such as trapping, poisoning and hunting (chasing and killing or capturing the animal) (Wilkie & Carpenter, 1999), three new factors: 1) the traditional beliefs, knowledge and practices of poachers, 2) the need to negotiate park rules, and 3) the size of the animal poached have been identified. The first and the second factors and their implication for wildlife management and conservation have been discussed elsewhere (Chapters 8 and 9 respectively). About the third factor, the bigger the animal, the more the people in a group that poached it. Big animals such as *Hippopotamus amphibius*, *Pan troglodytes* and *Sycerus caffer* are more likely to be poached by a group of people than small animals.

Poaching individually or in a group (here after referred to as collaborative hunting) has a number of lessons for wildlife conservation and management in the Rwenzori Mountains National Park. Collaborative hunting is said to have been traditionally used in African communities as a wildlife management and conservation strategy (Chapter 3). Under collaborative hunting arrangements, rights of access to and use of resources were highly regulated through a flexible balance of individual and "common property" entitlements (Burgess *et al*., 2005; DeGeorges & Reilly, 2008). Animals were hunted by groups of hunters who then shared the hunted animals with the community members. Such arrangements for collaborative hunting could also be implemented or revived in the Rwenzori Mountains to mitigate the current extent of poaching in the park.

This could be based on the parts that poachers extract from animals. Some people poached animals only to extract organs from those animals, yet other people killed the same species of animals for only hides and skins. From a biodiversity conservation point of view, this is an indicator of unsustainable utilisation of resources. If people interested in different parts of the same animal species engaged in collaborative hunting, it would be more sustainable than different people hunting the same species for different parts. In traditional African communities, people interested in different parts shared the same animals and this was a more sustainable hunting strategy (DeGeorges and Reilly, 2008).

Although changes brought about by modernisation in many African communities (Chapter 3) might not permit traditional biodiversity conservation strategies such as collaborative resource use, in the case of the Rwenzori Mountains, there is potential for collaborative hunting to be implemented. This

is because the Rwenzori Mountains are remote and the terrain has made the communities isolated from major towns and trading centers (Ernest, 2011). The communities still have remnants of traditional characteristics compared to communities in low land areas such as Fort-Portal, Kasese and Bundibugyo towns.

The suggestions made here do not mean that hunting should be legalized in the Rwenzori Mountains National Park, but serve as a starting point for exploring community-based wildlife management. It is better to understand the dimensions of hunting (some of which have been revealed in this chapter), and then assess how best to address the problem of poaching than attempting to address the problem of poaching using strategies that have already been found to be ineffective (Chapter 1).

There are a number of factors and steps that could be taken into account in implementing such a strategy. These factors and steps will enable making decisions about which animals should be considered under the collaborative hunting strategy. At each step, there is consideration and elimination of species that should not be included in the collaborative strategy (Figure 6.8).

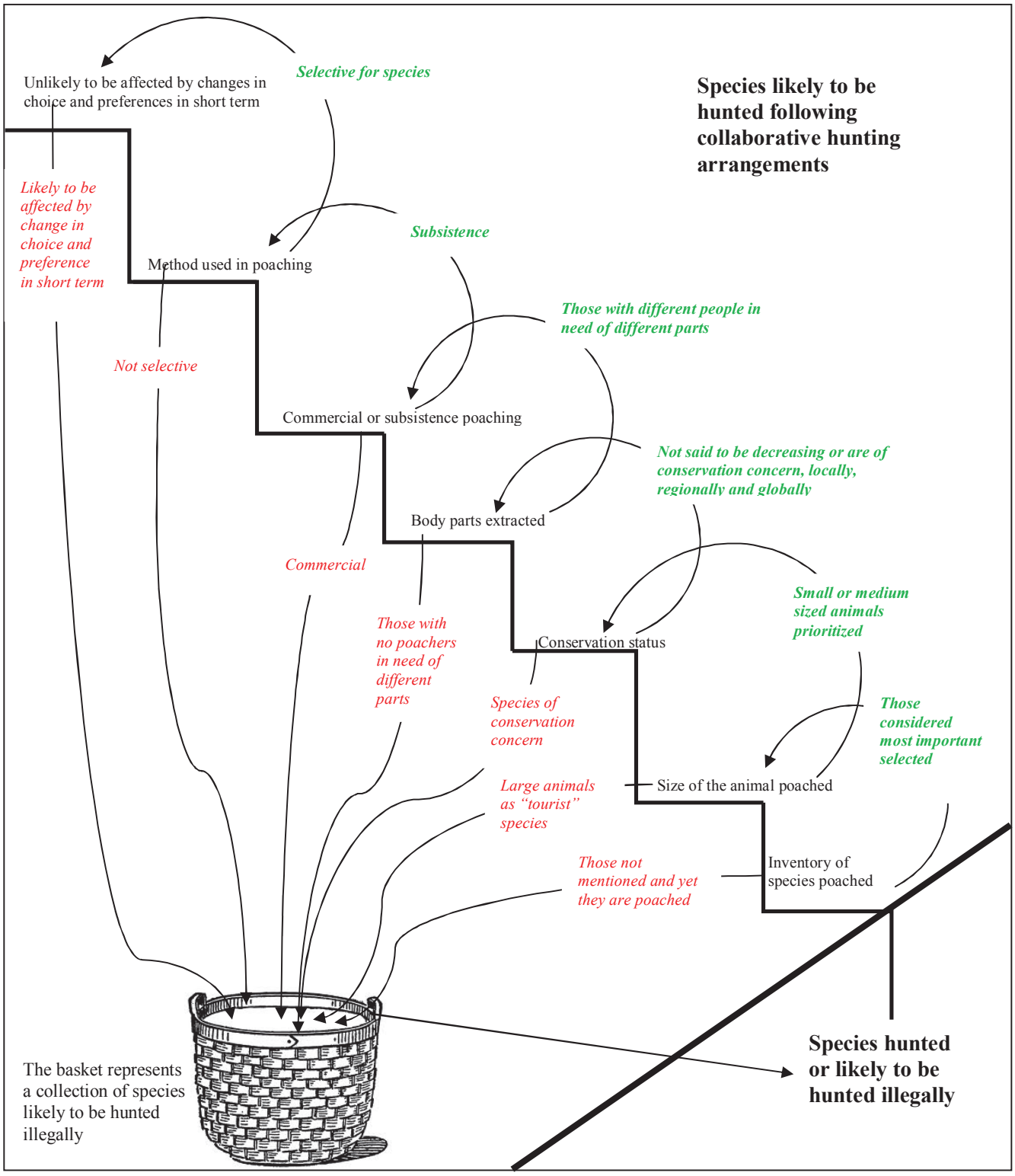

Figure 6.8 The process of planning for a collaborative hunting strategy and the factors to consider.

6.5.2.1 Inventory of animal species poached

In planning for a collaborative hunting strategy it would be necessary to start with an inventory of the animals poached. This should be based on the information provided by the local community especially poachers. This is necessary in order to identify the species that poachers consider important and the reasons why. For instance, in this study, it was found that some species that were in high demand were not necessarily those that local people considered the most important, and species that people consider important were not necessarily the ones in high demand. Blending local knowledge and scientific knowledge about species is often recommended for conservation priority setting (Harcourt, 1995). Some people regarded some animal species most important because those species were vital in cultural functions and others for meat or for sale. These differences must also be taken into account. It is expected that some species poached might intentionally or unintentionally not be revealed and these may not enter the conservation planning cycle and might continue being poached.

6.5.2.2 Body size of the species poached

It is expected that among the animals considered to be the most important there are large, medium and small sized animals. In this investigation, all species in the category of highest quantity, those hunted most frequently and in big numbers and the first four species in high demand were small or medium mammals. These results concur with other studies which found out that small and medium mammals in protected areas regardless of population sizes, fecundity, and reproduction rates are more at risk of poaching than large mammals (Powell & Proulx, 2003; Viveirosdecastro, 2004). The reason for this is more social than ecological. For instance, small and medium mammals are easier to trap than large animals (Powell & Proulx, 2003). In the Rwenzori Mountains National Park, poachers individually hunt small or medium animals unlike large animals which they hunt as a group. This factor coupled with low conservation priority given to small or medium mammals because they are not “tourism species” (Young, 1994) makes them vulnerable to poaching. Given that ecological studies of animals in protected areas predominantly focus on large mammals and birds (Young, 1994), coupled with the difficulties associated with monitoring of small mammal populations (Amori & Gippoliti, 2003), small mammals could be more susceptible to poaching than large mammals.

Over hunting of small animals is likely to cause negative consequences for the entire protected area. For example, small mammals are bio-indicators of the status of the ecosystem health (Fricke, Kempema & Powell, 2009). High abundance of small mammals such as rodents indicates ecosystem disturbance (Kelt, Meserve, Nabors, Forister, & Gutierrez, 2004). The population of large animals may also depend on the population of small mammals. Small mammals serve as food to large carnivores or omnivores mammals (Chase *et al*., 2002). This suggests that small mammals have the potential to tip the balance of an ecosystem if their population is not stable.

Collaborative hunting strategy should thus be extended to the conservation of small and medium animals even if they are hunted by individuals and not by groups. Thus, small or medium sized animals should be prioritized in planning for collaborative hunting.

6.5.2.3. Conservation status of the species

Among the small and medium sized animals, there are likely to be species of conservation concern locally or globally. These species need to be given priority for conservation. Local people might not know the global or even the local conservation status of the species but they can give information about the species they have noticed are decreasing. The park staff can use local, national and global data bases and reports to determine the conservation status of the species selected. For instance, the State of Environment Report for Uganda of 2008 (a document that reported on the status of wildlife populations in protected areas in Uganda) shows that some species identified in this investigation are of conservation concern in Uganda. *Hippopotamus amphibius* and *Syncerus caffer* were identified as species of conservation concern whose populations have declined in most forests in Western Uganda (The State of Environment Report 2008). *Syncerus caffer* was also described as hunted wherever it occurs and is restricted to a few habitats (FAO, 2004).

Other species of conservation concern in Uganda include: *Damaliscus topi* whose population was reported as decreasing (National Environment Management Authority, 2008), *Kobus ellipsiprymnus defassa* whose population was reported as low (National Environment Management Authority, 2008). Also, *Pan troglodytes* which IUCN (2008) described as West and East Africa's most dominant great ape that has suffered severe population declines throughout the Rwenzori region. *Kobus kob thomasi, Alcelaphus buselaphus jacksoni* and *Loxodonta africana* are species with low numbers in most parts of Uganda (State of Environment Report, 2008). *Cercopithecus aethiops* was listed among the species whose home range has been affected by deforestation and hence occupy disturbed habitats including farms because they provide an opportunity for food resources (FAO, 2004). The state of environment report (2008) listed *Ceratotherium simum*, and *Diceros bicornis* as extinct in forests of Western Uganda as a result of hunting. Also in this investigation none of these species were mentioned by respondents; which indicates that they may actually be extinct.

Therefore, species that are said to be decreasing and those with a conservation concern should not be included in the collaborative hunting strategy. These could be conserved following the current strict policies that prohibit poaching and the reasons why discussed with the local community and poachers.

6.5.2.4. Body parts extracted and their uses

Although the names of species poached are useful in planning for wildlife management (Wilkie & Carpenter, 1999), the body parts extracted from the animals poached and their uses have important implications for designing collaborative wildlife management strategies. The implications are not only important for finding alternatives to products from the animals poached but also for planning with

poachers which animals would be collaboratively hunted. The species from which different poachers obtain different parts should be included in the collaborative hunting strategy. Those that are hunted by individual poachers for a specific part should not be part of the collaborative hunting strategy.

6.5.2.5 Commercial or subsistence poaching

This factor is particularly important in the African context where it is expected that although there is some level of influence of cultural practices on subsistence poaching, the trend is changing to commercial use especially as traditional beliefs associated with hunting become less prevalent (Chapter 3) and the Rwenzori community might not be an exception. Local people neighbouring national parks depend on park resources not only for survival but also for livelihood (Caspary, 1999; Linder and Oates, 2011; Tumusiime *et al*., 2010). Contrary to findings by Olupot *et al*. (2009) that commercial hunting did not occur in the Rwenzori Mountains National Park, it has been revealed that people in the Rwenzori Mountains hunt animals for commercial as well as subsistence purposes.

Unlike people in traditional communities who hunted for subsistence (Dusseldorp, 2012a; Pargeter, 2011), hunting for commercial purposes has a negative consequence for biodiversity conservation. It involves large scale hunting and this necessitates use of indiscriminate methods and more sophisticated hunting gear (Dusseldorp, 2012b). A few people who are engaged in commercial hunting can hunt to the same extent as many people hunting for subsistence (Alvard, 1993a). This indicates that with commercial hunting, it is not an issue of the number of people involved in hunting. Commercial poaching does not apply the traditional methods of hunting which are said to have sustained biodiversity in traditional communities (Berkes, Colding & Folke, 2000). In the Rwenzori Mountains, increase in the number of animals hunted could be influenced by the rapid adoption of modern life styles motivated by capitalistic economies central to most of the African communities (Economic Commission for Africa, 2001).

Therefore, in planning for collaborative hunting, species that are hunted for subsistence and not for commercial use should be prioritized.

6.5.2.6 Methods currently used in poaching

Among other factors to consider in the investigation of collaborative hunting in the Rwenzori Mountains National Park is whether or not people currently involved in poaching are traditional hunters. To understand this, it requires an analysis of when respondents said they started poaching particular species. Species such as C*ercopithecus aethiops, Hylochoerus meinertzhageni, Pan troglodytes* and *Tragelaphus scriptus* have been poached since 20 years ago. These species are more likely to be associated with traditional methods of poaching such as collaborative hunting than species which respondents said they started poaching more recently. Planning for collaborative hunting should consider whether animals are captured using selective or non-selective methods. Those that are

captured using non-selective methods should not be included in collaborative hunting unless other methods that are selective are devised and used.

6.5.2.7 Changes in choices and preferences

The species that shall have been selected at this stage need to be evaluated on the basis of likely changes in choices and preferences. In this investigation, it was found that poachers changed the uses of body parts extracted from animals and this could have been due to changes in cultural beliefs. For example, all three species currently used for meat (Figure 6.6) were used for cultural and medicinal purposes respectively in the past. A change toward particular resource needs can also give protected area managers insight into what choices and preferences poachers have about animals in the park. Diversity in the choices and preferences, interests and knowledge of local people about animal species poached and how these are likely to change in future scenarios needs to be taken into account when designing and implementing the proposed collaborative hunting strategy.

6.6 CONCLUSION

In Uganda, research on animals hunted in Uganda's national parks has hitherto been limited to evaluations of trade in animal products in Queen Elizabeth National Park (CARE, 1999) and bush meat trade in various sites (Olupot *et al*., 2009). The results of this investigation have not only contributed to the understanding about animals poached in the Rwenzori Mountains National Park, but also to the identification of animal species that are in high demand, species that are considered important and species that poachers said were decreasing in availability. Also, there are various factors that underlie poaching which must be recognized if a collaborative wildlife management strategy is to be proposed and implemented. An exploration of a collaborative hunting strategy that includes species which are: considered most important by poachers, small or medium sized, not of conservation concern or said to be decreasing in number, poached for different parts by different people, used for subsistence purposes, captured using non-selective methods, and not likely to be affected by changes in choices and preferences of poachers in a short term is recommended.

CHAPTER 7

"BUT I HAVE NOT TAKEN ANY THING FROM THE PARK!" NON-EXTRACTIVE ILLEGAL USE OF RESOURCES IN THE RWENZORI MOUNTAINS NATIONAL PARK



Figure 7.1 Use of foot paths in the Rwenzori Mountains National Park: An example of non-extractive use of the park. (Photo by M. Muhumuza, April, 2009).

OVERVIEW OF THE CHAPTER

Studies on socio-ecological dynamics of non-extractive protected area resource use in Africa are rare. Literature on local people's dependence on national parks is dominated by studies on extractive use of resources by local people. Community-based conservation strategies are often proposed based only on the resources that people extract from national parks. This could limit the success of these strategies because people neighbouring national parks may also depend on them in a non-extractive way. Using the case of Rwenzori Mountains National Park, this chapter attempts to demonstrate that in addition to extracting resources, local people rely on national parks for non-extractive purposes. Face-to-face individual interviews were conducted with 163 respondents who were asked about the activities they conducted in the park and the socio-economic and cultural factors that underpin those activities. The investigation found that non-extractive use of the national park by local people included: grazing of animals, cultivating of crops, passing through, placing beehives and extracting honey, and conducting traditional rituals. The frequency of non-extractive use of the park varied for different activities. Some activities, such as cultivating crops in the park, were conducted seasonally, whilst passing through the park was done weekly or monthly. Other than passing through the park, other activities were not permitted in the park in the resource use agreements. Respondents had alternative areas other than the park where they could conduct all the non-extractive activities identified. However, all the alternative areas had constraints that prevented people from conducting activities there. Despite the potential effect that these activities have on the park, majority of the respondents thought that since the activities were not associated with extracting anything from the park, they did not have any negative impact on the park. The implications of these results for community-based biodiversity conservation are discussed.

7.1 INTRODUCTION

The literature provides a plethora of studies about dependence of local communities on national park resources. The dependence of local people on protected area resources has been studied in various countries. For instance, the extent of local people's dependence on national park resources has been studied in India (Shrivastava and Heinen, 2007), in Uganda (Tabutia, Dhilliona & Lyea, 2003), in Malawi (Fisher, 2004), in Canada (Stedman, Parkins & Beckley, 2005), and in eastern and southern Africa (Mogaka *et al.*, 2001).

Dependence on national park resources may be extractive (such as the removal of plants and animals as described in Chapters 5 and 6 respectively for communities neighboring the Rwenzori Mountains National Park), or non-extractive (which involves activities that people conduct in national parks without necessarily taking away resources from the park) (Abensperg-Traun, 2009). Examples of non-extractive use of resources include research, and all varieties of nature-based tourism such as tourism photography (Prato and Fagrie, 2005). In the context of this thesis "non-extractive" use refers to activities conducted in the park which do not involve directly taking away physical and quantifiable resources from the park.

Despite the occurrence of both extractive and non-extractive use of resources in national parks, many studies on protected area resource use by local people in Africa focus on extractive use of resources (Johannesen, 2007; Leach, Mearns & Scoones, 1999). Some studies where extractive use of resources

has been documented include: Escobal and Aldana (2003), Eves (2006) and Godoy and Lubowski (1992).

The dominance of studies on extraction of resources by local people has various implications for current biodiversity conservation strategies. For instance, conservationists are often more concerned about the resources which local people extract from national parks than the activities they conduct therein. Various community-based conservation strategies (discussed in chapter 3) have been implemented in many national parks in Africa as alternatives to strict measures that were initially put in place prohibiting access to national parks by the neighbouring communities. Community-based conservation strategies are intended to integrate the interests of local people into the management on national parks for more effective conservation of biodiversity in those parks. These strategies aim at encouraging people to support the conservation of biodiversity in national parks. However, the criteria for proposing various community-based conservation interventions are often based only on local people's extractive use of resources (Eves, 2006). Interventions such as Integrated Conservation and Development Projects, Collaborative Resource Use Schemes (such as resource use agreements), and provision of alternative sources of livelihoods to communities that depend on park resources are based only on the information about what resources people extract from parks (Alexiades and Shanley, 2004; Chen, Yang & Xie, 2005).

Non-extractive use of resources in national parks is rarely considered in community-based conservation because it is often argued that non-extractive use of resources is a sustainable way of utilising resources. For example, photo-tourism is considered a justifiable way of using park resources (Abensperg-Traun, 2009).

Although extractive use of resources, such as trophy hunting and logging, have been recorded as main threats to biodiversity (Abensperg-Traun, 2009), some non-extractive use of resources may not be a sustainable way of utilising national park resources. Non-extractive use of resources may also endanger biodiversity to the same level as extractive use of resources. For example depending on the level of scale of the activities, ecotourism and recreation in protected areas indirectly lead to unsustainable use of protected area resources to the same extent as direct extractive use of resources (Belesky, 1999; Megan, 1998; Rutten, 2004). Some of the activities associated with non-extractive resource use in national parks that are detrimental to biodiversity conservation include; the construction of camping sites in national parks (which affect habitats of animals), introduction of alien species (which could compete for resources with native species), and improper disposal of wastes (which could affect the health on animals) (Megan, 1998).

Habituation of wild animals in protected areas is another likely consequence of human activities associated with non-extractive use of resources. Noise that people make when in protected areas could affect the behaviour of animals in those protected areas (Griffin *et al*., 2006). The positive correlation between tourism and alteration of animal behaviour has been demonstrated in various studies (for instance Constantine, Brunton & Dennis, 2004; Finney, Pearce-Higgins & Yalden, 2005; Griffin *et*

al., 2006; Klein, Humphrey & Percival, 1996). Habituation is considered a negative impact on individual animals and populations because it may make them change their feeding or reproductive behaviours. This might happen even when local people simply pass through the park.
Additionally, the literature shows that the description of non-extractive use of resources excludes activities associated with traditional practices that are non-extractive in nature. For instance, traditional communities in Africa are said to have places set aside where they conduct aesthetic activities such as worship or performance of traditional rituals (Berkes, 1999). Whether or not such activities, when conducted in national parks endanger biodiversity is a matter for investigation on a case-by-case basis.

Non-extractive use of park resources that is associated with traditional practices is an important factor in the conservation of the Rwenzori Mountains National Park. Local people's way of life in the Rwenzori Mountains is closely associated with the mountains through traditional rituals they conduct in sacred sites located on some mountain ridges (Stacey, 1996). However, in the creation of the Rwenzori Mountains National Park, and subsequent implementation of community-based conservation, non-extractive use seems not to have been considered. In addition to extractive use of resources (discussed in Chapters 5 and 6), an understanding of non-extractive use of resources in the Rwenzori Mountains National Park should have been considered when the community-based biodiversity conservation was planned. Lack of prior knowledge about how and why local people use the park in non-extractive ways, and the reasons for these uses, could be one of the reasons why current attempts to address problems associated with biodiversity conservation in the Rwenzori Mountains National Park have been unsuccessful (Chapter 1).

This chapter reports on aspects of the study exploring the activities that local people conduct in the Rwenzori Mountains National Park that are non-extractive in nature, and to identify the drivers of those activities. An understanding of these activities and the factors influencing them is important not only for finding out why local people engage in illegal activities but also to propose ways of collaborating with the community to enhance the conservation of resources in the park.

7.2 METHODS

Questions targeting the required information were included in the interviews described in Chapter 5 and presented in Appendix 5.1. The questions elicited information on the purpose of conducting those activities, the number of times in a specified period they conducted the activities and whether there were any alternative places to conduct the activities other than the park.

7.3 RESULTS

7.3.1 Activities that respondents conducted in the park

The sampled respondents mentioned five activities they conducted in the Rwenzori Mountains National Park: grazing animals, cultivating crops, passing through, placing beehives, and conducting traditional rituals (Figure 7.2).

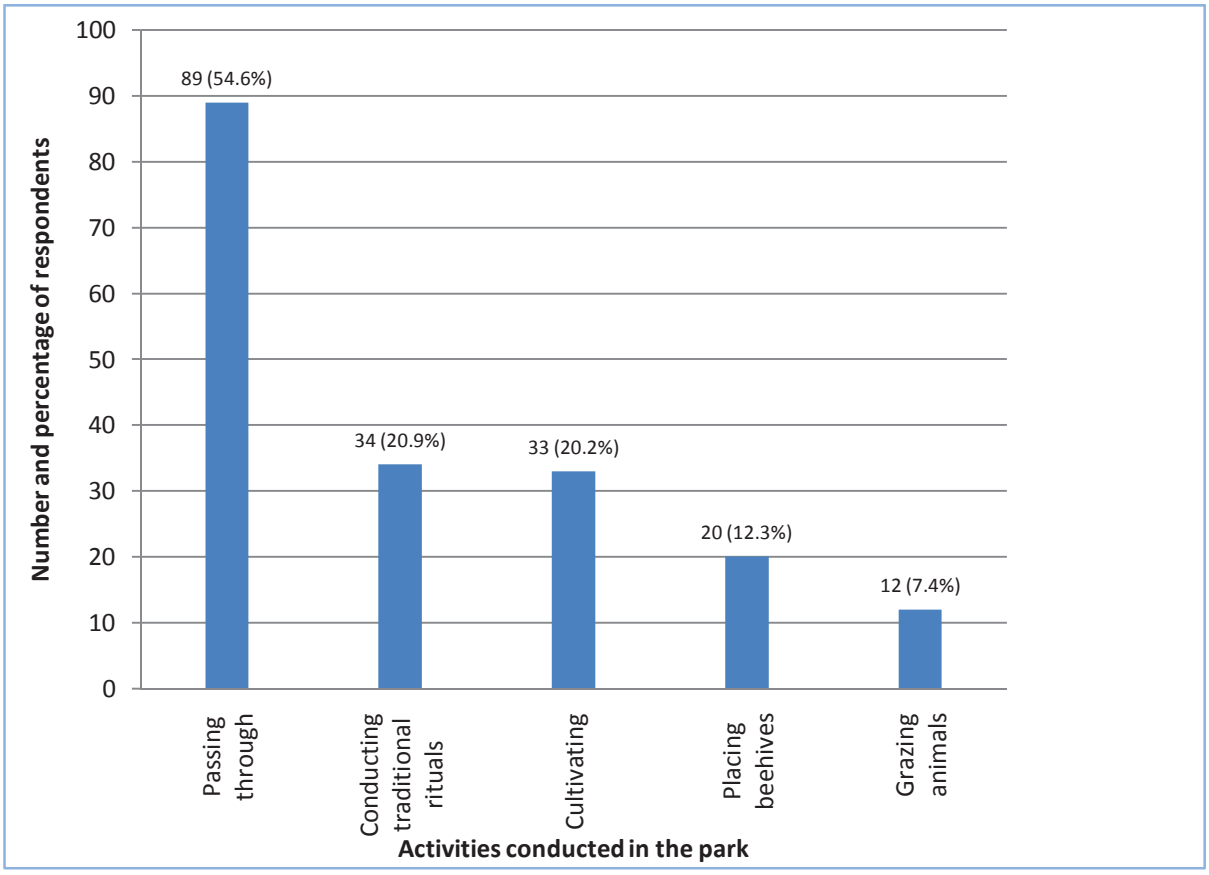

Figure 7.2 Activities conducted by local people in the Rwenzori Mountains National Park (n=163)

Respondents started engaging in the activities between 25 years and 1 year ago (Figure 7.3).

There was an exceptional trend in the number of people that started passing through the park 10 – 25 years ago and 9 years ago. The trend shows a slight increase in the number of people engaging in all the activities since 15 – 19 years ago. There was little change in the number of people who are engaged in traditional rituals and grazing animals in the park between 15 and 19 years ago.

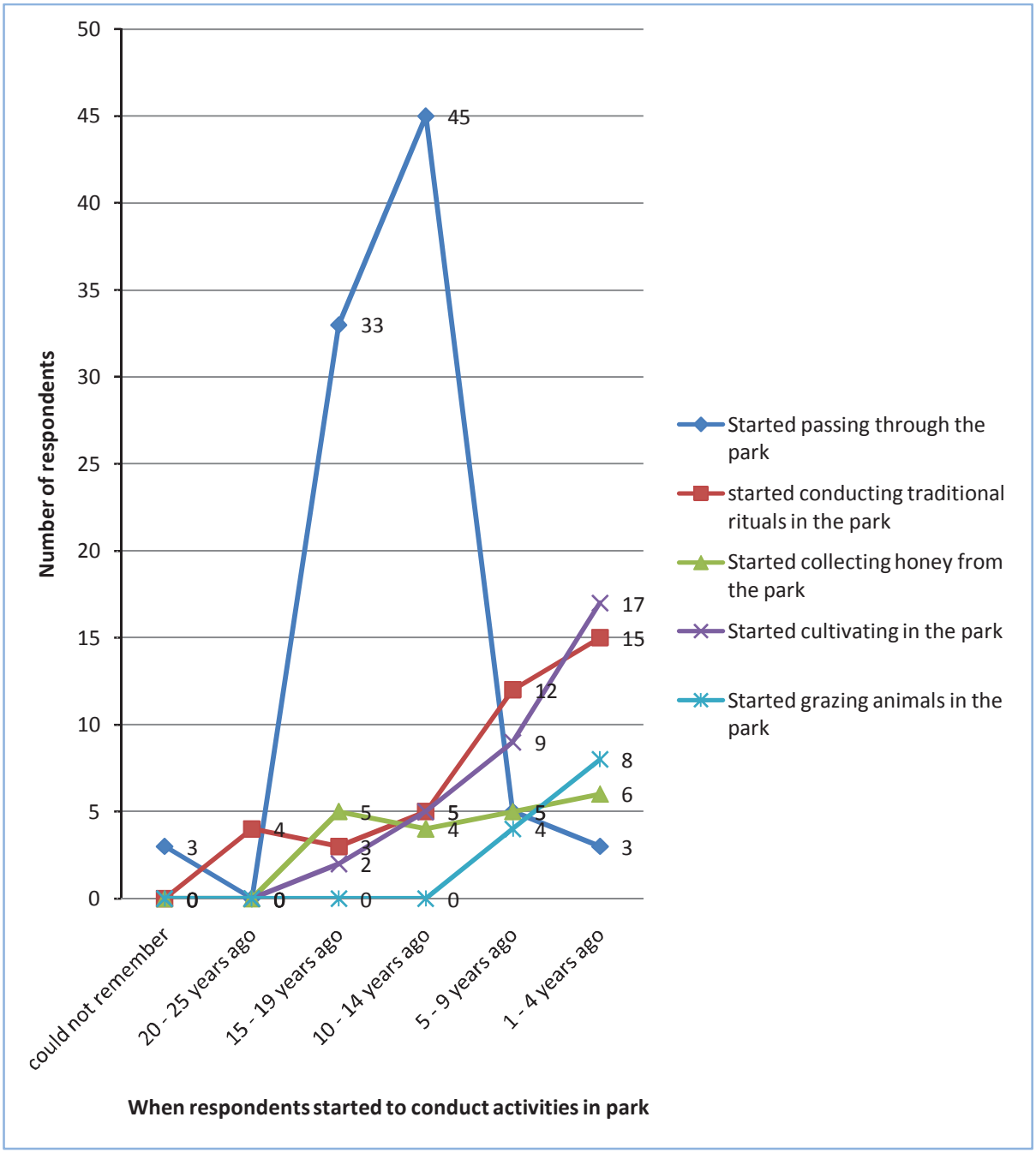

Figure 7.3 When respondents started engaging in the activities in the park

7.3.1.1 Passing through the park

Passing through the park was the most engaged-in activity. This is indicative of the importance of this activity to the local community. Respondents said that there are routes in the park (mostly foot paths) which they use to travel from one village to another, and linking Kasese, Kabarole, and Bundibugyo districts (Figure 7.4).

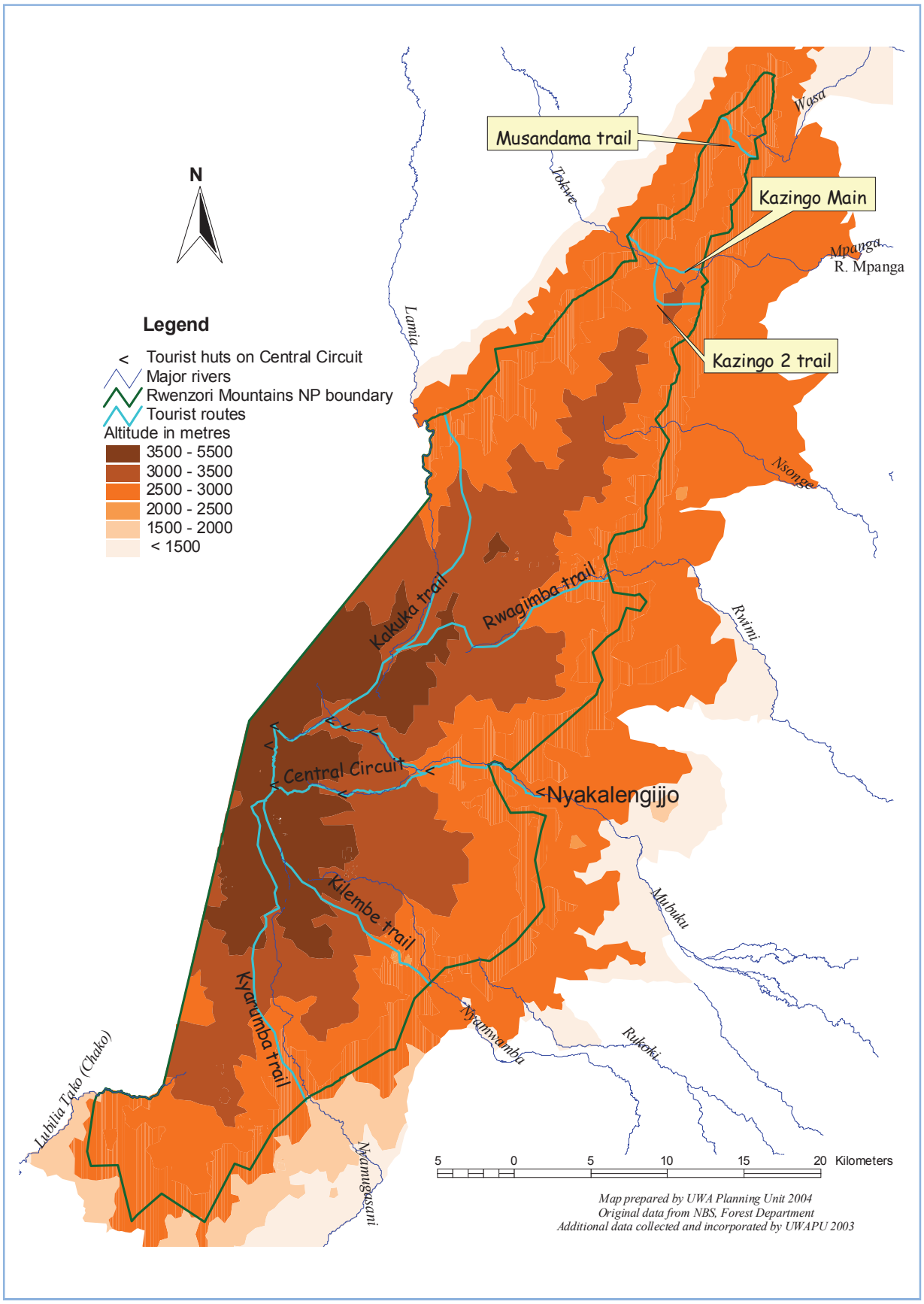

Figure 7.4 Routes traversing the park that the community used as footpaths

Sixty two out of 89 respodents said the most important route was Kazingo route, which enabled them to easily move to and from Kabarole and Bundibugyo districts across the northern spur of the mountain (Figure 7.5). Other important routes mentioned include: Mabere route (23 respodents), Musandama route (14 respodents), Karangura route (28 respodents), Kikyo route (14 respodents), Bulhambayiri route (9 respodents), and Karago route (24 respodents).



Figure 7.5 Local people on a foot path in the northern spur of the Rwenzori mountain. (Photo by M. Muhumuza, April, 2009**).**

People passed through the park weekly or monthly (Figure 7.6) with 2 to 4 other people (Figure 7.7).

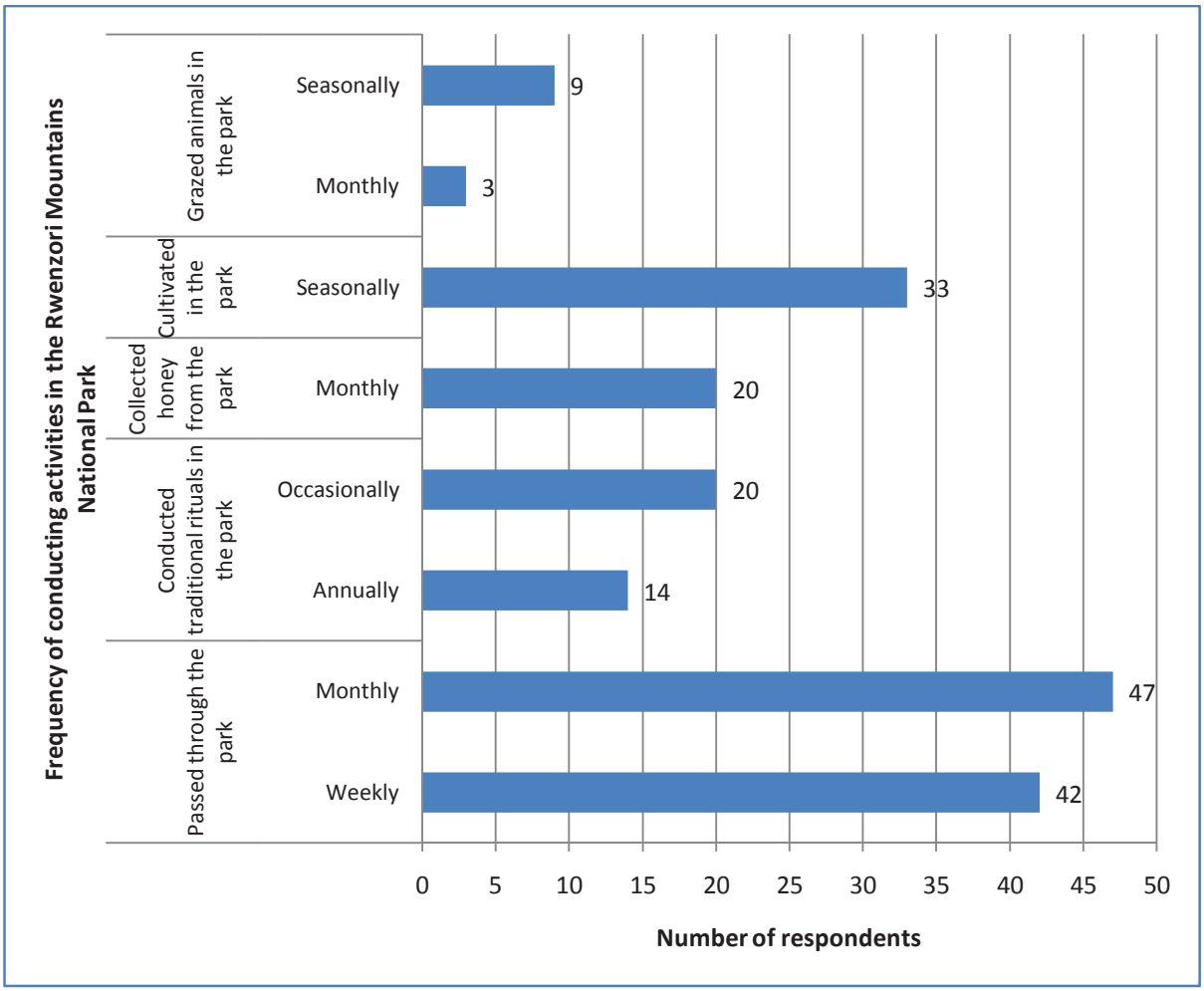

Figure 7.6 Frequency of conducting activities in the park

7.3.1.2 Conducting traditional rituals in the park

Four traditional rituals were mentioned: offering sacrifice, sweeping the ridge (which meant cleansing the mountain), construction of shrines, and merrymaking (involving singing, dancing, eating and drinking). Places where the rituals were conducted varied in nature and type but were referred to as sacred or cultural sites in general. One of such a place was the tomb of Isaya Mukirane, the first king of the Rwenzori Mountain people (Figure 7.9).

There were six reasons given by the local people as to why they conducted traditional rituals (Figure 7.8). These reasons revolve around local people's welfare such as peace, health, and obtaining personal needs. For instance, in case of an outbreak of a contagious disease, rituals were performed to prevent further spread.

> "*It is not that we have to always perform rituals for every disease, there are some small diseases such as colds and headaches that we treat using herbs*" KBR-146

Therefore, there was interplay between non-extractive and extractive use of resources in different contexts depending on the nature of the disease.

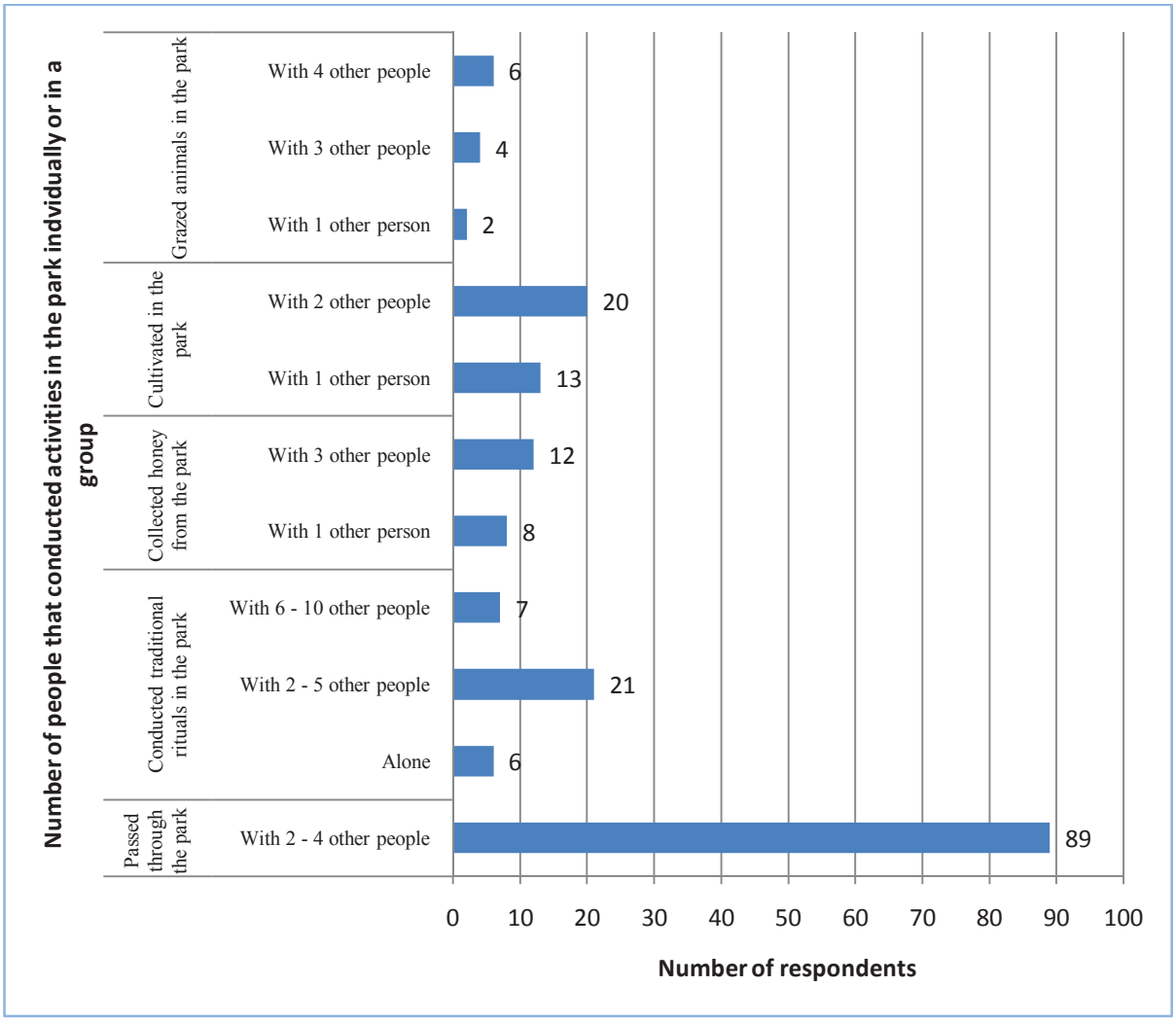

Figure 7.7 The number of people that conducted activities in the park individually or in a group.



Figure 7.8 The number of people that had particular reasons for conducting rituals in the park.



Figure 7.9 People standing near a tomb on the Rwenzori Mountains National Park. (Photo by M. Muhumuza, April, 2009**).**

When long dry spells occurred, and water volume in many rivers reduced, 4 respodents said they performed traditional rituals to avert the situation so as to prevent famine. One respondent explained:

> *"The community cannot be sustained without food, and rituals which are performed at the sacred sites in the park are improving the community's crop yields"* KBR-146.

Conducting traditional rituals was done occasionally or annually. Some rituals such as for inducing rainfall and preventing drought were conducted alone (the only activity which some respondents said they conducted alone) and others such as for clensing the ridge involved 2 to 10 people.

7.3.1.3 Cultivating crops in the park

Thirty three respondents cultivated crops in the park which included yams, irish potatoes and beans. All the crops were seasonal. Compared to annual or perennial crops these could more easily be grown in the park and harvested before the park rangers discover the gardens. Crops were for both commercial and subsistence purposes. Cultivation in the park was influenced by scarcity of land, loss of soil fertility in their arable land, and unpredictable planting seasons. Crops were protected from wild animals using traditional methods (Figure 7.10).



Figure 7.10 One of the fetishes used to protect crops from thieves and animal raids in the Rwenzori Mountains. (Photo by M. Muhumuza, April, 2009**).**

It is beyond the scope of this study to explore whether such traditional methods really worked or not, but it has various implications for biodiversity conservation because it was claimed that even rangers patrolling in the park could not destroy the gardens with such a protection and not even arrest people who made those gardens.

This activity was done only seasonally when other crops failed. Respondents cultivated in the park with either one or two other people (Figure 7.7).

7.3.1.4 Placing beehives in the park and collecting honey from them

Twenty respondents placed beehives in the Rwenzori Mountains National Park to attract bees to produce honey (Figure 7.11).



Figure 7.11 Beehives located in the Rwenzori Mountains National Park. (Photo by M. Muhumuza, April, 2009**).**

These respondents claimed that they did not extract any honey from natural beehives but only from the hives they placed there. In this way, they believed that they did not contravene any park regulations against extracting park resources.

After placing beehives in the park, honey was collected monthly (Figure 7.4) with either one or three other people (Figure 7.5).

7.3.1.5 Grazing animals in the park

Twelve respondents grazed animals such as goats and sheep in the park, all stating that they did so because of lack of pasture on their private land. The animals were tethered on to tree or shrub in the park and left there without any supervision and later in the evening brought back home. Grazing in the park was done monthly or seasonally (Figure 7.4) with either one other person or six other people (Figure 7.5).

7.3.2 Local people's views about the effect of the activities on the park

Respodents had differing views about the effect on the park of the activities they conducted (Table 7.1).

Table 7.1 Local people's views about the effect of their activities on the park

Activity	Effect that the respondents thought the activity had on the park	Number of respondents that mentioned the effect	Percentage of respondents*
Passing through the park	No effect.	85	95.5
	Did not know any effect.	4	4.5
Conducting traditional rituals in the park	No effect.	19	55.9
	Increased regeneration of resources	15	44.1
Placing beehives in the park	No effect.	20	100
Cultivating in the park	No effect.	33	100
Grazing animals in the park	No effect.	12	100

* *The percentage is a fraction of respondents that engaged in a particular activity in the park and not the total number of respondents*

For instance, all the people that engaged in grazing, crop cultivation and placing beehives in the park said that these activities did not have any effect on the park. One respondent said:

> "*I just go to the park to place beehives and later to collect honey from my beehives and nothing else. I do not kill or take away any bees. I do not even cut any plants. I am not like those who hunt in the park and bring meat to sell to us. So I do not cause any effect on the park*" KBR-026

Respondents claimed that their activities do not involve extracting resources from the park and hence they did not think they were destroying the park by engaging in those activities.

Four respondents (4.5%) did not know any effect associated with passing through the park and fifteen respondents (44.1%) thought that conducting rituals increased the regeneration and availability of plant resources in the park.

7.3.3 Alternative areas where respondents said they could conduct the activities

It was found that all activities that local people said they conducted in the park, had an alternative area where they could be conducted (Table 7.2).

Table 7.2 Activities that people conducted in the park and the alternative areas where those activities could be conducted (n= 163)

Activity	Alternative area where the activity could be conducted	Number of respondents that mentioned the alternatives	Percentage of respondents*
Passing through the park	Other routes	89	100
Conducting traditional rituals in the park	Shrines in their homestead	10	44.1
	Cultural sites	3	
	Sacred sites outside the park	2	
Placing bee hives in the park	Bee hives on private land	4	20
Cultivating in the park	Gardens on private land	33	100
Grazing animals in the park	Pastures on private land	12	100

* *The percentage is a fraction of respondents that engaged in a particular activity in the park and not the total number of respondents*

However, when asked why the activities could not be conducted in those areas, a number of constraints associated with those areas were revealed (Figure 7.12).

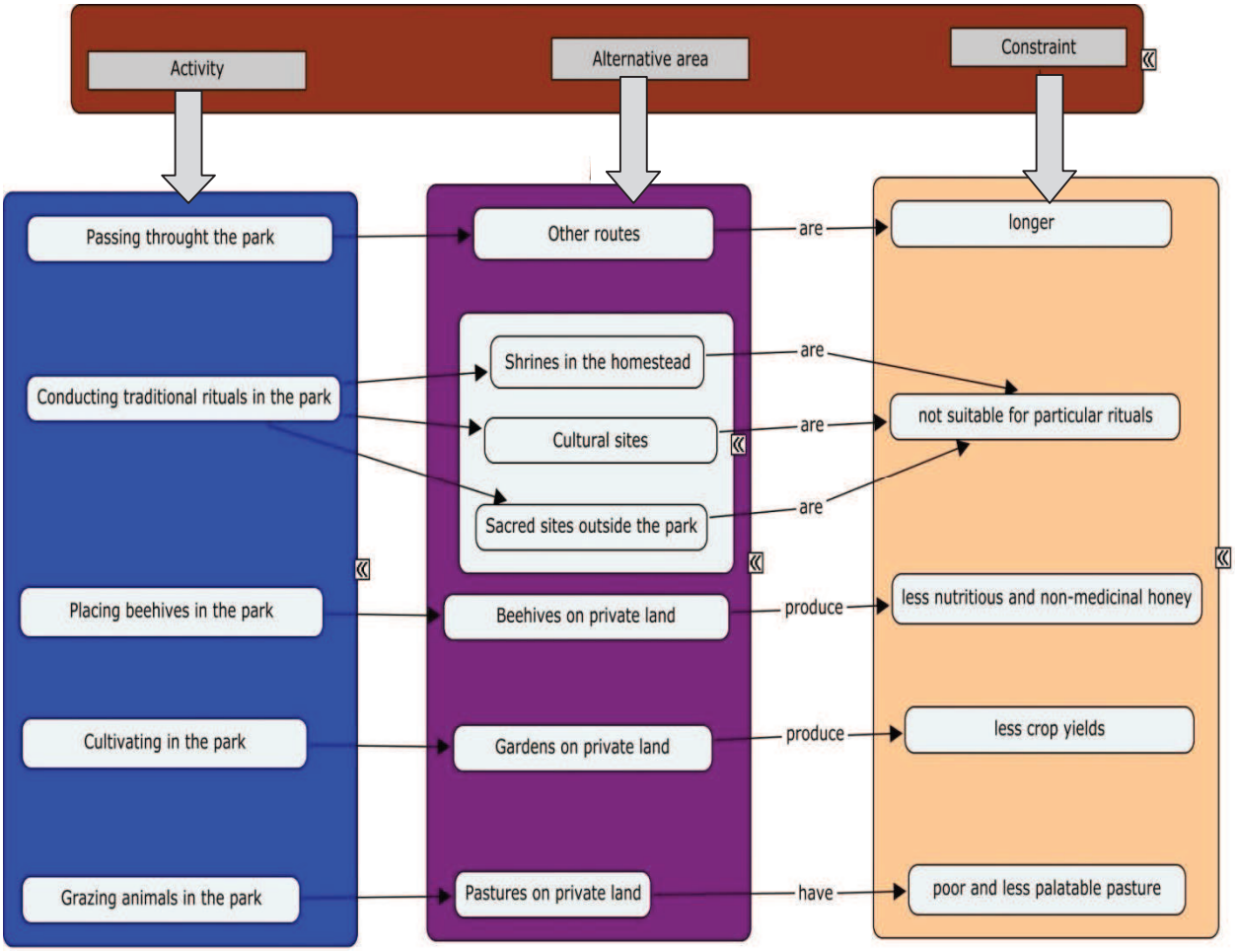

Figure 7.12 Activities conducted in the park, alternative areas for the activities, and constraints associated with the alternative areas.

As a result of these constraints, respondents continued to engage in illegal activities in the park.

7.4 DISCUSSION

It has been found that local people illegally access national parks to conduct non-extractive activities in addition to extractive use underscored in other studies as a driver of illegal access to national parks (Ewers & Laurance, 2006; Olupot, McNeilage & Plumptre, 2009; Robbins *et al.* 2006; Tole, 2002, and Totland *et al.* 2005). In addition to research and nature-based tourism (Prato and Fagrie, 2005) other non-extractive activities that occur in national parks have been identified in this study.

The trend of when people started engaging various activities in the park indicates that most of the people sampled started those activities after the park was created (after 1991). However, the sample of the study could have influenced the finding that most people started engaging in the activities after the park had been created because based on the ages of respondents (Chapter 5), some were born after the park was established or were very young to engage in any of the activities identified. For instance, local people traditionally used footpaths in the mountains (Chapter 8) but results indicate that those who currently use them started after 1991.

Other than passing though the park, the rest of the activities identified are prohibited in the current resource use agreements between the park administration and the local people. This is also the case in many other national parks in Africa where it has been found that community-based conservation excludes community activities such as cultivation and grazing and yet these activities are important to the community neighbouring parks. Establishment of national parks in Africa in some cases leads to cultural degeneration among the people who practiced certain rituals associated with park resources (Chapter 2). When the Rwenzori Mountains National Park was established, cultural practices in sacred sites in the mountains were declared illegal and this led to local people abandoning some of their cultural practices such as circumcision (Muhumuza, 2012).

When activities are of significant economic, social, and cultural value to the local people, rules prohibiting them in national parks are less likely to be followed. This is the case in the Rwenzori Mountains National Park. This partly explains why, despite the rules and regulations against these activities in the park, some people have continued to defy them.

Another factor for non-compliance with park rules could be selective application of the rules restricting the activities. For example, the current tourist routes such as Nyakalengijo, Katwekale, and Kazingo routes were developed from footpaths traditionally used by local people (Osmaston and Pasteur, 1972) and from footpaths that local people used traditionally to access sacred sites in the mountains (Fauna and Flora Iinternational-Uganda Wildlife Authority, 2012). When the Uganda Wildlife Authority stopped local people from using these routes but expanded the same routes and developed them as tourist trails, it angered the local people who persistently used them despite the rules in place prohibiting local people from using them and accessing resources in the park (Fauna

and Flora Iinternational-Uganda Wildlife Authority, 2012). From the point of view of Uganda wildlife Authority staff, the use of traditional footpaths could be associated to extractive use of resources. Speculatively, individuals allowed to passing through the park could use that opportunity to extract resources such as building materials, herbs, and firewood that they can easily carry along the way, and even they are likely to set traps for animals and use another opportunity of passing through the park to collect the trapped animals. This relationship should be an important consideration in the management of non-extractive use of resources in the Rwenzori Mountains National Park.

It would thus be necessary to find a way of integrating these activities within the community-based conservation strategies currently present. However, before they can be integrated, it is necessary to analyze the factors that drive these activities and the context in which they occur.

The need to conduct the identified activities is the main driver for illegal access to the park. The need is influenced by four factors: 1) lack of alternative areas to conduct the activities, 2) constraints associated with the alternatives, 3) changes in weather conditions, and 4) lack of knowledge about the potential effects that the activities have on the park (Figure 7.13). The last factor is inside the individual's mindset and the rest are external to the individual.

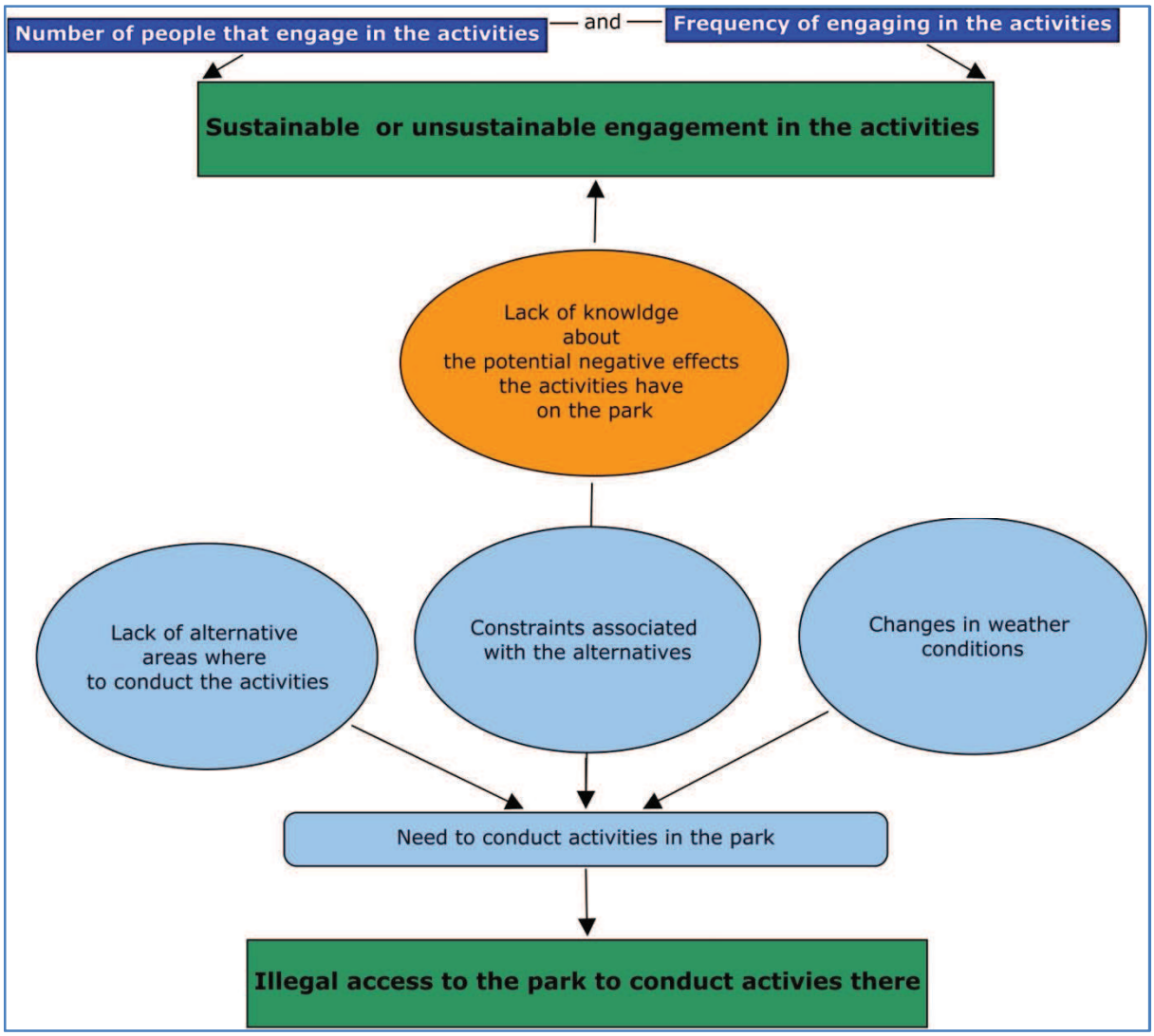

Figure 7.13 A scheme of factors that influence illegal access to the park for activities and sustainable or unsustainable engagement in the activities.

7.4.1 Lack of alternative areas to conduct the activities

The activities that people conducted in the park required land as a basis for other resources and activities. The availability of land in many parts of rural Africa has been gradually diminishing and resulting in local people encroaching on protected areas (Metzger, Sinclair, Hilborn, Grant & Mduma 2010). In many cases (discussed in Chapter 2) where there was creation of national parks, people were displaced from their land and denied access to resources therein without providing them with alternatives.

Although it is a common assumption in community-based conservation that what people need in national parks can be provided through alternative means, in some situations, especially with some activities, there is a lack of any viable alternative. For instance, conducting traditional rituals can only be done in sacred sites inside the park and nowhere else. Given that cultural practices and the welfare

of the people in the Rwenzori are said to have a strong link (Stacey, 1996), the integration of cultural practices in community-based conservation approaches should be given more consideration.

7.4.2 Constraints associated with alternative areas and possible ways of addressing them

The recognition of constraints associated with the identified factors is important for community-based biodiversity conservation. Although in many cases community-based biodiversity conservation interventions are aimed at providing alternative sources of livelihoods to local people who depend on national parks, in some cases there are no direct alternatives and in many cases such alternatives are not suitable. For instance, although in this study some respondents said they could conduct traditional rituals in shrines in their homestead, or cultural sites or sacred sites located outside the park, they also revealed there are some rituals that cannot be conducted elsewhere other than specific sacred sites in the park. Rituals conducted to control natural calamities, increase crop yields, manage crop pests, and prevent the outbreak of epidemics are supposed to be conducted only in a place called Katwekali. In such a case, there are no alternative areas for such rituals.

There is a possibility of addressing some of the constraints with alternatives (Figure 7.14). For instance the belief that less nutritious and medicinal honey from beehives placed on private land and hence not favored in the market could be addressed by improving the quality of the honey by adding nutritional ingredients.

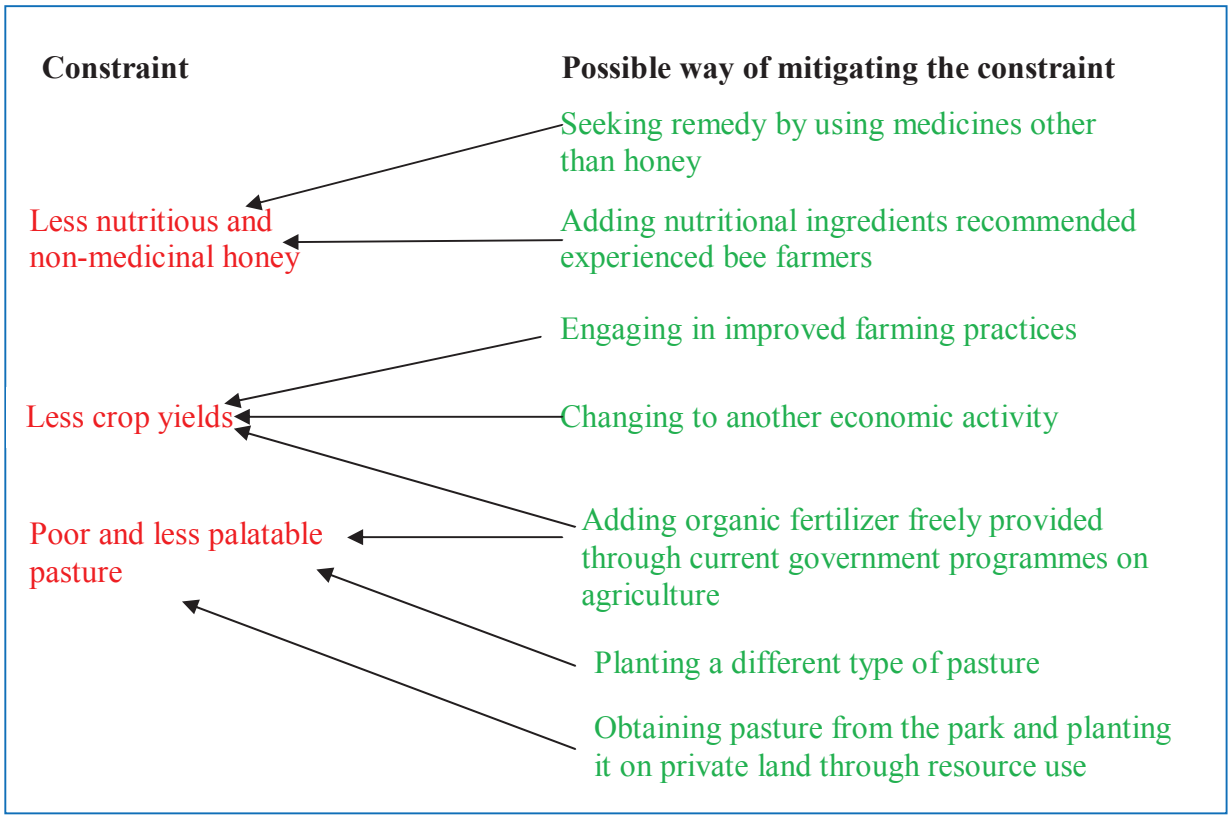

Figure 7.14 Possible ways of addressing constraints associated with alternative areas

The costs involved in the alternatives will determine whether the alternatives will work or whether the activities will continue in the park.

7.4.3 Changes in weather conditions

The change in weather conditions and unpredictability of the seasons has gained attention in many rural areas in Africa as one of the factors that is driving resource degradation in protected areas, especially in African rural areas. In the Rwenzori, changing weather conditions seem to be linked to climate change. Since the majority of the people in the mountains are smallholder farmers who depend on rain-fed agriculture, drought and reduced rainfall drives them to illegally access national parks for resources as a fall-back adaptive strategy. It was reported in a recent study that in situations of unpredictable seasonal changes or drought due to climate change, local people resort to illegal access to the park as a coping mechanism for livelihood and survival (Muhumuza, Muzinduki & Hyeroba, 2011).

When the Rwenzori Mountains National Park was created more than 20 years ago, climate change was not been a significant factor affecting survival and livelihood of smallholder farmers in the Rwenzori Mountains (Muhumuza *et al*., 2011). Interventions such as restricting access to the park were proposed without taking into account the possible future scenarios associated with climate change. They were based on the prevailing conditions of the time. It is expected that with more effects on other socio-economic activities such as trade and agriculture, more people are likely to be compelled to engage in non-extractive activities such as crop farming in the park.

Adaptive management which involves agreeing upon certain measures and strategies based on trends in human population and climate change should be considered. Uganda Wildlife Authority in partnership with other organizations could facilitate the collection and dissemination of reliable climatic data upon which projections can be made and agreements to access the park for non-extractive resource use can be negotiated accordingly.

7.4.4 Lack of knowledge about the potential effects that the activities have on the park

This is one of the most important factors driving the need to access park resources because unlike other factors, it is situated in the individual's mindset. The expressions by some respondents that they had done nothing that is detrimental to the park since they engaged in non-extractive resource use indicates their lack of knowledge on the potentials effects of their activities on the park. If individuals are not aware of the consequences of their activities on the park or believe that they do not have any negative effect on the park or that their activities enhance resource availability in the park, they are less likely to stop engaging in illegal activities. Their compliance to the rules governing access to the park is unlikely.

It would be necessary to address this constraint by providing the local people with environmental education. The nature and type of environmental education information that is necessary and how it should be provided is discussed in Chapter 10 and 11. It would be necessary to not only point out the potential negative effects of the activities but to involve the people in identifying those effects especially through demonstrations as recommended in effective environmental education programmes.

Discussions and demonstrations of the potential negative effects could be based on the existing literature and on local people's experiences. There are various studies (for instance Brockington, 2002; Brockington and Schmidt-Soltau, 2004; Wenzel, 1991) that have described how non-extractive use of park resources could impact negatively on biodiversity. In the Rwenzori Mountains, the nature of the activities could potentially have a negative effect on the park. For example, some traditional rituals involved lighting of a fire in the park and if not controlled such fires can spread to other areas, causing fire outbreak in the park affecting biodiversity. Also, the performance of some rituals involves domestic animals such as goats and hens. Successful performance of rituals required the hen to be killed and the goat to be left to wander in the mountains after the ritual (Cultural Values and Conservation Project, 2007). Wild animals in the park might feed on the meat of the hen or goat and puts the wild animals at risk especially if they (domestic animals) have certain diseases. This is one of the reasons why people are not allowed to take domestic animals in the park.

Placing beehives in the park and harvesting honey from those beehives may have an effect on vegetation in the park. In the Rwenzori Mountains, there was a difference in the vegetation density around beehives and places where there were no beehives as a result of trampling of vegetation as people set beehives and harvested honey (Muhumuza, 2006). Also, the removal of honey (even if it was from beehives placed there by local people) constitutes the removal of nutrients from the ecological system of the park. Bees naturally make hives and the honey they produce is often fed on by bees themselves and other animals. For instance, feeding on a special type of honey (royal jelly) influences the emergence of a queen bee in the hive, which influences formation of new colonies. Therefore, placing beehives in the park means that the honey produced by bees in those hives and extracted by people and taken from the park for trade or subsistence use affects the formation of new bee colonies. Honey extraction also has an effect on the process of pollination of flowers of plants in the park and the population dynamics of plant species.

Cultivation of crops or grazing animals in the park, even when done seasonally, may have an impact on biodiversity in the park. The effects of agriculture on biodiversity have been extensively studied (Gemmell, 2001; Harvey, *et al*, 2004; Leakey, 1999). Grazing leads to destruction of natural habitats especially when it is intensive (Leakey, 1999). Also cultivation of crops in the park may lead to the introduction of invasive exotic plant species. One threat of exotic species is that they outcompete and replace native species, communities and ecosystems (Elton, 1958; Reaser *et al.,* 2007; Simberloff, 1996). In many national parks of Africa, exotic species have received widespread recognition as one of the serious causes of species decline and habitat degradation (Reaser *et al.,* 2007). Additionally,

crop farming may involve the use of inorganic fertilizers which lead to pollution or poisoning of animals in the park.

However, from an ecological point of view expessed in the literature (Ghimire and Pimbert, 1997), controlled grazing of animals and cultivation of crops in the park might be beneficial to biodiversity in the park. This may occur especially if the populations of animals that naturally grazed in the area or those that created forest gaps are reduced (Ghimire and Pimbert, 1997). Animals control their own environment through interactions of feeding relationships (see Chapter 2 for a detailed discussion). For example, grazers control the population of vegetation which influences the plant population dynamics of the area. Therefore, in the absence of grazers, controlled grazing by goats and sheep could positively affect the plant population dynamics of the park.

The potential effect of non-extractive use of the park can also be analyzed in relation to the rainfall, soil type and gradient of the slope. Precipitation in the Rwenzori is concentrated mostly in two periods: March to May (when "long rains" occur) and October to December (when "short rains" occur) (Basalirwa, 1995; McSweeney, New, & Lizcano, 2012). This makes soils in areas receiving long rains most susceptible to erosion. Also given the mountainous terrain of the region, rainfall distribution is also affected by topography and elevation. Areas that are higher than 3,000 masl receive between 1,500 to 2,100 mm of rainfall annually, whereas those below 1,000 masl receive annual rainfall of less than 1,000 mm per year (Lara *et al.*, 2013). It would be expected that the areas of higher elevation are more likely to be affected by erosion. However, even though the areas below 3000 masl receive relatively low rainfall, the soils are characterised by organic soils comprising peaty loams, sandy to gritty clay loams and clays that are unstable (Foodnet, 2009; Harrop, 1960). Therefore, it is expected that the use of footpaths in all the areas even if they are of different elevation has potentially a similar negative effects on the soil by causing soil erosion.

7.5 CONCLUSION

This investigation aimed to identify non-extractive uses of resources by local people neighbouring the park and the underlying factors in the Rwenzori Mountains National Park. The investigation identified five non-extractive activities that local people conducted in the park: grazing animals, cultivating crops, passing through, placing beehives for honey extraction, and conducting traditional rituals. Other than passing through the park, the rest of the activities were not considered in the current community-based conservation strategies. Four factors, (lack of alternative areas to conduct the activities, constraints associated with alternative areas, changes in weather conditions, and lack of knowledge about the potential effects that the activities have on the park) influenced local people to engage in illegal activities in the park. The current community-based conservation strategies do not consider these factors. For the current community-based strategies to be more effective, it is necessary to address the constraints associated with each of the alternative areas where respondents said they would conduct the activities. Some of the ways the constraints could be addressed have been suggested.

CHAPTER 8

CAN TRADITIONAL BELIEFS, KNOWLEDGE AND PRACTICES ENHANCE BIODIVERSITY CONSERVATION IN THE RWENZORI MOUNTAINS NATIONAL PARK?



Figure 8.1 A traditional shrine where local people conducted some rituals associated with resource use in the Rwenzori Mountains. (Photo by M. Muhumuza, June, 2009**).**

OVERVIEW OF THE CHAPTER

The Bakonjo and Baamba people inhabit the Rwenzori Mountains in western Uganda. Their traditional culture is closely linked to the Rwenzori Mountains. Since historical times, the local people depended on the mountain resources for survival and livelihood. However, when the Rwenzori Mountains National Park was established, local people were denied access to most resources in the park and were offered restricted access to a few of the resources. This caused conflict between the local people and the park staff, and local people continued to illegally access the park. Consequently, the Rwenzori Mountains National Park administration met various problems in attempt to enforce policies governing the conservation of biodiversity in the park. During this study which was aimed at understanding the nature of the problems and their underlying causes, various factors such as traditional rules and resource management structures, traditional knowledge and specialization of resource extraction and usage, beliefs in gods and spirits, and totems associated with local people's culture were found to influence illegal access. Among these factors were fourteen traditional rituals and nineteen traditional taboos that were previously not documented but which influenced the use of mountain resources by local people. This was a unique ethnographic encounter that demonstrates how traditional cultures of local people in rural African communities are closely linked to the utilisation of protected areas resources. The association between these factors and resource use was not based on any scientific or logical explanation and it was not clear whether they enhanced or retarded conservation of biodiversity in the Rwenzori Mountains National Park. However, because they influenced illegal access and use of resources in the park, they are important determinants of success or failure of community-based conservation strategies and they must be taken into account in protected area management.

8.1 INTRODUCTION

It has been extensively documented that conservation of national parks must be supported by local communities neighbouring those parks if such efforts are to succed (Abrams *et al*., 2009). In cases where local people support parks, there is success and in cases where they do not support parks there is failure (see Chapter 2). Various studies have been conducted in search of what motivates people to support biodiversity conservation. Most of these studies link local people's support of conservation to benefits that they obtain from parks (Malleson, 2000; Kasparek, 2008). This means that people who do not benefit from the conservation of biodiversity in national parks are less likely to support conservation of biodiversity in those parks. Usually, they regard them as anathema to their welfare.

Integrated conservation and development projects are planned and implemented based on the assumption that if local people derive economic benefits from parks, they will support the conservation of biodiversity in parks (Kasparek, 2008). For instance, "tourism revenue sharing" schemes and alternative livelihood projects that are often implemented in communities near national parks aim at ensuring that local people benefit from the establishment of national parks and hence support biodiversity conservation in those parks.

Studies that have evaluated community-based conservation projects implemented in communities near national parks have found that it is not automatic that people will be motivated to conserve biodiversity in national parks if they are given incentives in compensation for their limited access to

the park (Malleson, 2000). In some cases, even when benefits that people receive as compensation for limited access to park resources change people's attitude towards the park (Holmern *et al.*, 2002), the attitude may not lead to change of behaviour into pro-conservation practices. In the Rwenzori Mountains, for instance, despite implementation of various strategies to motivate people to support conservation of the Rwenzori Mountains National Park (Chapter 1), local people still obtain resources in the park and conducted activities there illegally (Tusiime *et al.*, 2011). This calls for further exploration of the factors underlying illegal access to national parks for resources.

Some of the factors, such as the need for resources for survival and livelihood (including commercial trade) and claiming ownership of the protected area and the resources therein, are more obvious because they emanate from within the external environment of the individual. These are commonly targeted in interventions that attempt to address illegal access to resources and in facilitating sustainable utilisation (Chapters 5 to 8). There are other subtle factors emanating from an individual's mindset and intrinsic norms and values of the community in which the individual lives that may also influence illegal access to resources of protected areas. Resource use amongst traditional communities in rural Africa is, for instance, influenced by traditional beliefs and knowledge, which are in the individual's mindset (see Chapter 4).

Analysis of the literature on traditional approaches to biodiversity conservation (described in Chapter 3) revealed a variety of traditional approaches that may have been used in the sustainable utilisation of natural resources in the past. Through "these approaches protection of biodiversity and habitats could have been coincidentally achieved through a system of customary rules, traditional beliefs and practices which were informed by experiential indigenous knowledge" (Fauna and Flora International-Uganda Wildlife Authority, 2012 p.7).

Traditional cultures of people in rural Africa are said to have developed based on the environmental resources and resource availability which shape the evolution of cultural practices (Agrawal, 1995). Given the limited success of current community-based conservation strategies, an investigation into how traditional beliefs, knowledge and practices influence resource use and management is important. Such an investigation could provide useful information for understanding reasons for illegal access to park resources which could serve as a basis for proposing sustainable ways of utilising the resources.

8.1.1 Traditional beliefs, knowledge and practices associated with resource use in the Rwenzori Mountains

Among the Rwenzori Mountain people there may be beliefs which have an impact on the conservation of natural resources. The description of the culture of the mountain people (Stacey, 2003) shows a close relationship with the mountain environment, and plant and animal species in the mountains. For example, the Bakonzo cosmology begins with the creator (Nyamuhanga) who made the snow (Nzururu) (Masereka, 1996). According to oral legend, Nzururu is the father of the spirits Kithasamba and Nyabibuya, who are responsible for human life, its continuity and its welfare.

Kithasamba, who is believed to live in the glaciated mountain peaks, is a giant force who controls the natural environment and the lives of all of the mountain people (Masereka, 2006). Local people in the Rwenzori Mountains attribute current erratic seasons and the loss of snow to their turning away from their traditional customs, which has angered Kithasamba (see Chapter 1 for a detailed discussion). Therefore, there is an indication that the local people in the Rwenzori mountains still have strong indigenous beliefs associated with the environment. Also the etymologies of many of the words in the language spoken by the inhabitants of the Rwenzori Mountains are based on the natural resources in the mountains. For example, the word "Rwenzori" comes from a local word "Rwenjura" meaning that the mountain is a home of rainfall ("enjura" in the local language). Each mountain ridge has a local name with a local meaning (Makombo, 1999).

There is now an emerging body of knowledge generated by both biological and social scientists that describes the complexity and sophistication of many indigenous practices associated with natural resource use in understudied regions such as the Rwenzori Mountains (Huntington, 2000). Conservation efforts worldwide are slowly being directed towards understanding the basis for natural resource use among indigenous communities (Mutebi, 2005). The need to understand the the basis for natural resource use among indigenous communities provides an opportunity to investigate the traditional practices that could potentially enhance the conservation of biodiversity in the Rwenzori Mountains National Park.

The investigation of those practices is important because prior to 1941 the Rwenzori Mountains were without marked boundaries and were managed and controlled by local communities (Masereka, 1996). The Rwenzori Mountain people for centuries depended on the mountain resources regarding the mountain as a free gift of nature (Stacey, 1996). The Rwenzori Mountains had always been important in the livelihoods and culture of the local communities until part of the area was gazetted as a national park which disenfranchised local people by making access illegal (McCall, 1996). Ridge leaders and elderly members of the local community in the Rwenzori Mountains claimed that the important natural resources were well conserved through indigenous practices before the area was declared a national park (Stacey, 2003) and that there were traditionally set norms and customs to follow while carrying out certain rituals and while harvesting resources. Local people, especially those associated with the Obusinga Bwa Rwenzururu (a cultural institution of the Rwenzori mountain people), are enthusiastic about revitalizing traditional practices in order to improve their welfare (Taylor, 2006)" (Fauna and Flora International-Uganda Wildlife Authority, 2012).

Although it is claimed that the Rwenzori Mountains are a cultural symbol to the Rwenzori Mountain people (Stacey, 2003), a comprehensive inventory of traditional beliefs, knowledge and practices associated with natural resource use was lacking. Without taking the traditional beliefs, knowledge, and practices, into account the management of the national park, and conservation efforts might not succeed.

8.1.2 Aim of this aspect of my study

The aspect of my study described in this chapter aimed to investigate the relationship between traditional beliefs, knowledge and practices and how they influence illegal access and utilisation of resources in the Rwenzori Mountains National Park. Based on the information gathered, the problem of illegal access and utilisation of resources could be better understood and proposals made for more effective community-based biodiversity conservation.

The study attempted to answer the following questions:

1) What indigenous knowledge, beliefs and practices influence illegal access and utilisation of resources in the Rwenzori Mountains National Park?
2) What potential does the recognition and integration of knowledge, beliefs and practices in the management of the park have for more effective biodiversity conservation?

The study was based on three assumptions:

1) Some indigenous knowledge, beliefs, and practices may be counter-conservation, so they need to be discouraged if they influence illegal access to the park.
2) Some of the indigenous knowledge, beliefs and practices may be pro-conservation, so they need to be encouraged if they are associated with resource use in the park.
3) If pro-conservation indigenous knowledge, beliefs and practices are integrated in the general park management plan, more effective conservation can be achieved.

8.2 METHODS

The investigation was conducted in villages neighbouring the Rwenzori Mountains National Park, Uganda (see details of the location in Chapter 1). The Rwenzori Mountains are among the remotest areas in Uganda, they have lagged behind in infrastructural development and advancement in technology because of the mountainous terrain of the area. They therefore exhibit some characteristics reminiscent of African traditional cultures. The communities in the Rwenzori Mountains have retained more of their traditional cultural beliefs and practices compared to the communities in the low land areas. Therefore, this provided an opportunity for conducting an investigation on how traditional beliefs, knowledge and practices influence illegal resource use among these communities.

8.2.1 Data collection techniques

Face to face individual interview were conducted as described in Chapter 5. Respondents were asked to describe what they did before, during, and after the harvesting plant resources, hunting animals, and conducting activities in the park. The focus of this investigation was on households within 5 km of the

Rwenzori Mountains National Park boundary from the southwestern edge which is adjacent the Democratic Republic of Congo (DRC) border to the northern tip. Fifteen major trails traversing villages neighbouring the Rwenzori Mountains National Park and leading to the park were identified. The area between one trail and another and households therein constituted a cluster. This stratification criterion resulted in 14 clusters. Registers from offices of parish chiefs were obtained and cross-checked by local residents to identify all the households in each cluster. The smallest cluster comprised 50 households and the largest cluster comprised 250 households. Every household was assigned a number so that all households had an equal chance of being selected. From each cluster, 10% of the households were selected using a table of random numbers. This procedure resulted in a total of 163 households. Each of the selected households was visited and respondents selected. The entire process of sampling and collection of data was conducted between October 2009 and June 2010.

At the household, the first chance for interview was given to the household head. If the household head was absent, the next most senior person was interviewed. Interview questions were meticulously developed according to the guidelines suggested by Burns (2000). After a number of revisions, the final draft of the interview schedule was produced and translated to the local language by a language expert (a person who had authored an English and Rukonjo dictionary). The translation of interview questions was necessary because not all respondents were expected to speak English. According to Uganda Bureau of Statistics (2010) based on the data of 2005 and 2006, 31% of people in Uganda were illiterate.

Two pilot interviews were conducted to identify whether there were any weaknesses in interview questions and to find the most appropriate strategy for conducting the interviews. In one interview, questions were asked in English through an interpreter who immediately asked the same questions in the local language (Rukonjo). In the second interview, questions which were pre-interpreted by a language expert into Rukonjo were asked by a trained research assistant. The two interviews were audio-recorded, transcribed and analyzed.

The first interview did not yield the expected rich data. The interview was very long (lasting more than 2 and a half hours) and both the interpreter and the respondent were visibly bored before the interview was half way. The second interview was shorter (lasting 50 minutes) and both the respondent and the interviewer were active to the end. Compared to the first interview, probing in the second interview elicited much deeper and richer information. Additionally, it was during the second interview that it was realized that two different questions asked the same thing and that one question was not clear. On this basis, directly posing pre-interpreted questions by a trained research assistant was considered the most feasible and productive method. The method used in the second interview was thus used for subsequent interviews.

One hundred and twenty seven interviews were in the local languages (110 in Rukoonjo and 17 in Rutooro). The other (36 interviews) were in English. Interviews that were in Rutooro were translated into English by the author of this thesis. A language expert was hired to translate the interviews from Rukoonjo into English. Thirty four out of one hundred and twenty seven interviews were translated back into the local language and compared with the original versions to ascertain reliability of the translation process. The interviews that were translated from Rutooro to English were translated back to Rutooro by an independent language expert.

All the transcribed interviews were analyzed through thematic content analysis procedure. The coding of major themes was guided by the research objectives. However, many of the data did not have predefined codes and were therefore analyzed as described below:

a) All the transcripts were read all the way through and the themes and sub-themes noted.
b) The list of themes was reviewed, similar themes were grouped together, and sub themes were placed under broader themes. Care was taken to limit the number of themes to specific research questions to avoid difficulties in keeping track of codes during the coding process.
c) The themes were then edited to minimize ambiguities and to remove overlaps.
d) Codes for each theme and subtheme were defined with a brief description of each code so as to know exactly how the code should be interpreted.

How the detailed analyses of the data were conducted depended on each theme and research question.

8.3 RESULTS

Six factors associated with traditional beliefs, knowledge, and practices were found to influence illegal access and utilisation of resources in the Rwenzori Mountains National Park (Figure 8.2). Although in this study the factors are presented separately, in reality they are interlinked and influence each other.

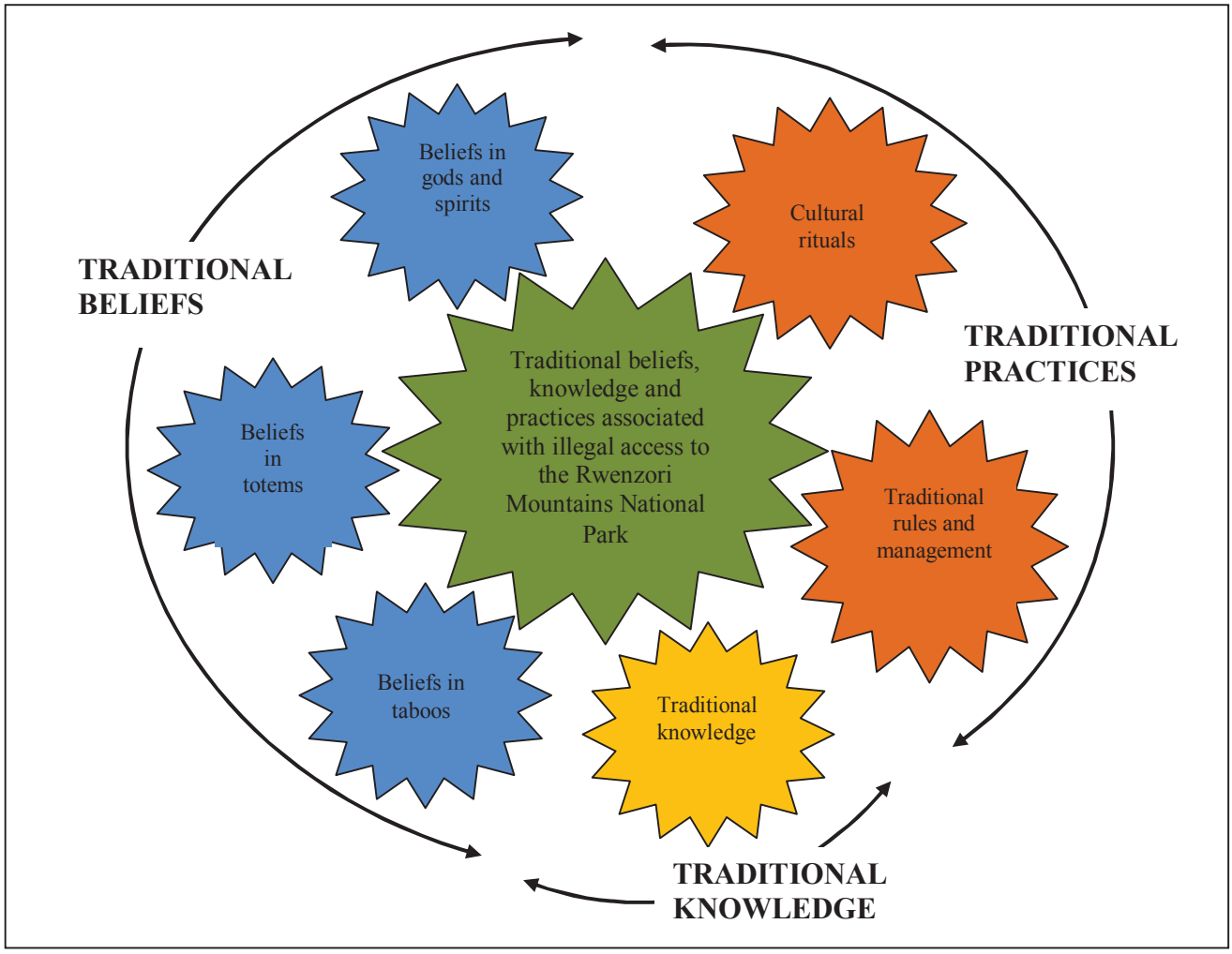

Figure 8.2 Traditional beliefs, Knowledge and practices that influence illegal access and utilisation of resources in the Rwenzori Mountains National Park

In the following section, how these factors operated in the traditional context is first described as before pointing out how they currently influence illegal use of resources.

8.3.1 Factors associated with traditional beliefs

Three types of traditional beliefs that influence access and utilisation of resources were distinguished: 1) beliefs in gods and spirits, 2) beliefs in taboos, and 3) beliefs in totems. Most of the description of these factors similar to the one contained herein was published in a technical report by Fauna and Flora International-Uganda Wildlife Authority, 2012 prepared by the author of this thesis. Except in this section, there are more details than in the technical report.

8.3.1.1 Beliefs in gods and spirits

Local people traditionally believed that gods live in different peaks and different mountain resources. Traditionally over 30 gods and goddesses were associated with various resources in the mountains but

only 21 (Table 8.1) were mentioned by respondents, because names of other gods and goddesses were supposed only to be mentioned while performing rituals and not casually such as in an interview.

Table 8.1 Gods and goddesses that local people believed control resource use in the Rwenzori Mountains

God and goddess	Responsibility of god or goddess
Nyamuhanga	The creator of everything.
Nzururu	The god of snow and a father to gods Kitasamba and Nyabibuya.
Kitasamba	The overall god. Kitasamba is believed to live in the glaciated Rwenzori Mountain peaks. This god is described as a giant force that controls the natural environment and the lives of all the mountain people.
Nyabibuya	The goddess of blessings.
Mugenyi	The god of visitors and domestic animals.
Ndahura	The god of diseases. This god was believed to cause and cure diseases.
Kalisya	The god of hunters.
Kahiyi	The god for all wild animals.
Nyabinji	The god of abundant harvest.
Irungu	The god and spirit of wilderness and hunters.
Mulindwa	The god of misfortune. He was believed to make people's plans work or fail.
Nyabahasa	The goddess believed to enable women to bear twins.
Walyuba	The god of life and its perpetuity.
Ndahukira	The god of luck and destiny.
Mulemberi	The god of children and expectant mothers.
Mbolhu	The goddess of strong love among women.
Ndyoka	The god of water and wetlands.
Kaleghire	The god of rescue.
Kathulikanzira	The god of travelers, is believed to guide the movements of travelers.
Kayikara	The god of herbalists.
Muthundi	The god of abundant harvest.

Local people traditionally believed that gods had wives, children, soldiers and pages. Gods mentioned can be placed in three categorical groups: one group comprised nine "white gods", the second group constituted an unspecified number of "black gods", and the third miscellaneous group (including mothers to gods, children, soldiers, and pages of gods). Each of the gods had unique names in relation to the power and control of that god.

There were several ways in which gods were believed to influence local people's relationship with resources and their utilisation. For instance, bark cloth (locally known as Orubugo and made from *Ficus* species) was said to be a cloth for the gods. It was also believed that all mountain ridges and some plant species are homes of gods. Gods brought resources from an unknown place to humankind and that some gods reside inside those resources. Plant species said to be homes of gods include: *Euphorbia candelabrum*, *Euphorbia tirucalli*, *Dracaena afromontana*, and *Cymbopogon afronardus*. It was believed that use of resources from those species and other resources in various mountain ridges must conform to the expectations of gods. People traditionally worshipped certain trees and they believed that in some situations if such trees were cut, they would bleed or cry or speak in expression of pain.

People with particular names associated with gods were supposed to harvest resources in a particular way. An individual with the name "Ndahura" was supposed to collect only species of plants that have thorns, and rough leaves. Such a person was the only one who could successfully hunt animals with rough and sharp fur. A person with the name "Mulindwa" was supposed to hunt only carnivores. Mulindwa was also supposed to collect plant species of medicinal value that protect people from attack by enemies or wild animals. Such people had powers to resist attack from any wild animal (ranging from small animals such as snakes to big animals such as lions and leopards). A person with the name "Mugenyi" was supposed to hunt herbivores. Mugenyi *was* also supposed to collect plant species of medicinal value that protect people from illnesses and plant species rich in amphetamines.

People who worshiped god Mulindwa were not supposed to worship god Mugenyi and hence each of the worshippers of one god were not supposed to gather resources that are gathered by another. The restrictions in worshiping gods did not only stop at gathering resources but also extended to social relations amongst the community.

Traditionally, people built houses or huts or shrines for gods and in those places they evoked them during cultural practices. Such houses were constructed using particular plant resources which had to be collected in a particular way.

Hunting was conducted in close consultation with gods. Hunters had to consult a god of wild animals ("Kalisya") before they engaged in hunting. People held a belief that the god of wild animals became furious not only when hunting occurred without consulting him but even when people did not engage in hunting.

"*Not hunting is disrespect to Kalisya, the god of hunters and the other hunting spirits and this is a bad omen*" KSK-034

Engaging in hunting without first honoring the demands of the gods would be fruitless.

Generally local people had strong beliefs about the control of gods on resource use evidenced by the statement below;

"*If the spirits themselves make their call, not even the rangers will see us going up to the sites and yet we will go through their protected area, even when they are there. I can even cut down all the trees without the rangers seeing me if the spirits are with me*!" BB-098

Obtaining resources in the mountains without following the proper procedure of appeasing the gods resulted in punishments from those particular gods. Common punishments included deformity of the body by developing hunchbacks, swollen limbs, atrophy in limbs, insensibility in some parts of the body, abnormality in the number of fingers and toes (especially the development of the sixth finger

and toe), the production of twins, and the occurrence of peculiar phenomena such as giving birth to albinos. These punishments occurred either immediately or later to the offender and or to his or her close relatives.

Such incidents could occur not necessarily as a result of not appeasing gods when collecting resources but also through other causes. However, there were traditional ways to know that the cause of the problem was non-conformity to the requirements by a particular god in the harvest of resources.

8.3.1.2 Beliefs in totems

The Rwenzori Mountain people are traditionally grouped in 15 clans, and each clan respected a particular totem. Only six clans were found to be associated with certain animals (Table 8.2) and none was associated with plant species.

Table 8.2 Examples of clans and the associated totems in the Rwenzori Mountains

Clan name	Totem
Baswagha	A Leopard
Abahira	A Guinea fowl
Abathangi	A Dog and a Chimpanzee
Abahambu	A Red eyed dove
Ababinga	A Baboon
Abasukali (also called the royal clan)	An Antelope

Respondents believed that totems of a particular clan were not supposed be killed or harmed by a member or relative of a person from that clan. For instance, a wife of a man who might be from a different tribe or clan and therefore has a different totem was not supposed to hurt the totem of her husband. Totems were believed to be part of the kindred of a particular tribe and were part of the ancestral lineage. To hurt a totem was tantamount to hurting the ancestors of that clan. Therefore, Abahambu clan members for instance were not supposed to kill or harm a Red eyed dove. Severe punishments, such as banishment, fines, hard labour, or death, were applied to anyone who disrespected their totem.

8.3.1.3 Beliefs in taboos

The sampled respondents believed in nineteen taboos associated with resource use in the Rwenzori Mountains. These taboos could be grouped into four categories: 1) taboos about use of plant resources, 2) taboos about hunting, 3) taboos about going to and through the mountains, and 4) other taboos that could not be placed in any of the three categories (Table 8.3).

The consequences associated with contravening particular taboos were to do with people's welfare and life. This indicates the seriousness of keeping the taboos un-violated.

8.3.2 Traditional knowledge

Collection of resources and performance of activities in the Rwenzori Mountains National Park was also influenced by the knowledge of resource users. The sampled respondents revealed that traditionally, people specialized in particular activities. In relation to resource use, it was revealed that people specialized only in hunting, others in gathering medicinal plant resources, and others in craft materials. For example, not everybody made baskets; specialized knowledge of basketry was restricted to a few members of the community who collected materials to use. Similarly, herbs were not for everyone to collect; only the traditional herbalists and healers had the mandate to collect herbs. The numbers of herbalists were 2 or 3 in an entire village (which constituted about 50 to 100 people). There were also specialized hunting households as well as people described as courageous and prominent who engaged in hunting. Such people could be as few as 2 in a whole village and they distributed meat in exchange for other things such as herbal medicine.

Based on the traditional knowledge of the local people, people extracted resources or hunted animals in a particular way. For example, although the community greatly depended on bamboo for various subsistence uses, harvesting bamboo was done only in two seasons and only the mature and dry stems were cut. If one had to get bamboo or bamboo leaves before the harvesting seasons, then they had to consult the ridge leader first. The green bamboo was cut occasionally to weave fences because it was known that fresh bamboo was easier to bend.

Also, people knew which species of plants did not grow in the foothills of the mountains and advised the community members accordingly especially on risks involved in growing certain species of plants in lowlands. For example a plant known as Embatule in the local language (Rutooro) was a good medicinal plant used in treating wounds instantly, but was also very poisonous to humans and animals if eaten accidentally and it was therefore not allowed to be grown in or near homesteads. Medicine from such a plant would be prepared and administered carefully by a specialist herbalist.

Table 8.3 Taboos associated with resource use in the Rwenzori Mountains National Park.

Taboos	Consequence of contravening the taboo
Taboos associated with plant resources	
To take young bamboo from the mountain to the valley.	The children of the individual would die.
To cut a tree called "Ekitimazi"	The individual would lose his or her way home and die in the mountains.
To cut *Ficus natalensis*, *Albizia lebbecki* and *Datura suaveolens*.	It would stop the rains and the area would suffer drought.
To go around a tree from which an individual is collecting resources for medicinal purposes.	The medicine would not work.
To cut a tree in which honeybees stay.	The individual would become mad or his or her family would get a family curse to be inherited by other family members in future.
To cut or break trees or sticks while moving in the mountain.	The consequence was not revealed
Taboos about hunting and eating bush meat	
To kill mother monkeys or their babies	The individual's wife or children would die.
To kill "leader" animals	The individual would die.
To kill a Black and White colubus monkey	The individual or his relatives would get a curse.
To kill what a person does not eat	The consequence was not revealed
To eat meat struck by a thunderbolt	The consequence was not revealed
Taboos about going to and through the mountains	
A woman to climb far in the mountains and access sacred sites.	Evil spirits would attack her or she would never get married or would never bear children. If married she would be compelled
To branch off the main foot paths and create one's own track in the mountains.	The consequence was not revealed
To walk over the mountain from one end to the other in one day.	The consequence was not revealed
To walk through the mountains during the rainy season.	The consequence was not revealed
To stop and rest in an undesignated [7] place in the mountains.	The consequence was not revealed
To look from side to side when moving through the mountains.	The individual would disappear mysteriously or it would rain very heavily and the individual would loose his/her way home and die in the mountains.
To go to the mountains with a radio or to whistle while there.	The consequence was not revealed
To have sexual intercourse while in the mountains.	The individuals involved would die on the spot or become barren or the gods would beat the individuals involved.
Other taboos	
To bring home the body of a person who has died from the mountains as a result of contravening taboos.	The community would be punished by the gods.
To cultivate near riverbanks.	The individual would be drowned in the water by spirits.
To leave the fire used in ritual sacrifice burning.	The individual would run mad and disappear without trace.

[7] Traditionally, there were designated resting places called Ekyiko in the Rwenzori Mountains.

People who wanted to cultivate in the forest only cleared trees that were known to make the soil infertile by drying it up. Such plants in a local language (Rukoonjo) were Emisebere, Kyungu, Ekisusuti, Ekyona, Omukole, and Omwolongo. Plant species that were known to increase soil fertility were not cleared.

Hunting was seasonal (once or twice a month) ensuring selective hunting as well. Selective hunting gear which only targeted one animal at a time was used. For instance, '*kitewo*' was a type of hunting gear described as a rope with a noose at one end for just one animal at a time. Also, it was revealed that hunters only killed adult animals and avoided young, pregnant, and leader animals. Hunters knew how to identify the leader animals based on the characteristics of their ears and horns.

8.3.3 Traditional practices

Two aspects: 1) traditional rules and management, and 2) cultural rituals associated with traditional practices and natural resource conservation were revealed.

8.3.3.1 Traditional rules and management

Respondents claimed that traditionally, the entire Rwenzori Mountains and the natural resources therein belonged to local people.

"*The Rwenzori Mountains were owned and are still owned by us, it is only the new people who do not know this and the young people have been made to forget their traditional rights over the mountains and the many uses that resources in there have in our life. I am happy that you have come to ask us who know how things were many years ago*" KSK-003

A particular traditional structure comprising various categories of people was followed during resource use and management (Figure 8.3). The structure was based on households, villages, ridges and clans which were all administered independently. Each household was administered by a household head (Nyineka). Different households made up a village (Obulhambo) which was administered by a ridge leader (Omukungu or Mukuluwabulhambu). Different villages (between 4 and 8) constituted a chiefdom which was administered by a Chieftain (Isemalhambu).

Every clan had a clan leader (Omwame) and on some clan matters his leadership was exercised independently from the Chieftain. The role of the clan leader was to maintain law and order, unity, security, and to govern use of resources associated with a particular clan in the form of totems or taboos that people of that clan must adhere to.

Authority over use of resources started with the household head who granted permission to a family member to use resources in his[8] area of jurisdiction. In case the resources needed were beyond his areas of jurisdiction and depending on the intended use of the resource, the household head sought permission from either the ridge leader or clan leader. These either approved or disapproved resource use or also sought permission from a higher authority.

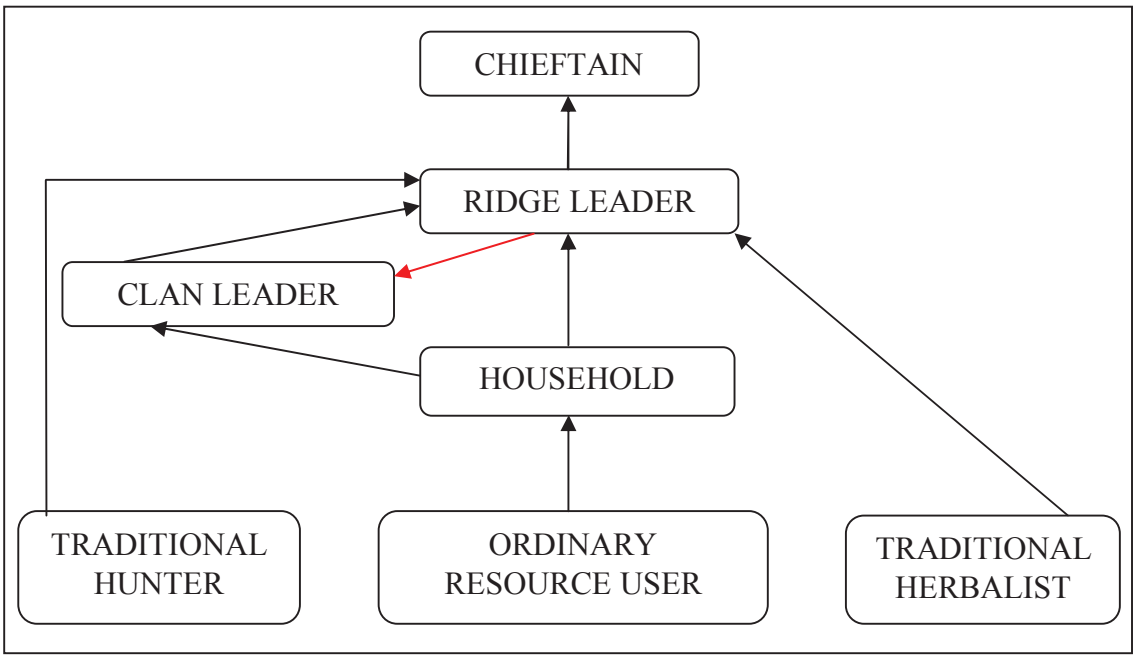

Figure 8.3 Diagrammatic presentation of the traditional structure followed in resource use in the Rwenzori Mountains.

Traditional hunters and herbalists sought permission directly from the ridge leaders. The ridge leader granted permission or first consulted the clan leader in case the resources needed were associated with particular clans.

[8] Traditionally all household heads, ringleaders, clan leaders and chieftains were males.

According to respondents, this structure was put in place in order to enforce rules and regulations governing resource use. For instance, rules and regulations governed the use of mushrooms. Each of the tree types of mushrooms (Obwiikwe, Ekitosa and Kiryabaheyi) was allowed to be harvested by different people. Obwiikwe were only allowed to be collected in the wet season by hunters when they went to hunt. People would only go to the spot that had a type of mushroom that they wanted.

The traditional structure was highly respected. Any disputes arising from resource use were handled in a traditional court involving the community members and presided over by clan leaders or ridge leaders and rarely the chieftains.

8.3.3.2 Cultural rituals

Respondents revealed various cultural rituals that traditionally influenced access and utilisation of resources in the mountains. The rituals revealed are in three categories; 1) rituals that were conducted by the local people before going to mountains or forest, 2) rituals conducted by local people while in the mountains or forest, 3) rituals conducted by respondents after leaving the forest or mountains, and 4) other precautionary rituals (see Table 8.4 and Appendix 8.1 for details about the rituals). Some words and phrases used in the description of rituals did not have English equivalents and attempts have been made to describe their meaning (Appendix 8.2).

Rituals did not have specific names; respondents just described how those rituals were conducted. The names used in this chapter and elsewhere in the thesis were coined by the author for purposes of categorization of the rituals for clarity, easy presentation, and description of information.

Table 8.4 Cultural rituals performed by some respondents before, during and after gathering resources in the Rwenzori Mountains

Ritual	Purpose of the ritual
Rituals before going to harvest resources	
Sweeping the ridge ritual	To cleanse the land
Irungu ritual	To foretell happenings
Esegete ritual	To foretell happenings
Entondo ritual	To foretell happenings
Omusekera ritual	To foretell happenings and manipulate ones fate
Omukongoizi rituals	To foretell happenings and to purify someone
Rituals while harvesting resources	
Banana stem and saliva ritual	For direction to the location of resources needed
Omuhati ritual	To make a special request
Eteete ritual	To check if the trap has caught any animal
Rituals after harvesting resources	
Irungu, Kalisya and Kahihi ritual	To give thanks
Omuhoko ritual	To check if one of his family members misbehaved in his absence
Shoes ritual	To check if a person has trodden on a prohibited area
Omukyora ritual	To ascertain that nothing illegal was done in the forest

The performance of rituals and traditional beliefs and knowledge were interdependent. For instance, conformity to the expectations of gods was achieved through performance of rituals in shrines or altars (Eshendekere).

8.3.4 Respondents that followed traditional beliefs, knowledge, and practices to illegally access and utilise resources in the park

The number of people that followed traditional beliefs, knowledge and practices varied in different periods (Figure 8.4). However, in both categories of factors, people that followed them before 1991 (before the park was created) were the highest in number. From the establishment of the park to present, the number that followed traditional beliefs, knowledge and practices has reduced. Beliefs in gods and spirits, and totems constitute the first and second activity with the highest number of people respectively. The number of people that follow traditional knowledge, beliefs in gods and spirits and totems has been relatively stable over time.

Those that currently follow rituals revealed that they performed some rituals such as "omusekera ritual" before they take their application to Uganda wildlife outpost office for permission to access resources in the park with a hope that the rituals would enhance their chances of getting permission. Although creation of national parks in rual African areas has been found to undermine traditional cultural practices (Chapter 3), the performance of traditional rituals especially prior to seeking permission from the park authorities indicates a stimulation of the evolution of traditional practices as a result of establishment of the park.

Respondents that followed traditional rules and management before they accessed resources in the park, did not ask for permission from the park rangers but rather from the local leaders of a particular ridge where the resource is located. These respondents happened to be closely associated with the matters of the kingdom of the Rwenzori people and hence claimed that they asked for permission from the ridge leaders as a revival of their traditional rules.

Some respondents did not follow traditional beliefs in gods and spirits when utilising resources in the park for various reasons. Some claimed that they had converted to modern religions, even though they upheld and revered the Rwenzori Mountain as their cultural symbol, they felt that some beliefs such as those associated with mountain gods conflicted with their current religious beliefs. Others claimed that it was because of disbandonment of the traditional leadership structure and that currently there is confusion amongst traditional leaders about who is the right leader for each ridge. This has caused conflict among local people because some mountain ridges were claimed by multiple owners and there was struggle for power to manage them.

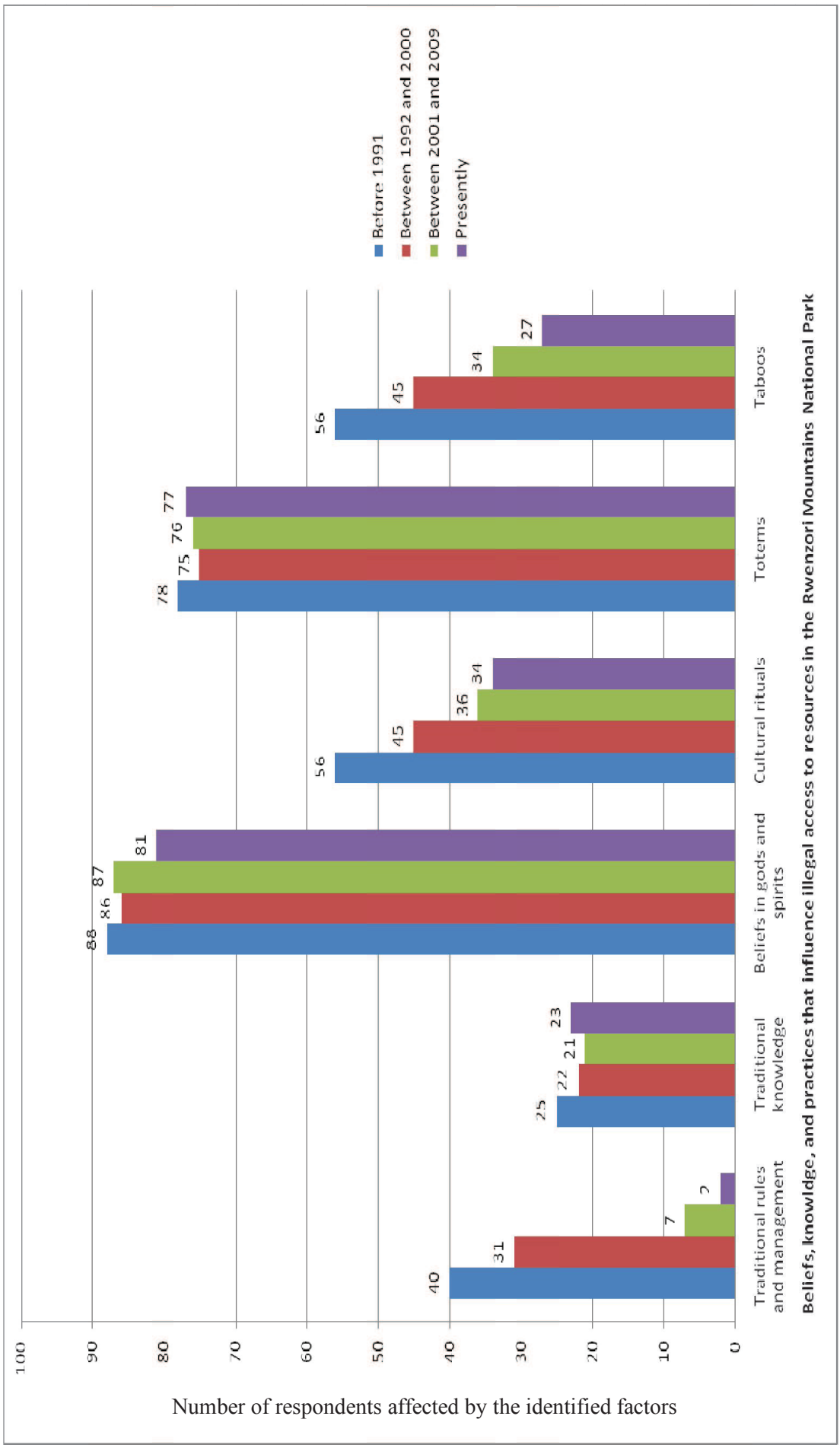

Figure 8.4 Factors affecting access to the Rwenzori Mountains National Park for the most important resources and activities.

8.4 DISCUSSION

Based on the information from the sampled respondents, it was obvious that resource use in the Rwenzori Mountains National Park was traditionally associated with traditional beliefs, knowledge and practices. Also currently, some local people engage in illegal use of resources from the park as a result of traditional beliefs, knowledge and practices. These were not recognized during the establishment of the park and even presently they have been ignored in the implementation of community-based conservation strategies. This situation is common among many African traditional communities (Colding and Folke, 2001; DeGeorges and Reilly, 2009; Maffi & Woodley, 2010). This could partly be due to lack of scientific explanations that link traditional beliefs, knowledge and practices with biodiversity conservation.

The beliefs, knowledge, and practices are based on folklore which is not based on scientific method of inquiry. Scholars have not empirically demonstrated a link between these factors and the intention to conserve (Alvard, 1993; Diamond, 1986). On scientific grounds Irungu spirit described in this investigation cannot communicate with wild animals in the Rwenzori Mountains. Similarly, there is no scientific or logical explanation on how an insect scratching its head with its hind leg or spreading its wings would mean that somebody would die. Also, various rituals were used to foretell happenings (Table 8.4) but did not show how they ensured sustainable utilisation of resources. What is known in the literature is that some trees cause allergies but there is no scientific relationship or logic between cutting a tree and a person who cut that tree becoming mad. Similarly, there is no scientific explanation for the death of someone's wife or children and the killing of young monkeys. Also why would women become barren if they climbed far in the mountains or went to sacred sites? In addition, scientific literature does not offer a logical explanation about why a hunter was not supposed to have sexual intercourse with his wife a night before going to hunt. Could the reason have been that the hunter sleeps better and could be more alert during hunting or he is able to save energy for hunting since sexual intercourse is biologically known as an energy consuming activity (MacDonald, 1997)? Taboos are spiritually based, superstitious, fatalistic and are not based on any scientific premise (Snively and Corsiglia, 2001).

Therefore, the factors associated with traditional knowledge, beliefs and practices have not previously been considered in the realm of conservation science (Byarugaba, 2010; Ceríaco *et al*., 2011; Maffi and Woodley, 2010) and this could be the same case for the Rwenzori Mountains National Park. This is a common shortcoming of community-based approaches. Even if they are not acceptable by scientists, it does not mean they have no influence over natural resource use practices of local people. Therefore, they need to be considered in strategies for addressing some of the problems associated with the conservation of biodiversity in rural areas.

8.4.1 Factors that need to be targeted in attempts to address illegal access to park resources

The factors identified in this investigation do not directly influence illegal access. The immediate determinant of illegal access to the park is the intention (Figure 8.5). Intention consists of attitudes a person forms towards resources in the park. These concepts are influenced by a person's attitude (a settled way of thinking or feeling) toward the resources. If the attitude is positive, the intention to access resources will be high and the person is more likely to engage in illegal use.

The attitude is directly influenced by the factors associated with traditional beliefs, knowledge and practices. These are the factors that need to be addressed in attempts to mitigate illegal access to park resources.

Approaches that attempt to change people's beliefs and knowledge other than coercive measures are recommended to deal with these factors because they are situated in the individual's mindset. Coercive measures such as penalizing contraveners, putting in place stringent conditions denying people access to the park have largely failed to address the problem in many protected areas in Africa (Chapter 2). This is because these measures do not deal with the factors in the internal milieu of the individual which underlie illegal access.

Strategies such as environmental education and provision of pro-conservation information and messages could better address the beliefs and knowledge held by the individual. These will not only address illegal access but also un-sustainable utilisation of resources that might be associated with traditional practices. This is because traditional practices are a function of beliefs and knowledge. Environmental education could for instance address beliefs about gods and explain how sustainable utilisation of resources is attained not necessarily though appeasing gods but though planned measures and interventions based on researched or experienced knowledge. This issue has been discussed in more detail in Chapters 10 and 11.

8.4.2 Possible ways in which traditional beliefs, knowledge and practices could have enhanced biodiversity conservation

Although traditional beliefs, knowledge and practices, influence illegal access to the park, on the other hand, they can enhance biodiversity conservation. It is not automatic that illegal access to a park constitutes unsustainable resource use. Traditional beliefs, knowledge and practices have in some cases (especially in community conserved areas) enhanced biodiversity conservation (Chapter 2). Therefore, this necessitates analyzing how traditional beliefs, knowledge, and practices could have enhanced biodiversity conservation in the Rwenzori Mountains National Park.

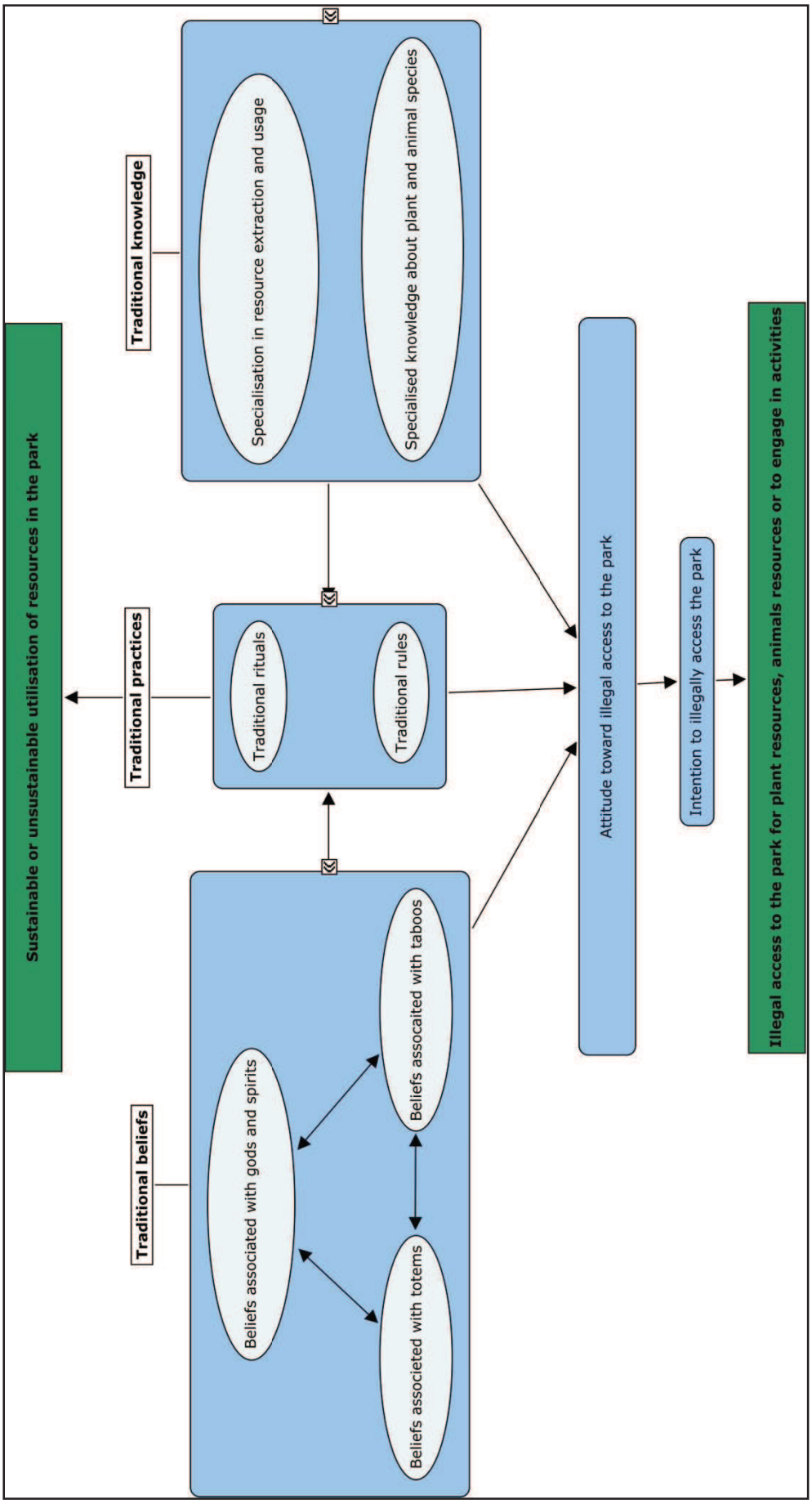

Figure 8.5 A scheme showing how factors associated with traditional beliefs, knowledge and practices influence illegal access to the park

There are five possible ways in which traditional beliefs, knowledge, and practices in the Rwenzori Mountains National Park could have enhanced biodiversity conservation (Figure 8.6). Reading the Figure from left to right shows that biodiversity conservation was achieved through intermediary factors. For example, traditional rules and management could have resulted in more effective planning for conservation through monitoring the extent of resource use. It was a rule that when resource users came back from where they extracted resources, they reported to the ridge leaders. Also the "Shoes" and "Omukyora" rituals might have served the same purpose. In such a relationship, the activities of the community were counterchecked.

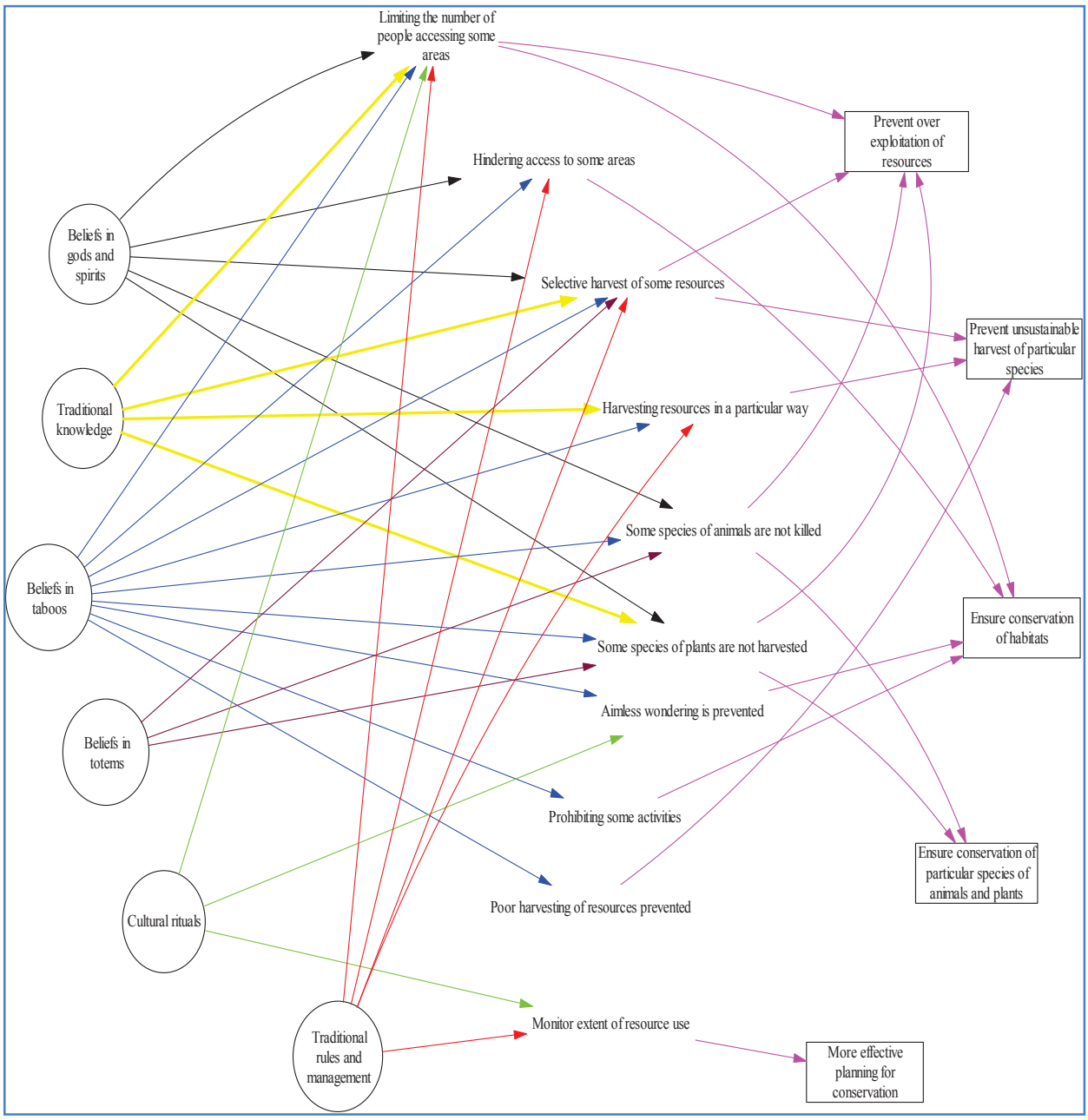

Figure 8.6 The link between factors associated with beliefs knowledge and practices and the conservation of biodiversity.

These rituals were similar to contemporary strategies that are implemented in community-based conservation strategies. For instance, resource use agreements between local people and park managers in the Rwenzori Mountains National Park required local people to present what they have collected from the park to the rangers at the outpost (Uganda Wildlife Authority, 2008). This is in line with findings of Colding and Folke (2001) that traditional cultures have some practices that are similar to current biodiversity conservation strategies but which have not been sufficiently recognized.

Also, performance of rituals might have facilitated sustainable utilisation of resources by making access to resources difficult. It is expected that some of the people could not successfully perform rituals and hence the number of people cleared through rituals to have access to resources was reduced. Access to resources by a limited number of people in a given period ensures continued availability of these resources (Karanth, *et al*., 2006; Vedeld *et al*., 2004). Access to resources by a limited number of people is one way of ensuring sustainable utilisation of resources (Vedeld *et al*., 2004).

Taboos associated with resource use might have also served as deterrents to accessing certain areas or harvesting certain resources and this ensured that:

a) some places were not accessed,
b) some species of animals were not killed,
c) some species of plants were not harvested, and
d) aimless wondering in the mountains was prevented.

For instance, the taboos against bringing down to the valley young bamboo stems could have been intended to prevent the harvest of young bamboo and to encourage the harvest of mature bamboo. Also a taboo against stopping and resting in an undesignated place in the mountains could have been intended to prevent unnecessary anthropogenic effects in the mountains which could potentially cause damage to some resources. Anthropogenic activities such as recreation and tourism although they involve non-extractive use of resources, may have a negative impact on biodiversity (Constantine *et al*., 2004; Finney *et al*., 2005; Griffin *et al*., 2006). In addition, although performance of rituals using fire was a non-extractive resource use, a taboo against leaving fire used in ritual sacrifice burning could have served precautionary purposes to prevent unintended outbreak of fire in the mountains.

A taboo against moving around a tree before harvesting any of its parts for medicinal products speculatively could have served two purposes for biodiversity conservation. Firstly, by not moving around the tree, a resource user was prevented from looking at other resources on the tree hence reducing the chances of extracting more resources than the intended ones. Secondly, it could have prevented resource users from getting all the leaves or the bark from a tree hence preventing unsustainable harvest of resources from plant species. Unsustainable harvest of some plant species has been recorded as one of the factors threatening the conservation of biodiversity. Sustainable use of resources partly depends on how resources are harvested. For most plant species, the harvest of all

leaves or all roots from the plant is less sustainable than the harvest of a few leaves or roots from different plants (Turner, 2007). For instance, poor harvest of *Prunus africana* in most African tropical forests by ring-barking is one of reasons why the species is listed among threatened species (IUCN, 2011). The taboo against moving around a tree could have minimized or prevented poor harvest of *Prunus africana*.

Another related example of how taboos could have enabled sustainable resource use is a taboo against killing a leader animal. Since leader animals had control over other animal and had distinct characteristics from other animals of the same species, killing them indiscriminately could have meant never to get any more of their variety. In current conservation approaches, keystone species are often conferred a high conservation priority (Kotliar, 2000).

A taboo against cutting trees where there were bees was an indication that taboos are extended to conservation of animals and their habitats. This contradicts a study by Saj *et al*. (2006) which showed that the protection that taboos may accord to biodiversity is often to one species and does not extend to other species' and their habitats.

Penalties associated with going against taboos could also have had implication for conservation. For example, the penalty called "muyuchi" (known as a family curse) which affects other family members in future and not the offenders could be interpreted in a sustainable development context. The principle of sustainable development is that resources have to be used in such a way that the future is not compromised (Kates *et al*., 2005). This means that poor use of resources could lead to the suffering of the future generation. With reference to penalties associated with the taboos, if they are not respected by utilising the resources in the required manner, it may lead to the suffering of the people in the next generation.

These examples are indicative that despite the non-scientific basis of taboos, they not only influence resource use but also could potentially lead to more effective biodiversity conservation in the Rwenzori Mountains if recognized given that since some of the people still follow them.

8.4.3 Analysis of the applicability of traditional beliefs, knowledge and practices in the current context

Rather than dealing with the identified factors in order to prevent illegal access in the Rwenzori Mountains National Park, there is potential for integration of these factors in park management for more effective conservation. Unlike other areas that have been "transformed" leading to loss of traditional cultural practices, in the Rwenzori Mountains, based on the percentage of people that follow traditional beliefs, knowledge and practices when harvesting resources in the park indicates that people still cherish their tradition and there could be more people expressing willingness to conserve biodiversity through traditional practices. Also, claims that names of some gods were not supposed to be mentioned in an interview but only when performing rituals is indicative that people

still cherish cultural values. This forms a good ground for starting the process integrating the traditional beliefs, knowledge and practices in current biodiversity conservation strategies in the Rwenzori Mountains National Park.

The use of existing cultural institutions can expedite the process. One such cultural institution is the Obusinga bwa Rwenzururu which was formally and legally established since 2008, and local people in the mountains (especially in Kasese and Kabarole) are enthusiastic about it (Masereka pers. comm. July 2010[9]). The traditional structures could easily be revised so that some of the resource use and management powers are shifted from Uganda Wildlife Authority to the traditional leaders. The activities of resource users such as those who do not like being monitored when in the park could be managed through traditional practices such as the shoes ritual. This suggestion is in line with lessons learned from elsewhere that successful biodiversity conservation in national parks is often more successful when management of the park is effected through local administrative structures than through decrees from an authority exogenous to the community where the park is established (Kasparek, 2008; Roe *et al.* 2000; Vodouhê *et al.*, 2010)

However, it would be necessary to recognize the limitations associated with the traditional beliefs, knowledge and practices. For instance, totems identified in this study were all animals. This means even if these are respected as well as the foods they eat, it might not protect other non totemic animals and the plants they eat. Also unlike in traditional communities where there was specialization in resource use, this might have limitations in the current context given that some respondents who hunted animals were also involved in the collection of plant resources. Changes in beliefs as a result of modern religions and acquisition of formal education might render traditional beliefs, knowledge and practices that enhanced biodiversity conservation ineffective in the long term unless focused interventions are implemented urgently.

8.5 CONCLUSION

Traditional beliefs, knowledge and practices not only influence illegal access to resources in the Rwenzori Mountains National Park but also the sustainable utilisation of these resources. However, these factors were not considered in the current strategies of conserving biodiversity in the park. The majority of people upheld beliefs in gods and spirits, and totems and the numbers have remained stable since the establishment of the park. However, the number of people that respect traditional

[9] Masereka Samuel is the Chairperson of the Rwenzori Mountains Cultural Values and Conservation Association.

rules and management, taboos, and cultural rituals has been reducing. All the factors that are associated with traditional beliefs, knowledge and practices need to be targeted if illegal access to park resources is to be addressed. These factors should be targeted through provision of education because they are situated in the mindsets of individuals. Since the factors might have traditionally enhanced biodiversity conservation through regulated and limited access to resources, their integration into the management of the park should be considered. Their role in the management is still relevant in the current context and their integration can be facilitated through the existing traditional cultural leadership structure.

CHAPTER 9

ATTEMPTS TO INTEGRATE TRADITIONAL BELIEFS, KNOWLEDGE AND PRACTICES IN THE MANAGEMENT OF THE RWENZORI MOUNTAINS NATIONAL PARK



Figure 9.1 Local people and a park staff member (in a green uniform) in a consultative meeting. (Photo by M. Muhumuza, January, 2010**).**

OVERVIEW OF THE CHAPTER

National parks in rural Africa are said to face various problems such as encroachment (by human settlement and agriculture) and loss of biodiversity as a result of illegal access and indiscriminate extraction of resources therein by the neighbouring community. Attempts by national park staff to address the problems have been ineffective and have resulted in poor relations with the local people living in nearby villages. Conflicts over use of national park resources are common in many national parks in Africa. In order to address these poor relations and conflicts in national parks, a plethora of studies especially from anthropologists and social scientists have argued for the integration of traditional beliefs, knowledge, and practices in the management of national parks. These studies have mainly been theoretical drawing from historical accounts of life styles of people in traditional societies, practical demonstrations and interventions are lacking. In Uganda, attempts were made to integrate traditional beliefs, knowledge and practices in a number of national parks including the Rwenzori Mountains National Park. This was done as a way of demonstrating how the integration of beliefs, knowledge, and practices in park management could achieve better relations between the local people and the park staff. It was assumed that improved relations could translate in reduced incidents of illegal access and resource use. This chapter describes the process of integrating beliefs, knowledge, and practices in park management based on sacred sites in the Rwenzori Mountains National Park. The experiences and lessons learned in the process are discussed.

9.1 INTRODUCTION

The view that indigenous people in traditional communities deliberately sustained biodiversity and therefore the knowledge and methods they used should be integrated in current conservation approaches is contentious. There is a substantial literature about whether or not people in African traditional communities conserved biodiversity (for instance Cinner, 2007; Cohn, 1988; Saj *et al*., 2006). The available literature provides contrasting points of views about traditional biodiversity conservation suggesting that people in traditional communities did not have motive and restraint over resource use to qualify as conservationists (Alvard, 1993a; Alvard, 1994; Winterhalder *et al*., 1988).

Publications about "the ecologically noble savage" (Hames, 2007; Posey, 1985) provide important debates about the pros and cons of recognizing and attempting to integrate traditional cultural aspects in modern conservation strategies. These debates have triggered a need to have more evidence to provide a basis for the recognition and inclusion of these strategies in current biodiversity conservation schemes (Beltrán, 2000; Brook and McLachlan, 2008; Byarugaba, 2010).

Scientific evidence is needed due to the close association of traditional biodiversity conservation strategies to folklore which according to science is not empirical but merely based on beliefs. Folklore is generally defined as oral history, jokes, legends, taboos, music, proverbs, customs and popular beliefs that are the traditions of a given culture and which have been passed from one generation to another through casual imitation or oral transmission (Medin and Atran, 1999). Folklore constitutes a lot of information gathered through experience with the natural world (Saikia, 2008). Traditional communities hold in folklore perceptions and ideas regarding plant and animal species (Saikia, 2008). Folklore could therefore offer important sources of information which could potentially solve a number of problems associated with the conservation of biodiversity.

Although there are various sub-types of folklore that can be distinguished into traditional beliefs, knowledge and practices (Ceríaco *et al*., 2011), most studies on the role of folklore in biodiversity conservation have mainly investigated traditional ecological knowledge (Berkes, 2008; Byarugaba, 2010; Cohn, 1988; Ramstad *et al*., 2007; Saj *et al*., 2006). Detailed descriptive studies about traditional beliefs, knowledge and practices and how they are linked to biodiversity conservation are few and their wider application in biodiversity conservation remains elusive.

Previous and current conservation strategies (Chapter 2) indicate that conservationists have shown no interest in studies that attempt to demonstrate the relationship between traditional beliefs, knowledge, practices and biodiversity conservation (Ceríaco *et al*., 2011). In part, this is due to continued inertia in favor of scientific practices that follow the scientific menthod of inquiry and the need to describe traditional beliefs, knowledge, and practices in scientific terms. The epistemology of traditional beliefs, knowledge, and practices is constructed on non-scientific grounds and hence conservationists think this limits their applicability in conservation science (Byarugaba, 2010). The non-scientific basis of traditional beliefs, knowledge and practices make it difficult to assess their role in biodiversity conservation. Also the difficulty of accessing information about traditional beliefs, knowledge, and practices, because it is rarely written down (Huntington, 2000), limits its integration into current biodiversity conservation strategies. Also, social and cultural changes in African communities as they adopt modern life styles make it difficult to locate traditional beliefs, knowledge, and practices that are linked to biodiversity conservation that could serve as practical examples.

The emphasis of formal scientific studies as a basis of creating, expanding and developing modern protected areas has resulted in the disregard of traditional aspects of biodiversity conservation. Local people are not even consulted in the process of proposing and implementing various conservation strategies even when these conservation decisions directly affect their livelihood and survival (Chapter 2). For example, in the International Union for Conservation of Nature Best Practice Guidelines on Indigenous and Traditional Peoples and Protected Areas, Wild and McLeod (2008) found that in ten out of eleven case studies communities had not been consulted before to the creation of the protected areas.

The low level of consultation of local communities indicates the exclusionary biodiversity conservation strategy where local people have been regarded as detrimental to conservation and, in many cases (as shown in Chapter 2) are removed from protected areas at significant economic and social costs.

Despite the difficulty associated with recognizing and integrating traditional beliefs, knowledge, and practices in biodiversity conservation, they are known to influence resource use and management in rural African communities where they are upheld (Chapter 8). The documentation of traditional beliefs, knowledge, and practices therefore becomes of considerable interest to conservation scientists especially when made from local people's perspective (Davis and Wagner, 2003). For instance, local people in Indian communities expressed traditional beliefs, attitudes and knowledge about ecological

aspects of their environment when investigated from a traditional cultural perspective than from formal schools (Bhagwat, 1958).

In the last 30 years (beginning in the early 1980) various alternatives to the exclusionary strategy have been emerging initially in Europe and have more recently spread to other continents especially in tropical countries. Discourses in biodiversity conservation strategies have hinged on more inclusive strategies such as integrated conservation and development and community education programmes. However, indications show that these strategies also have neither succeeded in interesting local people to support biodiversity conservation in protected areas nor have they led to a reduction in biodiversity loss in and outside protected areas (Chapter 2).

With these strategies failing, other ways for involving the local people in the preparation of protected area management plans have continued to be sought. Urgently, there is need to devise other strategies or improve the existing ones so as to create interest and build support among the local community to support conservation objectives associated with protected areas.

In pursuit of a more effective biodiversity conservation strategy in the Rwenzori Mountains National Park, a cultural based conservation strategy was proposed. The strategy was based on the integration of local people's traditional beliefs, knowledge, and practices in the management of the park. In 2005 the Culture, Values and Conservation Project (CVCP) started to be implemented by Uganda Wildlife Authority and Fauna and Flora International (FFI). The project was intended to test the application of traditional beliefs, knowledge and practices to the conservation of biodiversity in some national parks in Uganda (including the Rwenzori Mountains National Park) and to design practical interventions to integrate local people's culture in park management (find details at http://www.fauna-flora.org/wp-content/uploads/Rwenzori-Sacred-Sites-Technical-Report-and-Management-Proposals.pdf). The aim was:

> "*to strengthen the linkage between the park and their neighbouring communities by representing them through traditional values that are meaningful and relevant to them. The long-term goal of the project was to provide a practical demonstration of how improved relations with local communities can be achieved by incorporating locally meaningful traditional beliefs, knowledge and practices into protected area management*" (Fauna and Flora International-Uganda Wildlife Authority, 2012 p. 1).

The author of this thesis undertook consultative meetings and investigations on how traditional beliefs, knowledge and practices can be integrated in the management plans of the Rwenzori Mountains National Park for more effective biodiversity conservation. The aim in this chapter is to describe and discuss the efforts undertaken in conducting consultative meetings and investigations and arriving at adaptable management proposals. The experiences and lessons learned in the process are discussed. A summary of the content of this chapter (especially sections 9.3 to 9.9) was published in a technical report prepared by the author of this thesis and can be located at *http://sacrednaturalsites.org/items/current-status-ownership-and-management-of-sacred-sites-in-the-rwenzori-mountains/*.

9.2 CONSULTATIVE PROCESS WITH THE LOCAL COMMUNITY AND OTHER STAKEHOLDERS

There is an increasing appreciation that for long-term sustainable management of protected areas the cooperation and support of local people is needed (Rodney, 2000). It has been realized that biodiversity cannot be protected or sustainably used without all the stakeholders coming together and planning for the resources (Lakshman *et al*., 1999).

In the national parks of Uganda, local community support is often ingrained in community-based conservation strategies (Mutebi, 2005). Howver, the actual level of local people participation in the management of national park remain in question (Rodney, 2000). Six levels on the scale of participation ranging as a continuum from greatest dependence on external agents to greatest self-reliance (Figure 9.2).

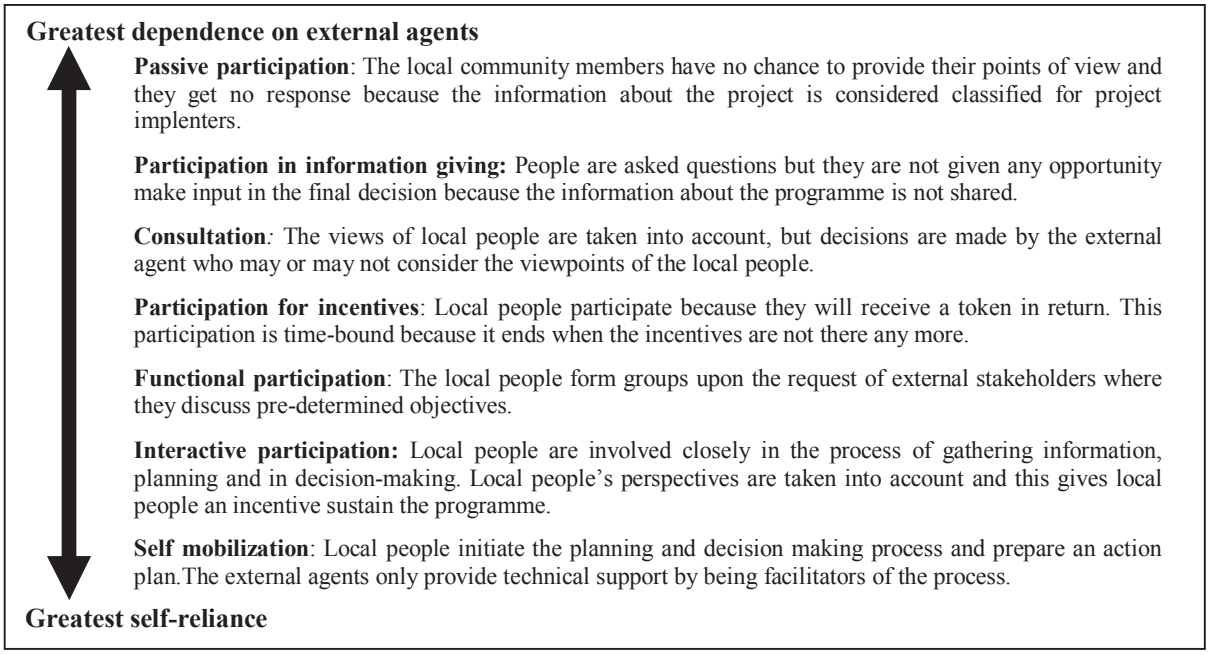

Figure 9.2 A continuum of local community participation. (adapted from Worah *et al*., 1999**).**

At one end of the continuum is

> *"**passive participation,** which may include employment and consultation after project design and implementation has begun (Mohammed, 1997). In such a case community hostility may increase as individuals perceive deprivation or a gap between the level of satisfaction they have achieved and the level they believe they deserve or can achieve through increased access to and exploitation of natural resources. Hostility may lead to disputes over access rights. Such disputes may be manifestations of underlying or deep-rooted conflicts over land tenure policies, historical settlement inequities, traditional practices and social and cultural identity*" (Worah *et al*., 1999 p.14),

as seems to be the case with the Rwenzori Mountains local community (Chapter 1). At the other end of the continuum is **self mobilization,** where local people are involved in the project from the

start (Mohammed, 1997). More meaningful participation occurs if the driving agency (in this case the national park administration) solicits participation from government, non-governmental organizations and community-based organizations (Rodney, 2000).

Stakeholders in conservation of protected areas are seen as:

> "*persons or groups that are generally aware of their interests in the protected area, who possess specific capacities such as skills, knowledge and a comparative advantage for management due to their proximity or resource-use mandate, and who are willing to invest time, money and political authority in becoming involved in protected areas management*" (Borrini, 1999 p. 25).

From the onset, stakeholder participation in the process of integrating traditional beliefs, knowledge and practices in the Rwenzori Mountains was considered important. Given that the Culture, Values and Conservation Project was initiated from outside the community where it was implemented, the participation of the community through self mobilization did not happen. However, based on prior work on local community perspectives and resource needs (Chapters 5 to 8) the project was introduced to the community and an interactive participation process occurred. The local community was closely involved in planning, information-gathering, and decision-making on how their beliefs, knowledge, and practices could be integrated in the management plan of the park.

Within the limits of time available (a common characteristic of donor driven projects which often have a short span), Rapid Ethnographic Assessment Procedures (Davis & Wagner, 2003) were used to conduct consultations with the local community. These were adopted because they enable investigations into a socio-cultural context in a short time (usually in less than a month or even a week) (Davis & Wagner, 2003). Rapid assessment was used to analyze how beliefs, knowledge and practices interrelate and how they could enhance biodiversity conservation in the Rwenzori Mountains National Park. Given that stakeholders were of different categories, they were approached differently using different methods (Individual, Expert, and Impromptu group interviews and Focus group discussions) as a characteristic element of a triangulated methodology inherent in rapid ethnographic assessment procedures.

- **Individual interviews (**10 interviews**)**: These were conducted with environmental officers, Uganda Wildlife Authority staff, and chairpersons of local organizations engaged in either cultural activities or conservation practices or both. These were asked to give their opinions about integration of traditional beliefs, knowledge and practices in the management of the Rwenzori Mountains National Park. Individual interviews lasted for 20 to 40 minutes.

- **Expert interviews (**15 interviews**)**: These were conducted with traditional leaders (such as ridge leaders and chieftains) and Uganda Wildlife Authority Wardens. These individuals were deemed to have expert knowledge on both traditional and current conservation strategies and practical suggestions on how biodiversity conservation in the park could be improved through the integration of traditional beliefs, knowledge and practices.

- **Impromptu group interviews (**12 interviews**)**: These were used especially in situations where people were gathered for a meeting. This enabled collection of data in a group context and mitigation of biased responses associated with pre-arranged meetings where the objectives for the meeting are communicated to participants prior to the meeting.

- **Focus group discussions (**3 group discussions**)**: These were conducted with members of a local organization (RweMMCA) which aimed at integrating culture in the conservation of biodiversity in the Rwenzori Mountains and administrators of a cultural institution of the Rwenzori Mountain people[10]. These were important in enabling a deeper understanding of traditional beliefs, knowledge and practices in the management of the park and in determining the extent of cultural knowledge in the community and in identifying areas of conflict and disagreement within the community. The groups consisted of 6 to 10 members and the discussion was conducted in the local language with the help of an interpreter.

Based on the consultative process undertaken through these methods, sacred sites were identified as a possible way for integrating traditional beliefs, knowledge and practices in the management of the park. This provided an opportunity for engaging the community further to propose a community-based conservation strategy based on sacred sites.

9.3 SACRED SITES AND BIODIVERSITY CONSERVATION

There is an expanding body of research demonstrating that many sacred sites support high levels of biodiversity. It is increasingly recognized by social scientists that this is not coincidental but is due to the protection afforded to these sacred areas by the custodian traditional communities (Chapter 3).

A sacred site is an area of special spiritual significance to peoples and communities (Harmon, 2002). Many sacred sites are associated with indigenous communities that use a wide variety of natural resources for their survival, economy, medicines, rituals, and other purposes (Harmon, 2002). Historical, cultural, and spiritual aspects of the ecology of indigenous communities are grounded in biodiversity, ecosystems, and landscapes in sacred sites (Hadley, 2002). For example, the Shona people who live in the Zambezi Valley of northern Zimbabwe consider trees, rivers, pools, mountains, and even whole mountain ranges to be sacred (Murombedzi, 2003). Their concept of sacred connotes something that is life sustaining and linked to rain and the fertility of the land (Harmon, 2002).

[10] In recent years (2012 and 2013), there are some tribes in the Rwenzori that have advocated for a different ethinic identity and started forming their own kingdom.

Sacred sites have been fronted in some situations as a basis for biodiversity conservation (Beltran, 2000). Sacred sites may either intentionally or coincidentally promote the conservation of biodiversity (Anderson *et al*., 2003). This could be that they are associated with certain taboos linked to spirits, and rules of access that restrict some practices from taking place there (Chapter 8). The management of sacred sites by indigenous people is said to be one of the ways that can complement national parks and other protected areas established by governments to conserve biodiversity (Anderson *et al*., 2003). For instance, in Zambezi Valley deforestation was found to be least 50% lower in sacred forests than in their secular counterparts. It was found that 133 species of native plants occur in these sacred forests whereas they are threatened, endangered, or extirpated elsewhere in Zimbabwe (Murombedzi, 2003). Based on such examples, the integration of traditional beliefs, knowledge, and practices associated with sacred sites present a better opportunity for enhancing biodiversity conservation in national parks than strategies imposed from governments and international agencies.

9.3.1 Sacred sites in the Rwenzori Mountains National Park

Based on the information gathered from the community, fourteen sacred sites associated with local people's beliefs, knowledge and practices and one cultural site (Bulemba) associated with a local cultural institution of the Rwenzori Mountain people were mapped (Figure 9.3).

It was realized that most of the sacred sites identified were located near the park boundary. Principle 2 of the Sacred Natural Sites Guidelines for Protected Area Managers (Wild and Mcleod, 2008) requires the use of zoning as a standard tool of land use planning and management of areas with natural sacred sites. Relative to the park zones, most of the identified sacred sites were in or near the buffer zone. This meant that access to these sites would comform to the provisions in the park management plan that restricts human activities in the strict nature zone but allowing negotiated access to the buffer zone (Chapter 1).

Sacred sites varied in nature and form: 6 were plants (trees and shrubs), 6 were hills, and 2 were stones (Table 9.1). The distance of sacred sites from the park boundary also varied. Kayimbi sacred site was the furthest (10km) from the boundary into the park. Sacred sites were said to be important areas to the local community for:

- worship,
- tourism attraction,
- expression of traditional culture,
- ridge cleansing,
- sacrificing to the gods,
- healing various diseases, and
- securing livelihood and welfare.

This further revealed that sacred sites were associated with performance of traditional practices influenced by traditional beliefs and knowledge.

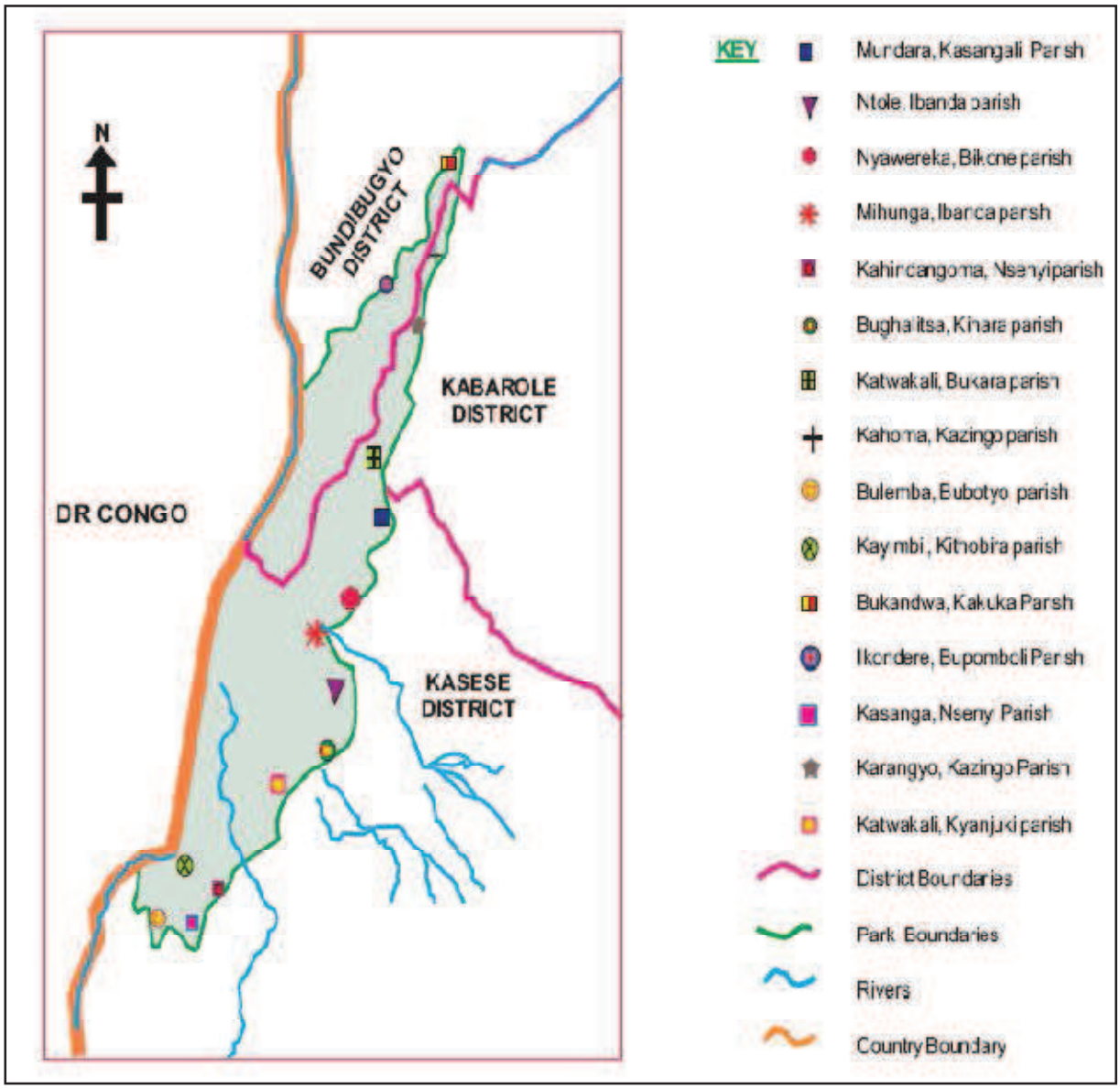

Figure 9.3 Map of Rwenzori Mountains National Park showing the 14 mapped sacred sites and 1 cultural site

Table 9.1 Location, ownership, and significance of the 14 sacred sites and 1 cultural site mapped in the Rwenzori Mountains

Name of the sacred site	Nature of the sacred site	Estimated distance from the park boundary	Traditional Ownership	Notes on some sacred sites
Mundara	A hill	4.5 km	Not known	
Ntole	A Bamboo shrub	3.5 km	Babinga clan	This site would be visited by the community for drought control, increase in crop yields and cleansing of ridges.
Mihunga	A hill	6 km	Not known	
Nyawereka	Tortoise shaped stone	2.5 km	Batangi clan	This site is for the Bikone community. It was visited for disease control, cleansing of ridges, and control of other natural calamities.
Kahindangoma	A hill	500 m	Not known	This site was highly regarded as a royal palace. Starting from 2008, the 30th June of each year, it is visited by the local people to mark the independence of the Bakonzo and Baamba from the Administarion of Tooro Kingdom.
Kasanga	A hill	2.5 km	Not known	The site is considered a cultural heritage. It comprises royal regalia and is considered a unifying place for all the Bakonzo and Bamba tribes.
Bughalitsa	A tree	3 km	Babinga clan	
Kambasa	Several trees	2.5 km	Not known	This is the site where god Kitasamba was prayed.
Kayimbi	A stone	10 km	Abaswagha clan	This site is for disease control, for animal and crop productivity, drought control and for spiritual meditation.
Katwekali	A hill	2 km	Abatangi clan	This site is for control of natural calamities, increase crop yields, control of pests and rodents and rituals to control outbreak of an epidermic
Katwekali	A hill	2.5 km	Batangi clan	This is found in Bukara Parish and is used by the community of Kinyampanika Village for the performance of rituals for security, disease control, productivity and control of calamities.
Kaghoma	A tree	3 km	Abaswagha clan and Abasukali.	This was at the boundary of Bundibugyo and Kabarole districts. It was previously used by both Bundibuyo and Kabarole people. The site would be visited when a woman experienced labor complications during births, cleansing of the land, drought control, disease control and for good luck during hunting
Ikondere	A tree	300m	Abaswagha clan	This was in Bupomboli Parish in Kaleyaleya Ridge. This site would be visited for peace, high crop yields, disease control, control of calamities, and cleansing of the land.
Bukandwa	A tree	1.5km	Abaswagha clan.	This site would be visited in order to control famine, performing rituals for peace, control of diseases and epidemics and cleansing of land.

It was also revealed that specific sacred sites were used for particular rituals which served specific purposes. This meant that in the process of planning community-based conservation, it was unlikely to find alternatives for sacred sites. Therefore exploration of how to integrate traditional beliefs, knowledge and practices through sacred sites did not venture into the possibility of provision of alternatives as is often the case with resource use through extraction.

9.4 INTERESTS OF THE LOCAL PEOPLE TOWARD INTEGRATION OF SACRED SITES IN PARK MANAGEMENT

Effecting community-based conservation through traditional structures influences successful conservation of biodiversity in national parks (Chapter 2). This happens when the local people and especially those managing the traditional structures have interest. Respondents expressed a need to revert ownership not only of sacred sites but also of the land on which they "sit" to the traditional owners. Exploration of views expressed by the local people revealed various interests. These were distinguished into two categories: cultural interests and economic interests.

9.4.1 Cultural interests

Respondents indicated a positive attitude towards the integration of sacred sites in the management of the park. This was evident from the responses given:

> "*We are happy that our culture is now being recognized by Uganda Wildlife Authority and we shall now work together to ensure that our mountain is protected*"

Some respondents indicated that access to sacred sites is an important factor for defining their cultural identity.

> "*Sacred sites in the mountain define our culture and for long they have been abandoned due to the creation of the park and the rangers have been restricting the people from going there and yet it is important for our survival*"

The interests were not only among the old people, some respondents stated that the young were also interested.

> *" The interests in sacred sites is not only for the old people like me but also the young ones are keen at learning what used to take place in our cultural traditions and allowing us to start practicing our rituals in these sacred sites will also help to mitigate some of the problems we are currently facing. The young people will also find a way of being interested in their culture and promote it to tourists instead of engaging in lousy activities in trading centers*"

Two factors seemed to drive the cultural interest of the respondents to have access and to manage sacred sites. Firstly, they perceived access to sacred sites as a way of recovering their culture and performing traditional practices for the sake of cultural identity. Secondly, they regarded access and use of sacred sites as a way of re-possessing what traditionally belonged to them and their fore fathers.

It was also revealed that as a result of cultural practices in sacred sites, they (sacred sites) had a diversity of plants and animals compared to other neighbouring areas. Respondents stated that this could have happened not because these areas were intentionally conserved but as a result of the taboos associated with them (Chapter 8). A follow up probe on this issue revealed that such taboos were to ensure that the sacredness of the site was maintained.

> "*It is just like the churches these days, one is expected not to play around at the altar, or collect money from the altar which Christians have offered to God, and this is for purposes of giving respect to a place that is considered holy. Similarly sanctions on sacred sites were put in place to keep the area holy*"

This was another strong point which indicated that sacred sites could offer a way of restricting resource extraction from some areas in the mountains.

However, as a way of exploring potential risks associated with traditional practices in sacred sites, it was further necessary to investigate the materials that were used in performing rituals in sacred sites. According to the regulations of Uganda Wildlife Authority, people restricted from taking certain materials inside the park for fear of posing potential risks to plants and animals therein (Chapter 1). Respondents revealed various materials necessary for performing of rituals. Some of the materials were to be obtained from outside the park and others from inside the park (Table 9.2).

Table 9.2 Basic materials required for performing rituals in sacred sites

Materials obtained from outside the park	Number	Materials obtained from inside the park	Number
Hen or cock	2-4	A bunch of spear grass	1
Eggs	2-8	Pieces of flexible branches of a plant locally called "*Mulyangote*"	50
Bunches of green Bananas	2	Pieces of dry wood	Many
Stems of sugar canes	20	Strands of "*Emikole*" as tying material during construction of shrines	Many
Clusters of purple Bananas	4		
Goats	2		

Uganda Wildlife Authority regulations do not permit taking the identified materials especially domestic animals to the park and yet these were required for performance of rituals in sacred sites. The community members pointed out that rituals cannot be conducted without these materials. This was an issue for negotiation between the park staff and the local people about how rituals would be performed without these materials. For instance, it was revealed that the goat is not killed in ritual performance but left to wander in the mountains. After negotiations between the local community and the Uganda Wildlife Authority staff, it was agreed that after the ritual, such a goat can be captured by people who are not associated with the ritual such as rangers. This will have fulfilled the expectations of the park staff as well as the local community. This was an example of adaptive integration of traditional beliefs, knowledge and practices in the management of national parks. Traditional beliefs knowledge and practices need to be integrated in the management of the park in exactly the same way they operated in the traditional context.

9.4.2 Economic interests

Views expressed by respondents also indicated that the community perceived sacred sites as areas that would easily generate income especially when developed for cultural tourism. This was revealed when they were asked about the activities that they would conduct in the sacred sites. Various cultural tourism activities were revealed (Table 9.3).

Table 9.3 Activities associated with tourism that local people would conduct in sacred sites

Activity	Anticipated interest of tourists in the activity
Handcrafts	Tourist would buy hand crafts sold along trails leading to sacred sites.
Iron smelting	Tourists would view how iron smelting is done using traditional methods associated with rituals conducted in sacred sites. Also, they would buy the products from iron smelting.
Rain making	Local people would perform rituals in sacred sites to evoke rainfall in the mountain for tourists.
Traditional birth control and family planning methods	Local people performed rituals in sacred sites to control birth and other reproductive behaviours of people for tourists.
Medicinal plants	Tourist would be interested in medicinal plants and the knowledge of preparing medicines through ritual performance.

Associating sacred sites and traditional rituals with economic benefit was not a traditional practice. This was an indication that community-based conservation interventions also need to be linked to economic benefits to the community. Therefore, attempts to integrate traditional beliefs, knowledge and practices in the management of national parks need to take into account economic needs of the people or be supported by other economic interventions.

9.5 OWNERSHIP OF SACRED SITES

Traditionally, sacred sites were owned by various categories of individuals and organized groups (Table 9.1). In the traditional cultural context, "ownership" meant that power was vested upon ridge leaders, chieftains and clan leaders to oversee the activities that take place in sacred sites. This took place at some unknown time in the social-cultural history of the Rwenzori Mountain people. This power was passed on from father to son, through many generations. When community members wished to access sacred sites, they would seek permission from those with vested power to manage the sites.

A defining feature of sacred sites associated with traditional communities is that people have cherished them for a long time (defined by their ancestral roots). At the time of this investigation, the ownership of sacred sites was either contested or unclear. For instance the park staff thought that since sacred sites were inside the park, they belonged to the government of Uganda in trust for the people. Local people on the other hand claimed that sacred sites are owned by the respective ridge leaders and

they still have interests in managing them despite the sacred sites being inside the boundaries of the park. Other people from the community said that sacred sites are traditionally owned by the community but the ridge leaders held them traditionally in trust for the people.

Other than contested ownership between the local people and the park staff, there were also ownership conflicts between the community members. The ownership of some sacred sites was claimed by several people and each wanted to have the powers to manage them if they were considered for integration into park management. There were incidents reported where a ritual was performed by a person other than the true person and resulted in calamities befalling the family of the person who had performed the ritual.

However, it was revealed that there were ways of identifying bona fide owners for some sacred sites through performance of certain traditional rituals. The ownership of other sacred sites was difficult to determine even through traditional rituals. Such sacred sites were abandoned during the 1970s and 1980s where there was civil war in Uganda and the mountains were used as hideouts for the soldiers. This coupled with the creation of the park in 1991 led to restricted access to some sites and it could have led to some individuals who traditionally manage those sites to lose interest and the hereditary chain was broken.

One way of identifying a sacred site is custodianship (Wild and Mcleod, 2008). There must be evidence on a sacred site that people have taken care and cherished these sites for a long time. But many of these mapped sites, there is no sign of care and hence the authenticity of the sites may be questioned. Therefore identifying and interacting with cultural values of sacred sites requires great sensitivity, respect and trust building. This is historically difficult, politically charged and tense because it appears that neither Uganda Wildlife Authority nor the local people trust each other (Chapter 1). The legitimacy, and even the authenticity, of sacred sites to be recognized as sacred could not be assumed because for many years, the sacred sites remained unutilised. Through the establishment of the park, the government indirectly imposed upon the management of sacred sites therein a management structure that replaced the existing one.

At the international level, traditional ownership of sacred sites within protected areas are supported by a number of programmes, conventions and declarations. One declaration is the Declaration on the Rights of Indigenous Peoples (2007) which provides reference to and support for the protection of sacred sites of indigenous people by affording them rights to manage and maintain traditional practices associated with them. These are some of the international conventions that were taken into account in teasing out the problems associated with ownership of sacred sites in the Rwenzori Mountains National Park. This was necessary as a way of legitimizing the process of integrating sacred sites in the management of the park and in negotiating with Uganda Wildlife Authority that although the laws governing national parks in Uganda have not yet considered traditional rights of the local people such rights are supported by international conventions to which the government of Uganda is a signatory.

9.6 CURRENT ARRANGEMENTS FOR LOCAL PEOPLE TO ACCESS THE PARK

It was necessary to explore the possible ways for collaboration between the local community and the park staff in integrating traditional beliefs, knowledge and practices through sacred sites in the management of the park.

National park rules required that local people seek permission before they could have access to some of the resources in the park (Chapter 1). A particular procedure had to be followed to access resources in the park (Figure 9.4).

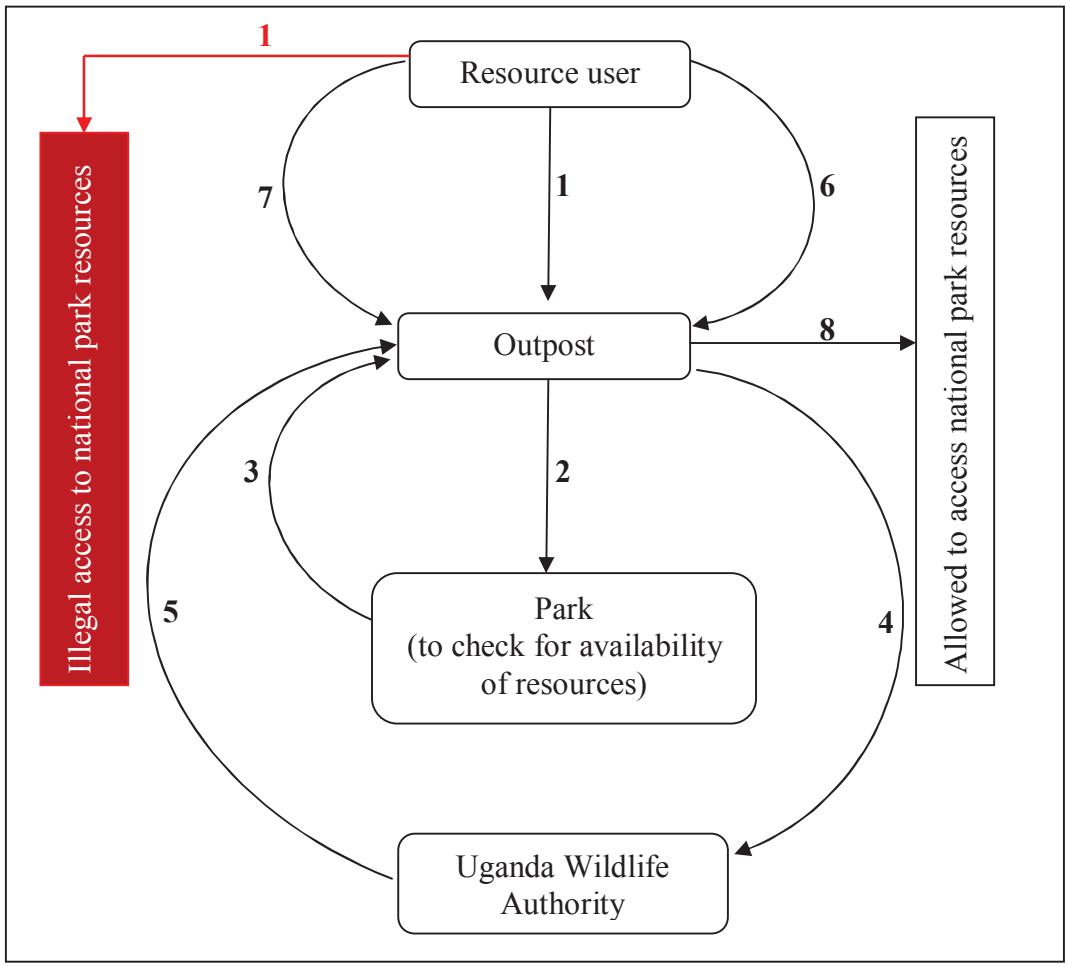

Figure 9.4 Diagrammatic representation of procedure for accessing resources and conducting activities in the Rwenzori Mountains National Park.

A resource user was required to make a formal request to the warden in charge of the nearest Uganda Wildlife Authority outpost to check in the park whether a required resource was available (arrow 1). When granted permission, the resource user goes to the park to check for the availability of the required resource (arrow 2). The resource user goes to the outpost to report on the availability of the required resource (arrow 3). If the required resource was found available, the Warden in charge at the outpost forwards the request to the nearest Uganda Wildlife Authority park headquarters (arrow 4). When a decision is made about the request, a formal acceptance or denial is sent to the Uganda

Wildlife Authority outpost (arrow 5). The resource user then goes to the outpost to obtain a formal acceptance or denial to access the required resource (arrow 6). If the resource user is accepted to access the resource, he/ she goes back to the outpost on the agreed day to get a ranger who escorts him/her to the park (arrow 7). The ranger then escorts the resource user to the park (arrow 8).

Respondents who no longer followed park rules claimed that getting permission to access resources in the park took a long bureaucratic process which discouraged them. Also, some respondents said that collection of some resources from the park that involved performing rituals could not be done in the presence of other people (such as rangers). Therefore, escorting resource users in the park and monitoring them was against local people's traditional practices of resource use. This also compelled some people to access the park clandestinely. People are prompted to go against these rules.

New arrangements would be necessary to facilitate negotiated access to sacred sites so that the same problems are not encountered. Some of this would require decentralizing some of the decisions by involving other stakeholders such as the local community and community-based organizations.

9.7 PROPOSALS FOR COLLABORATIVE MANAGEMENT OF THE PARK THROUGH NEGOTIATED ACCESS OF LOCAL PEOPLE TO SACRED SITES

Two proposals, one by Uganda Wildlife Authority and another by the local community were suggested on how local people's beliefs, knowledge and practices could be integrated in the management of the park through sacred sites.

9.7.1 Proposal 1 by Uganda Wildlife Authority staff

This proposal was based on the mandate that Uganda Wildlife Authority has for the management of national parks in Uganda. Other than Uganda Wildlife Authority, there was no individual, group or organization authorized to manage national parks and the resources therein. According to Uganda Wildlife Authority staff, they were cognizant of other stakeholders and appreciated their efforts and concerns on the conservation of biodiversity and were willing to work with them.

In this proposal, Uganda Wildlife Authority would sign an agreement with individuals who would wish to access sacred sites provided that those individuals offer information about the location of sacred sites and a detailed description of what they will do when they get to the sacred site. Uganda Wildlife Authority staff would among other roles be involved in monitoring activities taking place in sacred sites. An identified local organization or a resource user group and Obusinga Bwa Rwenzururu (described in Chapter 8) would serve as left and right "arms" of Uganda Wildlife Authority (Figure 9.5) to support regulated access and use of sacred sites in the park.

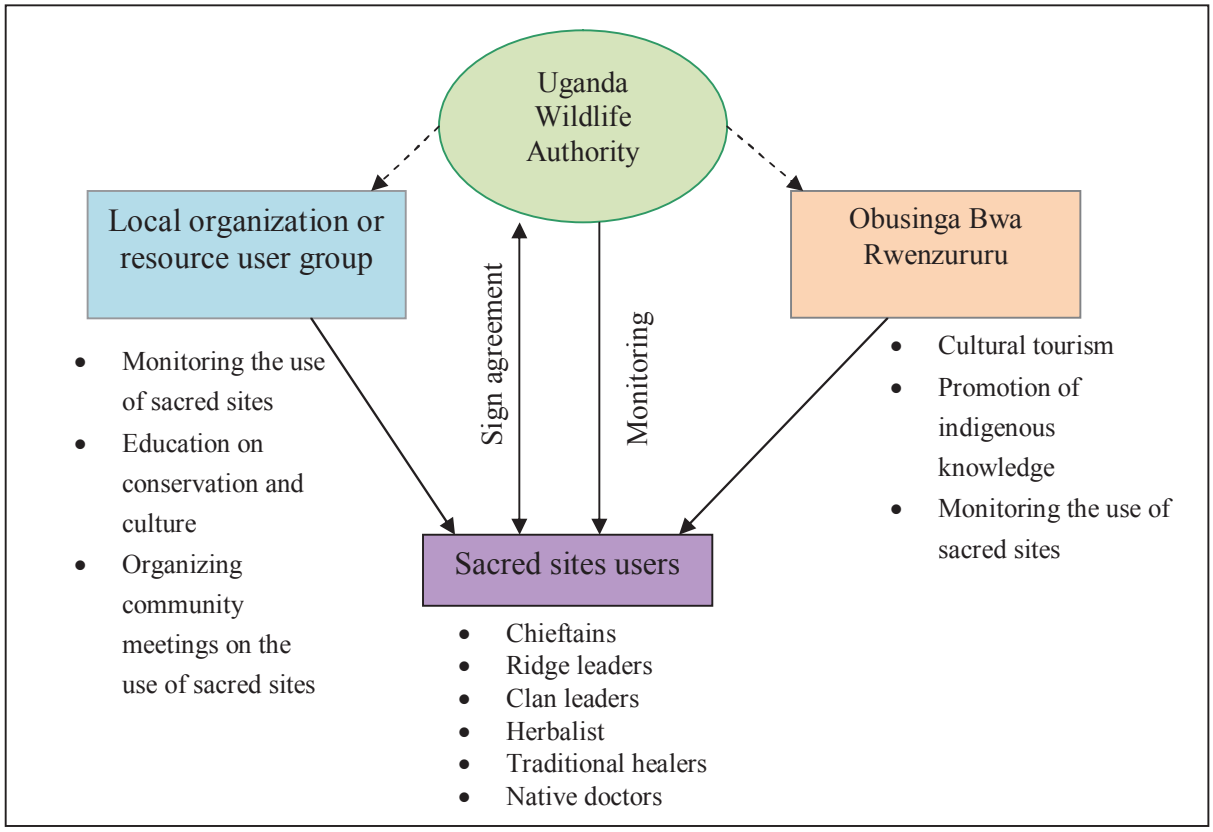

Figure 9.5 An illustration of the sacred site management proposal by Uganda Wildlife Authority staff.

9.7.2 Proposal 2 by the local community

The local community proposed that collaborative management of sacred sites be done through the traditional leadership structure based on what was in place before the park was created. According to this proposal, an agreement on the use and management of sacred sites would be signed between Uganda Wildlife Authority and Obusinga Bwa Rwenzururu (Figure 9.6). However, Uganda Wildlife Authority would monitor Obusinga Bwa Rwenzururu activities and Obusinga Bwa Rwenzururu would in turn monitor the use of sacred sites by the community. To do this, Obusinga Bwa Rwenzururu would where necessary work with community-based organizations (CBOs). These organizations would be delegated by Obusinga Bwa Rwenzururu to conduct some of the activities it is mandated to do in the agreement with Uganda Wildlife Authority. Uganda Wildlife Authority would, however, if deemed crucial monitor the activities of sacred site users directly.

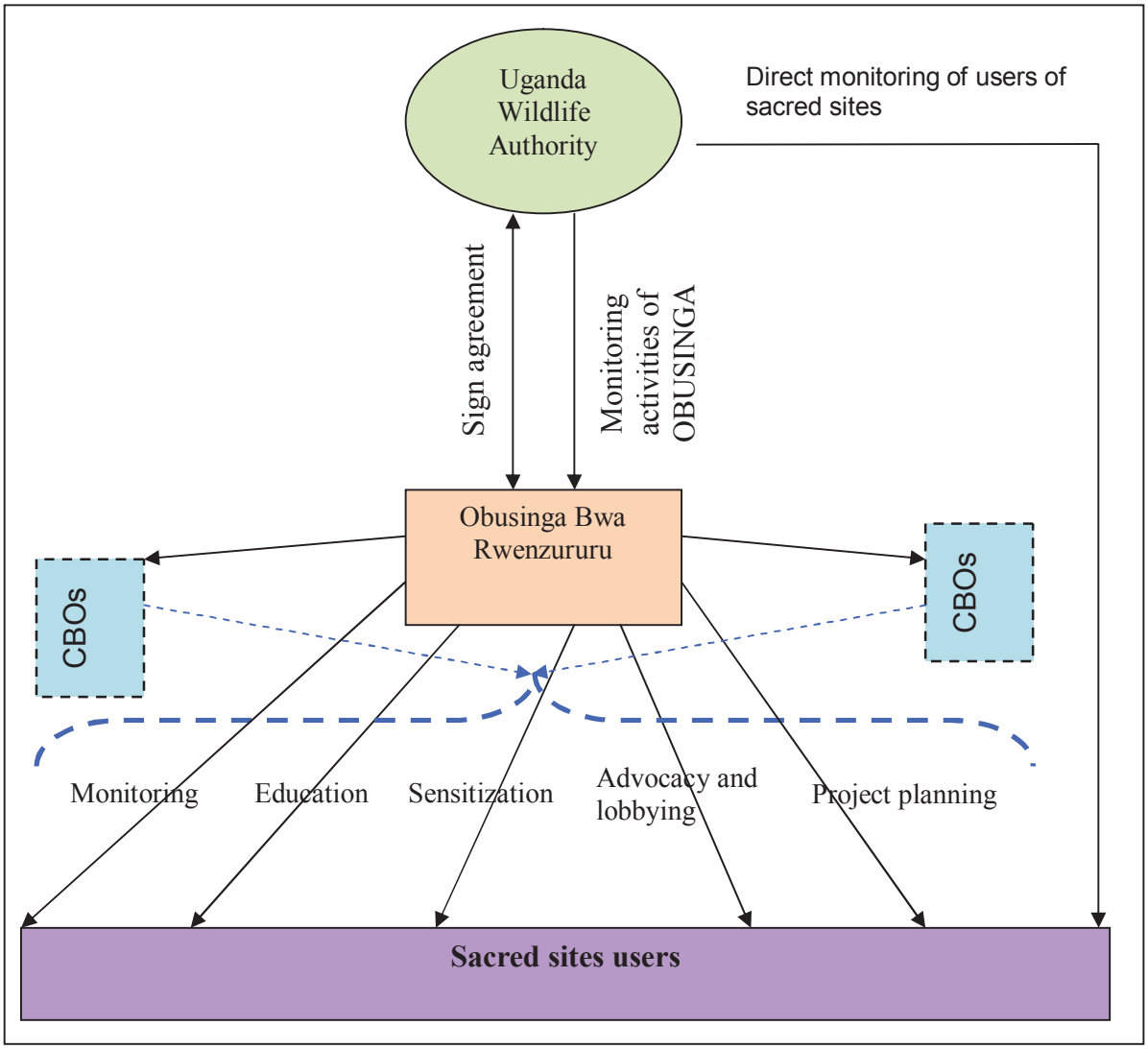

Figure 9.6 A presentation of management plan considering suggestions from community members

9.8 DISCUSSION OF THE PROPOSALS

The Rwenzori Mountains National Park is already a protected area under the management of Uganda Wildlife Authority and for many years the local people have been prohibited from accessing sacred sites therein. The proposal that sacred site users sign agreements with Uganda Wildlife Authority directly may serve well on the Uganda Wildlife Authority side of thinking because the sacred sites are in the protected areas and therefore should be managed by the Uganda Wildlife Authority. Also the Uganda Wildlife Authority has experience in planning and therefore can bring technical capacity and tools to the process. However, given the past history of resentment and conflict between the Uganda Wildlife Authority and the community members (Chapter 1), engaging the Uganda Wildlife Authority and the local people to sign an agreement directly may not lead to attaining the objectives of encouraging the local people to support the conservation of the park.

From the interviews with local community members, it was evident that they do not have trust in the Uganda Wildlife Authority staff at all. Therefore, signing an agreement with them might be perceived to be similar to current arrangements for local people to access the park that are not effective as described previously (see Section 9.6).

Additionally, although proposal 1 recognizes the existing structures put in place by Uganda Wildlife Authority, it might have weaknesses in the aspect of signing agreements with individual resource users. There are over 100 sacred sites in the Rwenzori Mountains National Park and this would mean signing over 100 agreements. Even if it is possible to sign all those agreements, it is practically complicated, given that each agreement may have its unique terms. Therefore it may be preferable for Uganda Wildlife Authority to sign an agreement with an "umbrella" organization that would be mandated to license, provide access to sacred sites and monitor the activities of local people in those sites.

Another challenge that might hinder the success of proposal 1 is the absence of a direct link between Obusinga Bwa Rwenzururu and a local organization or resource user group. This makes it difficult for the activities of each organization to complement each other.

Proposal 2 could be feasible if the suggested approaches are implemented. These could be strengthened by Obusinga Bwa Rwenzururu signing an agreement with the resource users. Obusinga Bwa Rwenzururu could take up the role of locating the spots with the resources the community requires, finding out the number of people who need the different resources and requesting for permission for the community to access the mountain for these resources. The success of this proposal shall depend on a good relationship between the parties involved. Vesting power in Obusinga Bwa Rwenzururu by the Uganda Wildlife Authority could be one way of engaging the local community in the planning and management of the park. The Obusinga Bwa Rwenzururu based on its nature as a traditional cultural institution has the capacity of mobilizing the local community and contributing the necessary traditional knowledge and management practices and structures for effecting collaborative resource use. However, it could be limited in technical skills and finances to effect conservation actions. In this regard, it needs the support of Uganda Wildlife Authority. The two institutions working together can mitigate the limitations of each organization in implementing conservation actions independently.

9.9 CONCLUSION

This chapter aimed at describing the process undertaken in attempts to integrate traditional beliefs, knowledge and practices in the management of the Rwenzori Mountains National Park. Traditional beliefs, knowledge and practices were closely linked to sacred sites. Therefore, sacred sites were identified as a basis for involving people in the management of the park despite access to them being illegal just like other resources in the park.

Although sacred sites were located in the park, they are traditionally owned by the respective ridge leaders who had interests in managing them. Access, utilisation and management of sacred sites are not expected to be exactly as they were in the traditional context prior to the creation of the park. For instance, in addition to cultural interests, the local people also expressed economic interests which were not associated with the sacred sites in a traditional context. Re-accessing these sites would involve having legalized access to them, making and maintaining access trails to them, constructing sanitation facilities at those sites, and developing some of them into tourist destinations and camping sites.

The process for the development and implementation of collaborative management of national park resources that is based on traditional beliefs, knowledge and practices should consist of a series of consultative workshops with representatives of the different stakeholders in the community. Planning needs to be a legitimate formal process with extensive consultations carried out by a group of selected, relevant and neutral parties. The major stakeholders (in this case the Uganda Wildlife Authority) need to be an important part of the process because they have a legal mandate. The traditional institutions will need to be involved as they are a key interested party, and an indentified local organized group preferably with a traditional management role and represents community interests needs to be involved. Other partners could be part of the committees that could coordinate and monitor access and use. In order to bring some of the identified partners on board, more painstaking collaboration strategies, stakeholder meetings, seminars, and workshops are necessary in an attempt to integrate traditional beliefs, knowledge, and practices in the management of national parks.

CHAPTER 10

NATURE AND EXTENT OF FORMAL ENVIRONMENTAL EDUCATION IN THE RWENZORI MOUNTAINS



Figure 10.1 A teacher of social studies in Ntoroko district in Western Uganda teaching learners about the different natural resources found in East Africa. (Photo by M. Muhumuza. June, 2010**).**

OVERVIEW OF THE CHAPTER

A common assumption underpinning formal environmental education programmes is that if appropriate environmental education is properly implemented in schools, it could lead to pro-environmental conservation behaviours among learners. Formal environmental education has been implemented in schools neighbouring the Rwenzori Mountains National Park as in the rest of Uganda. Despite this, there are various biodiversity conservation problems associated with illegal access to the park. Some of the factors underlying these problems have been identified and discussed (Chapter 5 to 8). In pursuit for a deeper understanding of why the problem has persisted, this study was aimed at analyzing the nature of environmental education in primary and secondary school syllabi and assess whether or not it targeted the factors underlying illegal access to resources in the park. The content of two volumes of the primary school teaching syllabus, and the content of 19 subjects that comprise the secondary school syllabus were analyzed. Contrary to findings reported in previous studies that the Ugandan primary school syllabus did not cover environmental education content, this study not only found content on environmental education in the primary school syllabus but also in the secondary school syllabus. Five themes pertaining environmental education emerged from the analysis. These included: words and sentences that describe the environment, resources in the environment, and how those resources are used; understanding the environment and its resources; understanding uses of the environmental resources; environmental degradation: indicators, causes and impacts; and, lastly, conservation, preservation and protection of the environment. The content associated with these themes was infused in the syllabi. Six factors thought to contribute to the persistence of problems of environmental degradation in Uganda despite provision of formal environmental education are discussed in the chapter.

10.1 ATTEMPTS TO ADDRESS ENVIRONMENTAL DEGRADATION IN UGANDA THROUGH FORMAL ENVIRONMENTAL EDUCATION

The government of Uganda has put in place various interventions to address the problem of environmental degradation. This is evidenced by the establishment of regulatory bodies such as National Environment Management Authority (NEMA), Uganda Wildlife Authority (UWA), and National Forestry Authority (NFA) to protect the environment and ensure sustainable utilisation of natural resources in the country. In addition to these regulatory bodies, the need for formal environmental education as a means of addressing problems of environmental degradation has long been recognized in Uganda. Topics which today would be considered under environmental education were taught in schools in Uganda in the early 1980s as nature study (Ofwono-Orecho & Bagoora, 1996). In 1987, there was a major reform in the primary science syllabus, and some environmental topics were incorporated into the syllabus (Ofwono-Orecho and Bagoora, 1996). These authors do not mention, however, what content was in the syllabus and what specifically was added.

In 1992, The Government White Paper on Education recommended the up-scaling of environmental education so that it is included in teaching syllabi across several subjects studied in primary and secondary schools, and institutions of higher learning. The recommendations of the white paper were operationalised through the implementation of the National Environmental Management Policy for Uganda (1994) by making environmental education mandatory at all levels of education in Uganda (Winkler & Sondergaard, 2008).

More recently, Uganda's State of Environment Reports (2006, 2007 and 2008) re-emphasised the need for formal environmental education. Findings from studies in Uganda (Winkler & Sondergaard, 2008) and elsewhere (Ozden, 2008) show that formal environmental education is important in promoting environmental conservation behaviour among the public. Given that the number of enrolments in primary and secondary schools in Uganda has increased from less than 50,000 in 1993 to more than 800,000 in 2006 (Hans & Dorica, 2011; Winkler & Sondergaard, 2008) and by more than 40% since 1990 in tertiary institutions (Winkler & Sondergaard, 2008), it can be assumed that more people in Uganda are acquiring environmental education now than 20 years ago. Indeed, recent evaluations of school-based environmental education programmes in Uganda (Johnson-Pynn & Johnson, 2005; Kuhar, Lehnhardt, Townsend, Cox, & Bettinger, 2007) indicate that there is a general increase in environmental knowledge among the public.

10.2 THE PROBLEM MOTIVATING THIS STUDY

It is expected that environmental education has been implemented in primary and secondary schools neighbouring the Rwenzori Mountains National Park since 1980 (more than ten years before the Rwenzori Mountains National Park was established and thirty two years at the time of conducting this investigation). It would be expected that by now (the year 2014), there would be a critical mass of people to ensure environmental protection and sustainable utilisation of resources in and around the park. This is because the aim of formal environmental education is to enable learners to develop environmentally responsible behaviours. The problems that affect the Rwenzori Mountains National Park (Chapter 1) show that the majority of the people living in villages neighbouring the park do not exhibit environmental responsible behaviours. This raises doubts about the nature of formal environmental education they have received.

There are various factors that could explain why people may or may not behave in an environmentally responsible manner even when they have received environmental education messages. One of the factors is that environmental education messages may not target the causes underlying reasons which influence people's anti-conservation behaviour. If this happens, some people may continue engaging in counter-conservation practices. In the Rwenzori Mountains National Park, factors that influence illegal use of resources in the park include: the need for park resources for livelihood and survival; lack of alternative sources of income; and traditional beliefs, knowledge and practices (Chapter 5 to 9). This chapter describes an investigation of whether formal environmental education in primary and secondary schools near the Rwenzori Mountains National Park targets the identified factors that influence illegal access to the park resources. This could facilitate an understanding of the appropriateness of the formal environmental education provided.

10.3 BACKGROUND INFORMATION ABOUT ENVIRONMENTAL EDUCATION

Environmental education has been decribed in different ways depending on the context. It is necessary to first give the background of environmental education and an account of its evolution as a discipline as a way of clarifying the context in which it is used in this thesis.

10.3.1 Meaning and philosophy of environmental education

The philosophical foundations of environmental education are rooted in nature study, conservation education, and outdoor education (Disinger, 1985). These antecedents to environmental education were developed from the philosophical views of John Muir, Enos Mills, Aldo Leopold and John Amos Comenius (Drummond, 1995; Nash, 1989).

The outdoor education antecedent draws from ideas in both nature study and conservation education (Disinger, 1985; Hammerman, 1980). The focus of the nature study antecedent is that the environment is a source of recreation, replenishment, and solace (Drummond, 1995). Nature study required that recreation, replenishment, and solace be the only benefits that people ought to derive from the environment (Drummond, 1995). The conservation education antecedent focuses on the need to conserve natural resources so that both non-extractive uses (such as enjoyment, relaxation, and health embodied in nature study) and extractive pursuits could be maintained in perpetuity (Drummond, 1995). It requires that resource consumption be balanced with maintaining habitat quality even to the point of leaving some wilderness intact for its own sake (Lorbiecke, 1996).

Outdoor education requires that the content of conservation education and nature study be taught and learned through sensory perception (Hammerman, 1980). It advocates for experiential teaching and learning about the environment.

Based on the points of view ingrained in outdoor education, conservation education, and nature study, environmental education emerged. Environmental education is the teaching and learning about the environment. It is commonly defined in terms of the outcome that is intended to be achieved as shown in the extract from Carter and Simmons (2010):

> "*Environmental education is a process aimed at developing a world population that is aware of and concerned about the total environment and its associated problems, and which has the knowledge, attitudes, motivations, commitments, and skills to work individually and collectively toward solutions of current problems and the prevention of new ones*". (United Nations Education, Scientific and Cultural Organisation-United Nations Environment Programme, 1976 cited in Carter & Simmons, 2010 p. 2).

From the definition above, it is evident that environmental education is not effected through a single occurrence or event but through a process that involves a series of actions or steps towards achieving a particular end.

As a discipline, environmental education developed through various stages stemming from the writings of American scholars in the 19th century questioning the pursuit of affluence for its own sake at the cost of the environment (Leopold, 1949). The Belgrade Charter of 1975, built on the framework of 'Stockholm conference of 1972, developed the definition, objectives, principles and outcomes of environmental education. The definitive codification of environmental education as a discipline came out of the First Intergovernmental Conference on Environmental Education held in Tbilisi USSR 1977. The product of this conference was a document that is popularly known as "The Tbilisi Declaration" that spelt out the goals of environmental education. According to "The Tbilisi Declaration" the goals of environmental education are to:

a) foster awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas,
b) provide people with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment, and
c) create new patterns in behaviour of individuals and groups of people that is "environmentally friendly".

Environmental education encourages people to understand and forge connections with the environment in their own neighbourhoods and communities (Carter and Simmons, 2010). It is through these connections that people gain the knowledge and skills that help them to make sound decisions about how to sustainably use resources in the environment (Carter and Simmons, 2010).

Environmental education strives to engage the public to think and act for the environment. Environmental education is intended to produce environmentally literate citizens (Srbinovski, Erdogan, & Ismaili, 2010) who are able to actively address environmental challenges and problems (Hungerford & Peyton, 1976; Roth, 1992; United Nations Education, Scientific and Cultural Organisation, 1980).

This means that environmental literacy is the product of environmental education. Environmental literate individuals according to North American Association for Environmental Education (2004), have four characteristics.

a) Show willingness and ability to ask questions about the surrounding world, speculate, hypothesize, seek and evaluate information, and develop answers to questions.
b) Demonstrate an understanding of environmental processes and systems, including human systems.
c) Identify, investigate, and formulate potential solutions to environmental issues.
d) Understand how what they do as individuals or in groups conserves or destroys the environment.

Environmental education aims to change inappropriate attitudes and enhance attitudes about the environment and its resources which will promote conservation and sustainable development (Gürsoy,

2010). Studies in environmental socio-psychology have found that attitudes are important determinants of environmentally oriented behaviour (Glasman and Albarracin, 2006). People who are aware of and understand the negative implications of resource destruction tend to have more positive attitudes toward resource conservation (Chhetri, Mugisha, & White, 2002; Howard *et al*., 2000; Hughes & Flintan, 2001; Igoe, 2002; Ite, 1996; Oonyu, 2009).

10.3.2 Types of environmental education

On the basis of the pedagogical principles of transferring environmental education messages (Archie, 2003), the literature provides two distinct types of environmental education: formal environmental education, and informal environmental education.

Formal environmental education, aims to inculcate environmental literacy in learners through a formal school setting (Srbinovski *et al*., 2010). It seeks to change the learner's cognitive and affective knowledge, skills and behaviour usually in a classroom setting (Carleton-Hug & Hug, 2009). This is based on assumption that if children in schools acquire appropriate knowledge and skills, the future generation is more likely to be composed of a critical mass of people that behave in an environmentally responsible manner (Kuhar, Bettinger, Lehnhardt, Tracy & Cox, 2010; Zohir, 2009 cited in Hassan & Ismail, 2011).

Informal environmental education requires voluntary participation of learners in an informal setting often outside a classroom (Heimlich, 1993). Informal environmental education engages the general public into environmental awareness (Hassan, Osman and Pud, 2009). It offers a flexible programme to acquire environmental knowledge at convenient places through different types of activities (Hassan *et al*., 2009). In some cases, informal environmental education is implemented by passing out to people stickers with environmental education messages (Jacobson, McDuff & Monroe, 2006).

Based on analysis of studies on theory, research and practice of environmental education, researchers Simmons (1995) and Volk & McBeth (1997) have categorized the outcomes from environmental education into five clusters: ecological knowledge, socio-political knowledge, knowledge of environmental issues, affective and cognitive skills, and environmentally responsible behaviours. The outcomes to be attained depend on the nature and extent of an environmental education curriculum.

10.4 CONCEPTUAL FRAMEWORK

The conceptual framework is based on what constitutes environmental education and how the content of environmental education is presented in an environmental education curriculum. There is no a prescription in the literature about what an effective environmental education curriculum should be. This is partly because the scope of environmental challenges that need to be addressed through environmental education varies with context. Based on the evolution of environmental education as a discipline (discussed in the previous section), there is general agreement about the goals, objectives

and characteristics of environmental education (Thomson & Hoffman, 2003). The development of past and current environmental education curriculum in different contexts is based on these three aspects (goals, objectives, and characteristics) (Bluhm, 1994).

Therefore, the analysis of whether a given environmental education curriculum is adequate or not needs to be based on the goals, objectives and characteristics of environmental education. Analysis of goals, objectives and characteristics of environmental education in this study has led to the identification of five factors that constitute the recommended content for environmental education which operates at three levels (Figure 10.2).

The first level constitutes content on the ecological foundations and skill for environmental action. Such content is on: the principles of ecology, communicating and applying major ecological concepts in the analysis of environmental issues, and predicting ecological consequences of potential interventions to environmental problems (Bluhm, 1994). At this level focus of environmental education is mainly on the understanding of the application of ecological principles in solving and mitigating environmental problems.

The second level constitutes content for conceptual awareness, and for investigation and evaluation of environmental issues. Conceptual awareness constitutes understanding and communicating how human activities influence the environment, how an individual's behaviors impact on the environment, and the viable alternative solutions available for remediating crucial environmental issues, and ecological and cultural implications of these various solutions aimed at addressing environmental problems (Hungerford, Peyton, & Wilke, 1983). According to Hungerford *et al*. (1983), conceptual awareness involves identifying a variety of environmental issues at various levels (local, national and international), and understanding the roles played by differing human beliefs and values in addressing environmental problems. Bluhm (1994) opines that conceptual awareness is enhanced through using examples of issues from a context of the learner rather than examples from different and distant contexts.

> "*Certainly, schools surrounded by tropical rain forest should learn the concepts associated with «ecosystem» by interacting with the rain forest. It is foolish to ignore the student's own regional biome and focus on another distant region. Similarly, environmental issues vary from region to region and those of immediate concern to the students should be used, at least initially, when instruction is being planned*" (Bluhm, 1994 p.10).

This emphasises that if local examples are available they should be integrated in the curriculum rather including distant examples that might have no direct relevance to learners.

The second aspect of the content at the second level (investigation and evaluation) involves applying the concepts from ecological foundations and conceptual awareness in understanding the need for environmental issue investigation and evaluation as prerequisite to sound decision making, applying skills and demonstrating the ability to identify and analyze environmental issues (Hungerford *et al*., 1983).

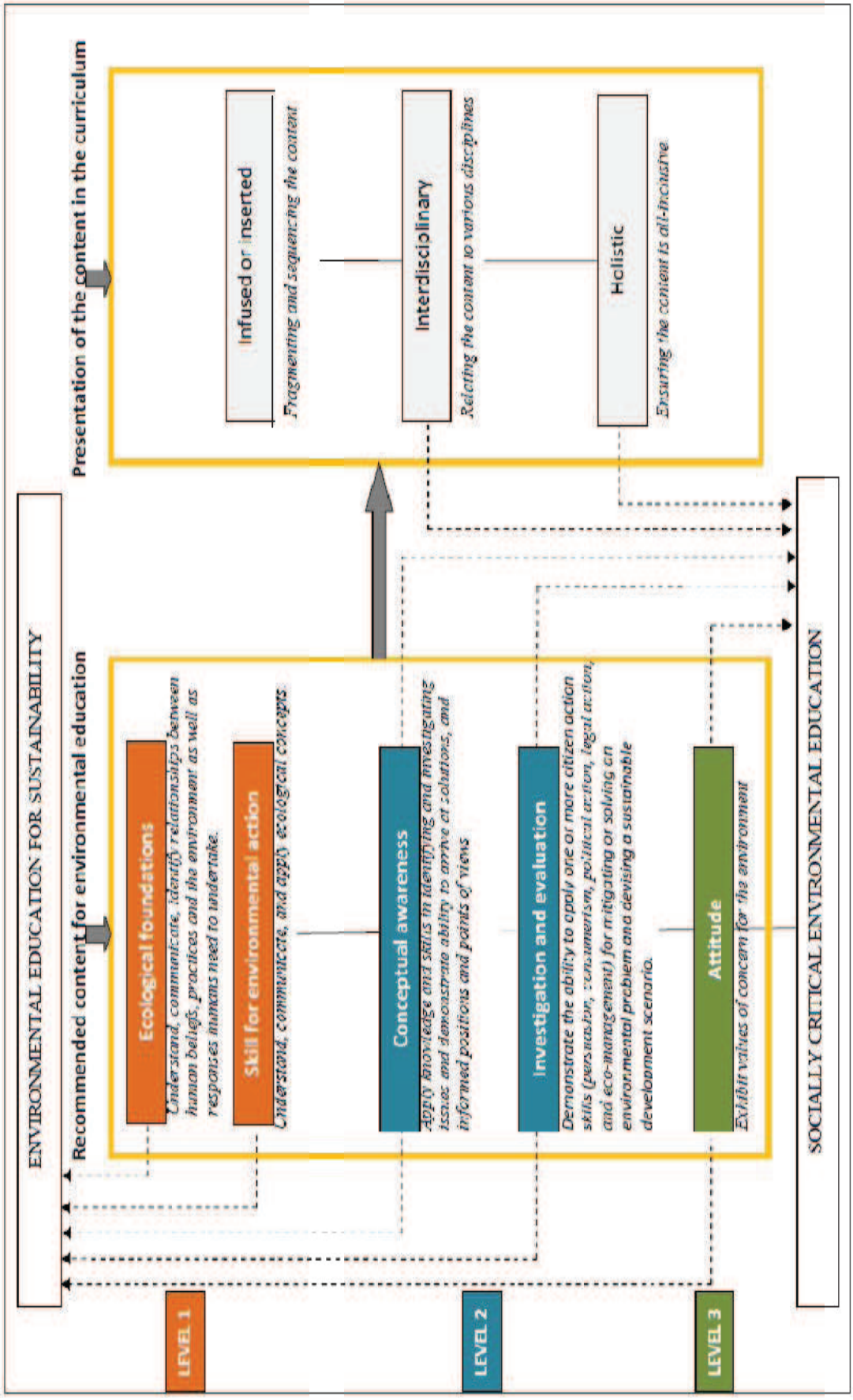

Figure 10.2 Recommended content of environmental education and how it is presented in environmental education curriculum.

The third level constitutes content that focuses on values and moral concern for the environment. According to Rennie and Dibley (2001), environmental education should include content on the moral and ethical obligations of humans to protect the environment for its own sake. Moral and ethical obligations entail having respect for all life on earth and exhibiting a commitment to act commitment to act towards solutions for addressing environmental problems. This according to Henegar (2005), this is the most important component of environmental education content.

> "*First, increase individuals' knowledge of the environmental and the problems facing it, then educate them on the possible solutions to these problems. The third, and most important aspect of environmental education, is instilling in the individuals the desire to take action in working towards these environmental solutions. If people have knowledge of the issues, but are not motivated to work towards solving them, then the education has not been completely successful*" (Henegar, 2005 p. 2).

An effective environmental education curriculum should have content on all the components at the three levels. The development of skills and positive attitudes towards the environment are as important as theoretical understanding of environmental issues (Nkwetisama, 2011). Particular examples could be used in the curriculum depending on a particular content and the environmental issues that need to be addressed.

Based on what constitutes the content of environmental education, literature distinguishes environmental education into two types: Socially Critical Environmental Education (SCEE) (Barry, 2006) and Environmental Education for Sustainability (EES) (Cloud, 2005). Socially Critical Environmental Education constitutes content on components at levels 1 and 2 and Environmental Education for Sustainability constitutes content at all the three levels. If the curriculum has content at only one or two levels, such a curriculum is regarded ineffective. There could be a range of other possibilities that define the extent of effectiveness of an education curriculum depending on the amount of content it consist from each of the three levels, an issue outside the scope of this chapter.

The way environmental education content is presented in the curriculum also determines the effectiveness of that curriculum. Environmental education content could be infused or inserted into the curriculum (Monroe and Cappaert, 1994). Infusion of content into the curriculum involves interspersing it in various topics in different subjects. This is different from "insertion" which involves creating and introducing separate environmental education courses or subjects in an existing curriculum. Monroe and Cappaert (1994) point out that infusion or insertion of content into the curriculum has advantages and disadvantages which depend on the subject in which the content is infused, the school level at which the content is taught and the topics to be taught before, after and alongside the environmental education content. Parlo & Butler (2007) point out an example of the circumstances under which infusion of content in the curriculum could be disadvantageous.

> "*Unaware of all the educational opportunities that environmental education presents, teachers may allow environmental education topics to be easily overshadowed by those that receive greater emphasis in national, state and local standards*" (Parlo & Butler, 2007 p.32).

Another defining future of effective environmental education is its interdisciplinary nature. The "environment" can be perceived in various contexts such as social, ecological, economic, and cultural (Bluhm, 1994). Although each of these contexts forms a specific discipline, the environmental problems in each of these disciplines are interlinked (Nkwetisama, 2011). Therefore for environmental education to address these challenges, it must be interdisciplinary and its implementation according to Nkwetisama (2011) should be cross-curricular.

One other characteristic of environmental education is that it should be holistic. This means that it should address knowledge, skills and attitudes of the learner. According to Nkwetisama (2011), environmental education should raise learner level of environmental knowledge, understanding, responsibility and ethics. Glynn (2000) opines that by being holistic, environmental education should include discipline integration, problem solving, and hands-on activities. For instance, a holistic environmental education programme should not only target how to address environmental degradation but also how to prevent it, promote positive environmental attitudes and pro-conservation behaviour. According to Bluhm (1994), holistic environmental education leads to the ultimate aim of environmental education which is environmental literacy.

Based on what constitutes environmental education and how it should be presented in a formal curriculum, this study was aimed at understanding whether the formal environmental education provided to the communities neighbouring the Rwenzori Mountains National Park was adequate to address the identified factors underlying illegal use of park resources. Also, the intention to conserve or not conserve may be influenced by various factors in and outside the individual's mindset (see Chapter 4). This thesis has shown that in the case of the Rwenzori Mountains National Park these factors include resource needs of the people for survival and livelihood (Chapter 5 to 7) and traditional beliefs, norms, knowledge and practices of the local people (Chapters 8). Therefore, another aspect that this chapter analyses is the extent to which content of the formal education syllabi addresses the identified factors.

10.5 METHODS

10.5.1 Sources of data

Data was collected from the primary school and secondary school syllabi. The primary school syllabus had two volumes called The 1999 Primary School Syllabus. Volume one comprised the subjects English Language, Integrated Science, Mathematics and Social Studies. Volume two comprised the subjects: Agriculture, Integrated Production Skills, Kiswahili, Local Languages, Performing Arts and Physical Education, and Religious Studies.

The secondary school syllabus comprised 19 subjects. They include English, Mathematics, Biology, Chemistry, Physics, Geography, History, Literature in English, Religious Education, Music, Art,

Agriculture, Technical Drawing, Woodwork, Metal Work, Business Education, Home Economics, Clothing and Textiles, Food and Nutrition.

In 2006, Uganda introduced at primary school level a new curriculum called the "Thematic Curriculum" where teaching and learning would be based on themes developed from content obtained from a range of different subjects. However, recent evaluation of the extent of implementation of the curriculum (Altinyelken, 2010) concluded that although the majority of teachers were enthusiastic about the thematic curriculum, their implementation of the curriculum was limited by a number of challenges including the inability of teachers to conduct cross-curricular teaching because they qualify from teacher training colleges to teach one or two subjects and not all the subjects contributing to a particular theme. It was therefore necessary in this study to analyse individual subjects from the old curriculum. Also, it would have been difficult to make inferences about the adequacy of the new curriculum in terms of addressing the factors influencing illegal access to the Rwenzori Mountains National Park by the local people when at the time of conducting this study, the implementation of the thematic curriculum was starting in primary schools.

10.5.2 Criteria for analysis of the syllabi

The criteria for analysis of the syllabi followed content analysis procedure discussed in Gall, Borg and Gall (1996) and Elo and Kyinga (2007). Content analysis is a data collection method that involves studying verbal or written information systematically with an objective of making an interpretation of that information (Krippendorff, 1980). According to Krippendorff (1980), through content analysis replicable and valid inferences can be made from the information analysed with the purpose of providing knowledge, new insights, a representation of facts and a practical guide to action. The aim of content analysis is usually to attain condensed concepts and categories describing the phenomenon.

Three phases of content analysis, comprising preparation, organizing and reporting, proposed by Elo and Kyinga (2007) were followed in this investigation. The phase of preparation starts with identifying the unit of analysis (Guthrie, Yongvanich, & Ricceri, 2004). Cavanagh (1997) suggests that deciding on the aspect to analyse, and the depth of the analysis and the sample size to include in the analysis are important factors to consider before selecting the unit of analysis. In this study, the aspect to analyse was what was recommended to constitute environmental education and how the content was presented in primary and secondary school syllabi. The unit of analysis in this investigation was the particular topic or theme about the environment. A comparison of the number of topics on a particular aspect in a document gives a quick quantitative judgment about the focus of the content of that document (Weber, 1990). The school term when that topic was scheduled to be studied was also recorded for purposes of identifying how the content was fragmented and sequenced.

The organizing phase involves grouping and categorization of the data emerging from the analysis (Elo and Kyinga, 2007). In this study, the topics about the environment were categorized based on the three content levels presented in Figure 10.2. The emerging content themes and the detailed content associated with each of the themes was analysed based on the interdisciplinary and holistic nature of

the environmental education curriculum and the way the content is presented in the curriculum (infused or inserted).

The third phase (reporting phase) involves presenting the information emerging from the analysis in an intelligible form (Elo and Kyinga, 2007). Presentation of information from the analysis of the syllabi in this case was in form of summaries of content presented in tables, followed by qualitative discussions accentuated with excerpts from the syllabi.

10.6 RESULTS AND DISCUSSION

10.6.1 Content of the primary and secondary school syllabi

Previous studies (such as Townsend, 2006) had reported that the Ugandan primary school syllabus did not cover environmental education content, however, this study not only found content on environmental education in the primary school syllabus but also in the secondary school syllabus. Out of 10 subjects in the primary school syllabus, 6 subjects (English, Integrated Science, Social Studies, Agriculture, Integrated Production Skills, and Religious Studies) had content on environmental education, and out of the 19 subjects in the secondary school syllabus, five subjects (Geography, Biology, Agriculture, Entrepreneurship, and History) contained topics about environmental education.

Environmental education found in the syllabi covered a variety of content which was classified into 5 content themes in the primary school syllabus and 4 themes in the secondary school syllabus (Tables 10.1 and 10.2 for the Primary school and Secondary school syllabi respectively). Details of the content covered in each topic and subject in the Primary and Secondary school syllabi are shown in Appendix 10.1.

Content themes were studied under different topics in the primary school and secondary school syllabi. Integrated science had the majority of the topics (32 out of 62 topics) on environmental education in the entire primary school syllabus. In the secondary school syllabus, the majority of the topics on environmental education were found in Geography, which had 31 topics out of the 55 topics.

Table 10.1 Environmental education content in the primary school teaching syllabus.

Content themes	Subject, primary school level, and term in which the topics on the content theme were studied						
	English Language	**Integrated Science**	**Social Studies**	**Agriculture**	**Integrated Production Skills**	**Religious Studies**	**No. of topics/ themes/ units**
T0: Words and sentences that describe the environment, its resources and how the resources are used	P2 T3 P3 TI P3 T2 P4 T2(2) P5 T1 P6 T3 P7 T3						**08**
T1: Understanding the environment and its resources		P1 T1 P1 T2(2) P1 T3 P2 T1(2) P2 T2(2) P3 T1(2) P3 T2(3) P3 T3 P4 T1(2) P4 T2 P5 T1 P5 T2 P6 T1 P6 T2	P1 T2 P1 T3 P2 T1 P3 T1 P4 T1(2) P5 T1(3) P6 T1(4) P7 T1(3)		P2 T1	P1 T1 P2 T1	**40**
T2: Understanding uses of the environmental resources		P2 T3 P3 T1 P6 T1 P7 T1	P4 T3				**05**
T3: Environmental degradation (indicators, causes and impacts of environmental degradation)		P6 T2 P7 T3		P7 T1			**03**
T4: Conservation, preservation and protection of the environment.		P5 T2 P6 T1 P7 T1 P7 T2 P7 T3			P7 T1		**06**
Total number of topics	**8**	**32**	**17**	**1**	**2**	**2**	**62**

Legend: P= Primary, T= Term

Table 10.2 Environmental education content in the secondary school syllabus

Content themes	Subject, secondary school level, and term in which the topics on the content theme were studied					
	Geography	**Biology**	**Agriculture**	**Entrepreneurship**	**History**	**No. of topics**
T1: Understanding the environment and its resources	S1 T2 S2 T2 S4 T1 (2) S5 T1 (2) S5 T2 (2) S5 T3 (2) S6 T1 (2) S6 T2 (2) S6 T3 (2)	S1 T1 S2 T1 S4 T3 S5 T3	S1 T1 S4 T1	S6 T1	S1 T1 (2) S1 T2 (2) S5 T1 S5 T2 S5 T3 S6 T1 S6 T2	**32**
T2: Understanding uses of the environmental resources	S1 T2 S4 T2	S.6 T1 S.6 T2	S1 T1			**05**
T3: Environmental degradation (indicators, causes and impacts of environmental degradation)	S2 T2 S2 T3 S3 T2 S5 T1 S5 T2 S5 T3 S6 T1 S6 T2 S6 T3	S 5 T3 S.6 T2	S1 T2			**12**
T4: Conservation, preservation, and protection of the environment.	S2 T2 S3 T1 S6 T2 S6 T3	S.6 T3	S1 T2			**06**
Total number of topics	**31**	**09**	**05**	**01**	**09**	**55**

Legend: S= Seniour, T= Term

10.6.2 Analysis of weaknesses and strengths in the syllabi in the perspective of teaching and learning formal environmental education

The primary and secondary school syllabi had a number of strengths and weaknesses in the perspective of environmental education. These are articulated in the next subsections.

10.6.2.1 Infusion and insertion of content in the syllabi

Environmental education content in the primary and secondary school syllabi was interspersed in various subjects of the entire formal curriculum (see Appendix 10.1). When environmental education content is infused in the syllabi, it is advantageous to curriculum developers, teachers and learners in a

number of ways. Firstly, the infusion strategy needs fewer resources (such as separate textbooks) and specialized teachers to implement it (Monroe and Cappaert, 1994); it partly ameliorates the problem of availability of teaching materials that are specifically tailored to environmental education subject (Townsend, 2006). This reduces the constraints of lack of scholastic materials (Al-Sa'ed, Abu-Madi & Heun, 2009). Secondly, in the infusion strategy, environmental education content does not compete with other subjects for time in the syllabus. Thirdly, infusion of environmental education content in a syllabus encourages learning and problem solving to take place across different subjects in the curriculum, enabling learners to relate ideas they acquire from different subjects more easily. For example, learners can relate the words that describe the environment learned in the English Language subject (English being a second language) to content on environmental degradation which they study in Social Studies. In this way, different subjects complement each other.

Although the infusion of environmental education in the syllabus could have the advantage of enabling learners to relate what they study from different subjects, it could easily cause confusion among learners, especially those at the elementary level (Nkwetisama, 2011). For example, in Integrated Science, learners are taught that natural resources and the environment have come about as a result of evolutionary processes in nature. But in Religious Education, learners are taught that natural resources and the environment were created by God. For instance, the content of Religious Education Syllabus Part 1 (which is about Christian Religious Education) that was to be taught in Primary 2, term 1, refers to the Bible (Genesis Chapter 1, verse 26 - 28).

> "*General objectives: To enable the learner : (1) describe God's creation and the position of human beings in it, (2) desire to care for and appreciate all created things*"

The message that the content of these verses portray to the learners is that all living things were created by God, and humans were also created by God to rule all the living things.

In both the Integrated Science and Religious Studies subjects, no mention is made about the existence of an alternative point of view such as those based on traditional beliefs of mountain gods discussed in Chapter 8 about the origin of the environment and the natural resources therein. A lack of such a cross reference between subjects or reconciling the different viewpoints can potentially cause confusion among learners about which ideas they should follow. The confusion could be lessened by including in each subject a reference to another subject where a different view point is presented, and by pointing out why differing points of view occur. This approach was found to work in a study aimed at integrating environmental education into the English as foreign language and English as second language classroom in Cameroon (Nkwetisama, 2011).

10.6.2.2 Theoretical understanding of environmental issues and development of skills

Another notable weakness in the primary and secondary school syllabi in the perspective of environmental education is that 40 out of 62 topics was about understanding and describing the

environment and its resources. For example, in the secondary school syllabus, in Senior 4, term 1, there were two topics in Geography that required learners to develop an understanding of different types of natural resources, such as forests and wetlands.

> "*Topic 9: The utilisation of Natural resources in British Colombia. Subtopic 2 Forestry as a natural resource, factors favoring forestry, problems facing forestry and ways of improving the forestry industry, utilisation of water resources – fishing*".

Although it is necessary that learners understand the environment and its resources, and important that they know they are part of a bigger environment and learn words which they can use to construct appropriate sentences to describe the environment, it is not a guarantee that they will conserve the environment or live amicably with other living and non-living things in the environment.

Additionally, although the content on understanding the environment and its resources could influence positive attitudes among learners about the environment and hence lead to pro-environmental behaviour, it does not mean that learners will translate what they understand into practice. The only indication in the syllabus that there was a need for practical work and development of skills was found in the primary school Integrated Science subject, Primary 6 term 2 Theme 1, which required students to be aware of the effects of environmental degradation, and to acquire scientific knowledge and skills for managing various types of degradation.

> *"General objective: To enable the learner to: 1) become aware of the effects of environmental degradation. 2) Acquire scientific knowledge and skills of managing various types of degradation"*

In that topic, it was required that learners visit degraded areas. Such a topic was important for environmental conservation because it emphasized acquisition of experiential knowledge and skills by learners to manage various types of environmental degradation. The rest of the content did not emphasize practical application of the knowledge that the learners acquire. For instance, the Integrated Science syllabus, Primary 6, term 1, theme 1, required learners to acquire scientific knowledge about soil and to develop skills to conserve it.
One of the tips required of teachers to effectely teach the topic was:

> "*Emphasis should be placed on enabling learners to visit various examples of degraded sites in the locality…."*

The syllabus, however, does not show how such skills should be developed. This means that the knowledge acquired by learners may remain theoretical. Unless teachers have the pedagogical content knowledge to help the children develop the skills, the knowledge acquired by learners may remain just theoretical.

The findings of this investigation concur with a study by Srbinovski *et al*. (2010) in Macedonia and Turkey. In both countries it was found that understanding of the environment and its resources was emphasized in environmental education programmes with little attention given to skills of managing the environment, and no attention given to changing attitudes toward the environment and developing

environmentally responsible behaviour. Understanding of the environment and its resources, alone, is unlikely to lead to change in behaviour. Possession of knowledge about the environment by an individual does not mean that the individual will behave in an environmentally friendly manner (Levin, 1993). Although knowledge is a prerequisite for appropriate conservation actions, it does not guarantee that appropriate conservation behaviours will be performed by individuals who have that knowledge (Kuhar *et al*., 2010).

In addition to providing understanding of the environment and the impact of humans on the environment, formal environmental education content should develop "sensitivity" to the environment amongst learners (Srbinovski *et al*., 2010). Formal environmental education should enable learners to develop positive attitudes and values that reflect feelings of concern for the environment, and have skills of identifying, investigating, and solving problems of environmental degradation. This suggests that formal environmental education in Uganda's primary and secondary school syllabi would need to be more practice-oriented. One way of doing this would be to connect classroom teaching with outdoor activities. Ajiboye and Olatundun (2010) suggest that there should be a balanced representation of classroom activities and outdoor environmental education activities in order to expose pupils to first hand learning experiences. Combining classroom teaching with outdoor activities is an important method of teaching and learning environmental education (Ford, 1986). Outdoor activities are experiential methods of learning which enable learners to perceive information using all their senses (Ford, 1986). Ford (1986) explains that the assumption behind outdoor activities is that outdoor experiences should be able to foster higher understanding, permanent retentive knowledge, motivation, and application to solve subsequent environmental issues and problems.

A study by Parkin (1998) in Queensland showed that environmental education was more effective in schools where teachers linked what they taught in class with outdoor activities (in centres established by the government) than where teachers confined teaching and learning to the classroom. By linking their lessons with outdoor activities, teachers enhanced experiential and practical learning (Parkin, 1998).

10.6.2.3 Content in Agriculture subject and its association to agricultural practices

Another weakness noted in the syllabi was that the subject Agriculture contributed the least and the second least number of topics in the primary school syllabus and secondary school syllabus respectively (Tables 11. 3 and 11.4). In both primary and secondary school syllabi, there was only 1 topic on the "environmental degradation" content theme.

Primary 6 Term 2 Theme 1: The environment Topic: Environmental degradation. The content was:

> *"1. Environmental degradation: a) what environmental degradation is, b) types of environmental degradation, e.g., devegetation, soil erosion, silting of water, wetland drainage, loss of plants and animal species. 2) Causes of environmental degradation: a) natural catastrophe, b) human-originated, 3) Consequences of environmental degradation: a) loss of soil, b) death and disappearance of biodiversity, 4) Control and prevention of environmental degradation"*

This was construed as a shortcoming in the syllabi because agricultural practices account for more than 70% of the environmental degradation in Uganda (Lokwiya, *et al*., 2002; Ogwang & Aanyu, 2002). Agriculture should have had more topics on indicators, causes and impacts of environmental degradation. According to Bekalo and Bangay (2002), if environmental education is to go beyond a taxonomic appreciation of the environment, it must begin by exploring the causes of environmental degradation.

In line with the point of view of Bekalo and Bangay (2002), the subject Entrepreneurship in the secondary school syllabus should, in addition to the topic on the content theme about "understanding the environment and its resources", have several other topics on the "environmental degradation" theme. Such content could be on the effects negative impacts of various business enterprises on the environment. This is because entrepreneurship is associated with the establishment of businesses which is often associated with taking financial risks in the hope of making profit usually and the expense of the integrity of the environment for sustainable provision of resources. Although the Entrepreneurship syllabus required learners to study social and environmental responsibilities of business, its content was limited to the understanding the resources in the environment, and did not the likely negative impacts of businesses on the environment. Entrepreneurship is intended to enable individuals attain high levels of economic development which is often not in tandem with the protection of the environment, especially in developing countries (Leiserowitz, Kates & Parris, 2005). It would be appropriate to add more content about environmental education in the Entrepreneurship subject so that learners study the impacts of various business ventures on the environment. This could be done as hypothetical case studies for them to critique in terms of environmental harm, or as a critical thinking exercise in which they considered the implications of a hypothetical scenario. Content on environment impact assessment and environmental degradation mitigation measures is also recommended in the Entrepreneurship syllabus as many children will eventually survive by such engaging in such entrepreneurial activities.

10.6.2.4 Addressing environmental degradation but not the prevention of environmental degradation

A further weakness in the syllabi related to the environmental degradation content theme, which did not show how environmental degradation should be prevented. Although that content was important for environmental protection, it emphasized the management of degraded areas but not preventing degradation. For instance, in the Geography syllabus:

> "*Topic 21 the soil of east Africa. Subtopic 6: Soil erosion. Subtopic 7: Conservation/Management of soil.*"

Learners were introduced to the concept of conservation and management of soil.

In Agriculture, in Senior 1, term 2:

> "*Subtopic 3 soil and water conservation – soil erosion (causes, types & factors affecting it), control of soil erosion using terraces, bunds, grassed water ways, planting trees, mulching etc*".

Learners were required to study the control of soil erosion using terraces, bunds, grassed waterways, tree planting, and mulching. The short coming is that the content is about addressing environmental degradation rather than preventing it.

10.6.2.5 Content scheduled towards the end of the primary school level

It was also noted that some topics in the primary and secondary syllabi were scheduled in the last years of the primary level. Critically important content is only covered in higher in grades, which many children never reach because of attrition. Primary 7 is the last year of the primary school level in Uganda and restricting content of environmental education to this year is a weakness in the syllabus. This is because less than 40% of the learners who join primary education in Uganda reach Primary 7 (Winkler & Sondergaard, 2008). For example, content on conservation, preservation and protection of the environment which is important for environmental protection was to be studied only once children reached upper primary (Primary 5 to Primary 7). Similarly, the only topic in the Agriculture subject syllabus about environmental degradation was just scheduled to be taught in Primary 7. Similarly, the content on words and sentences that describe the environment, its resources and how the resources are used, was only to be studied in English Language subject in Primary 7, term 3, which is after the subject content. Therefore, only introducing environmental education content in Primary 7 means that majority of the learners would drop out of school without studying it. It would have been more appropriate to introduce environmental education content such as environmental degradation at lower primary levels. For instance, the content on words and sentences that describe protection of the environment in English could be introduced in lower primary school (Primary 1 to Primary 4) as well.

10.6.2.6 Examples from outside the Uganda context

Although it is often a useful strategy when teaching to accentuate a point using examples, in the case of the syllabi reviewed (especially the secondary school syllabus), the examples in some topics were from outside the Uganda context and yet the examples in Uganda are available and more to the point. For example, the Geography syllabus of Senior 1, Term 2, Topic 9 required learners to study the utilisation of natural resources in British Colombia. Also, the Geography syllabus of Senior 4, Term 2, Topic 52 required learners to study use and development of forest resources in Africa, but the examples were from Swaziland, Ivory Coast (Cote D'Ivoire), Algeria and Gabon. Although Topic 24 in the Geography syllabus of Senior 2, Term 3, describes the relationship between environmental degradation and human population increase using examples from East Africa (a sub-region where Uganda is located), other topics on environmental degradation referred to examples from Europe. For instance, the Geography syllabus of Senior 2, Term 2, Topic 37 describes how industries cause environmental degradation using examples from Germany. Sub-topic 3 of Topic 37 describes

agricultural and industrial development in Germany, pointing out the challenges of industrial development in Germany, such as pollution and exhaustion of resources.

This means that learners may not perceive the similarities between the use, development and degradation of forests in those of other countries and Uganda, and hence may find it difficult to relate what they study in class to their local environment. It would have been more appropriate to use examples from the local situation in the Rwenzori Mountains and the neighbouring areas with these learners, or at least from Uganda.

10.6.2.7 Potential effect on learner behaviour of content on using and harvesting resources

The content was on using and harvesting resources might influence negatively learner behaviour towards sustainable resource utilisation. The emphasis on the use and development of forest and other resources without referring to the conservation of those resources could easily limit the learners' understanding of sustainable use of natural resources in Uganda. Content on understanding uses of the environmental resources was found mainly in the primary school syllabus. This content was found in 5 topics; 4 topics were in Integrated Science and 1 topic was in Social Studies. For instance, the Integrated Science syllabus of Primary 6, Term 1, Theme 1:

> *" 1. (a) Non-living things: soils, rocks, minerals, sun, fossils, fuels, water and air. (b) Living things as resources*
>
> *–plants: fibres, wood, medicine, food*
> *– animals: meat, skin, hides, horns, milk, honey, medicine, labour*
> *2. Harvesting and using resources from the environment"*

The content required learners to become increasingly aware of the importance of the environment as a resource base. It further required learners to acquire knowledge and skills for harvesting and using resources in the environment.

Arguably, the content on understanding uses of the environmental resources could easily further environment degradation. This is because such content encouraged learners to consider environment resources as resources at their disposal for use.

10.6.2.8 The content themes did not target all the factors underlying illegal access to the Rwenzori Mountains National Park

The content of the syllabus did not target all the factors underlying illegal access to the Rwenzori Mountains National Park by the local people. The factors underlying illegal access to the park were discussed in Chapters 5 to 8 and are summarized in Figure 10.3.

The only content theme was Theme 3 which was about Environmental degradation (indicators, causes and impacts of environmental degradation) that targeted lack of knowledge about the potential negative effect the activities have on the park.

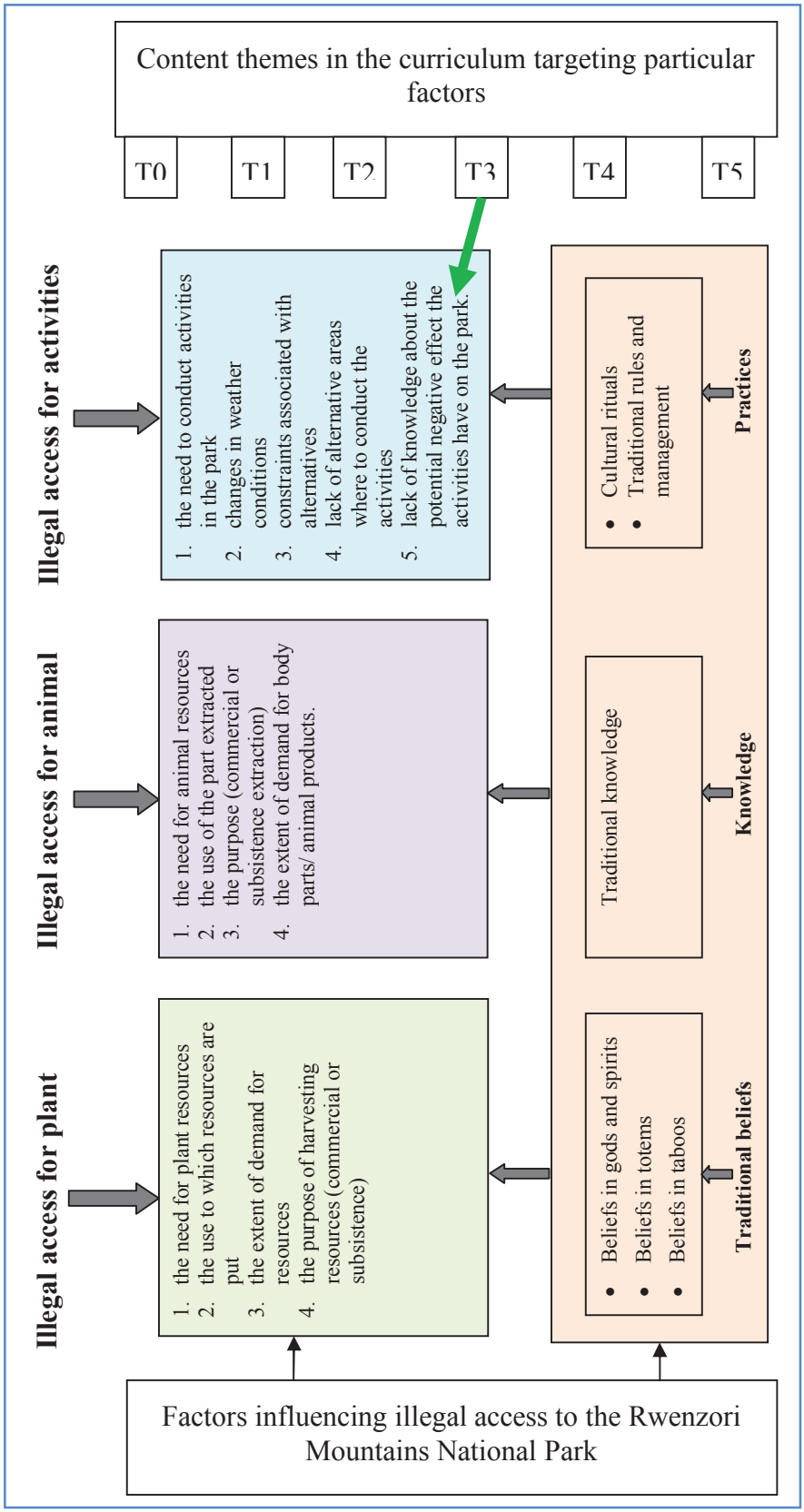

Figure 10.3 A summary of factors influencing illegal access to the Rwenzori Mountains National Park by the local people and the factors targeted in the content themes of the curriculum

It was expected that since the syllabi were prepared at the national level for all the schools in different regions of Uganda, the content themes could not have been tailored specifically to the problems in the Rwenzori Mountains National Park. The national curriculum may be adapted by teachers to fit the needs of learners in a particular community. Modification of the national curriculum could be one way of enhancing the curriculum. Teachers in schools near the Rwenzori Mountains National Park could modify the content in the syllabi to tailor it to environmental conservation problems in the Rwenzori Mountains and their underlying causes.

Teachers in schools near the Rwenzori Mountains National Park could adapt the content of some topics in the syllabi to influence change in beliefs, attitudes, knowledge, and practices that underlie the problems faced by the park. For example, when teaching the Religious Studies syllabus, Part 1 on the creation of natural resources by God, reference could be made to the religious beliefs associated with gods and spirits in the Rwenzori Mountains. Traditionally, people in the Rwenzori Mountains believe that gods brought resources from an unknown place to humankind and that some gods reside inside those resources. They believe that mountain gods are supposed to be appeased and many thus believe is not necessary to seek permission from park authorities and that these resources can be accessed for ever (Chapter 8). Some people therefore performed certain rituals in various places in the mountains to appease the gods. By making reference to such beliefs, teachers would be able to show the consequences of such beliefs and point out what scientists believe will happen, so that learners can make informed decisions to address some of underlying factors that lead to illegal use of resources in the park and also to realte traditional beliefs, knowledge and practices to the conservation of resources in the Rwenzori Mountains.

It is also important to point out that although knowledge is a prerequisite for appropriate conservation actions, it does not guarantee that when knowledge is acquired, appropriate behaviours toward environmental conservation will be performed (Kuhar *et al*., 2010). The teaching and learning of environmental education becomes more effective when it is practical and experiential (Ajiboye & Olatundun, 2010). This happens especially when classroom work is linked to outdoor activities (Ford, 1986).

10.7 CONCLUSION

This part of the investigation was aimed at analyzing the formal environmental education content in Uganda's primary and secondary school syllabi. This was motivated by the fact that, despite the provision of environmental education for the past 30 years in Uganda, environmental degradation and biodiversity loss from the Rwenzori Mountains National Park has persisted.

Contrary to findings reported in a study by Townsend (2006) that Uganda's primary school syllabus did not cover environmental education content, this study not only found content on environmental education in the primary school syllabus but also in the secondary school syllabus. The content in the syllabi was classified under five themes which included: words and sentences that describe the

environment, its resources and how the resources are used; understanding the environment and its resources; understanding uses of the environmental resources; environmental degradation (indicators, causes and impacts of environmental degradation); and conservation, preservation and protection of the environment. The environmental education content was infused in the syllabi and this presented several advantages to the teachers, learners and curriculum developers.

The persistence of problems of environmental degradation in Uganda, despite provision of formal environmental education was thought to be influenced by various factors. Firstly, some topics in the curriculum portrayed contrasting points of view about the explanation provided in science and in religious studies on the origin of the environment and natural resources. This could easily make learners confused about which points of view they should follow. Secondly, some vital content in the syllabi was scheduled towards the ends of primary school. Given the high dropout rate of more than 60% in primary schools in Uganda (Winkler and Sondergaard, 2008), the majority of students will never cover important topics of conservation and preservation of resources which they need in order to understand the threats to resources, and the need for sustainable harvesting. Thirdly, some examples used in the syllabus to explain environmental resources, their use, and conservation are from countries outside Uganda, and others were even from outside Africa. In some of these countries, the context may be different from Uganda and this limits learners from relating what they learn in the classroom with their local environment. Fourthly, although agriculture is the main cause of environmental degradation in Uganda (Ministry of Lands, Housing and Urban Development, 2011), the Agriculture syllabus had the least content on environmental degradation in both the primary and secondary school syllabi. This means that students who during or after their studies engage in agricultural practices are less likely to be aware of the potential negative effects of their activities on the environment and not be aware of less harmful practices and methods of sustainable agriculture, because they do not associate this with agriculture. Lastly, and probably most importantly, much more of the content in the syllabi was concerned with theoretical understanding of environmental issues than with the acquisition of practical skills to conserve the environment.

CHAPTER 11

NATURE AND EXTENT OF INFORMAL ENVIRONMENTAL EDUCATION IN THE RWENZORI MOUNTAINS

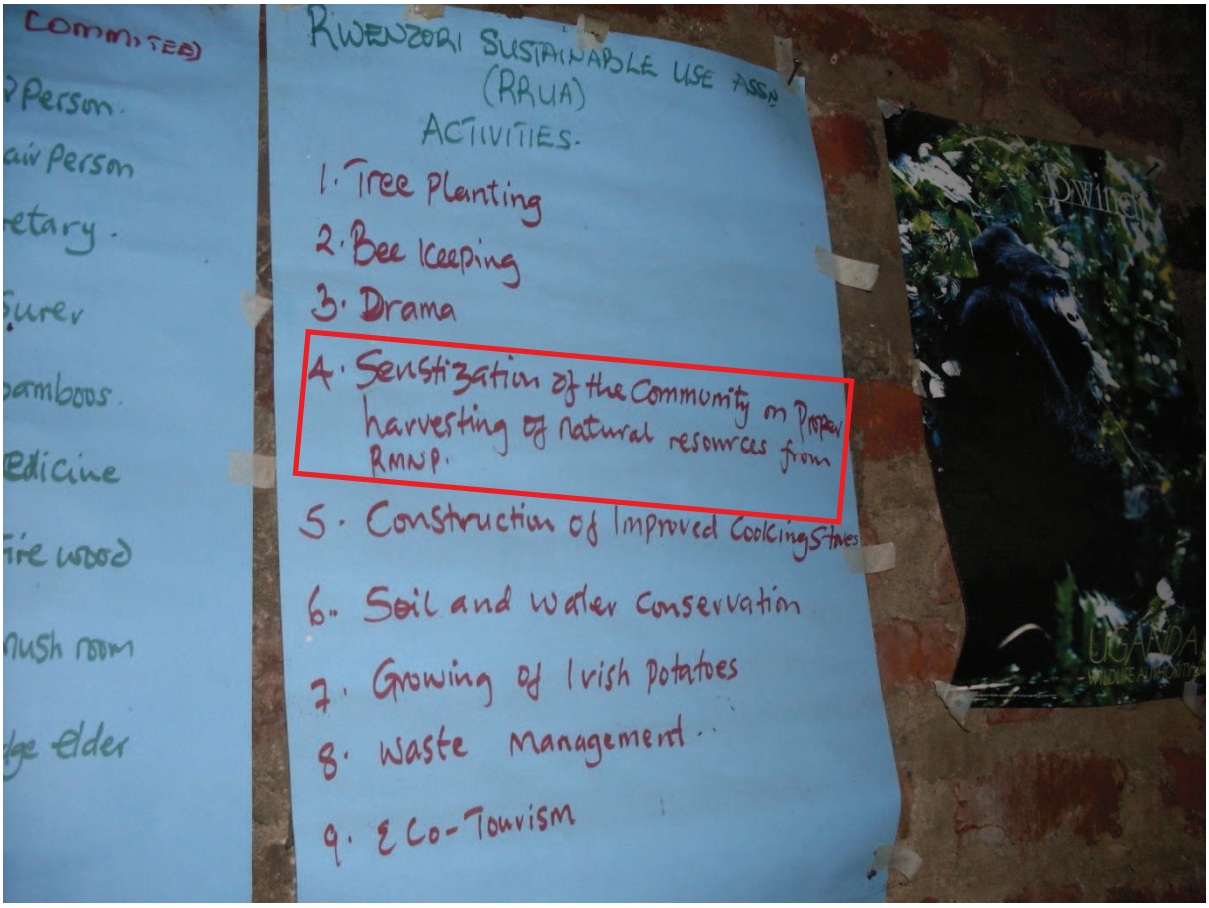

Figure 11.1 A chart indicating provison of informal environment education as one of the activities undertaken by a local organisation in the Rwenzori Mountains. (Photo by M. Muhumuza. April, 2009**).**

OVERVIEW OF THE CHAPTER

Informal environmental education programmes aimed at enlightening the local people about the importance of biodiversity conservation have been implemented in communities neighbouring national parks in Uganda including the Rwenzori Mountains National Park. However, the conservation of biodiversity in the park still faces various management challenges associated with illegal access by the local people. This study was aimed at analyzing the nature of informal environmental education messages that were provided to the local people; to investigating whether people heeded those messages, and in case they did not, to point out the reasons why. The content of the Rwenzori Region Environmental Conservation Education Strategy and quarterly reports for the year 2009 about how the strategy was implemented were analyzed. Findings showed that the Rwenzori Region Environmental Conservation Education Strategy was developed and implemented without specifying the actual messages needed to be conveyed to the people. It was in the implementation reports where the messages that were said to have been delivered to the people were stated. The messages were on: the rules governing the park and the activities prohibited in the park, understanding the importance of the park and the resources therein, agricultural activities that should not be practiced by the local people, and how local people should protect their crops from problem animals and vermin. The messages that were said to have been conveyed to the people did not target factors such as beliefs, knowledge, attitudes and traditional practices that influence illegal access to the park resources. The implications of these findings for community-based biodiversity conservation are discussed in the chapter.

11.1 INFORMAL ENVIRONMENTAL EDUCATION AND CONSERVATION OF BIODIVERSITY IN NATIONAL PARKS

Creation of national parks has often resulted in conflict between local people who neighbour national parks and park staff. There are various incidents indicating that the needs of local people to utilise resources in the park clash with the interests of the park staff to conserve or preserve resources in the park (Maikhuri, Nautiyal, Rao & Saxena, 2001; Oltremari & Jackson, 2006). This occurs especially when local people are restricted from accessing park resources. In such a situation, local people perceive the establishment of national parks as an interference with their livelihood and survival (MacKinnon, MacKinnon, Child, & Thorsell, 1986). Consequently, local people in rural communities do not support the objectives of conserving biodiversity through the establishment of the park by engaging in illegal activities in the park which may frustrate conservation efforts and cause the decline of resources in the park. However, Albers & Grinspoon (1997) claim that when local people in rural communities expect short and long term benefits from the established parks, they can play a key role in enhancing biodiversity conservation in those parks.

Various studies such as Balikowa (2008) and Bekalo & Bangay (2002) and others pointed out in Chapter 2 have justified the need for local communities to support the conservation of biodiversity in national parks because it has been found that sustainable conservation of national parks depends on long term support of the local communities that neighbour those parks.

In many national parks, various strategies have been used in attempt to engage local people to support biodiversity conservation. Among other strategies is the provision of environmental education to the

people (Chapter 10). A number of studies such as Archie (2003) have reported positive results from the implementation of informal environmental education programmes amongst communities neighbouring national parks. Researchers in some national parks in Africa and Asia (Dudley *et al.*, 2004; Kasparek, 2008; Ormsbyl & Kaplin, 2005) have attributed reduction of threats, successful conflict resolution, and sustainable use of resources in those parks to informal environmental education that was provided to the local community. For instance, in Masoala National Park in Madagascar, it was found that through the provision of informal environmental education 93% of residents living near the park supported the conservation of biodiversity through the establishment of the park (Ormsbyl & Kaplin, 2005). The success of the Sustainable Forest Management and Conservation Project that was implemented in four African countries (Botswana, Malawi, Mozambique and Namibia) was ascribed to informal environmental education (Dudley *et al.*, 2004). For instance Dudley *et al.* (2004) attributed the 31% increase in forest stock density in Malawi to the provision of informal environmental education. Public understanding of environmental issues in Malaysia was said to be a result from extensive implementation of informal environmental education programmes (Hassan, Osman & Pud, 2009). These examples are indicative of the usefulness of informal environmental education not only in biodiversity conservation but also in environmental management in general.

11.2 THE PROBLEM MOTIVATING THIS INVESTIGATION

Although there are myriad studies, some of which are from Uganda (such as Ferrie *et al.*, 2011; Kuhar, Bettinger, Lehnhardt, Tracy, & Cox, 2010; Oonyu, 2009) which show that informal environmental education is important in influencing people's attitudes toward the support for biodiversity conservation in national parks, the situation is different among communities neighbouring the Rwenzori Mountains National Park. Local people in these communities are said to have received informal environmental education. The National Environmental Management Authority (NEMA), the principle agency responsible for the management of environment in Uganda, has provided informal environmental education through the Department of Public Education and Awareness to communities in the Rwenzori Mountains (National Environmental Management Authority, 2008). In addition to the activities of the National Environmental Management Authority, a Rwenzori Region Environmental Conservation Education Strategy was implemented between 2006 and 2009. The strategy aimed to mitigate illegal activities in the park and to create a harmonious relationship between the park staff and the local community.

> "*This education strategy is intended to enable the local community realize the importance of conserving the park and to reduce the current conflicts with the park administration*" (Rwenzori Mountains Conservation and Environmental Management Project, 2005 p.5).
>
> "*The ultimate goal of the strategy was to ensure that the conservation of the Rwenzori mountains ecosystem was enhanced and its biodiversity and water catchment values maintained for the benefit of Uganda and the international communities"* (Rwenzori Mountains Conservation and Environmental Management Project, 2005 p.6)

The strategy was planned to be implemented in sub-counties that neighbour the Rwenzori Mountains National park in the three districts (Kasese, Kabarole and Bundibugyo) that are traversed by the park.

Recent studies conducted in the Rwenzori Mountains reported that threats to the Rwenzori Mountains National Park are prevalent in spite of efforts made by informal education programmes (Ernst, 2011; Tusiime, Vedeld & Gombya-Ssembajjwe, 2011). Local people that neighbour the park still clandestinely conduct illegal activities in the park as articulated in Chapter 5 to 7. Local people are frequently in conflict with the Rwenzori Mountains National Park staff who attempt to prevent such illegal activities associated with the extraction of resources from the park. Various problems related to the conservation of biodiversity in the park have occurred as a result of illegal access and utilization of resources in the park (Chapter 1).

The persistence of the problems despite the implementation of informal environmental education necessitated an investigation into the nature of informal environmental education messages provided and how the messages were conveyed to the audience. The purpose of this investigation was therefore to assess the nature and extent of informal environmental education messages targeting the factors underlying illegal access to the park by local people.

11.3 CONCEPTUAL UNDERPINNINGS OF THE STUDY

Literature on the evaluation of informal environmental education is dominated by studies that base their evaluation on the number of people attending environmental education sessions and the number of people enrolling in informal environmental education programmes (Jacobson, McDuff & Monroe, 2006). The assumption underpinning such evaluations is that the more people attending environmental education sessions or enrolling in an informal environmental education programme, the more successful the informal environmental education strategy is judged to be. Although such an evaluation criterion gives an indication of the number of people willing to receive informal environmental education messages, it does not show whether people respond positively to those messages. The new dimension that this investigation contributes to studies on environmental education is the assessment of how informal environmental education that people receive targets the underlying factors that influence their pro-conservation or counter-conservation behaviours.

The conceptual underpinnings of this investigation are founded on the factors such as beliefs, knowledge, attitudes and intentions that influence behaviour (see Chapter 4, Figure 4.3). Since environmental conservation or degradation by individuals is behavioural, it would be logical for environmental education programmes to target factors the factors that influence their behaviour. Whether or not environmental education targets these factors depends on various factors.

Factors documented in literature that affect the success of informal environmental education programmes include the method of implementation of informal environmental education programmes,

the nature of informal environmental education messages, what people think the purpose of receiving informal environmental education messages is, the language in which informal environmental education messages are communicated, and the frequency of giving and receiving informal environmental education messages.

These factors may interact (in theory or in practice) to effect change in behaviour of an individual receiving informal environmental education messages (Figure 11.2).

11.3.1 The method of implementation of environmental education programmes

The method of implementation of informal environmental education programmes is one of the factors that affects the success of those programmes. According to Jacobson *et al*. (2006) implementation of informal environmental education programmes should involves pilot tests and programme operations (which spells out the schedule and system for oversight of the programme). This helps to identify the constraints that are likely to affect the program during actual implementation. The implementation process is preceded by planning (which involves review of the mission of the programme, identification of the goals and objectives of the programme, identification of the target audience, ways of how to engage the audience, making an inventory of resources needed, and selecting activities and messages to be delivered) (Jacobson, 1999).

The implementation process should be followed by evaluation of the programmes (Seng & Rushton, 2003). During and after any informal environmental education session, environmental educators must ask if their objectives are being met. Evaluation reveals if the programme is worthwhile, if it needs to be modified or whether it should be terminated (Jacobson *et al*., 2006).

The implementation process of informal environmental education can be investigated by analyzing the document proposals for informal environmental education programmes and the reports on the implementation of those programmes.

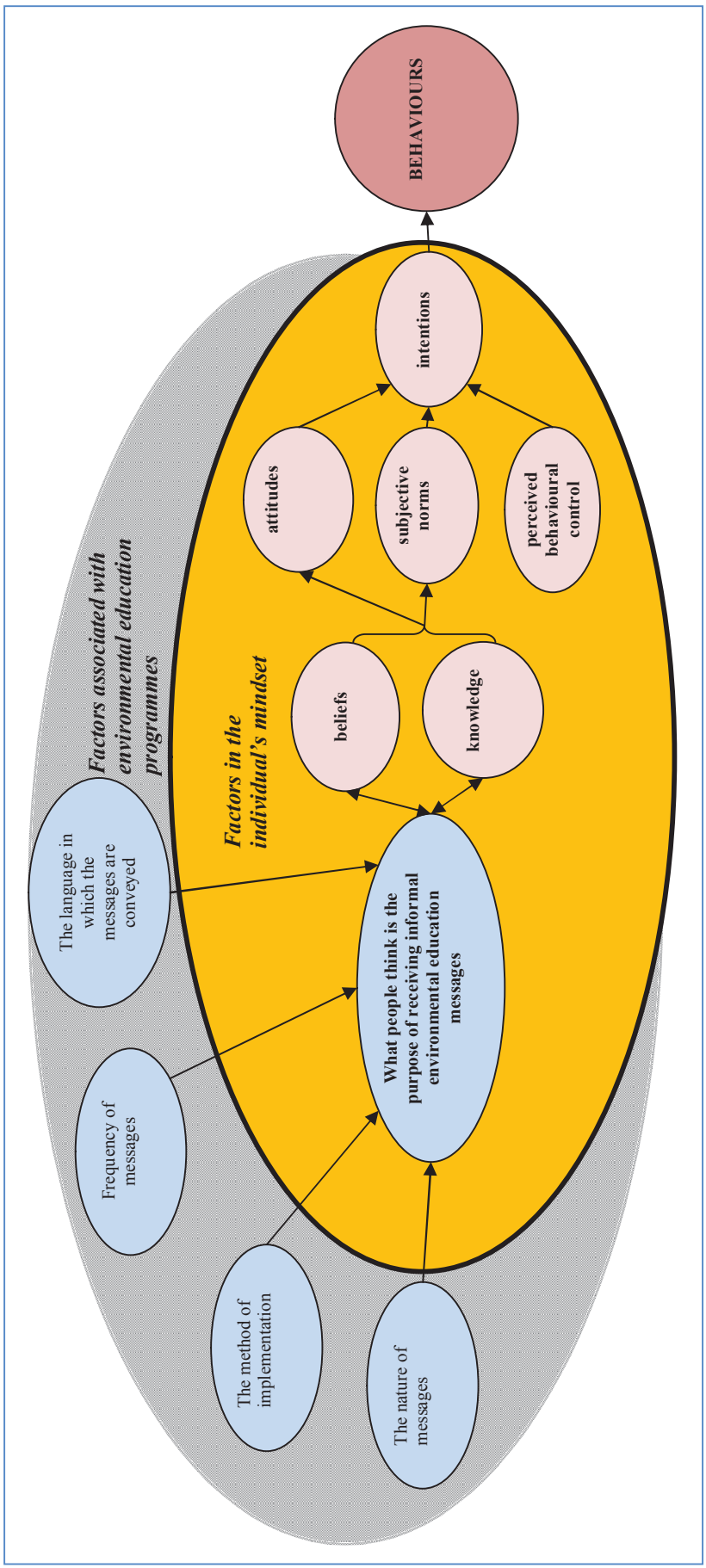

Figure 11.2 A scheme showing the factors that affect the success of informal environmental education programmes

11.3.2 The nature of the informal environmental education messages

The nature of environmental education messages which is basically the contents of environmental education messages also affects the success of environmental education programmes. According to Robson *et al*. (2010), three aspects of the nature of environmental education messages seem to have an effect: 1) the simplicity or complexity of the messages, 2) the "motivation" within the messages or why the audience should heed them, and 3) what the messages target. For instance, a study by Robson *et al*. (2010) found out that the use of technical and scientific terms in environmental education messages makes informal environmental education programmes unproductive because the complexity of the terms used overwhelms local stakeholders and deters some people from participating in future programmes. This occurs when the terms used are not associated with the local context of the audience (Hamersley, Chambers & Beckley, 2003; Sheppard & Achiam, 2004). Complexity influences restricted participation of stakeholders in future programmes because they lack the understanding of technical terms and are often not willing or unable to devote the time required to understand them (Cheng and Mattor, 2006).

Monroe, Day & Grieser (n.d) claim that before local people participate in informal environmental education programmes or before they heed environmental education messages, they first consider the benefits they expect to get from participating in those programmes or heeding the messages conveyed. Monroe *et al*. (n.d) recommend that environmental education messages should contain information about incentives for people to follow or not follow the behaviours that the messages are enhancing or discouraging respectively.

The recommendation of Monroe and colleagues is linked to the third aspect of informal environmental education messages, what the messages target. For the target group to be able to change their behaviour, the messages must target the underlying factors that influence their behaviour. If the messages do not target the root cause of anti-conservation behaviours, it is unlikely that people will heed those messages.

11.3.3 The frequency of the informal environmental education programmes

Frequency in this context means the number of times in a specified period informal environmental education programmes are provided to the audience. Jacobson (1999) uses three descriptiors for the frequency of messages: *regularly*, *seasonally* and *infrequently*. According to Jacobson *et al*. (2006), informal environmental education programmes change people's behaviours if they are regularly provided. According to Parkins *et al*. (2006), the audience may suffer from information overload if insufficient time is provided to process information so programmes should not occur too often. This means that the information which is conveyed to the audience in a specified period of time must be regulated for it to be effective. Parkins *et al*. (2006) caution that if informal environmental education contains wrong messages, even though it is delivered and received by the audience regularly, it may not change people's behaviour.

The frequency of providing informal environmental education pragrammes could be assessed by analyzing the work plan of the proposed informal environmental education programme, and the reports on the implementation of the programme.

11.3.4 The language in which environmental education messages are conveyed

Another factor that can affect the success of informal environmental education programmes is the medium of instruction. According to Batibo (2009) informal environmental education messages should be conveyed in a language that is understood by the target audience. In the case of the community in the Rwenzori Mountains, informal environmental education messages would need to be conveyed in at least the four languages spoken in the area: Rukonjo, Rutooro, Rubwisi, and Rwamba that are the main local languages of the communities that neighbour the Rwenzori Mountains National Park (Population Secretariat, 2011).

The language in which informal environmental education messages are conveyed could also be identified by analyzing the work plan of the proposed informal environmental education programme, and the reports on the implementation of the programme.

11.3.5 What people perceive the purpose of informal environmental education programmes is

This factor unlike the factors previously described is in the individual's mind-set. According to Jacobson *et al*. (2006), what people's perception of the purpose of informal environmental education messages is an important factor that determines the success or failure of environmental education programmes.

Each of the factors discussed above operate at three levels: 1) the level of planning, 2) the level of implementation, and 3) the level of feedback (Figure 11.3).

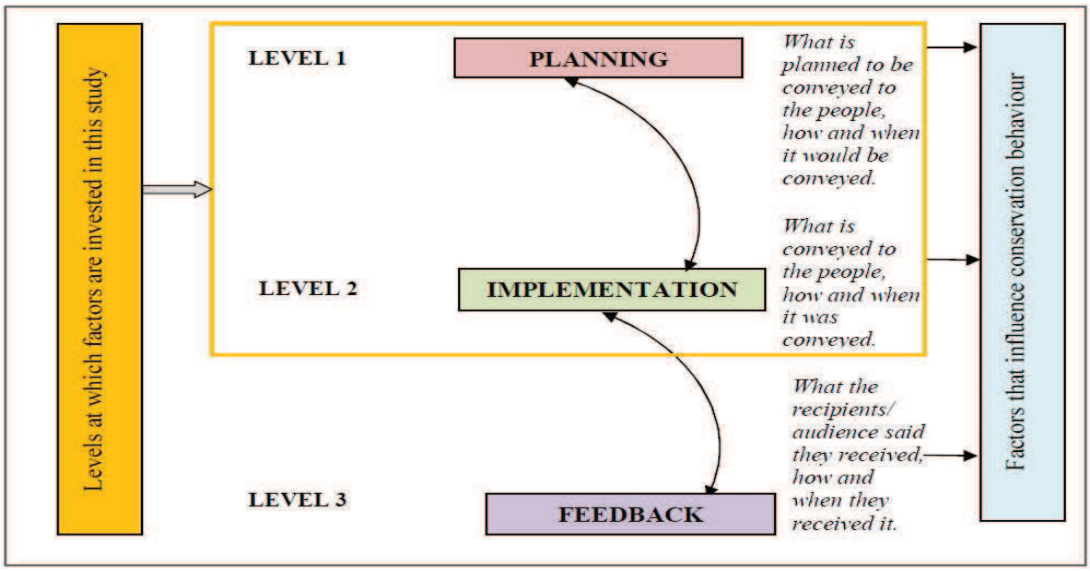

Figure 11.3 Diagrammatic representation of the three levels at which the factors affecting the success of informal environmental education programmes operate.

The factors described were investigated at two levels in the Rwenzori Mountains National Park. What was investigated at each of the two levels and the methods used is described in the next section.

11.4 METHODS OF DATA COLLECTION AND ANALYSIS

This study was conducted from the villages adjacent to the Rwenzori Mountains National Park. The geographical and ecological characteristics of the Rwenzori Mountains and the environmental problems in the area that motivated the study were described in Chapter 1. Based on the type of data needed for this part of the study, document analysis was used in data collection.

The procedure followed in document analysis is similar to what was dicussed in Chapter 10. Document analysis in this study involved studying informal environmental education programmes proposed (planning level) and those that were said to have actually been implemented in the Rwenzori Mountains (implementation level).

Analysis of documents on informal environmental education programmes was necessary in order to assess the nature of informal environmental education messages in the documents, the suggested frequency of delivering informal environmental education messages, the language in which the messages were to be conveyed, and the planned process of implementation of the programmes. These aspects as discussed earlier affect the success of informal environmental education programmes.

Although the initial idea was to analyze all the documents on the implementation of informal environmental education programmes in the Rwenzori Mountains between 1991 (when the park was established) up to present. A list of local, national, and international organizations associated with natural resource management in the Rwenzori region that was compiled by the Afromaison project (see Lara *et al*., 2013) was obtained to identify organizations that were likey to provide informal environmental education programs based on their recored activities and objectives (Table 11.1).

A representative of each organistion was approached and asked about whether the organization had implememented informal environmental education programmess in communities neighbouring the Rwenzori Mountains National Park and whether they had any documents about those programmes. Also the district local government offices responsible for natural resource management in the Rwenzori region were visited.

Table 11.1 List of organistions and institutions associated with natural resource management in Rwenzori region visited for informal on the implementation of environmental education programmes in the Rwenzori mountains.

Name	Provision of informal environmental education to communities near the Rwenzori Mountains National Park between 1991 and 2008	Availability of documents on the programme	Name of document available
Local and national organizations involved in natural resource management			
Kibale Association For Environment and Rural Development (KAFRED)	No		
Albertine Rift Conservation Society (ARCOS Network)	No		
Sustainable Agriculture Trainers Network (SATNET)	No		
Tooro Botanical Gardens, Fort Portal (TBG)	Yes	Not available	
Joint Efforts to Save the Environment (JESE)	Yes	Not available	
Rwenzori Resource Use Association (RRUA)	Yes	Not available	
International organizations involved in natural resource management in the Rwenzori region			
United States Agency for International Development (USAID)	No		
Environmental Conservation Trust of Uganda (ECOTRUST)	No		
World Wildlife Fund for Nature (WWF)	Yes	Available	Rwenzori Region Environmental Conservation Education Strategy
Jane Goodall Institute (JGI)	Yes	Not available	
PROTOS	No		
Government institutions associated with natural resource management in the Rwenzori region			
Uganda Wildlife Authority	Yes	Available	Implementation reports prepared quarterly on the Environmental Education Strategy for the year 2009
National Forestry Authority	Yes	Not available	
District environmental and natural resource office	Yes	Not available	
District education department	No		

The only documented information pertaining to informal environmental education in the Rwenzori Mountains was the Rwenzori Region Environmental Conservation Education Strategy. The strategy was planned and implemented between 2006 and 2009. The District Environment and the District Education Departments of the three districts traversed by the Rwenzori Mountains did not have documents on informal environmental education that was implemented in the Rwenzori Mountains in that period. Also, some local organizations[11] that were involved in environmental conservation activities did not have any documents on informal environmental education activities implemented in the communities in the Rwenzori Mountains. Previous informal environmental education programmes seem not to have been implemented in a systematic manner and there were no records of the activities of those programmes (Rwenzori Mountains Conservation and Environmental Management Project, 2005).

Although the Rwenzori Region Environmental Conservation Education Strategy was implemented during that period, only the implementation reports prepared for the year 2009 were available from the office of the community conservation warden in the Rwenzori Mountains National Park. Therefore, the only documents analysed in this investigation were the Rwenzori Region Environmental Conservation Education Strategy and the implementation reports of the year 2009.

The analysis of the Rwenzori Region Environmental Conservation Education Strategy was intended to extract the following information:

a) The nature of informal environmental education (the content and key messages proposed to be conveyed to the audience).
b) The proposed frequency of conveying the informal environmental education messages.
c) The language proposed to be used to convey informal environmental education messages.
d) The proposed implementation and evaluation plan of the strategy.

The analysis of the implementation reports was aimed at extracting the following information:

a) The content and key messages conveyed to the audience.
b) The documented frequency of conveying the informal environmental education messages.
c) The language (medium of instruction) used to convey messages.
d) The implementation and evaluation process.

[11] Such as Rwenzori Sustainable Use Association whose chart of activities is shown on the first page of this chapter.

Document analysis in this study was affected by two limitations. Firstly, it was expected that since the Region Environmental Conservation Education Strategy was planned to be implemented from 2006, there could have been a number of implementation reports. Only the quarterly reports for the year 2009 were available and the analysis was thus limited those. Secondly, not all the activities that were planned in the strategy were to be implemented in the year 2009. Therefore, some of the activities that might have been implemented earlier than 2009 were not in the 2009 reports. These limitations hindered a detailed comparison between what was planned and what was reported to have been done.

11.5 FINDINGS AND DISCUSSION

11.5.1 Content analysis: The Rwenzori Region Environmental Conservation Education Strategy and the implementation reports

The analysis revealed a number of factors that could have potentially affected the success of informal environmental education programmes implemented in the communities near the Rwenzori Mountains national parks.

11.5.1.1 The proposed implementation and evaluation plan for the Rwenzori Region Environmental Conservation Education Strategy

The Rwenzori Region Environmental Conservation Education Strategy had a detailed implementation and evaluation plan as recommended in the literature. The key elements recommended in the literature (Jacobson *et al*., 2006 & Seng & Rushton, 2003) such as the mission, goals, and objectives of the strategy, the target audience, and ways of how to engage the audience were found in the strategy. For instance, the mission statement was:

> *"The mission for this environmental education strategy is to ensure sustainable utilization of natural resources in the Rwenzori Mountains National park by Uganda Wildlife Authority in collaboration with the local community through sensitization and awareness*"

Additionally, the strategy spelt out the activities to be undertaken during implementation, the pilot tests that would be required for some activities and a schedule of how the activities would be undertaken. The strategy also had an evaluation plan based on the pre-stated evaluation indicators and goals and objectives as recommended by Jacobson *et al*. (2006) and Seng and Rushton (2003).

The exact time interval when the evaluations were to be done were not specified. This was construed as a weakness in the strategy because it could lead to a situation where an activity is evaluated when it is too late to rectify its limitations or negative effects. Based on recommendations by Jacobson *et al*. (2006) on informal environmental education strategies in general, in the Rwenzori Region Environmental Conservation Education Strategy, it should have been specified that during and after any informal environmental education activity, an evaluation should be conducted. This could enable the people implementing the programme to find out whether the objectives of the strategy were being met and whether there was need for a modification of the strategy.

11.5.1.2 The messages proposed to be conveyed and those reported to have been conveyed

The analysis revealed that in six out of nine strategic areas of the Rwenzori Region Environmental Conservation Strategy there was no mention of the messages to be conveyed to the audience. Even in the key strategic areas of the strategy such as the ones on advocacy and promotion of environmental education and public awareness raising and sensitization, there was no mention of the actual content and messages that were to be provided to the people.

It was only in the section on the demonstration approach where it was stated that the messages to be conveyed to the audience would be on local issues of the environment, sustainable development, and how to integrate local knowledge and culture in environmental management.

> *"In this approach the local community shall be trained on the management of the land on which they cultivate crops in order to improve on their livelihoods and reduce pressure off the national park resources. Issues of sustainable development shall be linked to local people current and future needs in the demonstration*"

> *"…….the local community's knowledge and culture. In the demonstration, such knowledge and cultural practices shall be integrated in the management of problem animals from the park*"

However, in the implementation reports, the messages said to have been conveyed to the audience were stated. The messages could be categorized into four groups, 1) messages on understanding the importance of the park and the resources therein, 2) messages on park rules and activities prohibited in the park, 3) messages on poor agricultural activities outside the park that should be avoided, and 4) message on how to protect crops from animals from the park (Table 11.2).

Table 11.2 Categories of informal environmental education messages found in the implementation reports of the Rwenzori Mountains National Park.

Messages on park rules, and activities prohibited in the park	• General by laws/ regulations governing the park. • Poaching • Theft of park equipment. • Timber logging. • Starting bush fire. • Charcoal burning.
Messages on understanding the importance of the park and the resources therein	• Conservation values of the park • Importance of wildlife and environmental conservation. • Multiplier effect of activities of communities neighbouring the park. • The values and usefulness of the weather equipment installed in the park.
Messages on agricultural activities outside the park that should not be practiced	• Bush clearance. • Inappropriate slash and burn cultivation. • Draining of wetlands.
Message on how to protect crops from animals from the park	How to construct a bending pattern of the fence.

The messages found in the implementation reports mainly focused on park rules and activities prohibited in the park and on understanding the importance of the park and the resources therein. Also the reports indicated that the messages were only conveyed to the people in and around specific areas (called pressure points) in parishes adjacent to the Rwenzori Mountains National Park.

> "*A team of four people including the warden in charge of community conservation and three rangers with the assistance of the LC1 chairperson visited pressure points and they people were given messages on……*"

Based on the findings from the Rwenzori Region Environmental Conservation Strategy and the implementation reports it was found that the environmental education messages did not target factors that influence resource use by the local people. For example, in the Rwenzori Region Environmental Conservation Strategy, the two key out comes expected from the messages proposed to be conveyed through the demonstration approach were;

> "*a) sound environmental management practices set up for farmers to emulate and replicate in their own farms, and b) localizing knowledge and skills as the owners of demonstrations plots act as local facilitators*"

Such messages were about agricultural practices of the farmers in the Rwenzori region and do not target the factors such as the need of park resources for livelihood and survival, beliefs, knowledge and traditional practices and other factors such as attitude in the individuals mindset that underlie illegal resource use from the Rwenzori Mountains National Park by local people (see Chapters 10, Figure 10.3). Also, the messages on the bending pattern of the fence (reported in the implementation reports) were about how local people should prevent problem animals from accessing their crops and not about how they should practice sound environmental management.

> "*The local community members were sensitized and trained on the construction of the bending pattern of the fence so that they can protect their crops from animals from the park. One fence for demonstration was constructed in Kaleyaleya*"

The messages were basically about rules and regulations governing use of resources in the park (McCall, 1996). This does not mean that local people should not know the rules and regulation governing the park but the people should be told the rationale for the rules. Community-based conservation programmes that engage local communities to understand the rules and regulations governing resource and the purpose of the rules and regulations, are more successful than those that simply spell out the rules and regulations without explaining their purpose (Gibson & Marks, 1995; Mbile *et al*., 2005).

Although the Rwenzori Mountains National Park administration emphasised environmental education as a main component of community-based conservation strategies (Tusiime *et al*., 2011), the messages that people said they had either heard, read or had been told about using resources in the park indicate that the park administration is still applying preservation approaches. It was evident from the implementation reports that most of the messages conveyed to the people were on strict rules and regulations prohibiting accesses to the park.

> *".....visited and the community members were sensitized on the regulations governing the park, the penalities that offenders are likey to get and how people could form groups and access some resources in the park through resource use agreements as required by the regulations of Uganda Wildlife Authority*"

Unlike community-based conservation approaches that allow collaborative use and management of resources (Child, 1993), preservation approaches restrict resource use (Igoe, 2004). The messages that local people said they received were dominantly intended to restrict them from using park resources. This could account for the persistence in conflict between the park staff and the local people. The provision of messages that are intended to restrict local people from accessing protected areas have previously been associated with conflict and lead to limited success of biodiversity conservation (Igoe, 2004).

It was also found that the information received by local people could not qualify as environmental education based on what is recommended in the literature. As pointed out by Carter and Simmons (2010) and discussed in Chapter 10, environmental education in general should encourage people to understand and forge connections with the environment in their own neighbourhoods and communities. Through environmental education, people should not only gain the knowledge about the park rules and regulations or about the importance of the park and the resources therein (as the case is in the Rwenzori Mountains) but also have skills helps them to engage in proper conservation practices. Acquisition of knowledge about the importance of the park and the resources therein does not guaranteed that people will engage in pro-conservation practices (Levin, 1993).

Informal environmental education messages that target the factors underlying anti-conservation behaviours are recommended. Environmental education efforts tend to be more successful when they begin with a needs assessment of the stakeholders in the area (Kuhar, Lehnhardt, Townsend, Cox & Bettinger, 2007). For instance environmental education messages could be linked to the provision of socio-economic incentives. According to Archabald and Naughton-Treves (2001) and Igoe (2002), good environmental education adequately reflects the environmental problems and issues of society in the local and regional contexts. Informal environmental education that considers the local context of the people paying attention to the socio-economic needs of the people may be more helpful for communities neighbouring the Rwenzori Mountains National Park. The success of that education shall depend on three factors; 1) the approaches for conveying the messages, 2) the frequency of conveying the messages, and 3) the language used in conveying the messages.

11.5.1.5 The approaches for conveying the messages

The analysis of the Rwenzori Region Environmental Conservation Education Strategy revealed 11 different approaches for conveying informal environmental education messages. In the implementation reports, only four out of the eleven approaches were reported to have been used in conveying the messages to the local people (Table 11.3).

Table 11.3 Approaches for conveying informal environmental education messages in the Rwenzori Region mountains

	Approaches for conveying informal environmental education messages									
Level at which the analysis of approaches was made	**Training of trainers workshops**	**Communication and learning support materials**	**Onsite training and sensitization meetings**	**Music Dance and Drama**	**Radio programmes**	**School programme**	**Learning/ field exchange visits**	**Demonstrations**	**Special events**	**Manuals/books**	**Video shows**
Planning (Rwenzori Region Environmental Conservation Education Strategy											
Implementation (Implementation reports)											

One of the strength of the Rwenzori Region Environmental Conservation Education Strategy was on the use of a variety of approaches to convey environmental education messages. A strategy that uses different approaches in the same or different audience is often more effective than the strategy that uses a single approach (Jacobson *et al*., 2006). This is because particular information contained in different sources is perceived differently by different people. For instance, an individual may take environmental conservation information from a priest's homily in church more seriously than from a park ranger.

Despite this strength, there were notable pitfalls in the approaches for conveying informal environmental education messages. Firstly, some approaches if persistently used could hinder local people from heeding environmental conservation messages. A study about the relationship between Rwenzori Mountains National Park staff and local people (Cultural Values and Conservation Project, 2007) showed that local people overlooked park rangers and yet in this investigation, it was found that most of the community sensitization meetings were conducted by the park rangers. Local people may not take information from park rangers seriously and hence they may not engage in pro-conservation practices. This means persistent involvement of rangers to convey environmental conservation messages could partly affect the extent to which local people heed environmental education. Previous unsuccessful environmental education programmes implemented in a particular area hinder the success of new programmes when implemented in the same area by the same people (Musumali, Larsen & Kaltenborn, 2007; Ormsbyl & Kaplin, 2005; Roe *et al*., 2000).

Secondly, the success of informal environmental education may also be limited if it does not take into account differences in the age of the audience. In this study, it was found that the approaches used in delivering and receiving environmental education messages were not sensitive to differences in age, a factor that could limit the effectiveness of those messages. Literature suggests that the success of environmental education messages depends on differentiation of messages conveyed to the young and adults (Jacobson *et al*. 2006). The adults and the young learn in different ways and therefore should have specific education messages (Jacobson, *et al*., 2006). Given that young people often explore a "world" that is fairly close to home, Jacobson *et al*. (2006) suggests that education programmes for the young should be limited to home-based environmental concepts that are appropriate for their cognitive, affective and psychomotor levels. Since the "world" of the old people is more expanded to include a wider perspective of the environment, education programmes that accommodate their interests by focusing on complex and global issues are often suitable (Sobel, 1996).

11.5.1.6 Frequency of conveying the informal environmental education messages.

The targeted number of out puts and frequency of providing informal environmental education messages were reported in various approaches (Table 11.4). For example, the strategy targeted to conduct 124 onsite training and sensitization meetings per year, 12 radio talk shows per district per year and 2 exchange visits per year.

Table 11.4 Frequency of conveying environmental education messages in the Rwenzori Mountains

Proposed approaches	Frequency of conveying the messages proposed in the Rwenzori Region Environmental Education strategy	Frequency of conveying the messages stated in the implementation reports
Training trainers	2 workshops	Not reported
Onsite training and sensitization meetings	124 per year, 4 per parish in 31 parishes	19 in January to March. 28 in April to July. 24 in July to September. 2 trainings for porters and cooks of tourists in July to September.
Music Dance and Drama	8 groups	4 in January to March 4 in April to June 2 in July to September. 9 in October.
Radio programmes	12 radio talk shows per district	Not stated
School programme	32 wildlife clubs supported and strengthened	17 schools in January to March. 5 schools in April to June 6 schools in July to September.
Learning/ exchange visits	2 exchange visits per year, 2 tours for pupils and patrons per year	Not reported
Demonstrations	155 demonstrations (14 sub-counties and 3 farmers from each sub-county)	Not reported
Special events	2 exhibitions carried (2 per district per year)	Not reported
Manuals	1 manual developed	Not reported
Video shows	62 video shows per year (2 per parish in 31 parishes)	Not reported

Although the targets and frequency in some approaches were stated, the frequency of delivering the messages to meet those targets was not clear in some of the approaches. For example, 8 groups of Music Dance and Drama were to be trained but the frequency of conveying environmental messages by those groups was not specified. Similarly, the frequency of accessing demonstrations by the target audience was not specified although the number of demonstrations to be established was mentioned.

Informal environmental education messages change people's behaviours if they are regularly provided and received by the target audience (Jacobson *et al*., 2006). However, Jacobson *et al*. (2006) did not describe what "regular" actually meant. This made it impossible to assess whether the frequency was regularly, seasonally of infrequent. Thus in this investigation it was not clear whether the frequency was regular.

The implementation of a strategy without a specific plan of the frequency of delivering environmental education messages potentially affects the effectiveness of an education strategy (Jacobson, 2009). This was the case with the Rwenzori Region Environmental Conservation Education Strategy.

Even the information obtained from the analysis of the reports was not useful in ascertaining whether or not the messages in the identified approaches were conveyed at an appropriate frequency that could lead to their effectiveness. The analysis of the reports revealed that four of the approaches (Onsite training and sensitization meetings, Music Dance and Drama, School programme and Learning/exchange visits) reported quarterly (in January to March, April to June, July to September, and October to December) the number of times particular message were conveyed to the audience.

11.5.1.7 The language for conveying informal environmental education messages

In none of the 11 approaches suggested for conveying environmental education messages was the medium of instruction specified. For example, the communication and learning materials (posters, brochures, newsletters, pamphlets, leaf lets, calendars, booklets and T-shirts) were proposed to be developed but the language in which they would be written was not stated. Similarly, although the strategy stated that onsite training and sensitization approach would be conducted by local people, the languages in which they would be conducted were not specified and yet the Rwenzori region where the strategy was meant to be implemented had many tribes (which include Batoro, Bamba, Bakonjo, Babwisi, Basongora and Batwa) that speak different languages. Even though it was stated in the strategy that music, dance and drama as an oral medium was important in involving people who might not know English, the language in which music, dance and drama would convey the messages was not stated. The same applies to the talk shows, jingles, and spot messages that were planned to be prepared and aired on local FM radio stations as stated in the strategy.

Even in the implementation reports, the languages used to convey the messages through the onsite training and sensitization meetings, music, dance and drama, school programme, learning/ exchange visits and demonstrations approaches were not stated.

A lack of specification of the language in which the informal environmental education messages were to be conveyed was a weakness in the Rwenzori Region Environmental Conservation Education Strategy. If the language to be used is not specified from the onset and left to the discretion of the implementers, it may affect the effectiveness of the strategy. Batibo (2009) opines that in such a situation, the implementers may use the language that is convenient to them and not the language that is convenient to the target audience.

The language in which messages are communicated and received plays an important role in assimilation and application of the information contained in those messages (Maffi & Woodley, 2010). When informal environmental education is communicated in an unfamiliar language, its aim is not met because the message risks distortion and misinterpretation (Mohapatra & Chowdhury, 2006). Misinformation and incorrect perceptions about the value of biological diversity and the importance of the national parks could lead to lack of concern for natural resources by local communities.

11.6 CONCLUSION

This study appraised the role of informal environmental education in addressing the problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park. Despite the implementation of the Rwenzori Region Environmental Conservation Education Strategy the problems have persisted. This was partly due to focusing the messages on park rules and activities prohibited in the park, understanding the importance of the park and the resources therein, poor agricultural activities outside the park that should be avoided, and how to prevent crops from animals from the park and not the factors such as economic needs and beliefs, knowledge, attitudes and traditional practices that influence illegal access to the park resources.

Environmental education alone might not solve the current problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park which are ascribed to a whole set of physical, biological, ecological, economic, social and cultural factors. Informal environmental education messages need to be linked with factors (discussed in Chapter 5 to 7) that underlie people's resource needs.

CHAPTER 12

GENERAL DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

12.1 A SYNOPSIS ON THE MOTIVATION FOR THE THESIS

The thrust of this thesis was to investigate the nature and causes of problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park. The conservation of biodiversity in the park was threatened by illegal access by the neighbouring community to extract plant resources, hunt animals, and conduct various other activities such as crop cultivation. Illegal access to the park is said to have led to indiscriminate harvesting of resources which consequently had a negative impact on biodiversity in the park. Biodiversity loss and resource degradation in the Rwenzori Mountains has occurred since its establishment in 1991 (Rwenzori Mountains Environmental Conservation Education strategy, 2004). Various animal species formerly abundant in the mountains are rare as a result anthropogenic activities (Loefler, 1997).

The problems in the Rwenzori Mountains National Park are not unique to the park. Other national parks especially in Africa have similar problems. Loss of biodiversity in national parks in Africa is often attributed to illegal access and unsustainable utilisation by the neighbouring local community. There are various examples in Kenya (Warui *et al.*, 2007), Tanzania (Kideghesho *et al.*, 2007), and Namibia (Hoole and Berkes, 2010) that describe the problem. These are indicative of a myriad of studies that have attributed biodiversity loss from national parks in Africa to illegal access and unsustainable use by local people.

Two main approaches have been used in various national parks in Africa as attempts to solve the problem. One approach (the preservation approach) is aimed at strictly preventing local people from accessing park resources (Wells and Brandon, 1992). Another approach (the community-based conservation approach) is aimed at allowing local people to have limited access to park resources (International Union for Conservation of Nature, 1994). The idea behind community-based biodiversity conservation is to enable both sustainable utilisation of resources and biodiversity conservation to occur (Adams and Hulme, 2001; Western & Wright, 1994). Details about the two approaches and their evolution and implementation in Africa can be found elsewhere (Adams, 2003). Debates about which of the two approaches should be used in the conservation of biodiversity in national parks are ongoing among not only among conservation biologists but also anthropologists, social scientists, and activists of human rights.

In the Rwenzori Mountains National Park both approaches have been implemented. Initially when the Rwenzori Mountains National Park was established, the preservation approach was applied, but experience indicated that the approach did not deter illegal access but resulted in conflicts between the park staff and the local community which made the problem even more complex (Chapter 1). Similar to the Rwenzori Mountains National Park, in many national parks in Africa, biodiversity was initially

conserved through the preservation approach but due to the problems encountered as a result of this approach there has been a shift to a community-based biodiversity conservation approach (Butchart *et al.,* 2010).

Current evidence suggests that despite a shift from the preservation approach to community-based conservation approach in many national parks in Africa, biodiversity loss has persisted (Butchart *et al.*, 2010). There are various examples (for instance Alden and Mbaya, 2001 and Mogaka *et al.*, 2001) to show that even when attempts to motivate local people to support conservation in the park by giving them economic incentives or alternate livelihoods, they persistently extracted plant, animal and other resources from the park illegally. In some cases, threats to biodiversity and natural resources in national parks have intensified (Secretariat of the Convention on Biological Diversity, 2010; Shrivastava and Heinen, 2007).

Attempts to prevent local people from illegally accessing resources in national parks have led to conflicts between park administrators and the local people. These conflicts often result in persistent and indiscriminate extraction of resources from parks and sometimes in the killing of animals in the park in revenge. For instance, the burning of part of Bwindi Impenetrable National Park in western Uganda by local people was as a result of protests by local people on the establishment of the park and enforcement of park rules (Byarugaba, 2004).

In the Rwenzori Mountains National park, despite provisions to let local people have access to some resources in the park, and to enable them to benefit economically from the establishment of the park, they persistently accessed the park to illegally extract resources therein. Enormous conflicts have occurred between the park rangers and the local people (Chapter 1).

The primary question that this thesis attempted to answer was:

> "*What is the nature and possible causes of the problems associated with biodiversity conservation in the Rwenzori Mountains National Park*?"

Although the thesis was tailored towards answering this question with reference to the Rwenzori Mountains National Park, most of the findings and discussion presented apply to many national parks in a rural African context.

12.2 RATIONALE FOR THE PERSPECTIVE, THE CHOICE OF METHODS, AND CONCEPTUAL FRAMEWORK USED IN THE THESIS

Although the discipline of biodiversity conservation is ingrained in the natural sciences, a meta-data analysis of the factors enhancing or limiting successful conservation of biodiversity in national parks in Africa (Chapter 2) indicated that the majority of the factors are social rather than biological in nature.

Literature reviewed (Chapter 3) also revealed substantial evidence suggesting that people's livelihood, survival and welfare in rural African communities are directly associated with biodiversity and other natural resources. Various case studies showed a strong relationship between cultural practices and natural resource use and management (Maffi and Woodley, 2010). Therefore, an understanding of local people's cultural practices could inform conservationists about the causes of the problems associated with the establishment of national parks and how to deal with them. Also, an understanding of cultural practices could be important for biodiversity conservation through traditional biodiversity conservation strategies (Berkes *et al.*, 2000; Moller *et al.*, 2004; Mauro and Hardison, 2000). However, cultural practices are outside the realm of conservation science; a discipline which informs current approaches to biodiversity conservation. Local people's cultural practices are yet to be considered in the management of many national parks in Africa.

Studies which empirically show that cultural practices were intentionally aimed at conserving biodiversity are rare and yet empiricism is a fundamental principle of scientific inquiry and as a basis of proposing biodiversity conservation strategies (Baird & Walter, 2008). Although there are a handful of studies that empirically link biodiversity conservation to cultural practices, there is substantial evidence to show that cultural practices influence resource use (Chapter 3). Although the cultural practices of the local people are influenced by traditional beliefs and knowledge which fall outside the realm of science, they underlie how local people use resources. This happens especially in areas where local people uphold cultural norms and values. There are various examples from Cameroon, Ethiopia, Kenya, Tanzania, Uganda, and South Africa (Maffi and Woodley, 2010) which show that traditional knowledge of the people in some communities in those countries influenced how they used resources. In the Rwenzori Mountains, previous studies (for instance Kabananukya, 1996; Stacey, 2003) had documented that cultural practices of the local people were closely associated with the Rwenzori Mountains and hence could potentially influence the use of resources in the mountains.

These points of view suggest that problems associated with biodiversity conservation in national parks in rural Africa are partly socio-cultural in nature and therefore need to be investigated from a socio-cultural perspective. This is not only important for understanding the underlying causes of illegal access and utilisation of resources in national parks but also as a basis for finding ways in which to deal with unsustainable resource use.

12.2.1 The need for anthropological methodologies in biodiversity conservation research

Given that the problems associated with biodiversity conservation in national parks are partly socio-cultural in nature, anthropological methodologies ought to be used in investigating them. Therefore in order to answer the primary question that motivated this study, an anthropological approach was adopted. Given that conservation of biodiversity has been the domain of biologists who aim to understand the biology of species and habitats (Newing, 2011) natural science methodologies are often used to investigate these problems using pure scientific methodologies. It is common in natural sciences for researchers to propose a hypothesis and then design an approach to test it. Although

hypothesis testing encourages clear thinking and understanding of a situation by breaking complex phenomena into their components, it may not be feasible in research that involves social and cultural issues. Unlike the "natural world" which biological scientists investigate in disconnected parts (Newing, 2011), it is impossible to break the "social world" into a set of discrete, tightly defined elements. In both the "social world" and the "natural world", things are interlinked and if they are to be understood, they must be studied in that way (Blaikie, 1993). Anthropological methodologies unlike scientific methodologies require more in-depth understanding of an issue under investigation than establishing a causal relationship between variables and making inferences (Blaikie, 1993). Therefore, in social science, having a large representative sample that leads to statistically valid and generalisable results is often not an aim but to search deeply into a situation in its general context (White *et al*., 2005).

This thesis was therefore founded on a holistic approach for investigating the problems affecting the biodiversity conservation in the Rwenzori Mountains National Park. For example, although various studies had showed that local people illegally extracted resources from the Rwenzori Mountains National Park, the underlying factors and how they are interlinked was not explored. For instance, previous studies had indicated that the cultural practices such as traditional rituals of the people were closely associated with the Rwenzori Mountains and resources therein (Stacey, 2003; Kabananukya, 1996), how the rituals influenced access to the park was not previously investigated. The investigation of these issues therefore necessitated the adoption of a social science methodology.

12.2.2 The role of psychological theories in studying human conservation behaviours

The problems in the Rwenzori Mountains National Park that motivated this study were associated with human practices. The approaches which the park administration attempted to use to address these problems involved preventing people from engaging in these practices or by enticing them to change their practices and support the conservation of biodiversity in the park (Chapter 1). The problems and attempts used to address the problems revolved around human behaviour. For instance, contravening rules governing the park to access resources is an indication of anti-conservation behaviour and acceptance of park rules and complying with them when accessing park resources is conversely an indication of pro-conservation behaviour. Therefore in order to understand why people accessed resources illegally or why they did not support the conservation of biodiversity in the park required an understanding of factors that influence human behaviour. Psychological theories that aim to explain why people behave in the way they do were informative in this investigation. A theory of planned behavior (Chapter 4) formed a basis for the development of a theoretical framework which guided the investigation into the factors that influenced illegal access to resources in the Rwenzori Mountains National Park and other factors underlying the problems experienced as a result of establishing the park.

12.2.3 Investigating biodiversity conservation problems from the perspectives of local people

One of the unique aspects of this thesis was that the nature and the causes of the problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park were investigated from the local people's perspectives. Local people in this case are individuals living in villages that neighbour national parks. There are various examples to show that in many cases national parks in Africa were established without consulting the local people who often incur costs when they are established (Hoole and Berkes, 2010; Kideghesho *et al.*, 2007; Warui *et al.*, 2007). Also, even when there is the implementation of community-based conservation approaches, local people are involved simply to meet certain procedural requirements (Songorwa, 1999). Local people are often passive partners who receive instructions from "biodiversity conservation experts" (Kellert *et al.*, 2000). Local people contribute little in park management and decision making. Therefore, their points of view about conservation of biodiversity in national parks that they neighbour remain unknown. Such a situation often results in unsuccessful biodiversity conservation interventions.

Rwenzori Mountains National Park is a typical example of where the establishment of a park did not take into account local people's views (Chapter 1). Also in the design of community-based conservation programmes in the Rwenzori Mountains National Park, local people in villages neighbouring the Rwenzori Mountains were not involved. For this reason this study was tailor-made to understand the nature and causes of the problems affecting biodiversity conservation in the Rwenzori Mountains National Park from the local people's perspective. This was expected to enrich the current community-based conservation programmes so that a more effective strategy could be proposed.

12.3 NATURE AND CAUSES OF PROBLEMS IN THE RWENZORI MOUNTAINS NATIONAL PARK

From the onset, this thesis was geared toward the understanding of the nature and causes of the problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park. The first part of this section presents a discussion on the nature of the problem and the second part discusses why despite the current interventions, the problems have persisted. The discussion in the second part draws from the theoretical framework that guided the study and presents a model showing how different factors influencing illegal utilisation of resources from the Rwenzori Mountains National park by local people are interlinked. The third part presents a framework for a holistic community-based conservation strategy that could potentially address the problems.

12.3.1 The nature of the problem

It was found that the nature of the problem affecting the Rwenzori Mountains National Park was the illegal use of resources from the park by the local community. The park was established mainly for the conservation of biodiversity with minimal and controlled subsistence utilisation of resources therein (McCall, 1996). This means that biodiversity conservation (a prime reason for the

establishment of the park), superseded extractive and non-extractive use of resources by local people. Contrary to this premise, local people accessed the park for extractive and non-extractive resource use (Chapter 5 to 8). Therefore, the nature of the problem faced by the Rwenzori Mountains National Park administration was illegal access to the park because it undermined the principle for which the park was established.

The focus of the park administration was to prevent illegal activities and not to address factors (such as the actual species demanded, the activities engaged in, the number of people involved in resource extraction, the frequency of resource extraction, and how the resources were extracted) which determine whether or not sustainable utilisation of resources occurs. Illegal access to park resources does not automatically mean that unsustainable resource use occurs. For instance, it has been found in many cases that subsistence use of resources by local people does not necessarily threaten biodiversity (Carruthers, 1995). Utilisation of resources becomes a conservation issue when the rate of harvest of resources by people is higher than the rate at which regeneration of resources occurs (Belem *et al*., 2006; Turner, 2007; Wild and Mutebi, 1996). This can occur even when a restricted number of people are allowed to harvest particular resources. For instance, when people use poor methods of harvesting plant resources such as extraction of roots, cutting the entire tree, removing the bark, the utilisation of those plant species may become a conservation concern (Chapter 5; Turner, 2007). Therefore, the Rwenzori Mountains National Park staff should not only attempt to address illegal access to resources but also how resources are used by the few people that are allowed access. This would require taking into account the factors that influence illegal use that is more likely to promote unsustainable utilization of resources are explored in the next section.

12.3.2 The factors underlying the problem and how they are interlinked

Possible causes of the problems associated with the conservation of biodiversity in the Rwenzori Mountains National Park were explored in the introductory chapter (Chapter 1). The causes pointed out were based on studies in the literature associated with the contextual issues in the Rwenzori Mountains (Rwenzori Think Tank, 2011) and on the management of the park. Based on this study, illegal access which is more likely to promote unsustainable use of resources in the Rwenzori Mountain National Park was comfirmed to be an issue of human behaviour as predicted at the commencement of the research (Chapter 4). Illegal access to the park was a function of myriad factors which are categorized into two: one category constitutes factors inside the individual's mindset and the second factors outside the individual's mindset (Figure 12.1). Factors outside the individual's mindset are futher distinguished into groups of factors such as: 1) socio-economic factors, 2) cultural factors, 3) environmental factors, 4) factors associated with need, and an aggregation of groups of factors that directly influence sustainable or unsustainable use of resources.

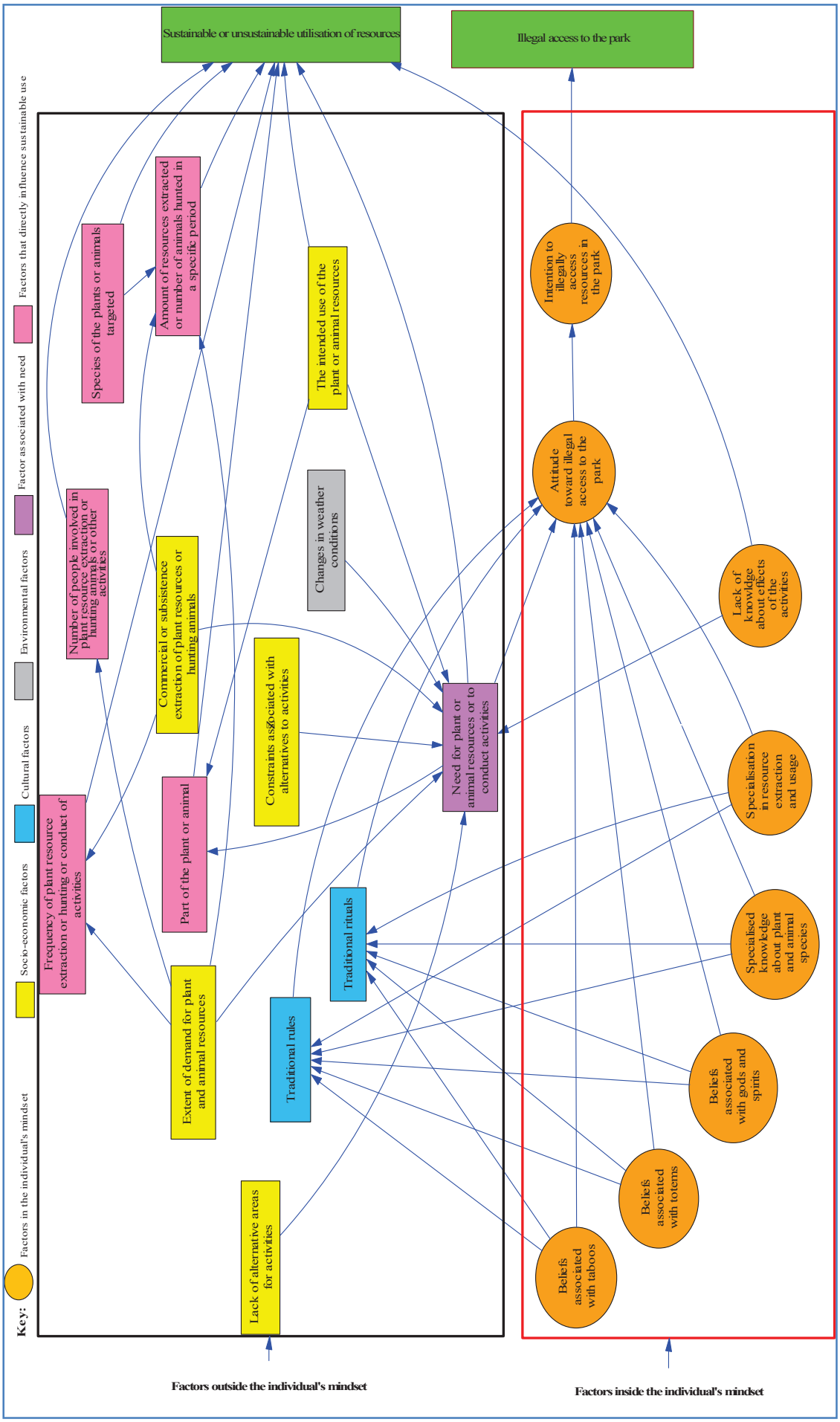

Figure 12.1 A scheme of factors underlying illegal access to and utilisation of resources in the Rwenzori Mountains National Park.

Although the cause-effect relationship among the factors is simplified in Figure 12.1, in reality, the relationship is very complex and it varies depending on the park resources targeted. For instance socio-economic factors are driven by other factors such as household size, high levels of unemployment, age, and gender of resource users. These factors were explored in previous studies in the Rwenzori Mountains (Tumusiime *et al*., 2011). These factors (even though external) they are highly depended on factors in the mindsets of individuals which was largely the focus of this thesis. The factors identified are important antecedents for pro-conservation or counter conservation behaviours of individuals.

The immediate determinant of illegal access to and utilisation of park resources is the intention to illegally access and utilise resources in the park. Intention constitutes conceptions formed by directing the mind toward an object (Chapter 4). In the context of this study, intention means conceptions formed by directing the mind toward access and utilisation of resources in the park. The interpretation of behaviour and behavioural intentions is subjective. The intention to perform a behaviour may not always result in the desired behaviour. For example, if people in the Rwenzori Mountains use the park resources in a particular way to avoid the punishment from the mountain gods (Chapter 8) and that intention results in conservation, one could erroneously assume the person's original intention was to conserve. Moreover, if intention resulted in unsustainable harvest of the resource, then the individual's original intention would be misinterpreted as indiscriminate use of resources. An understanding whether the individual's intention was to illegally extract resources with or without the intention for sustainable utilisation necessitates exploring the factors underlying the intention.

Intention to have access to park resources is influenced by attitude (a settled way of thinking or feeling about something) toward illegal access to the park. If the attitude toward illegal access to the park is positive, the individual is more likely to engage in illegal activity. For example, individuals with an attitude that they have a right to use resources even if those resources are in a protected area are likely to engage in illegal activities. Similarly, those with the attitude that resources in the park are abundant, are more likely to illegally extract those resources than those with the attitude that resources in the park are diminishing.

Various interventions that attempt to involve local communities in the management of national parks aim at changing people's attitudes toward the conservation of biodiversity in the park (Chapter 2). However, such interventions have been futile because they do not address the factors underlying the attitude. An individual's attitude that resources in the park are diminishing may not be enough to deter the individual from illegally accessing those resources. There are various other factors that directly or indirectly influence an individual's attitude towards the park. In this study eight factors that directly influence attitudes of individuals were indentified. These include: 1) beliefs associated with taboos, 2) beliefs associated with totems, 3) beliefs associated with gods and spirits, 4) specialized knowledge about plant and animal species, 5) specialization in resource extraction and usage, 6) the need for plant or animal resources or to conduct activities, 7) traditional rules, and 8) traditional rituals. Factors 6, 7 and 8 are influenced by factors 1, 2, 3, 4 and 5 and various other factors (Figure 12.1). Given the

complex interaction of the factors and for easy presentation of ideas, these factors shall be discussed in the framework of the model adopted from the theory of planned behavior (Chapter 4).

12.3.2.1 Need for resources

This factor encompasses the need for plant or animal resources or engagement in the activities in the park which influences the individual's attitude. This suggests that the need for resources influences an individual's favourable or unfavorable evaluations of engaging in illegal access to resources in the park. The need for resources also influences the part extracted from the plant or animal and sustainable or unsustainable utilisation of resources.

Local people in many rural areas of Africa are said to depend directly on environmental resources for livelihood and survival (Mamo *et al*., 2007). It has been suggested in various studies that addressing the "need" factor would solve the problem of illegal access to park resources (Child, 1993; Fiallo & Jacobson, 1995; Gadgil, 1992). Community-based conservation initiatives are often proposed and implemented on this basis (Child, 1993). Even in the Rwenzori Mountains National Park, community-based conservation initiatives were proposed based on the understanding that local people's need for resources from the park was responsible for their illegal access to the park.

However, community-based conservation initiatives in most national parks in Africa have generally failed to address the problem of illegal access to park resources (Chapter 2). The reason could be that these initiatives ignore other factors that influence resource need. For example, in the Rwenzori Mountains National Park, it was found that underlying the need for resources were seven factors six of these emanated from the external milieu (outside the mindset of the individual). For instance, lack of alternative areas for activities prompted people to conduct those activities in the park. Lack of alternatives to park resources was previously reported in the literature as a determinant factor of illegal access to park resources (Balikoowa, 2008; Borrini-Feyerabend *et al*., 2004; Tumusiime *et al*., 2011).

In community-based conservation initiatives, alternative sources of livelihoods are often implemented as a way of mitigating illegal access to protected areas. However, unless the alternative sources of livelihoods address the need for resources, the individual continues to have positive attitudes towards illegal access to resources in the park. In the Rwenzori Mountains National Park, the failure of the alternative sources of livelihoods to change people's behaviour could have partly been as a result of inability of the alternatives to address the individual's resource needs and attitudes. Therefore, in order to address attitudes of an individual toward the park, the choice of the part of the plant or animals extracted, and sustainable utilisation of resources in the park would partly require addressing not only the "need" factor but also the underlying factors.

12.3.2.2 Behavioural beliefs and individual attitude

Behavioural beliefs constitute what people believe about behaviour (Chapter 4). In the context of this study, behavioural beliefs comprise traditional beliefs in gods and spirits, taboos and totems that influence resource use. Beliefs held by individuals affect their attitude towards the conservation of biodiversity in the Rwenzori Mountains National Park. For instance, hunters believed that animals in the park are owned by a god (Kalisya) and that gods must be appeased to successfully hunt those animals (Chapter 8). Such a belief may be related to the real or perceived outcome of how the animal shall be hunted by an individual. They believed that gods (and not the park rangers) had the mandate to control hunting of animals in the park. Such a belief influenced people's attitude to hunt animals in the park. If the outcome is favorable and satisfies the needs of the individual, then the individual is likely to use park resources in that particular way. In this case, how the individual uses the resources is a factor of the individual's beliefs about the "rewardibility" of a particular way the resource is used. This explains why some hunters believed that engaging in hunting pleased the god of wild animals and in return he (the god) rewarded them with successful hunting in future.

Although traditional beliefs could have a role to play in fostering better conservation of parks, in some cases, they influence illegal use of resources and act as a barrier to the acceptance of conservation of objectives by local people. Traditional beliefs make people sustain a cultural attachment to resources in the park and hence they are compelled to defy park rules to access protected area resources. In the process of infusing traditional beliefs in the management of national parks, care must be taken to sieve out the ones that may be counter conservation and address them through environmental education (Chapters 10 and 11).

12.3.2.3 Subjective norms and normative beliefs

Subjective norms and normative beliefs constitute perceptions of social pressures to perform or not to perform a behaviour (Chapter 4). Individuals exist within a community, and may have beliefs about community norms and how the community will judge anyone harvesting resources from the park. In this context, normative beliefs are beliefs of individuals about whether people important to them or the local community in which they live approve or disapprove their illegal practices in the park. For instance, some animals are totems to relatives of individuals, the beliefs about hurting a totem of one's relative might therefore influence the attitude an individual will have toward particular species of animals. Also, the local community expects males and females to play different roles in resource extraction and utilisation.

Hunting was an activity only conducted by males and it was against the norms and values of the community for females to engage in hunting. Therefore, females would not illegally go to the park to hunt. In such a case, illegal access and utilisation of resources in the park is a function of social pressures on which resources are extracted and how they are utilised. Therefore, if an individual in the Rwenzori Mountains believes that the community or people important to him or her approve the way

he or she uses the resource, the individual is more likely to use the resource in the park in that particular way.

12.3.2.4 Perceived behavioural control and control beliefs

Perceived behavioural control constitutes perceptions of an individual on whether or not he or she can control the behaviour. This depends on beliefs (control beliefs) on whether the person actually has control over successful engagement in a behaviour or not. Individuals who feel that they are in control are more likely to perform the behaviour than those who believe that outside factors control their behaviour. In the context of this study, perceived behavioural control beliefs are beliefs of individuals about whether they are in control when they illegally access resources in the park and use them in a particular way. Such beliefs are associated with gods and spirits and influence the individual's perception of whether he or she is in control of the way resources are used.

For instance, individuals had beliefs associated with hunting which influenced them to perform rituals before engaging in poaching. These rituals involved tools and other hunting gear (Chapter 8). Successful performance of rituals could have made the individuals believe that they were in control during hunting and therefore were more likely to engage in poaching. In such a case, beliefs are a function of the individual's capability, skills, tools and expertise that are required to facilitate successful illegal access to the park. The Omusekera ritual (Chapter 8) for instance might have made individuals believe that they stood a better chance of illegally accessing the park and even when caught they would not be penalized. This means that individuals who conducted that ritual developed a perception that they were in control when illegally accessing the park resources. Such a perception could have consequently influenced the attitude to have access to park resources.

The presence or absence of other people in order to access resources in the park is another example of perceived behavioural control. For instance, some people collaborated with each other in order to access resources in the park. They alerted each other about the presence of park rangers in the park so that they are not arrested. In this case, an individual, who collaborated with other people, developed a perceived ability to negotiate patrols in the park and hence access resources illegally. Individuals with perceived ability to negotiate park patrols consequently developed an attitude to have access to resources in the park.

Generally, even when the individual's attitude is directed toward illegal access to resources in the park, the attitude is unlikey to translate the intention into action if he or she does not have the perceived ability to negotiate the constraints associated with illegal access to the park.

12.3.2.5 Knowledge of the individual

Individuals make decisions that govern behaviour based on their knowledge. Knowledge acquired by an individual may affect the attitude of that individual toward natural resource use and conservation.

Knowledge could lead to both pro-conservation and counter-conservation behaviours. In some cases, the more knowledge people have about environmental issues, the more helpless they may feel and give up doing anything to protect the environment. A form of knowledge that could influence an individual's behaviour in local traditional communities such as the Rwenzori Mountains could be contemporary scientific knowledge or traditional ecological knowledge.

In this study, the influence of both forms of knowledge on local people's attitude to have access to resources was evident. Individuals who had knowledge about uses of certain resources developed the attitude to have access to those resources. Some people were only engaged in hunting and others were only engaged in collection of plant resources. Non-herbalists (presumably without knowledge for medicinal herbs) did not have the attitudes to collect herbs. Similarly, non-hunters did not have the attitude of hunting animals.

Knowledge about resource use and biodiversity conservation also influenced what an individual perceived as the effect of his or her access to the park. For instance, some people did not have knowledge about the potential effect of their activities on the park. This could have influenced their perception about their effects on the park. In this case, they could have perceived that their access to the park did not have any effect and yet there are various effects of activities on the park (Chapter 7) and as demonstrated in other studies (Brockington, 2002; Brockington and Schmidt-Soltau, 2004).

Individuals who thought that resources were available in the park even for future generations were more likely to have an attitude that influenced their intention to have access to park resources than those who thought the resources were less abundant. These points of view suggest that knowledge is a fundamental factor that influences or hinders illegal access to resources in protected areas by local people.

12.4 POSSIBLE REASONS FOR THE CONTINUED ILLEGAL ACCESS TO THE RWENZORI MOUNTAINS NATIONAL PARK

Various interventions implemented in the Rwenzori Mountains National Park to address illegal access were ineffective (Chapter 1). This could have been as a result of four factors which include: 1) inappropriate methods of enforcing national park rules and regulations, 2) failure to target the underlying needs of the community when suggesting and providing alternatives to those needs, 3) weaknesses in resource use agreements, and 4) failure of environmental education to target the factors in the individual's mindset that influenced illegal access to the park.

12.4.1 Methods of effecting park rules were inappropriate

Although national park rules were implemented with an aim of preventing or allowing limited access to resources in the park, the way they were implemented prompted people not to follow them. Local people found the rules governing restricted access to the park difficult to follow especially when they

urgently needed resources (Chapter 9). As a consequence, people in urgent need of resources resorted to illegally accessing the park.

Also, the implementation of park rules conflicted with traditional practices associated with resource use. For instance, traditional beliefs are strong antecedents to illegal access to resources in the park (Chapter 8). During the harvesting of some of the resources, it was a traditional requirement that some people perform certain traditional rituals in isolation and yet according to the regulations governing restricted access to the park, park rangers were supposed to accompany resource users. This means that the presence of park rangers would be against the norms for the conduct of the traditional practices and consequently resource users defied some provisions in the regulations governing the park.

12.4.2 Weaknesses in resource use agreements and collaborative resource use arrangements

Resources that local people were allowed to access through resource use agreements were not necessarily the ones they needed. This finding is particularly important for the Rwenzori Mountains National Park administration because if the park administration conducts an assessment of abundance of resources that people are allowed to access, they may get a false impression when they find out that the resources are utilised at a sustainable level and yet resource users are actually harvesting other resources. This means that resources which people are allowed to get from the park do not address their resource needs.

The Rwenzori Mountains National Park administration did not take into account the "need" factor when implementing resource use agreements. For instance, there was a diversity of resource needs among the community members (Chapters 5 to 7) and yet in the implementation of the alternative resource use strategy, the park administrators assumed that all the people needed the same resources. People in rural African communities even when they appear to be of the same economic status, require different resources for livelihood and survival (Strædea and Treue, 2006). People are less likely to accept conservation strategies if those strategies conflict with what they require from the park more especially when people do not have alternatives to park resources. Evidently, lack of alternatives to resources strongly influenced access to park resources among the community neighbouring the Rwenzori Mountains National Park. However, this does not necessarily mean that people are less likely to depend on the park resources if they engage in other survival or income-generating activities.

An understanding of people's preference of park resources and an assessment of the pattern of extraction can contribute to a better understanding of the scope and nature of problem associated with illegal access to resources in protected areas (Cunningham, 2001). Such an understanding can form a basis upon which more realistic and effective community-based biodiversity conservation strategies can be proposed.

12.4.3 Environmental education did not target the underlying factors influencing illegal access to the park

The aim of environmental education is to provide knowledge and understanding and influence people's attitudes toward environmental protection and biodiversity conservation (Ajam & Iguchi, 2003; Mucunguzi, 1995; Nomura and Hendarti, 2005; Oonyu, 2001). The success of environmental education depends on the nature of its content and the extent it addresses the factors underlying the behaviour that needs to be enhanced or discouranged (Chapters 10 and 11).

Based on the factors that influence local people's intentions to illegally access resources in the Rwenzori Mountains National Park (Figure 12.1) and environmental education implemented in the community neighbouring the park (Chapter 10 and 11) information in formal and informal environmental education programmes targeted local people's illegal practices but not the underlying factors that influenced the practices. For instance, formal environmental education implemented in primary and secondary schools in the Rwenzori Mountains did not address attitudes of learners and yet attitudes are important determinants of environmental behaviour (Abazi, Ismaili & Srbinovski, 2007). Also, informal environmental education in the Rwenzori Mountains aimed at promoting acquisition of knowledge among the community and yet acquisition of knowledge about the environment does not necessarily lead to pro-conservation behaviour (Kuhar *et al*., 2007). Therefore, even when people have knowledge about biodiversity, it does not automatically mean that they will conserve biodiversity. Therefore, local people persistently defied rules against illegal access to the park.

12.5 PROPOSAL FOR A HOLISTIC FRAMEWORK FOR COMMUNITY-BASED BIODIVERSITY CONSERVATION: THE ENAD MODEL

The factors that influenced illegal access and sustainable or unsustainable utilisation of resources in the Rwenzori Mountains National Park were interlinked (Figure 12.1) and a consideration of that inter-linkage is essential for implementing a holistic framework for community based-biodiversity conservation. This thesis has shown that local people illegally access the Rwenzori Mountains National Park for plant resources, animal resources and activities.

Illegal access to the park for plant resources was influenced by the need for plant resources, the use to which resources are put, the extent of demand for resources, and the purpose of harvesting resources (commercial or subsistence) (Chapter 5). Illegal access to the park for animal resources was influenced by the need for animal resources, the use of the part extracted, the purpose (commercial or subsistence extraction) and the extent of demand for body parts/ animal products (Chapter 6). Illegal access to the park for activities was influenced by the need to conduct activities in the park, changes in weather conditions, constraints associated with alternatives, lack of alternative areas to conduct the activities, and lack of knowledge about the potential negative effect the activities have on the park (Chapter 7). Underling all these factors are traditional beliefs and knowledge, and practices of the people.

The interlinkage in these factors is not only within factors as a group (such as those influencing illegal access to plant resources or animal resources) but also among groups of factors. For instance, the need for a particular resource in some cases was found to be a pre-requisite for the need of other resources. For example, individuals needed to obtain branches of *Dracaena fragrans* so that they can jump them in a ritual that was required before going to hunt (see detailed description in appendix 8.1). But also the stem of *Dracaena fragrans* was required for fencing. This means resource use by local people is dependent on what they need to fulfill directly or indirectly. What they need to fulfill is also influenced by various other factors. This illustrates the complex inter-linkage among the factors which is necessary to consider in community-based conservation strategies.

It would be important to address all the factors involved directly or indirectly if the problems associated with illegal resource use are to be mitigated and this forms a basis for suggesting the holistic framework for community-based biodiversity conservation. However, it is obvious that in such a complex relationship among factors, it is difficult to tease out how to deal with each of the factors. In this thesis an approach on how to deal with the factors is proposed.

Although the factors are interlinked, there are some factors which only influenced other factors but were not influenced by any factor. These factors included: all the factors inside the individual's mindset (except attitude toward illegal access to the park and intention to illegally access resources in the park) and seven factors outside the individual's mindset which comprised: 1) lack of alternative areas for activities, 2) extent of demand for plant and animal resources, 3) constraints associated with alternative areas for activities, 4) commercial or subsistence extraction of plant resources or hunting animals, 5) changes in weather conditions, 6) species of the plants or animals targeted, and 7) the intended use of the plant or animal resources (Figure 12.2). When these factors are targeted, other factors that influence illegal access to the park and sustainable or unsustainable use of resources will be indirectly influenced. For instance all cultural factors and factors associated with need, will be indirectly addressed.

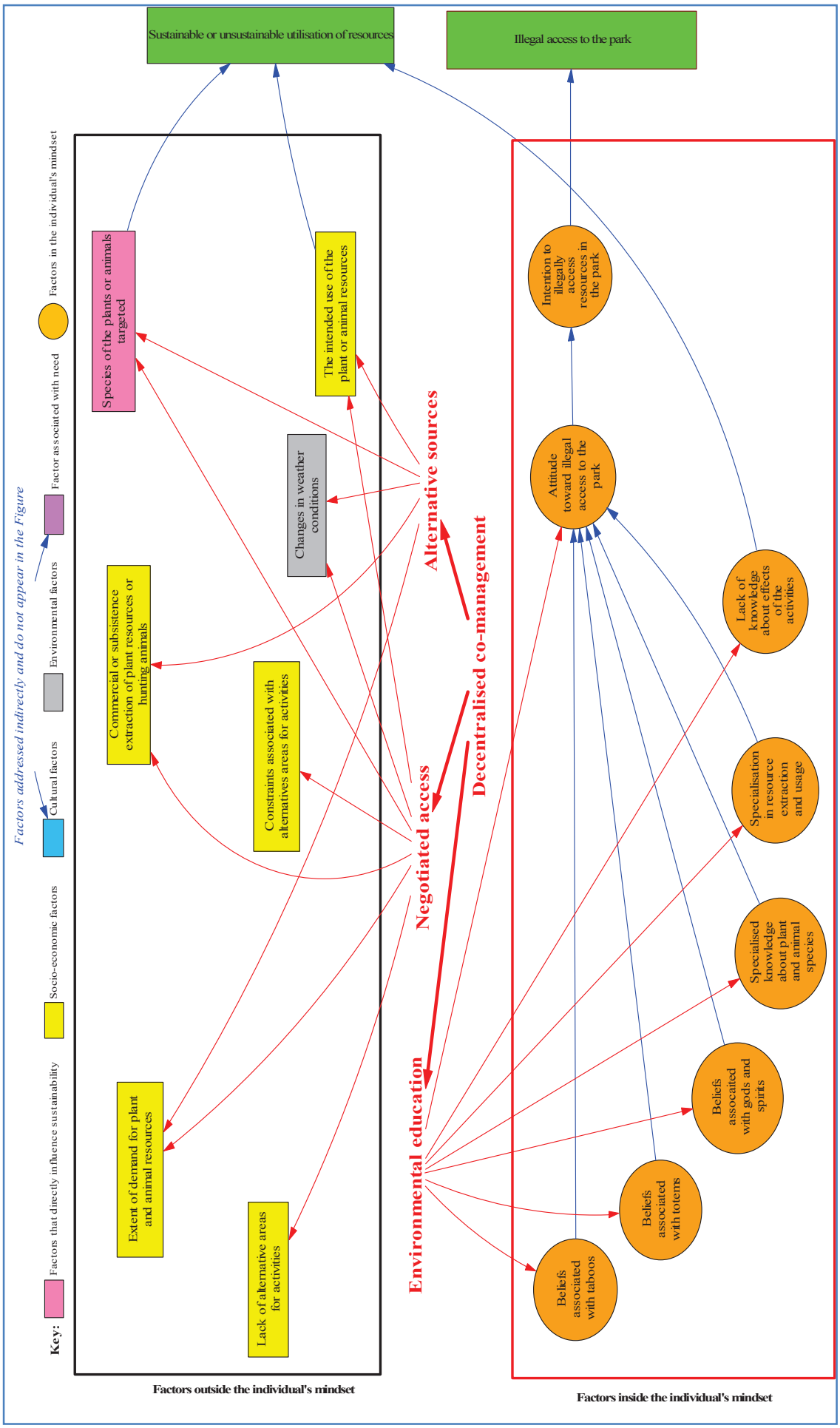

Figure 12.2 A framework for holistic community-based biodiversity conservation in the Rwenzori Mountains National Park

Four interventions including: 1) **E**nvironmental education, 2) **N**egotiated access, 3) **A**lternate sources, and 4) **D**ecentalised co-management could potentially address these factors. These interventions constitute the proposed **ENAD MODEL** for community-based conservation of national parks in the rural African context. Although these interventions are common components of current community-based conservation approaches, they are usully implemented in piecemeal and disjointed manner and not based on the local context (Chapter 2). In the proposed framework, these interventions need to be implemented holistically and be tailored toward a particular context. In the case of the Rwenzori Mountains National Park, what each of these interventions should constitute and how they should be implemented are discussed in the proceeding sections (sections 12.5.1 to 12.5.4).

12.5.1 Environmental education

This intervention shall consititute both formal and informal environmental education that takes into account factors inside the individual's mindset that influence illegal access and use of resources in the park. These factors shall be taken into account in environmental education in two ways: firstly by targeting environmental education messages toward beliefs and knowledge that influence counter-conservation behaviours and secondly by developing environmental education content that integrates traditional beliefs and knowledge. Various traditional beliefs were found to influence counter-conservation behaviours of the local people (Chapter 8). For instance, hunters believed that not hunting was disrespect to Kalisya, the god of hunters, and they therefore engaged in huting just for the sake of pleasing the god. Also, some of them believed that once they appeased the god, they could hunt all the animals in the park without the rangers noticing. Such beliefs can influence indiscriminate killing of animals. Additionally, some people engaged in illegal activities in the park thinking that the activities do not have any effect (Chapter 7). Environmental education could inculcate into the local people an understanding of the effects of activities on the park. Futher environmental education would contain information about the negative effect of poaching (Chapter 6) and harvesting certain plant resources (Chapter 5) on the conservation of biodiversity in the park.

Also, it was shown that traditional beliefs and knowledge are closely associated with resource utilisation and conservation (Chapter 8). Such an association could be integrated in environmental education content to make it easier to comprehend and to contextualize it by building on the perspective of the local people and what they already know. For instance, taboos against acessessing certain areas or extracting certain resources could be synergised with the current rules and regulations governing the park.

12.5.2 Negotiated access

This intervention constitutes controlled and monitored access to the park for certain resources or activities. Negotiated access could deal with seven factors which include: 1) lack of alternative areas for activities, 2) extent of demand for plant and animal resources, 3) commercial or subsistence extraction of plant resources or hunting animals, 4) constraints associated with alternative areas for

activities, 5) species of the plants and animals targeted, 6) changes in weather conditions, and 7) the intended use of the plant or animal resources (Figure 12.2).

Negotiated access could be applied under the following circumstances: where some areas areas (such as sacred sites) in the park which people need to access for traditional rituals but do not have alternative areas, where extent of demand for plant and animal resources is high, where there is subsistence extraction of plant resources or hunting animals, where there are constraints associated with alternative areas for activities, where species of plants and animals that are targeted could be utilised within sustainable levels, when changes in weather conditions threaten local people's survival, and where the intended use of the plant or animal resources cannot be provided in alternate ways.

12.5.3 Alternate sources

This intervention involves the provision of alternatives to resources that people need from the park or activities they need to conduct therein. This intervention would address five factors which include: 1) extent of demand for plant and animal resources, 2) commercial or subsistence extraction of plant resources or hunting animals, 3) changes in weather conditions, 4) species of the plants or animals targeted, and 5) the intended use of the plant or animal resources (Figure 12.2).

Alternate sources intervention could be implemented under certain circumstances such as: where extent of demand for plant and animal resources is high (for instance cultivation of plants on private land or provision of animal products from domestic animals), where the extraction of resources is for commercial purposes (for instance creation of employement opportunities for the people involved in illegal activities for economic gain), where the changes in weather affect people's livelihoods (for instance farming in wetlands could be permited for some crops such as vegetables that are less destructive to the wetlands), where the species targeted are of conservation concern such as rare or endemic species, and when the intended use of plant or animal resources can be provided though suitable alternatives. Generally, the provision of alternate sources intervention is likey to succeed when the alternates are appropriate and acceptable to the local people.

12.5.4 Decentralised co-management

The implementation of environmental education, negotiated access, and alternate sources interventions would require the use of the existing traditional leadership structures. Successful conservation of biodiversity in national parks is often more successful when management of the park is effected through local administrative structures than through decrees from an authority exogenous to the community (Kasparek, 2008; Roe *et al.* 2000; Vodouhê *et al.*, 2010). For instance, negotiated access to the Rwenzori Mountains National Park for resources could be implemented by decentralizing decision making on applications from resource users to the park outposts by a committee constituted by ridge leaders and Uganda Wildlife Authority staff instead of forwarding them to the Uganda Wildlife Authority park headquarters.

Also, an updated inventory of plant and animal species selected for utilisation could be kept at the park outpost and a copy given to ridge leaders so that it can be made easy for resource users to know which resources are available for harvest. This could save time for resource users to seek permission and to harvest resources and reduce the possibility of accessing park resources illegally due to a lengthy bureaucratic process followed when seeking for permission (Chapter 9).
The involvement of traditional leaders in the monitoring of resource use could complement the activities of staff employed to manage the park. Lack of adequate staff to patrol and monitor illegal resource use is one of the factors limiting successful conservation of biodiversity in national parks in Africa (Chapter 2). Generally, successful implementation of decentalised co-management intervention in the Rwenzori Mountains National Park shall depend on continued existence of traditional practices and leadership structures and whether they are cherished by the resource users.

12.6 GENERAL CONCLUSIONS

The aim of this thesis was to understand the nature and possible causes of the problems associated with biodiversity conservation in the Rwenzori Mountains National Park. The ultimate goal was to propose a framework for more effective community-based conservation of biodiversity not only in the Rwenzori Mountains National Park but also in other national parks in a rural African context.

One of the contributions of this study was a deeper understanding of some of the underlying causes of illegal access to park resources from a socio-cultural perspective. Factors such as the cost of collection (based on distance to the source of forest products), amount of returns from collection of forest products, availability of alternative income generating options, overall economic status of the household in terms of total land area under cultivation, and availability of labor force were the only ones previously documented in literature (Guthiga and Mburu, 2006; Holmes, 2003a; Newmark and Hough, 2000; Marcus, 2001; Shylajan, 2001; Shrivastava and Heinen, 2007; Stedman, *et al*., 2005). This research has not only addeded other factors such as: the need for resources, the intended use of the resources, the purpose (commercial or subsistence) of collecting the resources, and the traditional knowledge, beliefs and practices of resource gatherers, but has also shown how they are interlinked.

Using a psychological approach based on the theory of planned behavior to understand human behaviour toward conservation, this research has revealed that many of the factors that influence illegal access to resources in the Rwenzori Mountains National Park are less obvious and unanticipated because they are situated in the individual's mindset. Failure to address these factors in current community-based conservation intervention and directing conservation interventions to the more obvious factors associated with commercial and subsistence resource needs has caused persistence of the problems facing the park.

12.7 GENERAL RECOMMENDATIONS

An understanding of the factors underlying illegal access to national parks forms a basis for proposing more effective interventions to address the problems. The factors need to be handled holistically through the integration of socio-cultural aspects and actual needs of the local people. Given that the factors that influence illegal access to resources in the park are partly psychological, in the holistic approach, environmental education that people receive should target the factors in the mind-set of individuals and take into consideration the socio-economic and cultural factors in the external milieu (outside the mindset) of individuals. Revision of resource use agreements should take into consideration: a) actual resource needs of the people in quantity and quality in a defined period, b) possible ways of controlled cooperative hunting, and c) the existing traditional leadership structures in managing resource use agreements and implementation of park rules and regulations.

The staff of Uganda Wildlife Authority especially wardens and rangers in charge of community conservation should not only have skills in ecology and species conservation but also in social and community mobilization. This is necessary because problems that affect effective conservation of biodiversity are largely socio-cultural in nature and hence require anthropogenic approaches in addition to the current ecological interventions.

REFERENCES

Abazi, A., Ismaili, M., & Srbinovski, M. (2008). Environmental education for sustainability in republic of Macedonia: Some problems and prospects. Paper presented at to 4th International Conference on Environmental Science and Technology. Houston, 14–18 September.

Abd-El-Khalick, F., & Akerson, V. (2007). On the role and use of "theory" in science education research: A response to Johnston, Sutherland, and Sowell. *Science Education*, 91(1), 187–194.

Abensperg-Traun, M. (2009). CITES: Sustainable use of wild species and incentive-driven conservation in developing countries, with an emphasis on southern Africa. *Biological Conservation*, 142, 948–963.

Adams, W., & Hulme, D. (2001). Conservation and community: Changing narratives, policies and practices in African conservation: In D. Hulme & M. Murphree (Eds.), *African wildlife and livelihoods: The promise and performance of community conservation* (pp. 9–23). Oxford: James Currey.

Adams, W., & Thomas, D.H.L. (1996). Conservation and sustainable resource use in the Hadejia-Jama'are Valley, Nigeria. *Oryx*, 30, 13–142.

Adams, W. (2003). Nature and the colonial mind. In W.M. Adams & M. Mulligan (Eds.), *Decolonizing nature: Strategies for conservation in a post-colonial era* (pp. 16–50). London: Earthscan.

Adams, W. (2004). *Against extinction: The story of conservation*. London: Earthscan.

Agrawal, A. (1995). Dismantling the divide between indigenous and scientific knowledge. *Development and Change*, 26, 413–439.

Agrawal, A. (2002). Indigenous knowledge and the politics of classification. *International Social Science Journal*, 54(173), 287–297.

Agrawal, B. (1997). Environmental action, gender equity and women's participation. *Development and Change*, 28, 1–4.

Aguilar, G. (2001). Access to genetic resources and protection of traditional knowledge in the territories of indigenous peoples. *Environmental Science & Policy*, 4, 24–256.

Ajam, M., & Iguchi, J.N. (Eds.). (2003). Environmental *public awareness campaigns in Sabah: Case studies.* Kota Kinabalu, Public Awareness Component, Bornean Biodiversity and Ecosystem Conservation (BBEC) Programme in Sabah.

Ajiboye, J.O., & Olatundun, S.A. (2010). Impact of some environmental education outdoor activities on Nigerian primary school pupils' environmental knowledge. *Applied Environmental Education & Communication*, 9(3), 149–158.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behaviour and Human Decision Processes*, 50, 179–211.

Ajzen, I., & Madden, T. (1986). Prediction of goal-directed behaviour: attitudes, intentions and perceived behavioural control. *Journal of Experimental Social Psychology*, 22, 453–474.

Albers, H.J., & Grinspoon, E. (1997). A comparison of enforcement of access restrictions between Xishuangbanna nature Reserve (China) and Khao Yai National Park (Thailand). *Environmental Conservation*, 24(4), 351–362.

Alcon, J.B. (1993). Indigenous peoples and conservation. *Conservation biology*, 7(2), 424–426.

Alden, W.L., & Mbaya, S. (2001). *Land, people and forests in Eastern and Southern Africa at the beginning of the 21st century*. Nairobi, IUCN-EARO. Accessed on 23rd May 2012 from http://data.iucn.org/dbtw-wpd/edocs/2000-019-07.pdf

Alexiades, M.N., & Shanley, P. (2004). Forest products, livelihoods and conservation: Case studies of non-timber forest product systems. Translated from Alexiades, M.N. & Shanley, P. (2004). *Productos forestales, medios de subsistencia conservación: Estudios de caso sobre sistemas de manejo de productos forestales no maderables*. CIFOR: Indonesia.

Alpert, P. (1995). Integrated conservation and development: Applying ecological research at integrated conservation and development projects. *Ecological Applications*, 5, 570–582.

Al-Sa'ed, R., Abu-Madi, M., & Heun, J. (2009). Advancing environmental education and training for sustainable management of environmental resources in Palestine. *Applied Environmental Education & Communication*, 8(1), 30–39.

Altinyelken H.K. (2010). Curriculum change in Uganda: Teacher perspectives on the new thematic curriculum. *International Journal of Educational Development*, 30, 151–161.

Alvard, M. (1993). Testing the ecologically noble savage hypothesis: Inter-specific prey choice by Piro hunters of Amazonian Peru. *Human Ecology*, 21, 355–387.

Alvard, M.S. (1994). Conservation by native peoples: Prey choice in a depleted habitat. *Biosocial perspective*, 5, 12–54.

Amori, G., & Gippoliti, S. (2003). A higher-taxon approach to rodent conservation priorities for the 21st century. *Animal Biodiversity and Conservation,* 26, 1–18.

Amum, P., & Eves, H.E. (2009). *BEAN Bushmeat fact sheet: Boma National Park assessment, Southern Sudan*. Bushmeat-free Eastern Africa Network. Accessed on 17th May, 2010 from www.bushmeatnetwork.org.

Anderson, D., & Grove, R. (1987). *Conservation in Africa: People policies and practice*. Cambridge: Cambridge University Press.

Anderson, David G., & Eva, B. (Eds.). (2003). *Ethnographies of Conservation: Environmentalism and the distribution of privilege*. New York: Berghahn Books.

Anne, E.M. (2004). *Measuring biological diversity*. United States of America: Blackwell Publishing Company.

Antons, C. (2010). The role of traditional knowledge and access to genetic resources in biodiversity conservation in southeast Asia. *Biodiversity Conservation*, 19, 1189–1204.

Archabald, K., & Naughton-Treves, L. (2001). Tourism revenue-sharing around national parks in Western Uganda: Early efforts to identify and reward local communities. *Environmental Conservation*, 28(2), 135–149.

Archie, M. (2003). *Advancing education through environmental literacy*. Alexandria: Association for Supervision and Curriculum Development.

Audesirk, T., & Audesirk, G. (1996). *Biology: Life on Earth* (4th ed.). United States of America: Macmillan Publishing Company.

Baird, F.E., & Walter, K. (2008). *From Plato to Derrida*. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Balikoowa, K. (2008). *Impacts of Bwindi Impenetrable National Park on local peoples' livelihoods*. Unpublished Master's Thesis. University of Norway - Norway.

Bandura A. (1997). *Self efficacy: the exercise of control*. New York, USA: W.H. Freeman and Company.

Barnett, R. (2000). *Food for Thought: The utilisation of wild meat in Eastern and Southern Africa*. Nairobi, Kenya: TRAFFIC East/Southern Africa.

Barrett, C.B., & Arcese, P. (1995). Are conservation-development projects sustainable? On the conservation of large mammals in Sub-Saharan Africa. *World Development,* 23, 1073–1084.

Barrow, E., & Murphree, M. (2001) Community conservation: From concept to practice. In D. Hulme & M. Murphree (Eds.), *African Wildlife and livelihoods: The promise and performance of community conservation*, (pp. 24–37). Oxford: James Currey.

Barry, C. (2006). Environmental education is history: The extent to which modern history education adopts characteristics of Socially Critical Environmental Education. *Australian Journal of Environmental Education*, 22 (1), 3–13.

Basalirwa, C.P.K. (1995). Delineation of Uganda into climatological rainfall zones using the method 15 of Principal Component Analysis, *International Journal of Climatology*,15,1161–1177.

Basil, D. (1994). *The search for Africa, history, culture, politics*. New York: Random House.

Bassi, M. (2006). Community-conserved landscape of the Oroma-Borana, Ethiopia. Case study 21. In L. M. Worboys, & A. Kothari. *Managing protected Areas: A Global Guide* (pp.45–60). London: Earthscan.

Bates, P., Chiba, M., Kube, S., & Nakashima, D. (Eds.). (2009) *Learning and knowing in indigenous societies today*. Paris: United Nations Educational and Scientific Cultural Organisation. Accessed on 24th September 2012 from http://portal.unesco.org/science/en/ev.php-URL_ID=7509&URL_DO=DO_TOPIC&URL_SECTION=201.html

Bateson, G. (1979). *Mind and Nature: A Necessary Unity*. New York: Dutton.

Batibo, H.M. (2009). Transmitting indigenous knowledge through the school curriculum in a diminishing bio-cultural environment: The case of Botswana. In P. Bates, M. Chiba, S. Kube, & D. Nakashima (Eds.), *Learning and Knowing in Indigenous Societies* (pp. 121–129). Paris: UNESCO.

BBC on line (2010). *Uganda's highest ice cap splits on Mt Margherita* http://news.bbc.co.uk/2/hi/africa/8658270.stm.

Bekalo, S.A., & Bangay, C. (2002). Towards effective environmental education in Ethiopia: Problems and prospects in responding to the environment poverty challenge. *International Journal of Educational Development,* 22, 35–46.

Belcher, B., Cunningham, A.B., & Campbell, B.M. (2005). Livelihoods, carving and conservation. In: A., Cunningham, B. Campbell, and B. Belcher (Eds.), *Carving out a future: forests, livelihoods*

and the international woodcarving trade (pp. 1–9). People and Plants Conservation Series. London: Earthscan.

Belcher, B., Ruíz Pérez, M., & Achdiawan, R. (2005). Global patterns and trends in the use and management of commercial Non Timber Forest Products: Implications for livelihoods and conservation. *World Development,* 33(9), 1435–452.

Belem, B.B., Nacoulma, M.I., Gbangou, R., Kambou, S., Hansen, H.H., Gausset, Q., … Boussim, I.J. (2006). Use of non wood forest products by local people bordering the Parc National Kabor Tambi, Burkina Faso. *Journal of Transdisciplinary Environmental Studies*, 6, 21–27.

Belesky, J. (1999). Misrepresenting communities: The politics of community-based rural ecotourism in Gales Point Manatee, Belize. *Rural Sociology*, 64(4), 641–666.

Beltrán, J. (Ed.). (2000). *Indigenous and Traditional Peoples and Protected Areas: Principles, Guidelines and Case Studies*. Switzerland, Gland: International Union for Conservation of Nature.

Berkes, F. (1999). *Sacred ecology: Traditional ecological knowledge and resource management*. London: Taylor and Francis.

Berkes, F. (2008). *Sacred Ecology*. USA: Routledge Publishers.

Berkes, F. (Ed.). (1989). *Common property resources, ecology and community-based sustainable development*. London: Belhaven Press.

Berkes, F., Colding, J., & Folke, C. (2000). Rediscovery of traditional ecological knowledge as adaptive management. *Ecology Applied*, 10, 1251–1262.

Berkes, F., Folke, C., & Gadgil, M. (1995). Traditional ecological knowledge, biodiversity resilience and sustainability. In C.A Perrings (Ed.), *Biodiversity Conservation* (pp. 281–299). Netherlands: Kluwer Academic Publishers.

Berkes, F., Kislalioglu, M., Folke, C., & Gadgil, M. (1998). Exploring the basic ecological unit: Ecosystem-like concepts in traditional societies. *Ecosystems*, 1(5), 409–415.

Betti, J.L. (2006). An ethno-botanical study of medicinal plants among the Baka pygmies, in the Dja biosphere Reserve, Cameroon. *African Study Monographs*, 25(1), 1–27.

Bhagwat, A.S., & Rutte, C. (2006). Sacred groves: Potential for biodiversity management frontiers. *Ecology and the Environment*, 4(10), 519–524.

Bhagwat, D. (1958). *An Outline of Indian Folklore*. Bombay: Popular Book Depot.

Blaikie, N. (1993). *Approaches to social equity*. Cambridge: Polity press.

Bluhm, W.J. (1994). *A prototype environmental education curriculum for the middle school: A Discussion Guide for UNESCO Training Seminars on Environmental Education*. UNESCO Netherlands: Evironmental Education Unit printery.

Born, J., Boreux, V., & Lawes, M.J. (2009). Synthesis: Sharing ecological knowledge, the way forward. *Biotropica*, 41(5), 586–588.

Borrini-Feyerabend, G. (1999). Collaborative management of protected areas. In S. Stolton, & N. Dudley. (Eds.). *Partnerships for protection: New strategies for planning and management of protected areas*. London: Earthscan Publications.

Borrini-Feyerabend, G., Kothari, A., & Oviedo, G. (2004). *Indigenous and local communities and protected areas. Towards equity and enhanced conservation.* Best Practice Protected Area Guidelines Series No 11. Cambridge: IUCN /WCPA.

Borzekowski, D. (2011). Planning to hook up: Using the theory of planned behavior to explain concurrency intentions among youth from three countries. *Journal of Adolescent Health*, 48 (2), 81–112.

Brashares, J., Arcese, P., Sam, M.K., Coppolillo, P.B., Sinclair, A.R.E., & Balmford, A. (2004) Bush meat hunting, wildlife declines and fish supply in West Africa. *Science*, 306, 1180–1183.

Brito, D., Ambal, R.G., Brooks, T., De Silva, N., Foster, M., Wang, H., … Rodriguez, J.V. (2010). How similar are national red lists and the IUCN Red List? *Biological Conservation*, 143, 1154–1158.

Brockington, D., & Schmidt-Soltau, K. (2004). The social and environmental impacts of wilderness and development. *Oryx*, 38, 140–142.

Brockington, D. (2002). *Fortress conservation: The preservation of the Mkomazi Game Reserve, Tanzania*. Indiana: Indiana University Press.

Brook, K.R., & McLachlan, M.S. (2008). Trends and prospects for local knowledge in ecological and conservation research and monitoring. *Biodiversity Conservation*, 17, 3501–3512.

Brown, K. (1997). Plain tales from the grasslands: extraction, value and utilisation of biomass in Royal Bardia National Park, Nepal. *Biodiversity and Conservation*, 6, 59–74.

Brush, S.B. (2005). *Farmers' rights and protection of traditional agricultural knowledge*. CAPRi WORKING PAPER NO. 36. International Food Policy Research Institute.

Burgess, N., Per, W.K., Mutke, J., Brown, J., Westaway, S., Turpie, S., … Lovett, J.C. (2005). Major gaps in the distribution of protected areas for threatened and narrow range Afro tropical plants. *Biodiversity and Conservation*, 14, 1877–1894.

Butchart, S.H., Walpole, M., Collen, B., Strien, A., Scharlemann J.P.W., Almond, R.E.A., …Watson, R. (2010). Global Biodiversity: Indicators of Recent Declines. *Science*, 328 (5982), 1164–1168.

Byarugaba, D., & Nakakeeto, R.F. (2008). *Indigenous knowledge and conservation attitudes on biodiversity outside protected area systems in Uganda: Igara County Scenario.* Paper presented at the International Conference on Traditional Forest Knowledge and Sustainable Forest Management in Africa. Ghana, 15th–17th October.

Byarugaba, D. (2004). *Utilization, abundance, distribution and domestication of wild yams (Dioscorea sp.) in and around Bwindi National Park, South Western Uganda*. Unpublished PhD Thesis, Mbarara University of Science and Technology, Uganda.

Byarugaba, D. (2010). Integrating indigenous knowledge, active conservation and wild food plant use with reference to *Dioscorea species* in Bwindi forest, South-western Uganda. *African Journal of Ecology*, 48, 539–540.

Byers, B.A., Cunliffe, R.N., & Hudak, A.T. (2001). Linking the conservation of culture and nature: a case study of sacred forests in Zimbabwe. *Human Ecology*, 29, 187–218.

Caliendo, S., & Kyle, W. (1996). Establishing the theoretical frame. *Journal of Research in Science Teaching*, 33(3), 225–227.

Callicott, J.B., & Roger, T.A. (Eds.). (1989). *Nature in Asian Traditions of Thought: Essays in Environmental Philosophy*. Albany: State University of New York Press.

Camp, W.G. (2001). Formulating and evaluating theoretical frameworks for career and technical education research. *Journal of Vocational Education Research*, 26(1), 1–17.

Campbell, L.M. (1998). Use them or lose them? Conservation and the consumptive use of marine turtle eggs at Ostional, Costa Rica. *Environmental Conservation*, 25, 305–19.

Campbell, L.M. (2000). Human needs in rural developing areas: perceptions of wildlife conservation experts. *The Canadian Geographer*, 44, 167–181.

CARE. (1999). *Study of the demand for wood resources from Queen Elizabeth National Park, Uganda*. Unpublished report. CARE international.

Carleton-Hug, A., & Hug, J.W. (2010). Challenges and opportunities for evaluating environmental education programs. *Evaluation and Program Planning*, 33, 159–164.

Carruthers, J. (1989). Creating a national park, 1910 to 1926. *Journal of Southern African Studies*, 15 (2), 188–216.

Carruthers, J. (1995). *The Kruger National Park. A social and political history*. Pietermaritzburg: University of Natal Press.

Carter, R., & Simmons, B. (2010). The history and philosophy of environmental education. In Bodzin, A.M. (Eds.). *The Inclusion of Environmental Education* 3 *in Science Teacher Education*, (pp. 3–16). USA: Springer Science and Business Media.

Caspary, H.U. (1999). *Utilisation de la faune sauvage en Cote d'Ivoire et en Afrique de l'Quest - Chaudes, Tropenokologiches Begleitprogramm (TOB*). Accesed on 12th March 2012 from http://www.fao.org/docrep/MEETING/007/J1457E.HTM

Cavanagh, S. (1997). Content analysis: concepts, methods and applications. *Nurse Researcher*, 4, 5–16.

Cavendish, W. (2000). Empirical regularities in the poverty environment relationship of rural households: Evidence from Zimbabwe. *World Development*, 28(11), 1979–2003.

Ceríaco, L.M.P., Marques, M.P., Madeira, N.C., Vila-Viçosa, C.M., & Mendes, P. (2011). Folklore and traditional ecological knowledge of geckos in Southern Portugal: Implications for conservation and science. *Journal of Ethnobiology and Ethnomedicine*, 7(26), 1–9.

Chalmers, N., & Fabricius, C. (2007). Expert and generalist local knowledge about land-cover change on south Africa's Wild Coast: can local ecological knowledge add value to science? *Ecology and Society*, 12(1), 10–23.

Chao, Y. (2012). Predicting people's environmental behaviour: theory of planned behavior and model of responsible environmental behaviour. *Environmental Education Research*, 18(4), 437–461.

Chapman, A.D. (2009). *Numbers of living species in Australia and the world* (2nd ed.), Australia: Australian Biodiversity Information Services.

Chardonnet, P.B., des Clers, J., Fischer, R. Gerhold, F. Jori Z., & Lamarque, F. (2002). The value of wildlife. *Reviews of Science and Technology*, 21(1), 15–51.

Chase, J. M., Abrams, P. A., Grover, J.P., Diehl, S., Chesson, P., Holt, R.D.,… Case, T.J. (2002). The interaction between predation and competition: A review and synthesis. *Ecology Letters*, 5, 302–315.

Chawla, T. (1998). Significant life experiences revisited: A review of research on sources of environmental sensitivity. *Environmtal Education*, 4(4), 369–382.

Checkland, P. (1993). *Systems thinking, systems practice*. United Kingdom: Wiley Publishers.

Chen, T., & Chao, S. (2011). Habitual or reasoned? Using the theory of planned behavior, technology acceptance model, and habit to examine switching intentions toward the public. *Traffic Psychology and Behaviour*, 14(2), 128–137.

Chen, Z., Yang, J., & Xie, Z. (2005). Economic development of local communities and biodiversity conservation: A case study from Shennongjia National Nature Reserve, China. *Biodiversity and Conservation*, 14, 2095–2108.

Cheng, A.S., & Mattor, K.M. (2006). Why won't they come? Stakeholder perspectives on collaborative national forest planning by participation level. *Environmental Management*, 38(4) 545–561.

Chhetri, P., Mugisha, A., & White, S. (2002). Community resource use in Kibale and Mt. Elgon National Parks, Uganda. *Parks*, 13(1), 28–38.

Child, B. (1993). *Zimbabwe's CAMPFIRE Programme: Using the high value of wildlife recreation to revolutionize natural resource management in communal areas*. Paper presented at the 14th Commonwealth Forestry Conference. London, 14th–18th September.

Christie, M.J. (1991). Aboriginal science for the ecologically sustainable future. *Australian Science Teachers Journal*, 37, 26–31.

Cinne, E.J. (2007). The role of taboos in conserving coastal resources in Madagascar. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin*, 22, 15–23.

Cloud, A. (2005). *Educating for a Sustainable Future A National Environmental Education Statement for Australian Schools*. Australia: Published by Curriculum Corporation. Accessed from www.deh.gov.au/education 16th November 2013.

Coad, L, Campbell, A., Miles, L., & Humphries, K. (2008). *The costs and benefits of protected areas for local livelihoods: A review of the current literature*. Cambridge: United Nations Environment Programme.

Cocks, M. (2006). Biocultural diversity: Moving beyond the realm of indigenous and local people. *Human Ecology*, 34(2), 185–200.

Cohn, J.P. (1988). Culture and conservation: A greater sensitivity to local culture could increase the success of both conservation and development projects. *BioScience*, 38(7), 450–453.

Colchester, M. (2003). *Salvaging nature: Indigenous peoples, protected areas and biodiversity conservation*. 2nd Edition. Accessed on 12th December 2009 from www.wrm.org.uy/subjects/PA/texten.pdf

Colchester, M. (2004). Conservation policy and indigenous peoples. *Environmental Science and Policy,* 7, 145–153.

Colding, J., & Folke, C. (2001). Social taboos: "Invisible" systems of local resource management and biological conservation. *Ecological Applications*, 11, 584–600.

Colding, J. (1998). Analysis of hunting options by the use of general food taboos. *Ecological Modelling*, 11, 5–17.

Colding, J. Folke, C., & Elmqvist, T. (2003). Social institutions in ecosystem management and biodiversity conservation. *Tropical Ecology*, 44(1), 25–41.

Collinson, M., Kok, P., & Ganenne, M. (2006). *Migration and changing settlement patterns: Multilevel data for policy*. Report no. 03-04-01. Accessed on 23rd April 2012 from http://www.statssa.gov.za/PublicationsHTML/Report-03-04-01/html/Report-03-04-01_3.html

Concise Oxford English Dictionary, 11th Edition. United Kingdom: Oxford.

Conklin, H. (1957). *Hanunoo Agriculture: A report on an integral system of shifting cultivation in the Philippines*. Rome: FAO Forestry Development Paper 12. Accessed on 12th February 2011 from http://classes.yale.edu/02-03/anth500a/projects/project_sites/00_neidel/hanunoo&ifugao.htm

Constantine, R., Brunton, D.H., & Dennis, T. (2004). Dolphin-watching tour boats change dolphin (*Tursiops truncatus*) behaviour. *Biological Conservation*, 117, 299–307.

Conte, C.A. (2002). Imperial science, tropical ecology, and indigenous history: Tropical research stations in northeastern German East Africa, 1896 to the present. In G. Blue, M. Bunton and R. Croizier (Eds.) *Colonialism and the modern world: selected studies* (pp. 34–41). New York: Armonk M.E. Sharpe.

Coomes, O.T. (1995). A century of rain forest use in western Amazonia. *Forest Conservation and History,* 39, 108–120.

Corsiglia, J., & Snively, G. (1995). Global lessons from the traditional science of long-resident peoples. In G. Snively and A. MacKinnon (Eds.). *Thinking globally about mathematics and science education* (pp. 25–51). Vancouver: University of British Columbia, Research and Development Group.

Coulibaly-Lingani, P. (2011) *Appraisal of the participatory forest management program in southern Burkina Faso*. Unpublished PhD thesis. Acta Universitatis Agriculturae, Burkina Faso.

Coulibaly-Lingani, P. Savadogo P., Tigabu, M., & Oden, P. (2011). Factors influencing people's participation in the forest management program in Burkina Faso, West Africa. *Forest Policy and Economics*, 13, 292–302.

Crona, B., & Bodin, Ö. (2006). What you know is who you know? Communication patterns among resource users as a prerequisite for co-management. *Ecology and Society*, 11(2), 7–28.

Cullis, A., & Watson, C. (2005). Winners and losers: Privatizing the commons in Botswana. Accessed on 15th may 2008 from http://www.iied.org/docs/drylands/secur_comm9.pdf.

Cultural values and Conservation Project (2007a). Cultural values and sacred sites in conservation and management of protected areas: A case for Rwenzori Mountains National Park. CVCP project FFI and UWA.

Cultural Values and Conservation Project report. (2007b). *Field notes about sacred sites in the mountain areas of Kasese, Kabarole and Bundibugyo districts*. Kasese: Unpublished.

Cultural Values and Conservation Project. (2007c). Workshop proceedings Integration of cultural values into protected Area Management Rwenzori Mountains National Park. 22nd –23rd February 2007. Virina Gardens Hotel Kasese, Uganda. Fauna and Flora International and Uganda Wildlife Authority.

Cunningham, A., Campbell, B., & Belcher, B. (Eds.). (2005). *Carving out a future: forests, livelihoods and the international woodcarving trade*. People and Plants Conservation Series, London: Earthscan.

Cunningham, A.B. (1996). *People, park and plant use. Recommendations for multiple-use zones and development alternatives around Bwindi impenetrable National Park Uganda.* People and Plants working paper 4. UNESO. Paris, France.

Cunningham, A.B. (2001). *Applied Ethnonotany: People, Wild Plant Use & Conservation.* London: Earthscan.

Cunningham, A.B. (2005). Global overview: Tradition, technology and trade. In: A., Cunningham, B. Campbell, and B. Belcher (Eds.), *Carving out a future: forests, livelihoods and the international woodcarving trade* (pp. 11–27). People and Plants Conservation Series. London: Earthscan.

Darkoh, M.B.K. (2009). An overview of environmental issues in Southern Africa. *African Journal of Ecology*, 47(1), 93–98.

Davidson-Hunt, J.I., & Berkes, F. (undated). *Changing Resource Management Paradigms, Traditional Ecological Knowledge, and Non-timber Forest Products* (pp. 78–92). Non Timber Forest Products Conference Proceedings, Canada 12th – 15th July.

Davis, A., & Wagner, R.J. (2003). Who Knows? On the importance of identifying "experts" when researching local ecological knowledge. *Human Ecology*, 31(3) 463–489.

Davis, K.D. (2005). Indigenous knowledge and the desertification debate: Problematising expert knowledge in North Africa. *Geoforum*, 36, 509–524.

Davis, S. (1988). Aboriginal tenure of the sea in Northern Arnhem Land. In G. Gray & L. Zann (Eds.), *Traditional knowledge of the marine environment of Northern Australia (no pages)*. Great Barrier Reef Marine Park Authority. Workshop Series No. 8.

Davis, S.H. (Ed.). (1993). *Indigenous views of land and the environment. The international bank for reconstruction and development*. United States: The World Bank.

Decker, D.J., Brown, T.L., & Siemer, W.F. (2001). *Human dimension of wildlife management in North America*. Bethesda: The Wildlife Society.

DeGeorges, P.A., & Reilly, B.K. (2009). The Realities of community-based natural resource management and biodiversity conservation in Sub-Saharan Africa. *Sustainability*, 1, 734–788.

DeGeorges, P.A., & Reilly, B.K. (2008). *A critical evaluation of conservation and development in Sub Saharan Africa*. Lewiston, New York: The Edwin Mellen Press.

Devall B. (2006). Conservation of biodiversity: opportunities and challenges. *Human Ecology Review*, 13(1), 60–75.

Dewar, R. (1984). Extinctions in Madagascar: The Loss of the Subfossil Fauna. In P. Martin & R. Klein (Eds.), *Quaternary Extinctions* (pp.574–593). Tucson: University of Arizona Press.

Diamond, J. (1986). The golden age that never was. *Discover*, 9, 70–79.

Dikirr, P.M. (2008). The challenges of indigenizing Africa's environmental conservation goals. *The Journal of Pan African Studies*, 2(3), 81–99.

Disinger, J.F. (1985). What research says: Environmental education's definitional problem. *School Science and Mathematics,* 85(1), 59–68.

Dove, M.R. (2006). Indigenous people and environmental politics. *Annual review of anthropology*, 35, 191–208.

Dovie, D. B.K., Witkowski, E.T.F., & Shackleton, C.M. (2008). Knowledge of plant resource use based on location, gender and generation. *Applied Geography*, 28, 311–322.

Drummond, A. (1995). *Enos Mills: Citizen of nature*. Boulder, CO: University of Colorado Press.

Dudley, N., Belokurov, A., Borodin, O., Higgins-Zogib, L., Hockings, M., Lacerda, L., & Stolton, S. (2004). *How effective are protected areas? A preliminary analysis of forest protected areas*. Parties of the Convention on Biological Diversity: WWF International.

Durkheim, E. (1965). *The Elementary Forms of the Religious Life*. New York: The Free Press.

Durning, A. (1991). Asking how much is enough. In World Watch Institute, Washington, *State of the World* (p. 161). Washington District Council: World Watch Institute.

Dusseldorp, G.L. (2012a). Studying prehistoric hunting proficiency: Applying optimal foraging theory to the piddle palaeolithic and middle stone age. *Quaternary International*, 252, 3–15.

Dusseldorp, G.L. (2012b). Tracking the influence of technological change on Middle Stone Age hunting strategies in South Africa. *Quaternary International*, 2, 70–9.

Economic Commission for Africa (2008). *Technology Parks, Incubation Centres, Centres of Excellence: Best Practices and Business Model Development in North and Southern Africa.* First Session of the Committee on Development Information, Science and Technology Addis Ababa, Ethiopia 28th April–1st May. Accessed on 15 January 2011 from http://knusttechpark.com/E–ECA–CODIST–1–14–EN.pdf.

Economic commission for Africa (2001). *State of the environment in Africa*. ECA/FSSDD/01/06. Addis Ababa Ethiopia.

Elliott, J. (2005). Conceptual/operational frameworks. Workshop paper presented at the Association of International Agricultural and Extension Education conference, San Antonio, 12th–15th July.

Elo, S., & Kyinga, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing* 62(1), 107–115.

Elton, C.S. (1958). *The Ecology of Invasions by Animals and Plants*. London: Methuen

Emerton, L. (1998). The nature and benefits of nature: Why wildlife conservation has not economically benefited communities in Africa. Paper No. 5. England: Institute for Development Policy and Management, University of Manchester.

Emsley, J. (1991). Piecing together a safer insecticide. *New Scientist*, 132, 24.

Ernst, S. (2011). Uganda: Consequences of the establishment of Rwenzori Mountains National Park. *Geographische Rundschau*, 63(2), 57–63.

Escobal, J., & Aldana, U. (2003). Are non-timber forest products the antidote to rainforest degradation? *World Development*, 31, 1873–1887.

Eves, H.E. (2006). *The bushmeat crisis in central Africa: Resolving a common pool resource problem in the common interest*. Un published PhD thesis. Yale University, United States of America.

Ewers, R.M., & Laurance, W.F. (2006). Scale-dependent patterns of deforestation in the BrazilianAmazon. *Environmental Conservation*, 33, 203–211.

FAO. (2004). *The bush meat crisis in Africa: Conciliating food security and biodiversity conservation in the continent*. A paper presented at the 23rd regional conference for Africa. Johannesburg South Africa, 1–5th March,

FAO. (2009). *State of the World's Forests 2009*. FAO working papers.

Fauna and Flora International-Uganda Wildlife Authority (2012). *Current status, ownership and management of sacred sites in Rwenzori Mountains National Park*. Uganda: Kampala. Accessed from http://sacrednaturalsites.org/items/current-status-ownership-and-management-of-sacred-sites-in-the-rwenzori-mountains/ 2nd December 2013.

Ferrie, G.M, Bettinger, L.T., Kuhar, W.C., Lehnhardt, K., Apell, P., & Kasoma, P. (2011). Assessing community understanding of local environmental issues in two areas of Uganda. *Applied Environmental Education & Communication*, 10(1), 52–62.

Feyerabend, P. (1987). *Farewell to Reason*. London, UK: Verso.

Fiallo, E.A., & Jacobson, S.K. (1995). Local communities and protected areas: Attitudes of rural residents towards conservation in Machalilla National Park, Ecuador. *Environmental Conservation*, 22, 241–249.

Fiedler, P.L., & Subodh, K.J (Eds.). (1992). *Conservation biology: The theory and the practice of nature conservation, preservation and management*. London: Chapman and Hall.

Finney, S. K., Pearce-Higgins, J.W., & Yalden, D.W. (2005). The effect of recreational disturbance on an upland breeding bird, the golden plover *Pluvaialis apricaria*. *Biological Conservation*, 121**,** 53–63.

Fischer, J.B. (1981). Wood healing by exposed secondary xylem in Adansonia (Bombacaceae) *International Association of Wood Anatomists Bulletin*, 2 (4), 193–199.

Fisher, M. (2004). Household welfare and forest dependence in southern Malawi. *Environment and Development Economics*, 9, 135–154.

FitzGibbon, C.D., Mogaka, H., & Fanshawe, J.H. (2000). Threatened mammals, subsistence harvesting and high human population densities: A recipe for disaster. In Robinson, J.G. and Bennett E.L. (Eds). *Hunting for sustainability in tropical forests* (pp.154–167). Columbia: Colombia press.

Foltz, R.C. (2003). Does nature have historical agency? World history, environmental history, and how historians can help save the planet. *History Teacher*, 37(1), 9–28.

Foodnet. (2009). *Summary of livelihood zones -livelihood zones in Uganda*. No publishers. Accessed on 18 April 2013 from http://www.foodnet.cgiar.org/scrip/docs&databases/ifpristudies_ug_nonscrip/pdfs/more_reports/Livelihood%20Zones%20of%20Uganda.pdf.

Ford, P. (1986). *Outdoor education: Definition and philosophy*. Rural Education and Small Schools: ERIC Clearing House.

Freese, C.H. (1997). The "use it or lose it" debate: Issues of a conservation paradox. In C.H. Freese (Ed.), *Harvesting wild species: Implications for biodiversity conservation*. (pp 1–48). London: The Johns Hopkins University Press.

Frei B., Baltisberger, M., Sticher, O., & Heinrich, M. (1998). Medical ethnobotany of the Zapotecs of the Isthmus-Sierra (Oaxaca, Mexico): Documentation and assessment of indigenous uses. *Journal of Ethnopharmacology*, 62, 149–165.

Fricke, K.A., Kempema S.L.F., & Powell L.A. (2009). Ecology of small mammals, vegetation, and avian nest survival on private rangelands in Nebraska. *Great Plains Research,* 19, 65–72.

Fumihiko, S. (2007). *Local council commons management in Uganda: A theoretical reassessment*. Un published Msc. Dissertation. University of London: Graduate School of International Development, London.

Gadgil, M. (1992). Conserving biodiversity as if people matter: A case study from India. *Ambio*, 21, 266–270.

Gadgil, M., Berkes, F., & Folke, C. (1993). Indigenous knowledge for biodiversity conservation *Ambio*, 4, 151–156.

Gadgil, M., Olsson, P., Berkes, F., & Folke, C. (undated). Exploring the role of local ecological knowledge in ecosystem management: three case studies. In B. Fikred, C. Johan & F. Carl (Eds.). *Navigating social-ecological systems building resilience for complexity and Change* (pp. 189–209). Cambridge: Cambridge University Press.

Gall, M., Borg, W.R., & Gall, J.R. (1996). *Educational research* (6th Ed.). New York: Longman publishers.

Galvin, K.A., Thornton, P.K., Roque, P.J. Sunderland, J., & Boone, R.B. (2006). Integrated modeling and its potential for resolving conflicts between conservation and people in the rangelands of East Africa. *Human Ecology*, 34(2), 155–183.

Gemmell, B. (2001). *Managing agricultural resources for biodiversity conservation: A guide to best practices.* Draft version. UNEP/UNDP GEF Biodiversity Planning Support Program.

Ghimire, K. B., & Pimbert, M.P. (1997). *Social change and conservation: Environmental politics and impacts of national parks and protected areas*. London: Earthscan.

Gibbi, S., Linkie, M., & Leader-Williams, N. (2008). Evaluating the legacy of an integrated conservation and development project around a tiger reserve in India. *Environmental conservation*, 35 (4) 1–9.

Gibson, C.C., & Marks, L. (1995). Transforming rural hunters into conservationists: An assessment of community-based wildlife management programs in Africa. *World Development*, 23(6), 941–957.

Giles, H., Makoni, S., & Dailey, M.R. (2005). Intergenerational communication beliefs across the lifespan: Comparative data from Ghana and South Africa. *Journal of Cross Cultural Gerontology*, 20, 191–211.

Gilligan, B. (2006). The Indigenous Protected Areas Programme. Evaluation by commonwealth of Australia. Retrieved on 18th May 2010 from www.deh.gov.au/indigenous/publications/ ipa-evaluation.html

Gillingham, S., & Lee, P.C. (1999). The impact of wildlife-related benefits on the conservation attitudes of local people around the Selous Game Reserve, Tanzania. *Environmental Conservation*, 26, 218–228.

Given, D.R., & Norton, D.A. (1993). A multivariate approach to assessing threat and for priority setting in threatened species conservation. *Biological Conservation*, 64, 57–66.

Given, D.R. (1990). *Priorities for threatened plant conservation*. Unpublished report by Botany Institute, DSIR Land Resources, Christchurch, United Kingdom.

Glasman, L.R., & Albarracin, D. (2006). Forming attitudes that predict future behaviour: A meta-analysis of the attitude-behaviour relation. *Psychological Bulletin*, 2, 778–822.

Glynn, J.L. (2000). Environment-based education: Creating high performance schools and students Washington, D.C.: NEETF. Retrieved on May 18, 2010.from http://neetf.org/pubs/NEETF8400.pdf

Godoy, R., & Lubowski, R. (1992). Guidelines for the economic valuation of non-timber tropical-forest products. *Current Anthropology*, 33, 423–433.

Golson, J. (1977). No room at the top: Agricultural intensification in the New Guinea highlands. In J. Allen, J.Golson, & R. Jones (Eds.), *Prehistoric studies in southeast Asia, Melanesia and Australia* (pp. 601–638). London: Academic Press.

Griffin, S., Valois, T., Taper, M.L., & Mills, L.S. (2006). Effects of tourists on behaviour and demography of Olympic Marmots. *Conservation Biology Volume*, 21 (4), 1070–1081.

Gupta, A.K. (1999). Compensating local communities for conserving biodiversity: How much, who will, how and when. In E. Lakshman, D. Guruswamy & J.A. McNeely (eds.). *Rewarding Local Communities for Conserving Biodiversity: The Case of the Honey Bee in Protection of Global Biodiversity* (pp. 180–189). London: Duke University Press.

Gupta, A.K. (undated). Fishing in the 'troubled' waters: Recognizing, respecting, and rewarding local ecological knowledge. Innovations and practices concerning aquatic biological diversity project report. Retrieved on 14th February 2012.from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.21.249&rep=rep1&type=pdf

Gürsoy, E. (2010). Implementing environmental education in foreign language teaching to young learners. *Educational Research*, 1(8), 232–238.

Guthiga, P., & Mburu, J. (2006). Local communities' incentives for forest conservation: Case of Kakamega forest in Kenya. A paper presented at the 11th Biannual Conference of International Association for the Study of Common Property (IASCP). Bali Indonesia, 19th –23rd June,.

Guthrie, J., Yongvanich, K., & Ricceri, F. (2004). Using content analysis as a research method to inquire into intellectual capital reporting. *Journal of Intellectual Capital* 5, 282–293.

Hackett, R.I.J. (1994). Art and religion in Africa: Some observations and reflections. *Journal of Religion in Africa*, 24, 294–308.

Hadley, M. (2002). *Biosphere Reserves: Special Places for People and Nature*. Paris: UNESCO Man and the Biosphere Programme.

Hamersley, C.F., Chambers, F., & Beckley, T.M. (2003). Public involvement in sustainable boreal forest management. In C.M.P.J. Burton, D.W. Smith, & W.L. Adamowicz (Eds.), *Towards sustainable management in the boreal forest* (pp. 113–154). Canada: NRC Research Press.

Hames, R. (2007). The ecologically noble savage debate. *The Annual Review of Anthropology*, 36, 177–190.

Hammerman, W. (1980). *Fifty years of resident outdoor education 1930-1980: Its impact on American education*. Martinsville: The American Camping Association.

Hans, H., & Dorica, A. (2011). *Are our children learning? Numeracy and literacy across East Africa*. Kenya: Uwezo Unit, Twaweza.

Harcourt, A.H. (1995). Is the gorilla a threatened species? How should we judge? *Biological Conservation,* 75, 165–176.

Hardesty, D.L. (1977). *Ecological anthropology*. New York: Wiley.

Hardin, G. (1968). The tragedy of the commons. *Science* 162 (3859), 1243–1248.

Harmon, D. (2002). *In light of our differences: How diversity in nature and culture makes us human*. Washington: Smithsonian Institution Press.

Harrop, F.J. (1960). *The Soils of the Western Province of Uganda*, Memoirs of the Research Division Series 1-Soils. Kawanda Research Station:Kampala.

Harvey, C.A., Alpízar F., Chacón M., & Madrigal, R. (2004). *Assessing linkages between agriculture and biodiversity in Central America: Historical overview and future perspectives*. United States of America: The Nature Conservancy.

Hassan, A., Osman, K., & Pud, S. (2009). The adult's non-formal environmental education: A scenario in Sabah. *Malaysia Procedia Social and Behavioural Sciences*, 1, 2306–2311.

Hassan, A.M., & Ismail, Z. (2011). The infusion of environmental education in chemistry teaching and students' awareness and attitudes towards environment in Malaysia. *Procedia Social and Behavioural Sciences*, 15, 3404–3409.

Hawkins, S. (1998). The interpretation of Naangmin: Missionary ethnography, African theology, and history among the Lodagaa. *Journal of Religion in Africa*, 28, 32–61.

Hays, T.R. (1975). Neolithic settlement patterns in Saharan Africa. *The South African Archaeological Bulletin*, 30(117), 29–33.

Hedberg, O. (1963). The phytogeographical position of the Afro-alpine flora. *Records in Advanced Botany,*1, 914–928.

Heeds, A. (1991). Botanical pesticides. A*lternatives*, 18, 6–8

Hegde, R., & Enters, T. (2000). Forest products and households economy: A case study from Mudumalai Wildlife Sanctuary, southern India. *Environmental Conservation*, 27, 250–259.

Heimlich, J.E. (1993). Non-formal environmental education: Toward a working definition. Accessed on 3rd August 2011from http://www.stemworks.org/Bulletins/SEB93-3.html

Henegar, E. (2005). Environmental education: A look at its purpose, methods, and effectiveness. ENS Capstone Project. Accessed on 16th July 2013 from http://web.centre.edu/estudies/Capstone%20Projects/ENS%20Henegar%202005.pdf

Henn, M., Ostergren, D., & Nielsen, E. (2011). Integrating traditional ecological knowledge into natural resource management: *Perspectives and projects within western U.S. national parks*, 27(3), 33–48.

Hens, L. (2006). Indigenous knowledge and biodiversity conservation and management in Ghana. *Journal of human ecology*, 20(1), 21–30.

Hill, M. (1983). Kakadu National Park and the Aboriginals: Partners in protection. *Ambio*, 12, 158–166.

Hinz, M.O. (2003). *Without chiefs, there would be no game: Customary law and nature conservation*. Namibia: Out of Africa Publishers.

Hitchcock, R.K. (2000). Traditional African wildlife utilization: Subsistence hunting, poaching and sustainable use. In H.H.T. Prins, J.G. Grootenhuis & T. Dolan (Eds.), *Wildlife conservation and sustainable use* (no page numbers). Boston Kluwer: Academic Publishers.

Hitchcock, R.K. (2002). We are the first people: Land, natural resources and identity in the Central Kalahari, Botswana. *Journal of Southern African Studies*, 28(4), 797–824.

Hoddy, E. (1991). Nature's bitter boon: The Neem tree, a substitute for pesticides. *Development and Communication*, 5, 29–30.

Holdgate, M., (1999). *The Green Web-Union for World Conservation*. London: Earthscan.

Holmern, T., Muya, J., & Røskaf, E. (2007). Local law enforcement and illegal bush meat hunting outside the Serengeti National Park, Tanzania. *Environmental Conservation*, 34 (1), 55–63.

Holmern, T., Roskaft, E., Mbaruka, J., Mkama, Y.S., & Muya, J. (2002). Uneconomical game cropping in a community-based conservation project outside the Serengeti National Park, Tanzania. *Oryx*, 36(4), 364–372.

Holmes, C.M. (2003). Assessing the perceived utility of wood resources in a protected area in western Tanzania. *Biodiversity and Conservation*, 111, 179–189.

Holsinger, K.E. (2007). *Genetics, ecology, and climate change: Challenges for plant conservation in the 21st century*. Keynote address, Student Research in Plant Biology and Conservation, Chicago Botanic Garden. Accessed from http://archive.org/stream/annalsofsmithson1998smit/annalsofsmithson1998smit_djvu.txt 14th March 2012.

Hoole, A., & Berkes, F. (2010). Breaking down fences: Re-coupling social-ecological systems for biodiversity conservation in Namibia. *Geoforum*, 41, 304–317.

Howard, P.C. (1991). *Nature conservation in Uganda's tropical forest reserves*. International Union for Conservation of Nature. Netherlands: Glad.

Howard, P.C., Davenport, T.R.B., Kigenyi, F.W., Viskanic, P., Baltzer, M.C. Dickinson, C.J.,…Mupada, E. (2000). Protected area planning in the tropics: Uganda's national system of forest nature reserves. *Conservation Biology*, 14 (3), 858–875.

Hughes, R., & Flintan, F. (2001). *Integrating conservation and development: A review and bibliography of the ICDP literature*. London: IIED Publications.

Hulme, D., & Murphree, M. (Eds.). (2001). Community conservation in Africa: An introduction. In Hulme, D & Murphree, M. (Eds.) 2001. *African wildlife and livelihoods: the promise and performance of community conservation*. Oxford: James Currey.

Hungerford, H.R., & Peyton, R.B. (1976). *Teaching Environmental Education*. Portland: Weston Walch.

Hungerford, H.R., & Volk, T.L. (1990). Changing learner behaviour through environmental education. *Journal of Environmental Education*, 21(3), 8–22.

Hungerford, H.R., Peyton, R.B., & Wilke, R. (1983). Yes, EE does have definition and structure. *The Journal of Environmental Education,* 14(3), 1-2.

Hunn, E. (1982). Mobility as a factor limiting resource use in the Columbia Plateau of North America. In N. Williams and E. Hunn (Eds.), *Resource Managers: North American and Australian Hunter gatherers* (pp. 17–43). USA: Boulder West View Press.

Huntington, H.P. (2000). Using traditional ecological knowledge in science: Methods and applications. *Ecological Applications*, 10, 1270–1274.

Iaccarino, M. (2003). Science and culture. *EMBO*, 4, 220–223.

Igoe, J. (2002). National parks and human ecosystems: The challenge to community conservation, a case study from Simanjiro, Tanzania. In D. Chatty & M. Colchester (Eds.), *Conservation and mobile indigenous peoples: Displacement, forced settlement and sustainable development* (pp. 77–96). New York: Berghahn Books.

Igoe, J. (2003). *Conservation and Globalization: A Study of National Parks and Indigenous Communities from East Africa to South Dakota*. Belmont: Wadsworth Press.

Igoe, J. (2004). History, culture and conservation: In search of more informed guesses about whether "community-based conservation" has a chance to work. *Journal of the IUCN Commission on Environmental, Economic, and Social Policy*, 13, 174–185.

Infield, M. (2001). Cultural Values: A forgotten strategy for building community support for protected areas in Africa. *Conservation Biology*, 15, 3, 800–802.

Ingelse, K. (1997). *Theoretical frameworks*. Northern Arizona University Faculty Studio: Online teaching resources.

Inglis, J.T (Ed.). (1993). *Traditional ecological knowledge concepts and cases*. International Program on Traditional Ecological Knowledge International Development Research Centre. Accessed on 18th June 2011 from http://books.google.co.ug/books?id=J2CNS64AFvsC&printsec=frontcover#v=onepage&q&f=false

Institute of World Resources. (1998). *World resources 1998–1999: A guide to the Global environment in collaboration with UNEP, UNDP and the World Bank*. New York: Oxford University press.

International Union for Conservation of Nature (1994). *Guidelines for protected area management categories*. United Kingdom: Cambridge.

International Union for Conservation of Nature (2011). *IUCN Red List of Threatened Species*. Version 2011.1. Accessed on 3rd November 2011 from www.iucnredlist.org.

International Union for Conservation of Nature. (2008). IUCN Red List. Accessed on 12th May 2009 from http://www.iucnredlist.org

International Union for Conservation of Nature. (2010). Red List of Threatened Species. Accessed on 11th March 2011 from www.iucnredlist.org.

Ite, U. (1996). Community perceptions of the Cross River National Park, Nigeria. *Environmental Conservation*, 23(4), 351–357.

Jabareen, Y. (2009). Building a conceptual framework: Philosophy, definitions, and procedure. *International Journal of Qualitative Methods*, 8(4), 49–62.

Jacobson, K.S., McDuff, M.D., & Monroe, C.M. (2006). *Conservation education and outreach Techniques*. United Kingdom: Oxford University Press.

Jacobson, S. (1999). *Communication skills for conservation professionals*. Washington District .Council: Island Press.

Johannes, R. (1978). Traditional marine conservation methods in oceania and their demise. *Annual Review of Ecology and Systematics*, 9, 349–364.

Johannes, R.E. (1993). Integrating traditional ecological knowledge and management with environmental impact assessment. In J. Inglis (Ed.). *Traditional ecological knowledge: Concepts and cases* (pp. 33–41). Ottawa: International Development Research Center, Canadian Museum of Nature.

Johannesen, A. (2007). Protected areas, wildlife conservation, and local welfare. *Ecological Economics*, 62 (1), 126–135.

Johnson, L.M. (2000). A place that's good: Gitsan landscape perception and ethno-ecology. *Human Ecology*, 28(2), 301–325.

Johnson-Pynn, J.S., & Johnson, L.R. (2005). Successes and challenges in East African conservation education. *Journal of Environmental Education*, 36(2), 25–39.

Joyal, E. (1996). The palm has its time: an ethno-ecology of Sabal uresana in Sonora, Mexico. *Economic Botany*, 50: 446 – 462.

Jungerius, P.D. (1997). Indigenous knowledge of landscape-ecological zones among traditional herbalists: a case study in Keiyo District, Kenya. *Geo Journal*, 44(1), 51–60.

Kabananukye, I. (1996). Population dynamics of Abayanda pygmies of south western Uganda. Paper presented at cultural research conference at the University of Nairobi, 23rd–26th August.

Kaplan, S. (2000). Human nature and environmentally responsible behaviour. *Journal of Social Issues*, 56(3), 491–508.

Karanth, K.K., Curran, L.M., & Reuning-Scherer, J.D. (2006). Village size and forest disturbance in Bhadra Wildlife Sanctuary, western Ghats, India. *Biological Conservation*, 128, 147– 57.

Kasparek, M. (2008). *Sustainable forest management and conservation project evaluation of pilot measures in Botswana, Malawi, Mozambique and Namibia*. Sustainable Forests Management and Conservation Project FANR/SADC. GTZ.

Katende A.B., Birnie, A., & Tengnäs, B. (1995). *Useful trees and shrubs for Uganda: Identification, propagation and management for agricultural and pastoral communities*. Kenya: Regional Conservation Unit (RSCU)/SIDA.

Kates, R.W., Parris, M.T., & Leiserowitz, A.A. (2005). What is sustainable development? Goals, indicators, values, and practice. *Environment: Science and Policy for Sustainable Development*, 47(3), 8–21.

Kay, C. (1990). *Yellowstone's Northern Elk Herd: A Critical Evaluation of the "Natural Regulation" Paradigm*. UnPublished Ph.D. Thesis, Utah State University, United States of America.

Kay, C. (1992). An alternative interpretation of the historical evidence relating to the abundance of Wolves in the Yellowstone ecosystem. Paper presented at the Second North American Symposium on Wolves: Their Status, Biology and Management. North America, August 25th – 27th.

Kaya, H.O., & Masoga, M. (2005). Balanced literacy: Enhancing the school curriculum through African indigenous knowledge system. Indigenous Knowledge System Programme. North West University. United states of America.

Kellert, S.R., Mehta, J.H., Ebbin, S.A., & Lichtenfeld, L.L. (2000). Community natural resource management: Promise, rhetoric and reality. *Society and natural resources*, 13, 705–715.

Kelt, D.A. Meserve P.L. Nabors, L.K. Forister M.L., & Gutierrez J.R. (2004). Foraging ecology of small mammals in semiarid Chile: The interplay of biotic and abiotic effects. *Ecology,* 85(2), 383–397.

Kerlinger, F.N. (1986). *Foundations of behavioural research*. Orlando, Florida: Holt, Rinehart and Winston Publishers.

Kideghesho, J.R ., Røskaft, E., & Kaltenborn, B.P. (2007). Factors influencing conservation attitudes of local people in Western Serengeti, Tanzania. *Biodiversity Conservation*, 16, 2213–2230.

Kidwell, C.S. (1991). Systems of knowledge. In A. M. Josephy (Ed.). *America in 1492*, (pp. 369–403) New York: Alfred A. Knops.

Klein, M.L., Humphrey, S.R., & Percival, H.F. (1996). Effects of ecotourism on distribution of waterbirds in a wildlife refuge. *Conservation Biology*, 9, 1454–1465.

Kotliar, N.B. (2000). Application of the new "keystone species" concept to prairie dogs: How well does it work? *Conservation Biology*, 14(6) 1715–1721.

Krippendorff, K. (1980). *Content analysis: An introduction to its methodology*. London: Sage publications.

Kuhar, C.W., Bettinger, T.L., Lehnhardt, K., Tracy, O., & Cox, D. (2010). Evaluating the long term impact of an Environmental Education Program at the Kalinzu Forest Reserve, Uganda. *American Journal of Primatology*, 72, 407–413.

Kuhar, C.W., Lehnhardt, K., Townsend, S., Cox, D., & Bettinger, T.L. (2007). Evaluating the impact of a conservation education program in the Kalinzu Forest Reserve. *Journal of the International Zoo Educators Association*, 43, 12–15.

Kuhnlein, H., & Turner, N. (1991). *Traditional plant foods of Canadian indigenous peoples*. Philadelphia: Gordon and Breach Science Publishers.

Kumar, R., & Shahabuddin, G. (2005). Effects of biomass extraction on vegetation structure, diversity and composition of forests in Sariska Tiger Reserve, India. *Environmental Conservation*, 32, 248–259.

Kvist, P.L., Andersen, K.M., Stagegaard, J. Hesselsoe, M., & Llapapasca, C. (2001). Extraction from woody forest plants in food plain communities in Amazonian Peru: Use, choice, evaluation and conservation status of resources. *Forest Ecology and Management,* 150, 147–174.

Lado, C. (2004). Sustainable environmental resource utilisation: A case study of farmers' ethno-botanical knowledge and rural change in Bungoma district, Kenya. *Applied Geography*, 24, 281–302.

Lamola, L.M. (1992). *Linking the formal and informal sectors in plant genetic resources conservation and utilization: A proposal for cooperative research*. White Paper 92, Des Moines: Agricultural Law Center, Drake University Law School.

Lane, C. (1990). *Barabaig natural resource management: Sustainable land use under threat of destruction*. United Nations Research Institute for Social Development (UNRISD) Discussion Paper Number 12.

Lang, A. (1912). Method in the Study of Totemism. *American Anthropologist*, 14, 368–382.

Langholz, J. (1999). Exploring the effects of alternative income opportunities on rainforest use: insights from Guatemala's Maya Biosphere Reserve. *Society and Natural Resources*, 12, 139–149.

Lara, S.M., Cruz, T.E., & Anderson, A. (2013). *Baseline Report for the Rwenzori case study region*. Afromaison project: Uganda.

Lawi, Q.Y. (1999). Where physical and ideological landscapes meet: Landscape use and ecological knowledge in Northern Tanzania, 1920s–1950s. *The International Journal of African Historical Studies* 32, 281–310.

Lawrence, G., Higgins, V., & Lockie, S. (Eds.). (2001). *Environment, society, and natural resource management: Theoretical perspectives from Australasia and the Americas*. Northampton, MA: Edward Elgar.

Lay, D.W. (1965). Effects of periodic clipping on yield of some common browse species. *Journal of Range Management*, 18, 181–184.

Leach, M., Mearns, R., & Scoones, I. (1999). Environmental entitlements: Dynamics and institutions in community-based natural resource management. *World Development*, 27 (2): 225–247.

Leach, M. (1991). Endangered environments: Understanding natural resource management in the West African forest zone. *International Development Studies Bulletin*, 22, 17–24.

Leakey, R.R.B. (1999). Agro-forestry for biodiversity in farming systems. In Collins, W.W. and Qualset, C.O. (Eds.), *Biodiversity in Agro-ecosystems.* (pp 127–145) Washington: CRC Press.

Leb3 (2008). The landscape measures resource center: Conservation and biodiversity in agricultural landscapes. Accessed on 12th September 2012 from http://treadwell.cce.cornell.edu/ecoag1a/ .

Leduc, C., Coonishish, J., & Haddad C.P.A. (2006). Plants used by the Cree Nation of Eeyou Istchee (Quebec, Canada) for the treatment of diabetes: A novel approach in quantitative ethno-botany. *Journal of Ethnopharmacology*, 105, 55–63.

Leiserowitz, A., Kates, R., & Parris, T. (2005). Do global attitudes and behaviours support sustainable development? *Environment*, 47, 22–38.

Lejju, J.B. (2009). Vegetation dynamics in western Uganda during the last 1000 years: Climate change or human induced environmental degradation? *African Journal of Ecology*, 47(1), 21–29.

Leon-Portilla, M. (1980). *Native Meso American spirituality*. Toronto, Ontario: Paulist Press.

Leopold, A. (1949). *A sand county almanac and sketches here and there*. New York: Oxford University Press.

Letsela, T., Witkowski, E. T. F., & Balkwill, K. (2002). Direct use values of communal resources in Bokong and Tsehlanyane in Lesotho: Whither the commons? *The International Journal of Sustainable Development and World Ecology*, 9, 351–368.

Levin, G. (1993). Too green for their own good. *Advertising Age*, 64(15), 29–42.

Lewis, D.M., & Alpert, P. (1997). Trophy hunting and wildlife conservation in Zambia. *Conservation Biology*, 11, 50–68.

Lewis, D.M., & Phiri, A. (1998). Wildlife snaring: An indicator of community response to a community-based project. *Oryx*, 32, 111–121.

Lewis, D.M., Kaweche, G.B., & Mwenya, A. (1990). Wildlife conservation outside protected areas: Lessons from an experiment in Zambia. *Conservation Biology*, 4, 171–180.

Lewis, G. (1975). *Knowledge of illness in a Sepik society: A Study of the Gnau*, *New Guinea*. London: Athlone Press.

Linder, J. M., & Oates, J.F. (2011). Differential impact of bushmeat hunting on monkey species and implications for primate conservation in Korup National Park, Cameroon. *Biological Conservation*, 144, 738–745.

Lindsay, J. (1998). Designing legal space: Law as an enabling tool in community-based management. Plenary presentation, International Community-based Natural Resource Management Workshop Washington Distrct Columbia, United States of America, 10–14 April.

Lindsey, P.A., Roulet, P.A., & Romanache, S.S. (2007). Economic and conservation significance of trophy hunting industry in sub-Saharan Africa. *Biology Conservation*, 134, 455 – 469.

Loefler, I. (1997). *Protected areas programme, Rwenzori Mountains National Park: What is future for Rwenzori?* World heritage sites. UNEP.

Loibooki, M., Hofer, H., Campbell, K.L.I., & East, M.L. (2002) Bushmeat hunting by communities adjacent to the Serengeti National Park, Tanzania: The importance of livestock ownership and alternative sources of protein and income. *Environmental Conservation*, 29, 391–398.

Lokwiya, J.G., Akankwasa, D., Ddungu, B.B., Dutki G.Z., Farmer, B., Harrison M., … Byarugaba, S.R (2002). *The national forest plan*. Ministry of Water, Lands and Environment. Uganda: Kampala.

Lomborg, B. (2001). *The Skeptical environmentalist: Measuring the real state of the world*. Cambridge: Cambridge University Press

Lorbiecke, M. (1996). *Aldo Leopold: A fierce green fire*. Helena, MT: Falcon Publishing.

Luoga, E. J. Witkowski E. T. F., & Balkwill, K. (2000). Differential utilisation and ethno-botany of trees in Kitulanghalo Forest Reserve and surrounding communal lands, eastern Tanzania. *Economic Botany*, 54, (3), 328–343.

Lush, C. (1993). Cloud forests of the Rwenzori Mountains, Uganda: Research and management possibilities. In L. Hamilton, J. Juvik & F. Scatena (Eds.). *Tropical montane cloud forests East-West Center, Honolulu,Hawaii* (no pages). Netherlands: United Nations Educational, Scientific and Cultural Organisation.

Lykke, A.M. (1998). Assessment of species composition change in savanna vegetation by means of woody plants' size class distributions and local information. *Biodiversity and Conservation,* 7, 1261–1275.

MacDonald, K. (1997). Life history theory and human reproductive behaviour: Environmental/contextual influences and heritable variation. *Human Nature,* 8, 327–359.

Mace, G.M., & Lande, R. (1991). Assessing extinction threats: Towards a re-evaluation of IUCN threatened species categories. *Conservation Biology,* 5, 148–57.

MacKenzie, J.M. (1987). Chivalry, social Darwinism and ritualised killing: The hunting ethos in central Africa up to 1914. In D. Anderson & R. Grove (Eds.), *Conservation in Africa: People, Policies and Practice* (pp. 41–61). Cambridge: Cambridge University Press.

MacKenzie, J.M. (1988). *The empire of nature: Hunting, conservation and British imperialism.* Manchester: Manchester University Press.

MacKinnon, J., MacKinnon, K., Child, G., & Thorsell, J. (1986). *Managing protected areas in the tropics*. Gland, Switzerland. IUCN: The World Conservation Union.

Maffi, L., & Woodley, E. (2010). *Bio-cultural diversity conservation: A global Sourcebook*. Earth scan: London.

Maffi, L. (2006). Linguistic, cultural, and biological diversity. *The Annual Review of Anthropology*. 29, 599–617.

Magelah, P. (Lead Author): Sylvio G., Codella & Yahya, E. (Topic Editors). 2007. Totem. In J.C. Cutler (Ed.), *Encyclopedia of Earth*. Washington, D.C. Retrieved on 5th April 2010 from <http://www.eoearth.org/article/Totem.

Magesa, L. (1989). Christ the liberator and Africa today. In J.N.K. Mugambi & L. Magesa (Eds.), *Jesus in African Christianity: Experimentation and diversity in African Christology* (no page numbers). Nairobi: Initiatives Publishers.

Mahapatara, A., & Mitchell, C.P. (1997). Sustainable development of non-timber forest products: implications for forest management in India. *Forest Ecology and Management,* 94, 15–29.

Mahmud, F., & Osman, R. (2010). The determinants of recycling intention behaviour among Malaysian school students: An application of the theory of planned behavior. *Procedia - Social and Behavioural Sciences*, (9), 119–124.

Maikhuri, R.K., Nautiyal, S., Rao, K.S., & Saxena, K.G. (2001). Conservation policy-people conflicts: A case study from Nanda Devi Biosphere Reserve (a World Heritage Site), India. *Forest Policy and Economics*, 2(34), 355–365.

Majangu, A.W., & Basalirwa, C.P.K. (1996). Applications of climate variability for sustainable land use with particular reference to the Rwenzori Mountain Region. In H. Osmaston, J. Tukahirwa, C. Basalirwa & J. Nyakana (Eds.). *The Rwenzori Mountains National Park* (pp. 34–42). Kampala Uganda: Makerere University.

Malleson, R.C. (2000). *Forest livelihoods in southwest province, Cameroon: An evaluation of the Korup experience*. Unpublished PhD thesis. University College London.

Mamo, G., Sjaastad, E., & Vedeld, P. (2007). Economic dependence on forest resources: A case from Dendi District, Ethiopia. *Forest Policy and Economics*, 9(8), 916–927.

Mapinduzi, L.A., Oba, G., Weladji, R.B., & Colman, J.E (2003). Use of indigenous ecological knowledge of the Maasai pastoralists for assessing range land biodiversity in Tanzania. *African Journal of ecology*, 41, 329–336.

Marcus, R.R. (2001). Seeing the forest for the trees: Integrated conservation and development projects and the local perceptions of conservation in Madagascar. *Human Ecology*, 29, 381–397.

Mariko, K.A. (1981). *Le monde mysterieux des chasseurs traditionnels. Agence de Cooperation Culturelle et Technique*. Abidjan & Lome: Paris Dakar.

Marks, S.A. (1976). *Large mammals and a brave people: Subsistence hunters in Zambia*. Seattle: University of Washington Press.

Marks, S.A. (1984). *The imperial Lion: Human dimensions of wildlife management in central Africa*. Boulder: Westview Press.

Marks, S.A. (2001). Back to the future: Some unintended consequences of Zambia's Community–Based Wildlife Program. *Africa Today*, 48, (1), 121–141.

Marshall, E., & Newton, A.C. (2003). Non-timber forest products in the community of El Terrero, Sierra de Manantlan Biosphere Reserve, Mexico: Is their use sustainable? *Economic Botany*, 5, 262–278.

Martin, G.J. (1995). *Ethnobotany. A methods manual - people and plants conservation manuals*. London: Chapman and Hall.

Martin, R.B. (1994). Alternative approaches to sustainable use: what does and does not work. Paper presented at the Conference of Conservation Through Sustainable Use of Wildlife. University of Queensland, Brisbane. (no dates).

Masona, T. (1987). *Colonial game policy: A study of the origin and administration of game policy in southern Rhodesia, 1890–1945*. Unpublished PhD Thesis, University of Zimbabwe, Zimbabwe.

Mati, E., & deBoer, H. (2011). Ethno-botany and trade of medicinal plants in the Qaysari Market, Kurdish Autonomous Region, Iraq. *Journal of Ethnopharmacology*, 133, 490–510.

Matowanyika, J.Z.Z. (1989). Cast out of Eden: Peasants versus wildlife policy in Savanna Africa. *Alternatives*, 16, 30–39.

Matowanyika, J.Z.Z. (1992). Linking human and biological aspects with respect to protected Areas: Some Observations on indigenous systems in Africa. Fourth Congress on National Parks and Protected Areas, Caracas, Venezuela.

Maundu, P., Berger, D.J., Ole, S.C., Nasieku, J., Kipelian, M., Mathenge, S.G.,…Höft, R. (2001). *Ethnobotany of the Loita Maasai: Towards Community Management of the Forest of the Lost Child-Experiences from the Loita Ethnobotany Project*. People and Plants working paper 8. Paris: United Nations Educational, Scientific and Cultural Organisation.

Mauro, F., & Hardison, P.D. (2000). Traditional knowledge of indigenous and local communities: international debate and policy initiatives. *Ecological Applications*, 10(5) 1263–1269.

Maxwell, J.A. (2005). *Qualitative research design: An interactive approach*. Thousand Oaks, Califonia: Sage Publications, Inc.

Mbete, R.A., Banga-Mboko, H. Racey, P., Mfoukou-Ntsakala, A., Nganga, I., Vermeulen, C., … Leroy, P. (2011). Household bushmeat consumption in Brazzaville, the Republic of the Congo *Tropical Conservation Science*, 4 (2), 187–202.

Mbile, P., Vabi, M., Meboka, M., Okon, D., Arrey-Mbo, J., Nkongho, F., & Ebong, E. (2005). Linking management and livelihood in environmental conservation: A case of the Korup National Park Cameroon. *Journal of Environmental Management*, 76, 1–13.

Mbiti, J.S. (1988). *African religions and philosophy*. Nairobi: Heinemann, publishers.

McCall, D.R (1996). Conservation and management of the Rwenzori Mountains. In H. Osmaston, J. Tukahirwa, C. Basalirwa & J. Nyakana (Eds.). *The Rwenzori Mountains National Park* (pp. 66–73). Kampala Uganda: Makerere University.

McCann, K.S. (2007). Protecting biostructure. *Nature,* 29, 446–501.

McCorkle, C.M., & McClure, G. (1992). Farmer know-how and communication for technology transfer: CTTA in Niger. In D.M., Warren, D. Brokensha & L.J. Slikkerveer (Eds.), *Indigenous Knowledge Systems: The Cultural Dimension of Development* (pp.34–52). London: Kegan Paul International.

McGregor, J. (2003). Living with the river: Landscape & memory in the Zambezi Valley, Northwest Zimbabwe. In W. Beinart and J. McGregor (Eds.), *Social History and African Environments* (pp. 87–105). Oxford: James Currey.

McKenzie, J.M. (1988). *The empire of nature: hunting, conservation and British Imperialism.* England: Manchester University Press.

McNeely, L., Miller, K., Reid, W., Mittermeier, R., & Werner, T. (1990). *Conserving the world's biological diversity.* Washington: International Union for Conservation of Nature, World Resources Institute, Conservation International, Worldwide Fund for Nature-United States and the World Bank.

McShane, T.O. (1990). Wildlands and human needs: Resources use in an African protected area. *Landscape and Urban Planning*, 19, 145–158.

McSweeney C., New M., Lizcano G. (2012). *UNDP climate change country profiles-Uganda*. Updated 16 February 2012. Accessed 14 March 2013:http://country-profiles.geog.ox.ac.uk.

Medin, D., & Atran, S. (1999). *Folk Biology*. USA: MIT Press.

Megan E.W. (1998). *Meeting the global challenge of community participation in ecotourism: Case studies and lessons from ecuador*. Working Paper No. 4. Washington, DC: The Nature Conservancy.

Meilinda, W. (2006). Can local's ethno biological knowledge be applied to support biodiversity conservation? Paper presented at the 10th International Congress of Ethno-biology ICE Symposium. Chiang Rai, Thailand. November (no dates).

Metzger, K.L., Sinclair, A.R.E., Hilborn, R., Grant, J.H.C., & Mduma, S.A.R. (2010). Evaluating the protection of wildlife in parks: The case of African Buffalo in Serengeti. *Biodiversity Conservation*, 19, 3431–3444.

Middleton, K. (1999). Who killed 'Malagasy Cactus'? Science, environment and colonialism in Southern Madagascar (1924–1930). *Journal of Southern African Studies*, 25 (2), 215–248.

Miles, M.B., & Huberman, A.M. (1994) *Qualitative data analysis: an expanded sourcebook*. London and Thousand Oaks, California: Sage Publications, Inc.

Millennium Ecosystem Assessment (2011). Ecosystem services: Living within environmental limits. Retrieved from http://www.ecosystemservices.org.uk/ecoserv.htm on 22nd May 2014

Ministry of Lands, Housing and Urban Development. (2011). *Uganda national land policy*. Uganda: Kampala.

Miyako, K. (2006). Variation in ethno-botanical knowledge among the Penan Benalui of East Kalimantan: Clues to transmission and learning of “traditional” knowledge. Paper presented at the 10th International Congress of Ethno-biology ICE Symposium. Chiang Rai, Thailand. November (no dates).

Mogaka, H., Simons, G., Turpie J., Emerton L., & Karanja, F. (2001). *Economic aspects of community involvement in sustainable forest management in Eastern and Southern Africa*. The World Conservation Union: Eastern Africa Regional Office.

Mogaka, H., Simons, G., Turpie, J. Karanja F., & Emerton, L. (2001). *Economic Aspects of Community Involvement in Sustainable Forest Management in Eastern and Southern Africa*. International Union for Conservation of Nature. Netherlands: Gland.

Mohammed, N.A.L. (1997). Environmental Conflict in Africa. In N.P. Gleditsch (Ed.). *Conflict and the Environment* (pp.137–156). Kluwer: Academic Publishers.

Mohapatra, C.R., & Chowdhury, T. (2006). *Conservation education for critically important national parks and Wildlife sanctuaries through a comprehensive environment education program*. Mid-term Performance Assessment Report. India-Canada Environment Facility.

Moller, H.F., Berkes, P.O., Lyver, R., & Kislalioglu, M. (2004). Combining science and traditional ecological knowledge: Monitoring populations for co-management. *Ecology and Society* 9(3), 2–11.

Monroe, M., & Cappaert, D. (1994). Integrating Environmental Education into the school curriculum, in M. C. Monroe & D. Cappaert (Eds.). *Workshop Resource Manual* (pp. 1–56) Ann Arbor, MI: National Consortium for Environmental Education and Training.

Monroe, M.C., Day, B., & Grieser, M. (undated). Greencom weaves four strands. In (no Eds.), *Fundamental concepts in environmental education and communication: A hand book for international practioners* (pp. 3–6). No publishers.

Moore, D.S. (1998). Clear waters and muddied histories: Environmental history and the politics of community in Zimbabwe's eastern highlands. *Journal of Southern African Studies*, 24(2), 377–403.

Mucunguzi, P. (1995). A review of non-formal environmental education in Uganda. *Environmental Education Research*, 1(3), 337–344.

Mugisha, A., & Infield, M. (2009). People-oriented conservation: using cultural values in Uganda. *Oryx*, 43(1), 13–16.

Mugisha, R.A. (2002). *Evaluation of community-based conservation approaches: Management of protected areas in Uganda*. Unpublished PhD thesis, University of Florida, Unites States of America

Muhumuza M., & Balkwill, K. (2013). Factors affecting the success of conserving biodiversity in national parks: A review of case studies from Africa. *International Journal of Biodiversity*. http://dx.doi.org/10.1155/2013/798101

Muhumuza M., Muzinduki, P., & Hyeroba, G. (2011). Small holder farmers' knowledge and adaptation to climate change in the Rwenzori region. *Rwenzori Think Tank Journal*, 1, 101–117.

Muhumuza, M. (2006). *Land use in a mountainous terrain of Bugoye sub-county, Rwenzori region, south western Uganda*. Unpublished Msc Thesis, Mbarara University of Science and Technology, Uganda.

Muhumuza, M. (2012). Bio-cultural diversity conservation through sacred natural sites in the Rwenzori Mountains National Park. *Langscape,* 2(11), 40–43.

Muhumuza, M., Biira, O., & Mugisha, A. (2010).*The role of cultural values in the conservation of the Rwenzori Mountains National Park*. Paper presented at Nature Uganda conference, Kampala Uganda, 19th-20th November.

Mung'ong'o, C.G. (2009). Political ecology: a synthesis and search for relevance to today's ecosystems conservation and development. *African Journal of Ecology*, 47(1), 192–197.

Murombedzi, J. (2003). Pre–colonial and colonial conservation practices in southern Africa and their legacy today; IUCN: Harare, Zimbabawe, 2003. Accessed on 3rd March 2010 from http://dss.ucsd.edu/~ccgibson/docs/Murombedzi%20%20Precolonial%20and%20Colonial%20Origins.pdf

Musumali, M.M., Larsen, T.S., & Kaltenborn, B.P. (2007). An impasse in community-based natural resource management implementation: The case of Zambia and Botswana. *Oryx*, 41(3), 303–313.

Mutebi, J. (2005). *Co-managed protected areas from conflict to collaboration: Experience in Bwindi Impenetrable National Park, Uganda*. Uganda: CARE.

Nash, R. (1989). *The rights of nature: A history of environmental ethics*. Madison, WI: The University of Wisconsin Press.

National Environment Action Plan (1995). *The Nation Environmental Action Plan for Uganda*. Ministry of Natural Resources. Kampala, Uganda.

National Environment Management Authority (2006). *Third National Biodiversity Report*. Kampala: Uganda: National Environment Management Authority.

National Environment Management Authority. (2008*). State of Environment Report for Uganda*. Uganda: Kampala printery.

Naughton-treves, L., Margaret, H.B., & Brandon, K. (2005). The role of protected areas in conserving biodiversity and sustaining local livelihoods. *Annual Review of Environment Resources*, 30, 219–252.

Ndoye, O., & Kaimowitz, D. (1998). *Macro-economics, markets, and the humid forests of Cameroon*, 1967–1997. Montevideo-Uruguay: World Rainforest Movement.

Nelson, R. (2003). Environmental colonialism: "saving" Africa from Africans. *The Independent Review*, 8(1), 65–86.

Nelson, R.K. (1983). *Make prayers to the Raven: A Koyukon view of the northern forest*. Chicago: University of Chicago Press.

Nepal, S.K., & Weber, K.E. (1995). Managing resources and resolving conflicts: National parks and local people*. International Journal of Sustainable Development and World Ecology*, 2, 11–25.

Neumann, R.P., & Hirsch, E. (2000). *Commercialisation of non-timber forest products: Review and Analysis of Research*. Desa Putera, Indonesia: CIFOR, MT Grafika. Accessed on 15th September 2009 from http://www.cifor.org/online-library/browse/view-publication/publication/723.html.

Neumann, R.P. (1998). *Imposing wilderness: struggles over livelihood and nature preservation in Africa*. Berkeley: University of California Press.

Newing, H. (2011). *Conducting research in conservation: A social science perspective*. United Kingdom: Routledge.

Newmark, W.D., & Hough, J.L. (2000). Conserving wildlife in Africa: Integrated conservation and development projects and beyond. *Bioscience*, 50, 585–592.

Newmark, W.D., Leonard, N.L., Sariko, H.I., & Gamassa, D.G.M. (1993). Conservation attitudes of local people living adjacent to five protected areas in Tanzania. *Biological Conservation*, 63, 177–183.

Nganje, M. (2009). Harnessing traditional ecological knowledge for the conservation of forests and Biodiversity. Paper presented at the 13th World Forestry Congress. Buenos Aires, Argentina 18th–23rd October.

Nielsen, M.R. (2006). Importance, cause and effect of bushmeat hunting in the Udzungwa Mountains, Tanzania: Implications for community-based wildlife management. *Biological Conservation*, 128, 509–516.

Nkonya, E.P., John, S.D., & Pamela, J. (2002). Development pathways and land management in Uganda. In International food policy and livestock research institute (Ed.), *Policies for sustainable land management in the East African highlands* (no page nos.). No publishers.

Nkwetisama, C.M. (Ed.). (2011). EFL/ESL and environmental education: Towards an eco-applied linguistic awareness in Cameroon. *World Journal of Education*, 1, 110-118.

Nomura, K. & Hendarti, L. (Eds.) (2005). *Environmental Education and NGOs in Indonesia*. Yayasan Obor Indonesia: Jakarta.

Norman, P. (2011). The theory of planned behavior and binge drinking among undergraduate students: Assessing the impact of habit strength. *Addictive Behaviours*, 36(5), 502–507.

North American Association for Environmental Education. (2004). *Excellence in environmental education: Guidelines for learning (K-12)*. United States of America: Washington.

Noss, R.F. (1990). Indicators for monitoring biodiversity: A hierarchical approach. *Conservation Biology*, 4 (4), 355–364.

Oates, J.F. (1995). The dangers of conservation by rural development a case-study from the forests of Nigeria. *Oryx,* 29, 115–122.

ODI. (2006). ODI wild meat, livelihoods security, and conservation in the tropics project. Accessed on 9th May 2009 from http://www.odi.org.uk/bushmeat/about_project.htm.

Ofelia, S. (1985). *Overcoming Ethnocentrism in the Philosophy Classroom. Teaching Philosophy, 8*. Cincinnati, Ohio: University of Cincinnati.

Ofwono-Orecho, J.K.W., & Bagoora, F.D.K. (1996). Promoting public environmental awareness in Uganda. Unpublished Mimeo.

Ogwang, B., & Aanyu, S. (2002). *National Biodiversity Strategy and Action Plan*. Kampala: National Environment Management Authority.

Ogwang, D. A., & DeGeorges, P.A. (1992). *Community participation in interactive park planning and the privation process in Uganda's National parks*. Report prepared for Uganda National Parks and the United States Agency for International Development. Rwenzori Mountains National Park Book Bank: Kasese

Olson, S. (1989). Extinction on Islands: Man as a catastrophe. In D. Western and M. Pearl (Eds.), (1989). *Conservation for the Twenty-First Century* (pp. 50–53). New York: Oxford University Press.

Oltremari, J.V., & Jackson, R.G. (2006). Conflicts, perceptions, and expectations of indigenous communities associated with natural areas in Chile. *Natural Areas Journal*, 26(2), 215–220.

Olupot, W, McNeilage A. J., & Plumptre A. J. (2009). *An analysis of socioeconomics of bush meat hunting at major hunting sites in Uganda*. Working paper: Wildlife Conservation Society.

Omeja, P., Cunningham, A., and Obua, J. (2005). Drums and Hornbills. In: A., Cunningham, B. Campbell, and B. Belcher (Eds.), *Carving out a future: forests, livelihoods and the international woodcarving trade* (pp. 43–52). People and Plants Conservation Series. London: Earthscan. on 23rd August 2013.

Oonyu, J.C. (2001). Environmental awareness of local communities living around Mt. Elgon National Park, Uganda. *Journal of Environmental Education and Information*, 20(3), 169–186.

Oonyu, J.C. (2009). Conservation education and the attitudes of local communities living adjacent to Mt. Elgon National Park, Uganda. *Applied Environmental Education and Communication*, 8(4), 153–164.

Ormsbyl, A., & Kaplin, B.A. (2005). A framework for understanding community resident perceptions of Masoala National Park, Madagascar. *Environmental Conservation*, 32(2), 151–164.

Oryema, P.C. (1996). Strategies for sharing revenue and benefits that accrue from tourism in Rwenzori Mountains National Park. In H. Osmaston, J. Tukahirwa, C. Basalirwa & J. Nyakana (Eds.). *The Rwenzori Mountains National Park* (pp. 78–86). Kampala Uganda: Makerere University.

Osmaston, H.A., & Pasteur, D. (1972), *Guide to the Ruwenzori, The Mountains of the Moon.* Oxford: Alden Press.

Overwalle, V.G. (2005). Protecting and sharing biodiversity and traditional knowledge: Holder and user tools. *Ecological Economics*, 53, 585–607.

Owusu, E.H., Ntiamoa-Baidu, Y., & Ekpe, E.K. (2006). The dependence of local people on bushmeat in the Afadjato and Agumatsa Conservation Area, Ghana. *Nature & Faune*, 21, 33–44.

Ozden, M. (2008). Environmental awareness and attitudes of student teachers: An empirical research. *International Research in Geographical and Environmental Education*, 17 (1), 40–55.

Parcs Nationaux Madagascar (2001). *Madagascar protected area system management plan 200–2006*. Ministry of Environment Water and Forests: National printery.

Pargeter, J. (2011). Assessing the macrofracture method for identifying stone age hunting weaponry. *Journal of Archaeological Science*. Doi: 10.1016/j.jas.2011.04.018.

Parkin, D. (1998). Is outdoor education environmental education? *International Journal of Environmental Education and Information*, 17 (3), 275–286.

Parkins, J.R., Nadeau, S., Hunt, L., Sinclair, J., Reed, M., & Wallace, S. (2006). *Public participation in forest management: Results from a national survey of advisory committees. Information Report NOR-X-409E*. Canada: Natural Resources Canada, Canadian Forest Service & Northern Forestry Centre.

Parlo, A.T., & Butler, M.B. (2007). Impediments to environmental education instruction in the classroom: A post-workshop inquiry. *Journal of Environmental & Science Education*, 2(1), 32 – 37.

Parry, D., & Campbell, B. (1992). Attitudes of rural communities to animal wildlife and its utilization in Chobe Enclave and Mababe Depression, Botswana. *Environmental Conservation*, 19, 245–252.

Peters, C.M. (1994). *Sustainable Harvest of Non-Timber Forest Plant Resources in Tropical Moist Forest: An Ecological primer*. Biodiversity Support Program: Washington, DC.

Petty, R.E., & Priester, J.R. (1994). Mass media attitude change: Implications of the elaborate likelihood model of persuasion. In J. Bryant & D. Zillman (eds.). *Media effects: advances in theory and research*. (*pp. 91–122*). Hillsdale: Lawrence Erlbaum.

Phillips, O., & Gentry, A.H. (1993). The useful plants of Tambopata, Peru: Statistical hypothesis tests with a new quantitative technique. *Economic Botany*, 47, 15–32.

Phillips, O. (1993). The potential for harvesting fruits in tropical rainforest: New data from the Peruvian Amazon. *Biodiversity and Conservation*, 2, 18–38.

Picton, J. & Mack, J. (1989). *African Textiles*. British Museum Publications: London.

Pinkerton, E. (Ed.). (1989). *Co-operative management of local fisheries: New directions for improved management and community development*. Vancouver: University of British Columbia Press.

Plumptre, A.J., Behangana, M., Davenport, T.R.B., Kahindo, C., Kityo, R., Ndomba, E., ... Eilu, G. (Eds.) (2003). *The biodiversity of the Albertine Rift*. Albertine Rift Technical report Number 3. Wildlife Conservation Society, Kampala.

Poffenberger, M., McGean, B., Khare, A., & Campbell, J. (1992). *Field methods Manual*. Community forest economy and use patterns. Joint Forest Management Support Programme. New Delhi, India: Society for Promotion of Wastelands Development,.

Population Secretariat. (2011). *The State of Uganda Population Report 2011*. Uganda: Ministry of State for Finance, Planning and Economic Development, Kampala.

PorterBolland, L. Ellis, E.A. Guariguata, M.R.C., Ruiz-Mallén, I., Negrete-Yankelevich, S., & Reyes-García, V. (2011). Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics. *Forest Ecology and Management* (Early view).

Posey, D. (1985). Native and indigenous guidelines for Amazonian development strategies: Understanding biodiversity through ethno-ecology. In J. Hemming (Ed.), *Change in the Amazon* (pp. 156–181). Manchester, England: Manchester University Press.

Posey, D. (1993). Indigenous knowledge in the conservation and use of world forests. In Ramakrishna, K. & Woodwell, G. (Eds.). *World forests for the future, their use and conservation* (pp. 59–77). New York: Yale University Press.

Powell, R.A., & Proulx, G. (2003). Trapping and marking terrestrial mammals for research: Integrating ethics, performance criteria, techniques, and common sense. *ILAR Journal*, 44(4), 259–276.

Prance, G.S., Ballee, W., Boom, B.M., & Carnaria, R. J. (1987). Quantitative ethnobotany and the case for conservation in Amazonia. *Conservation Biology*, 1, 296–310.

Prato, T., & Fagre, D. (2005). *National parks and protected areas: Approaches for balancing social, economic, and ecological values.* Iowa: Blackwell Publishers.

Pretty, J. (1995). The many interpretations of participation. *In Focus*, 16, 4–5.

Prochaska, J.O., DiClemente, C.C., & Norcross, J.C. (1992). In search of how people change: Applications to addictive behaviors. *American Psychologist*, 47(9), 1102–1114.

Protos-Directorate of Water Resources Management (2012). The sensitization of the community in and around river Mpanga and its catchment using the Orugendo Rwakavera film. Uganda: Fort-Portal Kabarole.

Rabetaliana, H. (1999). *Analyse et modelisation de la gestion locale des ressources naturelles: le cas du Parc National d'Andringitra*, Unpublished PhD thesis, Université de Besançon.

Radcliffe-Brown, A.R. (1965). *Structure and Function in Primitive Society*. New York: The Free Press.

Radhakrishna, R.B., Yoder, E.P., & Ewing, J.C. (2007). Strategies for linking theoretical framework and research types. Proceedings of the 2007 American Association of Applied Education Research Conference. No dates. Michigan state,

Ramakrishnan, P.S. (2002). Coping with uncertainties: The role of traditional ecological knowledge in socio-ecological landscape management. *Proceedings of Indian Natural Science Academy,* 68(3) 235–254.

Ramstad, K.M., Nelson, N.J., Paine, G., Beech, D., Paul, A. & Paul, P. (2007). Species and cultural conservation in New Zealand: Maori Traditional Ecological Knowledge of Tuatara. *Conservation Biology*, 21, 455–464.

Rands, M.R.W. Adams, W.M., Bennun, L. Butchart, S.H.M, Clements, A. Coomes, D., …Vira, B. (2010). Biodiversity conservation: Challenges beyond 2010. *Science,* 329, 1298–1303.

Reaser, J.K., Meyerson, L.A., Cronk, Q., Poorter, M., Eldrege, L.G., Green, E., ...Vaiutu, L. (2007). Ecological and socioeconomic impacts of invasive alien species in island ecosystems. *Environmental Conservation*, 34, 98 –111.

Reddy, S.R.C., & Chakravarty, S.P. (1999). Forest dependence and income distribution in a subsistence economy: evidence from India. *World Development*, 27, 1141–1149.

Redford, K.H., & Sanderson, S.E. (2000). Extracting humans from nature. *Conservation biology*, 4 (5), 1362–1364.

Redford, K.H., & Sterman, A.M (1993). Forest dwelling and native Amazonians and the conservation of biodiversity: Interests in common or in collusion? *Conservation biology*, 7 (2) 248–255.

Redmond, I. Aldred, T., Jedamzik, K., & Westwood, M. (2006). *Recipes for survival: controlling the bushmeat trade*. Ape Alliance Report, accessed on 12th May 2009 from http://www.4apes.com.

Reichel-Dolmatoff, G. (1976). Cosmology as ecological analysis: A view from the rain forest. *Man* 11, 307–318.

Reij, C. (undated). Indigenous soil and water conservation in Africa. International Institute for Environment and Development Sustainable Agriculture and Rural Livelihoods Programme. GATEKEEPER SERIES No. 27

Rennie, P., & Dibley, J. (2001). Implementing the environmental education policy in your school. and, Brewongle Environmental compilation: Education Centre Department of Education and Training. Accessed on 1st February 2011 from
http://www.curriculumsupport.education.nsw.gov.au/env_ed/assets/pdf/eeimplementdoc.pdf

Richards, P. (1985). *Indigenous agricultural revolution*. London: Hutchinson

Ritter, E.A. (1955). *Shaka Zulu: The biography of the founder of the Zulu nation*. Penguin Books: New York.

Robbins, P., McSweeney, K., Waite, T., & Rice, J. (2006). Even conservation rules are made to be broken: Implications for biodiversity. *Environmental Management*, 37, 162–169.

Robinson, J.G., & Bennett, E.L. (2000). *Hunting for sustainability in tropical forests*. New York: Columbia University Press.

Robson, M., Rosenthal, J., Lemelin, H., Hunt, L.M., McIntyre, N., & Moore, J. (2010). Information complexity as a constraint to public involvement in sustainable forest management. *Society and Natural Resources*, 23(12), 1150–1169.

Rodney, J. (2000). Community participation: tools and examples. Paper presented at the Management Planning Workshop for the Trans-Himalayan Protected Areas, 25th –29th August. Unknown venue. Accessed on 23rd May 2012 from http://www.snowleopardconservancy.org/pdf/WII%202000%20Leh%20PA%20Workshop%20Paper%202.pdf.

Roe, D., Mayers, J., Grieg-Gran, M., Kothari, A., Fabricius, C., & Hughes, R. (2000). *Evaluating Eden: Exploring the myths and realities of community-based wildlife management*. Evaluating Eden Series no 8.

Rogers, E.M. (1995). *Diffusion of innovations*. New York: Free Press.

Ross, H.S. (2009). *Language shift and plant knowledge in the West Usambara Mountains, Tanzania: An exploration of the theories of Biocultural diversity*. Unpublished PhD thesis, University of East Anglia, England.

Roth, C.E. (1992). *Environmental Literacy: its roots, evolution and directions in the 1990s*. ERIC: CSMEE Publications.

Russell-Smith, J., Karunaratne, N.S., & Mahindapala, R. (2006). Rapid inventory of wild medicinal plant populations in Sri Lanka. *Biological Conservation,* 123, 22–32.

Rutherford, M.C. (1979). Plant-based techniques for determining available browse and browse utilisation: a review. *The Botanical Review*, 45, 203–228.

Rutten, M.E.M. (2004). *Partnerships in community-based ecotourism projects: Experiences from Maasai Region, Kenya*. African Studies Centre Leiden. The Netherlands.

Rwenzori African Development Foundation (2010). *A baseline survey report for Kasese and Bundibugyo Districts*. Kampala, Uganda: Development and Management Consultants International.

Rwenzori Mountains Conservation and Environmental Management Project (2005). Rwenzori *Region Environmental Conservation Education Strategy 2006–2009*. WWF Uganda: Kasese.

Rwenzori Mountains Environmental Conservation Education Strategy (2004). *An environmental education policy document for local governments of Kasese, Kabarole and Bundibugyo and the Rwenzori Mountains National Park. Kasese*. Uganda: World Wide Fund for Nature.

Rwenzori Think Tank (2011). *Small holder farmers' knowledge and adaptation to climate change in Rwenzori region. Un published technical report*. Kabarole Research and Resource Centre and Mountains of the Moon University. Uganda: Rwenzori Think Tank Initiative.

Saetre, D.V. (1994). *People and grasses: a case study from the Royal Bardia National Park, Nepal*. Unpublished Masters Thesis, University of Norway, Norway

Saikia, A. (2008). Folklore and Environment. *A Quarterly Newsletter from National Folklore Support Centre, Indian*, 20, 3–4.

Saj, T.L., Mather, C., & Sicotte, P. (2006). Traditional taboos in biological conservation: The case of *Colobus vellerosus* at the Boabeng-Fiema Monkey Sanctuary, Central Ghana. *Social science information*, 45, 285–310.

Salt, G. (1987). Insects and other invertebrate animals collected at high altitudes in the Rwenzori and on Mount Kenya. *African Journal of Ecology*, 25(2), 95–106.

Scherl, L.M., Wilson, A., Wild, R., Blockhus, J., Franks, P., McNeely, J.A., & McShane, T.O (2004). Can protected areas contribute to poverty reduction? Opportunities and limitations. Switzerland: World Conservation Union.

Schoffeleers, J.M. (1979). Introduction. In J.M. Schoffeleers (Ed.). *Guardians of the land: Essays on central African territorial cults* (no page numbers). Gweru: Mambo Press.

Schupp, J.R. (1992). Effect of root pruning and summer pruning on growth, yield, quality and fruit maturity of McIntosh apple trees. *Acta Horticulture*, 322, 173–183.

Scoones, I., & Thompson, J. (1993). *Challenging the populist perspective: Rural people's knowledge.* Agricultural Research and Extension Practice: Institute DS.

Secretariat of the Convention on Biological Diversity (2010). *Global Biodiversity Outlook 3*. Montréal, Canada. No publishers.

Sekaran, U. (2000). *Research methods for business*. New York: John Wiley & Sons.

Seng, P., & Rushton, S. (Eds.). (2003). *Best practices workbook for boating, fishing, and aquatic resources stewardship education*. Alexandria: Recreational boating and fishing foundation.

Sentwali, B.R. (1997). *Epistemology from an Afrocentric perspective: Enhancing black students' consciousness through an Afrocentric way of knowing*. Digital Commons at University of Nebraska: Lincoln.

Shahabuddin, G., & Rao, M. (2010). Do community-conserved areas effectively conserve biological diversity? Global insights and the Indian context. *Biological Conservation*, 143, 2926–2936.

Shanley P., & Stockdale, M. (2008). Traditional knowledge, forest management and certification: a reality check. *Forests, Trees and Livelihoods*, 18, 1–13

Sheppard, S.R.J., & Achiam, C.M. (2004). Public participation in forest decision making. In J. Burley, J. Evans & J. Youngquest (Eds.), *Encyclopedia of forest sciences* (pp.1173–1182). Oxford: Elsevier.

Shiho, H. (2006). Utilisation of Marantaceae plants by the Baka hunter-gatherers in south-eastern Cameroon. In F. Ichikawa and G. Yasuoka (Eds.). *African Study Monographs, Suppliments*, 33, 29–48.

Shipton, P. (1990). African famines and food security: Anthropological perspectives. In M. Madzwamuse & C. Fabricius (Eds.). *Local knowledge and the Basarwa in the Okavango Delta: The case of Xaxaba, Ngamiland District* (pp. 353–394). London: Earthscan.

Shova, T., & Hubacek, K. (2011). Drivers of illegal resource extraction: An analysis of Bardia National Park, Nepal. *Journal of Environmental Management*, 92, 156–164.

Shova, T., & Chapman, D.S. (2010). Impacts of resource extraction on forest structure and diversity in Bardia National Park, Nepal. *Forest Ecology and Management*, 259, 641–649.

Shrivastava, J.R., & Heinen, J. (2007). A Microsite analysis of resource use around Kaziranga National Park, India: Implications for conservation and development planning. *The Journal of Environment & Development* , 16 (2), 207–226.

Shukla, S. (undated). Strengthening community-based conservation through traditional ecological knowledge. Accessed from http://www.ed.psu.edu/icik/2004Proceedings/section9-shukla.pdf on 15th May 2010.

Shylajan, C.S. (2001). *Economic valuation of non-wood forest products: A study of community dependence on protected area forest resources*. Unpublished PhD Thesis. University of Madras, Madras.

Shylajan, C.S., & Mythili, G. (2003). Community dependence on protected forest areas: A study on valuation of non-wood forest products in a region of India. *Sri Lankan Journal of Agricultural Economics*, 5(1), 97–122.

Sileshi, G.W., Nyeko, P., Nkunika, P.O.Y., Sekematte, B.M., Akinnifesi, F.K., & Ajayi, O.C. (2009). Integrating ethno-ecological and scientific knowledge of termites for sustainable termite management and human welfare in Africa. *Ecology and Society*, 14(1), 48–72.

Simberloff, D. (1996). Impacts of introduced species in the United States: Consequences. *National Implications of Environmental Change*, 2, 13–22.

Simmons, D. (1995). Developing a framework for national environmental education standards. *Papers on the Development of Environmental Education Standards*, 2, 53–58.

Smith, E.A., & Wishnie, M. (2000).Conservation and subsistence in small scale societies. *Annual Review of Anthropology*, 29, 493–524.

Snively, G., & Corsiglia, J. (2001). Discovering indigenous science: Implications for science education. *Science Education*, 85, 6–34.

Sobel, D. (1996). *Beyond ecophobia: Reclaiming the heart in nature education*. Unpublished MA thesis, The Orion Society and The Myrin Institute, Canada.

Songorwa, A.N. (1999). Community-based wildlife management in Tanzania: Are the communities interested? *World Development*, 27, 2061–2079.

Srbinovski, M., Erdogan, M., & Ismaili, M. (2010). Environmental literacy in the science education curriculum in Macedonia and Turkey. *Procedia Social and Behavioural Sciences*, 2, 4528–4532.

Stacey, T. (1996). Bakonzo identity and the protection of Rwenzori: The spiritual factor. In Osmaston *et al*. (eds). *The Rwenzori Mountains National Park* (pp 34–65). Department of Geography, Makerere University Kampala.

Stacey, T. (2003). *Tribe: The hidden hstory of the Mountains of the Moon*. London: Stacey International.

Standa-Gunda, W., & Braedt, O. (2005). Fallbacks and tourist traps: Carving wood in southern Zimbabwe. In A. Cunningham, B. Campbell, and B. Belcher (Eds.). *Carving out a future: forests, livelihoods and the international woodcarving trade* (pp. 67–78). People and Plants Conservation Series. London: Earthscan.

Steadman, D., & Olson, S. (1985). Bird remains from an archaeological site on Henderson Island, South Pacific: Man-Caused Extinctions on an "Uninhabited" Island. *Proceedings of the National Academy of Sciences*, 82, 6191–6195.

Stedman, R.C, Parkins J.R., & Beckley, T.M. (2005). Forest dependence and community wellbeing in rural Canada: Variation by forest sector and region. *Canadian Journal of Forest Research*, 35, 215–220.

Stern, P.C. (2000). Toward a coherent theory of environmentally significant behaviour. *Journal of Social Issues*, 56(3), 322–348.

Stevens, S. (1997). The legacy of Yellowstone. In S. Stevens (Ed.), *Conservation through cultural survival: indigenous people and protected areas (*pp. 34–56*)*. Washington DC: Island Press.

Stewart, H. (1977). *Indian fishing*. British Columbia: North Vancouver

Strædea, S., & Treue, T. (2006). Beyond buffer zone protection: A comparative study of park and buffer zone products' importance to villagers living inside Royal Chitwan National Park and to villagers living in its buffer zone. *Journal of Environmental Management*, 78, 251–267.

Tabuti, J.R.S., & Mugula, B.B. (2007). The ethno-botany and ecological status of *Albizia coriaria* in Buwagi and Namizi parishes, Uganda. *African Journal of Ecology*, 45, 3, 126–129.

Tabutia, J.R.S., Dhilliona, S.S., & Lyea, K.A. (2003). Firewood use in Bulamogi county, Uganda: Species selection, harvesting and consumption patterns. *Biomass and Bioenergy* 25, 581–596.

Tamale, S.E., & Nzirambi, M.K. (1996). Local participation in the management and decision making of Rwenzori national park. In H. Osmaston, J. Tukahirwa, C. Basalirwa & J. Nyakana (Eds.). *The Rwenzori Mountains National Park* (pp. 78–86). Kampala, Uganda: Makerere University.

Tattersall, I. (1982). *The Primates of Madagascar*. New York: Colombia University Press.

Tengö, M., & Belfrage, K. (2004). Local management practices for dealing with change and uncertainty: a cross scale comparison of cases in Sweden and Tanzania. *Ecology and Society*, 9(3), 4–12.

Tenywa, M.M. (1996). Agricultural potential in the Rwenzori Mountains, with special reference to the lower slopes in Bwamba. In H. Osmaston, J. Tukahirwa, C. Basalirwa & J. Nyakana (Eds.). *The Rwenzori Mountains National Park* (pp. 96 –112). Kampala, Uganda: Makerere University.

Terborgh, J., Van Schaik, C., Davenport, L., & Rao, M. (Eds.). (2002). Making parks work: Strategies for preserving tropical nature. Washington: Island Press.

Thomson, G., & Hoffman, J. (2003). Measuring the success of Environmental Education programs. Canadian Parks and Wilderness Society, and Sierra Club of Canada. Accessed on 14th August, 2012 from http://macaw.pbworks.com/f/measuring_ee_outcomes.pdf

Ticktin, T. (2004). The ecological implications of harvesting non-timber forest products. *Journal of Applied Ecology,* 41, 11–21.

Tole, L. (2002). Habitat loss and anthropogenic disturbance in Jamaica's Hellshire Hills area. *Biodiversity and Conservation*, 11, 575–598.

Totland, O., Nyeko, P., Bjerknes, A.L., Hegland, S.J., & Nielsen, A. (2005). Does forest gap size affect population size, plant size, reproductive success and pollinator visitation in Lantana camara, a tropical invasive shrub? *Forest Ecology and Management* 215, 329–338.

Townsend, S. (2006). *Kalinzu environmental education teachers guide*. Kampala Uganda: Final project report.

Trilica, M.J., Buwai, M., & Menke, J.W. (1977). Effects of rest following defoliations on the recovery of several range species. *Journal of Range Management*, 30, 21–27.

Tuckman, B. (1999). *Conducting educational research*. Fort Worth: Harcourt Brace College Publishers.

Tukahirwa, J.M. (1995). *Measurement, prediction and socio-ecology of accelerated soil erosion in Kabale district.* Unpublished Ph.D Thesis, Makerere University, Kampala.

Tumusiime D.M. (2006). *Dependence on environmental income by households around Rwenzori Mountain National Park, Western Uganda*. Unpublished MSc Thesis. Norwegian University of Life Sciences, Norway.

Tumusiime, D. M., Eilu, G., Tweheyo, M., & Babweteera, F. (2010). Wildlife snaring in Budongo Forest Reserve, Uganda. *Human Dimensions of Wildlife*, 15(2), 129–144.

Tumusiime, D.M., Vedeld, P., & Gombya-Ssembajjwe, W. (2011). Breaking the law? Illegal livelihoods from a protected area in Uganda. *Forest and Policy Economics*, 13, 273–283.

Turner**,** K.E. (2007). *Assessing wild plant vulnerability to over-harvesting: Refinement of the "Rapid Vulnerability Assessment" method and its application in Huitzilac, Mexico*. Unpublished Masters Thesis, Mcgill University, Mexico.

Turner, N. (1991). Burning mountain sides for better crops: Aboriginal landscape burning in British Columbia. *Archeology in Montana*, 32, 57–74.

Tusiime, D.M., Vedeld, P., & Gombya-Ssembajjwe, W. (2011). Breakingthe law? Illegal livelihoods from a protected area in Uganda. *Forest and policy economics*, 13, 273–283.

Twarog, S., & Kapoor, P. (Eds.) (undated). *Protecting and promoting traditional knowledge: systems, national experiences and international dimensions*. United Nations conference on trade and development. Accessed on 14th August 2012 from http://unctad.org/en/docs/ditcted10_en.pdf

Uganda Bureau of Statistics (2002). *Uganda housing and population census report 2002*. Kampala, Uganda: Access reprographics.

Uganda Bureau of Statistics. (2011). *Consumer price index, June 2011*. Uganda Bureau of Statistics Kampala Uganda: Kampala publishers

Uganda Wildlife Authority (2004). The Rwenzori Mountains National Park General Management Plan, 2004–2014. Uganda: Kampla

Uganda Wildlife Authority (2008). *Resource use agreements between Rwenzori Mountains National Park and the local community*. Rwenzori Mountains National Park, Kasese. No publishers

United Nations Environment Programme (2006). *Africa environment outlook 2*. Malta: Progress Press.

United Nations Education, Scientific and Cultural Organisation (2008). Links between biological and cultural diversity: Concepts methods and experiences, Report of an international workshop, UNESCO, Paris.

United Nations Education, Scientific and Cultural Organisation (2002). Report on the 25th session of the world heritage committee, 2001 Paris.

United Nations Education, Scientific and Cultural Organisation (1980). *Environmental education in the light of the Tbilisi Conference*. France: Paris.

United Nations Educational, Scientific and Cultural Organisation (2000). Report on the 23rd session of the world heritage committee, 1999. Paris, France: Private publisher.

United Nations Educational, Scientific and Cultural Organisation (2002). Report on the 25th session of the world heritage committee, 2001. Paris, France: Private publisher.

Usher, P.J. (2000). Traditional ecological knowledge in environmental assessment and management. *Arctic*, 53, 183–193.

Vedeld, P., Angelsen, A., Sjaastad, E., & Berg, G.K. (2004). Counting on the environment: Forest incomes and the rural poor. The World Bank Environment Department. No publishers

Vedeld, P., Angelsen, A., Sjaastad, E., & Kobugabe, B.G. (2007). Forest environmental incomes and the rural poor. *Forest Policy and Economics*, 9, 869–879.

Vít, L., Stanislav, M., & Jitka, K. (2008). Plant traits and regeneration of urban plant communities after disturbance: Does the bud bank play any role? *Applied Vegetation Science,* 11, 387–394.

Viveirosdecastro, E. (2004) Determinants of differential extinction vulnerabilities of small mammals in Atlantic forest fragments in Brazil. *Biological Conservation*, 119(1), 73–80.

Vodouhê, F.G., Coulibaly, O., Adégbidi, A., & Sinsin, B. (2010). Community perception of biodiversity conservation within protected areas in Benin. *Forest policy and economics*, 12, 505–512.

Volk, T., & McBeth, W. (1997). *Environmental literacy in the Unites States: What should be…What is…Getting from here to there*. Environmental Education and Training Partnership. Washington: North American Association for Environmental Education.

Warren, M. (1997). Conservation of indigenous knowledge serves conservation of biodiversity. *Alternatives Journal*, 23, 26 –27.

Warui, K.J., Makonjio, O.M., & Ekajul, S.W. (2007). Managers' perceptions of threats to the protected areas of Kenya: Prioritization for effective management. *Oryx*, 41(3), 314–321.

Watson, A., Alessa, L., & Glaspell, B. (2003). The relationship between traditional ecological knowledge, evolving cultures, and wilderness protection in the circumpolar north. *Conservation Ecology,* 8(1), 2–21.

Waylen, A.K., Fischer, A. Mcgowan, P.J.K. Thirgood, J.S., & Milner-gulland, E.J. (2010). Effect of local cultural context on the success of community-Based conservation interventions. *Conservation Biology*, 24 (4), 1119–1129.

Weber, P.R. (1990). *Basic content analysis*. London: Sage publications.

Wellington, J. (2000). *Educational research: contemporary issues and practical approaches*. London: Continuum.

Wells, M. & Brandon, K. (1992). *People and parks: linking protected area management with local communities.* Washington: World Bank.

Wells, M., & Brandon, K.E. (1993). The principles and practice of buffer zones and local participation in biodiversity conservation. *Ambio*, 22, 157–162.

Wenzel, G. (1991). *Animal Rights, Human Rights: Ecology, Economy and Ideology in the Canadian Arctic*. Belhaven Press: London.

Western, D., & Wright, R.M. (Eds.). (1994). *Natural connections: Perspectives on community-based conservation*. Washington DC: Island Press.

Western, D. (1982). The environment and ecology of pastoralists in arid savannas. *Development and Change*, 13, 183–221.

Western, D. (1994). Ecosystem conservation and rural development: The Case of Amboseli. In D. Western and M.R. Wright (Eds.). *Natural Connections: Perspectives on community-based Conservation*. (pp. 15–52). Washington DC: Island Press.

White, P.C.L., Vaughan, J.N., Renwick, A.R., & Barker, N.H.L. (2005). Questionnaires in ecology: A review of past use and recommendations for best practice. *Journal of applied Ecology*, 42, 421–430.

Wild, R., & McLeod, C. (Eds.). (2008). *Sacred natural sites: Guidelines for protected area managers*. Gland, Switzerland: International Union for Conservation of Nature.

Wild, R.G., & Mutebi, J. (1996). *Conservation through community use of plant resources: Establishing collaborative management at Bwindi Impenetrable and Mgahinga Gorilla National Parks, Uganda.* People and Plants working paper 5. UNESCO. Paris, France.

Wilkie, D. (2003). Substitutes for bush meat. In Bennett, E.L. & Deutsch, F (Eds.*). Hunting and wildlife trade in central Africa: Identifying gaps and developing strategies* (pp. 80–82). Report of a meeting held in Lopé National Park, Gabon. Wildlife Conservation Society.

Wilkie, D.S., & Carpenter, J.F. (1999). Bush meat hunting in the Congo Basin: An assessment of impacts and options for mitigation. *Biodiversity and Conservation*, 8, 927–955.

Wilkie, D.S., Carpenter, J.F., & Zhang, Q.U. (2000). The under financing of protected areas in the Congo Basin: So many parks and so little willingness to pay. *Biodiversity and Conservation*, 10, 691–709.

Williams, N.M., & Baines, G. (Eds.). (1993). *Traditional ecological knowledge: Wisdom for Sustainable Development.* Australia: Australian National University, Centre for Resource and Environmental Studies.

Wilson, S. (1995). *Bird and mammal checklists for Uganda's national parks*. Kampala, Uganda: Institute of Environment & National Resources.

Wily, A.L., & Mbaya, S. (2001). Land, people and forests in eastern and southern Africa at the beginning of the 21st century. Netherlands: International Union for Conservation of Nature.

Winkler, D., & Sondergaard, L. (2008). *The efficiency of public education in Uganda*. Kampala: Ministry of Education and Sports.

Winterhalder, B., Baillargeon, W., Cappelletto, F., Daniel, L., & Prescott, C. (1988). The population ecology of hunter gatherers and their prey. *Journal of Anthropological Archaeology*, 7, 289–328.

Wittemyer, G., Elsen, P., Bean, W.T., Burton, A.C.O., & Brashares, J.S. (2008). Accelerated human population growth at protected area edges. *Science*, 321, 123–126

Worah, S., Svendsen, D. S., & Ongleo, C. (1999). *Integrated conservation and development: A Trainer's Manual*. Thailand: Asian Institute of Technology.

World Health Organisation. (2004). The world health report 2004: Changing history. Accessed on 12th June 2010 from http://www.who.int/whr/2004/en/

Worster, D. (1990).Transformations of the earth: Toward an agro-ecological perspective in history. *Journal of American History*, 76(4), 1087–1106.

Wyman, L.C. (1964). *Navaho Indian Ethno-entomology*. Albuquerque: University of New Mexico Press.

Yasuda, A. (2011). The impacts of sport hunting on the livelihoods of local people: A case study of Be´noue´ National Park, Cameroon. *Society and Natural Resources*, 24, 860–869.

Yihäisi, J. (2003). Forest privatization and the role of community in forests and nature protection in Tanzania. *Environmental Science & Policy*, 6, 279 –290.

Young, T.P. (1994). Natural die-offs of large mammals: Implications for conservation. *Conservation Biolology,* 8, 410–418.

Young, V.R. & Pellett, P.L. (1994). Plant proteins in relation to human protein and amino acid nutrition. *American Journal of Clinical Nutrition*, 59, 1203–1212.

Zavaleta, E. (1999). The emergence of waterfowl conservation among Yup'ik hunters in the Yukon-Kuskokwim Delta, Alaska. *Human Ecology*, 27, 231–246.

Zeba, S. (1998). *Community wildlife management in West Africa: A regional review*. Evaluating Eden Series. Working Paper No.9. accessed on 14 May 2012 from http://www.oceandocs.org/bitstream/1834/659/1/eden_dp9.pdf.

Zerbe, N. (2005). Biodiversity, ownership, and indigenous knowledge: Exploring legal frameworks for community, farmers, and intellectual property rights in Africa. *Ecological Economics*, 53, 493–506.

APPENDICES

Appendix 3.1 A list of publications reviewed in Chapter 3 on the conservation of biodiversity through traditional ecological knowledge

Agrawal A (2002). Indigenous knowledge and the politics of classification. UNESCO's action on local and indigenous knowledge systems.

Aguilar G. (2001). Access to genetic resources and protection of traditional knowledge in the territories of indigenous peoples. Environmental Science & Policy 4, 241–256

Alcon J.B (1993). Indigenous peoples and conservation. Conservation biology. 7 (2) 424 – 426

Anderson, D. and Grove, R. 1987. Conservation in Africa: people policies and practice. Cambridge: Cambridge University Press.

Bassi, M. 2006. Community-conserved landscape of the Oroma-Borana, Ethiopia. Case study 21.11. In: Lockwood, M. Worboys, G. and Kothari, A. 2006. Managing protected Areas: A Global Guide. Earthscan, London.

Beltrán, J. (Ed.) (2000). Indigenous and Traditional Peoples and Protected Areas: Principles, Guidelines and Case Studies. IUCN, Gland, Switzerland and Cambridge, UK and WWF International, Gland, Switzerland. xi + 133pp.

Berkes F. Kislalioglu M. Folke C. Gadgil M. (1998). Exploring the Basic Ecological Unit: Ecosystem-Like Concepts in Traditional Societies. Ecosystems, 1 (5) 409-415

Berkes, F. Colding, J. Folke, C. 2000. Rediscovery of traditional ecological knowledge as adaptive management. Ecology Applied 10: 1251–1262.

Berkes, F. Folke C. and Gadgil, M. (1995). Traditional ecological knowledge, biodiversity resilience and sustainability. In C.A Perrings et al (eds), Biodiversity Conservation 281 -299. Kluwer academic publishers, Netherlands.

Betti, J. L. 2006. An ethno botanical study of medicinal plants among the Baka pygmies, in the Dja biosphere Reserve, Cameroon. African Study Monographs, 25 (1): 1-27.

Born J. Boreux V. Lawes M. J. (2009). Synthesis: Sharing Ecological Knowledge- The Way Forward. Biotropica 41(5): 586 - 588.

Brook K. R. McLachlan M.S. (2008). Trends and prospects for local knowledge in ecological and conservation research and monitoring Biodivers Conserv (2008) 17:3501–3512

Brush S. B. (2005). Farmers' rights and protection of traditional agricultural knowledge. CAPRi WORKING PAPER NO. 36. International Food Policy Research Institute

Byarugaba D. (2010). Integrating indigenous knowledge, active conservation and wild food plant use with reference to Dioscorea species in Bwindi forest, South-western Uganda. African Journal of Ecology 48, 539–540

Byarugaba D. and Nakakeeto R. F (2008). Indigenous Knowledge (IK) and Conservation Attitudes on Biodiversity Outside Protected Area Systems in Uganda: Igara County Scenario. International Conference on Traditional Forest Knowledge and Sustainable Forest Management in Africa; Accra, Ghana; 15-17 October 2008.

Carruthers, J. 1995. The Kruger National Park. A social and political history. University of Natal Press: Pietermaritzburg, South Africa. 170p.

Chalmers, N., and C. Fabricius (2007). Expert and generalist local knowledge about land-cover change on south Africa's Wild Coast: can local ecological knowledge add value to science? Ecology and Society 12 (1): 10.

Cinner E. J. (2007). The role of taboos in conserving coastal resources in Madagascar. SPC Traditional Marine Resource Management and Knowledge Information Bulletin #22 15-23

Cocks M. (2006). Biocultural Diversity: Moving beyond the Realm of 'Indigenous' and 'Local' People. Human Ecology 34 (2) 185 – 200

Cohn J. P. (1988).Culture and conservation: A greater sensitivity to local culture could increase the success of both conservation and development projects. BioScience 38 (7)450 – 453

Colchester M. (2004). Conservation policy and indigenous peoples Environmental Science & Policy 7, 145 – 153

Colding J. (1998). Analysis of hunting options by the use of general food taboos. Ecological Modelling 110 5–17

Colding, J. Folke C. and Elmqvist T. (2003). Social institutions in ecosystem management and biodiversity conservation Tropical Ecology 44(1): 25-41, 2003 .

Corsiglia, J. and Snively, G. 1995. Global lessons from the traditional science of long-resident peoples. In Snively G and MacKinnon A (eds.). Thinking globally about mathematics and science education. Pages 25–51. Vancouver: University of British Columbia, Research and Development Group.

Crona, B. and Ö. Bodin (2006). What you know is who you know? Communication patterns among resource users as a prerequisite for co-management. Ecology and Society 11(2): 7.

Cullis, A. & Watson, C. 2005. Winners and losers: Privatizing the commons in Botswana. March. Securing the Commons No. 9. SMI (Distribution Services) Ltd., Stevenage, Hertfordshire SG1 4TP, UK. SMI Order No: 9529IIED. iied@earthprint.com. http://www.iied.org/docs/drylands/secur_comm9.pdf.

Davidson-Hunt J. Iain and Berkes F. (undated). Changing Resource Management Paradigms, Traditional Ecological Knowledge, and Non-timber Forest Products. NTFP Conference Proceedings 78- 92.

Davis A. and Wagner R. J. (2003). Who Knows? On the Importance of Identifying "Experts" When Researching Local Ecological Knowledge. Human Ecology 31 (3) 463-489

Davis K D. (2005). Indigenous knowledge and the desertification debate: problematising expert knowledge in North Africa. Geoforum 36, 509–524

Davis S. H. (ed.) (1993). Indigenous Views of Land and the Environment. The International Bank for Reconstruction and Development. The World Bank. U.S.A.

DeGeorges P. A. and Reilly B. K. 2009. The Realities of Community-based Natural Resource Management and Biodiversity Conservation in Sub-Saharan Africa. Sustainability. 1, 734-788

DeGeorges, P.A. and Reilly, B.K. 2008. A critical evaluation of conservation and development in Sub Saharan Africa. The Edwin Mellen Press: Lewiston, New York, NY, USA.

Dove Michael R (2006). Indigenous People and Environmental Politics. Annual Review of Anthropology 35:191–208

Gadgil M., Berkes F. Folke C (1993). Indigenous Knowledge for Biodiversity Conservation Ambio 22 (2/3). Biodiversity: Ecology, Economics, Policy 151-156

Gadgil, M. Olsson, P. Berkes, F. and Folke, C. (undated). Exploring the role of local ecological knowledge in ecosystem management: three case studies in Fikred Berkes, Johan Colding and Carl Folke (ed.) (undated) Navigating Social-ecological systems Building Resilience for complexity and Change pp 189 – 209. Cambridge University Press Cambridge, UK.

Gupta A. K. (undated). Fishing in the 'Troubled' Waters: Recognizing, Respecting, and Rewarding Local Ecological Knowledge, Innovations and Practices Concerning Aquatic Biological Diversity.

Hames R. (2007). The Ecologically Noble Savage Debate. The Annual Review of Anthropology 36, 177–90.

Hens L. (2006). Indigenous Knowledge and Biodiversity Conservation and Management in Ghana. Journal of human ecology 20(1): 21 - 30.

Hinz, M.O. 2003. Without chiefs there would be no game. Customary law and nature conservation. Out of Africa Publishers:Windhoek, Namibia.

Hitchcock, R.K. 2000a. Traditional African wildlife utilisation: Subsistence hunting, poaching and sustainable use. In: Prins, H.H.T. Grootenhuis, J.G. and Dolan, T. (eds.). Wildlife conservation and sustainable use. Kluwer Academic Publishers: Boston

Hitchcock, R.K. 2002a. "We are the First People: Land, natural resources and identity in the Central Kalahari, Botswana." Journal of Southern African Studies. 28 (4): 97-824.

Infield, M. 2001. Cultural Values: A Forgotten Strategy for Building Community Support for Protected Areas in Africa. *Conservation Biology* 15, 3: 800-802.

Inglis J.T (ed.). (1993). Traditional ecological knowledge concepts and cases. International Program on Traditional Ecological Knowledge International Development Research Centre

Inglis, J.T. (undated). Traditional ecological knowledge: Concepts and cases. International program on traditional ecological knowledge and international development research centre. IDRC.

Johannes, R. 1978. Traditional Marine Conservation Methods in Oceania and Their Demise. Annual Review of Ecology and Systematics 9:349-364.

Jungerius P. D (1997). Indigenous knowledge of landscape–ecological zones among traditional herbalists: a case study in Keiyo District, Kenya. Geo Journal 44 (1), 51–60

Lamola, L. M. 1992. Linking the formal and informal sectors in plant genetic resources conservation and utilisation: a proposal for cooperative research. White Paper 92-2. Des Moines: Agricultural Law Center, Drake University Law School.

Lane, C. 1990. Barabaig Natural Resource Management: Sustainable Land Use under Threat of Destruction. United Nations Research Institute for Social Development (UNRISD) Discussion Paper Number 12.

Lawi Q. Y. (1999). Where Physical and Ideological Landscapes Meet: Landscape Use and Ecological Knowledge in Iraqw, Northern Tanzania, 1920s-1950s. The International Journal of African Historical Studies 32 (2/3) 281-310.

Lewis, D.M. and Alpert, P. 1997. Trophy hunting and wildlife conservation in Zambia. Conservation Biology 11, 50-68.

Luoga, E. J. Witkowski E. T. F., Balkwill K. (2000). Differential utilisation and ethno-botany of trees in Kitulanghalo forest reserve and surrounding Communal lands, eastern Tanzania. Economic Botany 54(3) 328 – 343

MacKenzie, J. M. 1987. Chivalry, Social Darwinism and Ritualised Killing: The Hunting Ethos in Central Africa up to 1914. In Anderson D and Grove R (eds.) Conservation in Africa: People, Policies and Practice. Pages 41-61.Cambridge: Cambridge University Press.

MacKenzie, J. M. 1997. The empire of nature. Hunting, conservation and British imperialism. Studies in imperialism. Manchester University Press: Manchester & New York. 340p.

MacKenzie, J.M. 1988. The Empire of Nature: Hunting, Conservation and British Imperialism. Manchester University Press, Manchester.

Maffi L (2006). Linguistic, Cultural, and Biological Diversity. The Annual Review of Anthropology. 29, 599–617

Magelah P. (Lead Author); Sylvio G. Codella and Yahya Eid (Topic Editors). 2007. "Totem." In: Encyclopedia of Earth. Eds. Cutler J. Cleveland (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment). [Published in the Encyclopedia of Earth May 22, 2007; Retrieved April 5, 2010]. <http://www.eoearth.org/article/Totem

Mapinduzi L.A. Oba G. Weladji R.B. and Colman J.E (2003). Use of indigenous ecological knowledge of the Maasai pastoralists for assessing range land biodiversity in Tanzania. African Journal of ecology. 41, 329 – 336.

Mariko, K. A. 1981. Le monde mysterieux des chasseurs traditionnels. Agence de Cooperation Culturelle et Technique. Les Nouvelles Editions Africaines: Paris, Dakar, Abidjan & Lome. 200p

Marks, S. A. 1976. Large mammals and a brave people: Subsistence hunters in Zambia. University of Washington Press: Seattle. 254p.

Marks, S. A. 1984. The Imperial Lion: Human Dimensions of Wildlife Management in Central Africa. Boulder: Westview Press.

Masona, T. 1987. Colonial Game Policy: A study of the origin and administration of game policy in southern Rhodesia - 1890 - 1945. Unpublished dissertation, department of Economic History, University of Zimbabwe.

Maundu, P. Berger, D.J. Ole S.C. Nasieku, J. Kipelian, M. Mathenge, S.G. Morimoto, Y. Höft, R. 2001. Ethnobotany of the Loita Maasai: Towards Community Management of the Forest of the Lost Child - Experiences from the Loita Ethnobotany Project. People and Plants working paper 8. UNESCO, Paris.

Maundu, P., Berger, D.J., ole Saitabau, C., Nasieku, J., Kipelian, M., Mathenge, S.G., Morimoto, Y., Höft, R. (2001). Ethnobotany of the Loita Maasai: Towards Community Management of the Forest of the Lost Child - Experiences from the Loita Ethnobotany Project. People and Plants working paper 8. UNESCO, Paris.

Mauro F. and Hardison P.D (2000). Traditional knowledge of indigenous and local communities: international debate and policy initiatives Ecological Applications, 10(5) 1263–1269

Mbiti. J.S. 1988. African religions and philosophy. London, Ibadan, Nairobi, Gaborone: Heinemann, report.

McCorkle, C.M. and McClure, G. 1992. Farmer Know-How and Communication for Technology Transfer: CTTA in Niger. In Warren D.M. Brokensha D, and Slikkerveer L. J (eds.). 1992. Indigenous Knowledge Systems: The Cultural Dimension of Development. London: Kegan Paul International.

McGregor. J. 2003. Living with the River: Landscape and Memory in the Zambezi Valley, Northwest Zimbabwe. In Beinart W and McGregor J (eds.). 2003. Social History and African Environments. Pages 87-105.Oxford; Athens, OH; Cape Town: James Currey; Ohio University Press; David Philips.

Moller, H., F. Berkes, P. O. Lyver, and M. Kislalioglu. (2004). Combining science and traditional ecological knowledge: monitoring populations for co-management. Ecology and Society 9(3): 2.

Mugisha, A. Infield M. (2009). People-oriented conservation: using cultural values in Uganda. Oryx, 43(1), 13-16

Murombedzi, J. 2003. Pre-colonial and colonial conservation practices in southern Africa and their legacy today; IUCN: Harare, Zimbabawe, 2003. Available online: http://dss.ucsd.edu/~ccgibson/docs/Murombedzi%20%20Precolonial%20and%20Colonial%20Origins.pdf (Accessed 3 March 2010).

Ndoye, O. and Kaimowitz, D. 1998. Macro-economics, markets, and the humid forests of Cameroon, 1967-1997. World Rainforest Movement, Maldonado 1858 – 11200 Montevideo – Uruguay.

Nelson, R. K. 1983. Make prayers to the raven: A Koyukon view of the northern forest. Chicago: University of Chicago Press.

Nganje M. (2009). Harnessing Traditional Ecological Knowledge for the Conservation of Forests and Biodiversity. XIII World Forestry Congress Buenos Aires, Argentina, 18 – 23 October 2009

Overwalle V. G. (2005). Protecting and sharing biodiversity and traditional knowledge: Holder and user tools. Ecological Economics 53, 585– 607.

PorterBolland L. Ellis E. A. Guariguata M. R. c, Ruiz-Mallén I. Negrete-Yankelevich S. Reyes-García V. (2011). Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics. Forest Ecology and Management (article in press)

Rabetaliana, H. 1999. Analyse et modelisation de la gestion locale des ressources naturelles: le cas du Parc National d'Andringitra, Thèse de Doctorat en ecology (en preparation), Université de Besançon.

Ramakrishnan P.S. (2002). Coping with uncertainties: Role of Traditional ecological Knowledge in socio-ecological landscape management. Proceedings of Indian natural science academy (PINSA) B68 (3) 235 – 254

Reichel-Dolmatoff, G. 1976. Cosmology as Ecological Analysis: A View from the Rain Forest. Man 11:307 318.

Reij, C. (undated). Indigenous Soil and Water Conservation in Africa. International Institute for Environment and Development Sustainable Agriculture and Rural Livelihoods Programme. GATEKEEPER SERIES No. 27

Richards, P. 1985. Indigenous Agricultural Revolution. London: Hutchinson

Ritter, E.A. 1955. Shaka Zulu: The biography of the founder of the Zulu nation. Penguin Books: New York. 411p.

Ross H. S. (2009). Language shift and plant knowledge in the West Usambara Mountains, Tanzania: An exploration of the theories of Biocultural diversity. Unpublished PhD thesis, School of Development Studies, University of East Anglia.

Sacred Groves: Potential for Biodiversity Management Bhagwat A. S. and Rutte C. (2006). Frontiers in Ecology and the Environment 4(10) 519-524

Saj, T.L., Mather, C. and Sicotte, P. 2006. Traditional taboos in biological conservation: the case of Colobus vellerosus at the Boabeng-Fiema Monkey Sanctuary, Central Ghana. Social Science Information 45: 285-310

Schoffeleers, J.M. 1979. Introduction. In Schoffeleers, J.M. (ed.). (1979). Guardians of the Land: Essays on Central African Territorial Cults. Mambo Press, Gweru.

Shanley P. and Stockdale M. (2008). Traditional knowledge, forest management and certification: a reality check. Forests, Trees and Livelihoods, 18, 1 – 13

Shiho, H. 2006. Utilisation of Marantaceae Plants by the Baka Hunter-gatherers in Southeastern Cameroon. In Ichikawa and Yasuoka (eds.). (2006). African Study Monographs, Suppl.33:29-48

Shipton, P. 1990. African famines and food security: Anthropological perspectives. In Madzwamuse, M. and Fabricius, C. 2004. Local knowledge and the Basarwa in the Okavango Delta: The case of Xaxaba, Ngamiland District." Pages 353-394. Earthscan: London & Sterling, Virginia.

Shukla S. (undated). Strengthening Community-based Conservation through Traditional Ecological Knowledge.

Sileshi, G. W., P. Nyeko, P. O. Y. Nkunika, B. M. Sekematte, F. K. Akinnifesi, and O. C. Ajayi. (2009). Integrating ethno-ecological and scientific knowledge of termites for sustainable termite management and human welfare in Africa. Ecology and Society 14(1): 48.

Smith E. A. and Wishnie M. (2000).Conservation and Subsistence in Small-Scale Societies. Annual Review of Anthropology 29, 493 - 524

Stevens, S. 1997. The legacy of yellowstone. In Stevens, S. (ed.). Conservation through cultural survival: indigenous people and protected areas. Washington DC: Island Press.

Stewart, H. 1977. Indian fishing. North Vancouver

Tengö, M. and K. Belfrage (2004). Local management practices for dealing with change and uncertainty: a cross-scale comparison of cases in Sweden and Tanzania. Ecology and Society 9(3): 4.

Twarog S. and Kapoor P. (eds) (undated). Protecting and promoting traditional knowledge: systems, national experiences and international dimensions united nations conference on trade and development. UNCTAD/DITC/TEC/10.

UNESCO (2009), Learning and Knowing in Indigenous Societies Today. Edited by P. Bates, M. Chiba, S. Kube & D. Nakashima, UNESCO: Paris, 128 pp.

Waylen A K., Fischer A. Mcgowan P. J. K. Thirgood J S. and Milner-gulland E. J. (2010). Effect of Local Cultural Context on the Success of Community-Based Conservation Interventions. Conservation Biology, 24 (4) 1119- 1129.

Williams, N.M. and Baines, G. (eds). 1993. Traditional Ecological Knowledge: Wisdom for Sustainable Development. Australian National University, Centre for Resource and Environmental Studies.

Worster, D. 1990.Transformations of the earth: Toward an agroecological perspective in history. Journal of American History 76, no. 4:1087-1106.

Ylhäisi J. (2003). Forest privatization and the role of community in forests and nature protection in Tanzania. Environmental Science & Policy 6, 279–290.

Zeba S. (1998). community wildlife management in west Africa: A regional review. Evaluating Eden Series. Working Paper No.9

Zerbe N. (2005). Biodiversity, ownership, and indigenous knowledge: Exploring legal frameworks for community, farmers, and intellectual property rights in Africa. Ecological Economics 53, 493– 506

Appendix 5.1 The interview schedule used in the study

Thank you for accepting to take part in this study, so we are starting our interview now

Research question	Questions to ask the respondent	Remarks/follow up/ Probe questions
What is the nature and extent of usage of the park and its resources?	*Do you ever go into the Rwenzori Mountains National Park?*	**If he/she says "no"** probe to establish how true this is. Use probes such as *Didn't you ever go there to collect firewood?* *Have you never gone there to collects plants for food or medicine?* *Have you never visited the park with your parents?* **If he/she persists with "no" terminate the interview.**
		If he/she says "yes" ask *Why do you go there?* Encourage them to give many reasons, using prompts like *What other things do you do there?* *What else do you go into the Park for?* Then first choose the thread on resources to follow up on in detail. *You said you go there to collect things. What things do you collect from there?* (need to have a list of things first so that it is possible to probe on each of them). **If he/she does not volunteer more, follow each of the mentioned resources by asking** *Please tell me more about the things you collect. When did you start collecting [------]from the park?* *Why do you collect [------]from the park?* (note if the reasons are personal or influenced by the community). *Have you ever wished to collect [------] from the park but you are unable to? What are the*

		reasons? *Who goes with you to collect [------]?* *What do you use [------]for?* If they don't say, probe by asking *Do you use [------]to make a living by selling or exchanging it with other things or you just use it around the house or for your family?* *Is the use of [------] now different from what it was used for in the past?* If yes, Ask, *How different, please explain?* *How often do you collect [------]?* (Use probes such as *Do you collect once a year? Every month? How many times a week do you collect X?)* *How much [------]do you gather each time?* *Is the amount of [------]you collect different from that you used to collect in the past?* If "yes", Ask; *How much would you collect in the past? Please tell me more; Why did you start to gather more/less?*
How has the nature and extent of usage of the park changed with time?	*Have you noticed any changes in the availability of [------]?*	If he or she says "no" ask *Have you noticed that [------]is more / less abundant than it used to be?* (if yes move on the questions below that probe timing as well as extent of the problem)
		If he/ she says "yes" probe timing as well as extent of the problem *Please tell me more about what you have noticed* *This is interesting, when did you start noticing this?* *Why do you think [------]is seen less/ more often than before?* *Do you think [------]will still be available for collection by the children of your children?* If "no" ask; *Why do you think [------] will no longer be available?* *What do you think could be done to ensure that [------]is available for the children of your children?*

		If "yes" ask*; Why do you think [------] will be available for the children of your children?*
		Do you ever collect [------] from elsewhere (outside the Park)? **If he/she says "no " ask** *What is the reason that you don't collect it elsewhere?* **If he/she says "yes" ask** *Where else do you collect [------]?* and follow up on other details *(how often, and how much)*
		Ask about another resource (using similar probes as above) Make a follow up on other resources mentioned. Then move on to activities
	Earlier you told me you sometimes go to the Park to do [---]. That is interesting, Please tell me more about it.	*When did you start doing [------] in the park? Why do you do [---] in the park?* (note if the reasons are personal or influenced by the community). *Have you ever wished to [------] from the park but you are unable to? What are the reasons?* *Who goes with you to do [---]?* *How often do you do [---]?* Use probes such as; *Do you do that more than once a year? Every month? How many times a week do you do [---]?* *Is the number of times you do [------] different from that of the past?* If "yes", Ask *How often did you do[------] in the past? Please tell me more; When did this change occur? Why did this change occur?* *Would it be possible to carry out activity [---] somewhere else outside of the Park? Where?(Please explain your answer)* *Do you think carrying out activity [---] in the park has an y effect on the park?*
		Then make probes into another activity (following similar questions and probes as above) Then move on to research question 3.
	(This question will be asked to the respondent who will have mentioned more than 3 things that he/she gets from the park) *Please, I am sorry to take you back to the*	Pause for about 30 seconds to allow him/her to recollect. If the respondent does not recall the things, remind him/her by reading them? *You said you collect [---], [---], [---], [---], [---] and [---] from the park, which ones are the most*

What indigenous knowledge, beliefs and practices affect usage of the Rwenzori Mountain resources and how do these differ from the past?	*things that you told me you get from the park. What are the three most important that you have to get from there?*	*important?* When the respondent mentions the three things, proceed by asking him/her about each of them. *Why do you say [---] has to be obtained from the park? Why is [---] one of the most important things?*
	Please tell me how you collect [---]. Do you first do something to enable you collect thing [---]?	If the response is " no", probe to establish how true this is by asking *Have you ever obtained permission to go to collect [---]?* If Yes, ask *How do you obtain permission?* *From whom do you get permission?* *Why do you have to get permission from----?* *Do you ever perform a ritual before going to collect [---]?* **If he or she insist with "no" proceed to the questions that ask about what is done during collection of thing** *[---]*
		If the answer is yes, probe *What do you first do? That is very interesting; why do you have to do that?* *What else do you do first so that you are able to collect [---]?* If he or she does not volunteer more, move to the next question *Is what you have told me been like that in the past?* If No, ask *What changes have occurred?* *When did this start happening?* *Why has---- happened?* *What do you feel about this change?*
	Please tell me what you do when you get to the park to collect/gather/harvest [---]?	*That is exciting, Why do you do that?* *Do you have to gather [---] in a particular way?* If yes, probe *Please tell me more, why that particular way?*

		Were you doing this even in the past? If No ask; *How was it in the past?* *When did this change occur?* *Why is there that difference? What is your opinion about this change?*
	Aha, after gathering/collecting/harvesting [---] what do you do with it?	Let him/her talk and elaborate what is done after gathering the resource. When ever he/she mentions something of interest, interject by asking, *Please tell me more about that. Why do you do that?* *Have you always done this?* **If "no", ask** *What change has occurred? When did this change start?* *Why has this change taken place?* *What do you think about this change?*
	Are there any practices that you are not supposed to do when collecting[---]	If yes probe more; *What are you not supposed to do?* *Where did you hear this from?* *What happens when you do that?* *In your opinion do you think that is true?* *Do you avoid doing such practices when collecting [---]?*
	Some people are worried that too much of [---] is being taken from the park and that there will be nothing left for our children what do you think?	Probe by asking him/her to explain by suing probes such as; *Oh, why do you think------- is case?*
	Do you know of any local practices which ensure that [---] will be available in the park for collection for many years?	Tell me more. *Which local practices do you know?* *Where did you hear this?* *Who told you about it?* *How do you know that by following this practice, [---] will be available in the park for collection for many years?*

		Do you follow this practice when you collect [---]?
	Now proceed and ask him/her about the other two resources, following similar questions and probes as above. **When all the three resources have been asked about, move to activities.**	
	(Also this question will be asked to the respondent who will have stated that he/she performs more than three activities in the park) *You had also told me about activities that, you carry out from the park? Please tell me three most important activities that you do in the park?*	Pose for about 30 seconds to allow him/her to recollect. If the respondent does not recall the activities, remind him/her by reading them? *You said you do [---], [---], [---], [---], [---] and [---] in the park, which three are the most important?* When the respondent mentions the three activities proceed by asking him/her about each of them. *Why do you say [---] has to be done in the park? Why is [---] one of the most important?*
	Do you first do something to enable you do [---]?	If the response "no", probe to establish how true this is by asking *Have you ever obtained permission to go to do [---]?* If Yes, ask *How do you obtain the permission?* *From whom do you get the permission?* *Why do you have to get permission from----?* *Do you ever perform a ritual before going to do [---]?* **If he or she insist with "no" proceed to the question that asks about what is done during collection of thing** *[---]*
		If the answer is yes, probe *What do you first do? That is very interesting; why do you have to do that?* *What else do you do first so that you are able to do* [*---]?* If he or she does not volunteer more, move to the next question *Is what you have told me similar to what was done in the past?* If No, ask *What changes have occurred?*

		When did this start happening? *Why has---- happened?* *What do you feel about this change?*
	Aha, when you get to the park to do [---], how do you start?	*After that, What then do you do?* As the respondent describe how he/she performs does *[---]* interject from time to time with probes like: *Oh, that is interesting, but why do you do that?* Move on to establish the difference between now and the past *Thank you, has [---] always been done like that?* If No, ask *What changes have occurred?* *When did this change start happening?* *Why has---- happened?* *What do you feel about this change?*
	*Is there any activity that **must** be done after doing [---]?*	Let him/her talk and elaborate on what is done and then probe; *Wow, that is interesting. Please tell me more, why do you do that?* *What happens if you do not do that?* *Is what you have said different from what you used to do in the past?* **If "yes", ask** *What is the difference? When did this difference come about?* *Why did this change happen?* *How do you feel about this change?*
	Some people are worried that doing [---] is destroying the park and the things there, what do you think?	Probe to establish the reasons for the answer that he/she has given *Why do you think that-----?*
	Are there any things that you are not supposed to do when [---]?	If "yes" say; *Please tell me more; what are you not supposed to do [---]?* *Why should you not do that?*

		What happens if you do it? *In your opinion, do you believe that ----- happens if you don't to that?*
	Do you know of any local practices which ensure that doing [---] will continue for many years?	Tell me more. *What local practices are these?* *Where did you hear this?* *Who told you about it?* *How do you know that if you do----- will ensure that [---] is done for many years?*
	Now proceed and ask him/her about the other two activities, following similar questions and probes as above.	
What is the nature and extent of informal and formal environmental education that the people in the Rwenzori Mountains have received?	*Have you ever been told on how you should use things in the mountain or park?*	**If he/she says "no" ask** *Have you never been told how to use things in the park so that it is not destroyed?* *Haven't you heard from the radio that you should not cut down trees and destroy wetlands in the mountain?* *Has any one never told you that the things in the mountain and the park need to be used in such away that other people can use them in future?* **If he/ she insist with "no" end the interview**
		If he or she says "yes" ask *Please tell me more, What were you told?* First let him/her mention all the things that he/ she was told. *What else have you heard?* If he or she doesn't volunteer more, proceed by asking on each of the mentioned things. *Thank you, you said you were told that ------- when were you told this?* *Who told you that-------? or* *From where did you hear that-------?* *In what language were you told that------?* *What do you think were the reasons for being told that-------?* *How often do you hear that-----?* (Use probes such as *Do you hear about----once a year? Every*

		month? How many times in a week do you hear about ----?) *When you were last told that -------?* *When did you first hear that ---------?*
	Aha, that is good; do you follow ------when using things in the mountain or park?	If yes, ask *How do you follow------? Do you sometimes feel that you are doing ------ for the sake of other people? Please explain* If he/she says "no" ask *Why don't you follow-----?* Make a follow up on other things mentioned

This is the end of my questions, please feel free to say or ask me any questions. Thank you for your time and information. Stay well!!

Appendix 5.2 A copy of one of the interview transcripts

ID number: KSK-01

Int: - Good morning sir I have come with this man called Moses. He teaches at Mountains of the Moon University in Tooro and he is also a publicity secretary of RweMMCA you know our organization?

Res: - *Yes*

Int: - We are requesting to ask you some questions about the Rwenzori Mountains National Park. We know that UWA people believe that going there to gathering things destroys the park. But we are aware that some people in this village need to go to the park or gather things from there and have good reasons but these reasons as well as ways of gathering things from the park without destroying it may not be known to UWA.

Res: - *Yes, yes*

Int: - So we are trying to find out how and why you or your family members use the park or its resources. We have chosen you as one of the people to ask some questions because you live in a village close to the Rwenzori Mountains National Park.

Res: - *It means we are lucky*

Int: - Yes, please, we request you answer as truthfully as you can, because the information we will get from you will be used to inform UWA people about your reasons and points of view why you need to use things from the park.

Res: - *That will be good; we really need to be helped*

Int: - We hope UWA will look into your reasons and find ways of enabling you to fetch things or carry out activities in the park.

Res: - *Yes, yes! We have been suffering for long*

Int: - Your name will not be mentioned any where when I will be reporting the outcomes of this study, and no body else will know what you told me.

Res: - *Hahaha……(he laughs)*

Int: - So now, I am going to start asking you. Do you ever go into the Rwenzori Mountains National Park?

Res: - *Oh, yes!*

Int: - Why do you go there?

Res: - *I go there mainly to collect medicine for the treating my children and also to collect Kilingi when my kitchen has been destroyed by the goats*

Int: - What else do you go into the Park for?

Res: - *Aaa. Nothing else.*

Int: - What other things do you do there?

Res: - *For me apart from what I have told you, I don't do other things. You see the park is useful to many people I think you will ask other people and they will tell you what they get. Different people do different things.*

Int: - Alright thank you. You said you go there to collect medicine for your children, what exactly do you collect?

Res: - *I collect Mugabagaba (the leaves) which I squeeze out some juice and give them to drink.*

Int: - What else?

Res: - *Roots o f Musibura*

Int: - Is that all?

Res: - *No, no, also Bwiso (Ilex mitis) the bark is used to treat ulcers.*

Int: - Please tell me more about *Mugabagaba*. When did you start collecting *Mugabagaba* from the park?

Res: - *Aha as early as when I was still young, many years back, I would go with my father at first then later would send me alone, I got used since that time.*

Int: - But why do you collect *Mugabagaba* from the park?

Res: - *Yah, it is in the park where Mugabagaba is, you cannot find it any where else. There is kaghoma place but once I collected them but were not effective and all of us have to go to the park even though it is far.*

Int: - Have you ever wished to collect *Mugabagaba* from the park but you are unable to?

Res: - *Yes, as I have told you once I went to Kaghoma but they were not effective. It seems those in the park have a blessing of kaiakara. He is our god of all medicine.*

Int: - What were the reasons for going to Kaghoma?

Res: - *It was because the park is far and at that time the path there was not good it had rained none stop for three days and all my children were sick, so I was told that kaghoma also has mugabaga.*

Int: - Who goes with you to collect *Mugabagaba*?

Res: - *I go there alone. Going there with other people is not allowed, while collecting Mugabagaba the God must be respected. He does not like noise and only one person must collect from the tree at a time. So going with other people would have no meaning because what I can collect alone is enough for my family.*

Int: - What do you use *Mugabagaba* for?

Res: - *As I had said, it is for medicine. It serves many uses like stomach upsets, cough, diarrhea and many others. Some people even come here and request me to prepare for them.*

Int: - Is the use of *Mugabagaba* now different from what it was used for in the past?

Res: - *No, no we have been using them for that purpose. In the past all the people would use it for medicine. The hospital was very far, but now some people have resorted to modern medicine. For me I think this one is better I just give you one cup and the stomach upsets go instantly.*

Int: - How often do you collect Mugabagaba? Once a year? Every month? How many times a week ?

Res: - *Aha, it depends on the need from people and the sickness. But if I can guess, I think once a month. Even when in my family people are not sick, I get other neighbours in need of the medicine.*

Int: - How much *Mugabagaba* do you gather each time?

Res: - *Aha well, it depends, but I collect 20- 30 leaves. They are just enough for about five people.*

Int: - Is the amount of *Mugabagaba* you collect different from that you used to collect in the past?

Res: - *Yes in the past we would collect less, around 5 leaves but now we collect more because the park people restrict us. So I have to collect so that I prepare and keep some in case people come abruptly and they want the medicine.*

Int: - Have you noticed any changes in the availability of *Mugabagaba*?

Res: - *No, there are still there as used to be in the past. As I have told you, people now have turned to modern medicine, so fewer need it.*

Int: - Have you noticed that *Mugabagaba* is more / less abundant than it used to be?

Res: - *Ahs we have different places in the park where we collect Mugabagaba we rotate in different places. There is a way kaiakara directs you, you will find collecting it from far deep in the forest.*

Int: - Do you think *Mugabagaba* will still be available for collection by the children of your children?

Res: - *I think they will be available our children these day are taken up by modern life they are no longer interested in collecting them?*

Int: - You had told me that Roots o f Musibura. When did you start collecting *Musibura* from the park?

Res: - The same, when I was still young.

Int: - But why do you collect *Musibura* from the park?

Res: - *That one also is only found in the park, high up it is not as easy to get.*

Int: - Have you ever wished to collect *Musibura* from the park but you are unable to?

Res: - *Yes, there are times when we could not go to the park because of the rebels, they had occupied the higher areas where were getting it.*

Int: - Who goes with you to collect *Musibura*?

Res: - *Sometimes I go with my son Mumbere (pointing to his son). So he has to learn so that one day when I am away, he will be able to help the people I live behind.*

Int: - Why do you go with Mumbere to collect Musibura but not when you are going to collect Mugabagaba

Res: - *You see Mumbere is my first born son and forms the root of my next generation, and in collection the roots of Musibura must be done with the help of the first born.*

Int: - What do you use Musibura for?

Res: - *It is used for removing intestinal worms. Just three cups are enough one in the morning, one during the day and another in the evening*

Int: - Is the use of *Musibura* now different from what it was used for in the past?

Res: - *Yes, in the past we would cut Musibura for firewood, but now it is not acceptable by the park people and it is difficult to risk because it involves carrying heavy load.*

Int: - How often do you collect Musibura? Once a year? Every month? how many times a week?

Res: - *We collect it once in every three months. It is because after three months it is when the skin changes and develops some pimples a sign of intestinal worms. That is how we know (he said this grinning)*

Int: - How much *Musibura* do you gather each time?

Res: - *Some times 5 roots and other times three. It also depends on other people; if they need they tell me and plan for them. You see here different people do different things, when I also want some meat they give me. At times we just exchange.*

Int: - Is the amount of *Musibura* you collect different from that you used to collect in the past?

Res: - *Yes, in the past we would collect all the root about 30 that we would find. So we would prepare the medicine and store some for other people. But now some people go to the clinic and others are not interested in the culture of using local medicine.*

Int: - Have you noticed any changes in the availability of Musibura?

Res: - *No*

Int: - Have you noticed that Musibura is more / less abundant than it used to be?

Res: - *No, the way it used to be is still that way, we find that them except we are directed by the mountain god where to go.*

Int: - Do you think *Musibura* will still be available for collection by the children of your children?

Res: - *Yes yes!, because the park is stopping us from collecting as much as we want and few people are interested and when we the old die, we are not replaced.*

Int: - *What about Bwiso?* When did you start collecting it from the park?

Res: - *I think that one was after the around 1986.*

Int: - But why do you collect *Bwiso* from the park?

Res: - *Bwiso is only found only in the park?*

Int: - Before 1986, what were you using instead of Bwiso?

Res: - *There was another tree called aaa…..I have forgotten the name, when I recall I will tell you. It was very good and many people liked using it, so removing the back made it dry. But in Congo they were using Bwiso and it how we came to learn about it.*

Int: - Have you ever wished to collect *Bwiso* from the park but you are unable to?

Res: - *No every time I wish to collect it I find no problem.*

Int: - Who goes with you to collect *Bwiso*?

Res: - *It depends, sometime s I go alone, other time with old men when they are going to do other things.*

Int: - What do you use *Bwiso* for?

Res: - *As I had told you it helps in curing wounds in the stomach*

Int: - Is the use of *Bwiso* now different from what it was used for in the past?

Res: - *No, no, we have always used it for that problem.*

Int: - How often do you collect *Bwiso*? Once a year? Every month? How many times a week?

Res: - *Ha this one depends on when the sickness of my children comes. It can take even 2 years or even four years before I collect Bwiso.*

Int: - How much *Bwiso* do you gather each time?

Res: - *Just 10 small pieces are enough.*

Int: - Is the amount of *Bwiso* you collect different from that you used to collect in the past?

Res: - *No, in the past it was rare to find people suffering from stomach wounds.*

Int: - Have you noticed any changes in the availability of *Bwiso*?

Res: - *Yes, the tree is drying up because people remove the back and cut inside the stem and it cannot take water.*

Int: - Do you think *Mugabagaba* will still be available for collection by the children of your children?

Res: - *I am not sure, it may also be like … yes I have remembered the name of the tree that we used before in 1986 it is called Murama may be if we stop cutting deeper in the stem.*

Int: - *You had also told me about Kilingi?* When did you start collecting it from the park?

Res: - *That one we have used it since time I cannot remember. It has been used for building by many people, even my fathers house there was built with Kilingi.*

Int: - But why do you collect *Kilingi* from the park?

Res: - *Yah Kilingi is only found in the park, we used to have a tree here but was cut. I tried to plant in my other plot but failed to grow there. I think the place was not clean.*

Int: - What do you mean that the pace was not clean?

Res: - *Yes, the tree which is used to build a house must be planted on a place which is recommended by our ancestors, if not the house after heavy storm will fall and kill all the people in.*

Int: - Have you ever wished to collect *Kilingi* from the park but you are unable to?

Res: - *Yes Yes! very many time, the park people are aware that the tree is useful and many people like it. So it is one of the trees if collected without their permission can lead to arrest. My wife is a coward, she doesn't allow me to go and get it even when the kitchen is destroyed and remains like that for many months.*

Int: - Who goes with you to collect *Kilingi*?

Res: - *I usually tell my other friends. The young energetic boys from the valley down there. I have never gone with Mumbere, so that both me and him do not get in trouble. But I usually buy for the boys Kasese Kasese when we get back. In fact they even help me to hide them in the plantation.*

Int: - What do you use *Kilingi* for?

Res: - *Just for building, sometimes, the pieces that are cut off from the building poles my wife uses them for cooking.*

Int: - Is the use of *Kilingi* now different from what it was used for in the past?

Res: - *No, no, I said that even my fathers house was built using Kilingi. It is very good.*

Int: - How often do you collect *Kilingi*? Do you collect once a year? Every month? How many times a week do you collect Mugabagaba?

Res: - *Once a year, unless the storm destroys the houses that is when we go looking for it. Also some other people sell it to those educated who cannot manage to climb the mountain.*

Int: - How much *Kilingi* do you gather each time?

Res: - *It depends, to built a Kitchen like that requires over 30 poles of Kilingi*, but to repair it we need about 10-15 poles.

Int: - Is the amount of *Kilingi* you collect different from that you used to collect in the past?

Res: - *This depends on the size of the house to be constructed. I think since it is a good tree many people like it many times because many people now than before are constructing houses.*

Int: - Have you noticed any changes in the availability of *Kilingi*?

Res: - *Yes, many people like using it for building and the park people stop us from cutting it. It is now difficult to get, we have to walk far in the park to get it. We cannot cut it and carry it that same day. We cut it at night, and stay there during the day and then carry them out at night.*

Int: - Do you think *Kilingi* will still be available for collection by the children of your children?

Res: - *From my observation, in years to come Kilingi will not be easy to get. The only hope is that some people these days construct houses using brings and the latrine and kitchen also in the house. But that is only done by the rich.*

Int: - We are sorry to take you back to the things that you told us you get from the park. What are the three most important that you have to get from there?

Res: - *Aha I said Kilingi, Bwiso, Musibura, and Mugabagaba. You said the three most important?*

Int: - Yes

Res: - *Aha, now that is difficult, but I think Bwiso, Musibura, and Mugabagaba are very important. This is to me; another person could say a different answer.*

Int: - *Yes* thank you, but why do you say Bwiso has to be obtained from the park?

Res: - *As I had told you earlier, I have no where else to collect it is only in the park.*

Int: - *Why is Bwiso one of the most important things?*

Res: -*Yes the problem of stomach wounds is a big one in or family it is within our blood, even my wife suffers it. It is a recent occurrence in our family; I think it is because of the foods we buy from the market. It is bwiso that we use to treat them medicine from the clinic is expensive and not even good as bwiso; we tried to use it about three times.*

Int: - Please tell us how you collect Bwiso. Do you first do something to enable you collect thing Bwiso?

Res: -*Well, we don't do any thing except to follow the rituals that enable successful collection.*

Int: - What rituals do you do?

Res: -*You know all the plants owned by the gods in the mountains, who must be pleased so that he can bless the medicine.*

Int: - That is interesting, so how do you please the god?

Res: - *Before we go to collect Bwiso for example, we are not supposed to eat meat hunted from the mountains and not to drink any alcohol for three days. Also this applies to the people going to take the medicine. When I come, I am not supposed to sleep with my wife until the medicine has cured the person it was given to. But and following other ritual for example…….. (He recounted step by step a certain ritual, has not been recorded here due to difficulties in translation). Some times I first get permission from the rangers.*

Int: - How do you get the permission?

Res: - *I just go to the office and tell them that I need to go and collect Bwiso, and then they give me an escort or just a letter so that when other rangers meet me, they should not arrest me.*

Int: - Oh that is interesting, what else do you do first so that you are able to collect Bwiso?

Res: - ***Aha*** *nothing else except when other people go to hunt, they also must ensure that they do certain things.*

Int: - Oh you have good and interesting information, we shall come to hunting shortly after, but first, is what you have said about Bwiso been like that in the past?

Res: - *No, No, things have now changed, in the past we would have to fist go to the clan leader and the people who were herbalists, they would be able to tell us if there was any member of your family who has done something to prevent collection of Bwiso. If they would find problem then you would not go there but now sometimes we go and bring the medicine and it does not work but we are not able to tell why?*

Int: - When did this change start happening?

Res: - *Well I can't tell, it just that some of our clans leaders and herbalist die and are not replaced, you find the heir is not knowledgeable and does not know any thing. So that is why we try on our own now. Also the park people have interfered with our whole traditional system*

Int: - What do you feel about this change?

Res: - *I feel very sad, I don't know who will help us, I think through you people and RweMMCA we would solve some of these problems. This medicine kept we old people strong, but now may people die young, they even don't want to use local medicine, they think it is witch craft.*

Int: - You have told us what you do before you go to collect Bwiso. But when you get to the park to collect Bwiso, how do you start?

Res: - *No I just get there, to the tree and cut silently a few pieces.*

Int: - *After that, what then do you do?*

Res: - *Just put in my kicapu and then come back.*

Int: - Is this the way you have always collected Bwiso.

Res: - *Yes, there is no other way*.

Int: - You mean there are no changes that have occurred since you started collecting bwiso

Res: - *No, as I told you, it is only in the late 1980s that we stated collecting Bwiso; we got knowledge about it from Congo.*

Int: - Okay thank you, now after collecting Bwiso, is there any think else you do with it.

Res: - *No I just get home and start preparing it into medicine. No particular thing I do.*

Int: - Are there any practices that you are not supposed to do when collecting Bwiso

Res: - *No there is nothing, except the park people do not want us to collect Bwiso any more.*

Int: - Some people are worried that too much of Bwiso is being taken from the park and that there will be nothing left for our children what do you think?

Res: - *It is only the park people that say those things when we meet them during community meetings. I don't think that is true; there are not many people who suffer from stomach wounds. Some people with those problems go to the hospital. There are only few of us who know that Bwiso is good at curing stomach wounds. I think that is just MdomoMdomo (propaganda), and Bwiso will be still available for many years to come.*

Int: - Do you know of any local practices which ensure that Bwiso will be available in the park for collection for many years?

Res: - *No, but as I said, Bwiso will be available. You tell me where will it go? I know for many years will be there.*

Int: - *Please also tell me why Musibura is one of the most important things?*

Res: - *You know children eat different things and as a result they have worms that develop in the stomach which have to be removed. I easily notice when time is ready for the worms to be removed by the look of their skin, so it is important that they are removed. If not the children fall sick and can be very thin with no energy.*

Int: - Do you first do something to enable you collect thing Musubira?

Res: - *Yes, I tell my son to prepare to go with me. He is not supposed eat meat of wild animals. Also me there are certain things that I stop doing in preparation for the journey.*

Int: - Which things are those?

Res: - *One of them is that I am not supposed to eat meat of a hunted animal; also I am not supposed to sleep with my wife. Also I have to ask for permission and blessings from the ridge leader.*

Int: - *That is very interesting; why do you have to do that?*

Res: - *It is because that is what our culture tells us. Just that.*

Int: - *Is what you have told me been like that in the past?*

Res: - *Some of it is like in the past for example asking for blessing s from the ridge leaders. But other things have changed.*

Int: - What changes have occurred?

Res: - *Many changes, in the past, before going to collect, it was announced first by the ridge leaders ant a time when many children were observed from their skins that they need medication. Then drums could be made, we could all assemble in one place, the ridge leaders and the medicine men (my father was a herbalist) would be given instructions then they would go to collect the medicine, they would have to follow the instructions.*

Int: - When did these occur?

Res: - *The changes occurred at a time…….. It is hard to tell, but things just kept on changing, people could not assemble together, the park also restricting us.*

Int: - Why has this happened?

Res: - *I think it is that people joined the churches and they stared telling them that using local medicine is satanic and also the park people stopping us.*

Int: - What do you feel about this change?

Res: - *I feel that we are loosing our culture and our knowledge of herbs is disappearing some thing really needs to be done.*

Int: - Please tell me what you do when you and your son get to the park to gather Musubira?

Res: - *We just go to the tree, him leading in front. He digs out the first root then I help him to remove others.*

Int: - That is exciting, Why do you do that?

Res: - *Well, it is in our culture that we allow the first born son to remove the root first. It is one way of teaching him and it is also a way of pleasing the god.*

Int: - Do you have to dig out the roots in a particular way?

Res: - *Yes, when my son removes the first root, I then also remove the other roots. All the roots must be those near the surface and not the one going deep in the soil. From each plant, we cannot collect more than five roots and the roots have to be removed first the side facing the east and then if we need more we turn to the side facing west. If we don't, then next time we start from west side.*

Int: - Please tell me more, why that particular way?

Res: -*That way it is believed these trees are protected by the gods, so the gods are the ones that give us, the root going deep in the soil allows the gods also to eat on the tree. So we must take only from the ones which the god has left for us and are known fro the fact that they are moving side ways and near the surface. If they are not collected, at all, then the gods become angry.*

Int: - Were you doing this even in the past?

Res: -*Yes, but in the past we were not even supposed to look around, we would only go straight to a particular tree and collect the roots with out looking around for any other thing.*

Int: - When did this change occur?

Res: -*This change occurred when---it is difficult to tell. You see these things just change with out noticing them.*

Int: - Why is there that difference?

Res: -*The difference has been caused by loss of our cultural dignity. We are forced to think that what we do are primitive things especially by people who are educated.*

Int: - What is your opinion about this change?

Res: -*This change is bad, because, many people are now dying because they don't know how to cure certain diseases using out traditional knowledge of herbs.*

Int: - *Aha, after gathering/collecting/harvesting Musubira what do you do with it?*

Res: - *We just tie it using enkolekole and ask my son to carry it.*

Int: - *Have you always done this?*

Res: - *No in the past, we would cover and stick one root on the area where we have collected.*

Int: - That is interesting, why would you do that?

Res: - *This was a sign that some one else should not go on the same tree to collect the roots.*

Int: - Why do you no longer do this?

Res: - *It is because sometimes we fear park people to find us so we don't have all that time to do those things*

Int: - What do you think about this change?

Res: - *I think the god is not happy about our ways of eating with him from the same plant. That is why some times the trees dry up.*

Int: - Aha, after gathering/collecting/harvesting Musubira what do you do with it?

Res: - *As I said we just carry it home, dry it for a few hours, then pound it and add in some water and boil for hours.*

Int: - Are there any practices that you are not supposed to do when collecting Musubira?

Res: - *Not really, except we are not supposed to rotate around the tree.*

Int: - What happens when you do that?

Res: - *The answer is very simple, the medicine will not work.*

Int: - Where did you hear this from?

Res: - *Aaha, from since I was a child, my father used to tell me that.*

Int: - In your opinion do you think that is true?

Res: -*Ha ha (laughs) I don't know, I have never tried to do it to see whether the medicine works or not. But I don't think I cannot try to do it, that is testing god and who ever tests gods is punished. I and my family could die. So I have to avoid doing what is against the gods.*

Int: - Some people are worried that too much of Musubira is being taken from the park and that there will be nothing left for our children what do you think?

Res: - *Yes, I think it is true, some trees are drying up.*

Int: - Oh, what do you think is the cause?

Res: - *I had already said that now many people go in the park with fear that they will be arrested. So they end up not following all the things we used to follow in the past such as not collecting all the roots from one plant and avoiding to root through which the god feeds. Some people even collect it and when their medicine doesnot work, the go and collect more and when it also doesn't work they go to collect more and they don't follow the original procedure.*

Int: - Do you know of any local practices which ensure that Musubira will be available in the park for collection for many years?

Res: - *The only way I know of is that if we follow the traditional process of collecting Musubira.*

Int: - How do you know that by following this practice, Musubira will be available in the park for collection for many years?

Res: - *It is because in the past when we used to collect them with my father we had never experienced such problems.*

Int: - Please also tell me also about Mugabagaba. Why is it one of the most important things?

Res: - *This one is very important; it cures many diseases, so collecting once means that it can help in many ways.*

Int: - Do you first do something to enable you collect Mugabagaba?

Res: - *No, with this one, we only have to go to the park, some times with and other times without permission.*

Int: - Why do you some times first get permission.

Res: - *It is because, there are times we know that the park people are patrolling, so if there is high need we first ask for permission. But other times we don't because even when we ask for permission, we don't always receive it.*

Int: - *Is what you have told me been like that in the past?*

Res: - *No, there have been many changes*

Int: - What changes have occurred?

Res: - *In the past, Mugabagaba and other resources that had multiple uses used to be collected only by the specialists in herbal medicine. They would store the medicine and those who wanted to collect it would come with either chicken or other goods in exchange. I was lucky that my father was a specialist, so people would come and get from our home. That is how I leant how to prepare this medicine.*

Int: - When did this change occur?

Res: - *This change started happening in the late 1970s.*

Int: - Why has this happened?

Res: - *When my father passed away, people no longer came here. Also other herbal specialists were scared of going to the mountain because of the rebels and also the park restricted them.*

Int: - What do you feel about this change?

Res: - *This change is bad because few people know the uses of such herbs and even me I don't know as much as my father knew. So for every generation, there is a loss of knowledge.*

Int: - Please tell me what you get to the park to gather Mugabagaba?

Res: - *I just go and pick the leaves.*

Int: - Do you have to pick the leaves in any particular way?

Res: - Yes, I have only to pick the young leaves but I rap them in bigger old leaves.

Int: - Please tell me more, why do you do that?

Res: - *It is only the young ones that can use as medicine; the old ones if used could kill the person who takes the medicine. They have to be rapped because if the sun heats them they will not be useful.*

Int: - Were you doing this even in the past?

Res: - *No in the past it was only my father because he was a specialist in herbs. He told me that he could go direct to particular tree where the gods direct him and pick the leaves. Was not supposed to look around or collect any thing else.*

Int: - When did this change occur?

Res: - *Of course when he died things changed.*

Int: - Why is there that difference?

Res: - *The procedures that were used in the past were not well communicate to other people so e do what we just hard from stories but may not be exactly as used to.*

Int: - What is your opinion about this change?

Res: - *My opinion is that people like you who are writing down some of this information should be many so that books are written both in English and in the foreign language to enable others learn so that our ways of doing things are not completely lost.*

Int: - *Aha, after gathering/collecting/harvesting Mugabagaba what do you do with it?*

Res: - *I just come back home. If there is any thing else, I then move around and collect it also because I have got the chance.*

Int: - *Have you always done this?*

Res: - *Yes, this is how I have always done it. Except my father told me that they could sing some songs while collecting it and on the way home.*

Int: - That is interesting, why would he do that?

Res: - *This was for the purposes of praising and thanking the gods for providing the resources.*

Int: - Why do you no longer do this?

Res: - *It is because I don't know the songs they used to sing. They were not written any where, they did not even know how to read and write.*

Int: - What do you think about this change?

Res: - *Well things have changed but I have a hope that now our association RweMMCA and you people will help and interest the young to do it.*

Int: - Are there any practices that you are not supposed to do when collecting *Mugabagaba*?

Res: - *No, just collecting the young leaves is the most important.*

Int: - Do you know of any local practices which ensure that Mugabagaba will be available in the park for collection for many years?

Res: - *No, I just know that in the past, my father would do certain things before preparing the medicine which now I can't recall very well. I don't know whether these things were done to ensure that it remains available.*

Int: - *Thank you very much for that information. We are remaining with just few questions, and then we will go. Have you ever been told on how you should use things in the mountain or park?*

Res: - *Yes*

Int: - Please tell us me more, what were you told?

Res: - *Aha, we have been told many things. First of all that the Rwenzori Mountains are important to us, and that the plants and animals there are also important and they need to be protected for the future. That if they are not protected, in a few years to come they will no longer be there. That also we people are using the park in a way that has caused the snow from the mountains to disappear. So we are told to plant more trees.*

Int: - What else have you heard?

Res: - *That if we don't stop going to the park, our children in future will suffer. They have told us to spy on each other and who ever reports people who go to the park will be rewarded.*

Int: - *Thank you, you said you were told that the Rwenzori Mountains are important and that the plants and animals are also important and need to be protected for the future when were you told this?*

Res: - *Aaaa….. we have known since we were young that the Rwenzori Mountains plus the animals and plants in there are important to us. However it was after the park people came that we were told how to use it and saying that we are not using it well so we need to protect it.*

Int: - Who told you that information?

Res: - *The park people themselves. They have also employed other people I don't know from where who come and tell us these things.*

Int: - *From where did you hear that information?*

Res: - *Some times they call us for meetings all the people from different ridges come tighter. The groups of people sing and dance. Also some times we hear them talking on the radio.*

Int: - *In what language were you told that information?*

Res: - *Some times in English and another person translates on radio and some times in kikonzo especially during community meetings*

Int: - What do you think were the reasons for being told that?

Res: - They think that people are going in the park without permission and also that we are misusing the resources there.

Int: - *How often do you hear about this*?, o*nce a year? Every month? How many times in a week?*

Res: - *Ah it depends at least every once w week on radio. But community meetings it can take about four months.*

Int: - *When you were last hear about such information?*

Res: - *From the radio it was just this week? And we had a community meeting three weeks ago*

Int: - *Aha, that is good information you have told me; do you follow what you have been told about using things in the mountain or park?*

Res: - *Not all the time.*

Int: - *Why don't you follow what you have been told all the time?*

Res: - *You see it is difficult to see your child or your wife dying, you don't have any money to go to the clinic and then sit and watch and yet you know thee is medicine up there, so this is about life. We have always told these people our real problems but they do not listen may be people like you after getting this information you will tell them and they change.*

Int: - This is the end of our questions, please feel free to say or ask us any questions.

Res: - *Yes, you have taken me a photograph; will you bring me a copy?*

Int: - Yes, I will get you one copy, but this will be after I have visited other people. Is that all you wanted to ask?

Res: - *Yes*

Int: - Thank you for your time and information. Stay well!!

Res: - Thank you for coming, bye.

Appendix 5.3 A copy of the ethics clearance certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (NON MEDICAL)
R14/49 Muhumuza

CLEARANCE CERTIFICATE **PROTOCOL NUMBER H100 303**

PROJECT Factors influencing sustainable utilization of natural resources by people living in villages neighboring the Rwenzori Mountains National park

INVESTIGATORS Mr M Muhumuza

DEPARTMENT APES

DATE CONSIDERED 12.03.2010

DECISION OF THE COMMITTEE* Approved Unconditionally

NOTE:

Unless otherwise specified this ethical clearance is valid for 2 years and may be renewed upon application

DATE 24.05.2010 **CHAIRPERSON** .....
(Professor R Thornton)

cc: Supervisor : Prof/Prof M/K Sanders/Balkwill

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

.....
Signature

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix 5.4 Participant information sheet and informed consent form

PARTICIPANT INFORMATION SHEET FOR PEOPLE AT THE HOUSEHOLD (ENGLISH TRANSLATION)

Introducing myself

I am called Moses Muhumuza. I teach at Mountains of the Moon University. I am also a member and publicity secretary of Rwenzori Mountains Cultural Values and Conservation Association (RweMMCA). I am carrying out a PhD study to find out what things people in villages close to the Rwenzori Mountains National Park get from the park, how they get those things, the reasons why, as well as what they know about environmental protection.

What I will be doing

You probably know that you are not allowed to freely go the Rwenzori Mountains National Park, because UWA people believe that by going there and using or gathering things destroys the park. But I know that some people in this village need to go to the park, or need to gather things from there, and that they have good reasons. These reasons, as well as ways of gathering things from the park without destroying it, may not be known to UWA.

As part of my studies, I would like to gather information on what things people in villages close to the Rwenzori Mountains National Park get from the park, how they get those things, and the reasons why. I will also be asking people about what they have been told about protecting the park as well as their own points of view about the park. You have been chosen as one of the people to answer some questions, as a representative of your village, which is located close the Rwenzori Mountains National Park. Other people in other villages across the Rwenzori Mountains will also be interviewed. The interview will last approximately 40 to 50 minutes.

What I am asking you

I am asking your permission to allow me ask you a few questions. I promise that

1. allowing me to ask you questions is voluntary, and you may refuse to talk to me or can stop at any time in your talk.
2. when I report my study, you will not be named or described in a way which might identify you. A coding system will be used to which only I have the "key"

I would like to tape record our conversation so I can later listen carefully to what you said when writing the report. I will destroy the tape recording of this interview as soon as my report is completed.

What I will do with the information I find

The information will be written in form of a report which will tell UWA people about why you need to use things from the park.

How you can contact me

If you have any questions or concerns about this matter, please contact me at any time.

Name: Moses Muhumuza

Address: Mountains of the Moon University, P.O Box 837, Fort-Portal

Telephone: 0772-565-565 or 0392-813-999

Email: musacot@gmail.com

INFORMED CONSENT FORM FOR PEOPLE AT THE HOUSEHOLD
(ENGLISH TRANSLATION)

By signing this form, I give my consent to participate in a research study conducted by Mr. Moses Muhumuza as part of his PhD studies.

- I understand that this part of the research is to gather information what things people in villages close to the Rwenzori Mountains National Park get from the park, how they get those things, and the reasons why.
- I have been informed about my role in the research.
- I understand that my participation in this research is voluntary.
- I understand that I am one of many other people involved in this study.
- I am assured that my identity will be kept confidential.
- I have been given contacts of the researcher in case I need to contact him.
- All my questions about the research have been answered.

I agree to participate in this study.

Participant's name: _____

Participant's signature/ thumbprint: _____

Date: _____

Appendix 5.5 A list of plant species obtained by local people from the Rwenzori Mountains National Park

Botanical name	Local name	Family	Uses of the plant species, and the parts of the plant species used																	
			Firewood	Charcoal	Medicine	Ropes	Fencing	Timber	Food	Fodder	Art and Craft	Building	Bee forage	Tooth brushes	Banana ripening	Back cloth	Mulching	Ornamental	Shade for crops	Sand paper	Purpose
Acacia hockii	Mugando	Mimosaceae	s	s	r	b	s					s	s								Comm. & Subs.
Acacia sieberiana	Munyinya	Mimosaceae	s	s			s	s		L,f	s										Comm. & Subs.
Albizia adianthifolia	Mushebera	Mimosaceae	s	s				s													Comm. & Subs.
Albizia coriaria	Musisa	Mimosaceae	s	s	r,b			s		L		s		s	L						Comm. & Subs.
Albizia glaberrima	Muschero	Mimosaceae	s	s				s		L											Comm. & Subs.
Albizia grandibracteata	Nkwasi	Mimosaceae	s	s	r			s													Comm. & Subs.
Albizia gummifera	Musebere	Mimosaceae	s	s	r,b,f			s		L	s										Subs.
Albizia zygia	Nkwasi	Mimosaceae	s	s				s				s									Comm. & Subs.
Aningeria adolfi-friedericii	Sosi	Sapotaceae	s	s				s	f												Comm. & Subs.
Aningeria altissima	Mutoke	Sapotaceae	s	s				s													Comm. & Subs.
Antiaris toxicaria	Muhere	Moraceae			L,r			s								b					Comm. & Subs.
Arundinaria Alpina	Mulonge	Gramineae					s		s		s	s, L									Subs.
Basella alba	Nderema	Basellaceae			L				f, L												Subs.
Bersama abyssinica	Muhungura	Melianthaceae	s	s	L			s			s										Comm. & Subs.
Blighia unijugata	Mwatibale	Sapindaceae	s	s			s	s													Comm. & Subs.
Bridelia micrantha	Mubalagaza	Euphorbiaceae	s	s	r,b		s	s	f	L	s	s					L				Subs.
Canarium schweinfurthii	Mubani	Burseraceae	s	s				s	f		s							sa			Comm. & Subs.
Carapa grandiflora	Mujogo	Meliaceae	s	s				s	f												Comm. & Subs.
Carissa edulis	Munombi	Apocynaceae			r		s		f												Subs.

Celtis africana	Nyamanuka	Ulmaceae	s	s				s		L														Comm. & Subs.
Celtis durandaii	Bukemi	Ulmaceae	s	s	b			s																Subs.
Chrysophyllum albidum	Muhambulya	Sapotaceae	s	s				s	f		s													Comm. & Subs.
Cordia africana	Mutumba	Boraginaceae	s	s	r,b		s	s		L														Comm. & Subs.
Croton macrostachyus	Muhoti	Euphorbiaceae	s	s	r,b,f, sa			s			s	s												Subs.
Croton megalocarpus	Munyabakuru	Euphorbiaceae	s	s	b		s	s				s	L											Comm. & Subs.
Cyphomandra betacea	Nyanya-ezomuti	Solanaceae							f															Comm. & Subs.
Diospyros abyssinica	Muhoko	Ebenaceae	s	s				s			s													Subs.
Dombeya kirkii	Mukole	Sterculiaceae	s	s				s				s												Comm. & Subs.
Dovyalis macrocalyx	Ntengenene	Flacourtiaceae			r		s		f				L											Comm. & Subs.
Dracaena fragrans	Muramura	Dracaenaceae					s																	Subs.
Dracaena steudneri	Ngorogoro	Dracaenaceae			b			s																Comm. & Subs.
Ehretia cymosa	Nkabwa	Boraginaceae	s	s																				Comm. & Subs.
Entandrophragma angolense	Kikura	Meliaceae	s	s				s																Subs.
Entandrophragma excelsum	Muhungura	Meliaceae	s	s				s																Comm. & Subs.
Entandrophragma utile	Mufumbi	Meliaceae	s	s				s																Comm. & Subs.
Entandropragma cylindricum	Muyovu	Meliaceae	s	s				s																Subs.
Erythrina abyssinica	Kiko	Papilionaceae	s		r,b						s													Comm. & Subs.
Erythrina excelsa	Mulungula	Papilionaceae						s			s								s					Comm. & Subs.
Euphorbia candelabrum	Kikukulu	Euphorbiaceae	s					s																Comm. & Subs.
Euphorbia tirucalli	Nkoni	Euphorbiaceae	s	s	r,b (An.) s (Hum.)		s	s										b						Subs.
Faurea saligna	Mukuka	Proteaceae	s	s	r,b (An.) s (Hum.)		s	s				s						b						Comm. & Subs.
Ficus exasperata	Musomoro	Moraceae						s												L				Subs.
Harungana madagascariensis	Murinda	Guttiferae	s	s			s	s										b						Comm. & Subs.

Holoptelea grandis	Mutawale	Ulmaceae	s	s				s																	Subs.
Ilex mitis	Bwiso	Aquifoliaceae	s	s	b			s																	Comm. & Subs.
Khaya anthotheca	Munyama	Meliaceae	s	s				s																	Comm. & Subs.
Kigelia africana	Mwikya	Bignoniaceae	s		f,b			s	f														f		Comm. & Subs.
Lovoa swynnertonii	Mukusu	Meliaceae	s	s				s																	Comm. & Subs.
Lovoa trichilioides	Mukusu	Meliaceae	s	s				s																	Comm. & Subs.
Macaranga kilimandscharica	Muhunga	Euphorbiaceae	s	s										s											Comm. & Subs.
Maesa lanceolata	Muhanga-honga	Myrsinaceae	s	s	r,L	s																			Comm. & Subs.
Mangifera indica	Muyembe	Anacardiaceae	s	s					f																Comm. & Subs.
Millettia dura	Muhakwa	Papilionaceae	s	s		s	s			L	s														Subs.
Monodora myristica	Mugema	Annonaceae	s	s					f																Comm. & Subs.
Myrianthus holstii	Mwebende	Moraceae	s	s					f																Comm. & Subs.
Myrica salicifolia	Munalibo	Myricaceae	s	s	L																				Comm. & Subs.
Neoboutonia macrocalyx	Kiona	Euphorbiaceae	s					s																	Subs.
Newtonia buchananii	Muchenche	Mimosaceae	s					s		L,f															Comm. & Subs.
Olea capensis	Musodo	Oleaceae	s	s	s			s			s														Comm. & Subs.
Parkia filicoidea	Ngega	Mimosaceae	s	s					f	f													L		Comm. & Subs.
Phoenix reclinata	Mukindu	Palmae	s			s	s		f		L	L													Comm. & Subs.
Physalis peruviana	Ntuutu	Solanaceae							f																Comm. & Subs.
Phytolacca dodecandra	Ruhoko	Phytolaccaceae			r,L																		f		Subs.
Podocarpus latifolius	Bwipe	Podocarpaceae	s	s				s			s														Comm. & Subs.
Polyscias fulva	Kyango	Araliaceae	s					s														s			Comm. & Subs.
Pseudospondias microcapa	Mundrindi	Anacardiaceae	s	s	b				f																Comm. & Subs.
Pterygota mildbraedii	Mukoko	Sterculiaceae	s	s				s			s														Comm. & Subs.
Pycnanthus	Mukogota	Myristicaceae																					f	s	Comm.

angolensis																				& Subs.
Rapanea melanophloeos	Muongonyonye	Myrsinaceae	s	s				s												Comm. & Subs.
Raphia farinifera	Kiswali	Palmae				L					L	L						f		Comm. & Subs.
Rothmannia urcelliformis	Munyaburo	Rubiaceae	s	s			s													Subs.
Sapium ellipticum	Musanvuma	Euphorbiaceae	s	s	r,L			s			s									Comm. & Subs.
Schrebera arborea	Mulungulu	Oleaceae	s	s							s									Comm. & Subs.
Senecio hadiensis	Mugina	Compositae			L		s													Subs.
Spathodea campanulata	Murogorogoro	Bignoniaceae	s	s	b			s												Subs.
Strombosia scheffleri	Mukoora	Olacaceae	s	s				s											s	Comm. & Subs.
Strychnos mitis	Mugangara	Loganiaceae	s	s				s											s	Comm. & Subs.
Symphonia globulifera	Munimba	Guttiferae	s	s	r,s,b			s										sa		Subs.
Tabernaemontana pachysiphon	Mwongogwenkende	Apocynaceae	s	s																Comm. & Subs.
Tamarindus indica	Nondwa	Caesalpiniaceae	s	s	r,b,f,L		s	s	f	L,f								b		Comm. & Subs.
Teclea nobilis	Muzo	Rutaceae	s	s	r,L			s				s								Subs.
Terminalia brownii	Musongi	Combretaceae	s	s	L,b		s	s		L		s					L			Comm. & Subs.
Trema orientalis	Muhera	Ulmaceae	s						f	L,f								L,b		Comm. & Subs.
Turraeanthus africanus	Mbahira	Meliaceae	s	s				s												Subs.
Vangueria apiculata	Kasogo	Rubiaceae	s	s					f			s								Comm. & Subs.
Warburgia ugandensis	Muharami	Canellaceae	s	s	r,s,b			s	f											Comm. & Subs.
Zanthoxylum gilletii	Nyakabonde	Rutaceae	s	s	b			s												Comm. & Subs.

Legend: s- stem, L – leaf, b – bark, f- fruit, sa – sap, An – animal, Hum – human, Comm – commercial and Subs - subsistence.

Appendix 5.6 Calculations of the Weight for Quantity and Weight for Frequency

Quantity of the resources harvested from plant species in the park

Quantity of the plant resource harvested	Average Quantity (AQ) in a single gathering	Number of plant species (NS) from which that quantity was harvested	Number of people (NP) that harvested that quantity of the plant resource	Weight (AQXNP)
less than 5 stems (1 – 4 stems)	2.5	12	72	180
5 – 10 stems	7.5	16	52	390
more than 10 stems	10*	30	82	820
less than 5 roots (1 – 4 roots)	2.5	16	35	87.5
5 – 10 roots	7.5	5	65	488
less than 5 leaves (1 – 4 leaves)	2.5	6	94	235
5–10 leaves	7.5	4	77	578
10 – 15 leaves	12.5	4	32	200
15 – 20 leaves	17.5	5	104	1820
more than 20 leaves	20*	17	63	1260
less than 5 fruits (1 – 4 fruits)	2.5	12	76	190
5 – 10 fruits	7.5	12	90	675
more than 10 fruits	10*	12	64	640
less than 5 pieces of bark	3	11	25	75
5–10 pieces of bark	7.5	9	84	630
more than 10 pieces of bark	10*	5	51	510

* For these figures, the upper limit was not specified or the quantity specified was less than the next upper class limit.

Frequency of harvest of different parts of plant species

Frequency of harvest of different parts of plant species	Rank (RA)	Number of plant species (NS) from which particular parts were harvested in a specified period	Number of people (NP) that harvested particular parts of plant species in a specified period	Weight (RAXNP)
stems harvested weekly	52	2	84	4368
stems harvested monthly	12	44	92	1104
stems harvested annually	1	12	40	40
roots harvested monthly	12	9	21	252
roots harvested annually	1	12	20	20
leaves harvested weekly	52	10	63	3276
leaves harvested monthly	12	22	52	264
leaves harvested annually	1	4	24	24
bark harvested monthly	12	12	32	384
bark harvested annually	1	13	44	44
fruits harvested monthly	12	10	6	72
fruits harvested annually	1	24	62	62

Appendix 6.1 A list of animal species poached by local people from the Rwenzori Mountains National Park

Scientific name	English name	Local name	Family	Use of the animal and the part used					Purpose
				Food	Medicinal	Cultural	Art & Craft	Dog food	
Alcelaphus buselaphus jacksoni	Hartebeest	Mbithi (e-syo)	Bovidae	meat	Placenta, hair	Hooves	skin	meat	subs.
Canis mesomelas	Jackal	Booha (e-syo)	Onygenales	meat		Teeth, Nails		meat, bone	subs.
Cephalophus monticla	Duiker	Mughende (Mu-mi)	Bovidae	meat	Placenta, tail hair				subs.
Cercopithecus aethiops	Vervet monkey	Ngende (e-syo bwiruka)	Cercopithecidae	meat			Hair, Whiskers		comm. & subs.
Cercopithecus ascanius	Red tailed monkey	Ngende (e-syo Mukira Munyama)	Cercopithecidae	meat		Intestines, gullet	Tail hair		comm. & subs.
Cercopithecus mitis	Blue monkey	Ngende (e-syo kihgondo)	Cercopithecidae	meat		Intestines, bile		meat, bone	comm. & subs.
Colius striatus	Mouse bird	Akalikuku	Coliidae	meat	Fore head skin, nose	Quill			subs.
Colobus angolensis	Rwenzori colobus	Engeya	Cercopithecidae	meat		Brain, skull, Tongue			subs.
Colobus guereza	Black-and-white Colobus monkey	Enjima	Cercopithecidae	meat	Heart, intestines				subs.
Damaliscus topi	Topi	Punda (e-syo)	Bovidae	meat	Placenta				subs.
Enhydra lutris	Otter	Rihere (e-syo erirungu)	Mustelidea	meat	Skin, Bone	Skin, bone, teeth			comm. & subs.
Felis serval	Serval cat	Jangu (e-syo kipaka)	Felidae	meat		Teeth, claws, bone		meat	subs.
Felis silvestris	Wild cat	Jangu (e-syo erirungu)	Felidae	meat		Nails, bone		meat	comm. & subs.
Galerella sanguinea	Slender mongoose	Munyerere (Mu-mi)	Herpestidae	meat	Fat	Cloaca			subs.
Genetta genetta	Civet cat	Yisimba (yi-si)	Felidae			Nails, Whiskers		meat	subs.
Heliosciurus rufobrachium	Squirrel	Akasindi	Sciuridae	meat	Gullet			meat	subs.

Hippopotamus amphibius	Hippopotamus	Ekyamugoma/ Yisere (yi-si)	Hippopotamidae	meat	Ear	Male genitalia			comm. & subs.
Hylochoerus meinertzhageni	Giant Forest Hog	Nyamunungu (e-syo erirungu)	Suidae	meat	Hooves				subs.
Hystrix africaeaustralis	Porcupine	Nyamunungu (e-syo)	Erethizontidae	meat			Hair, skin		comm. & subs.
Ichneumia albicauda	White tailed mongoose	Munyerere (e-syo Mukira muzeru)	Herpestidae	meat		Whiskers	Tail hair		comm. & subs.
Kobus ellipsiprymnus defassa	Waterbuck	Syada (e-syo)	Bovidae	meat	Menses, placenta				subs.
Kobus kob thomasi	Uganda kob	Embara	Bovidae	meat		Skin			comm. & subs.
Loxodonta africana	Elephant	Enzoghu / Enzowu	Elephantidae	meat		Trunk			subs.
Madoqua kirkii	Dikdik	Sama (e-syo)	Bovidae	meat	Bile, bone, intestines				subs.
Mellivora capensis	Ratel	Ngulhube	Mustelidae			Skin			subs.
Mungos mungo	Banded Mongoose	Munyerere-mukolha	Herpestidae	meat	Hair		Skin	meat	subs.
Numida meleagris	Guinea Fowl	Entajumba	Numididae	meat			Quills, beak, feathers		subs.
Otocyon megalotis	Fox	Boha (e-syo)	Phasianidae	meat	Udder				comm. & subs.
Ourebia ourebi	Oribi	Mbaya (e-syo)	Bovidae.	meat	Udder, placenta, heart				subs.
Pan troglodytes	Chimpanzee	Ekibandu	Pongidae	meat	Brain	Skin	Skin		subs.
Panthera pardus	Leopard	Engwe	Felidae		Gut stone	Skin, bone, teeth, Whiskers			subs.
Papio anubis	Baboon	Bbaku (e-syo)	Cercopithecidae	meat			Skin, male genitalia		subs.
Pardofelis temminckii syn. Catopuma temminckii	Golden cat	Jangu (e-syo musithu)	Felidae	meat		Nails, teeth			subs.
Phacochoerus africanus	Warthog	Enjiri	Suidae	meat	Ear, joint bones				comm. & subs.

Piliocolobus tephrosceles	Red Colobus monkey	Enkende	Cercopithecidae	meat		Hair, skin	Hair, skin		subs.
Plectropterus gambensis	Duck	Embata	Anatidae	meat			Feathers		subs.
Potamochoerus larvatus	Bush pig	Empunu	Suidae	meat	Gullet				comm. & subs.
Procavia capensis	Rock Hyrax	Ekiyama	Procaviidae	meat		Eyes	Skin		subs.
Pternistis swainsonii	Francolin	Enyange	Phasianidae	meat			Feathers		comm. & subs.
Rattus ratus	Rat	Mbeba (e-syo)	Muridae	meat	Whiskers				subs.
Redunca fulvorufula	Reedbuck	Mughende (e-syo luseke)	Bovidae	meat	Male genitalia, Udder				subs.
Stephanoaetus coronatus	Crown Hawk eagle	Risamba (ri-ma)	Accipitridae	meat		Eyes	Feathers		subs.
Sycerus caffer	Buffalo	Emburura	Bovidae	meat		Horns, Skin			subs.
Thryonomys swynderianus	Cane rat	Mbeba (e-syo shapire)	Thryonomyidae	meat	Liver			meat, bone	comm. & subs.
Tragelaphus scriptus	Bushbuck	Mughende (e-syo kisuki)	Bovidae	meat	Placenta				subs.
Tragelaphus spekii	Sitatunga	Sama (e-syo muli)	Bovidae	meat		Skin, hair			comm. & subs.

Appendix 8.1 Cultural rituals performed before going to the forest or mountains

The "Sweeping the ridge" ritual

The most important ritual that influenced utilisation of resources in the Rwenzori Mountains was called "Sweeping the ridge". Sweeping the ridge literary meant cleansing the land of any misfortunes before people engaged in seasonal gathering of resources such as the harvest of particular medicinal plant species or performing certain activities in the mountains. This was a very important ritual that involved many people from various villages. Other rituals that involved individuals or smaller groups of (4 to 5 people) were performed after the ritual of "Sweeping the ridge".

"Sweeping the ridge" was done at specific times, usually after 1 or 2 years in the month of December and the process started in the morning hours. When the ritual was about to be performed, the community was informed days earlier 7 so that they obtain items required in the ritual. In preparation for the "Sweeping the ridge" ritual and during the episode of performing the ritual, community members were not allowed to go to their gardens and couples would forego their conjugal rights until the ritual was over.

The entire process of "Sweeping the ridge" would be triggered by the community requesting to visit the gods to offer sacrifices when they felt there was need. Some people claimed that sometimes the entire process would be triggered by supernatural forces beyond their control where ridge leaders would be beckoned by the spirits to go up the mountains.

The performance of "Sweeping the ridge" ritual was initiated by people in the traditional leadership structure who had to perform preliminary rituals to facilitate successful performance of the ritual. Preliminary rituals were performed by the ridge leaders assisted by traditional doctors, traditional healers, chieftains, elders and clan heads. Sometimes ridge leaders would go along with their first born son, and cabinet so as to witness the performance of the ritual. In rare occasions the preliminary rituals would be performed by chieftains together with ridge leaders and the *'basoki'* (line ridge men). Women were not supposed to go up the mountain to witness the performance of such rituals as they could easily be met by misfortune such as barrenness. If a person outside the accepted group of people was allowed to go and witness the rituals he was not supposed to inform any other person about it and they did not pick anything from the mountain.

Performing preliminary rituals when one was not supposed to or performing the ritual poorly resulted in grave consequences sometimes leading to death. One respondent revealed that a few weeks before the field visits for this investigation were commenced, there was a case where a family said to have performed a ritual badly was destroyed by a spirit. The family was in Kirenga village in Kisinga Sub County, lost 4 family members. As the four members were going to the gardens, a spirit called them and when they responded to the call, they were slapped, and they fell dead! It was believed that humans when not inspired are not supposed to see spirits or respond to spirits, less they face death.

When preliminary rituals have been successfully performed, all people living in a particular ridge would form an "entourage" and climb the mountain. The starting point for the "Sweeping the ridge" ritual was the top of the mountain and the end point was at Lake Kayanja in a place called *Ibuga*. The "entourage" would climb up the mountain with local brew, sheep, chicken, eggs, millet, a goat, white beans, oil from the castor oil plant, bunches of bananas, "*bundu"* (flour made from cassava), potatoes, yams and tobacco. In some cases other items such as spears and bags (made from animal skin) were also carried along. In some instances specific materials such banana with their male bud attached, a reddish cock, 2 eggs, 2 goats, sugarcanes, millet, and concentrated local brew (which is newly/ freshly prepared using hands) were required for the ritual as offertory. The bunch of matooke and the sugarcanes which are used in rituals are not cut with tools, but just pulled down by hand. In rare occasions, the clan leader was required to offer a white goat or lamb for sacrifice. All the items used for sacrifice were supposed to be obtained from people's gardens.

People holding special brooms called *'omuhambo'* would move down the mountain carrying the brooms and sweeping them through the air and singing special cleansing songs. In some instances the songs sang were erotic in nature with most of the words used metaphorically. In the process of "sweeping the ridge", the "entourage" would stop at each ridge leader's home, roast bananas and chicken, eat, and sleep there, and then proceed downhill the following day. A lot of rejoicing, eating and drinking went along with the ritual. Along the way, people would revere their respective gods, ask for guidance through the forest, as they go for sacrifice and resource harvest. When they reached a sacred site, they would make *'Eshendekere'* (small temporary houses for sacrifice*)*. They would then construct 2 small shrines, one on the left and the other on the right side of the *'Eshendekere'* and then start offering sacrifice. The shrines would be constructed in a special place where plants such as *Euphorbia candellebrum* and "*omusambya"* (a plant of the genus *Machamia*) were found.

Before starting to offer sacrifices at the sacred sites, shrines would be carpeted with a variety of grasses collectively called "*emwarryo*". Each of the grasses was said to be magical-religious, curative, and had a meaning only known to the ridge leader, chieftain, and clan leader. It is only through special training sessions that a layman could know the magical-religious elements of these grasses, and even when the person was told, he or she was warned against telling any other people.

Some of the plants used in "*emyarro*" and their magical-religious elements that were revealed during this investigation were:
"Omugorra" - this was to make a person have good judgment and make him or her speak like a judge.
"*Omuhabura*" - this was believed to guide a person in his or her affairs in the household or in society.
"Orweza"- this was a shrub that was believed to cleanse people so that they are no obstacles in their undertakings.
"*Akasekera"* - has the power of making people rich and beloved among others. (Some respondents who had signed resource use agreements with the park administrators revealed that they sometimes

used this plant so that it could increase their chances of getting their formal request to access some resources in the park accepted).
Other plants that were used as "*emyarro"* but whose magical-religious elements were not revealed in this investigation were *"Enyanga", "orwihura", "Eteete", "Akanyaihiira",* and *"Wamara yali mukama"*.

The "entourage" would also make stopovers at tops of various ridges until they reached the foot of the mountain and all the "dirt" that was collected from villages in the mountains would be dumped in the river and that would mark the end of the ritual of "sweeping the ridge". Depending on the needs of the community, the "Sweeping the ridge" ritual would take 1 day or 2 days. In rare circumstances, it would take a week.

Thereafter, people were allowed to access particular places in the mountains to hunt animals, gather some resources and conduct specified activities.

The "Irungu" ritual

Before going to the mountains, people would perform rituals which enable them to foretell what would happen. One such ritual was a ritual that involved "*Irungu"* a spirit (other people described him as a god) which is enabled people to foretell the future. Before going to hunt, the head of the household would collect special firewood called "*enku zengando"* (described as a thorny type of tree which burns easily even before the stem is dry). Then prepare juice and before it becomes fully fermented, put it in a shrine nearest the household. Fire would be lit and "*Maraca" (*described as a vessel made from gourd) were brought out and sounded. The juice, the fire and the sound of the "*Maraca"* would then inspire the spirit "*Irungu"* to sit in the fire, stand in it, and start foretelling the future. Hunters would listen carefully to *Irungu* about their success in a planned hunting activity.

It was believed that *Irungu* speaks with animals. He speaks in many languages and in different voices. He can charge like a lion, like a leopard, like a sheep or like a cow. He is described as a spirit that stays in the wilderness. He emerges from the horns of an animal, he can detect concealed danger, snares of witches, poisons, magic horns, know future enemies, and can even tell what would happen to a person who has evoked him.

Respondents believed that *Irungu* has the power and privilege to kill animals. It was a common practice for hunters therefore to cut a small piece of meat from the animal they have killed, and throw it in the bush for "*Irungu"*.

The "Esegete" ritual

Another ritual was the "*Esegete"* ritual. This ritual involved *Esegete (*described as a short stick wrapped with a bark-cloth on one end) used to foretell some happenings. Respondents used it not only

in foretelling their success in mountain resource use but also their successes or failures in all their planned activities.

People that engaged in the *Esegete* ritual first recited incantations. They then made requests to know about their success or failure in a particular planned activity and then sprinkled some water on *Esegete*. If the backcloth did not slide down, it meant that the person will be successful in a planned activity, but if it slid down quickly, then the person will not be successful. In the later case, the person engaged in the ritual would then quiver and hit his or her body while uttering some incantations so as to invite sprits to offer solutions.

The "Entondo" ritual

Another ritual performed to foretell what will happen was performed by individuals using *Entondo*. *Entondo* was described as an insect that looks like a grasshopper with small wings used to foretell happenings. The person performing the "*entondo*" ritual first cuts a stem of *engusuru* (described by respondents as a herbaceous plant), he mixes and crushes the stem together with leaves of this plant. Then he spits in saliva and puts the mixture on the branches of the *engusuru*. He then obtains *entondo* (the insect) and places it on that stem. During this process the person utters some incantations. The insect then makes movements and the person marks all the movements of the insect.

These movements meant many things when interpreted. For example, if the insect spreads the wings, it meant that the person would die in the mountain. Respondents explained that spreading of wings is analogous to people spreading backcloth to cover the dead body. Also if the insect scratches its head with its hind leg, then the person would die. The interpretation given by respondents to this behaviour of the insect was that relatives of the person in question should shave their heads. Shaving ones head is a cultural practice among the people in the Rwezori Mountains that marks the last respect for a dead person and as a gesture of bidding adieu to the dead. If the insect puts its forelimb on the head, then the person would meet difficulties in the mountain but shall not die. If the insect moves on steadily without any interruption so that it goes and eats the leaves it means that the person will be successful in what he goes to do in the mountains.

The "Omusekera" ritual

Another way of foretelling happening and manipulate ones fate so as to increase his luck was the "*Omusekera"* ritual that was performed using a plant called *Omusekera.* The person with ingenuity to use this plant cuts four, seven or ten pieces of the stem of the plant. Each piece is called *orusinga* (measured according to the length of the finger). Sometimes, if *Omusekera* was not available, *Birogotwa* or *entongani* (literally translated as the pleader) was used. The sticks are then put in water contained in a pot that has never been used to cook anything. The direction which the sticks point gives meaning to the person about his or her luck in a prospective activity.

Alternatively, the stem of *Omusekera* would be cut in "*engisa"* (a description of length of about one centimeter long) and then worn in the neck as a protective fetish, after dedicating it to the god or a spirit. The person wearing the fetish would be beloved amongst his community members and he would easily obtain what he requests from people. Some respondents revealed that they performed omusekera ritual prior to going to the Rwenzori Mountains National Park outpost to ask for permission to access some resources in the park.

The "Omukongoizi" rituals

Only a few people in the community were able to conduct rituals to fore tell what will happen, the majority of the people consulted other people with ingenuity. People who consulted engaged in two rituals called "*Omukongoizi*" rituals.

In one ritual, o*mukongoizi* ("native" doctor) used magic horns to foretell what will happen to other people. Many people therefore were able to learn about their future by consulting doctors who had the ingenuity of using magic horns. A person who wanted to consult went to the o*mukongoizi's* shrine. The o*mukongoizi* then lights a "*katadoba*" (a small lamp with a wick and uses paraffin), spreads a special mat on the ground, and the door of the shrine is bolted firmly. A backcloth is placed over the inner side of the door to intensify the darkness when the light is extinguished. Then the person sits down with folded legs as a mark of respect, otherwise he/she is flogged by the spirits. A bundle of dry banana leaves, trimmed and tied well like a broom is placed on the mat facing the door. The native doctor before extinguishing the light, asks the person to put a sum of money on the mat. The person then whispers on the money the things he/she wants to know or to obtain and then he or she places the money on the mat. Sometimes, instead of money, the native doctor would accept some goods before he starts his performance. The native doctor then selects a magic horn from a variety of horns based on the information that the client will have told him.

It was believed that magic horns are empowered by spirits. Some spirits delight in living in the horns of some animals when some particular herbs, pieces of cloth, skins of animals (the most popular was skin of *embalasasa;* which was described as a colorful lizard), organs of birds, insects, reptiles and cowrie shells are imbued in them. Commonly, horns of a bush-buck, a sheep, a rhinoceros, a water-hog, and buffalo are used.

The o*mukongoizi* then clothes the horn with skins of animals, such as civet cat, and hyena. Spirits have to be persuaded to enter the horns. It was stated that some spirits are not interested in getting into a horn so they have to be persuaded by adding in the horn medicine from *engusuru (a* herbaceous plant) and money (in form of coins). The o*mukongoizi* then extinguishes the light and intones a song. He sings song after song until the spirits come. Respondents revealed that these songs evoke the spirits. If the spirits delay, the doctor prays them to come and sometimes promises them something (usually at the expense of the client). The spirits come in the form of animals such as leopards (but does not harm anybody present), snakes or a rats.

When they have entered the horn, they are forced to stay there by closing them in. Depending on what has been put in the magic horn and incantations said, magic horns can be used for punishing, spiritual abode, reproduction, and others for killing plants and animals.

Spirits speak like people, they sing, they reveal faults, they predict danger, they punish, they prescribe medicine, and they give luck. Therefore, the individual would be able to learn whether or not he should go to the mountains. If the individual learns that he or she was not supposed to go to the mountains, the course of action he must take so that the o*mukongoizi* can cleanse him and remove any obstacles in his way.

Also, for hunters, dogs that did not hunt well would be taken to the witch doctor. The witch doctor would squeeze juice from herbs such as *Orucwamba*, *Engusuru* and *Orumbugu* and passes the juice through the dog's nose as he makes incantations. It is said that after the treatment, the dog's sense of smell would be improved.

In another ritual, other than consulting the o*mukongoizi* about future happenings, some people wished to be purified. It was believed that the purification ritual could make someone rich, loveable and friendly. Someone who needs to be washed goes to the o*mukongoizi* and spends a night at his home. In the morning, the o*mukongoizi* rubs him with medicine. Then he washes him in muddy water, in a pond with "*Orweza"* (literally translated as "purifier"). *Orweza* is a short shrub which respondents said clears away all the bad luck from a person. The person being treated is also washed with "*Akasekera"* (literary translated as "laugh with"). A*kasekera* is said to induce happiness from all people wherever the person who has washed with it goes to them. Another plant that was also used as a purifier was "*Rumazi"*. *Rumazi* was described by respondents as a tall shrub used in combination with *Orweza* and *Akasekera*. Some respondents revealed that sometimes they undergo purification by o*mukongoizi* before they go to seek permission from the Rwenzori Mountains National Park outpost, and in most times they succeed in getting the permission.

Cultural rituals performed when in the forest or mountain

"Banana and saliva" ritual

This ritual was mainly performed by plant gatherers. This ritual was performed when they got to the mountains in order to locate where particular plant resources were. This ritual involved plant resource gatherers getting to a certain sacred site in the mountain. At the sacred site, they cut a banana stem into two parts, then spit saliva on the stem and whisper what they desire. Then they put grains of millet on the saliva. If the young leaflet moves out and grows quickly like a young banana plant, then the resource they want to obtain will be obtained quickly and from the direction where the young leaf points. If the leaflet fails to grow, then they will not be able to obtain that resource hence they must repeat the ritual and request for directions to an alternative resource.

"Omuhati" ritual

This ritual was performed by hunters involving various items such as sugarcanes, bananas, a cock, eggs, meat and various food stuffs. When hunters arrived at the mountains, they would immediately go to a shrine where they would meet other people with whom they usually hunt to engage in the *Omuhati* ritual. During performance of *Omuhati* ritual, a cock is roasted, split into two halves and eaten by those present at the shrine. The cock's intestines are then put on a tree called *'omuhati'*, the liver of the cock is removed and broken into small pieces by hand and scattered through air into different directions. Eggs were put inside the shrine and sugarcanes outside near the entrance of the shrine. The bananas and meat were roasted and left on top of cooking stones.

The *Omuhati* ritual was performed to please the god of hunters. That was the reason why burnt offering or live domestic birds, animals and foodstuffs were left behind for the gods to "cook" and eat when they are hungry. A goat, for example, would be tied onto a tree with a very weak rope so the gods could easily pick it. It was believed that should such a goat escape and come home, it would multiply greatly and the family would become a rich family, but such a phenomenon was very rare. The respondents said that the aspect of leaving things for gods to eat is one way gods put people to test in order to have a judgment of their moral strength of restraint.

"Eteete" ritual

Hunting season in the Rwenzori Mountains National Park was usually in May, June and July. But during other months, hunters would dig pits, set traps and then would keep checking on them to see if they had caught anything. Because moving up and down the mountain to check on the traps was a tedious activity, some hunters performed *Eteete* ritual which enabled them to tell without necessarily going to the mountains whether the trap has caught something.

During the performance of *Eteete* ritual, six pieces of stem from a plant called *"eteete"* are put on a banana leaf and other sticks on bare ground (respondents emphasized that the ground must be very clean). While placing the sticks on the banana leaf and on the ground, the person utters some incantations. If after some time the person finds that the sticks have changed from the position in which they were left, then he reads the meaning. For example if he finds them in a certain arrangement, it could indicate that a different animal other than the intended one has been caught. This could mean performing other rituals to appease the god of animals for trapping what was not intended. If he finds them in the same way he left them, then no animal has been caught.

Rituals performed after leaving the mountains or forest

"Irumgu, Kalisya and Kahihi" rituals

Irumgu, Kalisya and *Kahihi* rituals were performed by hunters. When a hunter arrived at his home from hunting, his wife would not stand in the house, but she was supposed to just sit. The hunter

would not greet anybody in the house the following morning. The first words he would say was "prepare, is the meat ready?" The hunter would then put some of the meat on the basket of *Kalisya*, *Irungu* or *Kahiyi* and take it to the shrine to fulfill the promises that he had pledged if he was successful. Then the god or spirit would be evoked which then commands the hunter on what to do.

"Omuhoko" ritual

Sometimes, people especially the household head would stay in the mountains for several days. When they arrived home, they performed *Omuhoko* ritual which enabled them to tell whether any of their household members had engaged in any unbecoming behaviour. The *Omuhoko* ritual involved using "O*muhoko"* (described as a herbaceous plant). A pot with water would be placed somewhere in a safe place in a homestead. Every household member would be asked to spit on the leaf of the *omuhoko* and the sputum is covered carefully and placed under the pot for about half an hour and then unveiled. If the leaf was found to be slightly burnt, then that person has a hidden secret which the household head ought to know. If the leaf is completely burnt, then that person has done something wrong that warrants either his/her death or someone else in the household. But, if all the leaves remained not burnt then there was nothing wrong.

"Shoes" ritual

Sometimes, instead of going home directly, resource users that collected resources as a group from the mountains would first go to the ridge leader, clan leader or chieftain, to perform the *"Shoes"* ritual to verify that what they did in the mountains was what they were supposed to do. During the performance of "Shoes" ritual, the ground is first covered with a barkcloth. The ridge leader, clan leader or chieftain puts pairs of shoes of each of the people who went to the mountains on top of each other. He then throws them on the barkcloth. If they fall down without heaping themselves, the people have not done anything bad. If they pile themselves in three or four, that means they have a hidden secret, or they have stepped on something in an area they were not supposed to venture into, or they have committed an offence.

"Omukyora" ritual

Other than shoes, three plants *(Mukyora, Omusekera, and Omuhoko)* were used to tell whether the person has or has not done what was required. The native doctor or ridge leader, or a person with ingenuity to use the plants takes one of the plants for example "*omukyora"* (described by respondents as a purgative herb and juice from its leaves can make one vomit if drunk quickly). The native doctor or ridge leader, or a person with ingenuity burns its leaves and puts the ash in pipes of bamboo. Each person who went to the forest speaks instructed words while blowing air to the bamboo pipe. Four or five similar bamboo pipes are made. Red soil is then mixed with water and the powder of "o*mukyora"* in the bamboo. The water quickly separates from the mixture and this reveals something to the person performing the ritual.

Other precautionary rituals

Respondents revealed other rituals that were performed along with the rituals described in the previous sections. For instance, when hunters had successfully conducted rituals that were necessary before going to the mountains, they would either start their journey to the forest or consider the advice of the gods or spirits to perform other rituals that will clear the way. Hunters would be careful of a number of things if they were to be successful in their hunting activities in the mountains.

Before setting off, a hunter would ensure that he jumps three herbs which include: *Omuhabura* (to advise him to keep the right path and rectify all his actions and words), *Omuramura* (so that what he says is final just like the word of a judge) and *Wagana* (to prevent any misfortune from coming his way). He was the only one supposed to open the door of the house when he is setting off and was not supposed to meet an enemy or else his activities would bear no good fruit. He was supposed not to meet any woman on his way. He would ensure that his left foot does not accidentally kick the ground. He would not climb small anthills, he would not whistle, no one was supposed to pass behind him and he would not greet anyone. He was not supposed to sleep with his wife nor sleep in the room where he last slept with his wife.

If the individual is going to the mountains to hunt, domestic animals at his home would not touch him, no one would touch him on the shoulder, he would not eat leftovers of the previous night nor would he eat "*Eteke*" (a type of sauce, green in colour and slimy made from plant species of genus Amaranthus). He would eat "pemmican-like" food stuff in order to get blessings to kill more. "Pemmican-like" food was composed of roasted beef of an animal struck by thunderbolt mixed with white mushrooms and some extracts from the leaves of "*engusuru*" (a shrub in the egg plant family). He would not put his spear down, and he would not exchange the knife he presented to "*Irungu*" for another.

Appendix 8.2 Description of words that had no direct English translation

A word in the local language	A description of the word in English
Akanyaihiira	A plant traditionally used to "carpet" shrines in the Rwenzori Mountains.
Akasekera	A plant believed by people in the Rwenzori Mountains to be magical religious in nature. It is believed to have power to make people rich and beloved among others.
Basoki	Assistants to ridge leaders who in rare occasions perform preliminary rituals together chieftains and ridge leaders
Bundu	Flour or paste made from cassava
Ekisusuti	A type of tree that grows in the Rwenzori mountains and is believed by local people to make the soil infertile by drying it up.
Ekyiko	A special place in the higher peaks of the Rwenzori mountains where people were traditionally allowed to take a rest from.
Ekyona	A type of tree that grows in the Rwenzori mountains and is believed by local people to make the soil infertile by drying it up.
Embalasasa	A colorful lizard whose skin is believed by people in the Rwenzori mountains to be a habitat of some spirits.
Embatule	A medicinal plant found in the Rwenzori mountains used in treating wounds instantly, but is very poisonous to humans and animals in case eaten accidentally.
Emisebere	A type of tree that grows in the Rwenzori mountains and is believed by local people to make the soil infertile by drying it up.
Emyarro	A collective name of a variety of grasses carpeted in shrines.
Engisa	A proportion of about one centimeter long that forms part of the cultural regalia of the Rwenzori mountain people and is worn in the neck as a protective fetish, after dedicating it to the god or a spirit.
Enku z'engando	A thorny type of tree found in the Rwenzori mountains that burns easily even before the stem is dry, ans used in traditional rituals.
Enkwanzi ya makerere	A small spotlessly white bead
Entondo	An insect that looks like a grasshopper with small wings that was traditionally used by people in the Rwenzori Mountains to foretell happenings.
Enyanga	A plant traditionally used to carpet shrines in the Rwenzori Mountains.
Esegete	A as a short stick wrapped with a bark-cloth on one end traditionally used by people in the Rwenzori mountains to foretell some happenings.
Eshendekere	A shrine or altar, or a small temporary house where traditionally people in the Rwenzori mountains conducted ritual sacrifices
Eteete	A type of plant traditionally used by hunters in a ritual through which they are able to tell without necessarily going to the mountains whether the trap has caught something.
Eteete	A plant traditionally used to carpet shrines in the Rwenzori Mountains.
Eteke	A green and slimy sauce made from Amaranthus species that the person who intends to go to higher parts in the Rwenzori mountains was traditionally not supported to eat before his or her journey.
Irungu	A god of the Rwenzori mountains believed to be responsible for wilderness or hunters.
Isemalhambu	A Chieftain
Kahiyi	A god of the Rwenzori mountains believed to be responsible for all animals.
Kalisya	A god of the Rwenzori mountains believed to be responsible for hunters.
Kandolo fish	A type of fish found in the salty lakes in the Rwenzori mountains
Katadoba	A small lamp with a wick and uses paraffin
Kiryabaheyi	A type of mushroom found in the Rwenzori mountains
Kitasamba	A god believed by the Rwenzori people to live in the glaciated Rwenzori mountain peaks, and a giant force that controls the natural environment and the lives of all the mountain people.
Kkitewo	A rope with a noose at one end that was traditionally used by hunters in the Rwenzori Mountains to trap one animal at a time.

Kyungu,	A type of tree that grows in the Rwenzori mountains and is believed by local people to make the soil infertile by drying it up.
Mugenyi	A god of the Rwenzori mountains believed to be responsible for visitors and domesticated animals.
Mukuluwabulhambu	A ridge leader
Mukungu	A village leader
Mulindwa	A god of the Rwenzori mountains believed to be responsible for misfortune. He makes people plans work or fail.
Muyuchi	A family curse traditionally believed to be inheritable among members of a household in the Rwenzori mountains.
Ndahura	A god of the Rwenzori mountains believed to be responsible for the god of diseases. He has the power to cause and cure diseases.
Nyabahasa	A goddess of the Rwenzori mountains believed to be responsible for the bearing of twins.
Nyabibuya	A goddess believed by people in the Rwenzori mountains to be responsible for blessing or cursing women.
Nyabinji	A god of the Rwenzori mountains believed to be responsible for abundant harvest.
Nyamuhanga	A name of a god believed by people in the Rwenzori to be the creator of everything on earth.
Nyineka	A household head
Nzururu	A god of snow of the Rwenzori mountains.
Obukoko	A type of plant species harvested by
Obulhambo	A village
Obusinga	A kingdom of the Rwenzori mountain people especially the Bakonzo
Obwiikwe	A type of mushroom found in the Rwenzori mountains
Omugorra	A plant believed by people in the Rwenzori Mountains to be magical religious in nature. It is believed to make a person have good judgment and make him or her speak like a judge.
Omuhabura	A herbaceous plant believed by people in the Rwenzori Mountains to be magical religious in nature. It is believed to guide a person in his or her affairs in the household or in society.
Omuhambo	Special brooms traditionally used in the process of cleansing ridges in the Rwenzori mountains.
Omukole,	A type of tree that grows in the Rwenzori mountains and is believed by local people to make the soil infertile by drying it up.
Omukongoizi	A term used by the Rwenzori Mountain people to describe a person who has the power to perform traditional rituals.
Omwame	A clan leader
Omwolongo	A type of tree that grows in the Rwenzori mountains and is believed by local people to make the soil infertile by drying it up.
Orusinga	A description of each piece (the size of a finger in length) of a plant used in traditional rituals in the Rwenzori mountains.
Orweza	A plant believed by people in the Rwenzori Mountains to be magical religious in nature. It is a shrub believed to cleanse people so that they get no obstacles in their undertakings.
Orwihura	A plant traditionally used to carpet shrines in the Rwenzori Mountains.
Wamara yali mukama	A plant traditionally used to carpet shrines in the Rwenzori Mountains.

Appendix 10.1 Content about environmental education in the primary and secondary school syllabus of Uganda

Content in the primary school syllabus

Primary school level (P)	Term (T)	Subject					
		English language	**Integrated science**	**Social studies**	**Agriculture**	**Integrated production skills**	**Religious studies**
1	**1**		Theme 1: The environment: Topic: Components of the environment.				Theme 1: Christians discover God's love. Unit 3: The world god has made for us.
	2		Theme 3: The world of living things: Topic: flowering plants. Theme 6: Managing changes in the environment. Topic: Types of changes in the environment.	Theme: Living together in our home and school Topic 6: Other living things in our homes.			
	3		Theme 6: Managing changes in the environment. Topic: Types of changes in the environment.	Theme: Living together in our home and school Topic 7: Elements and effects of weather on our work and surroundings			
2	**1**		Theme 3: The world of living things. Topic: Animal life. Theme 1: The environment Topic: Components of the environment.	Theme: living together in our school and the neighbourhood. Topic 7: Living things in our school surroundings.		Theme: Using our environment Topic 1: Drawing and coloring/painting landscape pictures.	Theme 1: Christians live together in gods family. Unit 3: creation.
	2		Theme 6: Managing changes in the environment. Topic: Types of changes in the environment. Theme 3: The world of living things. Topic: plant life.				
	3	Unit 1 Topic : weather	Theme 1: The environment Topic: Resources in the environment for basic needs of people and other animals.				
3	**1**	Unit II: Topic	Theme 1: The environment Topic:	Theme: living together in			

		: weather	Animals and plants as resources in the environment. Theme 1: The environment Topic: Components of the environment (Soil). Theme 6: Managing changes in the environment. Topic: Finding out about changes in the environment.	our sub county/ municipality.			
	2	Unit III Topic: animals	Theme 7: Science in human activities and occupations. Topic: Growing crops. Theme 6: Managing changes in the environment. Topic: Monitoring natural and man made changes. Theme 3: The world of living things: Topic: plant life.				
	3		Theme 7: Science in human activities and occupation. Topic: Crop growing practices.				
4	**1**		Theme 3: The world of living things. Topic: plant life. Theme 1: The environment Topic: Interdependence of things in the environment.	Theme: living together in our district. Topic 2: Physical features and vegetation. Topic 3: Weather in our district.			
	2	Unit III and IV Topic: Seasons and crops. Unit V and VI Topic: Faming	Theme 6: Managing changes in the environment. Topic: Types of changes in weather and climate in the environment.				
	3			Theme: living together in our district. Topic 8: Natural resources in our district.			
5	**1**	Unit V and VI Topic: Geographical features	Theme 6: Managing changes in the environment. Topic: Types of changes: Biological, physical and chemical changes in the environment.	Theme: living together in Uganda. Topic 2: Physical features of Uganda. Topic 3: Climate of Uganda. Topic 4: Vegetation of Uganda			

	2		Theme 1: The environment Topic: Components of the environment: the soil.				
	3						
6	**1**		Theme 3: The world of living things. Topic: Classification of animals. Theme 1: Our environment Topic: Resources in our environment.	Theme: living together in East Africa. Topic 1: Location and physical features of east Africa. Topic 2: Vegetation of east Africa. Topic 3: Climate of east Africa. Topic 5 Population size and distribution in east Africa – see problems of population density.			
	2		Theme 1: The environment Topic: Environmental degradation. Theme 3: The world of living things. Topic: Classification of flowering and non flowering plants.				
	3	Unit V and VI Topic: Hunting					
7	**1**		Theme 1: The environment Topic: Energy resources in the environment. Theme 6: Managing changes in the environment. Topic: Controlling and managing changes in the environment.	Theme: living together in Africa. Topic 1: Location and physical features of Africa. Topic 2: Vegetation of Africa. Topic 3: Climate of Africa.	Theme V: Starting and managing a farm. Topic 3: Farming activities and the environment.	Theme: Managing our activities Topic 1: Conservation, recycling and management of resources.	
	2		Theme 1: The environment Topic: Growing crops and trees together.				
	3	Unit III Topic: Environmental protection	Theme 1: The environment Topic: Environmental degradation.				

Content in secondary school syllabus

Secondary school level	Term	Subjects				
		Geography	**Biology**	**Agriculture**	**Entrepreneurship**	**History**
1	**1**		Topic 1: diversity of living things.	Topic: Principles of land use – various forms of land use: Agriculture, forestry, wildlife Subtopic 4: Climate and its r/ship to agriculture		History of Southern Africa History East African
	2	Topic 7: the world climate zones Subtopic 2: Factors affecting the major climates of the world. Topic 9: The utilisation of Natural resources in British Colombia. Subtopic 2 Forestry as a natural resource, factors favoring forestry, problems facing forestry and ways of improving the forestry industry, utilisation of water resources – fishing.		Subtopic 3 soil and water conservation – soil erosion (causes, types & factors affecting it), control of soil erosion using terraces, bunds, grassed water ways, planting trees, mulching etc.		History of Southern Africa History East African
	3					
2	**1**		Topic 2: soil			
	2	Topic 21 the soil of east Africa. Subtopic 6: Soil erosion. Subtopic 7: Conservation/Management of soil. Topic 23 natural vegetation of East Africa Subtopics, Factors influencing natural vegetation, types of natural vegetation in East Africa, Forestry types and factors favoring forestry, importance of forestry in East Africa, problems facing				

		forestry					
	3	Topic 24: Population of east Africa Sub topic: Effects of population distribution in East Africa (e.g Over exploitation of resources)					
3	1	Topic 29: Wildlife conservation and tourism in East Africa. Subtopics: Major areas of wildlife conservation and tourism, factors leading to the development of tourist industry, contributions and challenges to the tourism industry					
	2	Topic 37: agricultural and industrial development in Germany. Subtopic 3 industrial development in Germany (Content – Challenges of industrial development in Germany- pollution, exhaustion of resources)					
	3						
4	1	Topic 46: The characteristics and factors affecting climate in Africa Subtopic: Major climate types and their characteristics, factors affecting climate in Africa. Topic 47: The characteristics and factors affecting vegetation in Africa. Subtopic: Major vegetation types and their Characteristics		Agriculture economics – d) land tenure, land fragmentation and consolidation.			
	2	Topic 52: Use and development of forest resources in Africa: Swaziland, Ivory coast (Corte D'ivoire) Algeria and Gabon. Subtopic: Location of main types of forests in Africa					
	3		Topic 12: inter-relationship				
5	1	Physical geography Meteorology World problems and development				African history 1855- 1914	

	2	Physical geography Meteorology. World problems and development				African history 1855- 1914
	3	Physical geography Meteorology World problems and development	Topic 4: Ecology (spreads to S.6)			African history 1855- 1914
6	**1**	Physical geography Meteorology World problems and development				African history 1855- 1914
	2	Physical geography Meteorology World problems and development			Topic 7 Social and environmental responsibilities of business	African history 1855- 1914
	3	Physical geography Meteorology World problems and development				

BIOGRAPHICAL SKETCH OF THE AUTHOR

Moses Muhumuza (33 years old) is a Ugandan from Fort-Portal Kabarole district in Western Uganda. He attended primary school at St. Peter's and Paul's Primary in Fort-Portal (Primary 1 – 4) and Katiri Primary (Primary 5 – 7) in Kilembe Kasese district. In 1995 he joined St. Mary's Seminary Virika where he completed O-level after 4 years. In 1998 he was admitted to A-level at Kitabi Seminary in Bushenyi district where he studied Physics, Chemistry and Biology (PCB) and subsidiary mathematics. In 2001 he was admitted on government sponsorship to Mbarara University of Science and Technology to pursue a Bachelor of Science with Education degree. He graduated with an honors second class upper degree in 2004 as a teacher by profession. In the same year, he enrolled for a Masters degree in Biology at Mbarara University of Science and Technology where he served as a teaching assistant under the guidance of Prof. Dominic Byarugaba.

He has taught in various secondary schools in western Uganda including: St. Leo's College Kyegobe, Bwera Secondary School, Kibubura Girls School, and Kagote Seed School. After completion of his Master Degree in 2006, he joined Mountains of the Moon University as an assistant lecturer and has since served in different positions at the University. In 2008, was admitted to the University of the Witwatersrand in South Africa to pursue a PhD sponsored by Mountains of the Moon University under the staff development scheme. During his PhD tenure he has worked closely with Uganda Wildlife Authority and Fauna and Flora International in the implementation of the Culture, Values and Conservation Project. Also he has participated in various activities of civil society organizations in the Rwenzori region. He has presented some of his research at local national and international fora. In 2012, he co-founded the Centre for Action and Applied Research for Development (CAARD). He plans to continue engaging in teaching and research.