Value Chain Analysis in the Proposed Witsieshoek Community Conservation Area (WCCA) in the Eastern Free State of South Africa

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Dedication

I would like to dedicate this MSc to the people who have a pillar of strength during the trying times in my studies; my family especially my sister Zodwa Sophy Zondo, my mother Mrs Zondo and Malerata Daphney Masike.

Abstract

The aim of this study is to analyze the value chains in the proposed Witsieshoek Community Conservation Area (WCCA) situated in the eastern part of the Free State Province of South Africa. The study assesses the state and attributes of the biophysical environment and their contribution to value chain systems in the area. The study evaluates the natural resources found in the environment, encompassing both the villages in the Witsieshoek Area and the proposed WCCA. In addition, the study identifies the benefits that are generated from these resources to rural livelihoods. The study also reflects on previous economic and environmental studies undertaken elsewhere in mountain environments. It focuses on the human-environment interactions and the resultant impacts on ecosystems and rural livelihoods. Accordingly, the study is guided by the Pressure-State-Response (P-S-R) model, which illustrates material flows from the natural resource base to the consumers and the impacts resulting from these flows. Its significance lies in the need to address the high poverty levels characterizing the Witsieshoek Area, with the view of finding sustainable ways of protecting the rich biodiversity found in this mountainous region. The natural resource base was analyzed through the collection of empirical data that provided information on the state of the environment and its attributes. This was complemented by qualitative data that were collected from local communities through a questionnaire survey. Additional socioeconomic and environmental data were also collected from other role players such developers and government officials involved in conservation through unstructured interviews. The findings of this study illustrate the strong link between the value chain systems and the biophysical environment in the area. However, the monetary value allocated to the natural resources increases with geographic distance from the resource base, yet the problems associated with the degradation of the resource base (resulting from resource exploitation) are only borne by the local communities. The study demonstrates that the sustainability of value chains that sustain rural communities depends on the state of the biophysical environment and vice versa. In conclusion, the study highlights the importance of natural resources in value chains and biodiversity conservation as a basis for sustainable development. It further demonstrates the need for further extensive investigation on how the natural environment to be improved in order to stabilize the value chain systems in community conservation areas.

KEY WORDS: value, sustainability, biodiversity, montane, goods, services

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The communities of the Witsieshoek Area for their guidance through their vast villages.

Declaration

I, Solomon Andries Zondo declares that this research is my own, original work. It is being submitted for the Degree of Masters of Science in the University of the Free State, QwaQwa. It has not been submitted before for any degree or examination in any other university.

(Signature of Candidate)

31 August 2016

(Date)

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LIST OF ACRONYMS

AU	African Union
CBNRM	Community Based Natural Resource Management
CMA	Catchment Management Agencies
DEA	Department of Environmental Affairs
D-P-S-I-R	Drivers-Pressure-State-Impact-Response (Model)
GIS	Geographic Information System
HSDS	Highveld Sourveld and Dohne Sourveld
IUCN	International Union for Conservation of Nature
MDTP	Maluti-Drakensberg Transfrontier Program
NEMA	Natural Environment Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
NRBV	Natural-Resource-Based View
P-S-R	Pressure State Response (Model)
SADAC	Southern African Development Community
SANBI	South African National Biodiversity Institute
SPSS	Statistical Package for the Social Science
STATSSA	Statistics South Africa
TFA	Themeda Festuca Alpine
WCCA	Witsieshoek Community Conservation Area

DEFINITIONS OF KEY TERMS

A mountain is a steep landform that is elevated above the surrounding surface.

Anthropogenic refers to effects resulting from human activities.

Catchment is land where water collects and drain into a common river system.

Conservation Area is a piece of land that is dedicated to the preservation of biodiversity, which can either be animals, plants, genes, and physical environment.

Environmental modifiers are agents that alters the state of the environment.

Montane environment refers to environments found in the mountains.

Socioecological system is a system associating bio-geo-physical unit with social actors and institutions.

Value is worth given to environmental goods and services by society.

Value Chain is a series of activities characterized by one or more process nodes in which use or non-use value is added.

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CHAPTER 1

BACKGROUND TO THE STUDY

1.1 Introduction

This research follows and analyses the value chains that originate from the natural environment in the proposed Witsieshoek Community Conservation Area (WCCA) in the eastern Free State Region of South Africa. Value chains in this case refer to movement of materials from the resource base and the value that communities assign to individual resources (van Noordwijk, 2014). Sustainable use of resources is a requirement for buoyance in value chain systems (Prior *et al*., 2013). The conservation of the natural environment is one of the tools used to support sustainability initiatives. Community conservation areas are a form of integrated conservation initiative aimed value chains. Different types of land uses are determined by resource availability, coupled with accessibility of the resources. The utilization of natural resources in community conservation areas is subject to laws and policies, and to a larger extent by certain principles acknowledging all role players as equal partners (Ostrom, 1990). In many cases these laws are aimed at promoting sustainable use of environmental resources.

In mountainous areas, the drive for sustainability is anchored on information sharing, education and healthy human livelihood. Some resource bases that occur in mountain areas are vulnerable to pressure emanating from either economic or subsistence resource extraction (Newton and Weichselgartner, 2014). This is especially the case where natural resources are drawn from sensitive environments like wetlands and other biodiversity hotspots which are already under pressure from human activities. Some mountains are characterized by endemic species, signifying their importance to conservation of habitats as gene banks (Pullaiah *et al*., 2015). Conservation is one of the ways of sustaining both these habitats and local communities. Some of the resources found in these areas are at the verge of extinction and many are already under already threat. The depletion of natural resources will eventually lead to social vulnerability due to lack of essential resources for livelihood sustainability (Adger, 2006). In South Africa, some mountain areas are under pressure from the human population. The majority of the poor people found in these areas directly depend on natural resources for livelihood, hence the degradation of the resource base.

Thus, while mountains in some parts of South Africa offer tranquillity to city people, either in the form of tourism or golf estates and resorts, locals do not find that solace in their immediate environment. This is because in social environmental terms these areas are short of the natural resources needed for development. Relief is one of the aspects that make life difficult for local people living in the mountainous areas. Rugged terrain, coupled with overcrowding, poses complex socio-economic problems. This is especially the case in the Witsieshoek Area, where the setting up of a community conservation area is currently in progress.

The concept of community conservation areas is perhaps one of the developments that can be used to redress human induced pressures in impoverished mountain areas, especially where conservation is integrated with the livelihoods of local communities. Guided by the Pressure-State-Response (P-S-R) Model, this study adopts an anthropocentric approach in assessing the contribution of the establishment of the Witsieshoek Community Conservation Area (WCCA) to value chains that benefit poor rural mountain communities in the Maluti-Drakensberg Mountains of South Africa.

This study brings to the fore some of the community issues that are often overlooked by conservation practitioners. Thus, the study constitutes a stepping-stone towards an exploratory analysis of the natural environment–human system in an area that is in the process of being proclaimed into a community conservation area.

1.2 Problem statement

In some cases, people who rely on natural resources for livelihood view conservation as a problem. It is often perceived as a threat to the livelihoods of thousands of people living near nature reserves and national parks. On the other hand, conservationists and environmentalists perceive humans as a threat to the natural environment (Vitousek *et al*., 2008). Since humans will always rely on nature for survival there is need to establish a common ground between role players involved in the natural environment-human system. In the case of the Witsieshoek Community Conservation Area (WCCA), value chain analysis is the vital common ground for policy development and planning. Value chain analysis provides the ground for consensus between government agencies, on the one hand, and the participating communities on the other. Harmonizing the goals of development and conservation has always been a problematic issue, especially in poor rural communities (Spenceley, 2012). This research taps into theories, principles and models from both economic and environmental fields to assess how human well-being and environmental protection can be simultaneously pursued in a sustainable manner.

1.3 Aim of the study

The aim of this research is to analyse the value chains associated with the WCCA.

1.4 Objectives of the study

- To assess the state of the biophysical environment in the proposed WCCA and its implications on the value chain systems in the area.
- To identify ecosystem goods and services that feed into value chain systems in the proposed WCCA.
- To assess the processes that degrade the natural resource base in the proposed WCCA and their impact on the value chain systems in the area, and
- To evaluate the role of management and conservation of the natural resources base in strengthening the value chain systems of the proposed WCCA.

1.5 Research questions

(i) What is the condition of the biophysical environment in the WCCA?

(ii) What ecosystems goods and services are derived from the WCCA and how are they related to the value chain systems in the area?

(iii) Which processes are responsible for natural resource degradation in the WCCA?

(iv) How do resource management and conservation initiatives impact on the value chain systems in the proposed WCCA?

1.6 Structure of the dissertation

Figure 1.1 shows the structure of the dissertation. As noted in Figure 1.1, this report consists of six chapters, as detailed below. Chapter 1 provides the background of the research study. Chapter 2 presents the literature that was reviewed in preparation for this research. Different sources from various fields ranging from Geography, Ecology, Economics, to Humanities were consulted for background information. The main aim of the literature review was first to identify the theoretical pillars from the different scientific disciplines that could be used to support the research. Literature review also highlighted some missing links in research endeavours on value chain analysis, especially those that are related to the montane areas of South Africa.

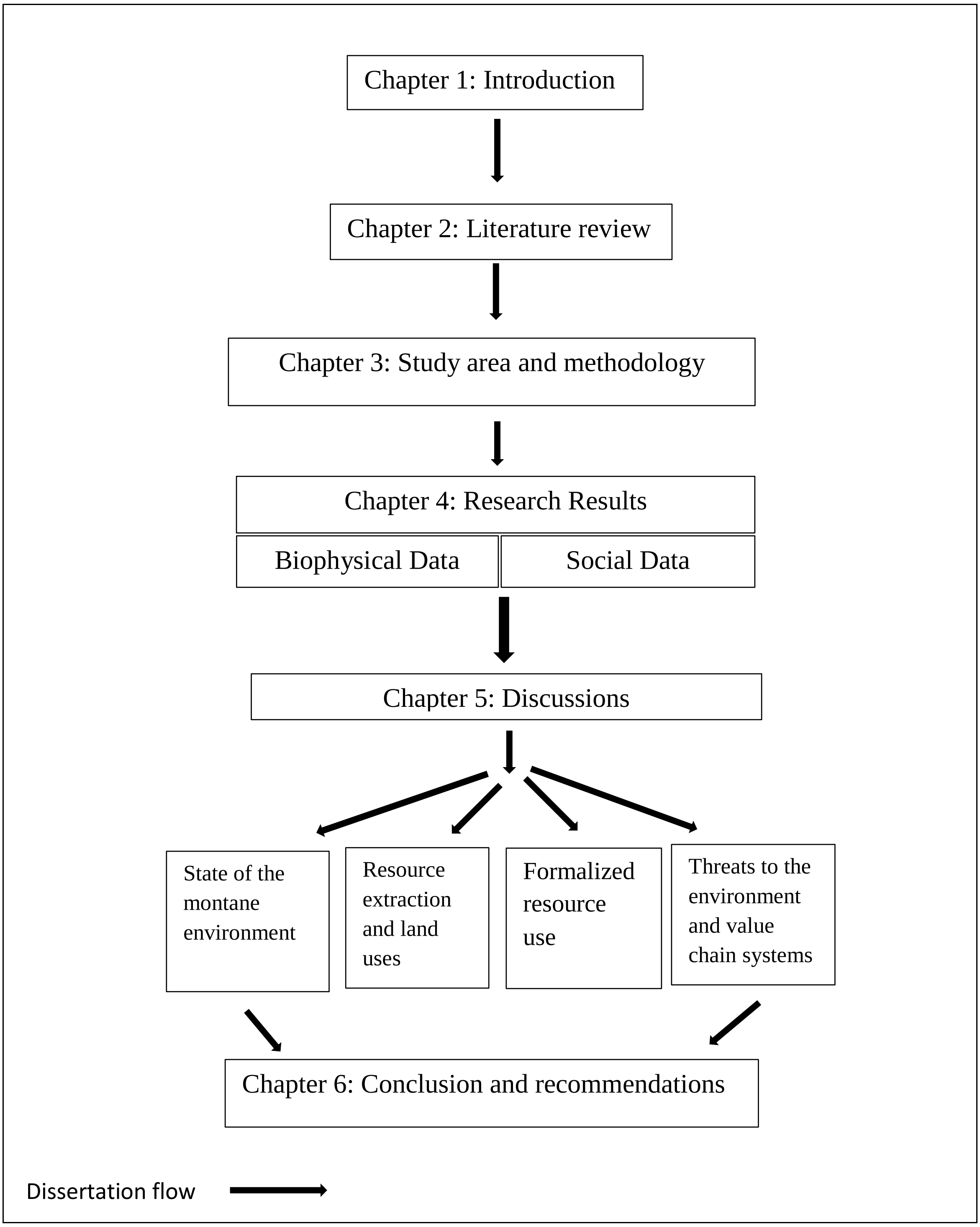

Figure 1.1 shows the schematic presentation of the dissertation with the outline of the chapters in the text below.

The chapter provides a summary of the theories that help with the understanding of the natural, social and economic analyses of value chains. Chapter 3 provides a description of the study area and the methodology that was employed in the study. The geographical description of the study area outlines the availability and accessibility of natural resources. Locating the study area in the larger South African landscape provided the navigation tool in terms of the kind of data that had to be collected, as well as the identification of data collection sites.

Microsoft Excel 2013 and Statistical Package for the Social Sciences (SPSS), (Version 23) were used for statistical analysis of the social data collected from local communities, using questionnaire surveys and interviews. The aim was to corroborate the data to see the relevance and impact of human activities on value chains. The results were presented in graphs and tables. Georeferenced social data was presented in form of maps, using ARCGIS (Version 10.3) to determine the role played by distance in resource use. Biophysical data were sorted through ARCGIS (Version 10.3) and distribution maps plotted for data presentation.

Chapter 4 presents the results of the study. First, it describes the state of the environment and identifies the role that natural resources play in the livelihoods of local communities. Secondly, it examines the different methods involved in natural resource extraction. Thirdly, the chapter identifies the pathways of the movement of the natural resources from the environment to consumers and the value chains related to these processes.

Chapter 5 discusses the findings of the research study, based on the results presented in Chapter 4. It also relates the results to the objectives of the study by examining the implications of the research findings. This chapter also compares the research results to those reported in previous studies, as presented in existing literature. As demonstrated in this chapter, environmental changes in the WCCA are important determinants of the sustainability of value chains. The identified resources are linked to relevant activities taking place in the proposed community conservation area. The influence of distance in the extraction of resources is also discussed in detail, within the context of regulators of value chains.

The last chapter (Chapter 6) concludes the dissertation. It highlights the importance of concepts, theories and previous researches and links them to the findings of this study and what needs to be done in order to improve value chain systems in the WCCA. Finally, the chapter briefly highlights some recommendations that could be relevant to the field of value chain analysis in community conservation areas.

1.7 Conclusion

The success of this research should contribute in painting a clearer picture about the current state of the environment in the WCCA and the surrounding villages. Progress made in conservation and human development has stagnated because of conflicts involving land ownership and deficiency in environmental education. Nevertheless, strides have been made in trying to close the gaps between social and scientific investigations with the aim of improving the gains made from natural resources, while maintaining sound environmental health. The next chapter explores previous studies on ecological economics and related disciplines, as well as theories and models that are relevant to this study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Natural environments provide a wide range of services and goods to humans. The value that humans attach to different environmental services and goods can determine the commercial value of those goods and services. These goods and services on the other hand provide natural capital for both commercial and human livelihood uses. However, access to environmental goods and services is often accompanied by environmental risks (Kasperson and Kasperson, 2013). These risks are more associated with nature of resource extraction. This is exacerbated by the fact that most of the goods and services are freely accessible to everyone (Mitchell and Carson, 2013). Some of the economic activities that may be used to add value in places around conservation areas may pose risk to the environment, for example subsistence farming, medicinal plant harvesting and many other practices. In some rural areas these activities are the sole source of income and the basis for future economic development. Rural areas provide natural capital for different kinds of value chains that are linked to socio economic development.

2.1.1 Value chain systems

A value chain is basically a series of different activities that are aimed at adding or enhancing the value of a product or a good. These activities should be guided by the concept of sustainability, which highlights the importance of the environment (Carter and Rogers, 2008). The value adding process is carried out categorically in relation to nature of activities. The processes are carried out in physical and virtual products or services that in turn culminate into physical and virtual value chains. The value adding activities can be categorized into primary and secondary activities. This categorization is based at the stage at which the product is found. Primary activities include extraction of resources from the environment, while the secondary activities include the processing of these commodities (Porter, 1998). The important factor in understanding a concept is to contextualize it with the aim of pinpointing the subject at hand (Yu *et al*., 2013). This may be done by providing a background upon which the activities and interactions of the subject take place. Taken into context, value chains can be viewed as interactions and movement of materials between different levels of an environment. The environment in question here may be economic, social or natural. The value chains become more complex if they are spread across different spatial locations, including economic, social and natural spaces (McCann, 2013; Parrilli *et al*., 2013). In such an instance, they occur in subsets, varying from ecosystem services, subsistence sale of natural goods to more formalized commercial activities. Usually, small isolated value chains are then linked through pathways to from networks of material movement on a grand scale. To achieve this milestone, intricate aspects in each of these levels and their role in material movement need to be understood. Naturally, the natural environment will be the starting point for the process as determined by social drivers and needs. The social needs are the once that give value to whatever the natural environment has to offer. This will eventually initiate the movement of materials, whereby the consumer has to pay for the natural commodity or service.

2.1.2 Conservation and sustainability of resources

For a sustainable value chain system, effective management systems should be in place. This can be achieved through the integration of different systems including ecosystem based management (Slocombe, 1993). Ecosystem based management driven by the quest to maintain optimal functioning of the social-ecological system is made up of human and ecological subsystems (Gallopin, 1991). The management framework is based on the assessment and monitoring of the natural environment. In the natural environment, the value chain system like any other system is characterized by inputs, throughputs and outputs. The natural environment, in most cases if not all, is where the conception of most products and services start (Kaplinsky and Morris, 2001). A certain material or commodity undergoes some steps within an environment and eventually provides a feedback to the environment. The feedback mechanism in an environment is then used as an indicator of what is happening in an environment as a result of the movement of that material. The feedback is either negative or positive. The input-throughput-output model can be represented in terms of supply from nature-processing-consumer (Sygulla *et al*., 2014). The value chain system in the environmental context dealing with conservation is mainly guarded by different levels of authority (Shaharudin *et al*., 2014). In community conservation areas the public guards the supply phase which is constituted by environment services. The commodities at this level may be evaluated in monetary terms or through environmental well-being as per different categories. Commodities and materials like nutrient cycling, soil formation and seed banks are directly beneficial to the environment, hence they have no monetary value, though environmental elements like plants and animals can be given a monetary value, as they are directly beneficial to humans economically (Robinson, 2013).

2.1.3 Resource values and socioeconomic relevance

Policies and laws as driving factors mostly characterize the social environment. Governments and municipalities, together with communities play a major role in formulating such laws and policies. The main aim of doing this is to give opportunities to all the role players to make an input with regard to their needs and mandates. The interaction between humans and the natural environment requires the development of policies and laws that promote sustainability. In some cases the humanities in the form of education is a requirement for information dissemination. This is all aimed at enforcing means and measures to regulate the appropriation of natural commodities and services. The traditional ways of resource harvesting have been a backbone of sustainable material movement from the environment (Camacho *et al*., 2016). This together with the modern resource use strategies is bound to take material movement to greater heights. In this way, conservation agents will achieve their goal of nature conservation while ensuring satisfaction of the local communities in terms of access to natural resources (Ribot and Peluso 2003). The natural environment will be protected under policies, acts and agreements between environmentalists and communities. This will help to promote the productivity of the natural environment thereby ensuring a future regular supply of goods and services. Productivity is in the form of services and goods supported by the same species used in ancient times (Child, 2004) and sustainable extraction can be enhanced through research outcomes (Davidson *et al*., 2014). The merger of the two methods is likely to yield a better approach in appropriation that will be centred on robust natural capital. The capital value of the natural environment is not static, as it is core to different appropriators, including consumers and users of natural commodities and services (Robinson *et al*., 2014). The nature of natural capital is mostly based on principles of the ecosystem approach that advocates integration in all levels from nature itself to various consumers of ecosystem services (Sayer *et al*., 2013).

The system through which monetary and nonmarket value is attached to natural commodities is driven by different factors. These include the human ecological footprint and state of environmental health. The human ecological footprint encompasses the extraction of natural resources and waste that ends in natural environments. Cost-benefit analysis has been used by many countries to measure the impact of resource extraction on the environment (Hanley and Spash, 1993). In most countries it is more monetary based as it puts human needs and wants above environmental wellness. In most cases the process is hindered by unclear monetary values given to resources. This may lead to ineffective policy making in resource conservation (Healy and Rosenberg. 2013). Such an approach is not good for attaining a sound or sustainable value chain system, as the environment is the source of capital and should be protected. This then calls for the development of the frameworks that are based on earth-centred environmental worldviews (Miller and Spoolman, 2011).

Like the human ecological footprint, environmental health is determined by how much of the natural resources humans extract from nature. The decrease in extractable natural commodities results in an increase of monetary value of those commodities. This observation calls for the analysis of the whole system concerned with the movement of materials in natural environments. This can be done through comprehensive analysis of the ecological model in which commodities and human factors are regarded as parameters, making it necessary to evaluate theories of value chains.

2.2 Theories of Value Chains

In order to define value chains, values have to be allocated to commodities concerned. Values are given according to the manner in which benefits are generated from a resource or commodity. According to the Marxist value theory, there are two types of values including use-value and exchange value (Bowman and Ambrosini, 2000). Use value refers to benefits that are sourced directly from a resource, whereas exchange value refers to the benefits which people willingly pay for. On the other hand we have the Baudrillard's value theory which is partly based on Marx's value theory, introducing two other value types including sign and symbolic values (Zander, 2014). A sign value can be associated with the marketing component of the firm or institution like the conservation area. The symbolic value concept projects the notion of giving which, on the long run may trigger a series of activities. Baudrillard's symbolic value encompasses Marx's exchange value and goes further to elaborate on commodity exchange as opposed to Marx's exchange that only deals with payments. This then results in the incorporation of Baudrillard's value concept approach as a possible guideline for value chain analysis.

As much as this approach provides the background for delineation of different values in the natural environment-based value chains, more needs to be done to understand the dynamics of these values. A strategic management approach needs to be put in place to forge the link between value theory, value creation and value capture. Every aspect of value in the natural environment is dependent on what Pickett *et al*, (2013) refer to as "ecological modifiers", like biological components of an ecosystem, as well as topography. These modifiers determine the resilience and robustness of a value chain system (Brando-Jones *et al*. 2014). This will ensure the sustainability and robustness of these values, as well as the impact of their performance on consumers. The success of value chains can be assessed through the growth theory, as adapted from traditional economic Growth Theory, to identify growth origins, as well the impact of policies on growth. To make sense of the Growth Theory in the context of nature conservation from which economics gains are made, green growth is employed as a guiding concept (Smulders *et al*., 2014). In order to highlight the plight and gains of the natural environment through ecosystem functioning, the 'input-throughput-output' model can be adopted.

The Resource Based Theory is one of the theories that provide that much needed link between the two sectors including social and natural environment (conservation) sector. The main driver of the system is the resource base in the form of the natural environment with the consumers in the form of local communities. This view looks at the resources as the main drivers, potential and performance of the institution or firm of which in this case is the community conservation area (Shay and Rothaermel, 1999). The task of identifying values and the ways in which value can be added on them is simplified through this approach. One must bear in mind the view that value creation depends on the capability of the supplier, which is the equivalent of the natural environment. The value creation process is also guided by the type of beneficiation of the natural resources in the natural environment. The benefits that communities get from the resource can either be in the form of extracted or purified commodities (Skilton, 2014). The Resource Based Theory also provides the setting for the assessment of the interaction between the consumer and the supplier (Priem and Swink, 2012). Through assessing the functioning of the ecosystem, one can assess stressors that may impede the functioning of the value chain system. The other side of the nature-social-economic value chain is the subsystem that is hosted by the natural environment and characterized by nature driven chain systems. This component of the value chain is not different from other value chain systems as its main objective, like any other similar systems, is to add value to resources or commodities in a systematic way.

The main aim of the study of value chain analysis is to integrate different role players and associated components. In this study, the integration of ecological and economic objectives will support the main objective of the community conservation area which is to preserve the natural environment and its services and sustain the livelihoods of local communities (Perfecto and Vandermeer, 2010). In the long run, when conservation comes short of the objective of maintaining the livelihoods of the local communities, other activities can be adopted. This can only be done with the integrated approach in mind, whereby environmentally friendly activities are practised. This is against the notion that land should be segregated amongst different activities (Phalan *et al*., 2011). This is what can be done as a last resort as agricultural resources are neither described as extracted nor purified resources from the natural environment. Nevertheless, agricultural activities may have both positive and negative impacts on biodiversity (Billeter *et al*., 2008; Robinson and Sutherland, 2002). This becomes evident when there are land use changes, especially from agriculture to conservation. Montane regions are no different when it comes to land use changes. Remnants of farming activities can still be seen in recently proclaimed conservation areas. Most of these areas were abandoned due to insufficient resources to support and sustain agricultural activities (MacDonald *et al*., 2000). This may have a negative effect on value chains, as there will be trade-offs on both ecological and economic benefits. Valuable goods and services will have vanished and, hence there will be a decline in natural capital to support ecological based value chains. The significance of land uses is important in value capturing and value creation, as well as the type of value sourced within a particular land use.

2.2.1 What determines the success and failure of value chains?

The success of every business venture depends on a well-planned marketing strategy. The same planning is vital in the value system in environmental economics. Emphasis must be put on the vital parts of the system which are the interlinkages between the economy and the environment. This is important for identifying the gaps that might exist between the two sectors. The fool proof plan should be guided by relevant policies and expertise in various sectors (Reim *et al*., 2015). Such sectors constitute decision makers in the form of producers, consumers and environmentalists (Mäler *et al*. 2013). Some rural communities harvest natural products, and then process them or sell them in a raw state in order to support their livelihoods (Vetter, 2013). They constitute both producer and consumer parts of the value chain system. This is the basic level of the value chain system that originates from the natural environment. Theoretically, this approach to the value chain systems within an environmental setup sounds good and promising until one starts pondering about attracting consumers and profit making (Turner *et al*., 2012). This is a stage where one has to come up with solid marketing strategies. This may be an easily accomplishable task in economics but it can be a daunting task in environmental fields. Land as a commodity is vital in environmental economics. This applies in both nature conservation and the natural resource based industry. Land, through land use and resources, constitutes a larger part of the capital in these sectors (Kareiva *et al*., 2011). To get around some of the stumbling blocks in 'commercializing' nature conservation, research needs to be guided by theories like Natural-Resource-Based View (NRBV) (Hart and Dowell, 2010)

2.2.3 Value chain analysis

Value chain analysis is an important tool in adding value to a commodity to enhance the satisfaction of the consumer (Darmawan *et al*., 2014; Cronin *et al*., 2000). To accomplish this, all aspects of material movement within the system should be quantified. This can be done by following the three steps that outline the value chain analysis tool. These steps include activity analysis, value analysis and evaluating and planning (Timmer *et al*., 2014).

Activity analysis

The core of activity analysis lies in the identification of commodities or services to be evaluated and the identification of the ways to add value to those commodities (Shank and Govindarajan, 1992). Activity analysis in the value chain system deals with the reason why and how an activity is performed and who performs it. The combination of all these factors provides a platform for evaluating the impact of the activity on a given firm or in this case natural environment. This makes it easy to identify which activities will add value to commodities with minimum negative impact on the environment. The demand of resources is also evaluated and sustainable resource use determined in order to meet the existing demand. Resource availability in the natural environment depends on dual determinant activities, including natural and anthropogenic processes (Siebert, 2016). In some cases, the services are not easily recognizable by consumers, unless some marketing plan is put in place. In the case of the natural environment and the associated goods and services, the best marketing strategy is the healthy ecosystem characterized by aesthetic beauty. The ideal healthy ecosystem will be characterized by an environment without signs of degradation, disturbances and infestation by any foreign biotic elements. This will constitute a well-functioning ecosystem.

Value analysis

Value analysis is the approach that assesses the goods or services and the costs involved in the sourcing or extraction of such resources (Howarth and Farber, 2002). In the case of the natural environment one can talk of resource purification or extraction cost against the maintenance or restoration cost. This analysis method also takes into consideration the satisfaction measure generated by consumers from the natural resources. It can even be applied to measure value of other resources that can be used as substitutes for scarce resources from the natural environment. In some cases there may be a need to protect, enhance or restore some environmental elements in order to maximize the services or goods output for the benefit of the consumer. This can be done in different ways, best of which is to let the natural environment heal itself without human input. This is best achieved through the preservation of possibly all the aspects of the biophysical environment. For the conservation area to realize its economic endeavour, all types of available capital are required. These include natural, human, financial, and manufactured capital (Hawken *et al*., 2013). These types of capital are sourced from different environments, ranging from natural, economic and social, as well as built environments. This perhaps is one of the factors that brings about complications in the dynamics of the value chains that are not solely based on natural capital. This is due to mixed policy frameworks controlling access to natural capital inside conservation areas (Agrawal and Gibson, 1999).

Evaluating and planning analysis

The ideal healthy ecosystem is characterized by both good and appealing visual and biophysical conditions. These are two attributes that provide capital for value chains in the natural environment. A value chain system viewed as part of the extended environmental 'input-output' model has natural capital as an input to generate output in the form of finished or refined products for easy traceability (Beckchanov *et al*., 2016, Appelhanz *et al*., 2016) The system itself is based on the quest to add value on the natural resources in the case of the natural environment. The added value is indicated through the social development, as well as in the improvement in ecosystem health.

2.3 Zonation and role of montane environments

Montane regions are divided into different zones, (Figure 2.1) according to altitude, which determines the local and changing climatic conditions (Shah *et al*., 2015). The zones are based on vegetation zones showing plant variation with altitude (Corbult, and Edward, 2004) This results in different distinct plant communities, as a result of variation in environmental attributes ranging from chemical to geological properties (Wasson *et al*., 2013). Montane environments tend to become complicated due to other factors that model out their functionality. Besides the environmental attribute, orientation, geographical location also plays a major role in the classification of montane zones. The main zones of montane environments are the montane belt, the alpine and the sub-alpine zones (Sproull *et al*, 2015). The alpine zone may also be further divided into high, middle and low alpine zones. The montane belt occurs below 1830 metres above sea level and is characterized by conifers which in South Africa, are represented by *Podocarpus* (El-Hawary *et al*., 2015). In South Africa, *Podocarpus* montane zone is found on the eastern side of the great escarpment (Drakensberg), while on the west this belt is treeless. Regions like the eastern Free State are thus characterized by two zones only including sub-alpine and alpine zones. The sub-alpine, found between 1830 to 2750 metres above sea level, is characterized by the grasslands that grade into some fynbos species with increasing altitude (Kietzka *et al*., 2015). The alpine zone is the highest zone of the montane environment, found above 2750 metres above sea level. The lower montane zones, the montane and sub-alpine belts form part of the Afromontane zone while the alpine form part of the Afro-alpine (Jacob *et al*., 2015). Different altitudes in the mountain environments define different micro ecosystems. The alpine zone is perhaps the least populated part of the montane environments. Global mountains are characterized by complex vegetation structures owing to the series micro climatic environments resulting from altitudinal variations. The South African mountains are largely characterized by alpine and subalpine grasslands (Brand *et al*., 2015).

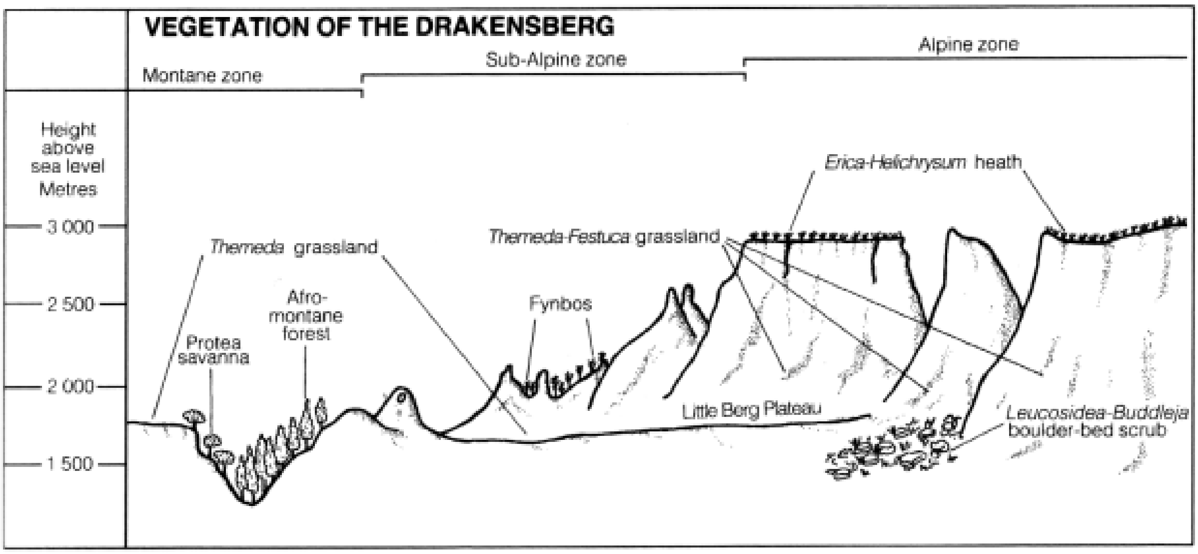

Figure 2.1: Altitudinal zones of the Drakensberg, Source: (Pumeza, 2015, p 5)

Besides vegetation types, mountains are also characterized by different soil formations and profiles. The lower reaches of the mountains are usually characterized by deep fertile soils. This zone is found at the altitudinal range below 2700 metres like in the case of the Himalayas and 900 m in the case of the Western Alps in Europe (Bailey, 2014). This part of the montane zone has been associated with human settlements for thousands of years. The climatic conditions in this part of the mountain environment favour the variety of natural-related human activities.

Montane environments are basically described by altitude and topography (Jimenez-Alfaro *et al*., 2014). In addition to altitude and topography, soil dynamics including pH variation, play a role in different habitats in the mountain environments (Schob *et al*., 2008). The mountains of the world play a major role in regional climates while some may even affect global atmospheric circulation (Barry, 2005). Mountains like the Eastern Arc Mountains in East Africa and the Drakensberg Mountains in the eastern South Africa are kept moist by the currents of the Indian Ocean (Lovett and Pocs, 1993). Mountains also play a major role in rainfall patterns of different regions of the world. One example of such effect is the orographic rain formation over the Drakensberg Mountain Range in South Africa. Beyond the visual aspect, mountains are living and dynamic elements of nature hosting some sensitive ecosystems (Beniston, 2002). The most important role of the mountains is the provision the natural resources, especially the basic ones like water. Mountains all over the world are the source of major rivers that sustain life in different ways. Montane environments are hosts to the large variety of biodiversity. Some of the most notable biodiversity hotspots located on the mountains are the moist montane tropical rain forest in Tanzania and Kenya. These are located on the Eastern Arc Mountains which are also rich in endemic species (Newmark, 2002). In South Africa, mountains host pockets of indigenous forest that support a number of plant and animal species some of which are threatened, endangered or endemic.

Montane environments also provide different types of habitats to both plants and animals. The habitat types in the montane environments are more varied compared to other environments due to geomorphological differences (Moreno-de las Heras and Gallart, 2016). The location of the montane zone on the mountain altitudinal profile provides deposition for eroded material from upper zones. The eroded material in some cases is laden with valuable minerals. In this way the soil becomes one of the valuable resources in the montane environment (Daniel, 2004).

2.3.1 Montane environments as source of value chains

The Mountains of the world play an important role in the livelihoods of many. Mountains are host to a variety of natural elements, including biological and physical elements. The fact that mountains are characterized by distinct altitudinal and geomorphological variations makes them highly dynamic environments, in terms of plant communities and natural processes (Pescador *et al*., 2015). This is also evident in the ecology of the biological elements, as well as in the geological aspect of the montane environments. Differences in elevations provide conditions for variations in microclimates, resulting in a number of different habitats within localities. Increased variation in plant communities and significant geological formations make these environments rich in natural resources (Beniston, 2016). This results in different plant and animal species recruiting and forming different communities within a quickly changing altitudinal gradient. In this way, a small spatial location in the montane environment hosts a larger number of diverse species compared to other environments. Montane environments bear a number of essential natural resources varying from biological to mineral resources. This is one of the factors that make certain zones of the montane environments to be inhabited by many people globally. The available resources are sourced in different ecosystems within the montane environments, and thus constitute the base for value chains.

2.3.2 Significance of montane environments to humans

The importance of the global montane environments lies more on their constituent elements that are determined by various processes. The elements range from natural phenomena right through to anthropogenic processes and related materials. However, the demand and pressures on montane environments are growing rapidly (Marchant and Lane, 2013). This is as a result of valuable resources that are hosted by these environments The lower reaches of the montane environments signify the zone of optimal interaction between humans and the elements of natural mountain environment. This is the zone of exploitation, conservation, degradation, nourishment, restrictions and many other human facilitated actions concerning nature (Viviroli *et al*., 2007). This zone has always been occupied by people and it has seen the concentration of activities over centuries (Vanacker *et al*., 2014). In the South African context, a larger part of montane environments are dominated by the grassland biome. On the other hand the grassland biome hosts a wide range of biodiversity and ecosystems like wetlands (Bredenkamp *et al*., 2006). The combination of grassland richness and montane environments being watersheds signifies the important role of montane environments in life. Grassland biomes are made up of different genera of plants which are dominated by grass species (Parr *et al*., 2014). They host a wide range of vascular plants from herbs to shrubs and conifers. The species richness in the montane grasslands makes these areas good candidates for conservation (Bredenkamp *et al*., 2006). In South Africa for instance, the temperate indigenous grassland hosts pockets of indigenous forest dominated by the small number of South Africa's conifers, *Podocarpus* species and forbs like the *Brunsvigia* species (Carbutt *et al*., 2011).

The valuable resources on montane environments vary in terms of their demand in sustaining or supporting human livelihoods. To maintain regular supply of ecosystem services and goods, healthy ecosystem is a necessity (Sala *et al*., 2000). Montane resources provide either services or goods to both humans and the environment. Humans get these services and goods through different types of land uses varying from taking residence, extracting raw materials to farming.

Water is one essential resource that is abundant in most montane environments around the world.

Besides the importance of montane environments to immediate local communities, these environments are also important for global change researchers (Becker and Bugmann, 1999). This is due to the multitude of different aspects of the geography of the mountains. The most significant aspects of mountains range from geology, geomorphology, climatology and inhabitants that including humans, plants and animals (Huber *et al*., 2006). These are elements that shape the mountain environment as we know it. Their existence and occurrences depend on the dynamism of the environment. The aspects of altitude and latitudinal location bring about the dynamic nature of the mountain environment. These aspects do not only influence the habitats on the mountain environments but also value chains. The latitudinal locations of the montane environments define the differences between global montane environments. This is explicitly expressed through vegetation types ranging from montane grasslands, montane forests to montane scrublands.

2.3.3 Human-ecological footprint and montane environments

The rate at which humans consume natural resources is used to determine the capacity of the environment to sustain them. This is the key concept in understanding the impact of human activities on natural products and materials. The concept of human ecological footprint is well demonstrated through the input-throughput-output ecological model. This model allows for the outcomes of the ecological process to be scrutinized. The output represents the feedback onto the environment. Humans extract resources from nature, process them and release waste back to the environment. In most cases the demand for natural resources exceeds the capacity of the natural environment to provide those resources. This is due to the slow rate at which nature can replenish those resources (Follum *et al*., 2015). In some cases the impact is so severe that certain resources can never recover e.g. when plants and animals are exploited to extinction (Menéndez-Guerrero and Graham, 2013). This is the most tragic phenomenon faced by nature and has far reaching consequences. The elimination of one biological element from the environment will have an impact on biodiversity and on some natural processes. Loss of natural elements due to exploitation affects every natural environment no matter how small or big the place may be. In many cases the anthropogenic activities exasperate the impact of natural phenomena like climate change. The combination of all these processes will help reverse the conditions to the desired state of the environment (Costanza *et al*., 1995).

2.4 Land uses of mountain areas

There are various kinds of land uses that prevail in montane environments all over the world (Thirumalai and Murugesan, 2015). These range from agricultural, cultural, resource extraction to human settlements. The concentration of land uses in most montane areas is subject to resource availability and accessibility. The sustainable land uses depend on integrated land use planning with all stakeholders involved. Each land use is characterized by modification of the environment to suite local needs and is guided by policies that attempt to minimize impact and advocate equal access (Kraft, 2015). Land uses in the montane environments are a bit different from land uses in other areas due to prevalence of fragile ecosystems like wetlands and river sources.

2.4.1 Impact of anthropogenic activities in montane environments

Besides the environmental changes brought about by natural phenomena, anthropogenic activities accelerate these changes to a state of degradation (Perrin, 1999). Most of these activities are associated with different kinds of land uses. As much as montane environments have sustained hundreds of thousands of humans over several years, the breakdown of this relationship is eminent. The way in which people treat mountains and the natural environment as a whole is different from that of ancient people. This is a logical explanation for the longevity of some montane forests that still exist today despite impacts of climate change. This is in contrast to convictions by some authors like (Schmidt, 1989: Dusar *et al*., 2011), who argue that the pressure on these forests dates back to the Iron Age. One might argue that during that period, industrialized activities were non-existent and few compared to the supply of resources from the vastness of natural forests. In some countries, especially in the sub-Saharan Africa, forest destruction may be associated with industrialization. The increasing demand for timber during industrial revolution had an immense impact on natural forests of the world. This is besides the conclusion by Machado *et al*., (1998) who state that climate plays a major role in environmental change. One driver of climate change is the increased concentration of carbon in the atmosphere that is related to reduced carbon sequestration and burning of fossil fuels. One can thus conclude that most of the environmental degradation is as a result of anthropogenic activities.

Grasslands, through vegetation alterations, can project a clear picture of the extent of environmental impact as a result of anthropogenic actives (Bachelet *et al*., 2001; Cao *et al*., 2004). The impacts range from alteration of vegetation structures, alien species invasions, and native species extinction to land degradation. The plight of the grasslands is exacerbated by the neglect and misuse of the world grasslands (Hoesktra *et al*., 2005). Substantial areas of grasslands are also found in montane environments and are also home to various other plant forms from conifers to herbs. Grasslands in lower altitudes are rich in grass, shrubs and herb species making this zone a highly sought after montane zone (Foley *et al*., 2011). This increases the pressure on biodiversity as there is intensive use of extracted resources. Overgrazing is one of the problems encountered at the lower slopes of the montane environments. This is coupled with uncontrolled burning of the rangelands in anticipation for new forage grass by villagers (Weir *et al*., 2013).

The South African Highveld grasslands are characterized by treeless landscapes due to climatic conditions together with wildfires and overgrazing. In rural areas found in the Highveld, people turn to alien tree species for firewood, windbreaks and other timber needs. This result in uncontrolled cultivation of alien tree species that in some cases end up invading large tracts of land. This is one of the most destructive forms of land degradation as its effects are multidimensional for example, excess water use leading to death of other species that are not competitive enough (Dean *et al*., 2002; Brand *et al*., 2012).

Consumption of natural resources from montane environments has increased dramatically in recent years. This is due to the ever increasing human populations and an ever shrinking natural resource base. The industrialization era came with the increased demand for raw materials when compared with the traditional resource use. Purified commodities like water are in high demand in rapidly industrializing countries like South Africa (Hoekstra *et al*., 2012). This increases the need to augment water supply to sustain everyday activities resulting in building of reservoirs and excessive water extraction. This, in many cases disregards the wellness of ecosystems which are in need of regular water supply in order to sustain riverine and other aquatic fauna and flora. The burden on the environment is increased by the amount of waste material that is released back into the natural environment. This is less prevalent in most montane environments. The impact of human activities on the montane environments can be measured on different scales ranging from local, regional up to the global scale (Palmer and Bennett, 2013). The impact on the environment, irrespective of the scale of activities, is detrimental to the natural environment. Irreversibility of most of environmental impacts will adversely affect material movement and ecosystem services thereby affecting human livelihoods.

2.4.2 Implications of modifiers in montane environments

"Modifiers'' is the term given to the set of activities, elements, phenomena and organisms that bring about change in an environment, thereby altering the functioning of that environment (Lal *et al*., 2010). In nature conservation areas, modifiers may include instability in animal or plant populations, anthropogenic activities, alien plants and animals and natural phenomena. Ecosystem modifiers affect the core of ecosystem services and reduce the output of resources and goods. In this way, the natural capital of the value chain system is degraded. The economic equivalent output of the conservation areas is thus crippled, so is the whole value chain system. The most prevalent ecosystem modifiers are biophysical degradation and plant and animal invasions. This is also the case with the Witsieshoek Conservation Area and many other protected areas. These modifiers, in most cases are promoted by anthropogenic activities which are mostly related with agriculture. This then highlights the importance of land use as both an element of ecosystem modification and value creation and capturing.

2.4.3 State of montane environments

Modifications, alterations and pressures that people exert upon an environment will reflect on the condition of the biophysical aspect of the environment. The state of the environment refers to the present conditions of the environment that can be used to quantify future environmental changes (Glasson *et al*., 2012). The state of the environment is observed through different environmental systems. These systems include the social and natural environments. A clear definition of the state of the environment will go a long way in forging viable links with other research fields other than natural sciences including economics, sociology and humanities. In economic terms, the state of the environment can be regarded as a capital commodity from which future investments and profits can be calculated (Costanza, 1997). Environmental elements are used to place the environment in the monetary value in order for the clear value chain analysis system to be developed (Pagiola *et al*., 2004).

The state of the environment includes several aspects that have to be taken into consideration during the proclamation period and might eventually form part of the management plan of the area. These aspects range from biological, physical, as well as ecological aspects of the environment (Yang *et al*., 2014). A suitable approach of determining the state of the environment is to examine the habitat conditions which form the biophysical part of the environment and assess the state of ecological processes. These aspects are also used for a long term management of the conservation area. Reference conditions are important in defining the state of the environment (Bennion *et al*., 2011). It is important for the conservation practitioners and environmentalists to consider the changes that might have taken place in the environment. This is to prevent the misleading evidence about the native organism of the area versus the introduced or exotic species. This applies to both plants and animals, and to a greater extent to the alteration of the chemical properties that may threaten the plant and animal life in the area. An example is the introduction of soil particles from different environments due to erosion and deposition processes (Bindler *et al*., 2010).

The environmental state of any area can be regarded as an assumption if it is not supported by comprehensive research that yields credible results and analysis (Martin and Tesser, 2013). In some cases conflict arises between how indigenous people perceive conservation and modern conservation methods (Doak *et al*., 2013). Scientific uncertainty is the worst thing that can happen in projects that include people who are not scientists (Stoll-Kleeman and Welp, 2006). The only way for the scientists to be certain about the state of the environment of an area considered for conservation is to collect and analyze the relevant data (Greyling and Huntley, 1984). This will in turn be used to educate the people and provide the framework for monitoring and managing the conservation area. This will also build confidence in people who dare to be involved with such initiatives as community conservation areas.

Environmental changes accompanied by the decline in ecological processes arise from pressure and stress exerted on the environment (Bartram and Balance, 1996). Activity trends can be traced through observing chemical, physical and biological environmental parameters. On top of the changes that take place within the ecosystem, is the consideration of the rate of change, as well as the agents that may accelerate or decelerate change. One such agent will be the anthropogenic activities in the environment (Herold, 2009). Extensive scientific knowledge is vital in the formulation of policies dealing with the monitoring of the state of the environment (Walmsley and White, 2003). Monitoring is primarily dependent on the well documented state of the environment (Wu *et al*., 2013).

2.5 Biodiversity conservation and value chains

Conservation is the discipline that aims to protect and advocate sustainable use of resources in order to prolong the existence of the natural environment and its elements, both physical and biological (Mace and Baillie, 2010). The success of the objectives of conservation depends on different factors both from within and outside of the environment. The most important factor in conservation is the knowledge of biodiversity and the state of the environment in the conservation area (Gibbs *et al*., 2008). There are different types of conservation, dealing with different elements of the natural environment. Biological conservation is one part of conservation dealing with the preservation and protection of living organisms. Biological conservation includes species, genetic, population as well as community conservation. This type of conservation also renders quantitative and qualitative enhancement and maintenance of ecosystem services (Mae *et al*., 2012). Physical conservation covers aspects like soil, water, and energy and landscape conservation. Conservation takes into consideration the interrelatedness of both the biotic and abiotic elements of the environment. This interrelationship adds the third element in environmental conservation, which takes the form of ecosystem services and functioning. Ecosystem services bring about the human factor into the conservation space. Human beings support their lives through environmental services and natural resources sourced from the environment. These resources are renewable, non-renewable or perpetual in nature (Chaudhry *et al*., 2010), the properties of which determine the period through which these resources will be available for human use and for sustaining the natural environment. The rate and quantity at which the resources are extracted from the environment also play a role in the longevity of resources (Yalung, 2013). Conservation is about putting in place guidelines, norms and policies that will help in curbing rapid depletion of resources.

Conservation is not only carried out in an authoritative way but can also be achieved through the active participation of local communities (Berkes, 2004). In this way people are empowered both financially and educationally. Child, (2004) raises concerns about documentation of the role played by traditional conservation in South Africa. Traditional conservation played a vital role in protecting biodiversity over centuries in South Africa and the world over. Traditional conservation may have been driven by sustainability practices like nomadic farming and timed food gathering. This is where the concept of environmentalism comes in, whereby there is engagement driven by different ideas and philosophies with the aim of conserving the environment (Del Mar, 2014). Today, initiatives like South African Grassland programme and local conservation groups form part of international programmes aimed at conserving wide range of ecosystems (Egoh *et al*., 2011; Sundnes, 2013). These conservation initiatives are also aimed and protecting wetlands found in the grasslands. This will in turn preserve ecosystem services like water purification by wetlands and carbon sequestration by grasses. Besides ecological services, wetlands and grasslands provide economic services like water and pastures respectively for agriculture. In this way natural capital is preserved in order to support viable value chains.

At international level, conservation can be carried out in transfrontier parks, national parks and at the national level (Buscher, 2012). Transfrontier conservation projects seek to preserve natural resources that overlap over different countries like the Maloti-Drakensberg Transfrontier Programme that traverses both South Africa and Lesotho (Shaw *et al*., 2011). The community conservation areas take the conservation to the local level. The main goal of conservation is preservation of natural resources including biological diversity (Vane-Wright *et al*., 1991). Conservation on the local scale calls for integrated planning as most places of conservation value fall under farming areas and rural settlements (Daily *et al*., 2001). One such area is the global grassland biome where billions of people reside (Egoh *et al.*, 2011). The vulnerability of this biome is increased by its agricultural suitability, both for animal husbandry and crop farming.

The grassland biome hosts different ecosystems like wetlands and pans (SANBI, 2010). In mountain areas, grasslands support a number of other life forms, including both plants and animals. The challenge in conservation of grasslands is that they are found in different landscapes and cover a wide area in South Africa. At the local level the stewardship approach is adopted for conservation of the whole biome system like the grassland (SANBI, 2010). This programme is based on the agreement between land owners and conservation authorities. The same conservation approach has been adopted for the conservation of resources like water, bird species like the secretary bird and in some cases some small animals like the Cape River otter (*Aonyx capensis*). These are natural elements that cannot be tamed, but must be kept free as their taming will disturb their interaction with the natural environment and endanger their lives. Elements like water are conserved through the implementation of laws that control the usage of the resource (Crisman, 2003).

In communal rangelands like the ones on the foothills of Maloti Drakensberg Mountains, a different scenario prevails. The tribal authorities are the representatives of the larger community and these make the principle of stewardship unfit for this type of setting. Community conservation areas are best maintained through the co-management principles which allow participation at all levels (Berkes, 2009). Such levels will include decision making in resource beneficiation and management. Community conservation area management should give local communities a significant role to play in both human empowerment and conservation initiatives. This is necessary in all countries under Southern African Development Community (SADAC), as stipulated by the International Convention on Biological Diversity (Fabricius *et al*., 2013). This ensures the protection of the interests of local communities in biodiversity conservation as a whole. More importantly, it is necessary to adopt such principles in addressing the gaps that may arise from the process of land restitution in South Africa (Walker *et al*., 2010).

Land restitution deals more with the development of South Africans through land allocation. This goes hand in hand with the conservation initiatives where there will be added value to natural resources to benefit local communities. Since most of the redistributed land falls under agricultural environments, there are some large tracts wild lands and conservation areas that are transferred to new owners (Lahiff and Li, 2014; Cundill *et al*., 2013). These are some of the instances where education in conservation with respect to other land uses is needed the most. This will go a long way in conserving these areas as well as ecosystem services and natural goods found in these areas. This also goes for newly proclaimed conservation areas where there may be changes in land use and land use planning.

2.5.1 Stakeholders involvement in conservation and value chain sustainability

Mountains have been home to millions of people around the world for thousands of years (Parish, 2014). They have sustained human, plant and animal lives in different ways from shelter to life sustaining resources. Mountains still sustain lives today and will do so in many more years to come if they are managed properly. Existing literature hints that some of the bacteria that are believed to be the source of life as we know it today were discovered in the mountain caves (Engel, 2015). Similar occurrences are still happening today, for example the migration of European eel, (*Anguilla Anguilla L)* from montane environments to the coast for spawning and swimming back upstream for maturity (Mouton *et al*., 2014). Some of the evidence of the importance of mountains to humans is the rock art by the San people in the mountains in South Africa. Mountains also boast of varied habitat types from the peaks, to the escarpment. These special variations support different vegetation types, including forests, shrubs, herbs and grasses (Mucina and Rutherford, 2006). These types of vegetation have supporting human beings in different spheres of life, from medicinal plant resource, to building materials and food stuffs. The montane vegetation has also ensured the well-being of animal life that was and is still the source of protein for humans. Livelihoods in both rural and urban areas rely on mountains for water. This is through portable water for consumption, industrial water use and energy generation. Montane landscapes play a vital role hydro power generation. Potential energy of water that is provided by elevation difference and water storage capacity on the higher elevation is used to turn turbines (Majumder and Ghosh, 2013).

Conservation concerns different stakeholders from authorities, consumers and general communities as land owners (Child, 2004). The role of the communities is much more important in the case of community conservation areas. A community conservation area entails different roles that can be played by a community such as those in the stewardship projects where land owners protect biodiversity on their properties. The contribution of indigenous people to conservation dates back centuries ago and is still influential in modern conservation (Cocks and Wiersum, 2014). Initiatives such as community conservation areas give people patriotic pride in taking part in protecting national wealth in the form of biodiversity. The most important role of the community is land ownership. Biodiversity and other subjects of conservation co-exist in the same space as communities. This co-existence makes communities hosts in any conservation endeavours. In some cases communities, through cultural heritage conservation, constitute conservation subjects. Land ownership covers land functionality and different natural resource uses (Eaton, 2013). In conservation, sustainability is the main driver that advocates resource use.

2.6 Impact of policies and legislation on conservation

Environmental protection in South Africa is one of the most important necessities, judging by the series of laws and regulations that are put in place to promote it. These laws and regulations are made in such a way that they cover every aspect of the environment, be it the natural, built-up, urban, rural or agricultural environment. The National Environmental Management Act (NEMA) of South Africa provides some much needed legislative guidance to a wide range of environmental projects. These range from built environment projects to the natural environmental land uses management projects. Several clauses and acts under NEMA provide for both the environment and its inhabitants. Conservation and protected areas are also catered for under this act making it one of the vital tools in the proclamation of such areas. This is due to the fact that the proclamation of these areas does not only concern the natural environment but also affect the human inhabitants. The impact of humans on the conservation areas and vice versa highlights the need of a good working relationship between the two. Land use and land use changes result in different types of impacts on either the environment or the community livelihoods. One way of trying to minimize these impacts is the creation of buffer zones between the two as provided by the Protected Areas Act No. 57 of 2003 and World Heritage Convention Act No. 49 of 1999. This correlates with the conservation of different commodities, including fauna and flora and cultural heritage in community conservation areas. Besides flora and flora, the natural environment hosts sources of vital resources, especially water.

Different agencies play different roles in the management of water catchments. The National Water Act, 1996, formed agencies like Catchment Management Agencies (CMAs) as per recognition of the need (Act 96 of 1998) (Muller, 2009). These agencies play a major role in facilitating the integrated monitoring and management of water sources along the entire hydrological system from ground water to surface water bodies like wetlands, rivers and lakes (Jovanovic *et al.*, 2013). Other important role players include government departments including Department of Water Affairs and Forestry, Department of Environmental Affairs and research institutions (Ashton, 2000). Government has got a legislative mandate to protect the whole catchment area system as well as ensuring distribution of water equally amongst its citizens (Wegelin and Jacobs 2013). This can be achieved through the implementation and enforcement of Water Service Act (Republic of South Africa 1997, Act No. 108) and Water Act (Republic of South Africa 1998, Act No. 36) (Meissner and Funke, 2014).

Environmental policies make or break some of the envisaged outcomes of conservation projects. This may emanate from some ambiguity in the interpretation and understanding of concepts concerning conservation. The difference in definition of conservation and protected areas in terms of policies and regulations may perhaps be the starting point demystifying conservation. This will be in line with the incorporation of the communities into the broad spectrum of biodiversity conservation. Educating communities about areas of conservation importance and policies governing their usage will go a long way in biodiversity protection. The starting point should be the clear definitions of those areas, why and from whom should they be protected. The policy implementing agents like municipalities, ministers and other people involved in conservation should be known to communities for transparency. The most important driver of successful conservation programmes involves happy and satisfied communities and responsible conservation agents (Bottrill *et al*., 2014). Stringent regulative measures may deter people from taking part in conservation programmes. It is vital to strike balance between nature conservation and human livelihoods. That balance should be informed by different global and national treaties and accords regarding human livelihoods, nature conservation and environment in general. This is a relevant path to take as modern conservation measures seek to unite different countries in conservation efforts through trans-frontier parks. The IUCN is one important body concerned with conservation objectives that can be used to link conservation policies and legislations from different countries (Dudley, 2008). Agreements for conservation in natural parks should include comprehensive legislative frameworks that will embrace every aspects of conservation from species migration to global value chains. Scientific researchers should also be given immunity to strict cross border movements to promote continuous monitoring and management (Benoit and Comeau, 2005).

In South Africa, policies on land conservation in general date back to the apartheid era. The two main acts that have an impact on conservation today are the Native Land Act 27 of 1913 and Native Trust and Land Act of 1936. These acts resulted in the so called ‘reserves’ or communal lands under which the Witsieshoek Area falls. The communal lands were created in what one may call the peripherals of South African economic space. The areas around these communal areas are now highly contested for biodiversity conservation (Bell, 1987). It becomes necessary to examine the implications of formalization of conservation areas in these areas. The implications are bound to be multi-dimensional, affecting both the residents, as well as the contested space. These implications, in many cases will lead to friction between local communities and conservation activists. The provision of education and environmental awareness is one of the tools that can curb conflicts in the proclamation process (Kopnina, 2014). This on the other hand implies outlining the relevance of conservation is integral successful conservation projects (Child, 2004). Former conservation policies had emphasis on aesthetic status of the environment which is more aligned with capitalist conservation (Buscher and Fletcher, 2014). In South Africa, this situation rendered conservation an oppressive tool that restricted the black majority and denied them a chance to comprehend the logistics of conservation. Good implementation plans are vital in avoiding the formation of “good on paper’ conservation areas (Timko and Innes, 2009).

Policies on conservation form part of the important tools used by environmental practitioners (Treby *et al*., 2014). Policy development in natural research requires input from researchers that will guide the policy development process (DEA, 2009). There are different factors that play a pivotal role in policy development. They include such tools like spatial interdependence and spatial non-convexities (Deacon *et al*., 1998). These tools define pathways through which environmental services and goods are transformed in a commercial landscape (Dasgupta and Mäler, 2004). Furthermore, this scientific background informs development of economic and environmental policies (O'riordan, 2014). These policies ensure accountability and responsibility on the side of consumers of natural resources in the form of payment for ecosystem services or otherwise (Zhang *et al*., 2010).

Governments, through environmental agencies, give clear guidelines on proclamation of new conservation areas (Sowman and Wynberg, 2014). These policies are mostly based on the wellness of the pre-existing entities like places of historical importance, and natural resources in the area to be proclaimed. The most important factors in the initial stages of proclamation are the designation of a relevant authority to oversee the whole process as mentioned under the environmental Conservation Act 73 of 9 June 1989 was superseded by Natural Environmental Management Act (NEMA). The personnel or the agency designated should be well informed with all the details of conservation and be able to bring together different stakeholders. Different stakeholders will be able to identify and assess the possible threats to the environment as required by the environmental regulation under NEMA.

Conservation initiatives that involve two or more authorities may require a formulation of special laws and treaties. These initiatives may either be across provincial or international boundaries. In the case of conservation initiatives that include different countries, international conservation agents or organizations may play a major role in the formulation of conservation policies. A transnational policy network is one of the legal tools needed in the conservation areas that border two countries as is the case with the greater Maloti Drakensberg Transfrontier Park (Buscher, 2014). Transboundary policies need to be considered for conservation areas which in their pre proclamation stages like the Witsieshoek Community Conservation Area (WCCA). The area may not be the transnational conservation area, but it will be affected by human activities like free range cattle grazing cross borders. Activities like these cannot be assessed and managed correctly if there are no proper plans in place.

Conservation policies that embrace each and every aspect of conservation should be developed and implemented. These aspects include environmental resources like fresh water, animals, plants and soil. All these aspects form part of the basis of most of the value chains upon which human beings rely for livelihood. Ecological resilience is important in the formulation of the sustainable value chain system (Bunting, 2013). Ecological resilience is represented by all the natural processes in the ecosystem from material and energy movement to competition amongst organisms. These factors are bound to affect the supply of these resources to the end user. The policies should be based on the outcomes of the environmental feedback mechanism (Rudel *et al*. 2005). This can only be achieved by following different pathways that fall within the human-environment interaction context. In this way, input and output synthesis can be quantified to inform policy makers on control and regulation measures. On top of control and regulation measures people have restricted access to some of the resources. In most cases people located near conservation areas are the ones who suffer the most (Western and Wright, 1994). In some cases, the views of the people are not valued and hence they are not incorporated in policy development (Bunce *et al*., 2010).

In South Africa these mishaps require that acts and regulations be formulated based on the needs of the local communities, as well as their exploits of the environment as stipulated in NEMA. There is a gap in implementation and monitoring regarding such acts. In the long run, some of the acts and regulations turn to be overridden by economic and property ownership endeavours. In many instances policies do not serve the desired purpose of equality and accountability. This gives rise to mistrust and eventuality in the breaking down of working relations (Garcia-Frapolli *et al*., 2009). Land ownership forms a vital part in conservation policy development. As noted by the African Union (AU) (2009), 'policies land rights should be strengthened in order to enhance productivity and secure livelihoods'. This is even more important in countries like South Africa which are in the wake of unsuccessful land reform (Aliber and Cousins, 2013).

The combination of the processes of land reform and proclamation of new conservation areas will lead to some adjustments in land uses. Regulations will also need to be adjusted in order to accommodate such changes. The adjustments will have to be beneficial to the natural environment as much as humans benefit from them. This will bring into the picture a fairly new aspect of conservation in South Africa, known as payment for ecosystem services (Benjamin, 2013). Amendments may have to be made in some of the policies and acts to strengthen the need for accountability. This will have to be accompanied by the unwavering enforcement and implementation of policies and plans, respectively. The incorporation of such clauses in new or revised conservation policies will ensure responsible use of resources while taking care of nature. This will also play a major role in cutting down unfair trade of natural resources that only benefit a few. Projects like the National Freshwater Ecosystem Priority Areas (NFEPA) depend on sound policies for their success. NFEPA is the project that can assist in the implementation of payment for ecosystem services (Roux and Nel, 2013). Payment for ecosystem services will help bridge the market gap that renders public goods not to be charged for. This, besides strengthening value chain systems, will also help in regulating the proper use of resources. Mountain Catchment Areas Act, 1970 (Act 63 of 1970) may form basis for protecting public goods like water which is abundant on most of the mountains falling under protected areas (SANBI, 2009).

2.7 Physical and abstract boundaries: the regulatory tools in conservation

Besides the models and frameworks that are in place for research work, there are laws and policies involved. These are mostly the tools that are used as regulatory measures in the social space. This then implies that the research in a nature-human system is partly embedded in a space that requires certain social prerequisites have to be fulfilled. Both implicit and explicit spatial references provide the integrative basis for multidisciplinary research like this (Kuhn, 2012). This is achieved through clear delineation of respective elements in both environmental and social space. Such elements like boundaries jurisdictions are defined through policies, laws and acts. This eventually leads the research work through politically defined space with natural attributes providing for cadastral boundaries. This is the main reason why policies and laws have to be taken into consideration not only as guidelines but also as objects of contention in the long run. In the context of South Africa, the environmental protection through legislations and acts mainly the South African National Environmental Act (NEMA) and other frameworks. These acts are not only focused on natural environment but also advocate the use of resource by people. On the other hand, the political authorities look at providing for humans through the use of social policies. The common ground for the two endeavours including human well-being and environmental protection lies in sustainability (Agarwala, 2014).

The reason why such research takes legislations and laws into consideration is to seek guidance in the investigation, as well as explore shortcomings and possible improvements where necessary. Size and the boundaries of any land use demarcation always signify the engagement of different role-players. Boundary issues become even more contentious when it comes to the proclamation of conservation areas. The contention is usually between the communities and the implementing agents. Did the introduction of community conservation areas bring about calm in this regard and has it softened up the boundaries? On the other hand, matters may be worsened by threats on biodiversity that is fuelled by ailing socio-economic status of communities (Jarv, 2016). What may be good for communities may not be good for the conservation endeavour and vice versa. This may bring about the most undesirable ambiguity to everybody concerned. The respective principles and theories guiding policy makers, scientists and demarcation boards should bring about some harmony in this regard.

2.8 Interaction between humans and the natural environment

People benefit directly and indirectly from the natural environment. The benefits that humans derive from the environment, is perhaps the most notable point of interaction (Bühler *et al.*, 2015). It involves different extraction mechanisms that culminate to positive and negative feedbacks to the environment. Extraction and feedback mechanisms define material movement patterns and possible impacts. This also makes it possible to quantify material stocks, as well as the sources. The relationship between people and resources is important in that it helps with the allocation of certain values to the resource stock (Freeman, 2014). Such values depend on affinity of people for a certain resource (Borowy, 2015). For a study that deals with the value chains on natural resources, the identification of resources is vital. This may be done by creating a criterion based on degree of demand and what the environment can offer. Besides the obvious goods and services that are beneficial to humans, there are services that are indirectly beneficial to both the environment and humans. Resources from which humans benefit directly include water, plants, soil and animal life. These resources are either used directly or processed and in some cases provide habitat for other extractable goods. Water is used directly through consumption or together with soil to grow plants and animals for both consumable and non-consumable goods. In many cases, the ability of the environment to provide services and goods may be altered by what humans do on the environment (Johnstone *et al*., 2016). Human activities can either be detrimental or beneficial to the environment. Besides activities like pollution, excessive resource consumption itself can be detrimental.

2.9 The positivist paradigm and Pressure-State-Response (P-S-R) Model in value chain analysis

Worldwide, there are a number of frameworks and models that are used in environmental researches because of social dynamics involved (Hunter *et al*., 2015). Most of these frameworks and models are focused on social environment, while others are focused on the natural environment. Consequently, there is a danger of an interdisciplinary research being biased to one disciplinary issues leading to fall out of some critical arguments, as pointed out by Price (2016). This may result in tedious organisational and analysis process whereby one may need to find a discourse between the disciplines involved. This may not be the only limitation arising from the discipline specific models in a world that is quickly being dominated by interdisciplinary research and studies (Fiksel *et. al*., 2013). The other challenge lies in the alignment of the spatial data which characterizes the nature-human coupled system.

Research on the nature of nature-human coupled system calls for the integration of various research tools from different disciplines. The integration of all the different tools can be guided by the Pressure-State-Response (P-S-R) model (Denscombe, 2014). The whole process is also characterized by different subsidiary models that form linkages between different disciplines. Furthermore, the Driver-Pressure-State-Impact-Response Model is also used in some instances to further investigate underlying factors driving environmental changes (Spangenberg *et al*., 2015). Thus, the refined P-S-R model in the form of D-P-S-I-R model significantly relates scientific investigations to social perceptions on human-environment systems.

The P-S-R framework provides a solid background for proper management of large scale projects like the Witsieshoek Community Conservation Area. This is due to the fact that it allows for monitoring of attributes, activities and outcomes of the system. The model does not only provide a structural framework but also highlights functional capabilities for the system in question. Through the P-S-R framework, it becomes easier to identify the stressors, the resultant impacts in the form of the state of the environment, as well as suitable mitigation measures (Goulletquer *et al*., 2014). This framework is suitable for addressing perceptions on different impacts that biodiversity conservation and other land uses may have on each other.

The pressure that is applied on the environment comes from both natural and anthropogenic phenomena and activities, respectively (Schlacher, 2016; Merilä and Hoffmann, 2016). These include climate change, land use change, modern agricultural practices, resource extraction and industrialization. Natural and anthropogenic activities form the basis of pressure that is endured by the natural environment. All these pressure sources or stressors impact the environment over geographical space and time (Harvey, 1990). Climate change for instance, has had a negative impact on natural resources like rangelands in montane environments (Peringer *et al*. 2013). Pressure from landscape fragmentation, restrictions on plant recruitment and development, and harsh conditions that may be brought about by unfair competition among plant species takes different forms (Malavasi *et al*., 2014).

The state of a system refers at the reference conditions that can be used to track either the previous conditions or predict the future state of the system through the use of environmental indicators. This can be achieved through the backing of sound scientific facts through which indicators for change can be derived (de Jonge *et al*., 2012). The fact that the impact of external stressors is active over an extended period of time calls for regular monitoring of the environment in order to identify the source of any change that is induced onto the system. The state of the system in the case of conservation and socio-economic system can be described in different approaches including utilitarian and anthropocentric theories. Both these approaches deal with the benefits that humans derive from nature. The utilitarian approach as a group of theories focusing on maximizing benefits from resources is equally indebted to different types of land uses and environments in which those activities are carried out (Loreau, 2014). On the other hand, the anthropocentric approach put priority on human well-being ahead of any other things (Beausoleil *et al.*, 2014). In the view of the two approaches, one can then assess the state of the environment through utilization outcomes that are underpinned on either natural or human-used environments. After analyzing the state of the environment, viewed against such impacts as degradation, resource depletion and other environmental changes, varying degrees of acceptable and unacceptable state of the environment will be determined. Different practitioners will have different convictions on the assessment of the state of the environment. Environmentalists will assess the environment in its entirety while the economists will mainly address issues related environmental resources. This will inform each of the role-players about strategies and measures that need to be employed in order to maintain the environmental state desired by their respective fields.

A selection of indicators is used to monitor changes that might be taking place in an environment. These indicators vary according to land use as well as environmental attributes (Johnson and Host 2010). After the assessment of the state of the environment, adaptation methods have to be put in place in order to address the gap arising from the altered environment (Wise *et al.*, 2014). The response in any scientific system is triggered by the feedback mechanism. In the case of conservation, seeking for adaptation ways is triggered by biodiversity loss while in the case of socio-economic approach, response is triggered by decline in resource availability or poverty. The responses will be based on maintaining the value of the environmental resources, both the true and market values (Burdon *et al*., 2014). The underlying aim will be to maintain the natural environment to sustain biodiversity and support the true value (natural value) of the environment. Adaptation measures or responses come at a price, as well as willingness to pay for restorative measures (Menz *et al*., 2013; BenDor *et al*., 2015). The price concerned involves research, labour and resources, whose availability will determine the effectiveness of the response. Delineation of important pathways in material movement within a certain environment will provide the basis for cost calculation based on the extent of degradation (Nkonya *et al*., 2016).

Despite its deterioration, the environment can still benefit some sectors of society. Previous studies have shown that biodiversity practitioners hold the highest standard of environmental health and quality for sustainability (Ridder, 2008; Sandifer *et al*., 2015). The same cannot be said about the economist and the general public who are often driven by the extracting mode, as opposed of the preservation mode. Salvaging biodiversity for conservation purposes is much more costly than extracting resources for economic purposes or domestic use (Wiens and Hobbs, 2015). The opposing directions taken by different stakeholders may weigh negatively on processes aimed at rehabilitating the natural environment (Fox *et al*., 2016). It is vital that any activity that is carried out within a conservation setting complies with the laws aimed at reducing environmentally destructive impacts.

2.10 Conclusion

The value chains that are based on natural capital are better understood through the integration of three disciplines including natural science, social sciences and economics. This interdisciplinary approach of analyzing value chains has not been fully grasped in scientific inquiry. This has created gaps in our understanding of the elements of the natural environment that are transformed into commodities and/or goods to create value chains. Such a situation has resulted from the use of unsuitable tools in value chain analysis. Previously, most researches on value chains were biased to specific disciplines, thus focusing exclusively on economics, natural or social sciences. The recent developments and advancement of interdisciplinary and multidisciplinary studies may be the solution in merging and erasing solid distinction between disciplines. This can be achieved through modification and integration of methodologies and data as well as policy changes to make research more relevant and useful to target study areas and populations. Mountain areas and other fragile environments pose additional challenges in integrative studies because of land use competitions and the dynamics of the environment and vulnerability which in most cases lead to biased studies. Theories and models play a major role in helping researchers to understand individual subjects of the study while allowing smooth integration of different disciplines within the study. The next chapter describes the profile of the study area, as well as the methodology of the study.

CHAPTER 3

STUDY AREA AND METHODOLOGY

3.1 Description of Study Area

The Witsieshoek Community Conservation Area (WCCA) is located in the Maluti-a-Phofung Local Municipality, in the eastern part of Free State Province of South Africa, (Figure 3.1). It is located between 28˚ 32’ and 28°46’S; and 28˚ 43’ and 28˚ 57’E, and has an average altitude of 1671 metres above sea level. The Maluti-a-Phofung Local Municipality is governed by the Thabo Mofutsanyane District Municipality. The Free State provincial government is based in Bloemfontein, the provincial capital. Maluti-a-Phofung, with its population of about 335 784 people, is rated one of the poorest municipalities in South Africa (Statistics South Africa, 2011). In the WCCA, land is held in communal trust and communal grazing is the main source of livelihood.

The area is situated in a summer rainfall region, and its average annual rainfall ranges from 750 mm in the lower lying areas to about 1600 mm in the mountains. The area is nestled under the towering Maloti-Drakensberg Mountains and it shares borders with the province of KwaZulu Natal, as well as with Lesotho. The location of the area along the Maloti Drakensberg Mountains plays a major role in shaping the climate and in determining the vegetation type of the area (Syscholt, 2002).

The eastern Free State region is rich in natural and man-made aquatic ecosystems. These comprise wetlands and riverine ecosystems. These ecosystems are in many instances the main attractions for holiday makers. In addition, these ecosystems support a wide variety of species, some of which are endemic to the region. The influx of tourists into the eastern Free State and other anthropogenic activities put a strain on the conservation of the wider environment.

In this area, there is a conflict of interest emanating from competition between different land uses, including conservation of biodiversity on one hand and direct and indirect resource use by resident communities on the other (Slater, 2002). The Witsieshoek Area is of great importance to different role players owing to its high population density. (Exner *et al*., 2015)

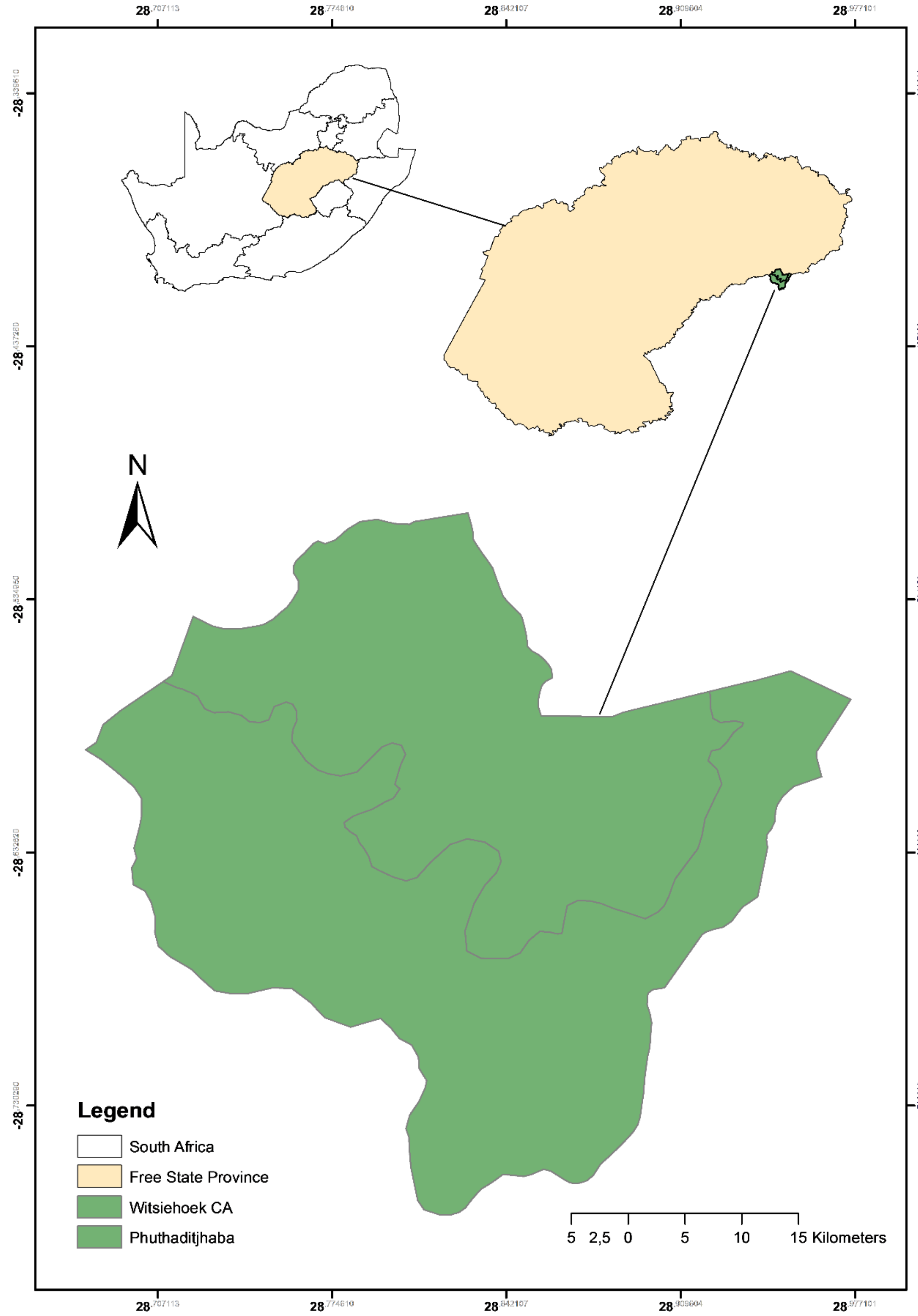

Figure 3.1: Location of the Study Area

The area is also part of one of the most important water catchments in South Africa and is close to the World Heritage Site, the UKhahlamba Drakensberg (Aplin, 2007). This has led to the proclamation of part of the Witsieshoek Area as a community conservation area. Located in QwaQwa, the Witsieshoek Area is an important source of rivers, some of which are tributaries to the Vaal River that flows into the Orange River. Features like Monontsha Wetland and man-made reservoirs like the Fika Patso and Metsi Matso Dams are situated in the Namahadi River catchment (DEA, 2011). Wetlands like Monontsha and a few others dotted around the area may not have an aesthetic value but they play an important role in terms of supply of water resources downstream.

Due to its proximity to UKhahlamba, the area forms part of internationally recognized biodiversity hotspot. This calls for careful assessment of natural resource extraction in the area, as well an improvement to the ways in which natural resources are harvested. This does not, however, totally eliminate the degradation of local ecosystems, but it reduces the disturbance of ecosystem services (McShane and McShane-Caluzi, 1997). Alteration of the mountain environment of this area is faced with problems requiring sound environmental management solutions. Government entities like Working for Water and Working for Wetlands have made significant strides in restoring the wetlands in the area. This restoration plays a major role in protecting biodiversity. Wetland restoration is one of the more important mitigation projects that are aimed at promoting conservation within the area. These projects play a major role in the livelihoods of the local community, especially through skills development, poverty reduction and employment creation.

The promotion of the conservation of the natural environment in the Witsieshoek Area will complement the work that is being done in the Maloti-Drakensberg Transfrontier Programme. It will create an opportunity for the integration of the indigenous conservation knowledge of the local people with formal conservation initiatives. The relevance of conservation in this area goes far beyond improving environmental health because it will also play an important role in changing local livelihoods, since the area is one of the poorest areas in South Africa, requiring socio-economic transformation.

3.2 Methodology

3.2.1 Methodological approaches of the study

Two sets of variables including scientific and social variables characterizes the subjects of this study. This study employs both subjective and objective methodological approaches with the view to relate humans and nature and finding the centre of interaction, which is ecosystem services (Flick, 2014). A positivist approach was employed with the aim of bringing social paradigms into scientific based research (Smith *et al*., 1996). This approach allows for systematic integration of both the scientific and social data. Surveys were undertaken to assess the knowledge that local communities have about conservation and its implications on their livelihoods. Empirical data were collected on the state of the natural environment, as well as on local conservation practices. The biophysical data that were collected to describe the current state of the environment, prior to the proclamation of the area into a community conservation area.

3.2.2 Sample selection

A combination of stratified random sampling and purposive was used in data collection. In order to achieve this goal, the study area was divided into three altitudinal zones, each characterized by a particular vegetation community. A total of 11 plots measuring 10x10 metres were randomly selected along the access roads for vegetation assessment. The collection of social data followed non-probability sampling approach. Specifically, Purposive sampling was chosen as the most suitable technique as it allowed data to be collected from the most relevant members of the community (Ruth *et al*., 2015). These people have the same characteristic in that they use at least one resource within the study area for monetary gain. The target population was the households that are found along the border of the proposed community conservation area. In this type of sampling technique, the participants are closest and directly linked to the subject of study (Tongco, 2007). In this study, the subject is value chains and the target population are actors within the value chain network.

A total of 110 questionnaire respondents were chosen for this study. The questions that were included in the questionnaires covered the sociodemographic information of the respondents, resource conservation and value chain systems. The perceptions of the respondents provided information about activities that cause changes in their environment. A combination of social and biophysical data helped with the identification of the most used natural resources and their extraction. Finally, the perceptions and opinions of the respondents provided an insight on the drivers that lead to natural resource extraction, the pressures that arise from the extraction, how these pressures change the state of the biophysical environment, as well as the impacts of the changes on rural livelihoods, as illustrated by the D-P-S-I-R model (Figure 3.2). As noted in Figure 3.2, data were also collected on how local communities are generating responses that reduce related undesirable environmental changes and how they think resources can be conserved in a way that benefits both local communities, as well as provide remedial actions that promote the restoration of natural capital.

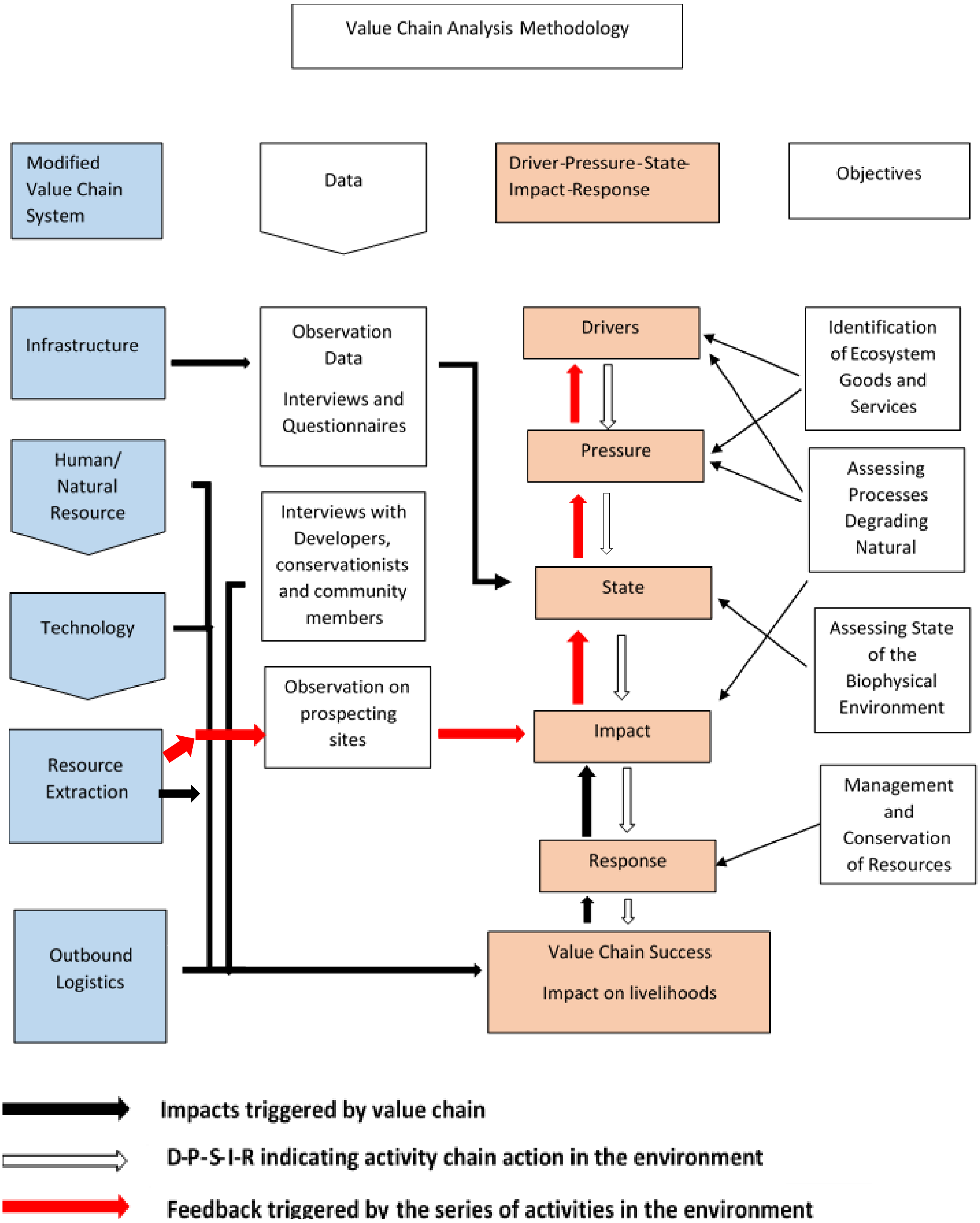

Figure 3.2 Different stages in the methodology of the study including value chain system, alignment of data, objectives and the guiding model; D-P-S-I-R

3.2.3 Collection of social data

The collected data had to answer the research questions stated in Chapter 1. Appendix A, shows the questionnaire that was used in the study, while Appendix B shows the inventory of the questions that were asked in the interviews that were held with key informants during the collection of social data. This questionnaire was first piloted in one of the villages within the study area for reliability testing. The selection of respondents was based on their availability and on whether they use any of the resources that were identified for this study.

The respondents were given a questionnaire to fill if they were able to read and write and a research assistant who explained the questions to them assisted those who could not. The majority of the respondents were not able to read or write, hence the interpretation of the questions was administered with the help of Sesotho speaking research assistants.

This was done to eliminate possible data recording errors and to reduce the non-response rate (De Leeuw and de Heer, 2002). SeSotho is the dominant local language spoken in the area. Interview data was incorporated into the discussion of the study providing information on developments associated with the proclamation of the community conservation area. This particularly applied with the information that was acquired through interviews that were held with small business enterprises.

3.2.4 Collection of biophysical data

Biophysical data consisted of both data from direct observations and data generated from plot surveys. The evidence of land use practiced at particular points guided the selection of plots. Thus, plots were selected from different land use categories, including grazing, sand mining and quarrying. Observation data serves the purpose of describing the wider physical aspects of the montane environment. The collection of observation data was guided by purposive sampling, taking into account features that are linked to socio-economic activities as parameters. Species composition and vegetation cover were recorded for each plot. These data describe the physical properties of the area, including its geological properties. Both observation data and data from plots were used to define the state of the environment, befitting the requirements of the D-P-S-I-R framework. Different plant species that were recorded during data collection are presented in Appendix C. Secondary data were sourced through Geographic Information Systems (GIS) in the form of maps.

Thus, biophysical and spatial data comprised two types of data sets including primary data, which was collected from the field, as well as secondary data comprised GIS shape files obtained the WCCA from. The biophysical data which constituted these types of data were collected through georeferenced 100m^2 plots marked across the site of the proposed conservation area. The plots were selected at random, and were approximately located at least one kilometer apart, across the study area. The data that were collected during the assessment included vegetation cover, vegetation type, physical condition of the area, soil type and geological characteristics of the area. These data were used for the identification of the factors that had a significant influence on the value chain systems of the study area. Such factors were attributed to each and every point or transact sampled in the field. Field observations included the identification of ecosystem types in areas where sampled plots were located. The identified ecosystems included the grasslands, wetlands, and shrub lands.

3.2.5 Data Analysis

Purposive social data does not conform to any specific statistical analysis method and excludes inferential statistics as it does not assume the characteristics of the larger population (McAbee, Landis, and Burke, 2017). For this reason, descriptive statistics in the form of frequency tables, percentages, charts and environmental assessment matrices were used. The results provided information on perceptions of local communities about conservation and natural resource contribution to their livelihoods.

Therefore, only frequency tables and charts were used to describe the sampled population. Further statistical analysis was restricted by the non-random nature of the data, hence no inferences could be made form to the larger population of the Witsieshoek Area.

3.2.6 Conclusion

Data presentation helped in the description of the sampled population and provided the quantitative and qualitative information of the variables that are describe the linkages of the value chain system. D-P-S-I-R model and qualified by Value Theory that allowed for values created on both natural and socioeconomic environments to be presented along the objectives of the study as illustrated in Figure 3.2. Indicative and descriptive data was essential in accomplishing data analysis using the mentioned model and theory. The next chapter focuses on the findings of the study acquired through the methods and tools described in this chapter.

CHAPTER 4

RESULTS OF THE STUDY

4.1 Introduction

This chapter presents the results of the study based on sampled plots for both social and biophysical data derived from three altitudinal zones (Figure 4.1).

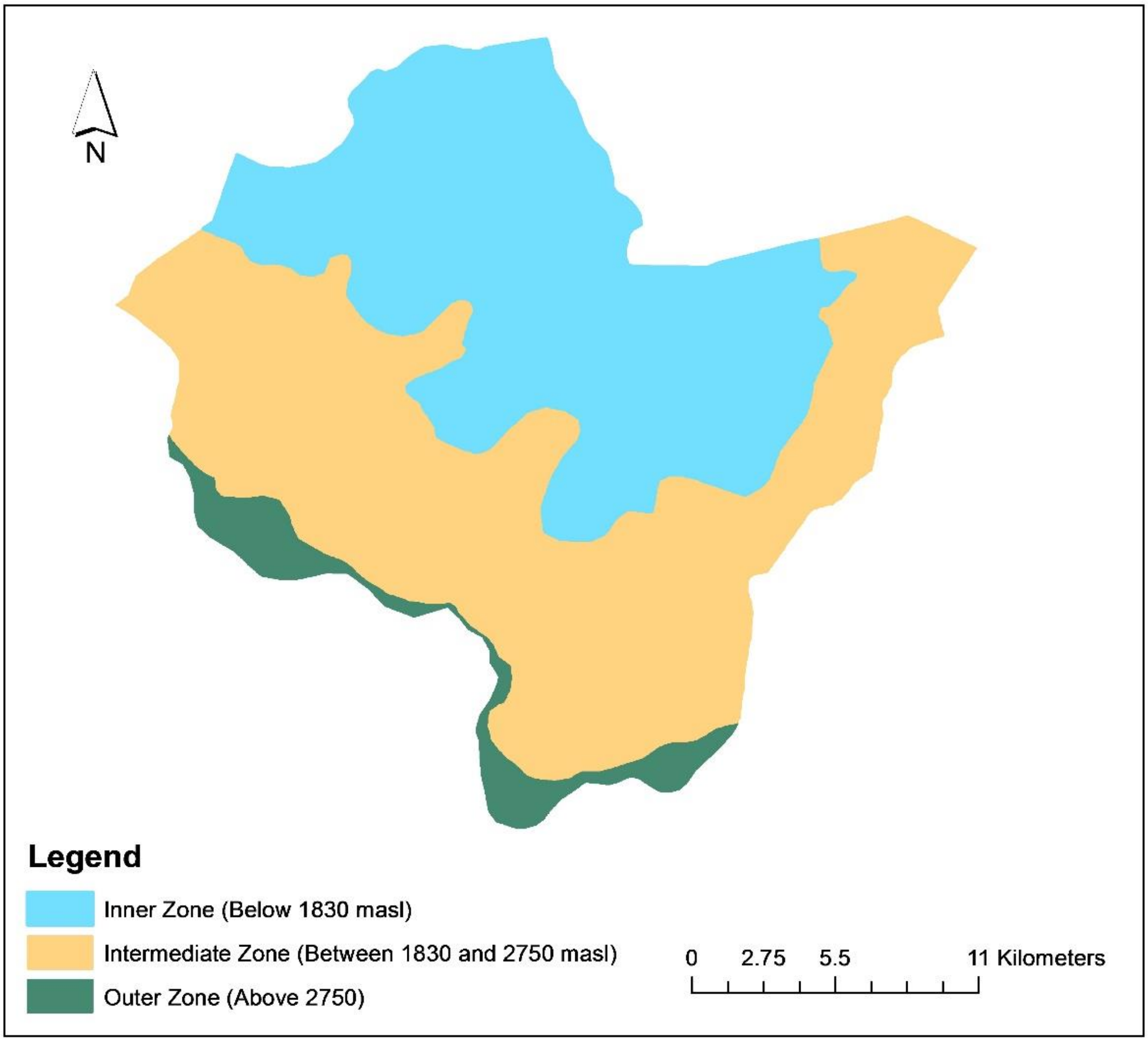

Figure 4.1: Altitudinal zones based on vegetation structure showing three different types of resource bases.

The results are presented according to the objectives of the study as noted below. Section 4.2 describes the state of the biophysical environment in the proposed WCCA and illustrates the state of the ecosystems that provide services and goods to local communities. In Section 4.3, the focus is on ecosystem services, goods, and their relationship with value chains in the WCCA. This section also presents information about commodities that play a role in the value chain systems prevailing in the different zones of the study area (Figure 4.1). The factors that cause degradation of the natural resource base within the proposed WCCA are presented in Section 4.4. These are the drivers of the environmental changes that were observed during field survey. Management and conservation strategies and plans of natural resources in the proposed WCCA are presented in Section 4.5.

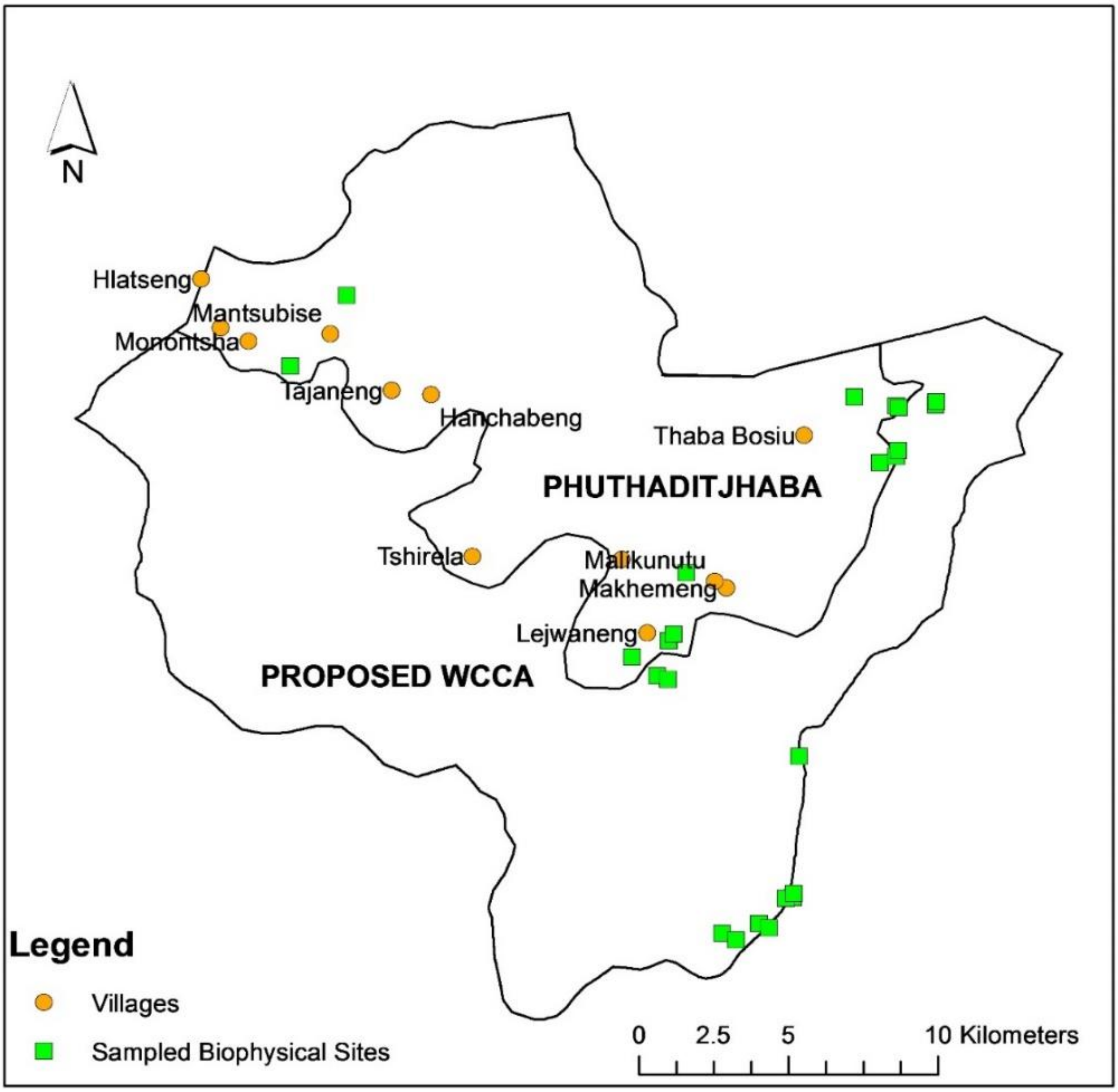

Figure 4.2: Sampled sites which are nodes in the value chain system

The location of the sampled plots are indicated on Figure 4.2 below. They are the source of the natural capital from which the value chains addressed in this study are derived. They also constitute part of the consumer base for the value chains, as well as part of the market for the products derived from the value chains. The results indicate that relief, as well as distance of the resource base from villages, and the value of natural resources are the key determinants of the viability of the value chain system in WCCA. Figure 4.2 shows the key elements of the WCCA value chain system, including the villages and sites that were sampled to generate the social and biophysical data that were collected in this study, as noted in Chapter 3. The main themes around which the results of the study are organized include the state of the biophysical environment in the WCCA, ecosystems goods and services from the area, and the processes influencing natural resource degradation within the area, each of which is discussed below.

4.2 State of the biophysical environment in the proposed Witsieshoek Community Conservation Area

Different activities taking place in the WCCA depend on the environmental health of the area. Environmental health was assessed through the analysis of the biological and physical attributes of the area, as defined by the nature of human-natural environment interactions characterizing the area. The mountain environment of the WCCA comprises pockets of different types of ecosystems, whose variability is determined by relief, geology and vegetation type. In some places within the montane, rapid change in altitude has led to large species variations compared to areas characterized by relatively flat terrain. Generally, biological diversity increases with altitude, making the upper zones the richest in plant diversity.

The existence of pockets of wetlands adds to the variability of biodiversity and the natural resources that can be extracted and commercialized, depending on resource accessibility, availability, as well as depletion trends, and in some cases leading to the degradation of the wider environment. The ruggedness of the terrain restricts most human activities to the more accessible lower reaches of the mountains, indicating that altitude is a key determinant of both availability and accessibility of natural resources. In order to analyze the variability of natural resources with altitude, the study area was divided into three distinct zones, each with its own altitudinal limits, as indicated in Figure 4.2. These zones include the inner, intermediate, and outer zones, depicting the montane, subalpine, and alpine belts respectively. These zones are arranged in a concentric manner, with the first zone lying closest to the villages, and the last the furthest and the highest in terms of altitude. These areas vary considerably in terms of relief, drainage, geological and edaphic conditions, as well as vegetation type.

4.2.1 Relief and drainage

The Witsieshoek Area comprises high mountains and rugged terrain that is punctuated by streams, whose morphometry culminates into northward flowing river systems (Figure 4.3), but with different zones exhibiting different characteristics, as noted below.

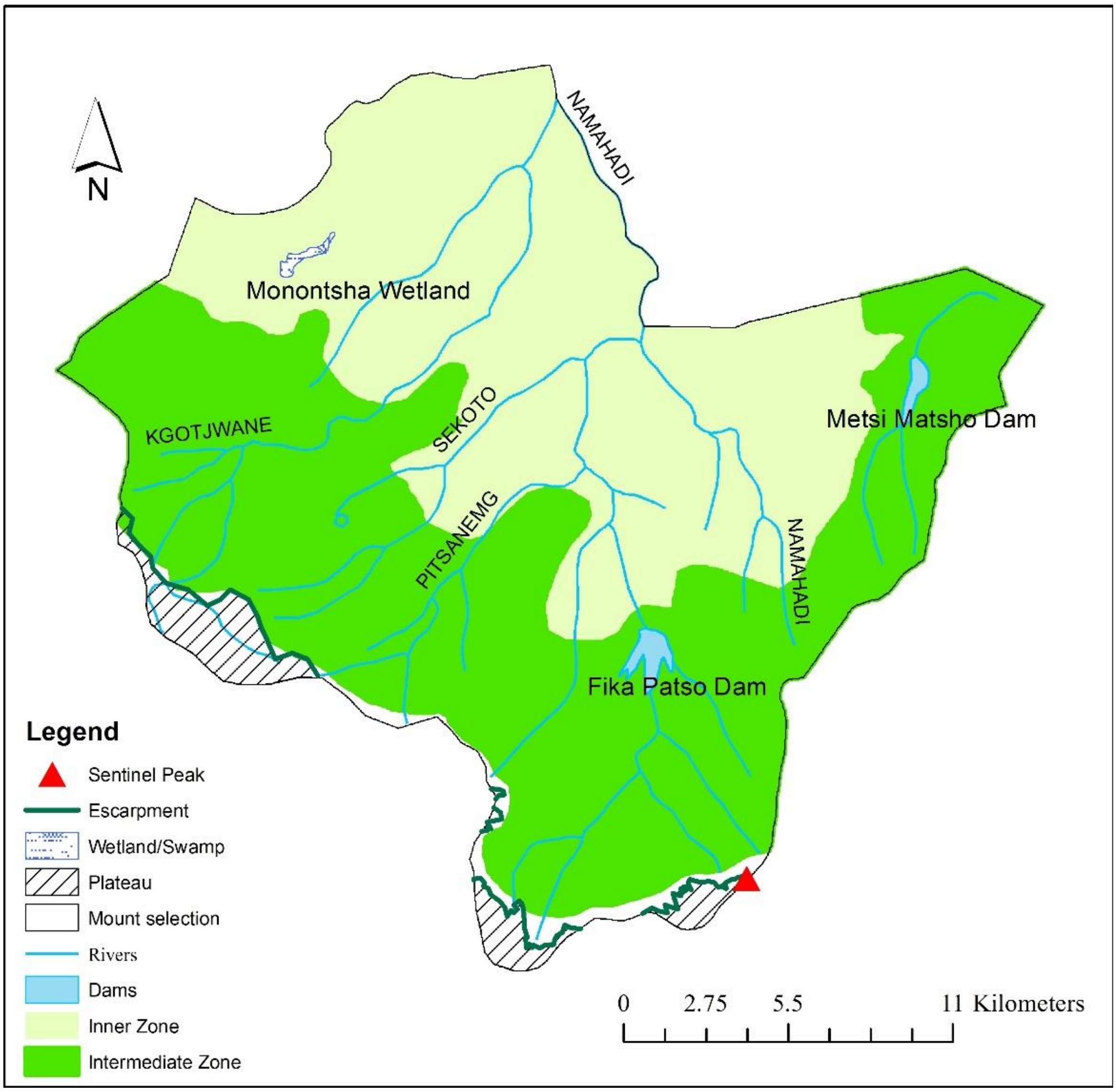

Figure 4.3: Relief of Witsieshoek Area showing the drainage system with two reservoirs including Fika Patso and Metsi Matso Dams

Relief and drainage characteristic of the inner zone (montane belt)

The inner zone extends between 1280 and 1830 metres above sea level (masl). The lowest elevation of the sampled sites was at the altitude of 1659 masl. The land within the inner zone is fairly flat, comprising valleys and wetlands. The slopes of some isolated foothills found within this zone, are fairly gentle. The hydrological profile of the inner zone is characterized by third order streams, in terms of Strahler system of stream ordering. The rivers in this zone show increased alluvium deposition, enhanced by the accumulation of sand and gravel. As a result of low gradient, the channels of the rivers found in this zone are fairly wide, exhibiting high width/depth ratios. On the western side of the Witsieshoek Area, some streams drain into the Monontsha Wetland, an extensive marshy area. Water from this wetland drains eastwards into the Wilge River, a tributary of Vaal River.

Figure 4.4: Monontsha Wetland (a) with berm structure in the foreground and one of many streams (Kgotjwane), (b), found within the inner zone on the right, (Author, 2016)

Relief and drainage of the intermediate zone (subalpine belt)

The intermediate zone is located in the mid-slope zone of the Maluti Drakensberg Mountains. This zone is situated between 1839 and 2750 masl. The lower reaches of this zone are characterized by gentle slopes that are interspersed with flat terrain and valleys. The upper reaches of the intermediate zone comprise rugged hilly terrain which becomes steeper towards the escarpment, (Figure 4.3). The ruggedness of the intermediate zone results from the numerous valleys of the first order streams that occur uphill and second order streams downhill. Little fluvial deposition takes place within this zone. A number of the headwater streams found in this zone drain into the Fika Patso and Metsi Matso Dams, also situated in this zone. The outlets of the dams feed into the Namahadi and Metsi Matso Rivers, respectively. Some of the headwaters occurring in this zone arise from the seepage of wetlands, from which water drains into streams, as shown in Figure 4.5.

Figure 4.5: Rugged terrain with a number of streams south of Fika Patso Dam on the background, on the left is one of the seepage wetlands on the west of the dam, (Author, 2015)

Relief and drainage characteristic of the outer zone (alpine belt)

The alpine belt is the furthest zone. It is found above the altitude of 2750 masl, and is located at the highest altitudes within the WCCA. The larger part of this zone is relatively flat, with just a narrow steep portion along the edge of the plateau, (Figure 4.3). This zone runs along the southern and western borders of the WCCA. The headwaters of the Namahadi River originate from this zone, where they form part of the Vaal River Drainage Basin. The plateau is criss-crossed by shallow streams that are restricted by a basaltic bedrock. This zone lacks prominent landforms, because sheet flow is the dominant type of runoff. Wetlands are common in this zone.

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Figure 4.6: Typical flat alpine terrain with clear mountain stream within the outer zone, (Author, 2015)

4.2.2 Geological and soil and soil characteristic of the WCCA

The geology of the Witsieshoek Area is dominated by three major rock formations, including arenite (sandstone), andesite (basalt), and mudstone (Figure 4.7). Sandstone cliffs can be seen across the larger part of the Witsieshoek Area, while basalt is confined to the plateau and the escarpment in the south. The area also comprises isolated intrusive igneous rock features like dolerite dykes. Vertic, melanic, duplex, plinthic, cumulic soils are some of the soil groups found in the Witsieshoek Area. However, geological and edaphic conditions vary according to altitude, as noted below.

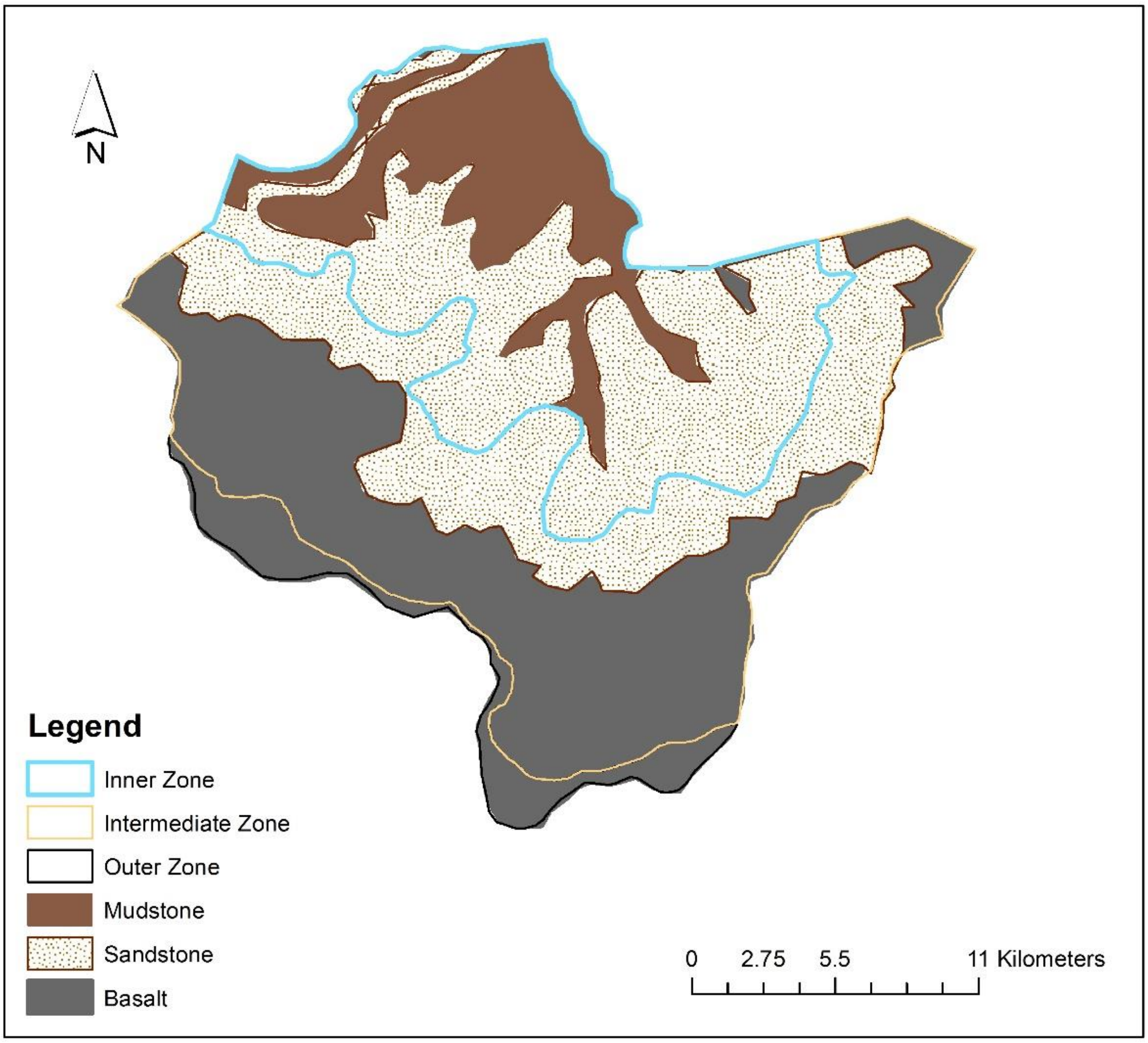

Figure 4.7: Geology of Witsieshoek Area showing distribution of three dominant rock types across the three altitudinal zones

Geological and edaphic characteristic of the inner zone

The inner zone is underlain by sandstone and mudstone with sandstone being the more prominent of the two. Sandstone is found along the entire southern rim of the inner zone, where it forms cliffs and boulders, but in some cases it is capped by basalt, especially in the northeast. Intense erosion in high altitude areas results in large amounts of sediments being deposited in this zone. As a result, the inner zone is characterized by deep sandy soil profiles, which are fairly fertile. The thicker soils found in the inner zone result from the accumulation of detritus from the other two zones. Scree, alluvium, and colluvium deposits and a variety of other products of mass wasting have all contributed to the thicker soils that are characteristic of this zone. This is more conspicuous along large river valleys where the terrain is fairly flat. The river beds are covered by basaltic gravel and finer sandy deposits from denuded sandstone. Brown and grey clayey soils dominate the higher areas in the eastern and western parts of this zone. These soils are mostly underlain by mudstone, which also provides parent material for the deeper soils.

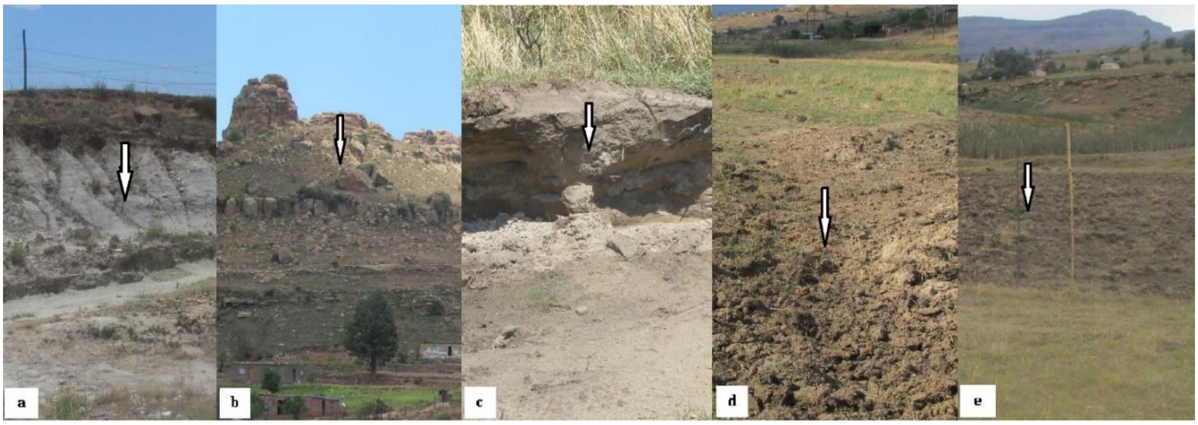

Figure 4.8: Geology and soils of the inner zone; (a) mudstone, (b) sandstone, (c) sandy loam soil on the bank of a stream, (d) wetland soils, and (e) dark clay (Author, 2016)

Geological and edaphic characteristic of the intermediate zone

Just like the inner zone, the intermediate zone is underlain by sandstone, especially in the north, but basalt is more prevalent in the south. At the lower level, sandstone is interspersed with mudstone and dolerite, the latter mainly occurring in the form of dolerite dykes. Much of the sandstone in this zone occurs as outcrops on the undulating foothills, as well as on the escarpment. The spread of the sandstone outcrops grades into basalt on the steep slopes of the escarpment. Unconsolidated sediments found on the lower part of this zone can be attributed to limited weathering. Besides the poor soil conditions of this zone, there are talus slopes below the cliffs. Parts of this zone are characterized by deep fertile soils. The soils have got different colours including light brown sandy clay, reddish brown clay, dark brown clay, grey and dark grey loamy clay (Figure 4.9)

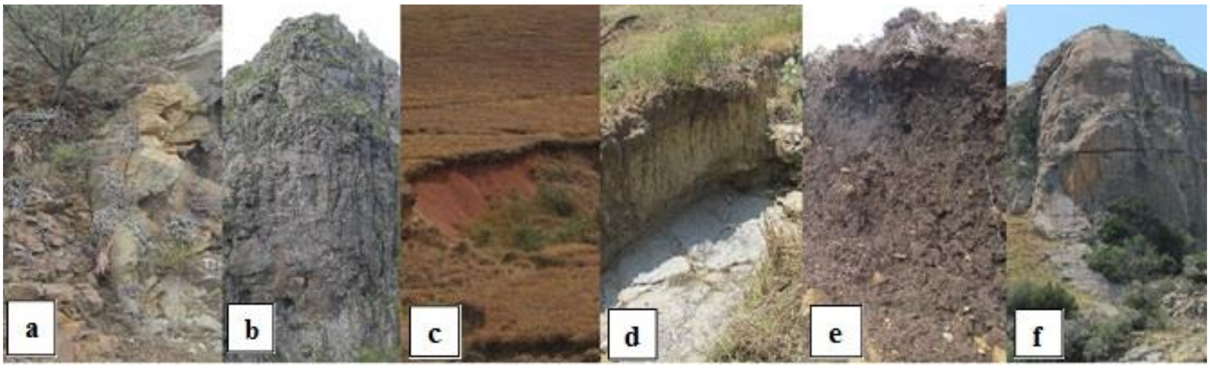

Figure 4.9: Geology and soils of the intermediate zone; (a) mudstone with dolerite intrusion, (b) basalt in the upper intermediate zone, (c) Red clay in a gully, (d) Light brown/whitish clay, (e) Dark loamy clay, and (f) sandstone boulder, (Author, 2016)

Geological and edaphic characteristics of the outer zone

The outer zone, the narrowest amongst the three zones, is totally underlain by basalt. Due to flat terrain, much of the basalt bedrock is covered in thick soils resulting from sheet flow. This is more visible in the lower lying areas of this zone. On the other hand, the upper parts of this zone are characterized by pot-holed basalt sheets (Figure 4.10). These sheets are found more on the edge of the plateau and towards the east where the WCCA borders KwaZulu Natal's Royal Natal National Park. The potholes on these rocky flats form temporary pools that are habitat to various plants and insects. Weathering on the basalt flats produces residual mantle that contributes to the formation of soils in this zone. Most of the soils in the elevated parts of this zone comprise consolidated basalt material as shown in Figure 4.10, while the lower areas consist of a mixture of consolidated, unconsolidated, and organic detritus.

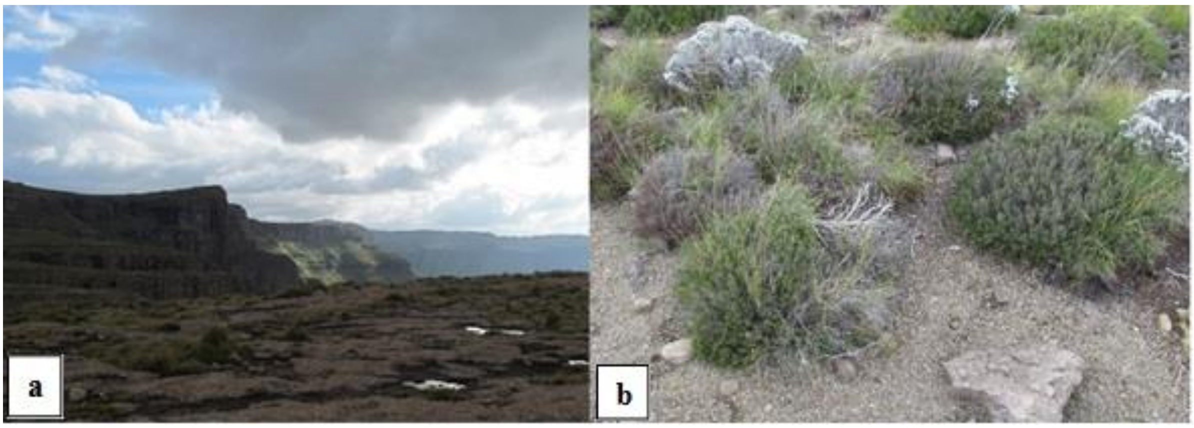

Figure 4.10: Geology and soils of the outer zone; (a), basalt sheet and basalt peak on the background and (b), the consolidated basalt forming the alpine soil, (Author, 2015)

4.2.3 Vegetation characteristics of the WCCA

The area earmarked for the proposed WWCA is situated in a montane grassland biome. Vegetation in the area is characterized by two dominant veld types including Highveld Sourveld and Dohne Sourveld (HSDS) veld; and Themeda Festuca Alpine (TFA) veld (Figure 4.11). The structure of the vegetation within the Witsieshoek Area has been determined by among other factors, veld fire, which is associated with grassland biomes in general, as well as climate, relief and soil types. Consequently, the vegetation structure of the area is dominated by a herbaceous layer, as well as a layer of shrubs occurring in isolated sheltered locations. The indigenous vegetation in this area is almost totally devoid of tree species and in a way that void has been filled by alien tree species. However, vegetation cover varies from one zone to another, in response to changes in altitude.

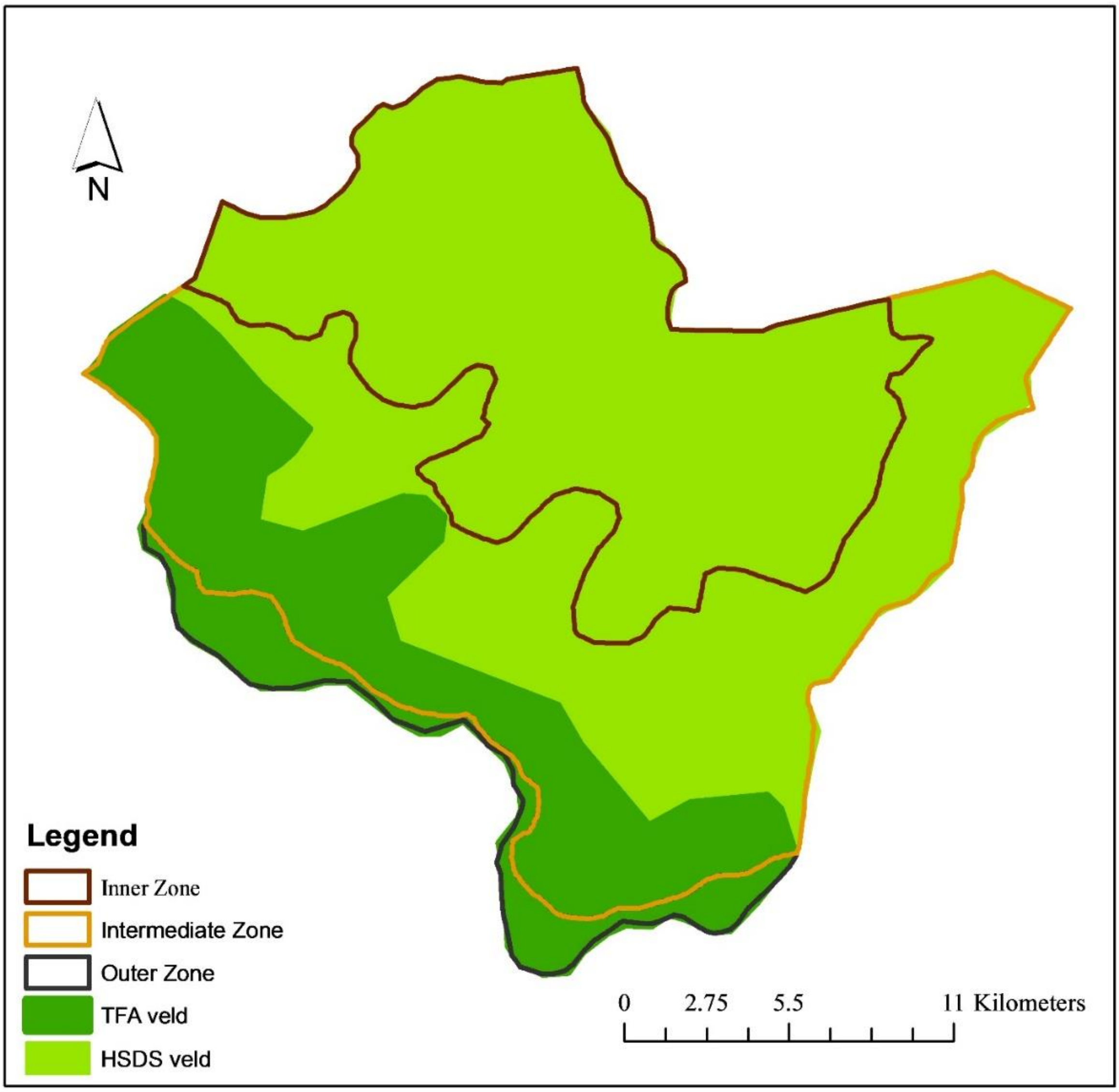

Figure 4.11: Mountain grassland communities of the proposed WCCA

The vegetation structure of the inner zone

Within the inner zone, the vegetation is in a degraded state, reflecting low species richness and an altered structure. The indigenous species found in this zone have been displaced by alien plant species like *Acacia mearnsii, Poplar spp., Pine spp.,* and *Eucalyptus spp.* Most of the species that characterize the original communities of the HSDS veld are scattered in small islands of shrubs, especially on the western side of the Witsieshoek Area. These small communities comprise amongst others, *Euclea sp.* and *Leucosidea sericae*. The herbaceous layer of the inner zone consists of remnants of grass species, including of *Themeda triandra* and *Hyparrhenia hirta.* Some grass species that are found in this zone include tufted grasses like *Panicum spp., Pennisetum spp*., and *Heteropogon contortus.* Other species include forbs like *Ledeburia spp.,* and *Senecio spp*. which are prevalent in Monontsha Wetland, as indicated in Figure 4.12. Much of the fertile land within the inner zone is used for cultivation while the remainder comprises abandoned fields, which have become seed banks for alien species.

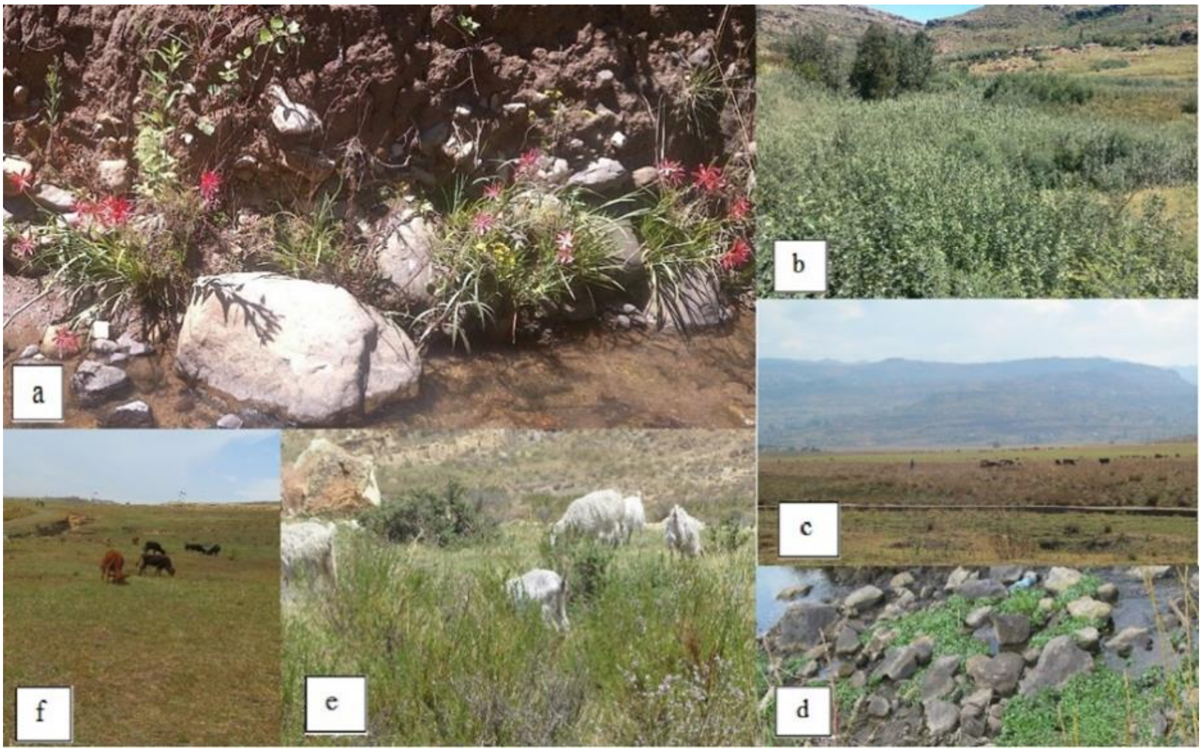

Figure 4.12: Varied vegetation found in different ecosystems in the inner zone; (a) aquatic plants like *Hesperantha* sp., (b) invasive poplar trees in a river basin, (c) wetland plants, (d) invasive aquatic plants, (d) *Felicia* sp. shrub and thatching grass in an overgrazed land, and (e) *Themeda* veld , (Author, 2016)

The Monontsha Wetland is habitat to a number of plant species, ranging from hydrophilic grass species, (both indigenous and alien), to sedges and rushes. The deteriorating state of this wetland has led to alien grass and sedge genera like *Panicum* and *Kyllinga*, respectively, colonizing the area. However, remnants of indigenous species like *Eleocharis dregeana*, *Leersia hexandra,* and *Carex spp*., as well as herbs like *Mentha aquatica, Aponogeton junceus,* and *Limosella grandiflora* can still be found in isolated communities within the wetland.

The vegetation structure of the intermediate zone

The lower reaches of the intermediate zone, indicate the limit of alien tree species. Though there are pockets of alien tree species above this zone, much of this zone is free from alien tree species. Only two of these species including *Acacia spp*. and *Polar spp*., persist into the lower reaches of this zone, especially in wet areas such as wetlands and places along the streams. Most of the grassland species have been displaced by the spreading of these tree species. In some areas, grass species like *Themeda triandra, Cymbopogon spp., and Merxmuellera spp.* have been replaced by *Pennisetum spp*. The lower areas of the intermediate zone are fairly devoid of forbs, compared to higher areas, although species like *Hypoxis hemmerocallidea* (African potato), some *Senecio spp*., *and Helichrysum spp*. are still fairly widespread.

The upper reaches of the intermediate zone, where TFA veld is prevalent, show an increase in populations of forbs species, especially bulbous plants like *Boophane disticha*, *Eucomis autumnalis*, *Scilla natalensis*, *Brunsvigia natalensis*, and *Dicoma anomala*. Other plant species found in this zone are *asteraceae* families like *Helichrysum spp*., mountain *Gerbera*, *Gazania spp.* Many of these plants are concentrated towards the south-eastern parts of the proposed WCCA, particularly where talus slopes are prevalent, for instance in areas below the Sentinel Peak, (Figure 4.3), and along the border with the KwaZulu Natal Province in the east.

The vegetation structure of the outer zone

The outer zone of the WCCA consists of the TFA and is characterized by alpine vegetation. Besides the grass and forbs species that are found here, this zone comprises a wide variety of cushion plants that establish themselves on shallow soils on the basalt bedrock on the edges of the plateau. Some parts of the open grassland areas show signs of overgrazing, with shrub encroachment by *Felicia spp*. Alpine grassland comprises grasses like *Festuca caprina*, *Merxmuellera stricta*, *Andropogon appendiculatus*, *Pentaschistis airoides,* and *Agrostis subulifolia.* Daisies in this part of the WCCA include *Cotula hispida*, *Helichrysum coriaceum*, *H. rugulosum*, and *Berkheya cordifolia.*

The outer zone also comprises alpine wetlands which contain plant species that are distinct from the surrounding dry lands. This increases the species count in the outer zone. Some of the wetland species found in the alpine wetlands are *Aponogeton junceus*, *Carex monotropa*, *Senecio cryptolanatus*, and *Sebaea martlothii*. Cushion plants form another form of vegetation type within the outer zone. These plants provide a specialized habitat in the outer zone. Common species in this zone are *Crassula spp*., *Helichrysum spp.*, and Mosses. The other plant community that is found in the outer alpine zone comprises the fynbos species community, a form of a shrubland. This community consists of *Erica dominans, Erica algida, Cliffortia spp.,* and *Anthospermum aethiopicum.*

4.3 Ecosystem services and goods and their relationship with the WCCA value chain system

The biophysical environment of the WCCA provides valuable resources that villagers depend on for livelihood. Besides the ecological services that are provided by the physical and biological elements of the environment like soil and plants, local communities also generate some commercial gains from the natural resources of the area. Some of the ecosystem services provided by the area maintain the natural environment or stabilize the natural capital that supports value chain systems. The natural processes that rely on environmental health, are the basis for the natural capital that feeds into value chain systems. The state of the resource base determines the quality and quantity of commodities that can be sourced from the area. With the increase in environmental degradation in parts of the WCCA comes a decline of the natural resource base. The few natural resources found in the WCCA gain value as their demand increases in areas outside the proposed conservation area, particularly after processing. The abundance of the harvested commodities varies from one zone to another, with the intermediate and outer zones supplying higher amounts of biological resources. This is in sharp contrast with geological resources, which are harvested in greater quantities in the lower intermediate and inner zones.

4.3.1 Goods and services that support the biophysical environment

There are some of the ecosystem goods and services that are essential for ecosystem functioning and health. These "commodities" should always be in regular supply in order to maintain the natural capital that supports value chain systems. These "commodities" vary from one zone to another.

Ecosystem goods and services sustaining the biophysical environment in the inner zone

Ecosystem health within the inner zone is highly compromised as the biophysical environment becomes more degraded. The extent of degradation spans across all the components that are vital for ecosystem functioning. The larger part of the inner zone has lost indigenous plants, especially tufted grasses that reduce erosion. Similarly, wetlands like Monontsha have lost a great number of plant species. This has compromised their ecological role like water retention, reduced surface runoff and flooding, and water purification. However, sedges like *Eleocharis spp*., the weed sedge species *Kyllinga spp*., hydrophilic grasses such as *Leersia hexandra*, and rushes like *Carex spp*. still provide grazing within the wetland ecosystem.

Ecosystem goods and services sustaining the biophysical environment in the intermediate zone

The lower part of the intermediate zone is highly degraded but conditions improve with altitude. The intermediate zone has lost some of the environmental components that contribute to ecosystem health. However, remnants of vital species like *Merxmuellera disticha,* and other tufted grass species have helped with the natural restoration of eroded slopes, especially on the eastern part of WCCA. To the contrary, the western side shows a high degree of degradation, as most of the indigenous species have been depleted. This is evident on bare slopes and eroded mountain wetlands around Fika Patso Dam. The land cover has been degraded causing considerable loss of tufted grass species, thus enhancing soil erodibility on most slopes. The upper reaches of the intermediate zone have been less affected. The uphill basalt bedrock and downhill sandstone bedrock within this zone provide some stability to the rugged terrain. This stability provides a substrate that supports a high number of species and abundant plant cover, even in areas where soils are relatively thin. This thriving vegetation, which includes some geophytes, is a source of cover to the thin soils and constitutes a strong base for ecological interaction within the biophysical environment. The phytosociology of the upper parts of the intermediate zone, attained through species abundance and variation, reflects sound ecosystem and ecosystem functioning.

Ecosystem goods and services sustaining the biophysical environment in the outer zone

Those from highly specialized plant communities within the alpine grassland mostly dominate resources from the outer zone. Much of the environment in this zone is fairly intact from alien plant invasions. Land cover is provided by short grasses and herbs that are typical of the TFA veld like *Themeda triandra*, *Festuca caprina*, and *Merxmuellera stricta*, as well as *Helichrysum spp.*, *Aesteracea* species, and *Conyza obscura.* These grasses and herbs play a major ecological role in reducing erosion and maintaining the habitat. In this part of the mountain environment, which is fragile, each species is vital for the health and function of the ecosystem. The shrub community in this zone is characterized by fynbos species like *Erica algida*, *Erica dominans*, *and Anthospermum aethiopicum*.

Figure 4.13: *Merxmuellera stricta* growing inside an eroded gulley on the bank of Metsi Matso River. As shown here soils on steep slopes are generally thin and prone to erosion (Author, 2016)

4.3.2 Goods and services that support socio-economic activities and value chains

Goods and services from the inner zone supporting socio-economic activities

Villagers harvest a variety of resources from the wetlands and practice free range grazing in the wetlands and in the process alter the structure of the vegetation in these areas. The inner zone is a source of medicinal plants and other plant based resources. The aesthetic qualities of the inner zone have been reduced by land degradation, plant depletion and invasion by alien species. The river that runs through the Monontsha Wetland provides irrigation water to village gardens and for other domestic uses, especially when taps run dry. Clayey soils found on the edge of the wetland and other locations within the inner zone provide an important raw material for clay brick making and pottery products. Sandstone is one resource that is highly utilized within this zone. A number of small sandstone mining operations are found in villages like

Thibela and Makeneng, some of which operate as commercial enterprises (Figure 4.15). Besides sandstone, basalt and amygdales, are also mined in Tsheseng and Metsi Matso villages (4.14). They are used in gabion construction in roadworks and wetland rehabilitation. A few of these mining operations have an established customer base, both locally and outside the Witsieshoek Area.

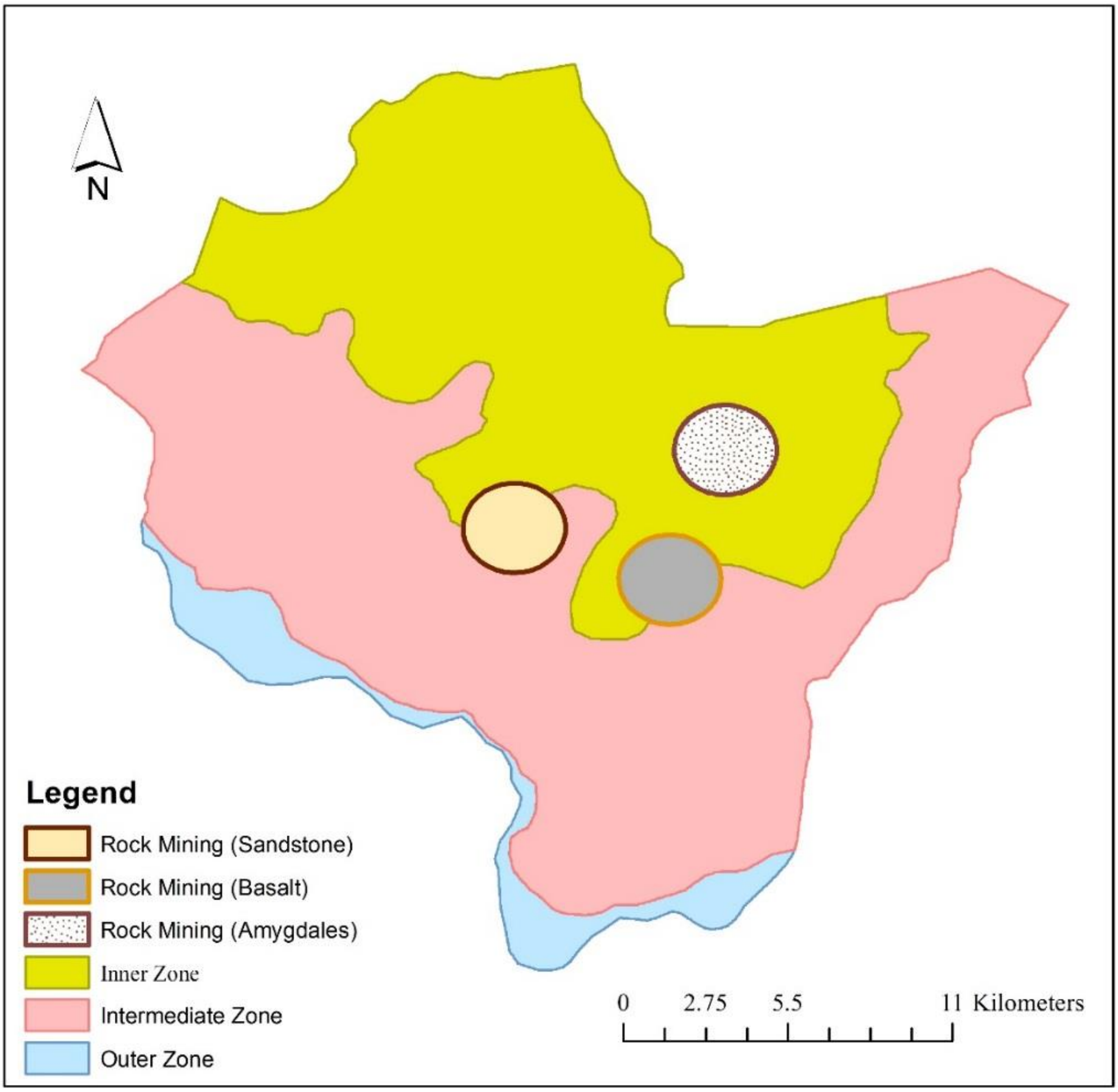

Figure 4.14: The main mining areas in the WCCA

Ecosystem goods and services from the intermediate zone supporting socio-economic activities

The good state of the biophysical environment within the intermediate zone, especially in the upper parts of this zone, is beneficial to the natural environment-human system. It ensures regular flow of goods and services from the natural environment into the human environment. The grassland on the slopes and valleys of undulating foothills provide free range grazing for livestock. As noted earlier, rangelands in this zone are stocked with short grasses like *Themeda triandra*, *Andropogon appendiculatus*, and *Merxmuellera stricta*, to name just a few. These species provide pasture to livestock. Relic grasses like *Merxmuellera spp*. are used as raw materials for making brooms and other artefacts. *Hyparrhenia hirta*, on the other hand, provides the thatching that is used by the local communities and also by construction companies that operate outside Qwaqwa.

Figure 4.15: Sandstone mining process; (A) quarrying on the bedrock, (B) scree left after breaking down of the rock, (C) , and (D) sandstone blocks being transported to consumers outside the WCCA, (Author, 2016)

A number of forb species are harvested for their medicinal properties and for horticultural purposes. *Helichrysum spp*., *Scilla natalensis* (Arum lily), *Ledeburia spp*., *Eucomis spp*. (Pineapple lily), and *Watsonia spp*. are some of the plants that are harvested for their medicinal value. Plant species like Brunsvigia spp., Arum lily, and pineapple lily are among the plants that are sought after for their ornamental worth. Sandstone is the main geological resource that is extracted from within the lower parts of the intermediate zone. However, the gains that are made from sandstone mining are not confined to the borders of the WCCA or Witsieshoek Area, but spread to the other areas outside Qwaqwa as well.

Ecosystem goods and services from the outer zone supporting socio-economic activities

The outer zone does not play much of a significant role in supporting socio-economic activities within the Witsieshoek Area. Instead, the narrow stretch of the outer zone provides rangelands to livestock herders. The aesthetic value of the area on the other hand does provide some kind of income through the influx of hiking tourists. Features that contribute to tourism in the outer zone are the chain ladders linking the intermediate and outer zones, and the UThukela Falls, which is part of the Royal Natal National Park, a wildlife conservation area. Here, endangered bird species like Cape Vulture (*Gyps coprotheres*), Bearded Vulture (*Gypaetus barbatus*), and other common bird species attract bird enthusiast. The two features are synonymous with tourism in the Northern Drakensberg Region. The Sentinel Peak is the main landscape feature that attracts abseiling enthusiasts. It is also significant in that it forms the northern buttress of the world renowned Drakensberg Amphitheatre.

4.3.3 Value chains and livelihoods in the WCCA

In this section, the focus is on the relationship between the natural resources that are derived from the WCCA and the livelihoods of local communities. The income generated from natural resources is an important source of livelihood for some households that are found in the WCCA, as well as in other places that are functionally linked to the proposed conservation area, as noted in Tables 4.1.

Demographic characteristics of the respondents

A total of110 respondents were surveyed using questionnaires whose gender breakdown was 53 males (48%) and 57 females (52%). Their ages ranged from younger than 21 (4%), 21-30 (7%), 31-40 (26%), 41-50 (32%), 51-60 (17%), 60 years and older (14%). Majority of the respondents have formal education with the lowest level of education being grade 7 (20%), and the highest level being tertiary education 8% of the 110 respondents. 65 % of the respondents

Table 4.1: The relationship between value chain-related activities and the socioeconomic impacts of these activities and rural livelihoods, (Interviews and Survey Data)

	Direction of Impact			
Activities	**Immediate environment**	**Village Livelihoods**	**Qwaqwa Factories**	**Areas outside Qwaqwa**
Sandstone mining	**-**	+	+	+
Basalt mining	**-**	+	+	+
Sand extraction	**-**	+	+	+
Water use	**-**	+	+	+
Clearing of alien species	+	**-**	**none**	**none**
Indigenous Plant harvest	**-**	+	**none**	+
Tourism	**-**	+	**none**	**none**

(-) represents negative impacts while (+) represents positive impacts and none means no impact

The exploitation and utilization of most of the resources drawn from the area have both ecological and socio-economic significance. However, income generation activities are influenced by distance, (as illustrated in Table 4.3). Figure 4.2 and Table 4.1 show only those resources that are extracted on a relatively large scale within the WCCA. As a result, the exploitation of the natural resources that are not harvested in significant quantities have been excluded. Normally, the commodities that are derived from such resources are not accounted for in the value chain system or in any economic activities. For instance, endemic and endangered plant species, have both a high economic and conservation value, partly because of their scarcity. The overexploitation of such goods affects both the natural capital and the resultant value chains depending on them. As demand for an environmental commodities or goods increases, trade-offs also increase on ecological services rendered by these goods.

Most of the consumers of bulky goods like sandstone are found outside WCCA, as was indicated by one sandstone quarry (Boiteko) manager and as a result they are not accountable to the environmental degradation or paying for the services rendered by local ecosystem. The supplier, who is usually an individual from Witsieshoek Area cannot take stock of the natural capital as many are driven by poverty as opposed to sound business or environmental acumen. This also applies to smaller commodities like medicinal plants where individuals harvest the plants even prior to any demand has arisen. In this manner, most of the goods are not utilized to their full capacity and their value and contribution to livelihoods are compromised. This weakens the value chains and lead to wastage of the environmental resources.

Accumulation of monetary value by resources from the WCCA

Figures 4.16 and 4.17 below show how different resources from the WCCA accumulate monetary value along the value chain system. Values within the Witsieshoek Area are lower compared to the values in places outside the area like Harrismith, Johannesburg, and other places in neighbouring provinces like KwaZulu Natal. Mostly, the value depends on whether a product is processed or not, as well as the distance which adds transport costs to the value of the resource. As noted from survey data, quarries in the Witsieshoek Area operate on a small scale and do not have the capacity to process large amounts of products. Sizeable amounts of geological resources are sold at low prices, usually as raw materials to large plants outside the Witsieshoek Area. In return, the finished products come back with an added value after their beneficiation outside Witsieshoek Area. These products include tiles, bricks, and stoneware in the case of geological resources. Similarly, biological resources are sold in a raw state, usually at low prices from primary consumers or harvesters and transported to areas with sophisticated laboratories and factories, often to return as finished products with added value. These include plant extracts, infusions, mats, and brooms as noted in Figure 4.17. Raw materials in the form of plants are harvested in bulks as they are lighter and can easily be carried over long walking distances. This may not be the case with heavier materials such as geological resources which require heavy duty transportation and only a limited amount can be carried from the source to the customer or processing site. This shows the significance of distance in resource extraction as shown in table 4.2.

Table 4.2: Comparison of the Standard Deviation and the mean of the distance people have to travel to collect or use some of natural resources

	Distance travelled for river sand (km)	Distance travelled for pit sand (km)	Distance travelled for clay (km)	Distance travelled for pastures (km)	Distance travelled for firewood (km)	Distance travelled for medicinal plants (km)	Distance travelled for sandstone (km)	Distance travelled for gravel (km)
Mean distance from the villages	3.89	3.32	3.14	2.95	2.30	2.26	**3.83**	**4.52**
Standard deviation of the distances from the villages	1.325	1.629	1.583	1.532	1.594	1.359	**0.983**	**0.846**

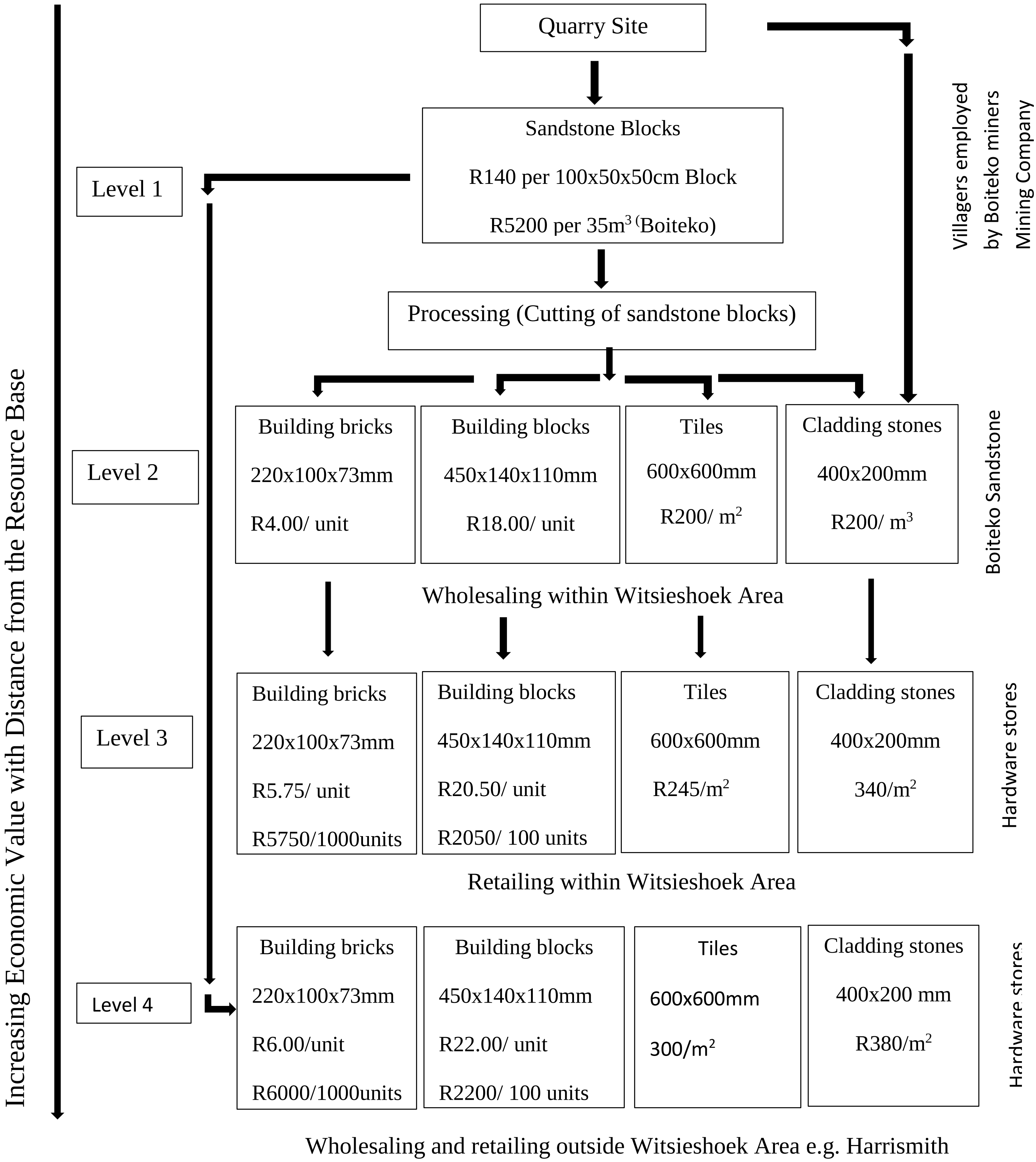

Figure 4.16: Flow chart showing increasing resource value with increasing distance from the geological resource base: A case of sandstone mining

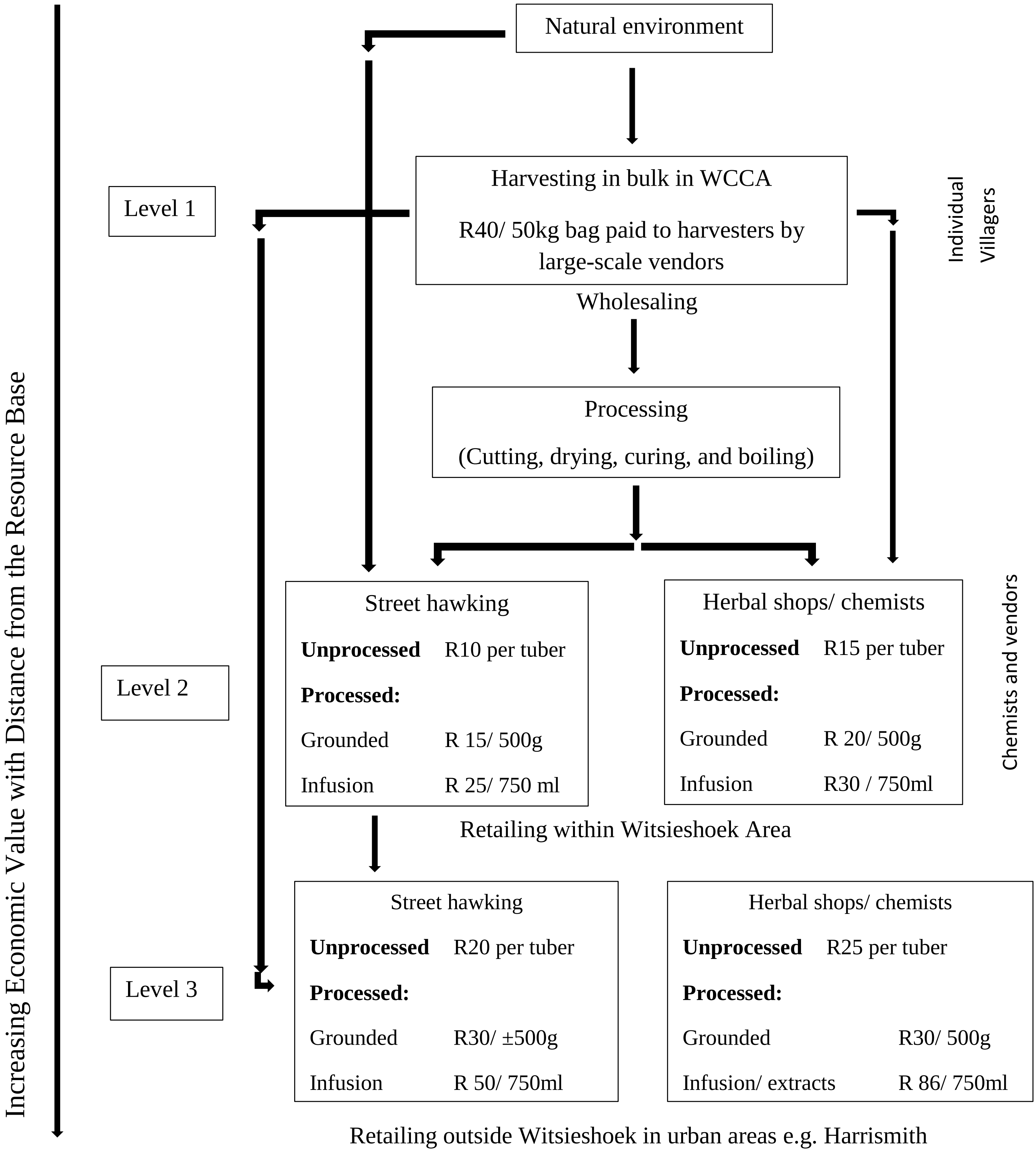

Figure 4.17: Flow chart showing increasing resource value with increasing distance from the biological resource base: A case of the African potato, (*Hypoxis hemmerocallidea*), (a medicinal plant)

Impact of created values on rural livelihoods within the WCCA

Value creation seems to have a limited positive impact on local communities compared to losses incurred by these communities. Being at the base of the value chain system means that local communities provide labour for little compensation. This reality applies to the benefits they derive from selling goods sourced from the WCCA. Of the 110 respondents who were included in the questionnaire survey, only 20% benefit from selling products from natural resources. Thirty-five percent of the respondents sell plant products for medicinal use while 10% use these products for domestic purposes. Most of the respondents who sell medicinal plants (60%) are elderly females who harvest the plants and sell them to generate earnings that sustain their livelihoods. The results show that about 5% of the respondents make gains from selling bulk resources like sandstone. The gains made vary with types of resources, as well as the stage of processing. The raw goods fetch the lowest prices followed by semi-processed, while processed goods fetch the highest prices. Smaller commodities like grass products fetch around R20.00 per broom, R150.00 to R200.00 per grass hat, while bulk commodities like sandstone sell at about R140.00 per m^3. In most instances, money earnined from the sale of goods is used to sustain households through food purchases, paying of school fees, and paying for medical health. In the case of the Boiteko Sandstone Company that sells unprocessed sandstone blocks, for R140.00 per m^3. R50.00 is paid to the workers, who are usually local villagers, while the company is left with R90.00 Lack of technology to beneficiate natural resources deprive local communities of the means to get more from the resource base. Some of the villagers who benefit commercially from the resources in the WCCA invest their money in livestock.

The monetary value of the resources increases as the goods move away from the WCCA, as illustrated in Figures 4.16 and 4.17. The opposite is true with the degradation of the resources, which negatively affects local livelihoods. The destruction of pastures by mining rubble and scree affects the lives of local people, some of whom do not make any commercial gains from geological resources. The state of the local environment deteriorates, leading to loss of the pastures that most villagers depend on for livelihood. As a result of the reduced carrying capacity of the rangelands, keeping livestock in the future might become a less viable option for people looking at improving their livelihoods. People who make money from selling medicinal plants on the streets are also affected by the degradation of the environment. All that the local communities will be left with is barren land.

Table 4.3: Values allocated to different resources in the WCCA

Environmental Attributes (Sourced Resources)	Allocated Values	Ecological Significance (Ecosystem services)	Economic Significance (Value creation)	Impact of Extraction
Geological/ Physical				
Sandstone	Use, Non-Use, and Aesthetic	Soil formation, prevent soil erosion, and provide habitat	Making of tiles and bricks, enhance tourism	Scarred landscape, erosion
Dolerite	Use and Non-Use	Soil formation, prevent soil erosion, and provide habitat	Used as gravel for roads and concrete making	Scarred landscape, erosion
Basalt	Use, non-Use, and Aesthetic	Soil formation, prevent soil erosion, and provide habitat	Used for building, enhance tourism	Scarred landscape, erosion
Soil	Use and Non-Use Value	Substrate for plants provide habitat, mineral cycling	Used for crop production	Erosion, Loss of nutrients
Plant-based				
Grasses	Use, Non-Use, and Aesthetic	Provides habitat and land cover, prevent erosion	Brooms, mats, thatching	Erosion, loss of biodiversity
***Leucosidea sericae* (shrub)**	Use, Non-Use, and Aesthetic	Habitat, reduce erosion, but sometimes invasive	Used for firewood and landscaping	Erosion, loss of biodiversity
***Eucalyptus sp.*(Tree)**	Use	Negative; excessive water use	Provide timber and firewood	Positive, environmental restoration
Herbaceous plants	Use, Non-Use, and Aesthetic	Provide habitat, reduce erosion	Medicinal use, horticulture	Erosion, loss of biodiversity
Sedges (wetlands/aquatic)	Use, Non-Use, and Aesthetic	Reduce evaporation, provide habitat, water purification	Grass mats, brooms,	Wetland degradation, loss of habitat and biodiversity
Water	Use, Non-Use, and Aesthetic	Sustain life including humans	Used in plantations, ‘sold’	Water shortage, loss of biodiversity and ecosystems

4.4 Degradation of the natural resource base within the WCCA

The larger part of the resource base of the WWCA is in a degraded state due to unguided and unsustainable resource extraction and use and of natural resources. High demand for resources and accessibility are two of the factors that exacerbate the decline in ecosystem health and functioning within the WCCA, depending on the zone in which the resources are exploited, as noted below.

4.4.1 Environmental degradation within the inner zone

The inner zone is the most degraded part of the WWCA. This zone has been affected by species depletion, vegetation structure alteration, invasion by alien species, and excessive extraction of natural resources. A number of villages are located within the inner zone, making it the most densely populated. This means that there is high competition for the limited resources available within this zone, since the zone is the most accessible. Short distances travelled to access the resources means that more resources are harvested, except for heavy and bulky resources like sandstone and other mineral or geological resources. Unavailability of resources like wood has brought about a deficiency in the value chain system. This situation has prompted the villagers to introduce alien plant species to fill the resource gap. These plants are planted without any documented guide on conservation or ecosystem health being put into consideration. Most of these trees have become naturalised and continue to spread profusely, taking over indigenous ecosystems (Figure 4.18). This obviously undermines the value chain systems of the area.

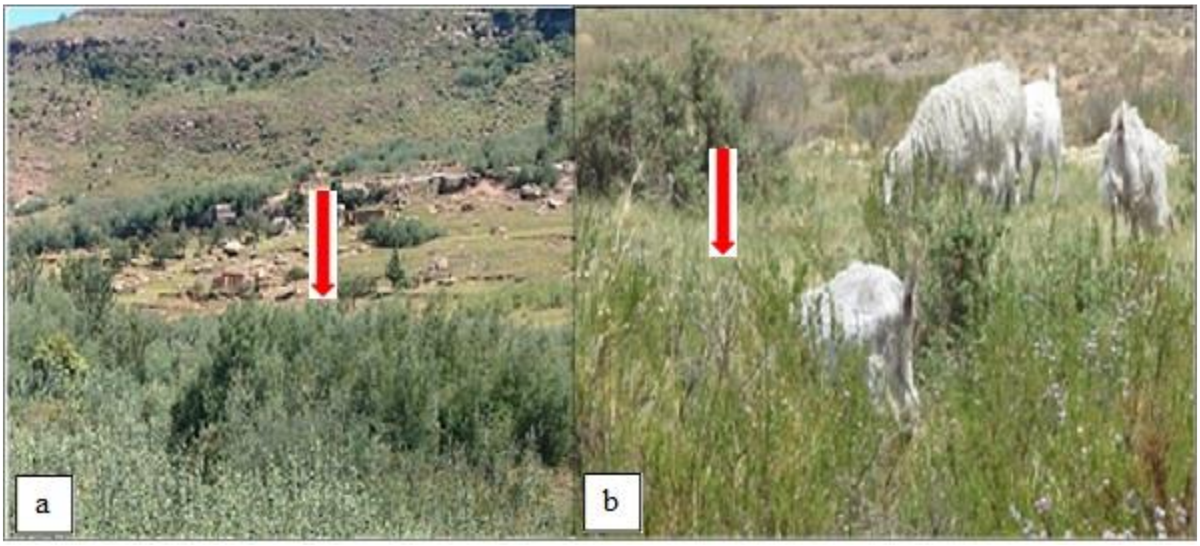

Figure 4.18: (a) Invasive species spreading from plantations, and (b) Felicia shrub encroachment due to overgrazing, (Author, 2016)

Another factor promoting the spreading of invasive species is closely associated with excessive removal of indigenous plants through overgrazing, medicinal plant harvesting, and construction. All of these practices are concentrated within the inner zone owing to this zone being the hub of human environment interactions. The following activities characterize the inner zone:

- Sandstone mining, which does not only lead to depletion of the resource, but which also impacts negatively on the surrounding environment. Scree and boulders from sandstone cutting litter the rangelands and degrades pastures, while finer particles cause silting in rivers and dams located downstream of the WCCA.
- Some people do not travel long distances when harvesting medicinal plants, so they settle for what is available nearby. This does not provide room for targeted species to recover, thus opening gaps for other plants to invade, thereby changing the vegetation's composition and structure.
- The spread of alien plants does not allow palatable grasses to re-establish themselves, resulting in loss of pastures around villages.
- Removal of wetland plants through free range grazing also facilitates the introduction and spreading of alien plants, most of which use water excessively. This eventually reduces water availability in the environment and affects the ecological role of the wetlands in the environment.
- Extraction of river sand and gravel from the inner zone rivers degrades the littoral environments where sedges, rushes, and hydrophilic plants grow, alters wetland ecosystems.
- Clay brick making is one of the activities that rely on soil resources in the form of clay. Without any proper management, clay is mined near sensitive aquatic ecosystems like wetlands, thereby disturbing the flow regime of rivers.
- The flow regimes of rivers in degraded wetlands tend to be characterized by faster water flows than the normal wetland water flow, leading to the increase in sediment removal. This reduces the "sponging effect" of wetlands, which enables them to retain and release water gradually and make it available in streams in all seasons.

4.4.2 Environmental degradation in the intermediate zone

Overall, the intermediate zone is by far the richest of the three zones in terms of resource supply, ranging from geological deposits at the lower reaches to abundant plant resource in its upper reaches. Its close proximity to the inner zone makes the lower part of this zone vulnerable to the destructive anthropogenic activities associated with the village economy of the inner zone. The spatial interaction between the two zones becomes weaker as distance into the intermediate zone increases. Consequently, degradation decreases with altitude as well. Geological and plant-based resources form part of the natural capital feeding into the value chain system, which can be summarized as follows:

- Unsustainable sandstone extraction causes landscape scarification, (Figure 4.19b) and sedimentation in lower lying ecosystems. This is because the guidelines on how environmental health (as stipulated in the Minerals and Petroleum Development Act of 2002, and National Environmental Management Act of 1998), are not being adequately followed.

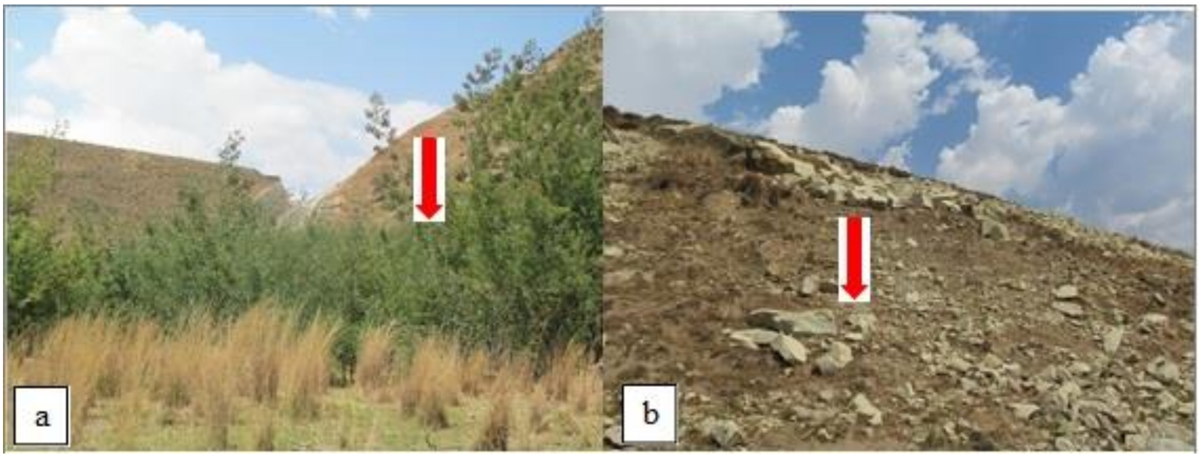

Figure 4.19: (a) Alien invasive species, and (b) scarified slope from sandstone mining in the intermediate zone, (Author, 2016)

- High stocking densities in the inner zone push livestock herders higher up into the intermediate zone, thus reducing the carrying capacity of rangelands in this zone and causing natural resource degradation.
- Not only does overgrazing alter rangelands, as shown in Figure 4.19a, but also the phytosociology of the area, leading to loss of some grasses and herbs that are less able to compete for the limited resources like suitable soil substrate and water available in a degraded grassland.

- The upper part of the intermediate zone, with abundant forbs, becomes the next target owing to the depletion of grazing resources in the lower areas.
- The distance factor plays a major role in the increase of degradation, as people collect more resources per trip to reduce the number of trips. With many people flocking into this zone for resources, overexploitation of resources becomes more vivid.
- Promotion of tourism without any ecological consideration also leads to degradation. The increase in the number of hikers brings about pressure on the environment in the form of soil compaction in some habitats, consequently leading to erosion, especially along hiking trails.
- Infrastructural development, for instance the construction of access roads supporting tourism, also contributes to habitat degradation through erosion and sedimentation from earth moving.

4.4.3 Environmental degradation in the outer zone

Compared to the other zones, the outer zone is more geographically isolated from most of the human environment and its associated activities. Even so, this zone does experience some human contact, almost on daily basis through hiking tourism and cattle herding. These activities have a negative impact on the natural resources in this zone. Adverse alpine weather conditions minimize the human impact, as the number of tourists hiking drops with bad weather experienced at high altitudes. This though does not apply to livestock herders, who build temporary shelters on the alpine plains to take advantage of the flourishing grassland, (Figure 4.20). The most significant value chain degrading activities associated with the outer zone are as follows:

- Some of the hiking trails that criss cross the high altitude slopes have been eroded into channels, fragmenting some plant communities and disturbing local habitats.
- In rainy conditions the eroded channels become hazardous because they become slippery due to reduced traction.

Figure 4.20: Overgrazed alpine grassland showing bush encroachment in the outer zone, (Author, 2015)

- The alpine plains are under pressure from overgrazing which causes loss of palatable short grasses. This opens gaps that are filled by shrubby vegetation, thus altering the vegetation structure of the zone. Most of the herders are from Lesotho and will not form part of the proposed community conservation area, hence they will not play any significant role in conservation initiatives of the Witsieshoek Area, especially due to the fact that the objectives of the Maloti Drakensberg Transfrontier Programme (MDTP) have not yet been successfully met.

4.5 Management, and conservation of natural resources in the WCCA

This section focuses on the assessment of conditions prevailing within the Witsieshoek communities to determine the likelihood of the successful implementation of the proposed WCCA. Both the nature of the impact of natural resource extraction and the responses from the local communities, including the role they will play through the WCCA are evaluated in line with the needs and perceptions of these communities, and within the context of the value chains prevailing in the area. Table 4.4 and Figure 4.21 show examples of some of the main impacts of natural resource extraction in the WCCA.

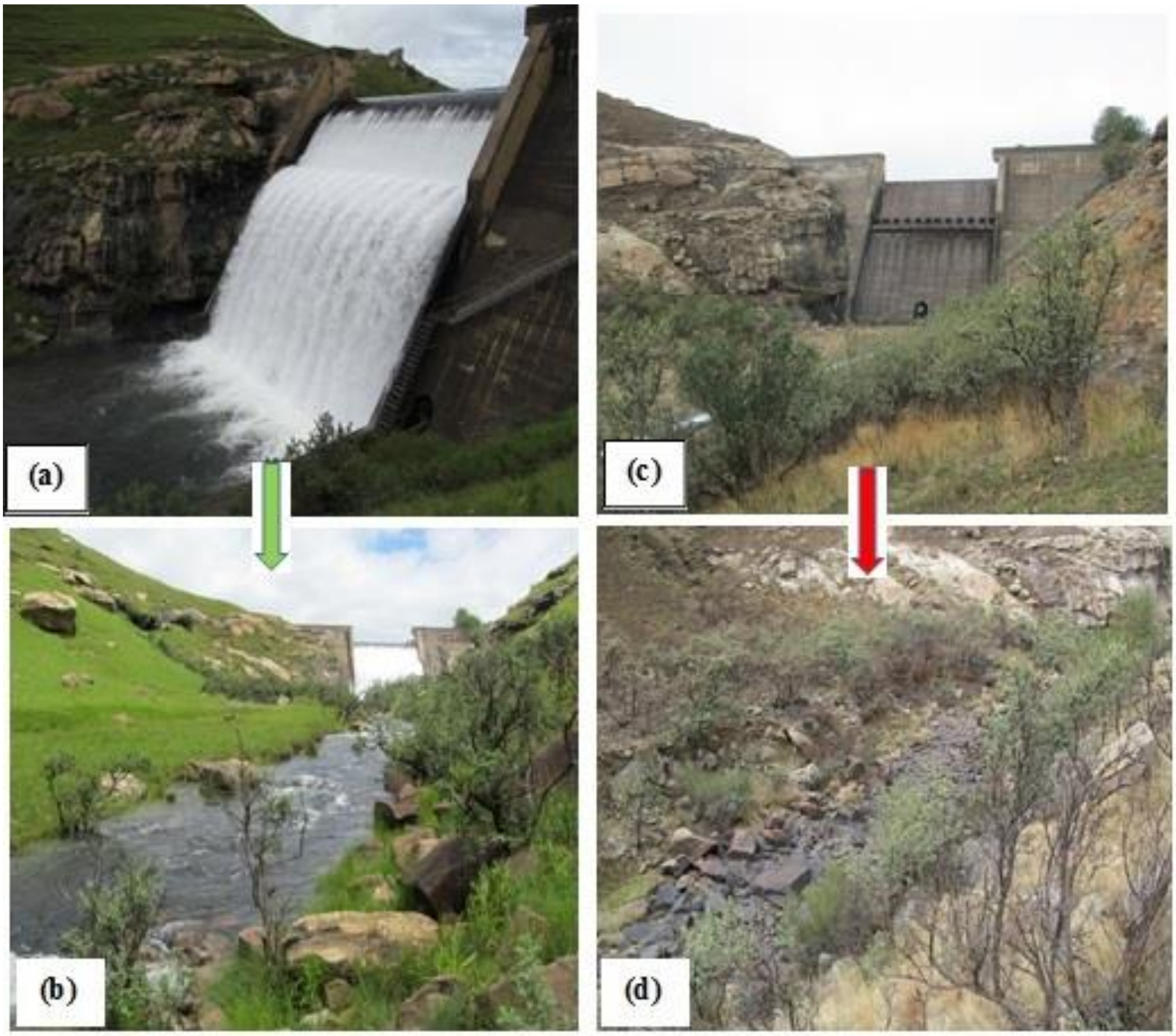

Figure 4.21: (a) and (b) water supporting ecological services, (Author, 2015); (c) and (d) overexploitation to support socio-economic services leading to deterioration of the environment, (Author, 2016)

4.5.1 Management of resources in the WCCA

Though there are three levels at which environmental resources are accessed within the WCCA, namely domestic, commercial and conservation levels, the responsibility of managing environmental resources lies heavily with local communities and the commercial enterprises sourcing resources from this area. The shortfall in this regard is the lack of expertise in assessing the wellbeing of the natural environment. Existing environmental tools such as policies and regulations are not followed, rendering the degradation of the resources inevitable. Because of this limitation, entitlement overshadows accountability in resource use. Thus, villagers involved in natural resource exploitation and use feel they are entitled to the resources, though only a few are prepared to bear the cost of environmental restoration.

Table 4.4: Summary of resources that are mostly utilized by people in the WCCA

Environmental Attributes (Sourced Resources)	Human Activities	Environmental Impacts
Geological/ Physical		
Sandstone	Sandstone mining	Scarred landscape, erosion
Dolerite	Dolerite mining	Scarred landscape, erosion
Basalt	Basalt mining	Scarred landscape, erosion
Soil	Sandstone mining	Erosion, Loss of nutrients
Plant-based		
Grasses	Grazing/ cutting	Erosion, loss of biodiversity
***Leucosidea sericae* (shrub)**	Cut for firewood	Erosion, loss of biodiversity
***Eucalyptus sp.*(Tree)**	Construction/ screening	Positive, environmental restoration
Herbaceous plants	Harvested for medicinal use	Erosion, loss of biodiversity
Sedges (wetlands/aquatic)	Harvested for craft making	Wetland degradation, loss of habitat and biodiversity
Water	Domestic and commercial use	Water shortage, loss of biodiversity and ecosystems

As shown in Table 4.4, prospects for environmental degradation are higher than those for conservation. However, though the WCCA is still in its infant stages, the idea of conservation is starting to take root among the villagers. Also, despite the reservations that some villagers have, regarding the establishment of the community conservation area, many are wary of the conflict of interest that may arise when the conservation area is proclaimed. Their main concern is the decline in commercial activities that may come with conservation regulations. This, they say will result from restrictions imposed on access to the resource base within the proposed WCCA. About 93.6% of the 110 respondents feel that restrictions from resources in the WCCA will have a negative impact on human livelihoods and local economic development. There is also a strong suspicion among villagers that they will be left out from the gains made through conservation.

4.5.2 Conservation of natural resources in the WCCA

Besides the perceived negative impacts associated with conservation, 56% of villagers are aware that natural resources will be depleted if not used sustainably. As indicated in Figure 4.17, 65% of the respondents have knowledge about conservation of the resources within the WCCA.

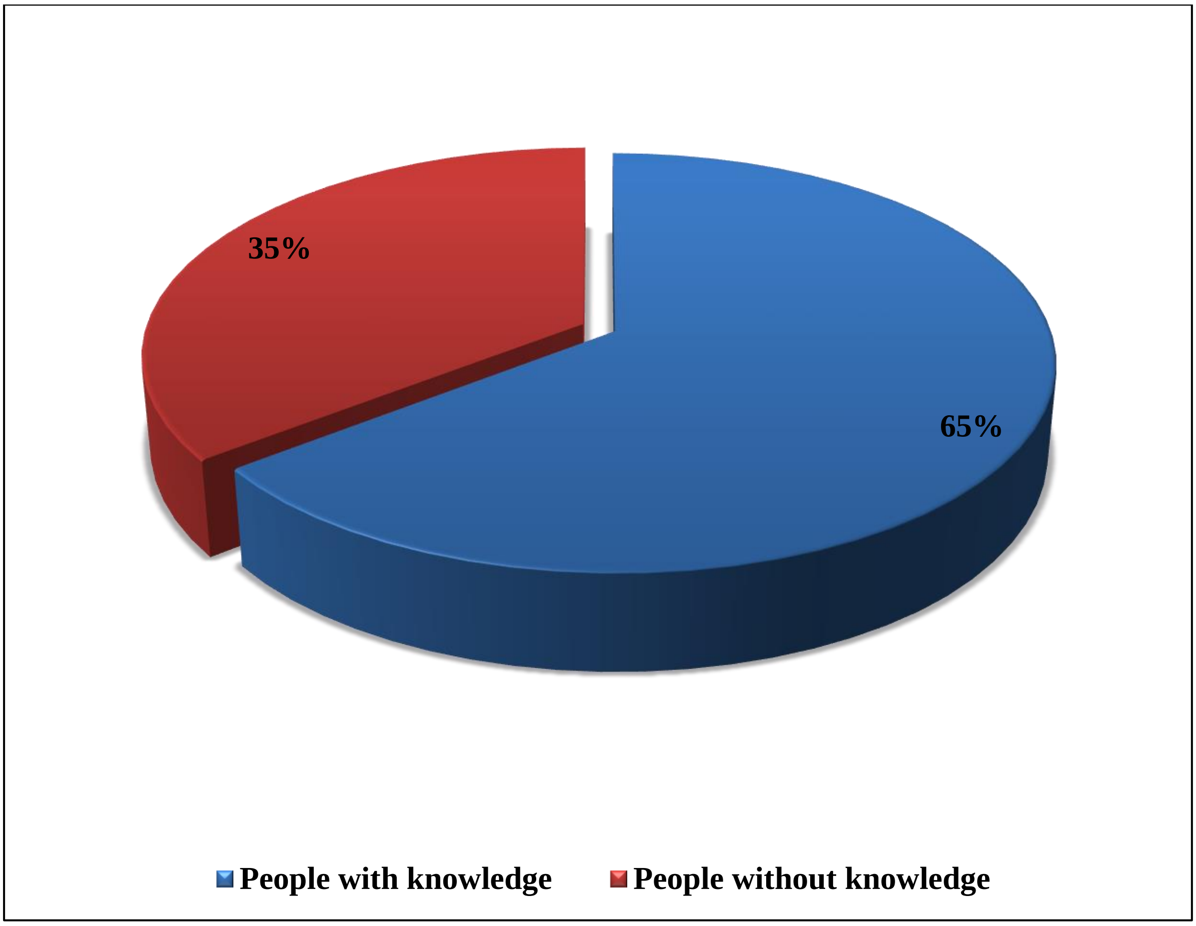

Figure: 4.22: Knowledge of the people about conservation of natural resources, (Survey data)

Some respondents reported that they were once involved in rehabilitation projects that were initiated by the Department of Environmental Affairs (DEA). These initiatives include the Working for Water and Working for Wetlands Programmes, (Figure 23). The respondents reported that they have learnt the basics about the local biodiversity and why they should conserve it. The knowledge gained from conservation projects seems to have changed the perceptions of many villagers about the Witsieshoek Area, which they consider to be more than just a settlement area, but a source of natural capital for livelihood. Conservation within the community conservation area requires that people are involved at all levels. Data from the questionnaire survey indicates that 80.9 % of the respondents were willing to take part in the establishment of the WCCA, provided they benefit in one way or another.

Figure 4.23: Working for Wetlands Programme in Monontsha Wetland, (Author, 2016)

Some villagers who are employed in rehabilitation projects showed interest in nature conservation. Coincidentally, it was indicated by some respondents that they have noticed an increase in environmental rehabilitation activities in the area, especially those which are aimed at saving water. Most of these projects are implemented in wetlands and littoral environments, as indicated in Figure 4.24. These projects are also meant to enhance the aesthetic value of the area, as well as the value chains related to the ecological and socioeconomic services derived from the environment.

Figure 4.24: An example of rehabilitation projects about 1km south west of the entrance of Metsi Matso Resort Development that address conservation in the WCCA, (Author, 2016)

4.6 Conclusion

The biophysical environment of the WCCA plays a major role in the value chain systems that directly depend on natural resources. Any activity that is related to resource extraction chips away the functional components of the ecosystems and changes the state of the environment. The main attraction for consumers is the natural services and goods provided by the environment through different ecosystems. These resources include the biological and geological resources that are either used by local households or sold locally or outside the WCCA. These commodities provide natural capital for various value chains, including those associated with tourism and production of consumable and construction materials. With the proclamation of the community conservation area looming, competition for resources will remain high in case conservation ignores the human livelihoods. This will result from the reduced amount of resources that are accessible to the local communities since part of these resources will be fenced off for conservation.

The overall results of this study indicate significant environmental attributes feeding into the value chain system. Lack of expertise and technology restrict villagers from getting maximum value from the resources. With most of the biophysical environment degraded, value chains are bound to suffer in the end. The failure of value chains can be averted by maximising the input of all stakeholders, including communities, conservation agencies, as well as different government departments. With clear conservation policies and regulations and economic expertise in place, it will be possible to improve value adding processes within the WCCA. When there are clearly defined boundaries between exploitation and conservation of resources, the stakeholders will become more liable and accountable regarding environmental resource degradation. The next chapter discusses the results of the research study.

CHAPTER 5

DISCUSSION OF THE FINDINGS OF THE STUDY

5.1 Introduction

This chapter focuses on the salient issues of the study. The Pressure-State-Response (P-S-R) model was applied in this study to examine the relationship between value chain systems in the Witsieshoek Community Conservation Area (WCCA), environmental pressures and the state of the environment in the area. The discussion in this chapter, is based on the objectives of the study, including the analyses of the:

- State of the biophysical environment in the proposed WCCA
- Goods and services feeding into value chains
- Degradation of the resource bases, and
- Evaluation of the utilization, management, and conservation of natural resources

These objectives define the pathways through which value chain systems link environmental resources to rural livelihoods, as noted below. The activities that have been highlighted in Chapter 4, are further analyzed through the P-S-R model, which is the key aspect of the study.

5.2 State of the biophysical environment in the proposed WCCA

The state of the biophysical environment in the WCCA is influenced by the state of the value chains in the area and vice versa. The degraded parts of the WCCA have lost value in terms of both ecological and socioeconomic benefits. Ecologically, environmental degradation adversely affects ecosystem dynamics. This is because the stochasticity and resilience of the ecosystem is compromised by ecological disturbances (Holling, 2001). This in turn reduces the amount of goods and services available to maintain the ecosystem and provide raw materials for value chain systems. Besides its negative impacts on value chains, land degradation has ripple effects on the larger environment. The resultant impacts like sedimentation can be felt several kilometers downstream along the water courses of the major drainage basins like Thukela River and Vaal River Basins (Mutema *et al*., 2015). In most cases sedimentation results from land uses that degrade river banks which are also common in the WCCA.

The negative impact resulting from resource extraction is augmented and becomes more conspicuous because of the sensitive micro environments typical of mountain areas (Pescador *et al*., 2015). Sources of water resources like wetlands are even more prone to degradation (Teittinen *et al*., 2016). Degradation of water resources has far reaching consequences to the livelihoods of the villagers and urban people. This suggests that the current state of the environment in the WCCA becomes more prone to further degradation, due to worsening changing climatic conditions. Climate change has the potential to increase the rate of land erosion and siltation of water courses and reservoirs. This will worsen the levels of degradation that is already too high, as noted in Chapter 4.

5.3 Ecosystem services and goods and their relationship with the value chain systems

Most ecosystems, including those characterizing mountain environments, provide humans with goods and services that are essential for livelihood (Fisher *et al*., 2009). As demonstrated by the research results in Chapter 4, reliance on natural goods and services increases the value of the natural environment to local communities. Amongst the allocated values within the WCCA, monetary values are more conspicuous and easier to follow. These values are created by people selling raw or processed natural goods (Vetter, 2013). With the wide variety of goods and services available to communities in the WCCA, a network of material flows is carved across the rural landscape. This research shows that resource extraction related activities are concentrated most on geological and plant resources. This means that only a part of the natural resource base is being utilized, compared to the total size of the resource base of the area. This means that there is high potential for diversifying the monetary benefits associated with the value chain systems in the WCCA exists, apart from tourism, mining, and harvesting wild plants.

Income made from activities that are based on natural resources sustain the livelihoods of many people in the Witsieshoek Area and other areas. Unfortunately, these commercial activities result in environmental degradation. The downside to the supply chain embedded in the natural environment is the lack of payment for ecosystem services. This means that there is no compensation for the destruction of the ecosystems providing goods and services to local communities. In this way, the integrity of the natural environment is highly compromised, which impacts negatively on local value chain systems. With conservation being one of the pillars of sustainability, the proposed community conservation area might be the solution to this problem.

However, lack of payment for ecosystem services is not the only problem facing the prospects for both the value chain systems and conservation. Conflict between the two is another. The conflict stems from the arrangement between the communities and the authorities concerned with nature conservation. If carefully implemented, Community Based Natural Resource Management (CBNRM) could solve this conflict, especially where power is devolved to local communities (Mahanty *et al*., 2016). Watersheds within the WCCA could be better protected from anthropogenic activities that have a negative impact on water sources, if a CBNRM approach is adopted. Employing such an approach within a community conservation area is appropriate because it allows local communities to protect their gains and at the same time ensuring the use of their indigenous knowledge in promoting sustainable use of natural resources.

The maximization of prospects for development leads to the decline of the quality of the natural environment and loss of ecosystem resilience (Adams *et al*., 2016), more so under circumstances where local communities lack sufficient environmental education and have limited participation in conservation. In line with the existing value chain systems, the increase in demand for environmental goods obviously leads to resource overexploitation, especially where money is valued more than the natural environment. In rural areas like the WCCA, where resources should be shared between development and conservation, trade-offs are incurred both ways (Christopher, 2016). With rife poverty in the Witsieshoek Area, more pressure will be exerted on the natural resources in future as the human population continues to increase.

However, the need to bridge the gap between conservation and development calls for all stakeholders to work together. This is a requirement in balancing the gains made by all parties involved (Mäler, 2013). In the WCCA, there are no signs showing that all members of the local community are making any significant monetary gains from natural resource conservation. Inequalities exist among community members in terms of access to opportunities related to the commercialization of natural resources. These discrepancies are exacerbated by lack proper regulations by authorities at the local level. The notion that natural resources are there for exploitation by a few without any environmental accounting or auditing worsens the situation.

As stated by Costanza *et al*. (2016), the sustainability of a natural resource base will remain a dream in an area where there is lack of environmental policy and economic expertise. On one hand, there is rigorous biological and geological resource extraction with little signs of economic development, while on the other hand, agricultural activities have been abandoned, except livestock herding. This puts pressure on the remaining environmental resources, especially where poverty is rife and where external support is limited as is the case with the Witsieshoek Area. Lack of adequate external support is the main cause of the failing commercial activities based on natural resources (MacDonald *et al*., 2000). Degraded natural capital cannot support robust value chains that are needed for local economic development. The loss of the natural resource base is made worse by growth in demand for resources (Marchant and Lane, 2014). With looming conflicts between communities and conservation agents, less resources will be available for commercial enterprises in future. Though this sounds pessimistic, new value creations that are in line with the national beneficiation drive will only increase conflicts between local communities and conservation agencies. The worrying factor in the proclamation of the WCCA is whether research and support for commercial enterprises will be on the same level with conservation enforcement. This stems from a general lack of research that addresses the merging of conservation with nature based activities (Ren *et al*., 2015).

5.4 Degradation of the natural resource base within the WCCA

With many commercial activities, including tourism, relying on natural elements, any environmental change will have a negative impact on the value chain systems of the WCCA as a whole. Competition for available resources has increased due to depletion of resources on the lower parts of the WCCA. This has led to villagers moving to upper lying areas to source goods and services. In the case of the WCCA, depletion of resources will spell the collapse of the whole value chain system. With the reduction of the supply of goods and services, ecosystems will malfunction, which in turn will lead to the degeneration of value chain systems. This situation could be exacerbated by an increased interest in natural resources that have got significant value in commercial dealings. The overexploitation of such resources will ensue as a result, and that may eventually lead to more resource depletion. Once the resources show signs of depletion, there will be a rapid increase in their value and they will no longer be freely available or easily accessible to village communities. When the environment becomes degraded, the main damage incurred by the natural systems, including plant and animal populations, as well as hydrological regimes, and pedogenic systems will lead to loss of resilience. The system's resilience is the ability of the system to withstand environmental pressures. The above noted systems are vital components needed for resilience in ecosystems

(Mitchell *et al*., 2015). Where most of the natural resources have been degraded, ecosystems become fragmented, resulting in loss of resilience and natural recovery (Scheffer *et al*., 2015). Ecosystem boundaries are also shifted in the process, leading to fuzzy delineation of different communities and micro habitats which are typical of the mountain environments (Tang *et al.*, 2015). This tends to affect the natural processes that hold such habitats or ecosystems together, thus affecting the services they render. It can therefore be concluded that the success and sustainability of value chains based on degraded environments in the WCCA may be compromised in future if the prevailing situation persists.

5.5 Evaluation of utilization, management, and conservation of natural resources in the WCCA

The WCCA as a whole, combining both the villages and the conservation area, is an important place to promote conservation due to the state of its natural resources and nature of human-environment interactions. The setting up of the WCCA will not only conserve the biophysical elements of the ecosystems, but also consolidate the value chains that are supported by natural goods and services. The conflict between the two land uses is conspicuous when one examines the trade-offs that are incurred, more so by the natural environment (Daw *et al*., 2015). Due to poverty and lack of collateral security, local communities find it difficult to secure loans or other forms of financial assistance from banks. This is because, as noted in Chapter 3, land is held in communal trust. Consequently, this limits the number of villagers involved in commercial enterprises in the WCCA. The same also goes for access to natural resources where property rights are not clearly defined (Tietenberg and Lewis, 2016). The significant elements of value chain systems span both the natural and social environments. However, as part of the Maluti Drakensberg Mountain Ranges, the WCCA comprises endemic species, major watersheds, significant geological formations, and a large rural population, making it complex and rich in elements that support a wide range of value chain systems. Endemism which is high in the Drakensberg Region, makes the WCCA rich in rare plants and animals. This increases the value of gene conservation. Consequently, conservation of geological resources is vital for both ecological resilience and stability, as well as socioeconomic development. Thus, with proper planning conservation initiatives could broaden the livelihoods of local communities in the WCCA.

5.6 Comparison of the findings of this study with previous research

The findings of this study clearly show that both current and past agricultural activities have had negative impacts on the natural environment, as indicated in Chapter 4. Plant and mineral resource extractions are the most conspicuous forms of resource exploitation in the WCCA. This is clearly reflected in the cumulative environmental changes that have occurred in the immediate environment.

Both direct and cumulative impacts have been shown to be detrimental to biodiversity, especially in montane environments, where they have compromised fragile micro ecosystems as has been demonstrated in montane environments elsewhere (Vanderduys *et al*., 2016). The challenge in this regard is that there have not been substantial studies to examine the link between anthropogenic activities and cumulative impacts, as highlighted by Gillingham and Johnson (2016). In the case of the Witsieshoek Area, some cumulative impacts arise from abandoned farmlands that have become seed banks for alien species. Yet, this serious problem, according to the results from the previous research, has not been reported as a biodiversity threat. None of the interventions previously proposed have focussed on abandoned agricultural environments and their species composition. Globally, mountain communities utilize every available piece of arable land to maximize natural resource use (Beniston, 2016). However, this seems not to be the case with villagers from the WCCA, especially when it comes to crop farming. In terms of the perceptions of members of the local community, formalized agriculture occupies a low rank in land uses practiced. This perceptual level applies to the resultant impacts associated with farming activities in an area (Blaikie and Brookfield, 2015). Livestock holding dominates agricultural activities in the WCCA. Other than selling fresh produce from gardens, members of the local communities make a living by selling medicinal and other related plant products, which is not surprising considering that natural resources in many mountain areas around the world play a vital role in improving rural livelihoods.

Dependence on natural resources seems to be a common state of affairs in mountain communities around the world (Chand and Leimgruber, 2016). It has led to the expansion of resource exploitation in areas that are not perceived to be easily accessible and well conserved (Watson *et al*., 2015). One thing that was not anticipated in the results of the current research study is the degradation of the alpine grassland. This is besides its geographical isolation and inaccessibility due to altitudinal extremes. Besides such natural boundaries more large scale environmental changes like uprooting of forbs on the escarpment cannot be fully explained in this study. The issue of entitlement which significantly affects conservation and livelihoods worldwide directly impacts on value chains based on the natural environment in the WCCA. With local communities believing that they have entitlement to natural resources in the area, it becomes difficult to manage and regulate resource use. Under the prevailing communal ownership of land within the WCCA, no one can be held accountable for environmental degradation.

5.7 Implications of the P-S-R Model on the findings of the study

The P-S-R Model, employed as the theoretical framework of this study, assumes that environmental problems arise due to certain activities and also allows for mitigation measures to reverse an undesired state. The P-S-R model makes it easier to analyze value chains while monitoring gains and losses incurred by both conservation and socioeconomic endeavours (Neri *et al.*, 2016). The overexploitation of resources has been observed as the major cause of degradation of the biophysical environment in the WCCA. The pressure applied on environmental elements causes them to disintegrate and lose their ability to perform ecological functions. This has led to the decline of ecosystem services and goods provided by the WCCA. Palatable grass species are one of the examples of the lost commodities. Cumulative impacts include the loss of biodiversity, aesthetic value, and disintegration of natural processes. With time, these impacts become more visible on the biophysical landscape, as is the case with the WCCA. The scarred landscape resulting from mining of geological resources and erosion indicate the underlying problems within the area, and may in turn reduce tourist visits or the availability of biological resources in the area.

Similarly, the functioning of the ecosystem, as well as its degradation is clearly definable through the use of the P-S-R model, as shown in Figure 5.1. The processes associated with resource extraction are used as linkages of processes that lead to environmental change. Meanwhile, environmental change does not only alter the biophysical environment but also affects value chains. This then requires the quantification, as well as quality assessment of the resources that are harvested or derived from the area. The reduction and alteration of the resource base indicates the need for improved resource management in order to sustain environmental resilience. Such interventions include conservation, restriction of commercial activities and environmental education, all of which constitute the response component of the P-S-R model. This can be extended to incorporate the feedback component, as illustrated in Figure 5.1.

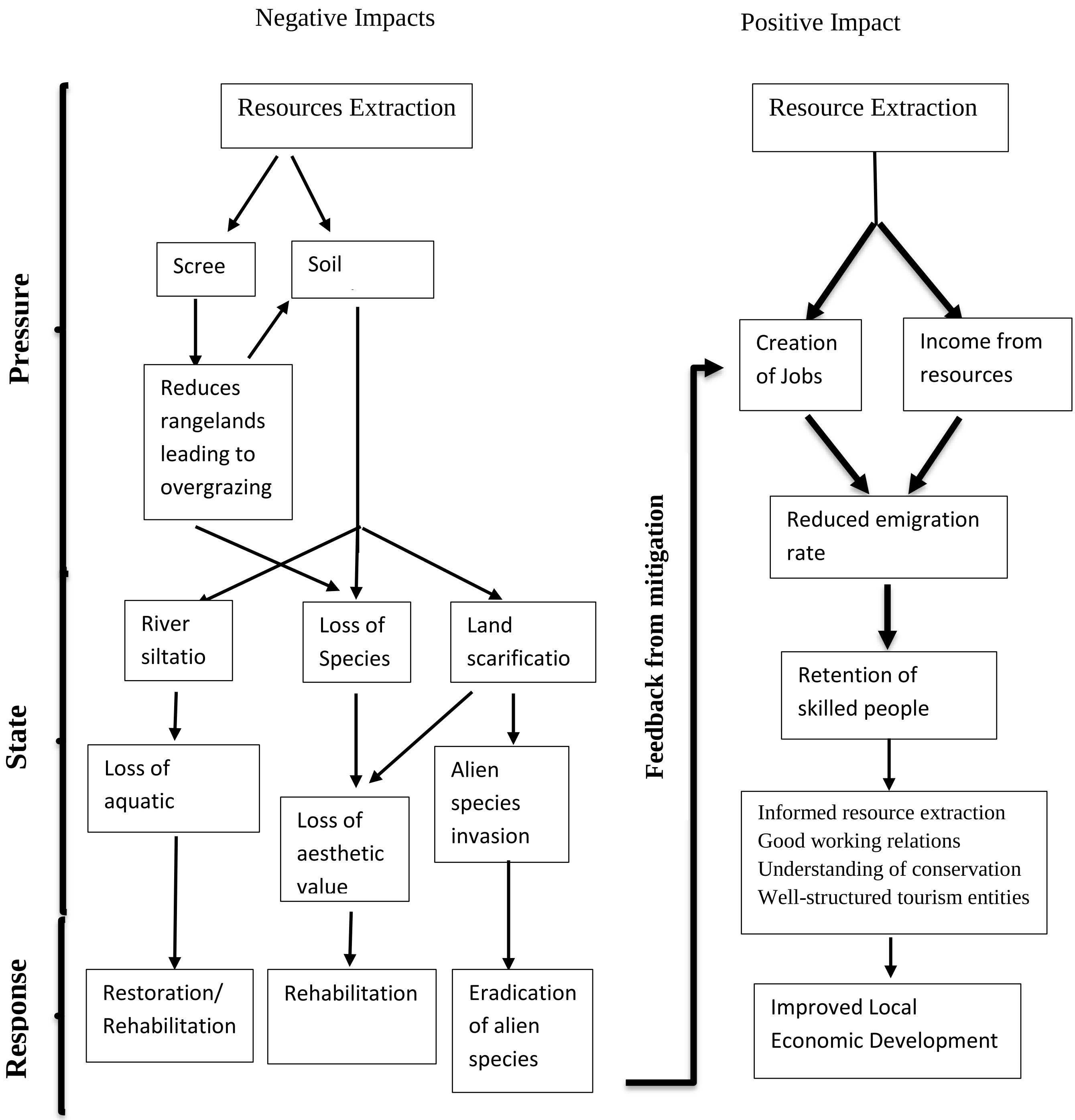

Figure 5.1: Relationship between P-S-R and value chain system in the WCCA, (Author, 2016)

However, what is missing from the model are the drivers of environmental change. Therefore, to ensure a more comprehensive analysis of the factors that alter the resource base within the WCCA, the Driver Pressure State Impact Response (D-P-S-I-R) Model should be applied. In the D-P-S-I-R Model, one of the important components of change are the drivers which are aligned with the demand and exploitation of resources. The D-P-S-I-R Model provides a mechanism for the clear identification of the source of environmental changes (Wang, 2015). The drivers are synonymous with the population dynamics of the area, including population pressure, poverty, morbidity, and markets. Counted in the top ten of small towns with large population, Phuthaditjhaba, the administrative centre of Witsieshoek Area, requires more resources to satisfy its community (STATS SA, 2011). Its land area is restricted by mountains, making land based resources inadequate. With more people relying on natural resources for survival, the carrying capacity of the area is strained drastically. This pressure is applied on both natural and health resources like hospitals.

Due to poverty, most people who cannot afford conventional medicines turn to medicinal plants in their environment for self-medication. Consequently, the market for medicinal plants in the WCCA increases due to high dependence on natural products from plants and the associated rise in demand for raw materials from the plants. Thus, with high levels of poverty in the area, the demand for natural resources remains critically high. Due to poverty, people extract every available resource in order to generate income regardless of market availability. This results in excessive exploitation of natural resources, which in turn causes extensive environmental degradation and reduces ecosystem resilience, and will ultimately lead to the collapse of natural resource base. This means that value chain systems lose their natural capital and fail to contribute towards poverty reduction.

Alexander von Humboldt (2014) defined mountain vegetation patterns as influenced by climate, elevation gradient, and soil conditions (Blumler, 2015). In the case of the WCCA, these patterns gave rise to the altitudinal zones that were used to locate and describe the resource base from which the value chain systems are derived. In this study, these altitudinal zones are linked to the inward flow of resources form the outer, intermediate and inner zones. Such commodity movements can be assessed using Von Thünen's concentric model which divides the rural landscape into distinct zones. Material flow in the WCCA is characterized by inward movement of goods, which is also the case with commodity movement in Von Thünen Model (Beckmann, 1972). Just as suggested by the Von Thünen Model, the intensity of land use decreases with distance from the inner zone, where settlements are situated. In the inner zone, for instance, livestock were seen tethered near homesteads while gardening was widely practiced. To the contrary, the outer zone was characterized by free ranging of livestock, an extensive form of land use. In the case of the WCCA, altitudinal gradient does not only determine accessibility but also the value of resources for both conservation and socioeconomics. Resources that are most valued by villagers are different from those valued by and appreciated by the inner zone dwellers referred to in Von Thünen's concentric model. Meanwhile, the altitudinal zones model is characterized by two way value changes, one being ecological value increasing with altitude and socio economic value increasing with distance. The distance factor is significant in both concentric and altitudinal zones models, as price value increases with distance from the source. The direct implication of location of consumers with respect to the resource base can be seen in the magnitude and success of value chains. The ineffectiveness of resource utilization in commercial activities is due to the overlooking of some important demographic land use issues. However, unlike what is suggested in Von Thünen's Model, the sourcing of bulky and heavier natural resources such as woodland products (and geological resources as well) was done near the homesteads rather than from the peripheral zone.

Parr (2015) mentions omissions related to some components of the Von Thünen concentric model as one of the things that lead to the failure of the implementation of the model. These components include urban system and transport regime. These components are important in supply chain systems, as well as value addition. With regard to the Witsieshoek Area, comprising rural villages that form the innermost zone, in Von Thünen's concentric model this zone becomes the outer zone. This results in villagers becoming suppliers at the very low end of the resource price scale due to the fact that demand increases towards the inner zone, which is the urban centre. This is beside the price that villagers have to pay through degradation of their immediate environment. The demand for services and goods in the inner zone increases the degradation of the resource base in the outer zones (Angelsen, 2007).

5.8 Conclusion

The state of the biophysical environment and all its underlying processes is important for both the upkeep of an ecosystem, as well as the supply of commercial resources in the WCCA. The important role played by the WCCA goes beyond the Witsieshoek Area, since the resources generated from the area are shared by people from other locations outside Witsieshoek Area. Meanwhile, the gains made by the human-natural environment system in this area are far below the benefits made outside the area. The fact that the degradation that prevails in the WCCA is directly linked to resource extraction, renders the value chain system short of the requirements that make the system resilient. This is worsened by the fact that the introduction of conservation measures in the WCCA is yet to be fully embraced by local communities. Consequently, the management of natural resources within the area will remain a challenge to all involved. This can be addressed by putting in place a framework and management plan that promote conservation.

Environmental management plans that are applicable to poverty stricken areas are built around CBNRM, to incorporate the initiatives of local communities. This solution addresses the conflicts that endanger both biodiversity and value chains. The improved and more robust value chain systems that will result from CBNRM initiatives will have a positive impact on poverty alleviation in the Witsieshoek Area. Not only will community engagement benefit the villagers, but the environment will also get time to recover thereby, improving the provision of the ecosystem services. Chapter 6 (Conclusion), will examine the outcomes of the study, based on the objectives, successes and limitations of the study. It will also identify the remaining research gaps and draw recommendations for future studies.

CHAPTER 6

CONCLUSION OF THE STUDY

6.1 Introduction

This study has shown that the poverty stricken rural communities of the Witsieshoek Area rely on natural resources to sustain their livelihoods. The main aim of this research study was to assess the value chain systems in the WCCA, while the objective was to analyze:

- The state and attributes of the biophysical environment in the proposed WCCA and its implications for the value chain systems in the area.
- The relationship between ecosystem services and goods and value chain systems in the proposed WCCA.
- The processes that degrade the natural resource base in the proposed WCCA and its impact on the value chain systems in the area.
- The role of management and conservation of the natural base in the proposed WCCA in strengthening the value chain systems.

A number of conclusions can be drawn in line with these objectives.

6.2 Conclusions from the research findings and their implications on value chains

The research findings that were discussed in the previous chapter show that the Witsieshoek Area is rich in biodiversity and geological resources, though most of the resources in the area are highly degraded. This degradation can be attributed to anthropogenic activities that result from increased rate of natural resource use. The rugged nature of the area increases the vulnerability of the environment to processes of degradation.

From the results of this research study, it can be concluded that the natural resources found in the area provide free natural capital to the local communities. However, the natural capital is available to the wide range of economic enterprises, varying from small to big, or individual and cooperative enterprises, including those that are based locally and those from outside the area. Easy accessibility to the natural environment has led to a rapid decline in ecosystem functionality resulting from overexploitation. Most of the environmental changes taking place in the area have cumulative impacts that affect parts of the WCCA, as well as places outside this area, from which resources are not directly exploited.

The resultant environmental changes taking place lead to the decline of ecosystem goods and services. It can therefore be concluded that the decline in ecosystem services and goods could eventually lead to the decline and failure of value chains. This reality has important implications for the local communities who are plagued by poverty. The conservation of the natural environment is one of the solutions that could help to sustain ecosystem goods and services that are vital for future value chain systems.

This can be achieved through an integrated approach, where both human and nature can be considered as equally important, and where there is environmental accountability. The adoption of approaches like Community Based Natural Resource Management (CBNRM) and conservation planning is the key to natural resource conservation. CBNRM will bring together planners and policy makers in the poverty stricken area and communities living in this area who rely on natural resources for their livelihood. If CBNRM is carefully pursued, the proclamation of the WCCA will go a long way in informing local people about their roles and responsibilities as natural resource stewards, rather than as mere resource exploiters.

6.3 Conclusions about the relationship between findings of the study and applicable theories

The Marxist value theory was useful in the identification of values in this study. However, because of limitations in the Marxist theory, the Baudrillard value theory was adopted. Though the Marxist value theory was useful for the identification of values analyzed in this study, its major limitation was that it deals only with use and exchange value without looking at the impacts on the environment. The Baudrillard value theory on the other hand provided an opportunity for further assessment of different values including sign and symbolic values that are associated with marketing and free use of resources. Accordingly, the Baudrillard value theory was found to be more applicable in explaining value changes and material flows in the WCCA. This makes it easy to relate to the P-S-R model. The Pressure-State-Response (P-S-R) Model provided a sound basis for quantifying the environmental changes in the WCCA. In this study, values are signified by reliance on natural resources for both subsistence and commercial values. The P-S-R model is useful in aligning change with the value creation embedded in ecosystem services. However, the Driver-Pressure-State-Impact-Response (D-P-S-I-R) Model a refined version of the P-S-R model was even more useful because it enabled a detailed examination of the processes that are involved in environmental change, especially the drivers. Thus, it can be concluded that the Baudrillard value theory and D-P-S-I-R model can provide a sound basis for analyzing value chain systems in community conservation areas found in poverty-stricken rural areas. The activities associated with the value chain systems, which are embedded in a natural system, resemble a relay where a change in one system triggers changes in the other. In this integrated system, the feedbacks from all the changes occurring become vital for tracing, identifying, and rectifying the causes of change. This provides a platform for merging natural and social science disciplines.

6.4 Applying theories to policies in value chain analysis

The Marxist and Baudrillard value theories were meant to show the value of resources that prompt socioeconomic and conservation initiatives as required by national laws. Policies, laws, regulations, and theories play an important part in providing guidelines that sustain the human-environment system. In South Africa, the Protected Areas Act No. 57 of 2003 and World Heritage Convention Act No. 49 of 1999, with their combined objectives aimed at protecting and conserving biodiversity and promoting sustainable use of natural resources, constitute key elements of conservation. From the descriptive findings of the study, it can be concluded that the values highlighted in the Marxist and Baudrillard value theories exist in the WCCA. The findings of this study, like those from previous studies, show that there is need for sufficient engagement with local communities during the setting up of the WCCA, as required by the existing national environmental policies. From poor working relationships between socioeconomic agents and conservation practitioners highlighted in the results and discussion of the study, it can be concluded that there is still a gap between how information from natural and social sciences is considered as useful in conservation planning. Not enough has been done to inform people about the importance of healthy natural environment on livelihoods within the WCCA. Thus, it can also be concluded that under prevailing working conditions in the WCCA, much still needs to be done in order to develop sustainable value chains that will improve the livelihoods of local communities.

6.5 Limitations of the study

Ruggedness of the WCCA posed a challenge in the collection of the empirical data on the biophysical environment. This limited the number of plant species that were used to characterize the biological resources that feed into value chains. At the beginning of the study, financial constraints slowed down the data collection process. Some community members who were not cooperative further perpetuated the problem. Some community members in the proposed WCCA expected monetary benefits from the research. Nevertheless, these challenges have also provided a platform for effective utilization of theories and models adopted in this study.

6.6 Recommendations of the study

The study could not cover other aspects of the environmental issues that are linked to value chains e.g. detailed ecological data that describes the biophysical environment. Policy issues were also not tackled to the core, owing to the fact that the conservation area is not yet proclaimed, most survey respondents do not know much about policies guiding the use of natural resources. Nevertheless, these shortfalls have opened the platform for policy adjustments in socioecological environments in the mountain areas.

6.6.1 Research recommendations

Due to time and resource constraints, this research study has not included comprehensive ecological data, including data on plant ecology and distribution. Having generated a strategy to build a database, the follow up research could focus on extending the database on biological resources, especially plants that are used by local communities. A more comprehensive investigation on the direct link between resource use, biodiversity conservation and socioeconomic development could provide information needed for developing tailor made environmental regulations for areas like the WCCA. The WCCA is unique as it is a community conservation area that is situated in a poor rural community. This requires the adoption of an integrated approach to rural development where the goals of local economic development are pursued alongside those for natural resource conservation.

6.6.2 Policy Recommendations

There is still a need to integrate human perspective, scientific, and political frameworks with the aim of achieving a balance between social and natural environment. This will benefit both human development and conservation of biodiversity. This study identified a gap in the way in which communities are engaged in conservation planning and implementations. From the interviews conducted with villagers, it was shown that people are not properly consulted as recommended by NEMA. Chapter 6 of NEMA: Biodiversity Act No. 10 2004 on Bioprospecting Access and Benefit-Sharing puts emphasis on biodiversity protection and issuing of permits but is silent on community engagement. This is in stark contrast with the main objective of NEMA which presents communities as custodians of the environments in which they live. Thus, this study recommends amendments to this act in order to promote bottom-up conservation strategies, in which local communities are viewed as part of the whole process of setting up community conservation areas from inception to the end.

6.7 Closing remarks

Community conservation areas are supposed to be a suitable base for natural resource based value chains. However, it has been highlighted through the study that the communities in the WCCA are not benefitting enough from natural resources. The degraded environment is the main threat to the value chains in the WCCA. Proper planning that conforms to national environmental policies can rectify this. For successful planning strategies, integrated approaches need to be adopted where all role players will contribute and benefit equally.

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APPENDICES

Appendix A – The questionnaire that was used to collect social data. It consists of three sections:

Section A (Personal Information), sought to get basic information about the respondents. It included such things as level of education, income, gender, age, the time the respondent has lived in the Witsieshoek Area, as well as the size of the household.

Section B (Knowledge about natural resources and their use), sought to gauge the knowledge of the respondent about resources. Moreover, some of the questions in this section were meant at finding information about the usage of resources the respondent and other community members.

Section C (Knowledge on conservation), was meant to understand the perception of the respondent about conservation in general, as well the proposed WCCA. It sought to provide knowledge about whether people are for or against conservation initiatives in the Witsieshoek Area. The last part of Section C provided respondent with an opportunity to express their feelings about issues that might have not been covered by the questions in the three sections.

Value Chain Analysis in Witsieshoek Community Conservation Area Questionnaire Survey

Geography Department

University of the Free State (QwaQwa Campus)

This questionnaire is supposed to be completed by the head of the household. It is meant to collect information about opinions and knowledge of the people in Qwaqwa about conservation of natural resources within the Witsieshoek Community Conservation Area. You are not required to state your name when completing the questionnaire. The information that you will provide will be treated with confidentiality and will only be used for research purposes. When completing the questionnaire your responses should be indicated by ticking in the appropriate boxes or by filling in the blank spaces provided.

General Information

Questionnaire No.	

Name of interviewer: ……………………………………………………………………………

Name of Section: ……………………………….…………...………………………….

Date of interview: ………………………………………………………………………….

Time of interview: ………………………………………………………………………….

Section A

Questions on personal information

(Tick in the appropriate box or fill in the blank spaces where applicable)

1. Gender of respondent

Male		Female	

2. Age of respondent

<21		21-30		31-40		41-50		51-60		>60	

3. How large is your household (People living under one roof)

4. Please state your highest level of education/qualification.

Have not received any formal education at all	
<Grade 7	
Grade 7-11	
Matric	
Tertiary (Diploma or Degree)	

5. How much does your household earn per month?

R 0-2000	
R 2001-5000	
R 5001-10000	
>R10000	

6. For how many years have you lived in this area?

0-10		10-20		20-30		30-40		>40	

SECTION B (Questions on resources in the proposed WCCA)

7. Which of the following natural resources within the proposed Community Conservation Area do you use?

Resources		**Nature of use**
River Sand		
Pit sand		
Gravel		
Clay		
Water		
Soil		
Pastures		
Medicinal plants		
Fuel wood		
Sandstone		
Dolerite		
Others (specify):		

8. Do you make any monetary gains from any of the resources?

Yes	
No	

9. If your answer is yes in 8, which resources are involved and where do you sell your products to? (Place)

……………………………………………………………………………………………………
…

10. To whom do you sell your products? (customer (s))

……………………………………………………………………………………………………
….

11. How far do you travel to access the following natural resources from the Witsieshoek Community Conservation Area?

Resources	< 0,5Km	0,5Km-1Km	1km-1,5km	1.6km-2km	>2km
River sand					
Pit sand					
Gravel					
Clay					
Water					
Soil					
Pastures					
Medicinal plants					
Fuel wood					
Sandstone					
Dolerite					

Others (specify)					

12. Do you think the setting of the conservation area will affect the gains you make from the natural resources?

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

13. Do you think the resources you use will be depleted one day?

Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**

14. To what extent do you agree that natural resources business in the Witsieshoek Community Conservation Area will be affected by the following conservation measures:

Measures	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
1. Restricting access to natural resources					

2. Stipulating the amount of extracted resources					
3. Stopping people from extracting some resources					
4. Licensing the use of some natural resources					
5. By bringing expertise from outside the villages					

Section C (Questions about conservation)

15. Do you know about natural resources and environmental conservation?

Yes	
No	

16. If the answer is yes in 13, where did you learn about it?

From school	
Roadshows	
Television	

Radio	
Newspapers	
Workshops	
Pamphlets	
Community meetings	
Project consultations	

17. Have you heard about Witsieshoek Community Conservation Area?

Yes	
No	

18. In what way is the Witsieshoek Community Conservation Area is going to benefit your community?

Employment	
Recreation	
Environmental education	
Culturally	
Tourism opportunities	
Other benefits	

19. In what way is the Witsieshoek Community Conservation Area is going to affect the local community negatively?

Restricted access to resources	
Restrict availability of land for grazing	
Restricted access to the park	
Restricted access to cultural heaths	

20. To what extent do you agree with the following statements regarding the resources that should be conserved in the proposed Witsieshoek Community Conservation Area:

The following natural resources should be conserved?

i. Natural landscapes

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

ii. Water resources

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

iii. Plants

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

iv. Wildlife

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

v. Mineral resources

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

21. To what extent do you agree with the following statements, regarding your participation in conservation activities in Witsieshoek Conservation Area?

i. I prefer to participate individually/as a household

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

ii. I prefer not to be involved at all

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

iii. Only our village community should be involved

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

22. In the space provided, please give your opinion about what can be done to benefit both the conservation area and the community.

………………………………………………………………………………………………

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Appendix B – Inventory questions used in interviews

Formal and informal interviews were conducted with key informants with significant role to play in the setting up of the WCCA, general environmental conservation, and nature based development. The key informants included people from government agencies, private developers involved in hospitality industry development. The main aim of the interviews was to establish the position in which general community is placed by developers and policy makers.

Interviews with developers:

A representative for River Ranger Trust which is responsible for the development of Metsi Matsho Lodge was interviewed.

1. Where is your company based?
2. Does it have any BEE commitments?
3. What is your role in the setting up of the WCCA and related infrastructure?
4. Do you employ any people from local communities?
5. Are u going to be in charge of the lodge you are constructing once it is completed?
6. Do you have any plans in place to address conservation objectives of the proposed WCCA?

Interview with conservation agents:

One of the contractors working under the Working for Wetlands Programme which is the subsidiary of South African National Biodiversity Institute, was interviewed.

1. How did you get an opportunity to work in wetland rehabilitation?
2. Where is your company based?
3. Do you get any training based on conservation and natural resources?
4. Do you employ locals in this project?
5. Do you transfer skills to people working for you?
6. What is the main objective of rehabilitating wetlands?
7. How does this programme contribute to livelihoods in the area?

Interview with commercial enterprises and street vendors

With one of the objectives of the study being identification of natural resources that contribute to community livelihoods through the value chain systems in the proposed WCCA, opinions and information on manufacturing and retailing had to be collected form stakeholders from the community. Locals making money from geological and plant resources were interviewed.

1. Are you from the Witsieshoek area and how long have you lived in the area?
2. Which resource(s) provide you with raw materials?
3. Where do you get these resources?
4. Who do you work with in your commercial enterprise?
5. Do you get any support, monetary or in form of other resources?
6. Have you had any training in business and manufacturing?
7. Do you sell natural goods raw or purified/ processed?
8. Who are your customers? Where are they located?
9. How much money do you make from natural resources/ products?
10. Where do you invest the profits made from your enterprise?

Appendix C – Plants that were recorded during the collection of biophysical and social data

A total of 45 were identified and recorded during data collection. Some of these plants were identified by members of the local communities as being used by people in the area while others were identified in the wild for their ecological role. Common names are provided for some plants while the same could not be found for others.

Botanical Name	**Common Name**
Acacia dealbata	Silver wattle
Acacia mearnsii	Black wattle
Agrostis subulifolia	-
Andropogon appendiculatus	Vlei bluestem
Anthospermum aethiopicum	Cape seedflower
Aponogeton junceus	Pondweed
Berkheya cordifolia	Heart-leaved moonseed
Boophane disticha	Tumbleweed/ windball
Brunsvigia natalensis	March Lilly
Carex monotropa	Ravine sedge
Cliffortia spp.	Starry rice bush
Conyza obscura	-
Cotula hispida	Silver cotula
Crassula ssp.	Jade plant
Cymbopogon spp.	Turpentine grass
Dicoma anomala	-
Eleocharis spp.	Spike rush

Erica algida	Teenage heaths/ Sehalahala (ss)
Erica dominans	Teenage heaths/ Sehalahala (ss)
Eucomis autumnalis	Pineapple lily
Felicia spp.	Michaelmas daisy
Festuca caprina	-
Gazania spp.	Treasure flower
Gerbera	Mountain daisy
Helichrysum coriaceum	Impepho (z)
Helichrysum rugulosum	Impepho (z)
Heteropogon contortus	Spear grass
Hyparrhenia hirta	Thatching grass
Hypoxis hemmerocallidea	African potato
Ledeburia	Common squill
Leersia hexandra	Cut grass/ swamp rice
Leucosidea sericae	Straggly shrub/ ouhout
Limosella grandiflora	Mudwort
Mentha aquatica	Water mint
Merxmuellera stricta	Bokbaardgras (a)
Panicum	Common millet
Pennisetum spp.	elephant grass
Pentaschistis airoides	Annual Pentaschistis
Populus alba	White poplar
Protea caffra	Common sugar bush

Scilla natalensis	Natal squill
Sebaea martlothii	-
Senecio cryptolanatus	Ragwort
Themeda triandra	Red grass
Watsonia	bulbil bugle-lily