

Assessing the Poverty-Environment Nexus in Three Rural South African Villages: Environmental Degradation, Vulnerability and Perceptions

Tshifhiwa Violet Ramatshimbila
Student Number: 593335



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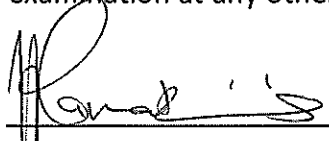
JOHANNESBURG

29 March 2018

Academic supervisor: Professor Wayne Twine

DECLARATION

I declare that this research report is my own, unaided work except where acknowledged. It is being submitted for the Degree of Doctor of Philosophy to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.



(Signature of candidate)

ABSTRACT

Poverty and environmental degradation are two serious challenges facing developing countries. The poor are often blamed for causing degradation, and degradation is assumed to worsen poverty. This relationship between the two has been referred to as the Poverty-Environment Nexus (PEN). The PEN is known to be complex and multidimensional, and is surrounded by a number of theories and controversies. Although the co-occurrence of poverty and degradation has been well explored across the developing world, it has received modest attention in the literature especially on how wealth differentiation within these communities shapes the way in which local people conceptualise, experience, and cope with degradation. The intersection between the PEN and local environmental governance is also under-studied.

This study addresses these knowledge gaps by investigating how household wealth status influences 1) local perceptions about woodland degradation, 2) household vulnerability to degradation, and 3) awareness and attitudes about local environmental governance, in three rural villages in Limpopo Province, South Africa. A mixed-methods approach was used, combining focus groups, a household survey (n=213), an individual survey (n=213) and key informant interviews. The influence of household wealth status score (derived from assets and income sources using Principal Component Analysis (PCA)) on individual perceptions, awareness, and attitudes, and household vulnerability to degradation, after controlling for confounding factors, was analysed statistically using multivariate logistic regression models. Focus groups and key informant interviews were useful for identifying themes and adding qualitative insights to the quantitative results.

Perceptions: Woodland degradation was perceived both in terms of physical aspects, such as reduction in large trees, and experiential aspects, namely having to travel further to collect resources. The latter perception was influenced by wealth status. Perceived causes of degradation included environmental, socio-economic, and governance factors, and these perceptions were mostly associated with increasing wealth status. However, poorer respondents were more aware of their own household's contribution to local degradation. For potential solutions, wealthier respondents focussed on using alternatives to harvested

resources (such as other energy sources), while the poorer respondents focussed on reducing daily resource consumption.

Vulnerability: Poorer households were more likely to use most of 13 woodland resources. Poorer households were thus more likely to report being impacted by degradation, especially by having to travel further to collect resources. Coping responses of the poor were typically inward-looking, focusing on modifying their natural resource use, such as by reducing quantities used or harvesting around other villages. By contrast, the wealthy were more outward-looking and focused on external coping mechanisms such as seeking employment and buying commercial alternatives from shops. The use of social capital to cope with degradation emerged as an important response strategy cross wealth status.

Governance: Traditional authorities were widely recognised as important institutional structures for local woodland management. Awareness of relevant government agencies was relatively low. Poorer respondents were more aware of customary environmental laws and penalties, while wealthier respondents were more aware of those of government agencies. Wealth status also influenced attitudes about the benefits of the various institutions for managing local communal woodlands. It was widely agreed that local woodland governance could be improved by delegating more power to traditional authorities and communities, and improving monitoring by government agencies. These views were not influenced by wealth status

Key insights from this study include:

- Even within poor communities, there is wealth differentiation in environmental perceptions that has consequences for addressing the poverty-environment nexus.
- The poor are hit by a “double whammy” when it comes to vulnerability to degradation – first, they are more at risk to impacts because they are more dependent on natural resources, and secondly, they are less able to adapt in ways which do not undermine human wellbeing or environmental sustainability.

Despite their weaknesses, traditional governance structures and institutions have an important role to play in managing the poverty-environment nexus in common property systems, but they need support from government.

Key words: *wealth status, poverty, woodland degradation, vulnerability, perceptions, environmental governance*

DEDICATION

I wish to first dedicate this work to the Glory of God for seeing me through.
Secondly my mom, Azwinndini Anna Tshipala.

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I am thankful to the Almighty God for His mercies and grace that covered me and enabled me to come this far. If it was not for Him, this research would not have been realized. I say “Ebeneza”. I am also very grateful to my supervisor, Professor Wayne Twine for his patience, criticisms and unwavering commitment that has made this research a success. It has been “a long walk” that we walked together, and finally the goal was achieved. I am also grateful for the valuable inputs I received from my research committee. I gratefully acknowledge Wits Rural Facility (WRF) staff in Hoedspruit which was my second home during my study, especially Minah Nkuna, for their support and love. I am also grateful for all the community leaders who allowed me access to their villages to collect data, those who agreed to be interviewed and those who helped me in data collection and capturing, especially Mukondeleli Charity Tshitimbi and Lucille Mbonzhe respectively. My sincere appreciation goes to my family (my sister Tshipala M, my brother Dr Tshipala NN) whose countless support helped and encouraged me during my studies at Wits University, especially to my young sister Fhatuwani Lucy Molefe who looked after my children during my last week’s towards submitting my research while I was away and for being a good listener when I wanted someone to talk to and my mom Anna Azwinndini Tshipala was calling me almost every day to check on my progress and encouraging me to go on even when I felt like giving up. I am also highly grateful to my husband Ramatshimbila Justice and children (Mulanga, Vhuthuhawe and Vhuhwavho) for their understanding, especially when I had to leave them for a long period at WRF to have time to study. That was the hardest thing for me to do but I am grateful that they made it easy for me. Thank you for your unwavering support, endless patience and infinite love. Finally, to my first born (Mulanga Treaty Ramatshimbila), thank you for all the encouraging words and believing in me; due to that I could not let you down. I had a reason to go on even when I felt like giving up.

You all supported me in your own special ways. You are amazing. THANK YOU.

Amen

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CHAPTER 1

GENERAL INTRODUCTION

1.1. INTRODUCTION

Poverty and environmental degradation are two serious challenges facing developing countries, and yet surprisingly little is known about how the poor conceptualise, experience, and respond to degradation (Duraiappah, 1998; Chokor, 2004). Rural people across the developing world rely heavily on local natural resources to support their livelihoods, and as a safety net that buffers them from shocks and stresses (Arnold & Bird, 1999; Shackleton & Shackleton, 2000; 2004; Babulo et al., 2008; Makhado et al., 2009). Non-Timber Forest Products (NTFP) derived from local ecosystems contribute significantly to rural households' economic wellbeing (Babulo et al., 2008), contributing an average of 22% of household income per annum (Vedeld et al., 2007). The poor have been accused of being responsible for causing environmental degradation and for being less environmentally concerned than the affluent, as they prioritise meeting daily needs over environmental sustainability (Duraiappah, 1996; Rahman, 2004). At the same time, environmental degradation can have significant negative impacts on the quality of life poor of people who depend on the local natural environment for livelihood support (Nankhuni & Findeis, 2003).

Poverty and environmental degradation are not independent problems and cannot be addressed individually (OECD/DAC, 2001). The Poverty-Environment Nexus (PEN) is thus widely conceived of as a two-way relationship in which poverty causes environmental degradation and environmental degradation exacerbates poverty (Aggrey et al., 2002; Mink, 1993). However, this simplistic formulation has been challenged, recognising the complexity of this nexus (Duraiappah, 1998b; Uitto, 2016). This includes attention given to the influence of aspects such as local environmental conditions, social factors (e.g. household wealth status, culture, gender, and demographics) and political and economic circumstances (e.g. strength of institutions, policy on land distribution, economic policies, resource prices, entitlements to natural resources, and limited access to markets) (Aggrey et al., 2010;

Arnold and Bird, 1999; Chowdhury, 2008; Chowdhury & Ahmed, 2008; Duraiappah, 1996; Uitto, 2016).

The PEN in developing countries has mainly been explored by comparing the spatial co-occurrence of poverty and degradation (e.g. (Meadows & Hoffman, 2002; Dasgupta et al., 2005; Lufumpa, 2005; Aggrey et al., 2010). However, the influence of wealth differentiation on the experience of degradation within these communities is less well studied (Bhattacharya & Innes, 2012). The relationship between household wealth status and reliance on NTFP in developing countries, especially in Africa, has received increasing attention in the last two decades (Cavendish, 2000; Bhattacharya & Innes, 2006; Vedeld et al., 2007; Babulo et al., 2008; Cocks et al., 2008; Narain et al., 2008; Heubach et al., 2011; Paumgarten & Shackleton 2011). From these insights, inferences can be made about the impacts of local environmental degradation on households of different socio-economic status. However, this is understudied empirically. Similarly, while local perceptions concerning environmental change in poor communities are receiving increased research attention (e.g. Bollig & Schulte, 1999; Chokor, 2004; Anderson et al., 2007; Kgosikoma et al. 2012; Lykke 2000; Sop & Oldeland 2013; Twongyirwe et al. 2017), the influence of wealth status on these perceptions is still under-studied (Hunter et al., 2010). Also, although the role of institutional failure in environmental degradation in poor countries has been acknowledged (Duraiappah, 1998; Swiderska et al., 2008), little is known about how wealth status shapes awareness and attitudes about governance of local environmental resources in these settings. This study addresses the above knowledge gaps in the PEN literature, by investigating how wealth differentiation shapes perceptions about woodland degradation, household vulnerability to this degradation, and awareness and attitudes of relevant environmental governance institutions and organizations responsible for woodland management, in three rural villages in Limpopo Province, South Africa.

1.2. LITERATURE REVIEW

1.2.1. The Poverty-Environmental Nexus

1.2.1.1. Introduction to the PEN

The nexus between poverty and the environment has been long recognized (United Nations Development Programme, 2010), and widely discussed in the environmental literature (Narain et al., 2008; Kuik, 2005; WRI, 2005; Chowdhury & Ahmed, 2010; Hayes & Nadkarni, 2001). The Poverty-Environment Nexus (PEN) is considered to be complex and multidimensional relationship (Sen, 2001; Aggrey et al., 2002; Chowdhury, 2008; Forsyth et al. 1998), and encompasses political, social and environmental factors that have implications for environmental conservation and implementation of management initiatives to meet social and economic needs (Jahan & Umana, 2003; Lufumpa, 2005; Uitto, 2016). The nexus is associated with a commonly held view that implicates the poor as the main cause of the environmental degradation due to their heavy dependency on natural resources, especially in the poor regions of the world (Duraiappah, 1998b; Cavendish, 2000; Lufumpa, 2005; Narain et al., 2008). Although there is a general agreement that there is a link between poverty and the environment, the precise nature of the relationship remains unclear and there is no universally accepted way of formulating these linkages (Adger, 2006). There are a number of PEN theories that have been developed in the literature, and these are briefly summarized below.

1.2.1.2. PEN Theories

The *downward spiral* hypothesis posits a two-way relationship in which the poor are seen as agents and victims of environmental degradation (Durning, 1989). Duraiappah (1998) and Ekbohm and Bojö (1999) maintain that poor people and environmental degradation are thus often caught in a downward spiral. Poverty constrains their options, and may induce the rural poor to deplete resources at rates that are incompatible with long-term sustainability as they seek to satisfy their urgent needs such as food, medicinal, and building materials (Jahan & Umana 2003; Aggrey et al., 2010). Poverty thus forces people to degrade the environment, and in turn, the degraded environment exacerbate people's poverty because

of its inability to provide services to support their livelihoods (Ronald, 2007). This hypothesis therefore supports the view that poverty is a direct cause of environmental degradation (Durning, 1989). It therefore assumes a poverty-environmental degradation cycle. The interaction between poverty and environmental degradation sets off a downward spiral of ecological deterioration that threatens the physical security, economic well-being, and health of the region's poorest people (Mink & Mundial, 1993; Aggrey et al., 2002).

The downward spiral hypothesis has been criticised for being over-simplistic. Somanathan (1991), argues that the poor do not have the resources or means to cause environmental degradation. It is therefore inappropriate to blame poverty as the main cause of environmental degradation because there are many underlying factors that influence this nexus (Duraiappah, 1996; Arnold & Bird, 1999; Aggrey et al., 2002; Chowdhury & Ahmed 2008). Factors such as governance systems and unsustainable resource use in the past can negatively affect the present generation. A practical example is the legacy of the past apartheid regime in South Africa that forced the black majority into poor marginal land that is inadequate for subsistence farming and prone to degradation (Meadows & Hoffman 2002; Musyoki et al., 2016). This inherited problem puts the poor in a difficult position because as they use the natural resources, they are exacerbating environmental degradation that is not necessarily entirely of their making, while deepening their poverty (Mink, 1993; Ekbom & Bojö, 1999; Aggrey et al., 2010). Critiques of this hypothesis therefore state that perception that the poor use resources without planning for the future should not be blamed on poverty only, but as the consequence of complex interactions among policy, markets, economic structures, institutional and social failures (Duraiappah, 1998). Furthermore, Aggrey et al., (2010) argued that the specific details of an understanding that poverty causes natural resource degradation, which in turn affects poverty, are still largely speculations.

The *Environmental Kuznets Curve (EKC) theory* and *Beckerman Hypothesis (BH)* have some similarities in approach, as they maintain that environmental degradation caused by economic development will be addressed and minimized at a later stage of development. The EKC theory hypothesizes that the environmental impact indicator is an inverted U-shaped function of income per capita (Kuznets, 1955; Stern, 2004; Yandle et al., 2002). This

implies that environmental degradation is initially very low among poor, pre-industrial societies, but is unavoidable at the early and intermediate stages of development, such that degradation and pollution increase, but beyond some level of income per capita, when the community becomes affluent, environmental impacts decrease relative to GDP growth at higher income levels (Jahan & Umana, 2003; Dinda, 2004). The *Beckerman Hypothesis* (BH) also assumes that degradation or environmental harm is unavoidable in early stages of development, but is reversible, and with sufficient resources, can always be ameliorated (Jahan & Umana, 2003). The challenge with the EKC and BH is that the transition from lower to higher level of per capita income occurs over a long period and the environmental degradation might occur faster than per capita income. Reliable data to monitor impact level in developing societies over time is a challenge in testing this hypothesis (Bruyn, 2002). Although there is evidence that some developed countries have become more environmentally friendly, for example, by reducing greenhouse gases emission, still there is no agreement in the literature on the income level at which environmental degradation starts declining (Dinda, 2004).

The *Porter Hypothesis* (PH) proposes that economic growth is essential for both poverty alleviation and environmental sustainability (Porter & Van der Linde, 1995). It thus hypothesised a potential 'win-win' situation using a regulatory framework that allows for both economic growth and environmental protection simultaneously (Rammer and Rexhauser, 2011; Ambec et al., 2013; Wagner, 2003). The PH further suggests that such economic growth should be pro-poor, without compromising environmental management. Therefore, the regulated economic growth will make resources available for poverty alleviation and reduction of environmental degradation (Jahan & Umana, 2003). The problem with the PH is that it naively assumes that economic development and environmental protection can be achieved without a trade-off between them. PH also assumes strong and effective regulatory systems, which in reality, are usually weak in countries facing the simultaneous challenges of poverty and environmental degradation (Swiderska et al., 2008). Ambec et al. (2013) argued that it is costly to take the management decisions based on the PH because of its requirements of developing a sound regulatory system, which might place undue financial burden on the implementing institution.

The PEN theory that is most preferred in the literature to explain the nexus between poverty and environmental deterioration, especially in the developing world, is the downward spiral hypothesis. The downward spiral hypothesis most directly considers the two-way relationship between poverty and environmental problems, including degradation (Chowdhury & Ahmed, 2008). Although the EKC, PH and BH are also PEN theories, they are less frequently referred to in explaining the PEN at local level because they are more focussed on economic growth, environmental degradation and poverty alleviation at a national or global scale (Jahan & Umana, 2003; Dinda, 2004).

1.2.1.3. Useful frameworks for assessing the PEN

In addition to specific theories about the relationship between poverty and environmental degradation, there are at least two widely accepted and used frameworks that are useful for assessing the PEN. Although these were not necessarily developed specifically for understanding the PEN, they are useful for conceptualising the two-way relationship between people and the environment, and how poverty shapes, and is shaped by these. The first is the Driver-Pressure-State-Impact Response DPSIR framework, which focuses at the scale of societies, and the second is the Sustainable Livelihoods Framework (SLF), which applies to the household level. These are briefly described below.

The *Driver-Pressure-State-Impact Response (DPSIR) framework* was developed by the European Environmental Agency (EEA) in 1999 and has been adopted by UNEP as an analytical framework for integrated environments assessment and reporting in complex social, economic and environmental systems (Kristensen, 2004; Carr et al., 2007; UNEP, 2007). DPSIR is composed of five components from which the acronym takes its name. These are 1) *Drivers* of environmental change, 2) *Pressures* exerted on the environment as a result of these drivers, 3) *State* of the environment as a consequence of the pressures, 4) *Impact* of the change in environmental state on society, and 5) *Responses* of society to these impacts (Svarstad et al., 2008) (Figure 1.2). The framework in Figure 1.2 indicates that environmental change originates with driving forces (D) such as population demographics, or economic factors (this would include poverty), which lead to human-induced pressures on the environment (P) such as resource extraction. These pressures result in change in the

state of the environment (S) such as land degradation and loss of biodiversity, which impacts (I) on the environment's capacity to provide ecosystem services, which in turn, impacts on human society (including wellbeing). Responses (R) are implemented by governments, local organisations, and communities to mitigate and adapt to these impacts, at different points in the causal chain (UNEP, 2007; European Environment Agency, 2010). In the EEA configuration of DPSIR, impacts feedback to drivers indirectly, via responses, while the in the UNEP version (Figure 1.1), impacts also can directly result in changes in drivers.

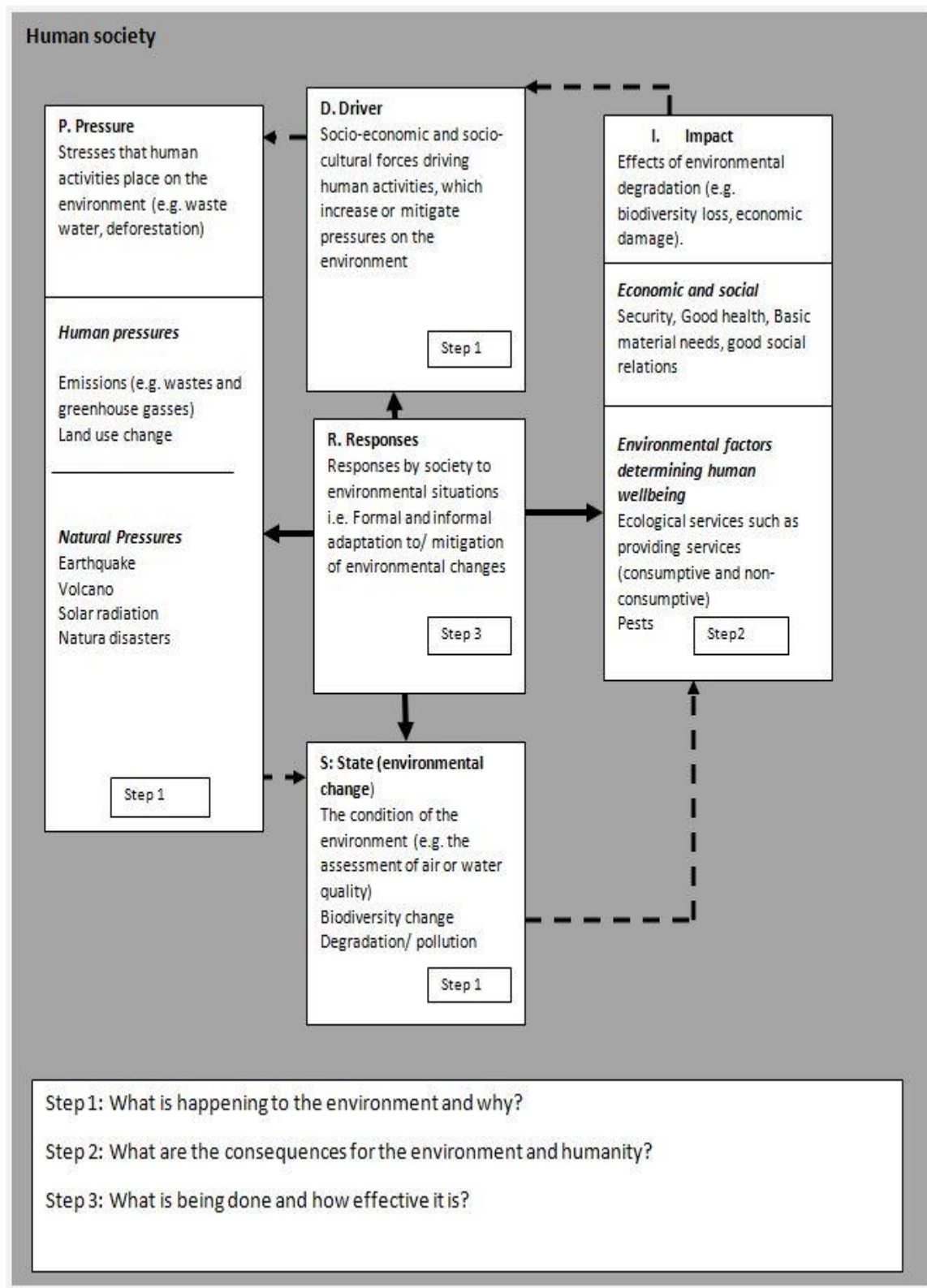


Figure 1.1. DPSIR framework modified from UNEP, (2007)

The framework is useful for understanding the bi-directional relationships between the environment and human beings, and how this is shaped by socio-economic factors. It shows the link from 'driving forces' (economic factors) through 'pressures' (human activities) to 'states' (environmental quality) and 'impacts' on ecosystems and humans, eventually leading to political and adaptive 'responses' (mitigation, prioritisation, target setting) (Kristensen, 2004). In the context of PEN, DPSIR provides a framework for considering how poverty (driver) might drive behaviour (pressure) that leads to degradation (state), how degradation impacts on society (impacts), how society responds to the impacts of degradation (responses), and how these responses mitigate the impacts of degradation and either exacerbate or ameliorate the drivers and pressure causing degradation.

The *Sustainable livelihoods framework (SLF)* was developed by the British Department for International Development (DFID) to provide a holistic and integrated way of understanding and assessing how households, particularly the poor, make a living (DFID, 1999). A livelihood can be defined as the assets (capital) and activities used by a household to secure the necessities to make a living (Krantz, 2001; DFID, 2008). The framework recognizes five livelihood capitals, namely financial (income, savings, insurance), physical (equipment, appliances, infrastructure), human (number, age, gender, and education levels of household members), social (social relations and networks) and natural (land, water biodiversity) capital (Scoones, 1998; Rakodi, 1999). Households engage in a range of activities and strategies, drawing on or building these capitals, to make a living. These may include farming, natural resource extraction, entrepreneurial activities, and employment (Babulo et al., 2008). The capitals available to households, and the strategies they use, determine livelihood outcomes, such as food security, environmental sustainability, and ability to accumulate assets, which reshape the capitals available to the household (Figure 1.2). The framework considers the vulnerability of households to shocks, trends, and stresses that place the household under pressure. These include shocks such as droughts, and pressures such as environmental degradation. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its assets, without undermining local natural capital (Carney, 1998). Finally, the SLF recognises that policies, institutions and processes influence the relationship between livelihood assets and activities, such as by regulating how households access and use local natural resources.

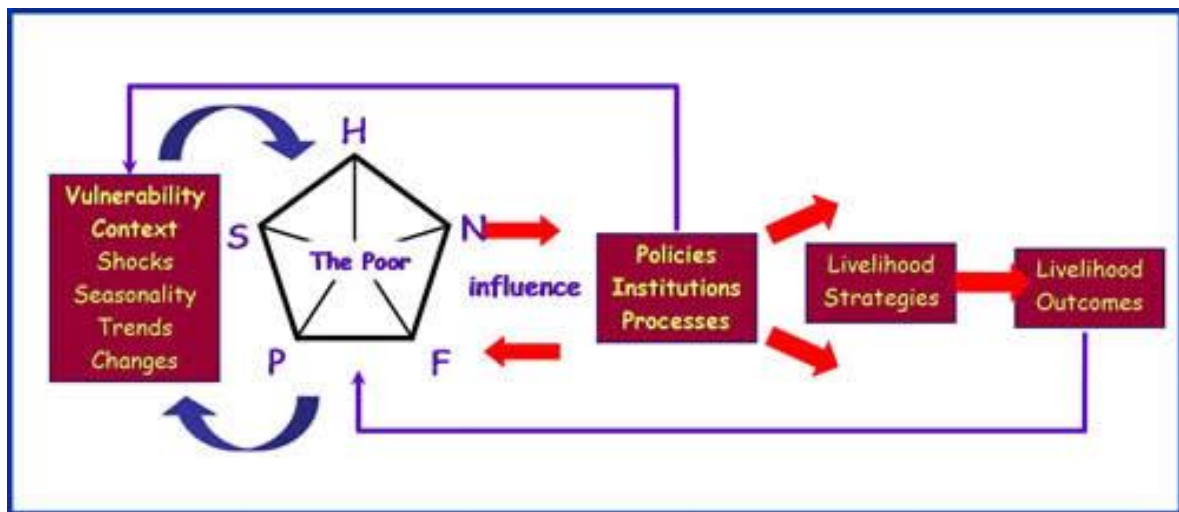


Figure 1.2. Sustainable Livelihood Framework (SLF) DFID, (1999)

It is important to note that households may diversify the strategies that they use to cope with shocks and stresses, depending on the assets available to them. Therefore, choices of capital to use when under pressure may vary across households depending on the household's characteristics (Babulo et al., 2008) and household ability to access capitals. Natural capital is one of the assets that is extensively used by rural people to make a living, and to cope during times of shocks and stresses. For example, households can increase consumption or sell forest resources temporarily to cope in times of crisis (Shackleton & Shackleton, 2004). This framework is useful for considering links between poverty and degradation because it provides a way of thinking about how poverty (low levels of financial and physical capital) might influence a household's dependence on natural capital, and conversely, how degradation, which is a depletion in natural capital, constitutes a livelihood stress with which households have to cope.

1.2.2. Environmental degradation

Environmental degradation has been seen as an outcome of the poverty-environment nexus (Duraiappah, 1998b). Human activities such as unsustainable natural use have played an increasingly important role in driving the environment beyond the carrying capacity, causing undesirable environmental change and depletion of natural resources (William, 1998; EEA 1999). Environmental degradation is a complex issue which results from a range of

unsustainable land use practices, and is influenced by socio-economic (e.g. poverty), political (e.g. governance), and natural (e.g. climate change) factors (Meadows & Hoffman, 2002; Gabriels & Cornelis, 2009; Hoffmann et al., 2014). For the purposes of this discussion, consideration of degradation will focus mainly on land degradation, and will exclude water and air pollution. In this context, definitions of degradation include loss of an ecosystem's ability to maintain growth and regeneration of its naturally occurring species, loss of biodiversity, loss of ecosystem function, deterioration of vegetation, loss of natural soil productivity, and a decrease in the capacity of an ecosystem to deliver ecosystem services to society (Barrow, 1991; Rahman, 2004; Stringer & Reed, 2007; Scholes, 2009; Thobejane, 2009). Although there is no single internationally approved definition of degradation, a common denominator in all of these definitions is that the undesirable environmental changes are directly or indirectly caused by human activities. At the same time, environmental degradation threatens the human wellbeing, especially the livelihoods of the poor who depend on natural resources (Shackleton et al., 2001).

Environmental degradation is becoming a concern in most part of the world (Warner, 1991), but it is more severe in Sub-Saharan Africa (SSA) because of the high dependency on natural resources by rural communities (driven by poverty), along with variable rainfall, weak institutional governance, and growing rural populations (Ward et al., 2000; Holden & Shiferaw, 2004; Chun-sheng et al., 2012; Hoffmann et al., 2014; Tsue et al., 2014; Nkonya et al., 2016). Rangeland degradation is regarded as a serious environmental problem particularly across the developing world (Hoffmann et al., 2014; Mussa et al., 2016), and has been reported in countries as diverse as China (Harris, 2010), South Africa (Hoffman & Todd, 2000; Manssour, 2011), Bangladesh (Bedunah & Angerer, 2012) and Ethiopia (Kassahun et al., 2008; Mussa et al., 2016). Common "syndromes" of rangeland degradation in SSA include 1) changes in plant species assemblages (e.g. bush encroachment; loss of palatable species), 2) Non-optimal harvesting (e.g. deforestation; overgrazing), 3) Hydrological change (e.g. falling water table), 4) soil and nutrient loss (soil erosion; nutrient depletion), and 5) climate change (Scholes, 2009). The socio-economic consequences of degradation for rural communities dependant on rangelands for forage and NTFP are exemplified in Ethiopia, where degradation was linked with increased poverty, exacerbating food insecurity, and tribal conflicts (Kassahun et al., 2008; Bedunah & Angerer, 2012; Mussa et al., 2016).

Within South Africa, land degradation is widely regarded as a severe and widespread environmental problem, especially in the communal lands of former *apartheid* homelands in Eastern Cape, KwaZulu Natal and Limpopo provinces (Wessels et al., 2004; Meadows & Hoffman 2000; 2002; Manssour, 2011). The communal areas are characterized by high human and livestock populations, overgrazing, soil erosion, excessive wood removal and the loss of more palatable grazing species (Hoffman et al., 1999; Hoffman and Todd 2000). Degradation threatens the local resource base upon which rural people's livelihoods in these communal areas depend (Shackleton et al., 2001).

1.2.3. Poverty

Poverty is one of the factors that has been blamed for having great influence on environmental degradation. The way poverty is measured and defined depends on the academic discipline and purpose of measurement and definition (Gordon & Spicker, 1999). Different types of poverty has been identified and explored, such as rural and urban poverty (Khan 2001), absolute and relative poverty (UN 1995), environment, ecological and climatic poverty (Lee, 2012), chronic and transient poverty (Jalan & Ravallion, 1998; Ribas & Machado, 2007) and many more. Dimensions of poverty are many and complex (Arnold & Bird 1999). Poverty often finds company with the terms such as relative and absolute deprivation, and lack of ownership of livelihood assets (Ribas & Machado, 2007).

In order to define poverty, Sen (1981) asked two important questions "Who are the poor?" and "At what level is poverty defined?" Another question on poverty measurement is "Should poverty be measured in absolute or relative terms" (Foster, 1998). During the nineteenth century, poverty researchers such as Charles Booth and Benjamin Seebohm Rowntree found it easy to define and measure relative poverty as it was a matter of counting the number of people engaged in a daily struggle to exist in the face of absolute hardship (Niemi, 2011). As poverty research developed, its definition and measurement became more difficult and complex. For example, traditionally measuring poverty focused on measuring food intake, income or consumption expenditures, while later it changed to a multi-dimensional approach that uses a large number of indicators to assess human wellbeing or standard of living (Sen, 1999).

Some researchers define poverty as a lack of basic material resources, low income and inability to acquire the goods and services that satisfy given minimum standards for each of the basic needs (Foster, 1998, Niemeitz, 2011). The World Bank also adopted the US dollar poverty line in its poverty definition. The most accepted poverty line internationally is the “US dollar (\$1.25) per day per person” (World bank, 2000). Even though this poverty line is accepted by many countries, the (World bank, 2000) cautions that it may not be suitable for all countries as different circumstances may influence the poverty line. Poverty lines vary in time and place because of differences in cost of living in countries. Therefore, countries may develop and use their own poverty lines which is appropriate for their level of development, economic, societal norms and circumstances (World bank, 2000).

Some researchers, and often the poor themselves, define poverty not only as lack of income or material, but as lack of basic services which include other dimensions such as bad health, illiteracy, lack of social services, etc., as well as a state of vulnerability and feelings of powerlessness in general (Kranz, 2001). People are ordinarily considered poor if they experience forms of lack that leads to suffering (Richmond, 2007). Sen brought in the capability and functioning perspective on the poverty definition (Sen, 1999). Sen posits that poverty includes the coupling of disadvantages between the income deprivation of a person and his/her ability to convert that income into functioning (a good living). Even though income cannot be used as the only variable in defining poverty, it is considered to be a major factor in poverty as lack of income can be principle reason for a person’s capabilities deprivation (Sen, 1999).

Focussing on South Africa (SA), rural areas, especially in the former homelands, are classified as regions with the highest poverty levels, based on the cost-of-basic needs poverty line assessments (STATSSA, 2018). Rural areas of SA show higher levels and severity of poverty than urban areas. The increase in poverty between 2011 and 2015 was also higher in rural compared to urban areas (STATSSA, 2018). About 5% of rural households report no cash incomes whatsoever, and for 12%, state pensions are their only source of cash income, while 26% rely on remittances from urban centres. Despite being rural dwellers, almost one million African households have no access to demarcated arable lands (Shackleton, 2006) and by most measures, the poorest provinces are those encompassing the most populous

former homeland areas, namely KwaZulu-Natal, Limpopo, and Eastern Cape provinces (Aliber, 2003). The state of poverty in South Africa cannot be understood without reference to the complex history that promoted inequality and discrimination by race (Kehler, 2001; Richmond, 2007).

1.2.4. Vulnerability to degradation

A key aspect of the nexus between poverty and the environment is how poverty shapes vulnerability of households to environmental degradation. Factors that determine community vulnerability are physical, social, economic or environmental (Singh et al., 2014). The most accepted definition of vulnerability is that used by the International Panel on Climate Change (IPCC) which defined vulnerability as *the degree to which a system is susceptible to, and unable to cope with, adverse effects* (McCarthy, 2001). Thus, the key parameters of vulnerability are 1) the stress to which the system is exposed, 2) its sensitivity to it, and 3) its adaptive capacity (Adger, 2006; Eakin & Luers, 2006). In the context of this thesis, the “system” under consideration is the household. The nature and degree to which the household or system experiences shocks (e.g. drought, floods, low agricultural yield) and stresses (e.g. environmental degradation) is defined as exposure. Sensitivity may vary considerably from one household to another (Preston & Stafford-Smith, 2009). Adaptation refers to the way in which a system (household, society) adjusts or changes in behaviour or characteristics as a way of improving its ability to cope with external stimuli (Smit et al., 2000). According to Adger (2006), the concept of vulnerability has been a powerful analytical tool for describing states of susceptibility to harm, powerlessness, and marginality of both physical and social systems, and for guiding normative analysis of actions to enhance wellbeing through reduction of risk.

The level of vulnerability to environmental or resource degradation differs depending on the factors such as household and individual characteristics, level of dependency and value placed on the resource (Maxwell et al., 1999; Nankhuni & Findeis, 2003). The rural poor are more vulnerable than other groups to social, economic and environmental shocks (Philip and Rayhan 2004; Aggrey et al. 2010). Mink (1993), further argued that poor rural households face higher levels of risk from various sources than better-off households, as

poverty exposes household to more shocks and stresses than their wealthier counterparts. Some of the factors that intensify their exposures are high dependency to natural resources due to lack of alternative options, and their locations which are often environmentally vulnerable or degraded (Rahman et al., 2010; Tsue et al., 2014). In many cases, factors that expose the poor to risk are beyond their control. Therefore, the perception that the poor use resources without planning for future should not be blamed on poverty only, but rather as the consequence of complex interactions among policy, markets, economic structures, institutional and social failure (Duraiappah, 1998).

Adaptation to environmental stresses does not occur without influence from other factors such as socio-economic, cultural, political, geographical, demographic, ecological and institutional that shape human-environment interactions (Yesuf et al., 2008; Eriksen et al., 2011). Adaptation is determined by the availability of resources and assets that one has to (Adger, 2003). These assets are interlinked and are important in determining the response strategy of households. For the purpose of this study, the DFID sustainable livelihood framework (SLF) has been used as a point of reference. The potential of the adoption of a particular coping strategy is influenced by set of factors, for example, behavioural factors such as risk perception, as well individual characteristics such as education, wealth, age and gender are all argued to shape choice of coping strategy (Berman et al., 2012). Responses to environmental stimuli vary and are influenced level by of exposure, perceptions, household's characteristics, individual traits, environmental, economic and political factors (Preston & Stafford-Smith, 2009).

Adaptation strategies to different shocks and stresses in African countries has been studied in various contexts, such as adaptation to food scarcity, climate change (including aspects such as drought, floods and increase in temperature levels), and environmental pollution (IPCC, 2001; Paavola, 2008; Ndambiri et al., 2013; IPCC, 2001; Adger, 2003; Osbahr et al., 2008; Smit & Wandel 2006). Most of these studies focused on adaptation of the agricultural sector to climate change, such as farmer's responses in to crop failures and reduction in grazing land (IPCC, 2001; Smit & Wandel, 2006; Osbahr et al., 2008; Agyei et al., 2014), aiming at increasing agricultural production in different regions including Sub Saharan Africa (SSA) (Kombo & Muchapondwa, 2015). Again, climate adaptation studies also focus on

adaptation of agricultural methods due to decline in crops and livestock production due to climate change, biophysical and social constraints (Chagumaira et al., 2015). For example, farmers adapt to climate by changing agricultural practice (e.g. crop variation, changing planting dates) (Bryan et al., 2009). In Ethiopia and South Africa, barrier factors influencing farmer's decision to adapt to climate change include lack of access to land, credit and government farm support and, wealth status. Some response mechanisms impact negatively on the environment (Paavola, 2008), which might exacerbate poverty and precipitate the downward spiral. Authors such as Makhado et al., (2009) and Shackleton and Shackleton (2003; 2004), point out that poor rural households, mostly in the developing world use, natural resources during times of stress and shocks (death of a bread winner) as a safety net. However, the influence of poverty on household vulnerability to environmental degradation is under-studied. In this study, household vulnerability to woodland degradation is assessed based on impacts (the results of exposure and sensitivity) and adaptive responses.

1.2.5. Environmental perceptions

Perceptions about local environmental problems, such as degradation, in less developed countries, is an understudied aspect of the PEN. National and international policy discussions on environment and development often take place without understanding the views of local residents, particularly the poor (White & Hunter, 2009). Better understanding of environmental perceptions and attitudes of residents in developing countries is thus needed to address the disconnect between international policy and local realities experienced by the poor (White & Hunter, 2009). Perceptions and attitudes about an environmental risk influence the adaptive capacity of communities and individuals exposed to this risk (Grunblatt & Alessa, 2016). Understanding local perspectives on environmental risks is therefore important in guiding communication about environmental risks and finding solutions that are appropriate within the local community context (Chanda, 1996; Grunblatt & Alessa, 2016).

Until relatively recently, most research on environmental perceptions focussed on developed countries (Moore & Thiongane, 2000; White & Hunter, 2009). In this context,

concern about environmental problems has been conceived of as a “post-materialist value” and environmental quality as a “luxury good” that is of little relevance to poorer people in less developed settings (Inglehart, 1995; Moore & Thiongane, 2000). The implications of environmental concern theory for Africa, where pressing environment problems occur in the context of poverty and common property resource systems, is unclear (Chokor, 2004). However, a growing body of scholars have started paying more attention to environmental perceptions in developing countries, particularly in relation to environmental change (e.g. Bollig and Schulte 1999; Chokor 2004; Anderson et al., 2007; Kgosikoma et al., 2012; Lykke, 2000; Sop & Oldeland, 2013; Twongyirwe et al., 2017). These studies show although that the rural poor in developing countries are indeed aware and concerned about local environmental change, this seems to be driven more by anthropocentric (human survival and wellbeing) than ecocentric (value of nature for its own sake) motives (Chokor, 2004). Nevertheless, it is clear that environmental perceptions among the rural poor are varied and complex.

Perception involves both the sensory reception of information about the world around us, and the cognitive processing of the information through various psychological and sociocultural filters (Silva et al., 2016). Perceptions are therefore shaped by individual factors such as age, gender, education, experience, and income, as well as other contextual factors such as religion, culture, livelihood and local environmental conditions (Stern & Dietz, 1994; Moore & Thiongane, 2000; Cinner & Pollnac, 2004; Cardona, 2012; Cerutti et al., 2015; Grunblatt & Alessa, 2016; Silva et al., 2016). Furthermore, value attached to a resource and level of impact and exposure to its degradation influences perception and level of concern and perception (Anderson et al., 2007). For example, pastoralists may be more likely than agriculturalists to perceive land shortages and rangeland degradation as a big problem, while women may be more likely than men to perceive fuelwood shortages due to deforestation as a serious issue (Chanda, 1996; Quinn et al., 2003). This implies that the way in which the local natural resources fit into a person’s livelihood strategy is likely to shape their environmental perception (Twongyirwe et al., 2017).

Most studies of environmental concern in less developed countries focus on factors such as age, gender, cultural context or direct experience of degradation (Hunter et al., 2010). Less

quantitative research has been done on the role of socio-economic factors in shaping environmental perceptions in these settings (White & Hunter, 2009; Hunter et al., 2010). The findings of the few studies that do consider the influence of wealth status on environment perceptions in rural Africa are variable and inconclusive, with some finding a strong socio-economic influence (e.g. White & Hunter, 2009; Twongyirwe et al., 2017) and others less so (e.g. (Hunter et al., 2010). This is clearly a knowledge gap in the PEN literature that needs greater attention.

The relationship between environmental perceptions, attitudes and behaviour is of interest to both researchers and environmental policy makers. There is an implicit assumption that by changing perceptions and awareness about environment issues, it is possible to change people's attitudes and behaviour in a way that promotes better stewardship of the environment by individuals and communities (Anderson et al., 2007). For this reason, environmental perceptions are usually studied in the context of how they influence people's attitudes, opinions, position and behaviour in relation to environmental issues (Barber et al., 2003; Gray et al., 2010; Sirivongs & Tsuchiya, 2012; Assefa & Hans-Rudolf, 2016). The specific links between perception, attitude and behaviour are conceptualized in different ways in the literature. For example, Tuan (1990) states that attitude (position one takes in relation to the world) is formed from a long succession of perceptions that are based on experiences. However, Grunblatt & Alessa (2016) use the issue of climate change to show that one's attitude to an environmental issue, which is shaped by one's beliefs and worldview, may also influence the way in which one processes information and makes sense of it, such as how one perceives environmental risk. In their study of perceptions and behaviour relating to water issues in South Africa, Anderson et al., (2007) conclude that behaviours aimed at mitigating environmental problems are strongly associated with perception of the problem. Vaske & Donnelly (1999), on the other hand, focus on how environmental attitudes shape intentions, and behaviour, while Stern (2000), argues that attitude and perceptions indirectly influence behaviour by shaping personal norms, and that other factors such as personal capabilities, place, and context, directly influence behaviour. It is not the intention of this thesis to resolve these debates, but rather to contribute insights on environmental perceptions in the context of the PEN. As pointed out by Moore

& Thiongane (2000), understanding the unique perspectives of the world's rural poor are essential for a truly global understanding of environmental perceptions.

1.2.6. The role of environmental governance

Internationally, there has been an increased awareness of the need to address environmental degradation and poverty simultaneously, especially on issues such as climate change and desertification (Onuoha, 2008). This was made evident by the adoption of the Millennium Development Goals (MDG) in 2000 and the Sustainable Development Goals (SDG) in 2015, which place emphasis on poverty alleviation and environmental management. However, as became evident in the Millennium Ecosystem Assessment, reversing environmental degradation while meeting the growing human demand for ecosystem services, will require changes to the environmental governance systems that are currently in place (Swiderska et al., 2008).

Poverty and high reliance on common property natural resources are often associated with weak governance (Campbell et al., 2001; Berkes, 2004;) In fact, weak governance (such as corruption and political marginalisation) is regarded as a key contributing factor to poverty and loss of biodiversity in regions such as the developing South (Swiderska et al., 2008). However, despite the large body of literature on governance of common property resources (e.g. Ostrom, 1990,2007; Bromley, 1995; Ostrom et al., 1999; Heltberg, 2001; Agrawal 2001, 2003; Francis, 2002; King, 2005; Quinn et al., 2007; Dietz et al., 2008; Swallow & Thondhlana et al., 2015; Findlay & Twine, 2018) little attention has been paid to the socio-economic dimensions of local environmental governance in the context of PEN.

Environmental governance refers to *“the set of regulatory processes, mechanisms and organizations through which political actors influence environmental actions and outcomes”* (Lemos & Agrawal, 2006). It therefore encompasses policies, institutions, actors, processes and power relating to management of the environment (Swiderska et al., 2008). Institutions are central to governance, and are the *“humanly devised constraints that structure political, economic and social interaction”* (North, 1991). Institutions are the ‘rules of the game’ that mediate access to and control over natural resources, and shape behaviour and

expectations of actors in relation to the environment (Heltberg, 2001; Bartley et al., 2008; Swiderska et al., 2008; Thondhlana et al., 2015). Institutions may be formal, such as rules, laws, and property rights, or informal, such as sanctions, taboos, customs, and codes of conduct (North, 1991). Some authors also include institutional actors, such as organizations, groups, and structures, in their definition of formal institutions, either explicitly or implicitly (Wells, 1998; Toulmin, 2009; Findlay & Twine, 2018), while others argue that these are distinct from institutions (Swiderska et al., 2008).

Typically, institutional actors that have decision-making powers, such as government or customary authorities, are the custodians and implementers of institutions. Customary actors, such as elders or traditional councils, enforce customary institutions including rules, sanctions, taboos and customary tenure (Virtanen, 2005). Government agencies enforce legislation and implement programmes. Actors and the institutions they enforce have a direct bearing on degradation, as they regulate and shape land use, land conversion, and types and quantities of resources extracted (Heltberg, 2001). Common property resource systems, such as those across most of Africa, are still usually governed by customary institutions and organizational structures (Findlay & Twine, 2018). However, they may additionally be subject to regulation by government agencies (Shackleton, 2009).

The institutions that are enforced, and the decisions and actions that are taken by governance actors are guided by, and are in support of, the organisation's policies. A policy is defined by Foy et al., (1998) as a process through which society identifies objectives by making choices between alternatives and the ways and means of achieving those goals. The Oxford English Dictionary defines a policy as *"A course or principle of action adopted or proposed by an organization or individual."* Policy, as a collection of individual policies, is thus a system of principles, plans and strategies used by an organisation to guide decisions and achieve desired outcomes. In the words of Mayers & Bass (2004), *"Policy is what organisations do,"*; it is not static, but continually evolves over time to address challenges. Policy is one of the tools that assists decision makers to manage challenges faced by the society or organization (Fakir, 1996). Importantly, these definitions are not limited to government; policy can be developed, adopted and implemented by governmental, private, or community organisations. Governance processes are the mechanisms by which these

organisations develop, implement, and review their policies and institutions (Swiderska et al., 2008).

Power determines the degree of influence that different actors can exert on policy and decision-making, and policies and laws may be unevenly enforced to serve the interests of the more powerful (Swiderska et al., 2008). This is important in the context of PEN because poor people, who are particularly dependent on the local environment for their livelihoods, tend to be marginalised from existing political structures and excluded from involvement in governance processes, such as formulating policies that impact on them Mayers & Bass, (2004).

The need for poverty alleviation was elevated to a national policy goal in South Africa after the birth of the democratic government in 1994 (Dargavel, 2006; Shackleton et al., 2006), and policies that are people-centred, encouraging stakeholders participation and sustainable use of forest and woodland resources, were developed. The 1996 White Paper on Sustainable Forest Development was developed in South Africa which resulted in the National Forest Act, 1998 (NFA) which provided the framework for sustainable development and stakeholders participation. NFA encourages sustainable utilization of natural resources. In an attempt to operationalize this practice, the former Department of Water Affairs and Forestry (now Department of Agriculture, Forestry and Fisheries – DAFF) adopted Participatory Forest Management (PFM) in 1996, while the Department of Environmental Affairs (DEA) adopted Community Based Natural Resource Management (CBNRM) as vehicles to address past imbalances and contribute on meeting the basic needs of previously disadvantaged rural communities through conservation and sustainable use of natural resources (Grundy & Michell, 2004). PFM and CBNRM have also been adopted by governments in other countries such as Tanzania (Sundström & Mustalahti, 2013) Malawi, and Zimbabwe (Campbell et al., 2003) as a policy approach to address poverty alleviation and sustainable environmental management.

In most developing countries, the PFM and CBNRM approaches have been and continued to be implemented with the assistance of donor funding such as The United States Agency for International Development (USAID), Danish International Development Agency (DANIDA),

and others (Department of water affairs and forestry, 2005; Garner, 2012). In South Africa, community projects such as beekeeping, medicinal plants gardens and arts and culture were implemented in early 2000 in provinces such as Limpopo, KwaZulu-Natal and Eastern Cape under the umbrella of PFM and CBNRM (Department of Water Affairs and Forestry, 2005; Sharaunga et al., 2013). The success of PFM in South Africa is debatable, as most of the projects did not survive beyond the donor funding. The sustainability of CBNRM and PFM as a management approach has been identified as a challenge in most African countries (Garner, 2012). Some of the reasons that are associated with the unsustainability of the PFM or CBNRM implementation are that projects have a tendency of being too short-term in nature and over-reliant on expatriate expertise. Furthermore, there is lack of clear criteria by which to judge sustainability or success in meeting conservation or development goals (Metcalf et al., 1994).

The participatory initiatives are complex and interdependent on several factors such as trust between stakeholders, the definition of a resource, cohesiveness of community management bodies, and locals accepting benefits derived from the forest among others (Hobley, 1996; Campbell et al., 2001; Grundy et al., 2004). However, PFM is a tool that can help forest managers to win the support of the adjacent local communities to promote good governance (Matiku et al., 2013). Chevallier & Harvey, (2016), also urged that communities that practice CBNRM in natural resource management have the potential of achieving good governance and benefit sharing. However, there must be effectively governed and a greater diversification of economic activities has to be encouraged (Kellert et al., 2000; Chevallier & Harvey, 2016). PFM policy is still regarded as a good management tool in natural resource management in SA, but it is still faced with multiple challenges such as funding, capacity to implement, trust among stakeholders and acceptable benefit sharing strategy by the local community.

1.3. RESEARCH AIM, HYPOTHESIS AND OBJECTIVES

1.3.1. Aim

The aim of this study was to assess the Poverty-Environment Nexus in three rural South African villages by investigating the influence of household wealth status on perceptions about degradation, vulnerability to degradation, and awareness and attitudes about local environmental governance.

This was achieved by addressing the following objectives:

1.3.2. Objectives

Objective 1

To assess perceptions of individuals from households of varying wealth status about aspects, causes, and solutions to local woodland degradation.

Key questions

- How does wealth status differentiation influence what is perceived as woodland degradation?
- What are the similarities and differences in what is perceived as causes of woodland degradation by individuals from households of different wealth status?
- How does wealth status influence perceived solutions to degradation suggested by individuals?

Objective 2

To investigate how wealth status influences vulnerability to woodland degradation in terms of how it impacts on households and their choice of responses.

Hypothesis: Poorer households are more vulnerable to woodland degradation than wealthier households

Key Questions

- How does woodland degradation impact on the livelihoods of households across a range of differing wealth status?
- How does wealth status shape choices of response strategies of households to woodland degradation?
- What are the mechanisms developed by households of different wealth status in order to respond to woodland degradation?
- Do response strategies involve the sustainable management of woodlands?

Objective 3

To explore the influence of wealth status on local people's awareness and attitudes regarding environmental governance in their local context in a rural communal landscape.

Key Questions

- Does wealth status influence choices of institutional actors that are perceived as important in woodland management?
- How do people from different wealth status perceive the roles of government laws in ensuring sustainable resource use and protection?
- How do local people, traditional leaders and government officials from DAFF and DEA perceive the effectiveness of environmental laws used to manage and protect woodland resources
- How does the present environmental governance system address PEN?

1.4. THESIS STRUCTURE

This thesis is arranged in six chapters as shown in Figure 1.3. Each chapter has a brief introduction and literature review building on the review done in Chapter 1. Chapters 3, 4 and 5 are the data chapters, based on the objectives of the research and are written in a format of scientific papers. They have data analysis, interpretation and discussion.

Chapter 1: Provides a background and general introduction of PEN. Theories that surround PEN were explored, including and useful frameworks for assessing the PEN. This chapter

also defines relevant terms and concepts. Finally, it outlines the rationale for the study and aim and objectives.

Chapter 2: Describes the study area in terms of geographical settings, demography, and vegetation composition. Methods common to all chapters are described, including sampling (individual and household), data collection (questionnaire, key informants, focus groups) and data analysis (qualitatively and quantitatively).

Chapter 3: Investigates perceptions of individuals about local woodland degradation. The influence of wealth status on Local people's perception of their local woodlands were investigated in relation to what was perceived as the degraded the causes of local woodland degradation, the contribution of households to woodland degradation, and perceived solutions of woodland degradation

Chapter 4: Investigates the influence of wealth status on household vulnerability to degradation in terms of the impacts of woodland degradation on households and their responses to it. Level of resource use by households of different wealth status and impacts of woodland degradation on households was also assessed.

Chapter 5: Investigates the influence of wealth status on people's awareness and attitudes regarding environmental governance of their communal woodlands. It further investigates the influence of wealth on awareness and attitude of environmental governance structures, specifically traditional and departmental governments

Chapter 6: Is the synthesis chapter, which presents a summary of results, key findings, cross-cutting themes, general discussion, conclusions and recommendations.

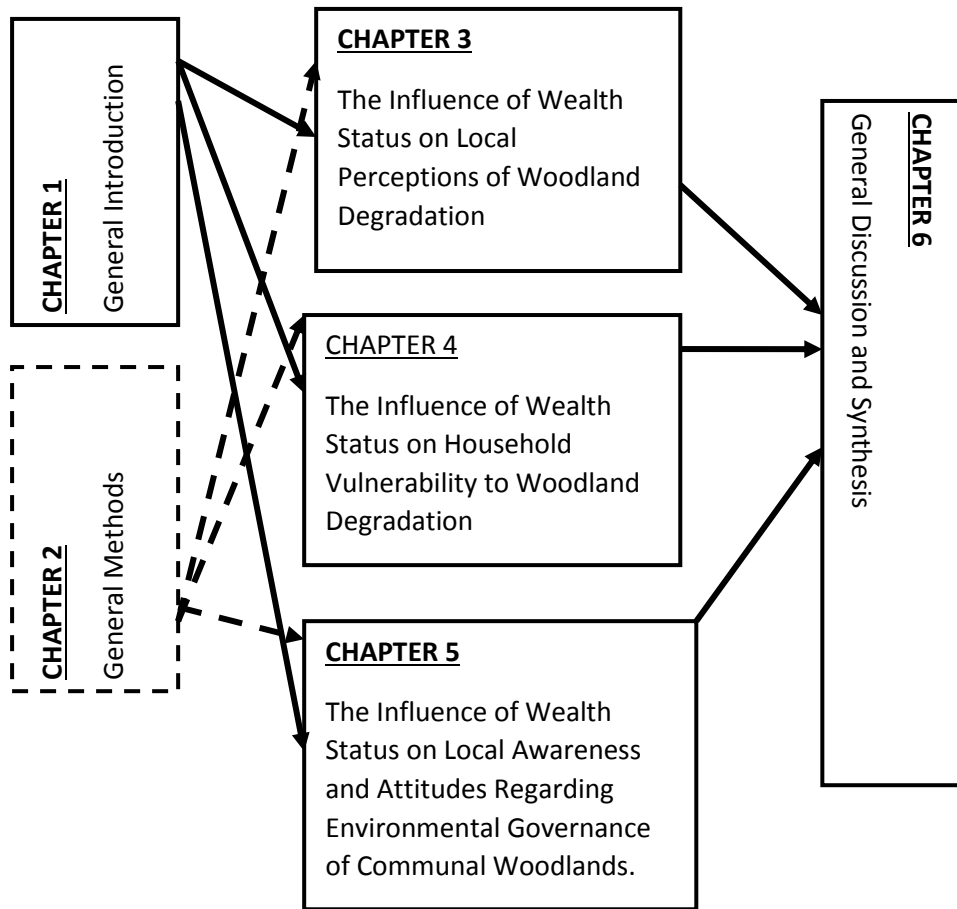


Figure 1.3: Thesis Structure

CHAPTER 2

DESCRIPTION OF STUDY AREA AND METHODOLOGY

2.1. STUDY AREA

2.1.1. General description of Limpopo Province and Vhembe District Municipality (VDM)

The study was conducted in the Vhembe District Municipality (VDM) of Limpopo Province situated in the most northerly part of South Africa (Figure 2.1). Limpopo Province, which covers an area of approximately 123,910 km², is one of the poorest and most rural provinces in the country (Gyekye & Akinboade, 2003; Stats SA, 2016). Most of the province is also regarded as severely degraded in terms of soil erosion and vegetation cover (Hoffmann et al., 2014). Figure 2.2 shows severe vegetation degradation in the far north of the province, where this study was conducted.



Figure 2.1. Map of Limpopo Province, South Africa, showing district municipalities, and the constituent local municipalities of the Vhembe District Municipality

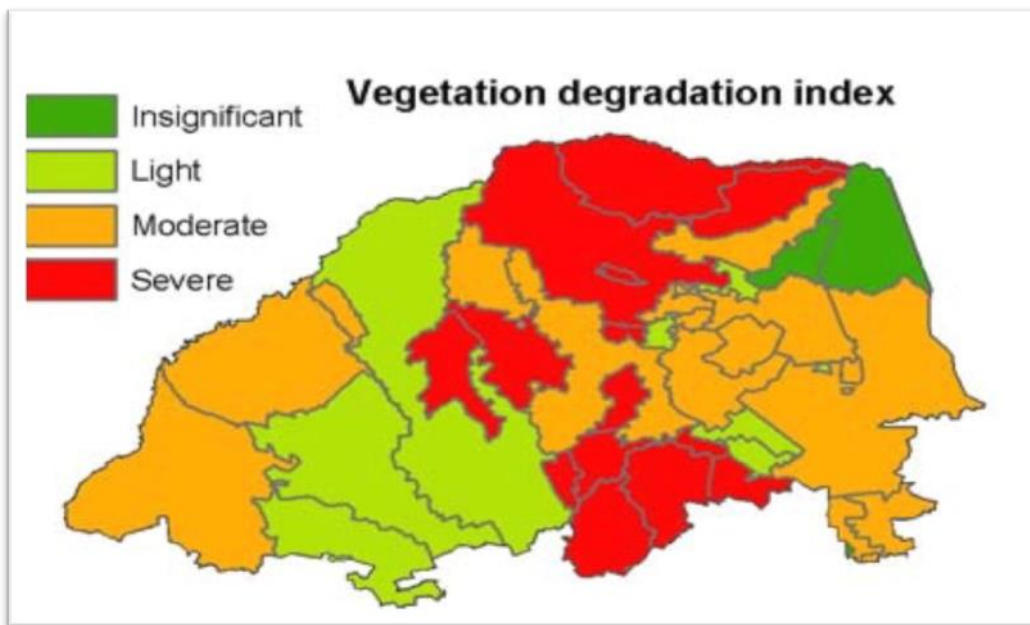


Figure 2.2. Vegetation degradation index map showing severity of vegetation degradation in Limpopo Province [Source: Hoffman et al., (1999) in Gibson (2007)]

The VDM is situated in the northeast of the province, covering 21,402 km² and is largely rural (Vhembe municipality (IDP), 2010/11-2015/2016). The district's population of 1.3 million people is predominantly black (Stats SA, 2011). VDM consist of four local municipalities, namely Thulamela, Mutale, Musina and Makhado. The study was conducted in Mutale and Thulamela local municipalities that share borders with Zimbabwe in the north, Mozambique in the east, Makhado Local Municipality to the west and Thulamela Local Municipality to the south (Mutale municipality (IDP), 2012/2013-2016/2017). The famous Kruger National Park forms the eastern boundary of Mutale Local Municipality, with the Limpopo River forming the border between Zimbabwe and South Africa forming the north-eastern boundary.

The climate of Vhembe is typically subtropical, with mild, dry winters and wet, warm summers characteristic of the lowveld. The rainfall pattern is largely influenced by the orographic rain effect of the Drakensberg (Wolkberg) range situated south of Vhembe and the Soutpansberg Mountains falling within the district. The mean annual rainfall is between 334 mm in the west and 432 mm in the east (Mucina & Rutherford, 2006). Vhembe is

situated within the savanna biome (Limpopo DFED, 2004; Mucina & Rutherford, 2006). It is faced with over-exploitation of resources resulting in land degradation (Mutale Municipality IDP 2012/13-2016/17) and infestation with invasive plants. The VDM is also underdeveloped, having inherited the apartheid legacy of poorly serviced rural areas (Dau, 2010). Poverty is known to be high among the black population in the study area, with approximately 65% living in poverty (Vhembe IDP, 2012/13-2016-17).

This study was conducted in the VDM local municipalities of Thulamela and Mutale, both of which were previously part of the *apartheid* homeland of Venda. The apartheid settlement policy involved forced relocation of black people per ethnic group and resulted in high population concentrations of native South Africans in the rural homelands (Munyati & Kabanda, 2009). Environmental degradation is widespread in the former homeland areas in South Africa, including Thulamela and Mutale (Gibson, 2007; Hoffmann et al., 2014). The homeland system was dismantled in 1994, as part of the transformation of South Africa into a democratic state, and all of the homelands in the country were absorbed into the nine newly created provinces (Munyai & Kabana, 2008).

The land tenure system in Thulamela and Mutale is communal. The use of local natural resources is governed by traditional authorities consisting of chiefs, village headmen and local councillors. Tribal councils are also the local traditional governance structures used by communities to organize themselves. The traditional authorities regulate resource use, allocation of land for cultivation, and enforcement of traditional taboos relating to environmental management. After democratic change in South Africa in 1994, the structure of tribal councils was determined by the Traditional Leadership and Government Framework Act 41 of 2003 (TLGFA) which requires that tribal councils are composed of 60% of people chosen by the chief and 40% democratically elected from the community. This Act gives tribal councils powers in land management or dispute resolution in their land. They also represent communities with respect to development initiatives. The local and provincial governments also play a role in local natural resource management.

2.1.2. Study villages

The study was conducted in three villages in Vhembe district, namely Matshena and Maholoni in Mutale local municipality, and Xigalo in Thulamela local municipality (Figure 2.3). A large part of Mutale and Thulamela municipalities are considered severely degraded (Figure 2.3). According to Mutale municipality IDP (2012/2013-2016/2017), high deforestation and infestation by alien invasive plants are the main contributors to vegetation degradation in these local municipalities.

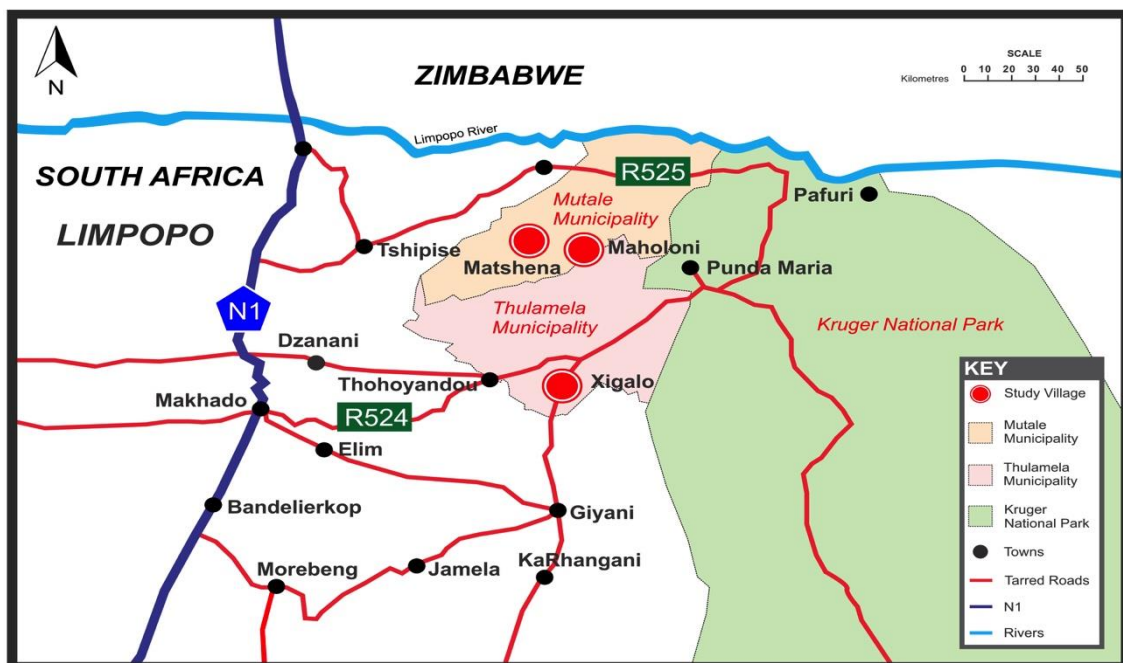


Figure 2.3. Map of the study area showing three study villages

The three villages were selected to represent a range of village sizes and related levels of severity of degradation in order to derive generalizable conclusions rather than to compare results across villages. These three villages, are typical of settlements in similar rural settings, and are characterized by lack of basic services and access to adequate health care and quality schools. Most villages have poor road infrastructure and water supply (Mutale IDP 2012/13-2015/16). Households generally collect water from communal taps, but in some instances where there is no tap, people need to walk long distances to collect water from rivers and fountains (Mutale IDP, 2012/13-2015/16). Furthermore, households do not have access to water-borne sewerage services. However, most households have access to electricity, which is mainly used for lighting due to the prohibitive costs of cooking

appliances and the energy they consume (Stats SA, 2011). The majority of the residents live in traditional dwellings that are, in terms of the South African rural development programme (RDP) standards, described as inadequate housing (Mutale IDP 2012/13-2015/16). The most common house structures are traditional huts made of mud bricks and thatched roofs. The government has set out to provide the poor households with the RDP four-roomed houses to address some of their socio economic problems (White Paper on Reconstruction and Development, 1994).

The main source of employment is in commercial or subsistence agriculture (STATSSA, 2011). Due to high levels of unemployment, state child support and old age pension grants are important in supporting households. Employment levels in the three study villages is low due to underdeveloped economies in the municipalities which results in people leaving the villages as labour migrants (Mutale IDP, 2012/13-2015/16). The average employment rate for the three villages is just above 5%; the higher the population per village, the lower the percentage of people employed (Table 2.1). Most households supplement their income by practicing subsistence farming with goats, sheep, cattle and donkeys, as well as rain-fed cultivation of crops such as water melon and maize. A high proportion of village residents depend on natural resources such as firewood, grazing land and wild fruits both for household consumption and income generation. The predominant language in Matshena and Maholoni is Tshivenda, while in Xigalo, Xitsonga is mainly spoken.

Table 2.1. The total population size and employment rate in the villages (STATSSA, 2010)

Village	Co-ordinates	Total Population size (included people under 15 years)	Employment rate
Xigalo	S 22° 92 95 E 30° 71 97	7,670	4.9%
Matshena	S 22° 39' 20 E 30° 50' 35	1,297	5,5%
Maholoni	S 22° 39' 35 E30° 48' 55	711	7.8%
Total		9 678	5.2%

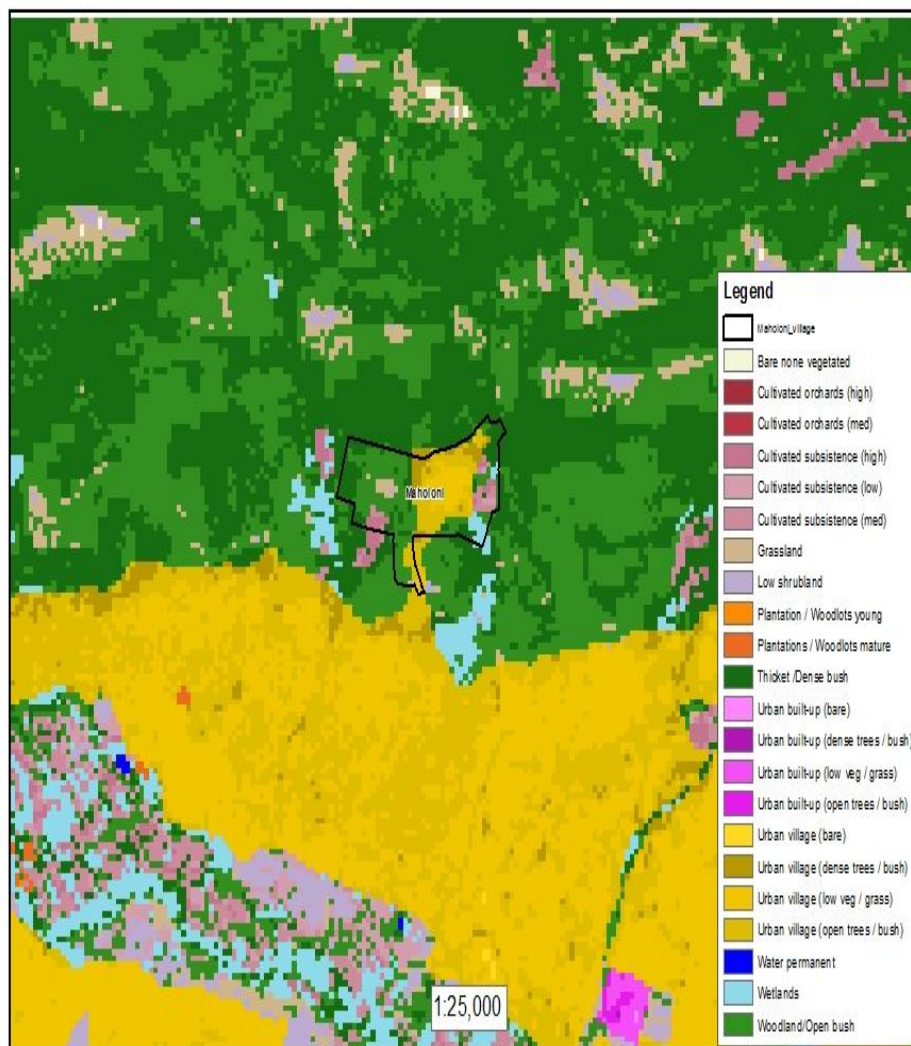
The nearest towns to Maholoni are Thohoyandou, which is about 60 km away, and Tshilamba which is 45 km away. The villages neighbouring Maholoni are Makhuya, Thondoni, Lamvi and Fandani. Neighbouring villages for Matshena are Zwigodini, Maseya and Tshipise. Residents of Matshena buy most of their household goods from Thohoyandou, which is 78 km away, and Musina, 108 km away. Matshena is situated approximately 30 km east of Tshipise (Hutten, 2003). Xigalo is near the Kruger National Park's Punda Maria Gate. Villages neighbouring are Tshikonelo, Mulenzhe, Khakhanwa and Vuwani. Xigalo is serviced by two towns; Malamulale which is 8, km away on the R81 and Thohoyandou which is 35 km away on the R524. Public transport is the main mode of transport to major towns for all three villages.

Study village selection was based on local knowledge and experience of the researcher who has been an environmental officer in the province for over 17 years. Furthermore, land cover maps from the National Department of Environmental Affairs (DEA) for 2009 and 2014 were used to compare vegetation cover change qualitatively over five years in the three villages under study (Figure 2.3, 2.4, 2.5). The 35 national land cover classes were used to interpret the maps. In terms of degradation, the three study villages represent less (Maholoni), intermediate (Matshena) and highly (Xigalo) degraded contexts in terms of change in vegetation cover. The village classification also recognized soil erosion which was visually observed during site visit as other forms of undesirable environmental change

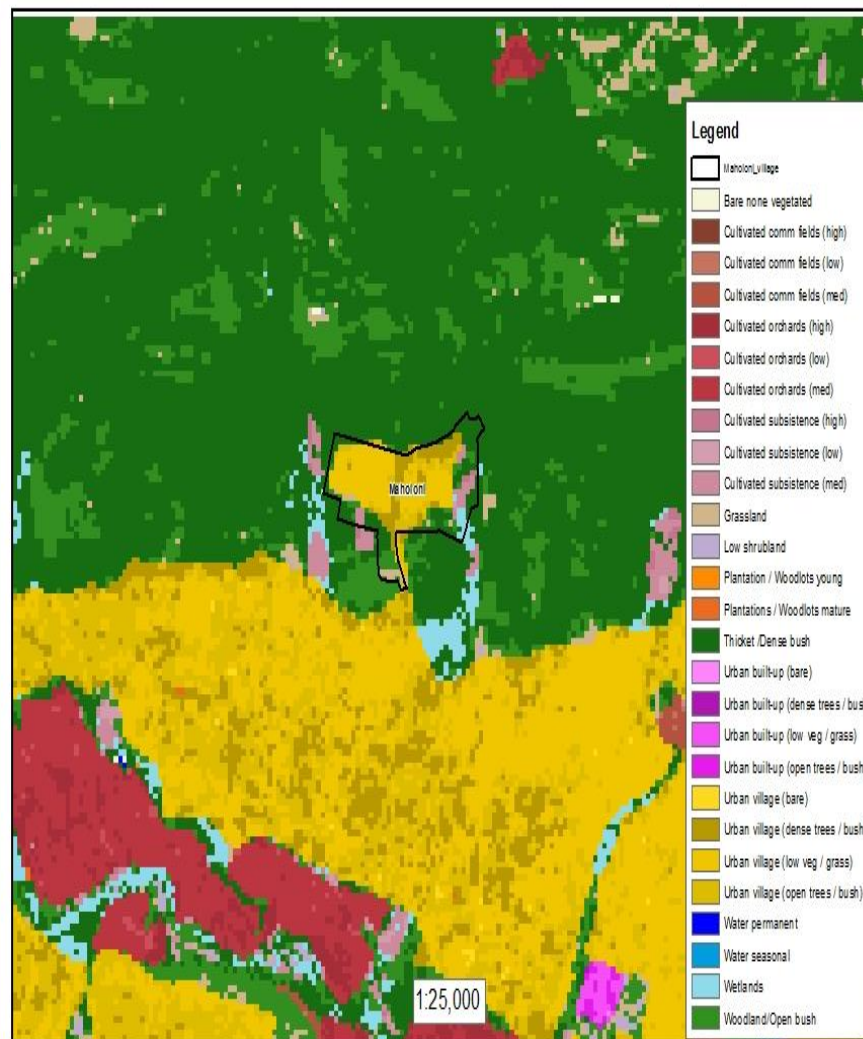
Over the course of the five years between 2009 and 2014, the vegetation around Maholoni has become thicker, with much of the open bush having become denser, probably due to bush encroachment. Matshena has also shown densification of bush, but in contrast to Maholoni, agricultural land has decreased, and open bush has increased. There is also an area of grassland south of Matshena that has remained relatively unchanged. Xigalo has had bush encroachment in the north-west, while in the east the vegetation has become more open. Neighbouring villages have also encroached into vegetation and agricultural land (Figure 2.4 -2.5).

Maholoni has a small population of 711 people is the least degraded surrounding communal lands relative to the other two villages (Figure 2.4). It is surrounded by mountains with rocky terrain and shallow soils. Matshena is in a low-lying area characterised with red sandy soils (Hutten, 2003). It can be regarded as 'medium' both in terms of level of land degradation (Figure 2.5) and population size relative to Maholoni and Xigalo, with 1,297 inhabitants Xigalo is in a low-lying area at risk of flooding and soil structure is mainly loamy sandy (Acocks, 1988). It is the village surrounded by the most degraded land relative to the three villages under study (Figure 2.6) and has the highest population at 7,670.

Musina Mopani Bushveld, Limpopo Ridge Bushveld and Makulela Sandy Bushveld vegetation types (Mucina & Rutherford, 2016) characterize the vegetation of Maholoni and Matshena. The most dominant tree species in the vicinity of Maholoni and Matshena are the mopani (*Colophospermum mopani*), baobab (*Andansonia digitata*) and marula (*Sclerocarya birrea*). The local vegetation of Xigalo, on the other hand, is classified as lowveld Mopaniveld Savanna (Rutherford et al., 2006). The most dominant tree species in the vicinity of Xigalo are *Colophospermum mopani*, *Sclerocarya birea*, and *Acacia* species. Throughout this thesis, the generic term "woodland" is used to refer to the vegetation around these villages. In the South African context, woodland is defined as a group of indigenous trees which are not a natural forest, but whose crowns cover more than five per cent of the area bounded by the trees forming the perimeter of the group (NFA, no.84. 1998).

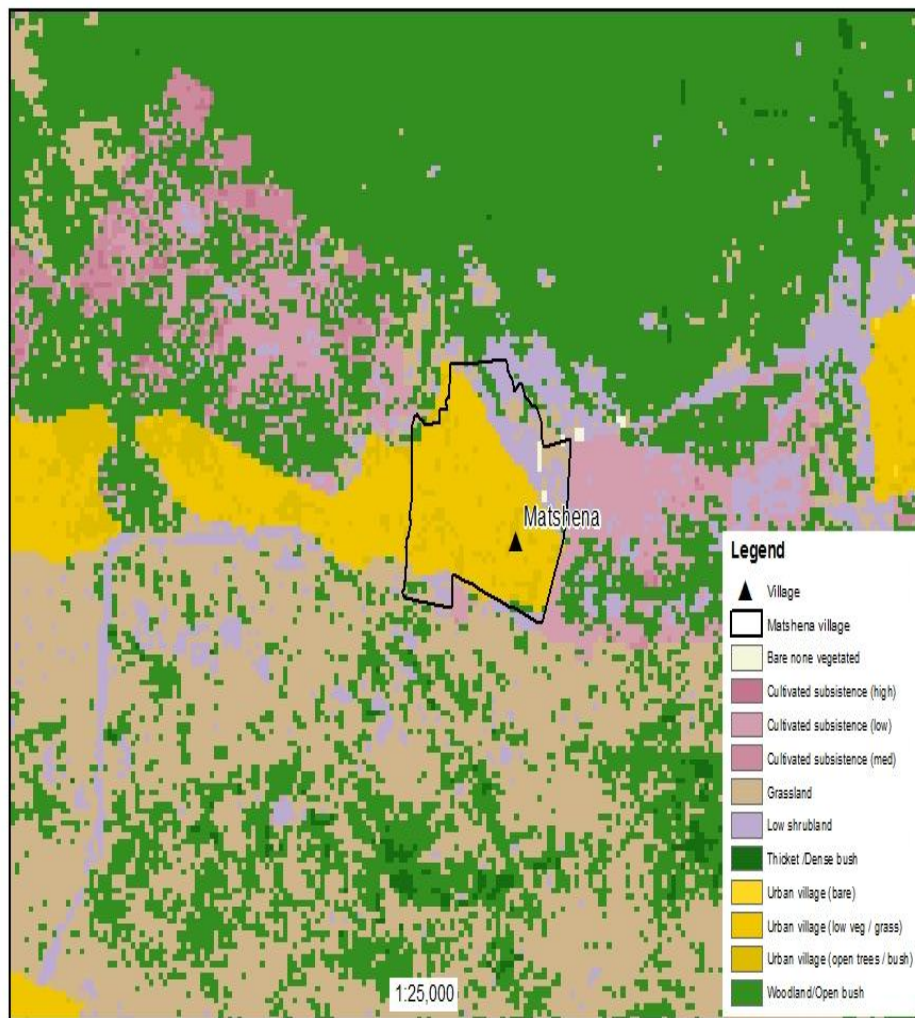


Maholoni Map A 2009



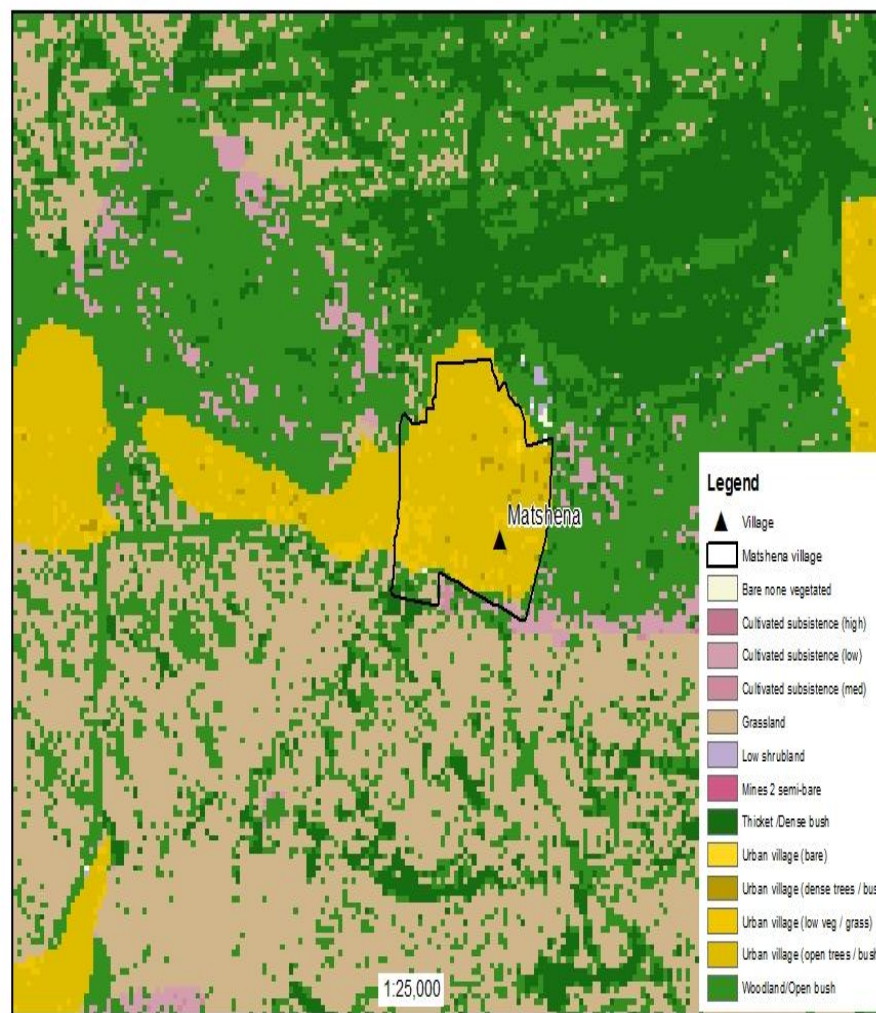
Maholoni Map B 2014

Figure 2.4 Land cover for Maholoni village in a) 2009 and b) 2014.

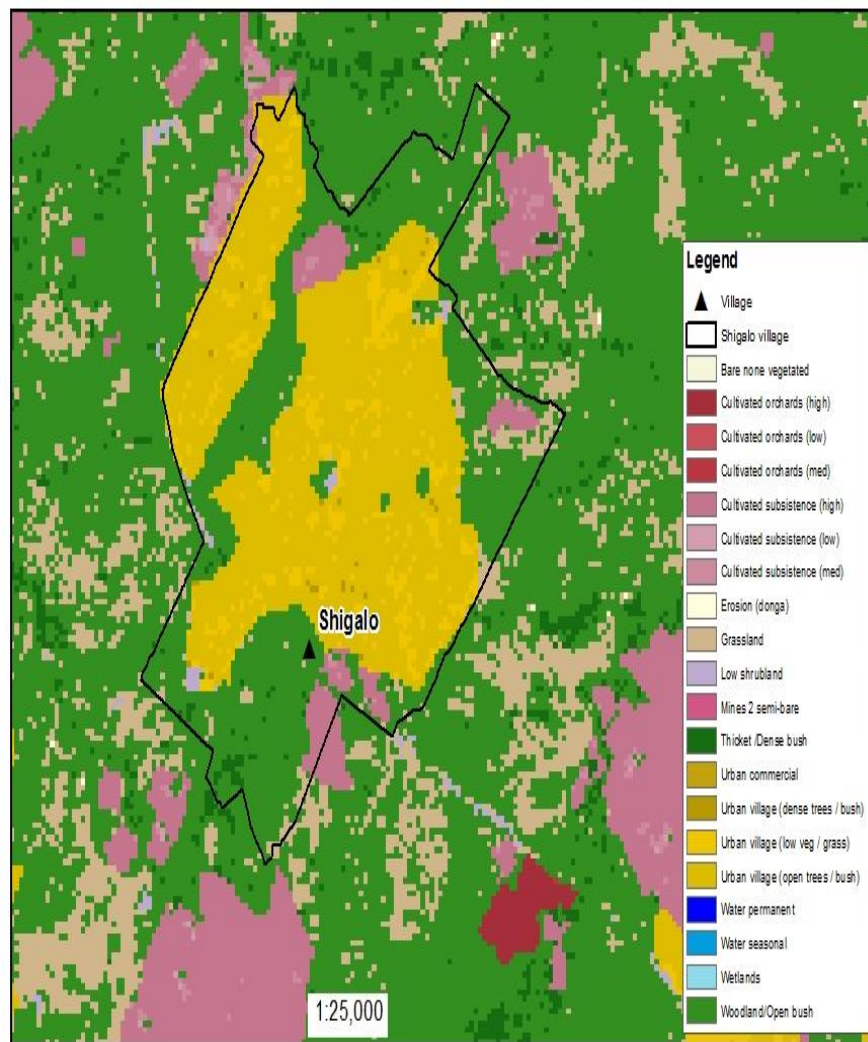


Matshena Map A 2009

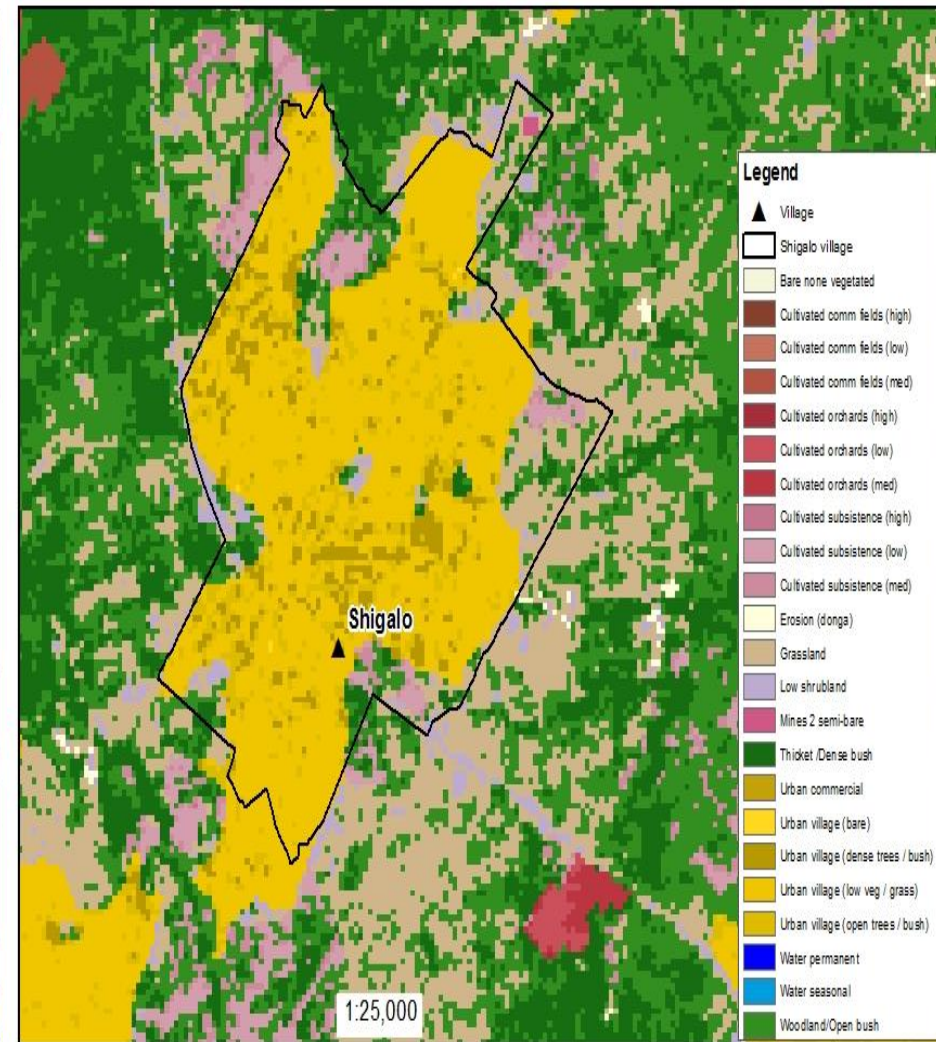
Figure 2.5. Land cover for Matshena village in a) 2009 and b) 2014.



Matshena Map B 2014



Xigalo Map A 2009



Xigalo Map B 2014

Figure 2.6. Land cover for Xigalo village in a) 2009 and b) 2014.

The dominant species in all three study villages are highly utilized by both humans and animals. Mopani, marula and baobab trees are some of the commonly woodland resources used to support livelihoods in these three study villages. Mopani, baobab and marula are considered to be over exploited or threatened species. In order to control harvesting and use of these trees, they are protected by Department of Environmental Affairs (DEA) and Department of Agriculture, Forestry & Fisheries (DAFF) through The National Forest Act no 84 of 1998 (NFA) Limpopo Environmental Management Act no. 107 of 1998 (LEMA). Trees that are protected cannot be damaged or transported without a permit from the relevant departments.

Mopani trees are used for both subsistence and commercial purposes. Mopani wood is widely used as a source of energy for cooking and heating (Makhado et al., 2014). It is also used as a medicinal plant and the wood ash is used as a fertilizer (Mashabane et al., 2001). The tree also hosts mopani worms (caterpillars of *Gonimbrasia belina*), especially during the summer season (Mojeremane & Lumbile, 2005). Mopani worms are one of a number of edible insect species eaten by communities in the study area and its broader environs. The worm is known for its high nutritional value (Mojeremane & Lumbile, 2005), and thus forms an important part of residents' diet. Some villagers sell mopani firewood and worms to urban dwellers and shop owners because it is a preferred wood-producing species for braai (barbeque) purposes. Mopani wood is, in fact, claimed to be the best firewood in southern Africa (Mashabane et al., 2001) resulting in high demand that in turn increases harvesting. The marula tree is mostly used for medicinal purposes and its fruits are also used to make marula beer. In many communities, this species is protected by the local chiefs because of the valuable fruit used to prepare marula beer, which is used during traditional events and as a drink in households. Local sale of marula beer as a supplementary income source is becoming increasingly common (Shackleton et al., 2008). The baobab tree has multiple uses, and is used for food, fibre and medicinal purposes and some of its products are sold across Africa. Importantly, the seed oil derived from baobab fruits had recently gained recognition (Sidibe & Williams, 2002). Based on this demand, its fruits are collected from the wild and sold to factories to prepare baobab oil.

2.2. GENERAL METHODS

This chapter presents the study design and methods used that are common to all data chapters: Chapter 3, Chapter 4 and Chapter 5. The methods sections of these three chapters give more detail and describe methods specific to those chapters.

2.2.1. Study design

This study investigated the influence of household wealth status on perception, vulnerability, and awareness and attitudes about environmental governance about woodland degradation in the three villages. In order to achieve the study objectives, a mixed-methods approach was used. The process was started in focus group discussions in each village. This was followed by data collection via household surveys, individual surveys, and finally, key respondent interviews. The focus group discussions held in the study villages and key respondent interviews were also conducted with officials who provided information that supplemented the household and individual surveys. The survey was used to collect data at both the household level (e.g. wealth status; resource use; impact of degradation) and the individual level (perceptions and attitudes relating to degradation) and governance. The sampling unit in the survey was a household, which was defined as a group of people who live together at least four nights a week, eat together, and share resources, or a single person who lives alone (STATSSA, 2003)

2.2.2. Focus group discussions

People of 21 years and older were recruited in each village to participate in focus group discussions. This was achieved with the help of community leaders who invited people to participate on the group discussion during the local community meeting. A date for the focus discussion was circulated to those who agreed to be part of the focus group discussion. Information-gathering via focus groups enabled the research to be introduced to the villages, and allowed the target community to bring up key issues to be noted. Focus groups were further used to further gain more general background information and insight about: the village

characteristics; types of non-timber forest products (NTFP) commonly used; perceptions about woodland degradation; understanding of environmental governance; and vulnerability of local people to woodland degradation.

Two focus groups were held in each of the three villages so that there could be separate males and female meetings. This was done because traditional gender dynamics could otherwise have hindered female participants from contributing to the discussions due to the presence of males. The participant group size ranged from five to eight, depending on people's availability and willingness to participate (Table 2.3). Participatory Rural Appraisal (PRA) techniques were used during focus group discussions. PRA is a commonly implemented set of techniques used to gather information from a community. The appraisal makes use of settings and processes that are relaxing and informal, respectful of differences in ideas and practically-oriented (Chambers, 1994). To ensure inclusion of all participants, the appraisal conducted involved getting respondents to express information using visual means, such as with pictures, rather than written words. Participants were encouraged to give their views on, and examples of, topics under discussion. During focus group sessions, information was recorded using an audio tape after the consent of the participants was obtained. Some of the data gathered during the focus group discussions were used to inform the development of the survey questionnaire, especially for the pre-listed options, resource use and for questions where binary responses were required.

Table 2.2. Participants in focus group session per village

Village	Number of focus group participants	Total number of focus group participants per village
Maholoni	6 females	13
	7 males	
Matshena	8 females	14
	6 males	
Xigalo	5 females	13
	8 males	

2.2.3. Household, individual and key respondent sampling

For the household survey, the confidence level of 95%, with a 10% margin of error and village relative size was used to determine the sample size. A total of 213 households were sampled in the study area. Table 2.2 indicates the number of households per village. Households were randomly sampled as follows: firstly, a list of stand numbers of all households in each study village was obtained from the tribal council and local civic structures. Households were randomly selected from the list and a member of tribal council and civic office -bearers accompanied the researcher to physically identify the households before data were collected. One participant per randomly selected household was selected for the individual surveys of perceptions, awareness, and attitudes.

Table 2.3. Village sample size (n = 213)

Village	Number of households per village	Number of households sampled
Xigalo	290	115
Matshena	248	63
Maholoni	185	35
Total	723	213

Only one member of the household was interviewed from each of the sampled households. The criterion sampling technique was used to sample individual respondents within the sampled households. This technique involves selecting cases that meet some predetermined criterion of importance for the study (Patton, 2002). In this case, age and the number of years that the respondent stayed in the village were the predetermined criterion. The respondents were identified as any member of the household who was above 21 years (i.e. adults) who could be interviewed without consent of their parents or guardians. Furthermore, they had to have lived in the sampled village for ten years or more. Therefore, they were regarded as being of sufficient age to have observed environmental changes over their lifetime, and it was assumed that they would have developed views on environmental issues by such an age. The respondent was any member of the household who met the set criteria and who was available in the sampled households during the day of the interview. An attempt was made to select individuals who met these criteria from a range of age and gender classes.

Data on individual characteristics of respondents such as age, gender, and educational status were collected, as these influence an individual's perceptions and experiences (Feinstein et al., 2006; Assefa & Hans-Rudolf, 2016). The individual data were grouped into categories; for example, age = 21-30, 31-40, 41-50 and 51 and above; education = no formal education, primary, secondary and tertiary; gender as male and female. Data for Chapters 3 and 5 were at the individual unit of analysis and for Chapter 4 was at a household level.

The survey was conducted in 2014 and 2015, coinciding with a drought period in South Africa. Limpopo Province was one of the provinces that was declared a disaster area by the national government (Stats SA, 2016). During this period, agricultural yield was low compared to past years of good rainfall and there was poor crop yield which exacerbated food insecurity of the poor rural households (AGRI SA, 2016). It is thus possible that there was greater reliance on NTFP than usual, especially among poorer households who were more dependent on woodland resources as safety nets or livelihoods support. However, although the drought may have

accentuated wealth-related differences in resource use and perception and experience of woodland degradation, it is unlikely that the direction and nature of these relationships were substantially altered by it. Given the climate change predictions for the Limpopo region of the country, the frequency and intensity of droughts are likely to increase over the coming decades, making the context of the study highly pertinent. Nevertheless, the influence of drought on respondents' perceptions of woodland degradation and level of resource use was accounted by the way in which questions were structured. For example, respondents were given an opportunity to define woodland degradation based on their own understanding and on what was observed over the past 10 years, responses were not only based on what was observed during the year of data collection. The pre-list included different possible causes ranging from environmental, social and governance factors and respondents were also allowed to add any option that they thought was missing. Questions were structured in a way that respondent had to justify their first response especially where the answer was either 'yes' or 'no'. Furthermore, the criterion used to select the participant was that they should have been living in the village for 10 years or more, the assumption being that they had witnessed change in woodland structure and availability over 10 years. This was done to avoid respondents giving responses based on their experience of the current drought years only.

2.2.4. Questionnaire pilot testing

The questionnaire pilot testing for household and individual surveys was conducted in three villages, one in each of the sampled municipalities with the local leaders and six community members. The group represented various subgroups that were intended to be interviewed in order to test the following:

- a) Is the research tool (questionnaire) suitable for the sample?
- b) Are there any errors that need to be corrected?
- c) How can the response rate be improved?
- d) Does the questionnaire take an appropriate amount of time to complete?
- e) Do any of the questions made respondents feel uncomfortable?

f) Finally, do respondents understand the questions?

The questionnaire pilot testing was done using the “think aloud interview” method, which allowed almost everyone to participate without being limited, by their literacy level. The researcher read questions from the questionnaire to an individual respondent and allowed him/her to respond based on their understanding. It was emphasized that there was no wrong or correct answer. Respondents were asked to indicate those questions that were difficult to respond to, or which made them feel uncomfortable. After pilot testing, the researcher analysed the response pattern and revised questions that needed clarification. After considering feedback from the piloting exercise, some questions were rephrased for greater clarity and the full survey (individual and household) was prepared. The key informant interview questionnaire was not piloted.

2.2.5. The survey process

The primary survey data were collected using questionnaires. Consent was obtained from participants before commencing with interviews. The purpose of the survey was first explained to the participants before starting to avoid raising expectations that may influence responses and bias of the respondents. The questionnaire was divided into five sections, namely 1) household demography (individual and household characteristics including assets owned, income sources housing structure), individual perceptions (aspects, causes and solutions to woodland degradation), household vulnerability (impacts and response strategies) and governance (awareness and attitudes about traditional and government institutions responsible for managing the communal woodlands). Lastly, the resource use part of the questionnaire included a checklist of all resources derived from the woodland (excluding aquatic and abiotic resources) that are utilized by the household. The same questionnaires were used in all three villages and translated into local languages for greater understanding for those participants who are illiterate (Appendix A).

The household survey questionnaire covered household characteristics, including assets and income sources used to derive a wealth status score, household use of woodland resources, impacts of degradation on the household, and household's response to undesirable woodland change. The individual survey covered individual perceptions about degradation, and awareness and attitudes about local woodland governance. More detail is given in the relevant data chapters.

In order to gather more information, the questionnaire was structured in a way that allowed respondents to choose 'yes' or 'no' answers, or define some phenomenon, and in other sections they were requested to give reasons for choosing certain options. Other sections of the questionnaire presented the pre-listed options for the respondents to choose option/s suitable for them individually or households. In order to avoid biasness they were given option to add any missing information on option provided as 'other'. Four point Likert scale was also used to measure respondent's perceptions of environmental degradation and importance of environmental governance institutions. A four point scale Likert scale was used to allow the respondents to take a position of a particular opinion while avoiding neutral response (Krosnick & Fabrigar, 1997).

2.2.6. Key informant interviews

Key informant interviews included eleven government officials and four traditional leaders. The interviewees were expected to be aware of general community issues, have an understanding dynamics of resource use, enforcement challenges and long-term changes in the local woodlands. Open-ended questions were used covering perceptions of woodland degradation, response and environmental governance systems to encourage free flow discussion. Table 2.3 indicates the numbers and profile of participants including why they were chosen to be interviewed.

Table 2.4. The profile of key informant participants

Participants	Number of participants	Reason for selection as key informant
Department of Agriculture, Forestry & Fisheries (DAFF)	4	DAFF has been involved in departmental community environmental awareness programmes such as participatory forest management (PFM), and monitoring and enforcement of the National Forest Act no. 84 of 1998 (NFA) DAFF were interviewed to give insight into the enforcement of the NFA
The Limpopo Department of Economic Development, Environment Tourism (LEDET) and Department of environmental affairs (DEA)	4	LEDET and DEA have been involved in departmental community environmental awareness programmes such as community based natural resource management (CBNRM), and monitoring and enforcement of the National Environmental Management Act no. 107 of 1998). LEDET and DEA officials were interviewed to give insight into the enforcement of the NEMA and Limpopo Environmental Management Act no.7 of 2003(LEMA)
Municipalities	3	Municipalities were interviewed to give insight into the enforcement of the LEMA and the Constitution Act 108 of 1996
Traditional leaders	4	Traditional leaders were interviewed to give insight on resources used in the community context

Purposeful sampling was used to sample government officials. Purposeful sampling is widely used in qualitative research for identification and selection of information-rich cases related to the phenomenon of interest or subject under study (Patton, 2002; Palinkas et al., 2015). All selected officials had been in the department for over 10 years at the time of being interviewed and are responsible for sustainable forest management and enforcement. Thus, officials were considered to have experience and knowledge on sustainable management and enforcement of forests and woodland resources. Appointments for interviews were secured with different participants and they were interviewed individually. Questions were also circulated by email to those officials who had the facility. Only officials who qualified in terms of experience (number

of years and operational activities) and who were willing to participate in this study were interviewed. The interviews with officials were conducted to ensure possible information gaps were filled after village surveys had been completed. The traditional leaders were interviewed to get their views, perceptions and knowledge of use of woodland resource. Finally, secondary data related to the research topic were collected by means of documents and desktop research that included existing literature such as journal papers, books, municipalities' documents, policies, and legislation.

2.2.7. Ethical considerations.

Permission to conduct research in the three villages was obtained from local municipalities, ward counsellors and traditional leaders before the research proceeded. The researcher introduced the research to the local traditional leaders (chiefs), local municipalities and ward counsellors by giving objectives and processes of the research. They could then allow the interviews and other research activities to be conducted in their area of jurisdiction. The Mutale Municipality issued a letter to the affected tribal councils approving the research to be conducted. The Thulamela Local Municipality community liaison official gave verbal permission and contacted the Xigalo Tribal Council to inform them about the research to be conducted in their area. Further, all the processes required by the University of the Witwatersrand (Wits) Human Research Ethics Committee (non-medical) were followed; an Ethic Clearance Certificate (H13/06/03) was also obtained. Before beginning with the household and individual survey, potential participants were informed about the objectives, goal and purpose of the interviews through a statement read by the interviewer. Participants were further assured that their participation was voluntary and that the data would remain anonymous. Interviews were conducted following the verbal consent of the respondent.

2.2.8. Data analysis

This study focused on the poverty-environment nexus, and the classification of households according to wealth status was thus crucial for all analyses. Wealth status can be measured by composite measure (using many indicators/ variables) or proxy measure (using one indicator/ variable such as annual income). The proxy measure is considered inappropriate as it does not reflect total wealth status (Cowan et al., 2003). There is also no single definition of wealth status for all study aims or variables that one “must” use (Galobardes et al., 2006). Wealth status was therefore determined in this study using a composite measure determined using principal component analysis (PCA) of asset and income source data (Cowan et al., 2003; Vyas & Kumaranayake, 2006).

PCA is a multivariate statistical technique used to reduce the number of variables in a data set into a smaller number of ‘dimensions’ (Vyas & Kumaranayake, 2006), that will account for most of the variance in the observed variables. The PCA was used to derive wealth status based on income sources as well as other variables that capture living standards, such as household infrastructure, source of water (tap in the yard or not), electrical appliances owned, house structures (having a tiled roof may be a good indicator of wealth) and fence type (McKenzie, 2005; Vyas & Kumaranayake, 2006).

PCA was used to derive weightings for the various assets, amenities, and income sources recommend that 10 to 20 variables be used to eliminate ‘clumping’ and ‘truncation’. (The variables (fourteen in total) selected to measure wealth status scores were: ownership of a vehicle, television set, electrical/gas refrigerator and stove, radio and livestock (cattle, sheep, pigs and goats); receiving of child support grant; and household structure (housing building materials and fence structures). Staying in a house with electricity and having a tap inside the yard with running water was excluded from the analysis because there was no variation in these metrics between households.

PCA works best when asset variables are correlated and when the distribution of variables varies across households (Vyas & Kumaranayake, 2006). Descriptive analysis for all fourteen variables was done as a first step, looking at the means, frequencies and standard deviation as illustrated in Table 2.1. Descriptive analysis was used to assess the variance of the variables that were selected across the sampled households. Wealth status factor scores for each variable used were derived using SPSS. Wealth status factor scores for each variable in the equation were added together using Microsoft Excel to get the total wealth status score for households. When interpreting the factor score variable with a positive factor, the score is associated with higher wealth status; conversely, a variable with a negative factor score is associated with lower wealth status.

Table 2.5. Factor scores table with the variables and weightings

Variables	Factor scores	Variables	Factor scores
Social grants for children	-0.069	Tiled roof	0.303
Old age pension	-0.050	Thatched grass Roof	-0.103
Full time employment	0.288	Cement wall	0.232
Stove	0.353	Mud bricks wall	-0.155
Refrigerator	0.317	Cement bricks walls	0.113
Television set	0.298	Clay walls	0.075
Radio	0.256	Cement block wall fence	0.257
Other	0.244	Steel poles fence	0.105
Goats	0.244	Indigenous poles fence	-0.050
Cattle	0.195	Treated pole fence	0.183
Iron roof	0.174	No Fence	-0.276

Along the first component higher wealth status is associated with having at least one family member employed full time, ownership of assets such as stove, radio, refrigerator, and having a house with iron or tile roof, cement walls, and a fence with steel poles. On the other hand, variables that are associated with low wealth status are receiving government child support or old age pension grants, staying in a mud hut with a thatched grass roof, and a fence made of

indigenous poles or no fence at all (Table 2.5). Assets that were more unequally distributed among households were given more weight in PCA. Variables with low standard deviation carried low weight from PCA; for example, an asset which all households own or which no households own (i.e. zero standard deviation) exhibited no variation between households and was weighted zero, and was of little use in differentiating wealth status. The wealth status score was a continuous variable ranging from low to high scores and categorical as wealthy (n=73), middle (n=71) and poor (n=68) class. The continuous wealth status score was used in regression analysis and the categorical classification was used to assess the spread of socioeconomic classes within the sampled population to avoid skewness of the data. That was important because SES was the main variable of interest.

STATA and SPSS software packages were used for statistical analysis of survey data. SPSS was used for most of the analyses since it is more user-friendly and familiar to the researcher. Furthermore, analysis of questionnaire data is a strength of SPSS because of its roots in social science. However, since there is no simple way to compare the AIC of various models in SPSS, STATA was used for model selection. Descriptive statistics were used to check frequency distribution and for normality. Cross-tabulation was used to check correlations of independent variables (age, gender, wealth status, village and education) and frequency of response to dependent variables. Age and education were strongly correlated, so education was not used in the statistical analyses. Females (65.07%) and male (34.93%) were interviewed. The frequency distributions of household and individual independent variables used the statistical analyses are presented in Figure 2.7, while Figure 2.8 presented the three SES classification (poor, middle and rich class). The distributions were similar across the three villages.

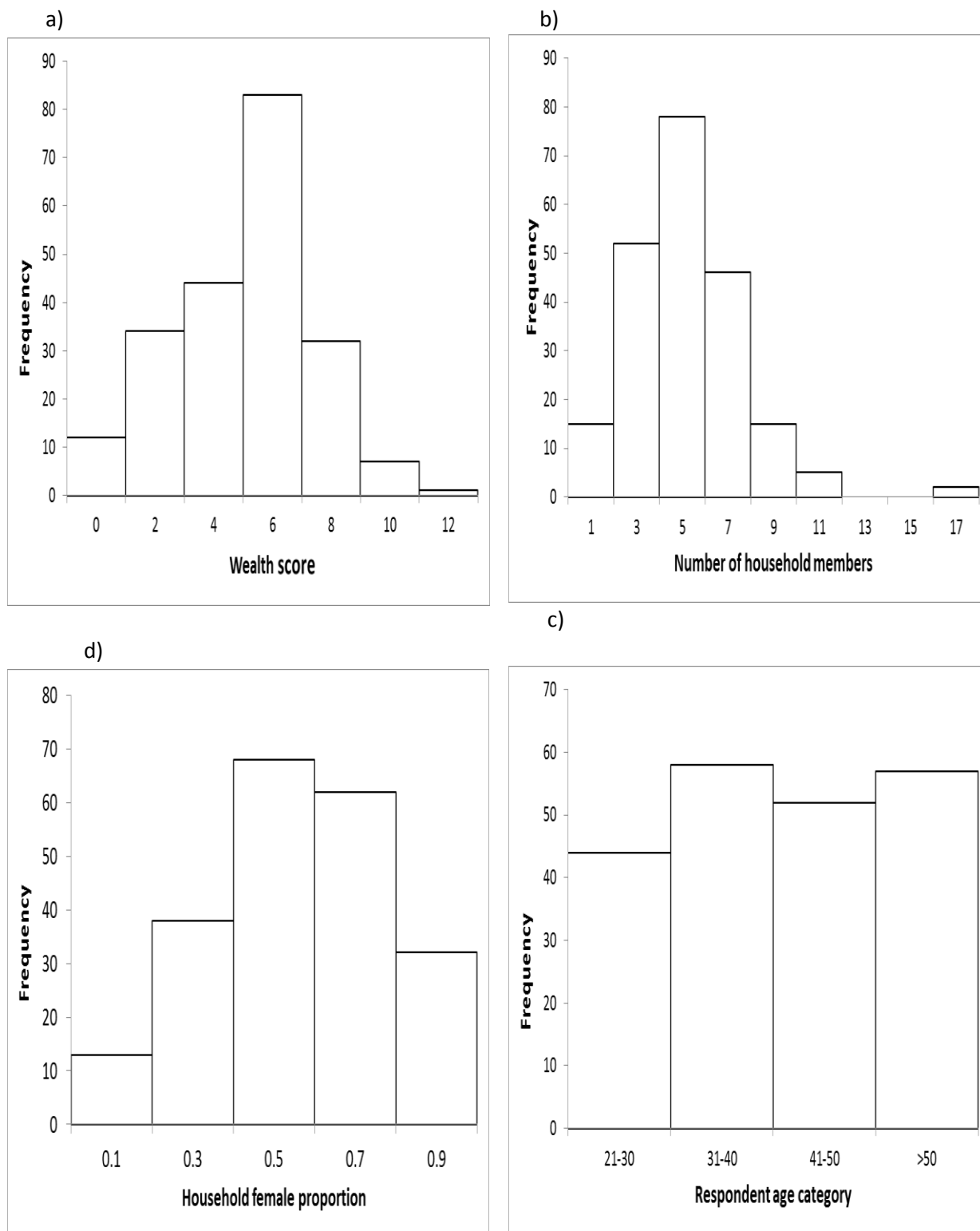


Figure 2.7. Frequency distribution of independent variables (a) wealth status, (b) number of people in the household, (c) household female proportion, and (d) respondent age category

Frequency tables were created to show a distribution of the responses. In cases where there was significant association, logic regression modelling was used to investigate the nature of the association. Education was not included in the logistic regression because of strong negative correlation with age. The influence of wealth status and confounding factors (gender, village and level of education) on the odds of a respondent perceiving aspects, causes and solutions of woodland degradation, and mentioning a given impact or response, were investigated using multivariate logistic regression models. Combinations of interactions were included in the models, and the most parsimonious model for each perception and response option were selected based on the Akaike Information Criterion (AIC). AIC was first developed by Akaike (1973) to compare different models on a given outcome (Snipes & Taylor, 2014). When using AIC for model selection, the model giving smallest AIC over the whole set of data is chosen and used for further analysis. The selection of the model is important to avoid under- and over-fitting model. An under-fitting model may not capture the true nature of the variability in the outcome variable, while an over-fitted model loses generality. Therefore, AIC is a way to select the model that best balances these drawbacks (Snipes & Taylor, 2014).

Multivariate logistic regression statistical models were used to test for the influence of wealth status on outcome variables, while controlling for other individual (gender, age), household (size, proportion female), and village confounding factors, with interactions. Models 1a-8 below were run for the various independent variables for chapter 3 (Influence of wealth status on individual perceptions of individuals about local woodland degradation) and chapter 5 (influence of wealth status on individual's awareness and attitudes regarding environmental governance of communal woodlands. Models 9-16 were run for independent variables investigated in chapter 4 (influence of wealth status on the impacts of woodland degradation on households and their responses to it). In each case, the model with the lowest AIC was chosen for interpretation.

Model 1a = wealth status, gender, age, village,

Model 2a = wealth status, gender, age, village, village* wealth status

Model 3a = wealth status, gender, age, village, gender*wealth status

Model 4a = wealth status, gender, age, village, age*wealth status

Model 5a = wealth status, gender, age, village, gender*wealth status, village* wealth status

Model 6a = wealth status, gender, age, village, age*wealth status, village*wealth status

Model 7a = wealth status, gender, age, village, age* wealth status, gender* wealth status

Model 8a = wealth status, gender, age, village, age* wealth status, gender*wealth status,
village*wealth status

Model 1b = wealth status, HH size, HH female proportion, village

Model 2b = wealth status, HH size, HH female proportion, village, village* wealth status

Model 3b = wealth status, HH size, HH sex proportion, village, HH female proportion*wealth
status

Model 4b = wealth status, HH size, HH sex proportion, village, HH size*wealth status

Model 5b = wealth status, HH size, HH sex proportion, village, HH female proportion*wealth
status, village*wealth status

Model 6b = wealth status, HH size, HH sex proportion, village, HH size* wealth status,
Village*wealth status

Model 7b = wealth status, HH size, HH sex proportion, village, HH size *wealth status,
HH female proportion and wealth status

Model 8b = wealth status, HH size, HH sex proportion, village, HH female proportion*wealth
status; HH size*wealth status, village *wealth status

CHAPTER 3

THE INFLUENCE OF WEALTH STATUS ON LOCAL PERCEPTIONS OF WOODLAND DEGRADATION

Abstract

Research on environmental perceptions in developing countries challenges the commonly held view that the poor are less concerned about environmental problems than people in wealthier countries, because they are mainly concerned with day-to-day survival. However, very little is known about how perceptions about environmental problems vary by wealth status within communities in the developing world. This chapter addresses this knowledge gap by investigating how household wealth status influences local perceptions on components of woodland degradation, causes of this degradation, and potential solutions to it, in a rural region of Limpopo Province South Africa. Data were collected in a survey of 213 respondents sampled from three rural villages, using a questionnaire. The influence of household wealth status score (derived from assets and income sources) on responses, after controlling for confounding effects of age, gender, and village, were analysed using multivariate logistic regression models. Aspects of degradation perceived by respondents were both physical (e.g. soil erosion, few big trees), and experiential (travel long distances to collect resources). Wealth status only affected perception of the experiential aspect, and surprisingly, the likelihood of mentioning traveling long distances to collect resources increased with wealth score. The likelihood of perceiving environmental (e.g. poor rainfall), socio-economic (e.g. increasing poverty) and governance-related (e.g. poor enforcement of laws) causes of degradation increased with wealth status. However, poorer households were more likely to acknowledge their one household's contribution to local woodland degradation. For solutions, wealthier respondents were more likely to suggest using alternative energy sources to fuelwood, while poorer individuals were more likely to suggest reducing daily quantities of resources used. The findings show that even within poor communities, there is wealth differentiation in environmental perceptions that have consequences for addressing the poverty-environment nexus.

3.1. INTRODUCTION

There is an urgent need for more data on the influence of socio-economic factors in the formation of perceptions of the environmental problems, and behaviours in response to these perceptions, in less developed settings (Anderson et al., 2007; Hunter et al., 2010). Studies on environmental perceptions are instrumental in understanding the complexity of the interactions of people with their natural environment (Whyte, 1977; Gray et al., 2010), and provide insight into the local experience and knowledge of the environment (Gebrehiwot et al., 2014). Perception involves the cognitive processing of complex sensory information encountered in everyday life (Bell et al., 1996). Environmental perception is thus the way in which people make sense of the natural world around them. These perceptions are context-specific, and are influenced by a range of factors such as an individual's age, gender, education level, interaction with the local environment, personal experience, cultural, political, religious beliefs, wealth status and level of dependency on the natural resources (Stern & Dietz, 1994; Cinner & Pollnac, 2004; Cardona, 2012; Cerutti et al., 2015). Although some environmental issues, such as climate change, are global in their origin and impact, others are locally generated and experienced. Therefore, it is important to recognize and understand the local social construction of environmental perspectives (Moore & Thiongane, 2000). Because people's perceptions of the natural environment vary (Mbewe, 2016), people within the same society may attach different meanings to the same landscape. For example, what is perceived as degraded by one person may not be regarded degraded by another.

Although under-studied, there is a growing body of literature on environmental perceptions in the developing world, particularly in rural societies. Much of this is in relation to perceptions of environmental problems and risk, such as environmental degradation, and the factors influencing these. Studies of local perceptions of rangeland degradation in Botswana (Chanda 1996; Kgosikoma et al., 2012), Kenya (Bollig & Schulte, 1999), and Namibia (Bollig & Schulte, 1999; Ward et al., 2000) show that pastoralists indeed perceive undesirable changes in their rangelands, often showing detailed knowledge of changes that had occurred in the structure,

such as bush encroachment, and species composition of the vegetation, such as the loss of palatable grass species and increase in unpalatable species. In addition to describing degradation in terms of observable changes in the rangelands, some communities also expressed it in terms of how change was experienced by resource users, such as increased distances to good grazing (Ward et al., 2000). A common perception in all of these studies was that the primary cause of the degradation was variable or declining rainfall, rather than local land use practices. Because of this, no discernible strategies were developed by the pastoralists to address the perceived degradation (Ward et al., 2000). However, in some communities, issues related to land use, such as overgrazing, and fire (Kgosikoma et al., 2012) were also mentioned as secondary factors. Among Pokot pastoralists in Kenya, supernatural forces were also regarded as being behind the observed environmental change, such as due to curses, or conflict between young and old men (Bollig & Schulte, 1999). This highlights the importance of cultural beliefs in shaping environmental perceptions.

Perceptions of change in forest and savanna vegetation have been studied in countries such as Uganda (Twongyirwe et al., 2017), Senegal (Lykke, 2000), Burkina Faso (Sop & Oldeland, 2013), Niger (Wezel & Haigis, 2000), Namibia (Ward et al., 2000) and Bangladesh (Iftekhar & Takama, 2008). Common to all these studies is the widespread local perception of declining tree cover, which in some cases, was verified with remote sensing data (e.g. Twongyirwe et al., (2017). Some communities also mentioned changes in the abundance of particular plant species, such as decline in tree species used for construction timber, fruit, and medicine (Lykke, 2000; Wezel & Haigis, 2000), and increase in drought-tolerant (Sop & Oldeland, 2013) and introduced species (Wezel & Haigis, 2000). As in the rangeland studies, some communities described degradation both in terms of observed ecological change as well as experience of the consequences of the change, such as increased time to harvest fuelwood (Ward et al., 2000). Although rainfall was once again often mentioned as contributing to change in the vegetation (Lykke, 2000; Ward et al., 2000; Sop & Oldeland, 2013), reduced woodland cover was also widely attributed to human factors such as deforestation (Iftekhar & Takama, 2008; Sop &

Oldeland, 2013) and increased frequency and intensity of fires (Lykke, 2000; Sop and Oldeland, 2013).

Other studies have investigated perceptions of environmental change and quality more broadly. Chanda (1996) explored perceptions of degradation in central Botswana in relation to local livelihood systems, namely dryland agriculture, livestock farming, and harvesting of non-timber forest products. There was widespread awareness of undesirable environmental change that resulted in livelihood impacts such as crop failure, shortages of water and pasture, and declining availability of NTFP. Once again, external factors such as drought were given as the primary drivers, although overpopulation was also mentioned as a cause. Suggested solutions were thus also outwardly focussed, centred on intervention by government. In rural South Africa, residents were concerned about a range of environmental problems, including soil erosion, bushfires, litter, water pollution, and cutting of trees (Hunter et al., 2010). In rural Senegal, Moore and Thiongane (2000) asked respondents about the seriousness of a wide range of social problems in their community. Two environmental issues, namely drought and shortage of fuelwood, were highly ranked among these, highlighting the importance of degradation as a social issue within poor communities.

In their study in coastal Ghana, White & Hunter (2009) found widespread awareness and concern about environmental problems such as deforestation and water pollution, with roughly a third of respondents being more concerned about these than social problems such as crime and poor health services. Similarly, in rural Tanzania, Quinn et al., (2003) some of the environmental risks named by respondent, such as land shortage and forest destruction were ranked higher in severity than important socio-economic risks such as insufficient access to agricultural inputs or infrastructure such as schools and hospitals. In rural Nigeria, the five most commonly recognised signs of degradation, in order of percent of responses, were 1) scarcity of forest resources, 2) declining crop yields, 3) rising prices of commercially traded forest resources, 4) premature harvesting of resources, and 5) increasing distance to resources (Chokor, 2004). Perception of degradation thus had a strong emphasis on experience of

economic impacts of degradation. These changes were ascribed to agricultural expansion, bushfires, and indiscriminate hunting. As to solutions, the most commonly mentioned was intervention by government with legislation to regulate resource use. Education, provision of employment, and community dialogue on these issues were less commonly cited solutions.

Concerning factors influencing environmental perceptions in poor rural settings, gender was widely found to have a strong influence (Moore & Thiongane, 2000; Wezel & Haigis, 2000; Quinn et al., 2003; White & Hunter, 2009; Hunter et al., 2010), although there were a few exceptions (Sop & Oldeland, 2013). In most cases, this effect was related to gendered impacts of degradation linked to gender roles in relation to resource use. For example, women were more likely to be concerned about decline in fuelwood availability while men perceived reduced availability of construction timber (Quinn et al., 2003). Although age and education had a significant effect in some cases, they did not in others (White & Hunter, 2009; Hunter et al., 2010; Kgosikoma et al., 2012; Sop & Oldeland, 2013). Local socio-economic and environmental context consistently appears as a strong determinant (Quinn et al., 2003; Anderson et al., 2007; White & Hunter, 2009; Kgosikoma et al., 2012).

As to the focus of this study, namely the effect of wealth status on perceptions of degradation, little published evidence exists for the developing world. White and Hunter (2009) found in coastal Ghana that wealthier respondents generally had more favourable perceptions of the state of the local environment, were more likely to prioritise environmental preservation over economic growth, but were less likely to be concerned about depletion of fisheries, which was a major economic activity of less wealthy coastal dwellers. In contrast this, Hunter et al. (2010) found that in rural South Africa, wealth status had limited influence on perceptions on local environmental problems. In their study of perceptions and awareness about water issues among rural and urban South Africans, Anderson et al. (2007) found that poorer respondents were more likely to perceive water pollution as a community problem, while affluent respondents were more aware of a government programme aimed at clearing alien vegetation from waterways. The relationship between poverty and environmental perceptions is often closely linked to livelihoods. For example, respondents from low income households that relied

heavily on mixed farming livelihoods were most likely to perceive reduction in forest cover in Uganda (Twongyirwe et al., 2017). In Tanzania, pastoralists were more likely to list land scarcity as an environmental risk than agriculturalists (Quinn et al., 2003).

Understanding local people's perception of their environment is important before attempting to understand and influence their behaviour and attitude towards their local environment (Brackney & McAndrew, 2001). Perception is a vital social factor in determining local people's level of understanding of local environmental challenges and their effects (O'Higgins 2007; Kangalawe 2012; Assefa & Hans-Rudolf, 2016). Public perception often drives the activities of a society, and the acknowledgment of public perceptions is a key aspect of policy development and decision-making (Pereira et al., 2016a). Therefore, policy makers need to know how local people, including the poor who depend on natural resources, perceive their local environment, in order to develop and implement policies that do not exclude their needs (Hynek, 1985). Furthermore, policy formulations that address environmental degradation should be in consideration of local perception as this will determine their chances of success or failure (Meijaard et al., 2013; Pereira et al., 2016a). For example, small holder farmer's perceptions on land cover change in central Palestine were significantly related to their willingness to support initiatives managing and reducing degradation (Hammad & Børresen, 2006).

People support management initiatives that they perceive as important to their livelihoods which is likely to be influenced by wealth status (Sesabo et al., 2006; Makindi, 2016). The way in which one values the environment and benefits from it (e.g. economic, spiritual or social) will influence one's perception (Pollnac, 2000), which might affect one's motivation and willingness to engage with government resource management interventions. Although environmental perception is well understood in more affluent and urban contexts (Saksena, 2011; Liao et al., 2015), environmental perceptions of the rural poor in the developing world remain understudied (Hunter et al., 2010; Dube et al., 2015). Those studies that do exist have typically looked at the perceptions of particular groups, such as farmers or households heads, a particular resource (e.g. fuelwood, rangeland), or specific environmental issues (e.g. soil erosion) (Tegene,

1992; Wezel & Haigis, 2000; Haq et al., 2010). The influence of wealth status on these perceptions within communities is particularly under studied. In response to these knowledge gaps, the aim of this chapter was to assess perceptions of individuals from households of varying wealth status about aspects, and causes of degradation in their local woodlands, and well as potential solutions to these. The chapter is concerned more with understanding respondent's perceptions rather than uncovering objective facts.

3.2. METHODS

Details of the general methods were described in chapter 2, but this section focuses more on the methods specific to this chapter. Perceptions data were collected using a survey, focus group discussions and key informant interviews. During the focus group discussions, participants were asked to describe that they perceive as the aspects, causes and solutions of woodland degradation. It was an open-ended question which allowed them to define aspects of woodland degradation (definition), causes and solutions) based on their own understanding. Their responses were categorized into common themes and subsequently, a list of four aspects, six causes, and three solutions of woodland degradation were distilled from the responses.

In the perception questionnaire, respondents were presented with a pre-list of choices obtained during the focus group discussions. They were requested to indicate whether they agreed or did not agree with a given statement and responses to questions were not mutually exclusive. The responses were captured in binary format. A Likert scale question was used to ask participants to rank whether they perceive their households as contributing to woodland degradation (not really, no, yes and very much). Those who choose yes and very much were asked to give contributing factors, which were categorized into four themes. Due to low frequency in some of the option categories, the responses were converted to binary format ("not really" and "no" into "no", and "yes, "yes, very much" into "yes") Frequency tables and graphs were created to explore the distribution of responses across gender, village and age. The influence of wealth status and confounding factors (age, gender, and village) on the odds of a respondent perceiving aspects, causes, contribution and mitigation strategies to woodland

degradation was investigated using multivariate logistic regression models. Combinations of interactions were included in the models, and the most parsimonious model for each response option was selected based on the Akaike information criterion (AIC) using STATA. Tables were produced and odds ratio, p values and 95 confidence intervals were used to explain the odds and the likelihood of participants in perceiving undesirable change, drivers, and solutions and of woodland degradation.

3.3. RESULTS

3.3.1 Aspects of woodland perceived as degraded

A pre-list of four options obtained from focus group discussions of aspects of woodland degradation were given to the respondents to indicate if they agreed or not, namely 1) soil erosion, 2) few large trees, 3) woodlands cleared for agriculture and settlements, and 4) traveling long distances to collect resources. Nearly half of the respondents agreed with the first two, while the latter two were mentioned by less than 10% of respondents (Table 3.1).

Table 3.1. Prevalence of perceived aspects of woodland degradation (n=213)

Aspect of degradation	Respondents
1) Soil erosion	45.5% (97)
2) Few big trees	44.6% (95)
3) Travel longer distances to collect resources	8.9% (19)
4) Woodlands cleared for agriculture and settlements	4.7% (10)

Wealth status on its own only had a significant influence on the odds of respondents mentioning "traveling a long distance to collect resources", the odds of which increased with increasing wealth status score (Table 3.2, model 3, OR=1.736, $p<0.01$). The most parsimonious models for the first three degradation categories included an interaction between wealth status and village. Residents of Matshena village were more likely to perceive soil erosion than those

from Xigalo with increasing wealth status scores ($p < 0.01$, $OR = 1.857$). On the other hand, they were less likely to perceive few big trees as an aspect of woodland degradation than those from Xigalo with increasing wealth status ($p < 0.05$, $OR = 0.581$). Maholoni residents were less likely to perceive travel long distances to collect woodland resources when compared to those from Xigalo with an increase wealth status ($p < 0.01$, $OR = 0.391$), (model 3).

Regarding the respondents' characteristics, age and gender had no significant influence in any of the models. Residents from Maholoni were substantially more likely than those in Xigalo to perceive "travelling longer distances to collect resources" ($p < 0.001$, $OR = 576.747$) and "clearing of woodland for agriculture and settlement" ($p < 0.01$, $OR = 47.611$) respectively (Table 3.2, model 3 and 4). Residents from Matshena were almost 0.051 times less likely to perceive soil erosion as an aspect of woodland degradation than those at Xigalo (Table 3.2, model 1). Consequently, residents from Matshena were almost 32 times more likely to perceive few big trees than those in Xigalo ($p < 0.01$), as an aspect of woodland degradation (Table 3.2, Model 2).

Table 3.2: Logistics regression model results (OR $\pm$ 95% CI) for aspects of woodland degradation.

Independent variables	Soil Erosion (Model 1)	Few big trees (Model 2)	Travel long distances to collect woodland resources (Model 3)	Clearing of woodland for agriculture and settlement (Model 4)
Age (21-30)	0.965 (0.406-2.291)	1.651 (0.676-4.032)	0.389 (0.077-1.970)	0.787 (0.137-4.528)
Age (31-40)	0.900 (0.398-2.035)	1.791 (0.773-4.146)	0.628 (0.141-2.794)	0.173 (0.013-2.369)
Age (41-50)	0.918 (0.394-2.138)	1.427 (0.593-3.434)	0.662 (0.142-3.083)	0.958 (0.067-13.670)
Males	0.776 (0.411-1.465)	1.484 (0.774-2.844)	1.609 (0.498-5.193)	1.684 (0.207-13.726)
Maholoni Village	4.587 (0.474-44.399)	2.204 (0.239-20.375)	576.747 (18.744-17746.243)***	47.611 (4.230-535.875)**
Matshena Village	0.051 (0.006-0.454)**	31.702 (3.156-318.462)**	-	-
Wealth status	1.057 (0.900-1.241)	0.872 (0.737-1.032)	1.736 (1.198-2.516)**	1.235 (0.852-1.789)
Wealth status x Maholoni Village	0.704 (0.482-1.027)	0.892 (0.616-1.293)	0.391 (0.227-0.671)**	
Wealth status x Matshena Village	1.857 (1.238-2.785)**	0.581 (.383-0.882)*	0.591 (-)	
Model P value	<0.01	<0.01	<0.001	<0.001
Model summary	2Loglikelihood=259.569 Cox & Snell R square=0.129 Nagelkerke R square=0.172	2Loglikelihood=250.788 Cox & Snell R square=0.156 Nagelkerke R square=0.207	2Loglikelihood=90.332 Cox & Snell R square=0.162 Nagelkerke R square=0.356	2Loglikelihood=48.167 Cox & Snell R square=0.143 Nagelkerke R square=0.447

*p< 0.05, **p<0.01 and ***P<0.001, #P<0.10, Reference categories: Age=Age 51+, Gender =Female, Village =Xigalo

3.3.2 Causes of woodland degradation

Respondents had to indicate whether they perceive the pre-listed options of seven categories as causes of woodland degradation or not. The most widely cited were 1) high population growth in the village, 2) poor rainfall, 3) increased poverty, 4) and high dependency on woodland resources, which were mentioned by at least 70% of respondents in each case. Fewer respondents cited insufficient awareness programs (40.4%) and poor enforcement by traditional leaders (42.7%) (Table 3.3).

Table 3.3: Prevalence of perceived causes of woodland degradation (n=213)

Causes of woodland degradation	Respondents
1) High population growth	73.7% (157)
2) Poor rainfall	73.2% (156)
3) Increased poverty in the village	70.9% (151)
4) High dependency on woodland resources by locals and people from other villages (<i>high dependency on woodland resources</i>)	70.0 % (149)
5) Poor enforcement of environmental laws by government departments (<i>poor enforcement by government</i>)	56.3% (120)
6) Poor enforcement of laws related to environmental management by traditional leaders (<i>poor enforcement by traditional leaders</i>)	42.7% (91)
7) Insufficient environmental awareness programs (<i>insufficient awareness-raising</i>)	40.4% (86)

After controlling for the influences of individual characteristics and village that they lived in, household wealth status had a significant influence on the odds of respondents perceiving poor enforcement by traditional authorities, poor rainfall, insufficient awareness-raising and increased poverty in the village as causes of degradation (Table 3.4, Models 1 to 5). Overall, there was a positive association between perception of causes of degradation and household wealth status. The odds of perceiving poor enforcement by traditional authority and low rainfall especially as cause of woodland degradation increased by 1.187 ($p < 0.05$) and 1.178 ($p < 0.05$) respectively with every increase of one unit of the wealth score (Model 2 & 3). The odds of perceiving insufficient awareness raising as the cause of woodland degradation increased by

1.231 times ($p < 0.01$) with every increase of one unit of the wealth score (Table 3.4, Model 4) and the odds of perceiving increased poverty in the village increased by 1.302 times ($p < 0.01$) with increased wealth status scores (Table 3.4, Model 5). Household wealth status had no significant influence on individuals' perceptions of poor enforcement by government departments. The results for the model for high population growth are not presented, as the overall model was not significant.

The odds of perceiving insufficient awareness was low for individuals staying at Matshena, the medium village in terms of size and level of degradation, compared to those residing in Xigalo ($OR = 0.235$, $p < 0.001$). On the other hand, individuals residing in Matshena were less likely to perceive insufficient awareness ($OR = 0.049$, $p < 0.001$), increased poverty in the village ($OR = 0.252$, $p < 0.01$) and low rainfall ($OR = 0.241$, $p < 0.01$) as a cause to woodland degradation than those from Xigalo (Table 3.4, model 3 to 5). The odds of perceiving poor enforcement by government officials as a cause of woodland degradation was 29.925 higher for the individuals residing in Matshena than for those in Xigalo ($p < 0.001$) (Table 3.4, Model 1). Gender had no significant influence on perceptions of causes of degradation, while individuals in age group 41-50 were less likely than those in age group 51 years and above ($p < 0.05$, $OR = 0.698$) to mention insufficient awareness as a cause of woodland degradation (Table 3.4, Model 4).

The most parsimonious models were for poor enforcement by government departments and traditional authorities (Table 3.4, Models 1 and 2) included a wealth status x village interaction term. Residents of Maholoni village became less likely to perceive poor enforcement by traditional leaders than those from Xigalo with increasing wealth status ($OR = 0.697$, $p < 0.01$). The same trend was also observed with those from Matshena, who became less probable to perceive poor enforcement by government officials as a cause of woodland degradation than those from Xigalo with increasing wealth status ($OR = 0.500$, $p < 0.05$).

Table 3.4: Regression model results (odds ratios $\pm$ 95% CI) for perceived cause of woodland degradation

Independent variables	Poor enforcement by government (Model 1)	Poor enforcement by traditional authority (Model 2)	Poor rainfall) (Model 3)	Insufficient awareness-raising (Model 4)	Increased poverty in a village (Model 5)
Age(21-30)	0.484 (0.183-1.282)	0.454 (0.181-1.138)	0.477 (0.168-1.350)	0.668 (0.256-1.746)	0.520 (0.1891-1.436)
Age(31-40)	0.835 (0.334-2.086)	0.774 (0.336-1.785)	0.542 (0.198-1.479)	0.731 (0.309-1.734)	0.631 (0.235-1.694)
Age(41-50)	0.406 (0.164-1.006)	0.736 (0.313-1.731)	0.385 (0.139-1.065)	0.698 (0.289-1.684)*	0.520 (0.185-1.462)
Male	0.761 (0.384-1.509)	1.093 (0.570-2.093)	1.338 (0.637-2.808)	0.994 (0.507-1.946)	3.544 (0.668-18.797)
Maholoni Village	0.483 (0.036-6.430)	10.336 (0.821-130.133)	0.628 (0.219-1.799)	0.049 (0.013-0.182)***	0.064 (0.023-0.178)***
Matshena Village	29.925 (3.600-248.8)**	0.205 (0.035-1.217)	0.241 (0.115-0.509)***	0.235 (0.011-0.493)***	0.252 (0.113-0.563)**
Wealth status	1.153 (0.973-1.366)	1.187 (1.003-1.404)*	1.178 (1.023-1.356)*	1.231 (1.072-1.415)**	1.302 (1.079-1.570)**
Wealth status x Maholoni Village	0.697 (0.444-1.094)	0.500 (0.318-0.786)**	-	-	-
Wealth status x Matshena Village	0.615 (0.432-0.875)**	1.126 (0.826-1.535)	-	-	-
Model P value	<0.001	<0.001	<0.001	<0.001	<0.001
Model summary	2Loglikelihood=227.89 Cox & Snell R squared=0.238 Nagelkerke R squared=0.320	2Loglikelihood=227.5 Cox & Snell R squared=0.240 Nagelkerke R squared=0.322	2Loglikelihood=212.498 Cox & Snell R squared=0.125 Nagelkerke R squared=0.183	2Loglikelihood=232.306 Cox & Snell R squared=0.207 Nagelkerke R squared=0.280	2Loglikelihood=207.580 Cox & Snell R squared=0.184 Nagelkerke R squared=0.263

*p< 0.05, **p<0.01 and ***P<0.001, Reference categories: Age=Age 51+, Gender =Female, Village =Xigalo

3.3.3 Contributions of households to woodland degradation

A high proportion (91.5%) of respondents agreed that the way in which they utilize the local woodland contributes undesirable change in the local environment. Individuals from Maholoni, the village with the least degradation, were less likely to perceive their households as contributing to woodland degradation than those from Xigalo, the biggest village with the most degradation (OR=0.036, $p<0.05$). After controlling for the influences of individual characteristics and village that they lived in, wealth status had a significant negative influence on the odds of perceiving their households as having an impact on woodland degradation, the odds of which decreased by 0.617 ($p<0.01$) with every increase of one unit of the wealth score (Table 3.5).

Table 3.5: Regression model results (OR $\pm$ 95% CI) of households perceiving their activities as contributing to woodland degradation

Independent variables	Households contributing to woodland degradation
Age(21-30)	1.337 (0.476-3.759)
Age(31-40)	0.795 (0.296-2.137)
Age(41-50)	0.730 (0.265-2.009)
Males	0.661 (0.303-1.442)
Maholoni Village	0.036 (0.002-0.617)*
Matshena Village	0.116 (0.012-1.163)
Wealth status score	0.617 (0.469-0.813)**
Wealth status x Maholoni Village	1.097 (0.683-1.761)
Wealth status x Matshena Village	1.303 (0.894-1.899)
Model P value	<0.001
Model summary	-2Loglikelihood=197.482 Cox & Snell R squared=0.259 Nagelkerke R squared=0.364

* $p<0.05$, ** $p<0.01$ and *** $P<0.001$, # $P<0.10$, Reference categories: Age=Age 51+, Gender =Female, Village =Xigalo

Roughly 69.9% of respondents cited use of woodland resources by their own household as contributing to woodland degradation while cutting of live stems and harvesting resources for own use and selling and, using woodland resources occasionally were less frequently cited (Table 3.6). None of the models predicting the likelihood of a respondent mentioning a household activity contributing to degradation were significant.

Table 3.6. Prevalence of perceived household activities contributing to woodland degradation (n=213).

Variables	Respondents
1) Use of woodland resources by their households	69.9% (144)
2) Cutting live tree stems	15.5% (32)
3) Harvesting resources for own use and selling	6.3% (13)
4) Occasionally use woodland resources	8.3% (17)

3.3.4. Perceived solutions to woodland degradation

A pre-list of three potential solutions of woodland degradation derived from the focus group discussions were presented to the respondents, and they responded by indicating whether they agreed or disagreed with them. They were given an option of choosing more than one answer. More than half of respondents agreed with the use of other forms of energy, whereas less than 20% agreed with buying resources from shops instead of collecting from the woodland, and reducing the quantity of resources used per day as solutions to woodland degradation (Table 3.7).

Table 3.7. Prevalence of perceived solutions to woodland degradation (n=213)

Variables	Respondents
1) Use electricity, gas and paraffin (<i>Use other forms of energy</i>)	61.5% (131)
2) Buying resources from shops instead of collecting from the woodland (<i>buy resources from shops</i>)	16.9% (36)
3) Reduce quantity of woodland resources used per household per day (<i>reduce quantity of resources used per day</i>)	15.0% (32)

Wealth status on its own had a significant influence on Model 1 and 3 (Table 3.8); use other forms of energy and reduce the quantity of resources used per day. The odds of perceiving utilizing electricity and other sources of energy as a solution increased by 1.846 times with an increase in one wealth status score unit ($p < 0.001$) (Table 3.8, Model 1). On the other hand, the odds of mentioning the reduction of quantities of resource use as a solution of local degradation decreased with increasing wealth score, ($OR = 0.752$, $p < 0.01$), (Table 3.8, Model 3). None of the parsimonious models included an interaction between wealth status and village, but there was a significant interaction between wealth status and age for using other forms of energy (Table 3.8, Model 1). Individuals between 31 to 40 years and 41 to 50 years became less likely to perceive the use other forms of energy than those of 51 years and above with increasing wealth status score (Table 3.8, Model 1).

Gender had no significant influence on respondent's odds of perceiving solutions of woodland degradation in all the models, but the village had a significant influence in all three models, and age had a significant influence only in model 1. Individuals of between age 31-20 and 41-50 were more likely to perceive the use of other forms of energy as a solution to woodland degradation than those of 51 years and above ($OR = 17.117$, $p < 0.05$ and $OR = 21.307$, $p < 0.01$). Individuals from Matshena were almost 42 times more likely to perceive the use of other forms of energy as a solution to woodland degradation than those from Xigalo ($p < 0.001$), and they were 4.829 times more likely to perceive buying resources from the shop than collecting from woodland than those from Xigalo ($p < 0.01$) (Table 3.8, Model 1 and 2). However, the odds of individuals from Matshena mentioning reducing quantity of resources used a solution to woodland degradation was lower than those from Xigalo (0.051 , $p < 0.01$), Table 3.8.

Table 3.8. Regression model results (OR $\pm$ 95% C.I) for perceived solutions of woodland degradation

Independent variables	Use other forms of energy (Model 1)	Buying resources from shops (Model 2)	Reduce quantity of resources used per day (Model 3)
Age (21-30)	0.983 (0.047-20.530)	0.543 (0.169-1.748)	0.504 (0.116-2.195)
Age (31-40)	17.117 (1.734-168.991)*	0.788 (0.280-2.218)	2.036 (0.701-5.916)
Age (41-50)	21.307 (2.140-212.108)**	0.808 (0.273-2.394)	0.944 (0.282-3.155)
Male	0.612 (0.292-1.281)	1.223 (0.516-2.895)	1.268 (0.526-3.056)
Maholoni Village	1.204 (0.456-3.178)	2.013 (0.625-6.481)	0.923 (0.286-2.979)
Matshena Village	41.803 (9.911-176.324)***	4.829 (1.925-12.116)**	0.051 (0.007-0.406)**
Wealth status	1.846 (1.355-2.514)***	1.125 (0.954-1.325)	0.752 (0.629-0.900)**
Age (21-30) x Wealth status	0.936 (0.543-1.613)	-	-
Age (31-40) x Wealth status	0.528 (0.349-0.799)**	-	-
Age (41-50) x Wealth status	0.564 (0.370-0.858)**	-	-
Model P value	<0.001	<0.05	<0.001
Model summary	-2Loglikelihood=186.731 Cox & Snell R squared=0.319 Nagelkerke R squared =0.432	-2Loglikelihood=170.697 Cox & Snell R squared=0.073 Nagelkerke R squared =0.121	2Loglikelihood=137.585 Cox & Snell R squared=0.160 Nagelkerke R squared=0.276

*p< 0.05, **p<0.01 and***P<0.001, Reference categories: Age=Age 51+, Gender=Female, Village =Xigalo

3.4. DISCUSSION

The objective of this chapter was to assess perceptions of individuals from households of varying wealth status about aspects and causes of woodland degradation, their household's contribution to it, and possible solutions. Most respondents were generally aware of the degradation in their local environment. The findings support the assertion by Chokor (2004) that although the rural poor have a limited voice in national and global strategies for addressing environmental problems, they are aware of the various aspects of environmental degradation at the local level and its impacts on their livelihoods. The aspects of woodland degradation identified by respondents can be divided into two classes, namely the physically visible and the experienced. As expected, aspects of structural change of the woodland were identified as degradation (physically visible). However, travelling long distances to collect resources was a perceived experiential aspect of degradation. This finding was supported by other studies of rural people's perception on environmental degradation which also pointed out to experiential aspects of environmental degradation as widely mentioned (Lykke, 2000; Moore & Thiongane, 2000; Chokor, 2004) as physical visibility. This highlights the importance of taking into consideration people's experience of degradation when defining it in the context of the poverty-environment nexus.

While wealth status did not influence the perception of the physical dimensions of degradation, it did for the experiential aspect mentioned (increased distances travelled to harvest resources). Wealthier respondents were more likely to perceive this as an aspect of woodland degradation than poorer. This finding is surprising because it is well established in the literature that poorer households travel long distances to collect resources, especially women and children, due to their dependency on the natural environment and because they bear the responsibility of collecting these (Mercer & Soussan, 1992; Shackleton et al., 1994, 2007; Nankhuni & Findeis, 2003; Twine et al., 2003). This may be because poorer households have been exposed to gradual degradation daily for a longer time and may have thus become more accustomed to travelling further to collect resources and no longer see this as an aspect of woodland degradation. Wealthier households, on the other hand, tend to harvest less

frequently and often collect resources using vehicles (Twine et al., 2003) and would therefore be aware of increasing fuel costs of resource collection trips as a consequence of degradation. However, as will be shown in chapter 5, wealthier households were less likely to mention travelling long distances as an actual impact of degradation on their particular households, so this is probably more a perceived than experienced aspect of degradation.

Moving to causes of woodland degradation, there was widespread agreement on these, but the most commonly mentioned were demographic, socio-economic and environmental factors. Issues relating to environmental governance were less frequently cited. Local people are clearly aware of the pressures that their communities are placing on their environment and the ultimate drivers of these, including poverty. Interestingly, endogenous factors were more widely recognised as causes of degradation than has been found in other rural African studies (Chanda, 1996; Bollig & Schulte, 1999; Ward et al., 2000; Kgosikoma et al., 2012). However, the high prevalence of poor rainfall being cited as a cause of degradation is consistent with the findings of these studies. As to the influence of wealth status on these perceptions, wealthier respondents were more likely to perceive most of the listed causes. These results point to the fact that wealthier respondents might be more aware of the causes of environmental problems than those from poorer households. This positive influence of wealth on awareness concerning environmental matters is probably related to wealth-related factors such as better education and access to information (White & Hunter, 2009). As to be expected, village context was also another important determinant of perceived causes of degradation, as types and causes of degradation are, to some extent, be village-specific (Hunter et al., 2010). Village context interacted with wealth status in its influence on perceptions.

In addition to being aware of the environmental impacts of their communities, respondents also acknowledged the negative impacts of their own households through the use of woodland resources. This means that people's continued use of woodland resources is driven by need rather than a lack of awareness of the impact of this on the environment. Other factors such as poverty and lack of alternatives drive the high levels of dependency on local natural resources

(Shackleton & Shackleton, 2004). In assessing the influence of wealth status on perception of household impacts, individuals from poorer households were more likely than those from wealthier households to agree that their activities contributed to woodland degradation. This could be based on the empirical evidence which points out that the poor households depend more heavily on woodland resources to support their livelihoods than wealthier households, at least in relative terms (Shackleton and Shackleton 2000;2002;2006; Twine, Moshe, et al., 2003; Kalaba et al., 2013; McHadry, 2002). Wealthier households may thus perceive their interaction with the environment as minimal and having less impact because they are not dependent on the environment for their livelihoods apart from supplementing other livelihood sources.

Interestingly, proposed solutions to local degradation did not include aspects of improved resource management, other than reducing resource use. This is in line with the findings of other studies on perceptions of degradation in Africa (Chanda, 1996; Ward et al., 2000). The most commonly cited potential solution to woodland degradation was use of alternative sources of energy such as electricity and paraffin. This clearly demonstrates that most respondents perceived fuelwood harvesting as the main driver of woodland degradation (Hosonuma et al., 2012), although they did not mention it explicitly. However, wealthier respondents, who were probably inclined to believe that more households should follow their example by being less dependent on fuelwood, more commonly mentioned this solution. This was also the preferred solution by younger respondents who are likely to aspire to a more modern, urban lifestyle (Smit, 1998). This is in contrast to poorer respondents who focused on more sparing use of woodland resources by households as a solution. These same patterns emerged in households' own responses to degradation covered in the next chapter.

3.5. CONCLUSION

The results of this study contribute to PEN theory by shedding light on the influence of wealth status on rural people's perceptions regarding degradation of their local environment, and its causes and possible solutions. Understanding these is important because perceptions shape people's attitudes and behaviour, and would therefore influence the level of success of policies

and interventions aimed at addressing degradation in these communities. Perceptions are shaped by individual factors such as age, gender, education, experience, and income which were accounted for in this study. However, the influence of other social contextual factors such as religion, culture, and local common narratives could not be avoided. In this context, wealth status and village had a more significant influence on local people's perceptions of their environment than individual traits such as age and gender. However, wealth status did not influence people's perception of what constitutes woodland degradation except for the experiential aspect. Nevertheless, it was an important determinant of what respondents perceived as being causes of degradation and potential solutions. Village was a key driver of all three aspects of perception about degradation that were explored. As shown in chapter 2, village population size, distance from towns, and degree of degradation varied greatly between the study villages, and contextual factors such as these are likely to shape the influence of village on environmental perceptions. The widespread awareness of causes of degradation, both at household and community level, particularly resource harvesting and poverty, has a number of implications for mitigation strategies. Firstly, policies and interventions that aim at addressing woodland degradation should not only focus on raising environmental awareness, but must also address the underlying driver of poverty. Secondly, the fact that wealthier respondents were less likely to see themselves as part of the problem may negatively influence their support of strategies employed to manage degradation, because perception determines support for environmental mitigation initiatives. Environmental laws and mitigation strategies should be sensitive of social dynamic such as differences in perceptions in local wealth status. Therefore, mitigation strategies should incorporate environmental interests and perceptions across the range of wealth status so that they can gain support at the implementation phase. Building on this study, future research should further explore the causal linkages between perception, attitude and change in behaviour in relation to degradation, and how wealth status influences these.

CHAPTER 4

THE INFLUENCE OF WEALTH STATUS ON HOUSEHOLD VULNERABILITY TO WOODLAND DEGRADATION

Abstract

Vulnerability of rural households to environmental hazards such as climate change is well studied. However, less attention has been paid to their vulnerability to local environment degradation, and how this is shaped by poverty. This is an important knowledge gap, given the seriousness of both environmental degradation and poverty across Sub-Saharan Africa. This chapter sheds light on these relationships in a sample of 213 rural households from three rural villages in Limpopo Province, South Africa. A household survey was used to collect data on household characteristics, use of woodland resources, experience of impacts due to woodland degradation, and coping responses to degradation. Quantitative data were supplemented with qualitative data from focus groups and key informant interviews. Household wealth score, derived from income sources and assets, was divided into three quintiles, and chi-squared tests were used to assess resource use across wealth classes. Multivariate logistic regression models were used to determine the influence of household wealth status score on impacts experienced and coping responses pursued, after controlling for the confounding effects of household size, gender composition, and village. Prevalence of use was higher among poorer households for most of 13 woodland resources. Poorer households were more likely to report being impacted by woodland degradation, particularly by increased distances travelled to harvest resources. The most commonly used response strategies were relying on social capital (assistance from relatives and neighbours, and savings societies), relying on economic resources (looking for employment, and buying goods from shops rather than harvesting resources) and changing resource use patterns (reducing resource consumption, and harvesting around neighbouring villages). Wealthier households were more likely to seek employment while poorer were more likely to change their resources use patterns, in ways that potentially exposed them to greater welfare vulnerability. These findings highlight the vulnerability of poor rural households to degradation, and the importance of addressing degradation as a human welfare issue.

4.1. INTRODUCTION

Environmental degradation is a challenge in most parts of the world, with Sub Saharan Africa (SSA) experiencing the most severe levels (Lal, 1994; Nkonya et al., 2016). Such degradation threatens livelihoods of households (Pandey et al., 2016), especially the rural poor who are heavily dependent on natural resources, and as such, it constitutes a livelihood stress (Somorin, 2010). Negative impacts of environmental stresses on households are well studied in the context of climate change and natural disasters (McGuigan et al., 2002; Reid, 2007; Masters & Norgrove, 2010; Mishra & Pede, 2017). This includes households' vulnerability to drought, drop in agricultural yield, and increased temperatures, as well as natural disasters such as earthquakes and hurricanes. The negative impacts of ecosystem degradation on rural households are less well studied, and those studies that do exist typically focus on the consequences of declining availability of a particular resource such as fuelwood (Brouwer et al., 1997; Guta, 2014), as opposed to degradation more broadly. Given that African savanna woodlands support 160 million people (Wessels et al., 2013), the paucity of research on the impacts of woodland degradation in general, is cause for concern.

Non-timber forest products (NTFPs) are a key livelihood sources for rural households across the developing world, and they act as a safety net against shocks and stresses, especially for poor and relatively vulnerable households (Clarke et al., 1996; Shackleton and Shackleton, 2004; Paumgarten and Shackleton, 2011; Mulenga et al., 2012; Fikir et al., 2016; Somorin, 2010; Pandey et al., 2016). Degradation itself also constitutes a livelihood stress to which rural households are exposed. Although wealthy households often consume greater quantities of NTFP, these resources make a greater contribution to the livelihoods of the poor, relative to other livelihood sources such as wage labour (Cavendish, 2000; Shackleton & Shackleton, 2000, 2004; Babulo et al., 2008; Timko et al., 2010; Paumgarten & Shackleton, 2011; Matsika et al., 2013). High dependence on woodland resources in rural communities, coupled with other factors such as high population density and poor governance, often leads to environmental degradation. Such degradation in turn affects the availability of NTFPs (Chikanda, 2009).

Anthropogenic activities such as overexploitation of natural resources, and unsustainable agricultural practices contributes to environmental degradation (Chikanda, 2009). Such degradation is more likely to impact negatively on those who depend heavily on natural resources for livelihood support and as a safety nets (Scott, 2006). Rural livelihoods are thus potentially more vulnerable to environmental degradation than their wealthier counterparts. Poverty increases the vulnerability of households to environmental stresses (Leichenko & Silva, 2014) because they have limited assets, which constrains their response options for mitigating these impacts. Household vulnerability is determined by household exposure and sensitivity to degradation, which determines impacts, and household adaptive capacity, which determines ability to cope with the impacts.

Households adopt a number of short- and long-term response strategies in order to cope with, and adapt to, environmental stresses and hazards. These include changes in consumption patterns and production strategies, as well as migration (Loneragan, 1998; Mulwa et al., 2016; Roy, 2016; Wei et al., 2016). Furthermore, farming households may respond to climatic-related shocks by drawing on savings, consuming food stocks, diversifying crops and selling livestock amongst other strategies (Oyekale & Gedion, 2012; Rurinda et al., 2014). As with any household reaction to other livelihood shocks or stresses, response mechanisms relating to degradation are likely to be shaped by a range of factors, including socio-economic status. (Campbell et al., (2000) argued that not all groups in a society are able to adapt by substituting use of one natural resource for another, especially the poor, due to limited assets available to them. Since types and levels of livelihood capital available to households shape their vulnerability context (Ashley & Carney, 1999). For example, drawing from natural capital to adapt to livelihood crises can exacerbate environmental degradation, which will further increase household vulnerability and limit adaptive capacity (Paavola, 2008)

The decline in availability of individual resources associated with land cover change in utilized woodland landscapes, has been relatively well studied (e.g. Wessels et al., 2013). Documented impacts of these changes on users include increasing time spent collecting resources such as

fuelwood (Nankhuni & Findeis, 2003) . However, assessments of the broader impacts of the various dimensions of woodland degradation as perceived and experienced by rural households, as well as households responses to this degradation, are lacking (Yan et al., 2006; Campbell, 1996). A few empirical studies on adaptation to ecosystem degradation exist for tropical forest systems (McSweeney, 2004), but less attention has been paid to savanna woodlands. Furthermore, consideration of the influence of wealth status on these relationships is limited. Household experience of impacts and their response strategies are influenced by both the type of stress that they are exposed to, and household socio-economic characteristics such as size and wealth status (Mc Leo & Kessler, 1990). Therefore, it is important to take wealth status into consideration when assessing impacts of, and responses to woodland degradation. It is also especially relevant since households are not homogenous but are diverse in their characteristics. There is clearly a gap in this area of research and limited progress has been made in documenting woodland degradation impacts on households.

Key questions that flow from the above discussion are: if the natural assets (woodland resources) that support livelihoods are now degraded, how will this impact on households? How will they respond? How does wealth status shape these relationships? The promotion of sustainable response strategies is the first step towards robust coping and adaptation strategies to address undesirable environmental changes. Furthermore, it is important to understand how local people respond to their changing environment because that knowledge may assist in formulating effective resource management policies. Therefore, there is a need for empirical studies to provide insight on how wealth status influences households' choice and implementation of response strategies. Recognizing this gap, this chapter investigates how wealth status influences local households' vulnerability to woodland degradation in terms of impacts and choice of responses, in three rural villages in Limpopo Province, South Africa. The working hypothesis of this chapter is that poorer households are more vulnerable to degradation. This chapter provides new insights on these relationships relevant for planning and implementing mitigation strategies at local and regional level.

4.2. METHODS

General sampling procedure, village descriptions and wealth status classification for this chapter are provided in full in Chapter 2. This section describes the data collection and statistical procedures used for analyses and interpretation of this chapter. Data on woodland impacts on households and household response strategies were collected using a household questionnaire. A total of 213 households were interviewed across the three study villages.

Open-ended questions were used during focus group discussions with traditional leaders and community members. This information was used to determine the list of locally used resources and pre-selected answer options for questions about impacts and responses. During the survey, open ended and closed-ended questions were used, and for some close-ended questions, a list of list of options were provided. Firstly, respondents were asked to name local woodland resources that were used by their households. In order to identify impacts perceived to apply to their households, respondents were asked if their household had been impacted by any undesirable changes in their local woodland environment. A Likert scale question was used to, for which respondents were required to choose one answer from “no”, “not really” ,” yes” and “very much”. However, due to low response frequencies for “no” and “not really”, and relatively low for “very much”, the first two were combined into a “no” response while “yes” and “very much” were converted to a “yes” response for analysis using multivariate models. If the response was “yes” they were asked to identify the impact faced by their household. The responses were categorised into themes four themes, namely:

- 1) Decrease in resources availability (*resources availability decreased*)
- 2) Increased distance travelled to collect resources (*increased distances travelled*)
- 3) Resources collected now are of low quality (*low quality resources*)
- 4) No enough resources for own use and for selling (*limited resources*)

Respondents were also asked to indicate by choosing “yes” or “no”, if they consider their household as contributing to woodland degradation. An open-ended question was used to ask

respondents to indicate the impacts that they experience due to woodland degradation, and a list of four impacts experienced was developed

- 1) Decrease in resources availability (*resources decreased*)
- 2) Increased distance travelled to collect resources (*Increased distance travelled*)
- 3) Resources collected now are of low quality (*low quality resources*)
- 4) Not enough resources for own use or for selling (*insufficient resources*)

During the focus group discussions, participants were asked to mention and discuss coping mechanisms to woodland degradation. Lastly, a list of response strategies used by the household to cope with undesirable woodland change was also developed from the focus group discussions.

- 1) Searching for employment outside of the village (*searching for employment*)
- 2) Buy resources from shops instead of collecting from the woodland (*buy resources*)
- 3) Getting support from relatives and neighbours, which refers to activities such as borrowing money or other resources from (*support of others*)
- 4) Sourcing resources from the woodlands of other nearby villages (*resources from other villages*)
- 5) Selling of assets including livestock (*selling assets*)
- 6) Reducing number of meals per day, referring to reducing meals times from three per day to two or one per day, depending on the resources available in that particular household (*reduce meals*).
- 7) Burial societies and saving clubs (*burial societies and saving clubs*)

Respondents were then asked to choose from a list, response strategy that their household currently employs, or would very likely employ in the near future, to cope with the impacts of undesirable change in their environment. Respondents were allowed to choose more than one answer and were also given the option of adding any response strategy not listed. All responses were converted into binary format where “yes” was recorded as 1 and “no” as 0.

Prevalence of use of various woodland resources in relation to wealth status was determined by first classifying the household wealth status scores into tertiles (low, intermediate, and high

wealth). The frequencies of “yes” and “no” responses for use of each resource were compared across the three wealth classes using cross tabulation with Pearson’s Chi-squared test. The influence of wealth status and confounding factors of villages, household size and proportion members that were female on the odds of a respondent mentioning a given impact or response was investigated using multivariate logistic regression models. Combinations of interactions were included in the models, and the most parsimonious model for each response option was selected based on the Akaike information criterion (AIC). Wealth status, household size and proportion of female members per household were determined to be continuous dependent variables while the village was the only categorical variable; the last category of the categorical variable (Xigalo village) was used as the reference in the model. Binary logistic regression analysis was used with wealth status as the main variable to assess a) the likelihood of respondent mentioning resources commonly used in their household, and b) impacts that their households were exposed to c) response strategies used to cope with undesirable woodland change. The odds ratios were used to predict the likelihood of a particular outcome. All statistical analyses were done using SPSS version 20 and Stata 13.

4.3. RESULTS

4.3.1 Resource use

A high percentage of households used wild vegetables, edible insects, wild fruits and firewood harvested from local woodlands (Table 4.1). The most used resources were firewood and wild vegetables (roughly 95%). Around 50% of households reported using medicinal plants and wood for carving and fencing. Somewhat lower proportions reported using thatching grass and wood for housing, while the minority reported using bush meat, mushrooms and honey to support their livelihood, with the lowest reported use being for grass brooms.

Table 4.1. Prevalence of use of woodland resources by households (n=213)

Resource used	Households
Firewood	95.3% (203)
Wild vegetables	94.4% (201)
Edible insects	80.8% (172)
Wild fruits	79.8% (170)
Medicinal plants	50.2% (107)
Wood for carving	49.3% (105)
Wood for fencing	48.4% (103)
Thatching grass	46.5% (99)
Wood for housing	35.2% (75)
Bush meat	23.9% (51)
Mushroom	23.5% (50)
Honey	22.5% (48)
Grass brooms	16.0% (34)

A greater proportion of households in the low wealth status class used each of the listed resources than those in the intermediate and high wealth categories, with the exception of wood for carvings (Fig 1). This higher prevalence of use by poorer households was significant for edible insects ($\chi^2=10.88$, $p<0.01$), wood for fencing ($\chi^2=9.50$, $p<0.01$), wood for construction ($\chi^2=19.820$, $p<0.001$), thatching grass ($\chi^2=6.24$, $p<0.05$), mushrooms ($\chi^2=13.52$, $p<0.01$), honey ($\chi^2=9.18$, $p<0.05$), and grass brooms ($\chi^2=17.04$, $p<0.001$). For some resources, such as wood for fencing and thatching grass, prevalence of use decreased sequentially with increasing wealth class, while for others, such as edible insects and grass brooms, the lower relative frequencies for intermediate and high wealth classes were more or less the same. A greater proportion of households in the high wealth class used wood for carvings, but this difference was not significant ($p=0.159$).

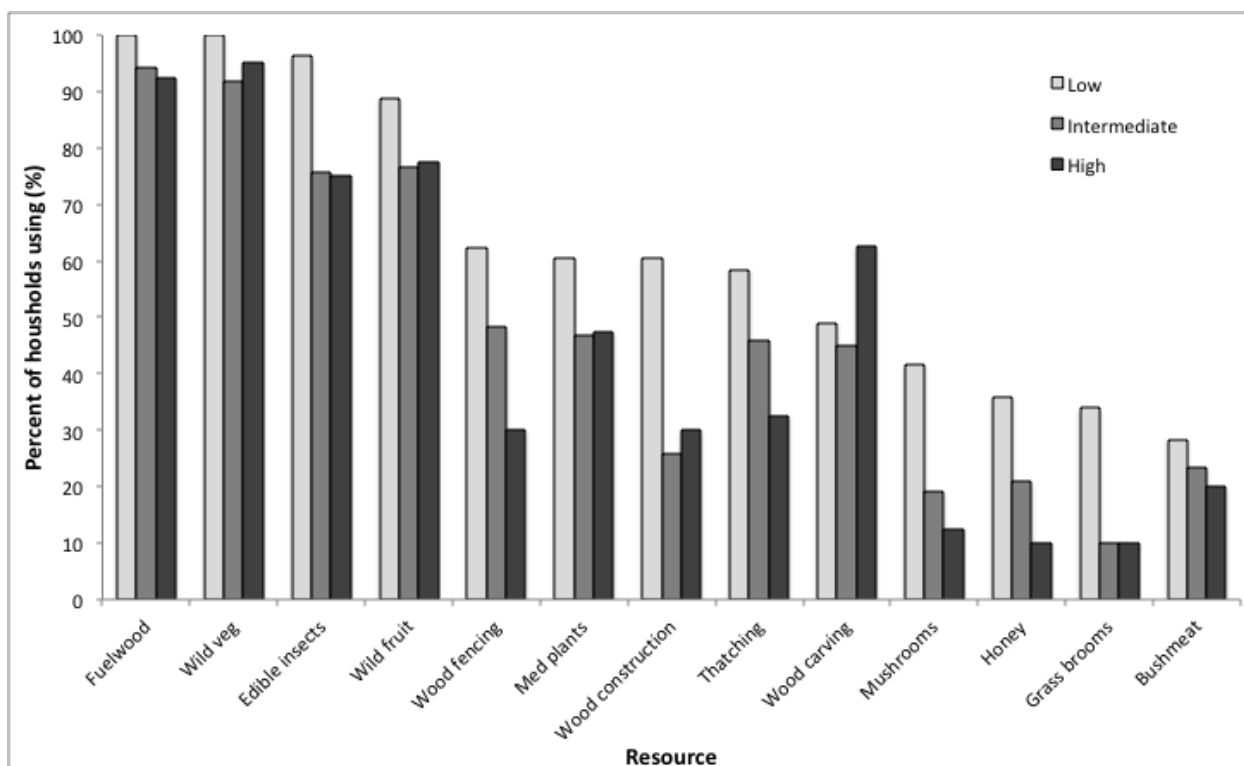


Figure 4.1. Prevalence of household use of woodland resources across wealth status tertiles (low, intermediate, high) (n=213)

4.3.2. Impacts of woodland degradation on households

Almost 80% of the respondents agreed that woodland degradation had negatively impacted their household to some extent (Table 4.2). The level of impact varied across the respondents with about 22% indicating that they were strongly impacted and only 8% indicating that they were not impacted (Table 4.2). About 77% of the respondents reported that they only experienced one negative impact, while less than one percent reported being affected by three such impacts.

Table 4.2. Degree and number of woodland degradation impacts experienced by households (n=213)

Degree of impacts	Households	Number of impacts per households	Households
No	8.02% (17)	No impact	14.65% (31)
Not really	12.74% (27)	1 impact	77.0% (164)
Yes	57.08% (121)	2 impacts	7.8% (17)
Very much	22.17% (47)	3 impacts	0.5% (1)

The likelihood of indicating that woodland degradation had impacted a respondent's household decreased by almost 0.320 times with every increase of one unit of the wealth score (Table 4.3). Individuals from Matshena were less likely than those from Xigalo to indicate that woodland degradation had a negative impact on their households (OR=0.343, $p<0.01$). Household size and relative proportion of females in a household did not significantly influence respondents agreeing that woodland degradation had negatively impacting their household.

Table 4.3. Logistic regression model results (OR $\pm$ 95% CI) for reported negative impacts of woodland degradation on households

Independent variables	Woodland degradation has impacted on household
Household size	0.972 (0.803-1.176)
Household female proportion	0.005 (0.000-3.303)
Maholoni Village	0.913 (0.315-2.646)
Matshena Village	0.343 (0.143-0.825)*
Wealth status	0.320 (0.165-0.625)**
Wealth status x Household female proportion	2.579 (0.931-7.141)
Model P value	<0.001
Model summary	-2Loglikelihood = 166.649 Cox & Snell R squared = 0.211 Nagelkerke R squared = 0.329

* $p<0.05$, ** $p<0.01$ and *** $P<0.001$, Reference categories: Village =Xigalo

The most frequently cited impact of woodland degradation was a decrease in resources (62.3%), although relatively few respondents (5.4%) indicated that this had led to insufficient resources (Table 4.4). The second-most frequently mentioned impact was increased distances travelled to collect resources, followed by decline in resource quality.

Table 4.4. Prevalence of listed impacts of woodland degradation on households (n=213)

Impact of woodland degradation on households	Households
1) Decrease in resources availability (<i>resources decreased</i>)	62.7% (128)
2) Increased distance travelled to collect resources (<i>Increased distance travelled</i>)	14.2% (29)
3) Resources collected now are of low quality (<i>low quality resources</i>)	7.4% (15)
4) Not enough resources for own use or for selling (<i>insufficient resources</i>)	5.4% (11)

After controlling for other factors, household wealth status had a significant influence on increased distance travelled. The likelihood of indicating increased distance travelled as an impact experienced decreased by 0.801 ($p < 0.05$) with every increase of one unit of the wealth score, (Table 4.5, Model 2). The interaction between wealth status and village showed a significant influence on the likelihood of a respondent mentioning low quality resources as an impact experienced by households as a result of woodland degradation. Individuals from Matshena were 0.664 times less likely ($p < 0.05$) to cite resources decreased as an impact than those from Xigalo with increasing wealth status score (Table 4.5, Model 1). Individuals from Matshena were less likely than those from Xigalo to mention increased distance travelled as an impact experienced by households due to woodland degradations ($OR = 0.279$, $p < 0.05$) (Table 4.5, Model 2). Logistic regression models for insufficient resources and low quality resources were not included in the results because the model p value was not significant.

Table 4.5. Logistic regression model results (OR $\pm$ 95% CI) for impacts of woodland degradation

Independent variables	Affected by resources decreased (Model 1)	Affected by increased distance travelled (Model 2)
Household size	0.927 (0.817-1.052)	1.119 (0.951-1.316)
Household female proportion	1.230 (0.350-4.326)	5.673 (0.965-33.336)
Maholoni Village	0.339 (0.040-2.852)	0.687 (0.206-2.289)
Matshena Village	0.620 (0.911-48.086)*	0.279 (0.089-0.875)*
wealth status score	0.924 (0.777-1.100)	0.801 (0.670-0.957)*
wealth status x Maholoni Village	1.211 (0.850-1.726)	
wealth status x Matshena Village	0.664 (0.468-0.942)*	
Model P value	<0.05	<0.01
Model summary	-2Loglikelihood=251.964 Cox & Snell R squared=0.082 Nagelkerke R squared=0.112	-2Loglikelihood=148.422 Cox & Snell R squared=0.086 Nagelkerke R squared =0.154

*p< 0.05, **p<0.01 and ***P<0.001, Reference categories: Village =Xigalo

4.3.3. Responses to woodland degradation

Getting support from relatives and neighbours and searching for employment were the most frequently selected response strategies to woodland degradation (>63%). On the other hand, selling of assets, collecting resources from nearby villages, and reducing resource consumption were cited by far fewer respondents (Table 4.6).

Table 4.6: Prevalence of response strategies used by households to cope with undesirable change in local woodlands (n= 213)

Response strategy	Households
1) Get support from relatives and neighbours (<i>support from others</i>)	64.9% (137)
2) Searching for employment out of the village (<i>searching for employment</i>)	63.6% (131)
3) Burial societies and saving clubs (<i>burial societies and saving clubs</i>)	51.1% (108)
4) Buy resources from shops instead of collecting from woodlands (<i>buy resources</i>)	17.6% (36)
5) Reduce quantity of resources used per day per (<i>reduce resource consumption</i>)	15.8% (32)
6) Slaughter or selling of assets including livestock (<i>selling assets</i>)	12.7% (26)
7) Fetching resources from nearby villages not from own local village (<i>collecting resources from nearby villages</i>)	7.3% (15)

Wealth status on its own had a significant influence on the likelihood of a respondent citing searching for employment, collecting resources from nearby villages, and reducing resource consumption (Table 4.7). The odds of a household member searching for employment increased by almost 1.3 times ($p < 0.01$) with every increase of one unit of the wealth score (Table 4.7 and Model 1). Conversely, the odds of a household reducing resource consumption decreased by 0.747 ($p < 0.01$) with every increase of one unit of the wealth score (Table 4.7, Model 5) and the odds of collecting resources from nearby villages also decreased by 0.467 score ($p < 0.05$) with every increase of one unit of the wealth score. The interaction of wealth status and village showed significant influence on the odds of a household selling assets and reducing quantity of resources consumed, while interaction between wealth status and household female proportion had a significant negative influence on relying on burial societies and saving clubs ($OR = 0.043$, $p < 0.05$). Individuals from Matshena were twice more likely to cite selling assets than those from Xigalo with increasing wealth status score ($p < 0.01$) (Table 4.7, Model 4). Individuals from Matshena were 0.527 less likely to cite *reduce resources consumption* than those from Xigalo with increasing wealth status score ($p < 0.001$) (Table 4.7, Model 5). On the other hand, households with a high proportion of females were almost twice

as likely to choose burial societies and saving clubs as a response strategy to woodland degradation ($p < 0.05$) with increasing wealth status score. Village of residence had a significant influence on six strategies (Table 4.7). Individuals from Matshena (the intermediate-sized village) were more likely than those from Xigalo (largest, most degraded) to mention searching for employment ($OR = 24.620$, $p < 0.001$) and buying resources ($OR = 4.768$, $p < 0.05$) (Table 4.7, Models 1 and 2). On the other hand, individuals from Matshena were 0.707 ($p < 0.05$) less likely to indicate reducing quantity of resources consumed as a response strategy to woodland degradation (Table 4.7, Model 5). They were also 0.023 times less likely ($p < 0.01$) to mention burial societies and saving clubs as a response strategy to woodland degradation (Table 4.7, Model 7). Individuals from Maholoni were more likely than those from Xigalo to mention collecting resources from nearby villages ($OR = 11.261$, $p < 0.05$) (Table 4.7, Model 3). However, they were 0.078 less likely ($p < 0.001$) to use of saving clubs and burial societies as a response to woodland degradation. Household size had no significant influence on participant's identification of the seven response strategies.

Table 4.7. Regression Model results (OR $\pm$ 95% CI) for response strategies

Independent variables	Searching for employment (Model 1)	Buy resources (Model 2)	Collecting resources from nearby villages (Model 3)	Selling assets (Model 4)	Reduce resources consumption (Model 5)	Support from relatives (Model 6)	Burial societies and saving clubs (Model 7)
Household size	1.044 (0.911-1.197)	1.012 (0.862-1.187)	0.938 (0.732-1.200)	1.026 (0.839-1.254)	1.079 (0.927-1.255)	0.977 (0.858-1.112)	0.998 (0.859-1.160)
Household female proportion	1.334 (0.362-4.922)	0.460 (0.090-2.355)	0.119 (0.003-4.398)	0.042 (0.004-0.418)**	0.407 (0.088-1.889)	1.046 (0.287-3.806)	0.043 (0.002-0.876)*
Maholoni Village	1.108 (0.490-2.503)	1.888 (0.622-5.735)	16.184 (3.813-68.687)***	4.337 (0.050-375.195)	0.707 (0.235-2.128)	0.444 (0.053-3.710)	0.078 (0.030-0.200)***
Matshena Village	24.620 (7.076-85.664)***	4.768 (2.030-11.199)***	1.249 (0.254-6.135)	0.216 (0.011-4.219)	0.047 (0.006-0.366)**	9.350 (1.277-68.437)	0.023 (0.009-0.062)**
Wealth status	1.270 (1.096-1.473)**	1.114 (0.946-1.312)	0.467 (0.254-.0.847)*	0.984 (0.703-1.379)	0.747 (0.628-0.889)**	1.140 (0.947-1.374)	0.758 (0.530-1.084)
Wealth status x Maholoni Village				0.663 (0.268-1.6440)	0.831 (0.582-1.185)		
wealth status x Matshena Village				2.001 (1.202-3.334)**	0.527 (0.367-0.755)***		

wealth status x Household female proportion		2.119 (0.869-5.216)					1.988 (1.074-3.682)*
Model P value	<0.000	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001
Model summary	- 2Loglikelihood=127.602 Cox & Snell R squared=0.263 Nagelkerke R squared=0.432	- 2Loglikelihood=83.352 Cox & Snell R squared=0.110 Nagelkerke R squared=0.171	- 2Loglikelihood=86.043 Cox & Snell R squared=0.099 Nagelkerke R squared=0.242	- 2Loglikelihood=107.473 Cox & Snell R squared=0.211 Nagelkerke R squared=0.395	- 2Loglikelihood=144.827 Cox & Snell R squared=0.146 Nagelkerke R squared=0.251	- 2Loglikelihood=137.313 Cox & Snell R squared=0.247 Nagelkerke R squared=0.395	- 2Loglikelihood=187.875 Cox & Snell R squared=0.385 Nagelkerke R squared=0.514

*p< 0.05, **p<0.01 and ***P<0.001, Reference categories: Village =Xigalo

4.3.4. Overview of focus groups discussions and key informant interviews

During focus group discussions, community members mentioned that they have observed a growing trend of using alternative resources such as cow dung and plastic bottles for cooking instead of firewood in other villages, but not in their respective villages. Use of electricity and other sources of energy were mentioned as important strategies that can assist to relieve pressure from the local woodland. For these to be realized, subsidizing of food, electricity and other day-to-day commodities by government were also mentioned as important to enable households to implement these response strategies. These strategies were the most frequently mentioned out of the list of strategies in all three villages. Of direct relevance to the focus of this chapter, they also mentioned that use of alternative response strategies such use of electricity was impractical for those who are unemployed and poor. They also suggested government intervention in the form of food and electricity subsidies so that they can cease collecting such resources from the forest. However, there was disagreement among participants as the older participants preferred using woodland resources such as firewood rather than electricity to prepare their food. One of the older respondents said that *“there is a difference in taste of food that is cooked by electricity and that which is cooked by firewood, the one cooked by firewood tastes better”*.

Department officials pointed out that the success of response strategies requires integrated planning involving different spheres of government, including mobilization of funds to support initiatives that reduce pressure on woodlands. One official from LEDET said that *“communal woodland must be divided into camps and introducing rotational harvesting of resources”*. Another departmental official also mentioned that *“the community had a major role to play because they are familiar with the area and local tree species”*. They thus envisaged that with minimal training, community members could assist in monitoring tree regeneration. There seemed to be agreement between government officials and community members on the need for subsidizing electricity and other day-to-day commodities so that households, especially the poor, would be able to reduce their dependency on the woodlands.

4.4. DISCUSSION

This chapter investigates how wealth status influences the vulnerability of households to woodland degradation, in terms of the perceived impacts of degradation on households and the household choice of response strategies to cope with this degradation. The results of this study support the hypothesis that poorer households are more vulnerable to woodland degradation. As to general experience of impact, poorer households were more likely than wealthier ones to report being impacted by woodland degradation. These findings are in line with other studies, given that it is widely accepted that poor households are more reliant on natural resources for their livelihoods, and that the use of natural resources buffers poor households from other livelihood shocks (Shackleton & Shackleton 2004; Makhado et al., 2012; Matsika et al., 2013; Cerutti et al., 2015). Furthermore, declining natural resource availability would thus leave households potentially more vulnerable to shocks and stresses in general (Shackleton & Shackleton, 2004a; Paumgarten & Shackleton, 2011). For example, the use of plastic bottles as a response strategy to a shortage of fuel, as highlighted by participants during the focus group discussions and key informant interviews, may expose poorer households to health hazards due to toxic emission from plastic bottles, especially if burnt inside the house. If this becomes a widespread strategy, it could even contribute to air pollution more broadly. These results illustrate the complexity of PEN, as some household coping strategies in response to the shortage of environmental resources may lead to unintended negative impacts at local, regional and even international scales.

The consistently higher proportion of poor households using the various local NTFPs in this study reiterates the dependence of the poor on these resources, and their potentially higher exposure to degradation as a stress. However, given the high use of key resources such as firewood (95.3%), the proportion of households reporting noticeable impacts of degradation (79.3%) was lower than expected. This may be because the majority of households, which are of poor or intermediate wealth status, use NTFP on a daily basis for survival, and their exposure is thus more-or-less constant. Some poorer households may therefore have become habituated

to lower resource availability over time, and they thus do not perceive the impacts. On the other hand, although poorer households were more likely to report being impacted by degradation, a greater proportion of wealthier households perceived impacts than would be expected. A possible explanation is that, while they do not use NTFP's to support their livelihoods to the same extent as poor households, they typically use a wider range of resources and utilize greater amounts, albeit less frequently (Cavendish, 2000; Twine et al., 2003a). They are also more likely than poorer households to buy resources because they have financial means of doing so (Twine et al., 2003a) and may thus be aware of, and impacted by, rising costs for buying or transporting resources than poor households.

Concerning particular types, two related impacts come to the fore as being the most commonly mentioned by those who reported being negatively impacted. The first was wide recognition of declining availability of resources. This echoes findings elsewhere in Africa where rural residents indicated decline in NTFP availability as an impact of environmental degradation that affects their households (Chanda, 1996; Lykke, 2000; Moore & Thiongane, 2000; Wezel & Haigis, 2000a). The second, which is a consequence of the first, is the need to travel longer distances to collect resources. In the literature, this is often mentioned in specific relation to fuelwood, which is collected daily (Brouwer et al., 1997; Giannecchini et al., 2007). Increased distance to suitable resource stocks translates into increased collection times, and the harvesters, typically women, thus incur a degradation-related opportunity cost (Ward et al., 2000; Heltberg, 2001; Madubansi & Shackleton, 2007; Matsika et al., 2013). Although wealthier households were more likely to mention traveling long distances to access resources in their definition of degradation (chapter 3), they were less likely to mention it as impacting their household specifically (this chapter). This supports the point that poorer households suffer by traveling long distances to collect resources because they do not have other alternative sources (Nankhuni & Findeis 2003; Shackleton et al., 1994). For example, households that have the financial resources, may respond to fuelwood shortages by buying wood from vendors, or switching to other energy types, while this option is not feasible for poorer households (Madubansi & Shackleton, 2007). Furthermore, the poor are also more likely to collect natural

resources themselves and travel on foot, as opposed to the wealthy, who use vehicles or hire people to harvest for them (Twine et al., 2003a). This is supported by other research findings which also indicated that wealth status influences the exposure to shocks and stresses by households, with application to vulnerability to environmental degradation (Paumgarten & Shackleton, 2011; Wei et al., 2016)

Regarding responses to the above-mentioned impacts, support from relatives and neighbours emerged as the most important coping strategy for mitigating against the negative impacts of woodland degradation. Getting financial assistance from burial societies and saving clubs to which respondents belonged, was also an important response strategy. Taken together, this highlights the importance of social capital for buffering households from the impacts of degradation. This is supported by other studies that have discovered the prominent role of kinship connections (Njana et al., 2013; Paumgarten, 2005; Shackleton & Shackleton, 2003), neighbours and friends from the same or nearby villages (McSweeney, 2004; Tibesigwa et al., 2016; Tamako & Thamaga-Chitja, 2017), and membership in social groups (Tibesigwa et al., 2016) as important safety nets for households during times of hardship.

The other prominent response was seeking employment elsewhere. Environmental stress has been shown in some contexts to be one of the major causes of temporary migration from rural communities to seek better opportunities such as employment or better rangelands (Magadza, 2000). However, in other contexts, labour migration has been found to be positively correlated with better vegetation cover (Hunter et al., 2014). This may be because better access to natural capital enables households to take the risk of sending members to look for work elsewhere (Hunter et al., 2014). The findings in this chapter support the first scenario.

The preferred response strategy of households was influenced by wealth status. Wealthier households were more likely to cope by migrating to other areas to seek employment. It could be argued that wealthier households would tend to have financial assets that afford them better livelihood options in other settings. Moreover, wealthier households might have more

educated members who are eligible for formal employment elsewhere. Wealthier households may allocate substantial economic resources to sending migrants in search of employment, due to the prospects of return on the investment in the form of future remittances (Azam & Gubert, 2006). By contrast, the strategies more likely to be used by poorer households related to changes in patterns of resource use and access. The poorer households reported having to reduce resource consumption and collecting resources from around other villages. This suggests that the poor are not able to substitute natural resources with other livelihoods sources, which constrains the coping strategies available to them, making them more vulnerable to degradation (De Sherbinin et al., 2008). Ironically, these response strategies of the poor to degradation could potentially worsen both poverty and degradation. Firstly, they are more likely to be exposed to stress and reduced wellbeing because of decreased consumption of resources such as wild foods. The stress is contributed by factors such as reduced access to cooking energy for example, and insufficient financial resources precludes purchase of alternatives. Secondly, by harvesting resources from other villages, they potentially increase the pressure on those resources, thus spreading resource degradation to the surrounding villages. In turn, the impacts of degradation on the poor are exacerbated. On the other hand, wealthier households were found to be less likely to modify their resource use and acquisition patterns because they were likely to be in a better position to use their financial and physical assets to respond to resource shortages. In addition, wealthier households are better able to access resources such as loans from financial institutions than poorer households. This further reinforces their ability to utilize economic resources to respond to natural resource degradation, rather than modifying natural resource use.

It is important to note that while wealth status clearly influenced negative impacts on households and their responses to such impacts, other household and contextual factors were also important determinants. These may interact with wealth status. For example, households with a high proportion of females were more likely to pursue strategies that relieve them from collecting NTFP's by substituting with buying resources from the shops. This is due to the fact that the responsibility of collecting resources such as firewood and water rests on females

rather than males (Nankhuni & Findeis, 2003). Therefore, females more acutely experience hardships of traveling long distances collecting natural resources. Consequently, alternative strategies that in their perception would relieve them from resource collection would be preferred. This study also highlighted the importance of geographic context, such as place of residence (village); individual villages differed in terms of the influence of wealth status on perceived impacts and of responses chosen.

4.5. CONCLUSION

In light of the above results and discussion, three key conclusions can be drawn to answer the research questions addressed in this chapter. First, poverty increases household exposure to the impacts of degradation, particularly due to reduced resource availability and resultant increase in distances travelled to harvest resources, with results in time and opportunity costs. Second, wealth status influences the way in which households respond to these impacts. Poorer households' responses typically revolve around adapting resource use strategies in ways that potentially exacerbate their vulnerability. By contrast, wealthier households respond to these impacts with economic strategies that do not worsen household wellbeing. Third, the context in which a household lives, such as village, has a strong influence on household experience of, and response to, woodland degradation impacts. The implication of this is that these household-level relationships should not be examined in isolation from the local context when considering the poverty-environmental nexus. The findings of this study have implications for the design of strategies for the mitigation of woodland degradation at a policy level. These should take note of the interaction between poverty and degradation, and how this relationship is influenced by local context. What remains unclear, is the long-term consequences of woodland degradation and the resultant local response strategies for both household and environmental sustainability. This highlights the need for long-term studies for navigating the trade-offs between poverty alleviation and woodland management.

CHAPTER 5

THE INFLUENCE OF WEALTH STATUS ON LOCAL AWARENESS AND ATTITUDES REGARDING ENVIRONMENTAL GOVERNANCE OF COMMUNAL WOODLANDS

Abstract

Weak governance in developing countries usually accompanies environmental degradation and poverty. The role of local structures and institutions in the governance of common property resources has been well researched, including the environmental consequences of weakening institutions. However, the intersection between poverty and environmental governance has largely been overlooked in these systems. This chapter provides unique insights on how wealth status shapes awareness and attitudes about local resource governance in three rural villages in Limpopo Province, South Africa. A sample of 213 respondents were interviewed using a questionnaire to determine their awareness and attitudes about various resource governance structures, institutions, and strategies around their villages, and to quantify their household wealth status based on income sources and assets. The influence of wealth status on these, after controlling for the effects of age, gender, and village, were analysed using multivariate logistic models. Traditional authorities were unanimously identified as important in resource governance in communal areas, while awareness of various relevant government structures was relatively low. Wealth status had no effect on awareness of these. Concerning institutions such as laws, poorer respondents were more likely to be aware of a customary law forbidding the cutting of whole trees and the penalty for breaking this rule, while awareness of the penalty for contravening the government law banning the harvesting of trees without a permit was higher among wealthier households. Wealth status also influenced opinions on the value of environmental laws; wealthier respondents felt that they were important for making clear which species may be harvested, while poorer respondents were more likely to indicate that they provided information on how to access permits. There was widespread agreement that woodland governance could be improved by delegating more power to the traditional authorities and communities, as well as better monitoring of resources by government officials, and these opinions were not influenced by wealth status. These findings provide new insights on the governance dimension of the poverty-environment nexus, with policy implications.

5.1. INTRODUCTION

Environmental governance has existed in Africa dating back before the pre-colonial period (Average & Desmond, 2007), as natural resources have always played an important role in the culture and livelihoods in these societies. These governance systems were used to control access and use of the local natural resource through the use of norms, customary laws, taboos, and religious and cultural beliefs (Campbell et al., 2003; Kowero, 2003; Fabricius, 2004; Fuggle & Rabie 2009; Makhado et al., 2012; Brewer & Stern, 2005). This included controlling resource use such as grazing by livestock and harvesting of forest resources such as firewood and medicinal plants (Fabricius, 2004; Kowero, 2003; Makhado et al., 2012; Virtanen, 2005; Makhado et al., 2012; Mowo et al., 2013; Mowo et al., 2013; Virtanen, 2005)

In the context of this thesis, a governance system is conceived of as consisting of institutional structures (e.g. traditional authorities and government agencies), that employ a range of institutions, such as laws, to achieve certain outcomes. This is done using various processes such as monitoring and enforcement. Governance structures, institutions and processes are guided by, and are in support of, policies. Taken together, these influence the attainment of outcomes such as environmental sustainability, poverty alleviation, justice and trust (Fakier et al., 2005; Swiderska et al., 2008). This framework assumes that the outcomes will feed back to processes, institutions and structures. This is necessary so that there will be amendment of the institutions and processes by the structures where necessary to achieve desired outcomes.

This chapter focuses mainly on traditional and government governance systems because these are central to resource management across Africa (Augustine, 2016). Customary institutions still exist in South Africa, in the form of the Traditional Authorities. These consist of a chief, headmen, and councillors, which together constitute a tribal council. They execute their roles in land allocation and regulation of resource use in the communal lands (Ntsebeza, 2004; King, 2005). However they are faced with challenges in executing their mandate of natural resources management, and their powers and effectiveness in managing natural resources in the communal lands has declined (Twine et al., 2003b; King, 2005;

Kirkland et al., 2007; Findlay & Twine, 2018). This has become particularly noticeable since democratic change in South Africa in 1994, due to rising uncertainty about the role of hereditary traditional authorities in a modern democracy (Twine et al., 2003c). Factors such as budget cuts for local “tribal rangers” by government, corruption, and inconsistency in handing down judgements have also eroded the effectiveness of traditional authorities and community confidence in them (Twine et al., 2003). A similar trend in erosion of traditional institutions and structures has been observed in other African countries such as Zimbabwe (Campbell et al., 2001), Ethiopia (Schmidt & Pearson, 2016) and Cameroon (Asah et al., 2008). However, it is important to note that the effectiveness of the traditional authorities in resource governance is highly variable in South Africa, ranging from very effective (Saidi & Tshipala-Ramatshimbila, 2006) to highly ineffective (Kirkland et al., 2007).

It has also been argued that in some cases, chiefs might be intentionally lax in enforcing local laws, such as the prohibition of cutting live wood, for political expediency, not wanting to alienate the community, because they recognise that the rural poor do not have other options when dry wood has been exhausted (Findlay & Twine, 2018). This highlights the PEN dimension of resource governance in common property system, which has not received much attention in the literature. Regardless of the political dynamics, decline in local resource governance has been blamed for observed increased over-exploitation of natural resources both by local people and outsiders (Makhado et al., 2009; Murphree, 1993; Twine, Saphugu, et al., 2003). This has direct implications for the rural poor, who are vulnerable to environment degradation (see chapter 4).

In modern societies, government institutions such as environmental ministries/departments are ultimately responsible for natural resource governance via policy implementation and legislation enforcement. The approach and policies of government institutions have changed over time, from ‘fortress conservation’ to more inclusive participatory approaches.(DWAF, 1995). In South Africa, forestry and conservation policies of the *apartheid* government were focused on preservation of natural resource for the benefit of the privileged white minority. Since the 1994 democratic transition, poverty reduction, redress, and equitable sharing of resources has been the core of many sectorial policies in South Africa, including the environmental sector. These principles are contained in the National Forests Act (Act No. 84

of 1998) and the 2005 National Forestry Plan. Programs using approaches such as participatory forest management (PFM) and community-based natural resource management (CBNRM) were implemented aligned to the new policies and legislation. These programmes advocate benefit-sharing, co-management and a bottom-top approach to natural resource management. This approach includes areas outside of protected areas such as the communal woodlands. CBNRM attempts to empower local communities to reduce poverty through the sustainable use of their natural resources (Isyaku et al., 2011). Under the PFM and CBNRM, communities become the primary implementers, assisted and monitored by government technical services and other external role-players (white paper on sustainable forest development, 1995).

In South Africa, in addition to national and provincial government, local government (comprising municipalities) also has an obligation to manage the environment sustainably. This is necessary to ensure that citizens' environmental rights, as stated in Section 24 of the Constitution of the Republic of South Africa, 1996, are realized. However, evidence suggests that local government lacks capacity and political will to proactively manage the commons (Shackleton, 2009). Environmental matters are not given high priority except for developments that require Environmental Impact Assessments (EIAs). Environmental services are mentioned in few municipalities' Integrated Development Plans (IDPs) with the emphasis on developing community projects such as eco-tourism and forestry related projects including bee keeping and mushroom collection (Shackleton, 2009).

Effective governance of local resources in South African communal areas is hampered by several factors affecting traditional authorities and all three spheres of government. Firstly, there is a lack of clarity on the respective roles and jurisdiction of the different agencies responsible for resource management, particularly in the communal woodlands (Kowero, 2003; Middleton et al., 2011; Wingqvist et al., 2012). Secondly, all of these institutions face severe resource constraints, such as budgets and personnel (Shackleton, 2009).

People's experience of environmental governance systems, including those discussed above, are likely to be shaped by a range of factors. Key among these would be the way in which people interact with and are able to make use of their local environment. These experiences

influence people's exposure to, and perceptions of, these systems. As demonstrated in previous chapters and in the literature, wealth status is a key determinant of household resource-use patterns (Shackleton & Shackleton, 2004; 2006). Wealth status is also known to influence people's attitudes and perceptions in a range of other contexts (Adler & Ostrove, 1999; Demakakos et al., 2008; Giles-Corti & Donovan, 2002; Murgor et al., 2013; SANI 2017; Shackleton & Shackleton, 2006; Shange, 2015). Therefore, it stands to reason that wealth status influences people's awareness and attitudes about the governance systems relevant to their local environment. However, this dimension of the poverty-environment nexus has not received much research attention.

The way in which socio-economic status (wealth status), and other household and individual factors, influence environmental awareness and attitudes is well documented in the literature (Priskin, 2003; Sesabo et al., 2006). However, this is usually in relation to environmental problems or the conservation (Infield & Namara, 2001; Holmes, 2003; Anderson et al., 2007), rather than concerning the institutions and structures that govern the local the environment. It is important to understand how wealth status shapes individual's orientations towards local environmental governance systems because this is likely to impact on the way they value and cooperate with these structures and processes. This would influence the success or failure of resource management strategies, especially in the implementation phase (Fakier et al., 2005; Lo & Tang, 2013; Plummer et al., 2017). This chapter therefore explores the influence of wealth status on local people's awareness and attitudes regarding environmental governance in their local context of a rural communal landscape.

5.2 METHODS

Sampling procedure, village descriptions and wealth status classification for this chapter are discussed in full in the methods chapter (Chapter 2). This section describes the data collection and statistical procedures used for analyses and interpretation specific to this chapter.

Data for this chapter were obtained from demographic and governance sections of the survey questionnaire. Key informant interviews and focus group discussions were further used as an additional source of data. The focus group discussions were conducted with community members in each of the three sampled villages. Government officials interviewed were employed at the Department of Agriculture Forestry and Fisheries (DAFF) and Department of Environmental Affairs (DEA). The two departments share the legal mandate of managing natural forests and woodlands within the province and at the national level. However, the responsibility differs in terms of the legal mandate, in that DAFF enforces the National Forests Act (NFA) (Act No. 84 of 1998) and DEA the National Environmental Management Act (NEMA) (Act No. 107 of 1998 as amended). The interviews with government officials targeted those responsible for the monitoring and enforcement of those acts. To qualify to be interviewed, they were required to have worked in the government department for over ten years. Both lower qualified officers, including forest guards with limited education, and those at the management level with tertiary qualifications, were interviewed. This was done to ensure information was gathered from the range of officials with first-hand information on policy and legislative implementation. The main themes discussed in the interviews were recorded during individual interviews (guiding interview questions attached as Annexure B). The main themes were used to develop questionnaires, as well as to interpret and interrogate results of interviews conducted in the villages.

The questionnaire utilized both closed and open-ended questions. In all close-ended questions, participants were given an opportunity to add any responses they thought were missing from the provided list. Respondents were first asked to choose from a list of institutional structures those they thought were important in the management of local woodlands. Five structures responsible for woodland management derived from the focus group discussions were given to the respondents to choose from. Respondents were allowed to choose more than one institution. They were also requested to mention any traditional or government laws that they were aware of in relation to woodland management and could provide more than one law. The open-ended responses were classified into common themes and categories.

The respondents mentioned four customary laws that are used by traditional authorities to management woodland degradation. An abbreviated format was assigned to each rule (in italics below) for reporting purposes, as follows:

1. No cutting of indigenous trees without a permit from the local traditional council (*no cutting without permit*) (Rule 1.1).
2. Permission to only cut tree branches and not the whole tree (*no cutting down of whole tree but only branches permitted*) (Rule 1.2).
3. No cutting of indigenous fruit trees (*no cutting of indigenous fruit trees*) (Rule 1.3).
4. Penalty of a fine for cutting trees without a permit issued by the local traditional council (*fine for cutting without permit*) (Rule 1.4).

Respondents mentioned one law and one penalty attached to it. An abbreviated format was assigned to each (in italics below) for the reporting purposes, as follows:

1. No cutting of living tree stems without permit from government authorities (*No cutting of living trees without permit*) (Rule 2.1).
2. A R500 fine for cutting indigenous living stem trees and confiscating the equipment's used in cutting trees (*R500 fine for cutting indigenous living trees*) (Penalty 2.2).

They were then coded to allow for quantitative analysis of the data with relative ease. Likert-scale questions were used to measure the importance of roles of environmental laws and strategies for the improvement of woodland management. The respondents were asked to indicate the roles of the environmental laws in providing guidelines used to manage woodland degradation by choosing either 'important', 'extremely important', or 'not important', as well as 'not important at all' on the statements given. Those options were derived from the NFA. An abbreviated form was assigned to each rule (in italics) for the reporting purposes. All Likert-scale responses were converted into binary format due to lack of variance and low frequency in some of the response categories. The categories 'important' and 'extremely important' were both recorded as "yes" while 'not important' and, 'not important at all' were recorded as "no".

All categorical response variables were converted into binary variables, where 0 represented "no" and 1 represented "yes". Various multivariate logistic regression models were run,

including with interactions between wealth status, gender, village and age. The models were aimed at assessing the influence of wealth status on the likelihood of giving certain responses, after controlling for confounding factors such as age or gender of respondent, or the village they lived in. Only wealth status was continuous while the other variables were categorical, so, the last category of the categorical variables being used as references in the model, as indicated in the regression results tables. Various models were run for each of dependent variables, with four independent variables, and combinations of interactions between wealth status and the other three. Akaike's Information Criterion (AIC) scores were used to select the most parsimonious model for each question. Model results were reported as odds ratios, p-values and the 95% confidence interval, and these were used to explain the influence of the independent variables on the likelihood of participants mentioning or choosing particular options.

5.3. RESULTS

5.3.1. Institutional structures

Roughly, 95% of participants regarded traditional authorities as being important in woodland management, followed by 50% who mentioned civic association. Municipality and government departments were less commonly chosen, and very few mentioned non-governmental organizations (NGOs) (Table 5.1).

Table 5.1. Prevalence of respondents indicating institutions responsible for woodland management (n=213)

Institution	Respondents
1) Traditional authorities	95.3% (203)
2) Civic Association	50.2% (107)
3) Municipality	35.7% (76)
4) Government departments (DAFF and LEDET)	33.3% (71)
5) Non-governmental organizations (NGO)	8.9% (19)

Wealth status on its own had no significance influence on individual's choice of institutions responsible for woodland management. However, there was a significant interaction between wealth status and village, and wealth status and age, in their influence on a respondent identifying NGOs, government department and municipality as institutions responsible for woodland management. The odds of individuals from Matshena choosing NGO decreased relative to those from Xigalo with increasing wealth status score those (OR=0.591, $p<0.05$) (Table 5.3, Model 2). They were again less likely to choose government departments (OR=0.589, $p<0.01$) and municipality (OR=0.387, $p<0.01$) than those from Xigalo with increasing wealth status score (Table 5.3, Models 3 and 5). The odds of an individual between 31-40 years was almost 2 times more likely to choose government department than those of 51 years and above with increasing wealth status scores ($p<0.01$).

Age had a significant influence on individual choices of NGOs and government departments as important institutional structures responsible for woodland management. Individuals from age groups 21–30 and 31–40 were less likely than the elderly to select NGOs (OR=0.173 ($p<0.05$), and government departments (OR=0.016, $p<0.01$) Table 5.2, Models 2 and 3). On the other hand, the odds of individuals 31–40 of age were almost twice as likely than those 51 years and older to choose government departments increasing wealth status score, $p<0.05$ (Table 5.2, Model 3). Males were less likely than females to choose NGOs (OR=0.034, $p<0.05$) (Table 5.2, Model 2). Individuals from Matshena were more likely than those from Xigalo to choose NGO (OR=56.081, $p<0.01$), government departments (OR=90.325, $p<0.01$), civic structures (OR=1128.671, $p<0.01$) and municipality (OR=17499.194, $p<0.001$) as important institutional structures responsible for woodland management (Table 5.2, Models 2–5).

Table 5.2. Logistic regression model results OR $\pm$ 95% CI) for institutions responsible for woodland management.

Independent variables	Traditional authorities (Model 1)	Non-governmental organizations (Model 2)	Government Departments (Model 3)	Civic structures (Model 4)	Municipality (Model 5)
Age (21-30)	1.247 (0.207-7.527)	0.173 (0.030-0.984)*	0.385 (0.020-7.458)	0.766 (0.265-2.217)	0.600 (0.153-2.359)
Age (31-40)	2.010 (0.234-17.260)	0.176 (0.035-0.892)*	0.016 (0.001-0.269)**	0.834 (0.312-2.229)	0.356 (0.092-1.368)
Age (41-50)	0.975 (0.105-9.005)	0.272 (0.058-1.271)	0.093 (0.008-1.145)	0.803 (0.280-2.305)	0.971 (0.301-3.136)
Male	0.261 (0.054-1.272)	0.178 (0.034-0.930)*	0.854 (0.407-1.791)	0.511 (0.228-1.149)	0.496 (0.183-1.348)
Maholoni Village	0.00	0.000	0.106 (0.001-9.319)	0.588 (0.048-7.194)	1.138 (0.019-69.493)
Matshena Village	0.00	56.081 (4.443-707.922)**	90.325 (9.14-892.420)**	1128.671 (12.170-104679.208)**	17499.194 (239.215-1280110.408)***
Wealth status	1.046 (0.770-1.421)	0.925 (0.643-1.332)	0.890 (0.674-1.176)	1.026 (0.847-1.244)	1.258 (0.981-1.612)
Wealth status x Maholoni Village		1.075 (0.000-0.000)	0.875 (0.414-1.851)	1.334 (0.890-2.000)	0.770 (0.394-1.504)
Wealth status x Matshena Village		0.591 (0.35-0.990)*	0.589(0.399-0.871)**	0.658 (0.350-1.237)	0.387 (0.209-0.714)**
Wealth status x Age (21-30)			1.110 (0.658-1.872)		
Wealth status x Age (31-40)			1.929 (1.192-3.122)**		
Wealth status x Age (41-50)			1.390 (0.914-2.114)		
Model P value	<0.001	<0.001	<0.001	<0.05	<0.001

Model summary	-2Loglikelihood =58.225 Cox & Snell R squared=0.100 Nagelkerke R square=0.314	-2Loglikelihood =86.004 Cox & Snell R squared=0.179 Nagelkerke R square =0.393	-2Loglikelihood =198.648 Cox & Snell R squared=0.227 Nagelkerke R square=0.385	-2Loglikelihood =98.174 Cox & Snell R squared=0.067 Nagelkerke R square=0.160	-2Loglikelihood =131.952 Cox & Snell R squared=0.490 Nagelkerke R square=0.673
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*p< 0.05, **p<0.01 and ***P<0.001, Reference categories Age= Age 51+, Gender =Male, Village =Xigalo

5.3.2. Categories of environmental institutions used by governance structures

5.3.2.1. Customary laws and penalties

The most commonly mentioned customary law was prohibiting the cutting of live trees without a permit from the traditional authority (61.5%) (Table 5.3, Rule 1.1). Far less frequently cited laws were those permitting the cutting of branches but not the whole tree (Rule 1.2) and prohibiting the cutting of the indigenous fruit trees, such as marula (Rule 1.3). The rule about the penalty of a fine for contravening Rule 1.1 was mentioned by only 6.6% of respondents (Rule 1.4).

Table 5.3. Prevalence of respondents mentioning customary laws used by traditional authorities to manage woodlands (n=213).

Law	Respondents
1) No cutting of indigenous trees without a permit from the local traditional council (<i>No cutting without permit</i>) (Rule 1.1)	61.5% (131)
2) No cutting down of whole tree but only branches (Rule 1.2)	7.7% (16)
3) No cutting of indigenous fruit trees (Rule 1.3)	2.3% (5)
4) Penalty of a fine for cutting trees without a permit issued by the local traditional council (<i>fine for cutting without permit</i>) (Rule 1.4)	6.6% (14)

As indicated in Table 5.4, wealth status had no significant influence on the odds of individuals mentioning Rules 1.1 and 1.3. However, after controlling for individual characteristics and place of residence, wealth status had a significant influence on Rule 1.2 and the penalty (Rule 1.4) (Models 2 and 4). The likelihood of mentioning no cutting of indigenous wild fruit trees (Rule 1.3) and the fine for cutting trees without a permits (Rule 1.4) decreased by 0.731 and 0.837 times respectively with every increase of one unit of the wealth score ($p < 0.05$) (Table 5.4, Models 2 and 4).

Village of residence had a significant influence on all categories of traditional rules, while gender had a significant influence on awareness of the penalty. Individuals from Maholoni were much more likely to mention Rules 1.1, 1.2, 1.4 than those from Xigalo (OR=9406.377, $p < 0.05$; OR=13.140, $p < 0.001$; OR=8.480, $p < 0.05$). Individuals from Matshena were much

more likely to mention Rule 1.2 (OR=122.086, $p<0.001$) but less likely to mention Rule 1.3 (OR=0.098, $p<0.05$) as traditional laws used to safeguard sustainable woodland management. Male respondents were 6 times more likely than females to be aware of fine for cutting trees without permits (Rule 1.4) as a penalty that ensures sustainable woodland management (Table 5.4, Model 4).

Table 5.4. Logistic regression model results (OR $\pm$ 95% CI) for traditional laws and a penalty.

Independent variables	No cutting without permit (Model 1)	No cutting of indigenous fruit trees (Model 2)	No cutting down of indigenous whole tree but only branches (Model 3)	Fine for cutting trees without permits (Model 4)
Age (21-30)	0.345 (0.26-4.491)	0.893 (0.294-2.712)	3.153 (0.769-12.921)	0.198 (0.030-1.291)
Age (31-40)	0.916 (0.074-11.335)	1.516 (0.569-4.039)	0.810 (0.161-4.073)	0.204 (0.036-1.148)
Age (41-50)	1.583 (0.084-29.983)	0.997 (0.357-2.781)	0.830 (0.167-4.1280)	0.339 (0.059-1.959)
Male	128.072 (0.237-69244.751)	0.668 (0.310-1.437)	1.305 (0.439-3.881)	6.557 (1.519-28.307)*
Maholoni Village	9406.377 (8.377-10562208.398)*	13.140 (4.328-39.893)***	0.160 (0.019-1.375)	8.480 (1.684-42.688)*
Matshena Village	2.121 (0.804-5.595)	122.086 (15.719-948.187)***	0.098 (0.12-0.804)*	0.885 (0.141-5.569)
Wealth status	2.121 (0.804-5.595)	0.837 (0.712-0.984)*	0.981 (0.778-1.236)	0.731 (0.573-0.923)*
Wealth status x Maholoni Village	0.358 (0.128-1.001)			
Wealth status x Matshena Village	0.697 (-)			
Wealth status x Male	0.391 (0.104-1.473)			
Model P value	<0.001	<0.05	<0.05	<0.05
Model summary	-2Loglikelihood=212.498 Cox & Snell R squared=0.125 Nagelkerke R squared=0.183	-2Loglikelihood=75.116 Cox & Snell R squared=0.101 Nagelkerke R squared=0.269	-2Loglikelihood=98.174 Cox & Snell R squared=0.067 Nagelkerke R squared=0.160	-2Loglikelihood=35.8869 Cox & Snell R squared=0.115 Nagelkerke R squared=0.449

*p< 0.05, **p<0.01 and ***P<0.001Reference categories Age= Age 51+, Gender =Male, Village =Xigalo

5.3.2.2. Government laws and penalties

A higher percentage of respondents were aware of the law forbidding cutting of live tree stems without a permit from the government authorities (41.5%) than those mentioning its penalty of a R500 (26.1 %). Wealth status had a significant influence on the odds of respondents knowing about Rule 2.2 to protect woodlands trees. The odds of mentioning a R500 fine for cutting indigenous living tree stem increased by 2.531 times with every increase of one unit in the wealth score (Table 5.5, Model 2). There was a significant interaction between wealth status and village for the Rule 2.1 (Table 5.5, Model 2). The greater their wealth status scores, less likely individuals from Maholoni were less likely to mention Rule 2.1 than those from Xigalo (OR=0.567, $p<0.05$) (Table 5.5, Model 2). Village had a significant influence on both rules, but age had a significant influence on Rule 2.2 only. Individuals from Maholoni were less likely to mention government Rule 2.1 than those from Xigalo (OR=0.127, $p<0.05$). On the other hand, those from Maholoni were over 25 times more likely than those from Xigalo to mention Rule 2.2 (OR=29.154, $p<0.05$). Individuals between the ages of 21 and 30 years were less likely to mention Rule 2.2 than those aged 51 years and above (OR=0.255, $p<0.05$). Gender had no significant influence on awareness of either rule or penalty.

Table 5.5. Logistic regression model results (OR $\pm$ 95% CI) for government law and penalty

Independent variables	No cutting of living tree stems without permit (Model 1)	R500 fine for cutting indigenous living tree stems (Model 2)
Age (21-30)	0.430 (0.088-2.107)	0.255 (0.079-0.815)*
Age (31-40)	0.710 (0.140-3.592)	0.413 (0.146-1.174)
Age (41-50)	0.614 (0.066-5.719)	0.893 (0.326-2.443)
Male	121.132 (0.807-18179.928)	1.120 (0.489-2.563)
Maholoni Village	0.127 (0.034-0.474)*	29.154 (1.851-459.080)*
Matshena Village	-	-
Wealth status score	0.897 90.671-1.200)	2.531 (0.241-26.555)*
Wealth status x Male	0.537 90.253-1.139)	1.388 (1.071-1.800)
Wealth status x Maholoni Village	-	0.567 (0.355-0.906)*
Wealth status x Matshena Village	-	1.161 (0.776-1.735)
Constant	10.569	0.50
Model P value	<0.001	<0.001
Model summary	-2Loglikelihood=65.099 Cox & Snell R squared=0.559 Nagelkerke R squared =0.753	-2Loglikelihood=177.965 Cox & Snell R squared=0.219 Nagelkerke R squared=0.319

*p< 0.05, **p<0.01 and ***P<0.001Reference categories: Age=Age 51+, Gender=Male, Village=Xigalo

5.3.3. Individual perceptions of the importance of environmental laws for woodland management

More than 62% of respondents agreed that all four management categories used by traditional authorities and government officials to ensure sustainable management of woodland resources were important. The category with the highest frequency was stakeholder engagement, highlighting the importance of good working relationships between those involved in woodland management (81.0%). The variable with the lowest frequency was providing information on how to obtain permits for access and harvesting (62.4%) (Table 5.6).

Table 5.6. Prevalence of respondents for the importance of the roles of environmental laws in woodland management (n=213)

Role of laws in woodland management	Respondents
1) Providing information that guides in building and maintaining good working relationship with stakeholders involved in woodland management (<i>stakeholder engagement</i>)	81.0% (170)
2) Providing information on transporting of collected natural resources (<i>transporting resources</i>)	80.9% (157)
3) Providing information on species that can be utilized to promote sustainable resources utilization (<i>species utilization</i>).	71.1% (143)
4) Providing information on how to obtain permits for access and harvesting (<i>access permits</i>)	62.4% (121)

Wealth status had a significant influence on respondents' perception of the importance of environmental laws in providing information on sustainable harvesting of woodland species (Table 5.7). The likelihood of choosing species utilisation increased by 1.181 times ($p < 0.05$) with every increase of one unit of the wealth score (Table 5.7, Model 1). On the other hand, the likelihood of choosing information on how to obtain access permit decreased by 0.891 times ($p < 0.05$) with every increase of one unit of the wealth score (Table 5.7, Model 3). There was a significant interaction between wealth status and village in perceiving laws that provide information that promotes stakeholder engagement and information on how to obtain access permits to collect resources in woodlands as important in woodland management (Table 5.7, Models 2 and 3). With increasing wealth status score, individuals from Maholoni became less likely to mention stakeholder engagement than those from Xigalo ($p < 0.05$) (Table 5.7, Model 2). Age and gender had no significant influence on any of the three provisions (Table 5.7).

Table 5.7. Logistic regression model results (OR $\pm$ 95% CI) of importance of provisions of environmental laws

Independent variables	Provide information on species to be utilized (Model 1)	Provide information on stakeholder engagement (Model 2)	Provide information on how to obtain access permits (Model 3)
Age (21-30)	0.784 (0.268-2.292)	0.614 (0.150-2.507)	0.057 (0.004-0.888)
Age (31-40)	1.160 (0.407-3.305)	1.027 (0.260-6.277)	0.338 (0.044-2.624)
Age (41-50)	2.916 (0.906-9.387)	1.279 (0.260-6.277)	0.221 (0.025-1.917)
Male	1.482 (0.613-3.586)	0.850 (0.258-2.807)	0.733 (0.370-1.451)
Maholoni Village	0.198 (0.064-0.609)*	0.001 (0.000-0.873)*	0.171 (0.008-3.764)*
Matshena Village	0.055 (0.022-0.136)*	0.000 (0.000-0.006)*	0.070 (0.011-0.436)
wealth status score	1.181 (1.004-1.390)*	0.499 (0.208-1.1960)	0.891 (0.676-1.173)*
wealth status x Maholoni		2.177 (0.839-5.648)	1.364 (0.816-2.282)
wealth status x Matshena		4.045 (1.548-10.567)*	1.478 (1.046-2.087)*
wealth status x Age (21-30)			1.604 (0.962-2.675)
wealth status x Age (31-40)			1.035 (0.725-1.478)
wealth status x Age (41-50)			1.297 (0.885-1.903)
Model P value	<0.001	<0.001	<0.005
Model summary	-2Loglikelihood=171.398 Cox & Snell R squared=0.283 Nagelkerke R squared=0.405	-2Loglikelihood=108.577 Cox & Snell R squared=0.358 Nagelkerke R squared=0.577	-2Loglikelihood=222.413 Cox & Snell R squared=0.139 Nagelkerke R squared=0.190

*p< 0.05, **p<0.01 and ***P<0.001, Reference categories: Age=Age 51+, Gender=Male, Village=Xigalo

5.3.4. Strategies aimed at improving woodland management

Over 80% of respondents agreed that all three environmental strategies as set out in Table 5.9 were important in improving woodland management. The larger majority of respondents chose delegating management and monitoring powers to traditional authorities, rather than powers to be held by government officials or community members (Table 5.8).

Table 5.8. Prevalence of respondents choosing potential governance strategies that aimed at improving woodland governance management (n=213)

Variables	Respondents
1) Delegate management and monitoring to traditional authorities (<i>management and monitoring powers to traditional authorities</i>)	93.5% (188)
2) Monitor resource use by officials from government environmental departments (<i>monitoring powers to government officials</i>)	81.9% (167)
3) Delegate enforcement powers to community members (<i>monitoring powers to community members</i>)	80.5% (161)

Wealth status on its own had no significant influence on any of the governance strategies, but there was a significant interaction between wealth status and village for delegating monitoring powers to community members (Table 5.9, Model 3). The respondents from Matshena became almost twice more likely to identify the latter strategy than those from Xigalo with increasing wealth status score ($p<0.05$) (Table 5.9, model 3). On the other hand, individuals from Matshena were less likely to agree with delegating monitoring powers to government department officials as an enabling strategy to improve woodland management than those from Xigalo (Table 5.9, model 1). The same trend was observed with those from Maholoni. These villagers were also less likely than those residing in Xigalo to support either delegating monitoring powers of woodlands to traditional authorities (OR=0.030, $p<0.001$) or delegating monitoring powers of woodland management to community members (OR=0.621, $p<0.001$) as enabling strategies for promoting sustainable woodland management (Table 5.9, Models 2 and 3).

Table 5.9. Logistic regression model results of perception of environmental enforcement strategies for woodland management

Independent variables	Monitor resource use by officials from government environmental departments (Model 1)	Delegate management and monitoring to traditional authorities (Model 2)	Delegate enforcement powers to community members (Model 3)
Age (21-30)	1.125 (0.044-28.949)	1.146 (0.150-8.732)	0.493 (0.143-1.700)
Age (31-40)	1.665 (0.075-36.820)	0.660 (0.097-4.481)	1.086 (0.298-3.958)
Age (41-50)	0.430 (0.009-21.225)	0.120 (0.016-0.911)	1.082 (0.272-4.307)
Male	1.772 (0.588-5.337)	0.488 (0.114-2.083)	1.239 (0.439-3.498)
Maholoni Village	0.092 (0.001-8.181)	0.030 (0.005-0.193)***	0.621 (0.027-14.436)***
Matshena Village	0.002 (0.000-0.074)**	2.031 (0.209-19.730)	0.007 (0.001-0.083)
Wealth status score	0.904 (0.492-1.662)	1.136 (0.864-1.495)	1.094 (0.774-1.545)
Wealth status x Maholoni Village	1.104 (0.542-2.252)		0.88 (0.519-1.491)
Wealth status x Matshena Village	1.747 (0.960-3.178)		1.714 (1.044-2.8112)*
Wealth status x Age (21-30)	0.917 (0.516-1.629)		
Wealth status x Age (31-40)	0.808 (0.481-1.359)		
Wealth status x Age (41-50)	1.216 (0.603-2.453)		
Model P value	<0.000	<0.001	<0.000
Model summary	-2Loglikelihood=127.602 Cox & Snell R squared=0.263 Nagelkerke R squared=0.432	-2Loglikelihood=70.160 Cox & Snell R squared=0.122 Nagelkerke R squared=0.317	2Loglikelihood=137.313 Cox & Snell R squared=0.247 Nagelkerke R squared=0.395

*p< 0.05, **p<0.01 and ***P<0.001Reference categories: Age=Age 51+, Gender=Male, Village=Xigalo

5.3.5. Overview of focus groups discussions and key informant interviews

During focus group discussions, community members indicated that they were aware of environmental laws that governed natural resource collection, use and transportation. They further perceived the way that they utilize woodland resources as having a negative impact on the woodland. One women mentioned that *“I must cook for my family everyday and without any other form of energy I am forced to cut firewood from the woodland to meet the need. I know it is not good for the environment”*. She further indicted that *“to avoid being caught and pay penalties, I go to the woodland to collect firewood after those who enforce government environmental laws have knocked off”*. Community members reported that they were forced to cut and use woodland resources without considering laws because these resources were free, while they lacked the financial means to purchase alternatives.

None of the community groups identified DAFF as one of the departments enforcing environment laws, and perceived DEA as the only government department responsible for woodland management. The Limpopo Economic Development Environment and Tourism (LEDET) officials patrolling woodlands in communal lands occasionally account for this awareness; this is done especially in areas where Mopani trees are protected by the Limpopo Environmental Management Act (LEMA) (Act No 7 of 2003) and are found in those three villages. Some participants of the focus group in Matshena said that they prevent the enforcement officials from LEDET from doing search and raids in their homestead and village by telling them that *“the soils that they walk on during patrols will be collected and sent to a witchdoctor and bad things or death might happen to them or their family members”*. This was seen as a deterrent to those departmental enforcement officials who are superstitious.

In Xigalo, some community members mentioned corruption by local tribal guards as a barrier to proper enforcement of environmental laws. They indicated that if family members or friends of the local tribal council guards were caught contravening some form of the environmental law, they were not charged or fined. They advocated for departmental officials to rather do the enforcement in their areas for equality in the enforcement of the law.

Traditional leaders across the three villages blamed the democratic government for the poor enforcement of the traditional laws responsible for woodland management. They said that since the new democratic government came into power, their local guards were reduced in number; they were furthermore no longer allowed to employ more guards due to lack of government funding for salaries, transport, uniforms and other necessary resources. In Xigalo, they had one official who was responsible for the enforcement of environmental traditional law in the whole village. That official had neither uniform nor motorized transport, and at the time of data collection in 2015, he was using a bicycle. He had challenges in apprehending offenders by himself as some overpowered him and ran away. In a few cases where community members or traditional leaders apprehended an offender, there were no standardized fine for offences. Fines were reported to be set at the chief's discretion and community members claimed that the system is prone to favouritism and corruption. Community members stressed that the government permit system for access, collection, use and transportation outlined to them during the interview session was not practical, as they were not aware of a forestry office either in Thulamale Municipality or nearby towns. The remote location of DAFF offices makes it difficult and costly for them to obtain permits, and for this reason, they resort to collecting and transporting woodland resources without permits.

Government officials were more interested in the regulated enforcement strategies that promote conservation of woodlands and sustainable use woodland resources than community or traditional authority monitoring. They claimed that they were promoting environmental awareness and doing enforcement but were limited by current financial resources. They also argued that over-exploitation of natural resources cannot be blamed on poverty alone but also on ignorance on the part of rural people. They further argued that community members sold firewood and other resources to people not residing in their village for cash, satisfying short-term needs rather than focusing on long-term sustainability. Government officials were also concerned about the roles of traditional authorities in natural resource management, as powers have been eroded since the establishment of the democratic government in 1994. Although they have a legal mandate to assist in environmental management (Section 20 (j) of the Traditional Leadership and Governance

Framework Amendment Act (TLGFA) (Act No. 41 of 2003), their roles are not clearly stipulated in NEMA and NFA. Traditional authorities can only issue fines in terms of the NFA if such powers have been delegated. This is not currently the case, but they issue permits and fines under the TLGFA.

5.4. DISCUSSION

The objective of this chapter was to assess the influence of wealth status on people's awareness and attitudes concerning environmental governance systems relevant to their communal woodlands. The first key finding is that almost all respondents regarded traditional authorities as the institution primarily responsible for woodland management in the communal areas. Civic structures were also widely regarded as being important in this role. Conversely, the role of government was not widely recognized, and some respondents were even unaware of the existence of government departments responsible for woodland management, such as DAFF. This finding was supported by Shackleton, (2009), who also found that DAFF was unknown in some rural community members. This is understandable, given that the traditional authorities and other civic structures are embedded in the local culture and society, while government, whether local, provincial or national, is external and usually distant. It is important to note that, although there are other DAFF directorates that operate in communal lands, combating environmental degradation through government programmes such as Land Care, Working on Fires (WoF) and working for Water (WfW), they do not monitor and enforce compliance of the NFA.

Residents were also more aware of traditional laws than government laws pertaining to use of woodland resources. Despite this, non-compliance with the traditional laws was found to be widespread. Such non-compliance is not due to a lack of awareness but is driven by necessity as households face financial and other resource shortages. As emerged from the focus group discussions, poverty limits the ability of households to use alternative (non-woodland) resources. In addition, despite the local legitimacy of traditional institutions, respondents still aired complaints about these structures, both in terms their trustworthiness and effectiveness. This agrees with the findings of other studies in the region that show that while local people are aware of the role of traditional institutions in

natural resource management, there are hindrances to their capacity to be fully functional (Twine et al., 2003). The present research and other studies across Africa show that the powers of traditional leaders to manage natural resources through norms and customary laws have eroded. That was attributed to a combination of factors including political change (e.g. democratization), social change (e.g. modernization), lack of human and financial resources, corruption, and environmental degradation (Swallow & Bromley, 1995; Campbell et al., 2001; Twine et al., 2003; King, 2005; Kirkland et al., 2007; Asah et al., 2008; Schmidt & Pearson, 2016). The latter constrains people's resource harvesting options (Twine et al., 2003; Kirkland et al., 2007; Makhado et al., 2009).

Wealth status had no influence on which institution was regarded as important in managing woodland resources. Firstly, because the traditional authorities were unanimously regarded as the most important institution, little room was left for variation in wealth influence. Secondly, the findings suggest that individual factors such as age and gender, as well as village context, are more important than wealth status in shaping awareness and opinion of the roles of other institutions. However, wealth status did influence awareness of the laws of traditional versus government institutions. Individuals from poorer households were more aware of traditional laws while those from wealthier households were more aware of government laws. More specifically, those traditional laws that impacted more directly on the poor, such as fines for illegal harvesting, or that safe-guarded resources important to them e.g. indigenous fruit trees, were widely known amongst these households. This stands to reason because poorer households depend more heavily on woodland resources, such as marula trees, to support their livelihoods (Shackleton & Shackleton, 2002; Kalaba et al., 2009). Wealthier households were more likely to be aware of the penalty for contravening the government law such as banning the cutting of trees without a permit. The possible explanation for that could be that individuals from wealthier households are more likely to be educated and have better access to information via the media. Therefore, they are more likely to be aware of government laws, which are publicized in the media, even if they do not contravene them themselves. The results of this study support the view that wealthier people are generally more environmentally aware (Anderson et al., 2007; White & Hunter, 2009), at least in relation to environmental policies and laws.

Importantly, both traditional and government laws specify fines for those who contravene them. NFA and LEMA both have sections that prohibit cutting of indigenous trees and protected trees such as marula, mopani and baobab, which are also protected by customary law. These findings suggest that in the South African context, there is good synchronization between customary law and national legislation protecting indigenous trees in the communal lands, in that there is overlap between laws enforced by traditional authorities and government agencies. The implication of this is that it avoids creating confusion and conflict in implementing the laws protecting woodland resources. Thus, although most respondents were not aware of government institutions and their laws, theoretically, if they obeyed traditional laws, by default they would be obeying government laws. This implies that the influence of wealth on awareness of the different systems of laws and penalties would not substantially influence the net outcome if all the laws were obeyed. In contrast, where customary and government laws are contradictory, wealth influence on awareness of different systems of law might lead to conflict if people of different wealth status obey different sets of laws. Synergy between institutions that are responsible for resource management is therefore important. Thus, despite the complementarity between government and customary laws in this study context, there is clearly still a need for better cooperation and coordination between these two governance systems. The observed low level of awareness of the relevant government institutions and their laws also brings to the fore the need for government departments to allocate more resources to disseminating information in rural communities.

Moving on to the efficacy of the environmental laws, respondents from wealthier households acknowledged that these were important for providing guidance on species that are allowed be collected. This is surprising, because Cocks et al., (2008) found no significant difference in the mean number of plant species used between wealthy and poor households in the Eastern Cape, South Africa, suggesting that the observation in the current study is not likely due to wealthier households using more species. One possibility is that wealthier households can be more selective about which species they harvest, as they are not as heavily dependent on NTFP for daily use as poor households. Conversely, circumstances are likely to force poor households to harvest protected species to meet their daily needs, especially if there are shortages of resources, and hence knowing which species they may

harvest is not particularly useful to them. In Mpumalanga Province of South Africa, fuelwood shortages have resulted in rising occurrence of chopping of marula trees for wood, despite being protected by both local customary law and national legislation (Kirkland et al., 2007). Wealthier households are also more likely than poor households to buy the NTFP rather than harvesting them (Shackleton & Shackleton, 2006). Therefore, they would be less concerned with information of how to obtain permits to harvest these protected resources. On the contrary, the value of legislation in providing clear guidance on how to access harvesting permits was more important to poorer households, as this directly impacts on their livelihoods due to their dependency on natural resources.

Lastly, there was widespread agreement on strategies that would enhance governance of communal woodlands. On the one hand, the respondents highlighted the need for greater delegation of power to the traditional authorities and community members. On the other hand, there was also recognition of the important role of government in resource monitoring. This highlights the need for greater cooperation and coordination between government and traditional institutions for more effective woodland governance. This is in contrast to other studies which found that rural residents saw that government intervention was the solution to degradation, showing little confidence in the efficacy of traditional institutions in solving environmental problems in these common property resource systems (Chanda, 1996; Chokor, 2004). The findings of this study also show that the village context has a more important influence than wealth status in determining these perceptions.

5.5. CONCLUSION

This chapter provides new insights on the intersection between wealth status and resource governance in communal woodlands, via people's awareness and attitudes towards relevant actors and institutions. While wealth status did not apparently influence awareness of the relevant institutions and their roles, it did influence knowledge of the various customary and government laws and penalties. Wealth status was also shown to have significant influence on opinions of the beneficial roles of laws in sustainable woodland management. These insights show the importance of taking into consideration local awareness and attitudes concerning resource governance when investigating the poverty-environment nexus in rural

areas. The poor are most directly impacted by local governance systems constraining their access to natural resources. This highlights the difficult situation that traditional authorities are faced with in balancing the trade-off between poverty alleviation and managing sustainable use of dwindling resources in communal woodlands. The observed willingness of community members to collaborate with government agencies in managing woodland is important as it puts government departments in a better position to implement CBNRM and PFM policies, which address the poverty-environment nexus, in partnership with communities. Although this study yields insights on the relationship between wealth status and local awareness and opinions on resource governance, it remains unclear how this translates into pro-environmental behaviour along the socio-economic continuum. Future research should therefore investigate household woodland use practices in relation to government and customary laws and guidelines, and how this is influenced by wealth status.

CHAPTER 6

GENERAL DISCUSSION AND SYNTHESIS

6.1. SUMMARY OF KEY FINDINGS

This study yields a number of important new insights on the poverty dimensions of environmental degradation in a rural African context. The first are in relation to influence of wealth status on perceptions of various dimensions of woodland degradation. As to the local definitions of woodland degradation, wealth status did not influence people's perception of the physical aspects, although it did influence their perception of the experiential aspect. This points to the fact that relationships between wealth status and environmental perceptions that are observed in comparisons between poor and wealthy neighbourhoods, urban and rural communities (Williams & Bird, 2003; Wilson et al., 2004), and countries of different wealth status, do not necessarily apply between households of different wealth status within a community. In contrast, wealth status did influence perception of the causes of and solutions to woodland degradation, and in common with the general trend in the literature (Franzen & Meyer, 2009), wealthier people were more aware of these than poorer.

With regard to causes, although most respondents agreed that their activities impact negatively on woodlands, only wealthier respondents were aware of more general causes. This shows that lack of awareness is not the main driver of unsustainable resource use behaviour, but the need to support livelihoods. Finally, people's perceptions of potential solutions to degradation were influenced by wealth status. Wealthier people were more likely to suggest solutions relating to using more expensive alternatives (e.g. electricity instead of fuelwood), and less likely to mention reducing resource consumption levels. This is an understudied topic in the PEN literature other than in the agricultural sector. Regarding the contributions of households to woodland degradation, people widely perceived that their activities contributed to woodland degradation. Importantly, people from poorer households perceived the negative environmental contribution of their household's

activities to a greater extent than wealthier people. Bringing these two insights together, the results suggest that while wealthier people may have greater theoretical knowledge about drivers of environmental problems, poorer people are more in tune with their own impacts on their local environment.

Moving to the influence of poverty on household vulnerability to degradation, this study points to three important findings. First, poor households reported being more impacted by woodland degradation than wealthier. This finding is not surprising, as it is well established in this research and on literature that poorer households are more heavily dependent on NTFP for day to day survival, even if they do not necessarily use greater quantities than wealthier households (Dovie et al., 2002; Twine et al., 2003; Shackleton & Shackleton, 2006a; Paumgarten & Shackleton, 2009), and are therefore more likely to be impacted by environmental degradation than the wealthier. This also supports the notion of a poverty-degradation loop, explained by the downward spiral PEN theory (Aggrey et al., 2010). A key impact on the poor was increased travel distances (and time) to harvest resources. This time cost of degradation is experienced most by women and children, who usually have the responsibility of harvesting daily resources (Timko et al., 2010). They therefore experience opportunity costs, such as time taken away from economic activities or studying.

In response to environmental impacts, households' choices of coping strategies were influenced by their wealth status. Firstly, the choice of response strategies to woodland degradation by wealthier households focused more on the use of human, financial and physical capital and less on use of natural capital, while the poorer households were most likely to cope by adjusting use and acquisition of natural resources (natural capital). Findings of this study support several dominant notions on the influence of wealth differentiation on choosing and using capitals by households (as indicated in the SLF) in responding to shocks and stress especially in climate change and agricultural studies (Deressa et al., 2009; Berman et al., 2012; Woittiez et al., 2013). It has been documented that households that are able to specialize in higher-return activities, such as employment or a commercial activity, are better able to cope with livelihood crises due to the increased capital available to them (Eriksen & Silva, 2009). The poor are hit by a "double whammy" when it comes to vulnerability to degradation – first, they are more at risk to impacts because they are more

dependent on natural resources, and secondly, they are less able to adapt in ways which do not undermine human wellbeing or environmental sustainability. The use of social capital (social group) emerged as an important coping strategy within the three villages. This calls for an integrated approach to addressing the impacts of degradation on poor rural societies that supports and strengthens social capital (e.g. local organizations and groups).

Lastly, the role of people's awareness and attitudes in relation to local governance structures that have a legal mandate to manage woodland management was explored. Local structures were widely regarded as important in managing local natural resources across the wealth status range, despite the literature showing that their powers are weakening in Sub Saharan Africa (SSA) (Swallow & Bromley, 1995; Campbell et al., 2001; Twine et al., 2003; King, 2005; Kirkland et al., 2007; Asah et al., 2008; Schmidt & Pearson, 2016). In contrast, wealth status influenced awareness of laws enforced by two governance structures (government agencies and traditional authorities). Wealthier respondents were more likely to be aware of the tools institutions used by government agencies, while poorer individuals were more aware of those used by traditional authorities. People were thus more likely to be aware of the laws that impact on them personally and institutions that they interact with, such as in terms of permit acquisition for resources access. This clear distinction can create conflict between different spheres of government managing natural resources, which is likely to pose challenges for implementing environmental laws for different wealth status groups if there is no clear role differentiation.

Moving to efficacy of government laws and enforcement strategies, wealth status significantly influenced people's perception on the efficacy of the government laws, but not on the enforcement strategies that improve woodland management. Wealthier households were aware of the laws that provide guidance on species that can be utilized in a sustainable manner, while the poorer were likely to acknowledge those that give guidance on how to obtain access permits. These results show that wealth differentiation influences awareness and attitudes of local people with regards to environmental governance, which needs to be taken into consideration when addressing the poverty-environment nexus (PEN) at a local level. This is an understudied topic in the PEN literature.

6.2. CROSS-CUTTING THEMES

This study explored the intersection between wealth status and three aspects of environmental degradation, namely local perceptions about degradation, household vulnerability to it, and local awareness and attitudes about environmental governance to address degradation. However, in addition to useful insights that were gained within each of these domains, a number of interesting cross-cutting themes emerged across the data chapters. These are briefly discussed below.

Firstly, insights on the response strategies employed by households (chapter 4) and the perceived potential solutions to degradation (chapter 3) highlight the importance of wealth status in addressing the PEN. Poverty clearly limits people's options for coping with woodland degradation themselves but it also impacts on their perception of what is possible at a community level to address degradation. The findings of this study show that the poor were typically inward-looking, focusing on responses and solutions that pertain to modifying their natural resource use. By contrast, the wealthy were more outward-looking and focused on external coping mechanisms and solutions. This may lead to a *degradation poverty trap* in which the degraded environment increases people's poverty due to reduced capacity to provide ecosystem services to support the livelihoods of the poor, and poverty forces people to continue to degrade the environment because they have limited alternatives. These findings support the downward spiral theory of PEN (Mink 1993).

It is important to note that response strategies by households of different wealth status may have unintended consequences. For example, the coping strategies of the wealthier households may contribute to larger scale environmental degradation over a long period that might have negative impacts on both social classes. Such impacts include, among others, increased greenhouse gas emissions through electricity generation processes especially with the use of coal. The implication of this is that local strategies for mitigating or reversing degradation would be different between predominantly poor communities and those that are better off. However, all response strategies may contribute to some form of environmental degradation at different levels. Thus, for the poorer households, the impacts

are localised (local woodland degradation due to high dependency) while for the wealthier, the impacts are at a larger scale (carbon emissions at a global level).

Secondly, the issue of environmental governance emerged not only in the discussions about the role of governance structures and institutions in resource management (chapter 5), but also in the context of perceived drivers of degradation (chapter 3). Ineffective woodland governance due to poor enforcement of laws by government and traditional institutions was recognised as contributing to woodland degradation (chapter 3). However, this was not ranked as highly as other factors, such as poverty, as a cause of degradation. Nevertheless, there was widespread recognition of the importance of traditional authorities in resource governance and support for delegating more power to them to better regulate the woodlands (chapter 5). The implication of this is that the role of traditional institutions in managing woodland degradation, as imperfect as they may be, is perceived to be more important than their weakness in performing this role. Concerning awareness and knowledge of local environment governance institutions, involvement of traditional institutions in managing woodland resources was widely reported (chapter 5). On the other hand, the poor enforcement of environmental laws was widely perceived as a cause of woodland degradation (chapter 3). This implies that although traditional institutions' powers are reported to have weakened (Twine et al., 2003), they are still recognised as important in managing local environmental resources. In order to improve PEN management initiatives, national government should develop policies that clarify roles of local governance structures and institutions to reinforce their capacity to manage local natural resources. Government and other external stakeholders also need to work closely with these structures, building their capacity and facilitating better coordination and cooperation among them, rather than duplicating them. This speaks to the importance of supporting and building the capacity of local governance institutions in addressing the PEN in rural African settings, rather than replacing them with totally new local institutions.

Thirdly, the village context had an influence on all three domains of PEN investigated in this study, and often interacted with wealth status in its effect. In addition to influencing individual perceptions, awareness, and attitudes, village context also shaped the vulnerability context of households. For example, residents from the village that

experienced a higher degree of environmental change between 2009 to 2014 (chapter 2) were more likely to mention outward-looking responses to degradation than those from villages that experienced less change, who were more likely to focus on inward-looking responses. Even though this study was conducted in villages in the same district with similar ecological, cultural and socio economic characteristics, the specific local village context had a strong influence on the PEN relationships investigated. Based on these findings, future research and environmental management initiatives addressing the PEN in rural African settings should take into consideration the influence of the very local context in shaping these relationships. This also suggests that caution should be used when making generalizations based on PEN data from very different contexts. The influence of local context such as village should be accounted for when making such generalizations.

Fourthly, there is not necessarily a clear distinction between what degradation is (chapter 1), and how it affects people's lives (chapter 4), in the way that local people think about degradation. This finding was supported by other studies which show rural people's understanding of environmental degradation as multi-faceted (Lykke, 2000; Moore & Thiongane, 2000; Chokor, 2004). Researchers therefore need to be careful not to impose a western scientific understanding of environmental degradation when investigating relationships between poverty and degradation.

6.3. SOUTH AFRICAN POLICY AND LEGISLATION IN RELATION TO THE PEN

This study provides an opportunity to reflect on the extent to which national environmental policy and legislation addresses the poverty environment nexus in rural South African settings such as in the three study villages. The two bodies of environmental legislation that are used to manage forest and woodland resources in communal land and declared protected areas are the National Environmental Management Act 107 Of 1998 (NEMA) and the National Forest Act Number 84 of 1998 (NFA). The Limpopo Environmental Management Act (LEMA) is a provincial act which was developed from the NEMA, which is national legislation, with the intention of managing provincial issues that are broadly mentioned NEMA. They both have sections that are meant to address the PEN by regulating sustainable use of NTFPs for domestic use, focusing on previously disadvantaged rural

communities that stay adjacent to the declared state forests or on communal land. They intend to achieve a “win-win” outcome by reducing poverty through the sustainable use of natural resources, without compromising environmental sustainability.

Both the NFA and LEMA have exemptions that allow resource use in a regulated manner. The NFA has provisions that allow the use of state forests for both consumptive and non-consumptive purposes (section 20,21,23(1) and 24(1). For example, NFA allows domestic use of natural resources by the local communities to promote economic development and stakeholder participation, which in principle, addresses the PEN. The act has guidelines that regulate use (e.g. local communities staying adjacent to the forest are allowed to collect NTFP’s for domestic use). They are only allowed to do so under the following conditions: 1) if they get a permit from the local forestry office, 2) if they collect resources that they can carry by themselves (that is not by car or any other forms of transport), and 3), they may only collect during the daylight hours.

Moving to LEMA, it allows collection of a headload firewood in the communal land without a permit (section 64(4)(f)(i)(ii)). For easy transportation, vehicles, donkey cart, wheelbarrows and other forms of transport are permitted to convey firewood equivalent to a head load. The exemption does not allow collection from areas of ecological importance, a protected environment, or a private nature reserve. Specific reference is made here to firewood collection under the exemption because it is the most used woodland resource in rural villages (Shackleton & Shackleton, 2004; Matsika et al. 2013; Wessels et al. 2013). According to the NFA, people are only allowed to collect dry fuelwood, transported by headload, and it must be for domestic use only.

The assessment of NFA and LEMA in light of this study brings some useful insights. Despite the good intentions and frameworks that aim at addressing PEN, there are shortcomings that need to be addressed to achieve the intended results. In implementing these exemptions, governance institution and the resource users face several challenges. Firstly, DAFF, which is supposed to issue permits for use of NTFPs, is not known by the local users. This is evident by the responses of local people during focus group discussions, who pointed out that they have never heard of DAFF, and they regard traditional institutions as the most

important institution for woodland management. Secondly, fuelwood shortages and the lack of dead wood in the communal lands is well documented (Kirkland et al., 2007a; Wessels et al., 2013). Therefore, hypothetically, even though local people could apply for a permit to collect dry firewood, where would they get it? During focus groups in all three villages, people clearly indicated that there is no dry firewood left in their local communal woodlands. Thirdly, budgetary constraints and lack of resources makes it difficult to monitor resource collection and use in local villages. During the key informant interviews, government officials cited low budget allocation to do frequent patrols in communal lands and also indicated that some members of the enforcement team are old with little education and have challenges in interpreting legislation. This makes it difficult for the department to fulfil its mandate as per the Act and constitution of the Republic. With regard to LEMA, with ineffective monitoring, commercial transportation of fuelwood by the truckload is common (Twine, 2005). Fourthly, communities are dynamic and other than poverty, there are other drivers such as population growth, and institutional change that may hinder the intentions of the legal frameworks from addressing the poverty-environment nexus through sustainable use without compromising environmental management. Lastly, there is no empirical evidence that clearly shows whether implementation of these environmental legislation is taking people out of the poverty trap or exacerbating the poverty-degradation cycle.

The acts also make it a requirement that public participation should be conducted when developing and amending the act. Again they make a provision of establishing an Environmental Advisory Body (chapter 2 of LEMA) and National Forestry Advisory Council (chapter 5 of NFA), which are composed of a variety of stakeholders, including the resource users. The National Forestry Advisory Council advises the Minister of Agriculture Forestry and Fisheries on any matters relating to forestry both in public and private sectors in the Republic of South Africa, while the Environmental Advisory Body offers environmental advice to the members of the Executive Council of the Province (MEC). Through this process, the voices of those who frequently use the local environment or impacted by environmental governance are heard. These are important processes because they empower people to be part of decision-making on issues that impacts and affects their wellbeing. These mechanisms are important for addressing the PEN because they potentially give a voice to

the poor, who are impacted by degradation, but who are often overlooked in the formulation of policy that affects them (Chokor, 2004).

6.4. RECOMMENDATIONS

6.4.1. Policy recommendations

Based on the above insights, this study suggests a number of policy recommendations:

a) There is a need to strengthen environmental governance institutions that address the PEN by building their capacity. This applies particularly to traditional institutions because respondents widely acknowledged them as important in local resource management. They can also be instrumental in monitoring resources use, because government agencies are faced with insufficient budgets, which hinders them to do frequent patrols in communal lands. Traditional institutions are local and they may require less resources to do monitoring than government officials who are external. Therefore, the need arises for incorporating traditional institutions in the PEN strategy. Proper stakeholder coordination between environmental governance institutions would be key in order to optimize their roles of in local natural resources management.

b) The emphasis on environmental awareness by government programmes needs to be balanced with clear environmental management initiatives and poverty mitigation strategies. The findings of this study show that people are aware of negative impacts that are associated with their households' use of woodland resources but due to factors beyond their control – mainly poverty – they continue to use the natural resources, often illegally.

c) Government's PEN strategy should build on six pillars (building capacity, Community Based Natural Management/ Participatory Forest Management (CBNRM/PFM), managing sustainable use, building on social capital, raising awareness, and monitoring and enforcement) highlighted on Figure 6.1. These pillars show the complexity of managing PEN by highlighting the use of combination and coordination of different strategies, as no single strategy on its own can address a complex poverty-environment nexus. The proposed strategy also shows that both community members and governance institutions have a role

to play in managing. For example, in order to alleviate poverty without compromising environmental management, governance institutions need to embark on awareness-raising to emphasise the importance of the local environment (6) and sustainable harvesting techniques (2). Governance institutions (4) should be capacitated (funds and other resources) to do monitoring and enforcement of environmental legislation. Community members should be allowed to participate in forest management initiatives (PFM/CBNRM) to promote a sense of belonging and benefits sharing (3). The findings of this research (chapter 4) show the importance of social assets (1) to cope with shocks and stress. Government thus needs to create an enabling environment for building social capital, to enable poor household's people to cope better with resource shortages and reduce dependency from the environment.

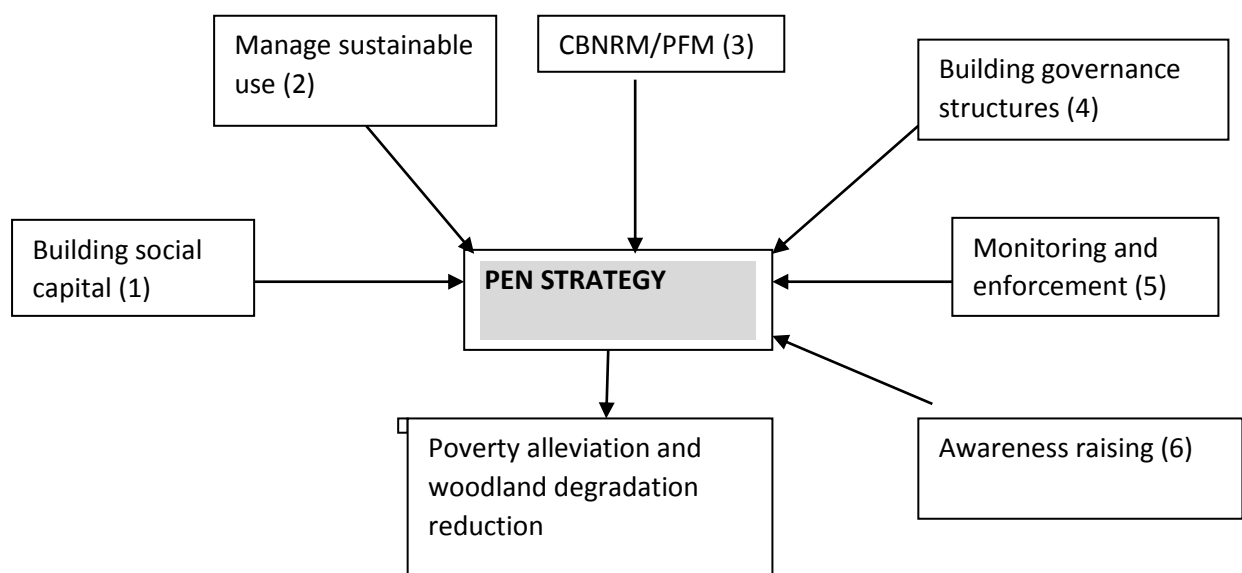


Figure 6.1. Proposed PEN strategy for reversing the poverty degradation cycle

Applying the central finding from each data chapter to policy, this study suggests that firstly, policy that addresses PEN needs to take into consideration local perceptions of the environment, poverty-driven vulnerability to degradation, response strategies, and capitals used. Secondly, PEN strategies should directly address poverty, which is the driver of woodland degradation due to heavy dependency and limited options by the rural poor. Thirdly, roles of the traditional institutions in local natural resources management should be

well defined in the environmental governance legal framework. They must be supported and capacitated to deal with the dilemma of balancing use and conservation without compromising the needs of the present and future generation. That should be done in a way that is legislated, in order to build trust between traditional authorities, government, and local communities

This research also provides additional insights that have relevance for policy and interventions aimed at addressing the nexus between poverty and environmental degradation. Firstly, environmental management initiatives either at policy development or implementation level should be sensitive to the influence of local perceptions, awareness and attitudes. Therefore, the legal framework that encourages public participation for policy developments and amendments should be strengthened so that the local voices of those who are most affected the PEN be elevated and heard by those who are mandated by legislations to act (e.g. head of departments). Secondly, management initiatives should avoid a one-size-fits-all approach, because local context influences three domain of PEN investigated in this research. Village factors such as local environment, history, population size, infrastructure, access to markets and employment opportunities, and traditional leadership are likely to influence the PEN at the very local level. Therefore, government should develop policies that allow flexibility, and permit local structures to develop bylaws and mitigation strategies that are context-specific. Finally, the use natural capital as a response strategy by the poor requires new innovations by both users and environmental governance institutions to reach a trade-off between resource utilization and poverty alleviation to avoid downward spiral hence addressing PEN. Local institutions, supported by government, are central to this.

6.4.2. Future research recommendations

Although this study shed new light on reported behaviours, impacts and responses in relation to environmental degradation, it was not feasible to verify if these played out in reality, due to the timeframe of the research. Similarly, it was not possible to quantify the livelihood and environmental consequences of household response strategies or proposed solutions. Therefore, future research on the PEN in such contexts should focus on

longitudinal studies that track these factors and their interaction over time. This will deepen our understanding of the complex relationships between poverty, behaviour, and the environment, and provide insight the extent to which response strategies lead to adaptation or maladaptation. Maladaptation is the coping strategies that might deepen poverty, and may lead to poverty trap and downward spiral as one exposure renders the same community or household more vulnerable to other exposures (Rantanen et al., 2010) . The long-term studies may also be instrumental in giving more insight on the trade-offs between poverty alleviation and woodland management strategies, thus further contributing to PEN theory.

The study assumption was that people's perceptions are related to their experience, which is also associated wealth status. It is well established in literature that perceptions are shaped by individual factors such as age, gender, education, experience, and income, as well as other contextual factors such as religion, culture, livelihood and local environmental conditions (Stern & Dietz, 1994; Cinner & Pollnac, 2004; Cardona, 2012; Cerutti et al., 2015; Grunblatt & Alessa, 2016; Silva et al., 2016). The results of this study also showed an association of variables, such as SES and place of residence in influencing respondent's perceptions on different aspects of woodland degradation, environmental governance and vulnerability. Therefore, future research should determine the extent to which local perceptions are influenced by the dominant narratives within a society and how that might be influenced by wealth status. The suggested future studies are important in understanding the influence of perceptions in relation to people's environmental behaviour and would be instrumental in informing policy. Understanding local people's perception of their environment is important before attempting to understand and influence their behaviour and attitude towards their local environment (Brackney & McAndrew, 2001). It further states that perception is a vital social factor in determining local people's level of understanding of local environmental challenges and their effects (O'Higgins 2007; Kangalawe 2012; Assefa & Hans-Rudolf, 2016). Public perception is often regarded as a key factor that drives the activities of a society, and the acknowledgment of public perceptions is again regarded as a key aspect of policy development and decision-making (Pereira et al., 2016).

A strategy for reversing the poverty-degradation cycle was proposed in this study as a means of addressing the PEN loop. This study was not able to test the applicability of the proposed strategy in reality due to financial and time constraints. A multi-dimensional case study that would incorporate all six pillars of the strategy should be conducted in order to assess if that proposed strategy would add value in managing PEN in reality. This is important in improving already existing strategies as such PFM and CBNRM that were implemented by government in developing countries including Africa and other entities with the aim of managing environmental problems (deforestation, local pollution, etc,) and empowering local people (reducing poverty, creating employment etc.).

Lastly, future research should build on this by investigating the pathways by which degradation impacts on households, and specific ways in which households are vulnerable to woodland degradation. Furthermore, in-depth research on how poverty reduces resilience and increases household's vulnerability to woodland degradation will assist in understanding the PEN loop. Future research should also explore how vulnerability of the poor to degradation can be reduced. However, it is important to acknowledge that although poverty alleviation is part of the solution, realistically, no government or society will ever totally eliminate poverty. Therefore, it is important to conduct research that would assess how households, policy makers and community would reduce vulnerability of the poor to woodland degradation. Finally, specific steps that can be taken to increase the resilience of poor households to degradation should be explored.

6.5. CONCLUSION

This study contributes new knowledge to the investigation of the poverty-environment nexus in an African setting. This research applied a number of innovations in the approach taken. Firstly, unlike most other PEN research, this study did not impose a pre-defined scientific definition of degradation in discussions with local people. It allowed respondents the freedom to define degradation in their local environment based on their own perceptions, knowledge, and experience. This yielded new insights on how people conceptualize degradation. Secondly, the influence of poverty on perceptions, awareness, and attitudes concerning degradation itself, as well as solutions and environmental

governance in general, was a central theme in this thesis. This is an under-studied area in the PEN scholarship. Thirdly, whereas most poverty-environment studies focus on a particular resource (e.g. fuelwood) or environmental issue (e.g. climate change), this study concentrated on undesirable change in the local ecosystem (woodlands in this case), as perceived by local residents. This more holistic, integrated approach is better aligned with people's everyday experience of degradation. Fourthly, this study included investigation of interactions between wealth status and other factors shaping the way in which people interact with their environment, such as their age and village in which they live. This more nuanced approach considers the complexity of the PEN and the range of interacting factors shaping these relationships. Finally, in the poverty-degradation cycle, the impact of wealth status, livelihoods and resource use on the environment, is better understood than the feedback loop of the impact of degradation on the poor. In this study, both loops in the cycle are considered and integrated.

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Appendix A

Questionnaire

Dear participant

You are cordially invited to participate in an academic research study conducted by Ramatshimbila Tshifhiwa Animal, Plants and Environmental Studies, a doctoral candidate from at the University of Witwatersrand.

Please note the following:

- This study involves an anonymous questionnaire. Your name will not appear on the questionnaire and the answers you provide will be strictly confidential.
- Your participation to the study is important to the success of the study.
- Please answer the questions as completely and honestly as possible. This should not take more than a few minutes of your time.
- The results of the study will be used for academic purposes only and may be published in an academic journal. A summary of the findings will be available on request.

Have a great day

Ramatshimbila Tshifhiwa

Tel: 0828047621

E-mail: RamatshimbilaQueeny@gmail.com

SES Questionnaires (1-9)

Appendix A Questionnaires

Instructions: Write a cross (X) where is suitable

For each question you can only cross one box unless specified.

Location: _____ Date _____ Time: _____

GPS points.....

1. **Section A: Demographic Questions.** Please provide the following information for all household members, including those who are away at the moment. All members (keys are attached)

A	b	c	d	e	f	g	h	i
No.	Gender M/F	Age (key 1)	Resident status (Key 2)	Education status (Key 3)	Type of gov. grant receiving (Key 4)	Marital status (key 5)	Main Occupation (key 6)	Monthly income (key 7)

Key 1: Age

1=15-20	5=36-40	9=56-60
2=21-25	6=41-45	10=61-65
3=26-30	7=46-50	11=66-70
4=31-35	8=51-55	12=>71

Key 4. Grant type

1=Kids Grant 2= Old age pension
3=sickness 4=Disability
5=None

Key 7: Monthly income

1=<R1, 000pm
2=R1, 000-R1, 999pm
3=R2,000-R3,999 pm
4=R4,000-R5,999pm
5=R6,000 + pm 6= None
X =Don't know

Key 2: Residential status

P=Permanent resident
T=Temp. Migrant (working/looking for work)
O=Temporary migrant (other)
L=Recent out migrant
I=Recent in-migrant
B=Recent birth

Key 5: Marital status

S=Single (never married)
M=Married: Formal
I=Married: Informal
W=Widowed
D=Divorced
P=Separated

Key 3: Highest education attainment

N=None	P= Partial tertiary
A= between grade 1-4	T= completer Tertiary
B=between grade 5-7	PT=Post tertiary qualification
C=between grade 8-10	
D=between grade 11-12	
X=Don't know	

Key 6:Main occupation/activity

1=scholars
2=Employed: Full time
3=Employed: Part time
4=Self-employed (e.g Own business/trader): Full time
5=Self employed (e.g Own business/trader): Part time
6=Pensioner
7=unemployed (not including scholar, pensioner or self employed)

2. Do you have electricity?

Yes	NO
-----	----

3.Please indicate electrical appliances you own and use by an X?	More than one answer is allowed	Do you Own livestock?	Yes/ NO if yes put an X where applicable
Stove		Goats	
Refrigerator		Pigs	
Television		Cattle	
Radio (including DVD player)		Sheep	
Other (specify)		Chickens	

4.Do you have a tap with water in your yard?

Yes	NO
-----	----

5.Do you own cultivated field out of your homestead?

Yes	NO
-----	----

6.Does your household own a vehicle?

Yes	NO
-----	----

7. Who is heading the household?	8. Do you think your household is poor, middle (not poor and not rich) or Rich
Married Adults	Poor
Single Mother	Middle class (In between)
Single Father	Rich
Relatives (eg grandparents, uncles, cousins)	Why do you classify household in that level or class (social class and financial standing)
Grandparents	
Neighbors	
Older sibling	

9. Observation Main Dwelling by Research assistant

Roof	Walls	Fence of the homestead
Iron roof	Cement Blocks	Cement block (Wall)
Roof tiles	Mud bricks	Fence made of steel poles
Thatch grass	Use of cement and sand mixer while building walls	Fence made of Indigenous poles
Reeds	Use of soil mixer while building walls	Fence made of treated poles
Other	Other	No fence

(Resource use and Vulnerability)

10. What are the resources that are used by your household from woodland?			11. How do you get those resources? (All options are possible depending on the resources)	Buy material raw	Buy finished product (Mats, Marula beer, processes medicine etc)	Collect by members of households
	Wild Vegetables (Vowa, delelele etc)		Wild Vegetables (Vowa, delelele etc)			
	Edible insects		Edible insects			
	Wild fruits (mazwulu, Nombelo, Maramba, Mafula etc)		Wild fruits (mazwulu, Nombelo, Maramba, Mafula etc)			
	Wild mushrooms		Wild mushrooms			
	Bush meat		Bush meat			
	Wild Honey		Wild Honey			
	Medicinal plants		Medicinal plants			
	Fuel wood		Fuel wood			
	Wooden carvings		Wooden carvings			
	Wood for housing poles		Wood for housing poles			
	Wood for Fencing		Wood for Fencing			
	Thatching grass		Thatching grass			
	Grass Brushes		Grass Brushes			
	Reeds for (construction)		Reeds for (construction)			
	Sedges (Mutate) Decoration and for making sleeping and sitting mats)		Sedges (Mutate) Decoration and for making sleeping and sitting mats)			
	Weaving Materials		Weaving Materials			
	Other (Specify)		Other (Specify)			

10.1 Out of all those resources which one is the most important?.....

10.2 And Why.....

12. Please give an estimate of the amount of resources that you use in one month (when in season)	Mug	5 liters atchar bucket	10 liters atchar bucket	15 liters atchar bucket	20 liters atchar bucket	Other	13. How often do you use those resources in one month, when in season?	1-2x/ week	3-4x/ week	5-7x/ week	Occasionally/< 1x month
Wild Vegetables (Vowa, delelele etc) (When in season)							Wild Vegetables (Vowa, delelele etc) (When in season)				
Edible insects							Edible insects				
Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)							Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)				
Wild mushrooms							Wild mushrooms				
Bush meat							Bush meat				
Wild Honey							Wild Honey				
Medicinal plants (<u>herbs</u>)							Medicinal plants (<u>herbs</u>)				
14. How much firewood do you use one month	Headload Bundle	Wheel barrow	Bakkie load				15. How often do you use firewood in one month	1-2x/ week	3-4x/ week	5-7x/ week	Occasionally/ 1-2x/ month
Fuel wood							Fuel wood				

16. What do you use woodland resources mentioned below for?	Own household (Domestic use)	Main Source of income	Additional source of income	17. How important are the woodland resources in your household's livelihoods? (more than one option is allowed depending on the resource)	Means of survival (providing for day to day needs)	Safety nets during bad times (no jobs, illness. Increases in prices including electricity, food, fuel)	Source of income
Wild Vegetables (Vowa, delelele etc)				Wild Vegetables (Vowa, delelele etc)			
Edible insects				Edible insects			
Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)				Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)			
Wild mushrooms				Wild mushrooms			
Bush meat				Bush meat			
Wild Honey				Wild Honey			
Medicinal plants				Medicinal plants			
Fuel wood				Fuel wood			
Wooden carvings				Wooden carvings			
Wood for housing poles				Wood for housing poles			
Wood for Fencing				Wood for Fencing			
Thatching grass				Thatching grass			
Grass Brushes				Grass Brushes			
Reeds (Madzhesi) (construction)				Reeds (Madzhesi) (construction)			
Sedges (Mutate) Decoration and for making sleeping and sitting mats)				Sedges (Mutate) Decoration and for making sleeping and sitting mats)			

18. How do you get most woodland resources

Collect	
Buy	

19. Do you sell some of the resources

Yes	
No	

For those who collect resources themselves (check answer on Question (18))

20. How Often do you collect those resources? For those resources that are seasonal, please indicate frequency while on season.		Daily	weekly	Monthly /seasonal	21. How much do you collect at once	Mug	5 liters atchar bucket	10 liters atchar bucket	15 liters atchar bucket	20 liters atchar bucket	Other
	Wild Vegetables (Vowa, delelele etc)				Wild Vegetables (Vowa, delelele etc) (When in season)						
	Edible insects				Edible insects						
	Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)				Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)						
	Wild mushrooms				Wild mushrooms						
	Bush meat				Bush meat						
	Wild Honey				Wild Honey						
	Medicinal plants				Medicinal plants (herbs)						
22. How Often do you collect firewood?		Daily	weekly	Monthly /seasonal	23. How much do you collect at once	Head load	Wheelbarrow	Bakke			
	Fuel wood				Fuel wood						

24 Why do you collect instead of buying? Please explain

.....

.....

25. Out of the items mentioned below how many are owned by your household?	1-3	4-6	7-9	10-11	26. How many months/ years does it take to replace the resources mentioned below?	
Wooden carvings (lufo, lufheto, ndilo, mutuli, musi etc)					Wooden carvings (lufo, lufheto, ndilo, mutuli, musi etc)	
Poles for housing poles					Poles for housing poles	
Poles for Fencing					Poles for Fencing	
Thatching grass					Thatching grass	
Grass Brushes					Grass Brushes	
Sleeping or sitting mats					Sleeping or sitting mats	

27. Please estimate the time that you spent travelling to go to collect the resources.

28. Has there been a change in availability of those resources over the past ten years	Decreased greatly	decreased	same	Increased	Increased greatly	29. How much time do you spend in collecting those resources compared to ten years ago (you may ignore resources that you do not use)	More time than before	Less time than before	No change
Wild Vegetables (Vowa, delelele etc)						Wild Vegetables (Vowa, delelele etc)			
Edible insects						Edible insects			
Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)						Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)			
Wild mushrooms						Wild mushrooms			
Bush meat						Bush meat			
Wild Honey						Wild Honey			
Medicinal plants						Medicinal plants			
Fuel wood						Fuel wood			
Wooden carvings						Wooden carvings			
Wood for housing poles						Wood for housing poles			
Thatching grass						Thatching grass			
Grass Brushes						Grass Brushes			
Reeds for (construction)						Reeds for (construction)			
Sedges (Mutate) Decoration and for making sleeping and sitting mats)						Sedges (Mutate) Decoration and for making sleeping and sitting mats)			
Weaving Materials						Weaving Materials			
Other (specify)						Other (specify)			

30. Compared to 10 years ago do you still travel the same distance you use to travel while collecting same resources?		Travelling same distance	Distance Increased	Distance decreased	31. Do you still collect same quality of resources in the same locality as compared to 10 years ago? Eg same species	Yes, Collecting same quality	changed from good to worse quality	quality changed from worse to good
	Wild Vegetables (Vowa, delelele etc)				Wild Vegetables (Vowa, delelele etc)			
	Edible insects				Edible insects			
	Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)				Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)			
	Wild mushrooms				Wild mushrooms			
	Bush meat				Bush meat			
	Wild Honey				Wild Honey			
	Medicinal plants				Medicinal plants			
	Fuel wood				Fuel wood			
	Wooden carvings				Wooden carvings			
	Wood for housing poles				Wood for housing poles			
	Wood for Fencing				Wood for Fencing			
	Thatching grass				Thatching grass			
	Grass Brushes				Grass Brushes			
	Reeds for (construction)				Reeds for (construction,)			
	Sedges (Mutate) Decoration and for making sleeping and sitting mats)				Sedges (Mutate) Decoration and for making sleeping and sitting mats)			
	Weaving Materials				Weaving Materials			
	Other (specify				Other (specify			

32. How do you transport resources that has been collected in the last year in this household	Head load	Vehicle (Bakkie, truck)	Donkey carts	Wheelbarrow	Container	Plastic bags	Other (specify)	33. Who collects resources?	Older Male	Older female	Tens & youth	Grandparents
Wild Vegetables (Vowa, delelele etc)								Wild Vegetables (Vowa, delelele etc)				
Edible insects								Edible insects				
Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)								Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)				
Wild mushrooms								Wild mushrooms				
Bush meat								Bush meat				
Wild Honey								Wild Honey				
Medicinal plants								Medicinal plants				
Fuel wood								Fuel wood				
Wooden carvings								Wooden carvings				
Wood for housing poles								Wood for housing poles				
Wood for Fencing								Wood for Fencing				
Thatching grass								Thatching grass				
Grass Brushes								Grass Brushes				
Reeds for (construction)								Reeds for (construction)				
Sedges (Mutate) Decoration and for making sleeping and sitting mats)								Sedges (Mutate) Decoration and for making sleeping and sitting mats)				
Weaving Materials								Weaving Materials				
Other (specify								Other (specify				

For those who buy the resources check answer to Question 18 and 19

34. Please give an estimate of the amount resources that you buy in one month	Mug	5 liters atchar bucket	10 liters atchar bucket	15 liters atchar bucket	20 liters atchar bucket	other	35. How much per unit?	Price in Rands
Wild Vegetables (Vowa, delelele etc) (When in season)							Wild Vegetables (Vowa, delelele etc) (When in season)	
Edible insects							Edible insects	
Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)							Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)	
Wild mushrooms							Wild mushrooms	
Bush meat							Bush meat	
Wild Honey							Wild Honey	
Medicinal plants (herbs)							Medicinal plants (herbs)	
36. How much firewood do you use in one month	Headload Bundle	Wheel barrow	Bakkie load				37. How much per unit?	
Fuel wood							Fuel wood	

38. How often do you buy those resources in one month	1-2x/ week	3-4x/ week	5-7x/ week	Occasionally/ 1-2x/ month	Other (specify)
Wild Vegetables (Vowa, delelele etc) (When in season)					
Edible insects					
Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)					
Wild mushrooms					
Bush meat					
Wild Honey					
Medicinal plants (herbs)					
39 How often do you buy fuelwood in one month	1-2x/ week	3-4x/ week	5-7x/ week	Occasionally/ 1-2x/ month	Other (specify)
Fuel wood					

40. Why do you buy these instead of collecting them yourselves?	Resources are no longer found in abundance in the nearby surroundings	It is difficult to transport resources from far places	Households members go to work/school during the day so they can't collect the resources	Do not have the required skills to make final product	Other (specify
Wild Vegetables (Vowa, delelele etc)					
Edible insects					
Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)					
Wild mushrooms					
Bush meat					
Wild Honey					
Medicinal plants					
Fuel wood					
Wooden carvings					
Wood for housing poles					
Thatching grass					
Grass Brushes					
Reeds for (construction,)					
Sedges (Mutate) Decoration and for making sleeping and sitting mats)					
Weaving Materials					

41. During which year did you start to buy most of the products/woodland resources? **Please mention the year?**

For those who are selling the resources?

42. Please give an estimate of the amount resources that you sell in one month	Mug	5 liters atchar bucket	10liters atchar bucket	15 liters atchar bucket	20 liters atchar bucket	other	43 At how much do you sell resources mentioned below for? Please mention the size of the resource and then price.	Price in Rands
Wild Vegetables (Vowa, delelele etc) (When in season)							Wild Vegetables (Vowa, delelele etc) (When in season)	
Edible insects							Edible insects	
Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)							Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)	
Wild mushrooms							Wild mushrooms	
Bush meat							Bush meat	
Wild Honey							Wild Honey	
Medicinal plants (<u>herbs</u>)							Medicinal plants (<u>herbs</u>)	
44. How much firewood do you sell in one month	Headload Bundle	Wheel barrow	Bakkie load				45.At how much do you sell firewood for?	
Fuel wood							Fuel wood	

46. How much money do you earn in a month/season/year from selling those resources? Please indicate the amount?

47. Why do you sell these?	
Is the source of income	
I have resources to transport and collecting resources	
To supplement my income	
Other (specify)	

48. During which year did you start to selling most of the products/woodland resources? Please mention the year?

SECTION C: GOVERNANCE QUESTIONS (More than one answer is possible).

49	Select an Institution that is/are important and involved to woodland resource management		50	Please select institutions that are mostly work together to promote resource sustainability?	
	Traditional leaders			Traditional leaders	
	NGO's			NGO's	
	Government departments			Government departments	
	Municipality			Municipality	
	Civic			Other:	
	Other:				
Why?					
51	Do you think those institutions are assisting in good management of woodland resources?				

52. Are there any conflicts between the institutions that are involved in woodland resources management?	yes	No	Never had about it
53. Are you aware of the laws that are used by <u>traditional leaders</u> in enforcing sustainable utilization of woodland resources?	Yes	No	never heard about it
54. Mention those that you know			

55. Are you aware of the laws that are used by <u>governments department</u> in enforcing sustainable utilization of woodland resources?	Yes	No	Never had about it	
56. Mention those that you know				
57. Between government and traditional legislations which are the most important	Traditional legislation	Government Legislation		
58. Do you know of government programmes that aims at poverty alleviation and sustainable forest management?			Please select where applicable	
Participatory forest management projects				
Community Based Natural Resource management				
Working for Water				
Working for Wetlands				
Land Care				
59. How important are those laws in ensuring sustainable/proper forest management?	Not important at all	Not important at all	Important	Extremely important
Providing information on species that can be utilized	1	2	3	4
Providing access in sustainable utilization	1	2	3	4
Assisting community in obtaining permit to harvest and transporting resources	1	2	3	4
Promoting sustainable utilization of local woodland resources	1	2	3	4
Promoting participatory forest management (co-management between community and forestry departments)	1	2	3	4
60. What should be done in order to promote the current rules and regulations governing the resource?	Not important at all	Important	Very important	Extremely important
Promote good working relationship between different stakeholders (municipality, governments departments and traditional leaders)	1	2	3	4
Monitoring of resources by professionals in order to issue permit	1	2	3	4
Delegating more powers to the traditional authorities on woodland resource management	1	2	3	4
Enforcement must be done by community members rather than official who stays far away from the site	1	2	3	4
Other (record)	1	2	3	4

SECTION D PERCEPTION AND VULNERABILITY ON WOODLAND DEGRADATION

61. Give your understanding of undesirable change of woodland resources?			
60. Have you ever perceived any undesirable change in the woodland?		Yes	No
62. If yes what type of change			
1. Changing from woody to grassland			
2. Changing from forest to shrubs			
3. Trees are now scattered			
4. There is a lot of erosion			
5. There are changes in resources availability (people travel long distance to collect firewood, medicinal plants, mushrooms etc)			
63.	If the change is decrease in resource availability; What could be the main causes of change in the woodland? More than one answer can be possible		
	High dependency on natural resources the locals		Poor enforcement by traditional leaders
	Over exploitation by outsiders		No awareness on sustainable utilization of woodland resources
	Poor enforcement by Departments		Population growth
	Poor rain/ change in weather conditions		Poverty increasing in the village
	Other (specify)		
64	If the change is Increase in resource availability what could be the reason?		
	Proper supervision by forest department		Efforts by local authorities i.e chiefs and civic
	SAPS enforcing legislations		Change in reliability on Natural resources to technology(not using firewood but electricity)
	Efforts by local authorities i.e chiefs and civic		Improvement in monitoring
	People changing attitude towards natural resources management and consumption		Good Rainfall/climate change
	Other (please specify)		

65. Do you think undesirable changes on woodland resources may have any impact on your household?	Not really		No		Yes		Very much	
66. Which change has affected your household?								

67. Do you think the way in which your household use woodland resources contributes to the decrease of the woodland resources?	Yes	No	
--	-----	----	--

68. In what way: _____

69. What can be done to balance undesirable change and resource use?	
Control resource collection through permit system	
Change the resource use pattern	
Proper enforcement by the government departments	
Supplement resource consumption by other resources	
Substitute resource consumption by other resources	
Other (specify)	

70. Which woodland resources do you use the most during time of shock (i.e Death of a breadwinner/ increase in electricity prices/ retrenchment)? (Put an X where appropriate) more than one answer is accepted			
	Wild Vegetables (Vowa, delelele etc)		Wooden carvings
	Edible insects		Wood for housing poles
	Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)		Wood for Fencing
	Wild mushrooms		Twig brushes
	Bush meat		Thatching grass
	Wild Honey		Grass Brushes
	Medicinal plants		Reeds for (construction, Decoration and for making sleeping and sitting mats)
	Fuel wood		Weaving Materials

71. Why those resources?

72. Are woodland resources important to your household during the time of shock? Eg The time of loss of breadwinner, electricity hike, loss of grant, drought, floods etc	Very important	Important	Not important at all
--	----------------	-----------	----------------------

73. What are/ could be the most important responses that assist your household during the time of shock? Eg The time of loss of breadwinner, electricity hike, loss of grant, drought, floods etc			
Support from relatives, neighbors and Friends		Searching for work within and out of the village	
Burial societies and stockvels		Changing diet or meals intervals	
Using consumable and con-consumable woodland resources for domestic/own use		Loaning money from Loan sharks/Matshonise	
Using consumable and con-consumable woodland resources as source of income			
Selling assets			
Selling livestock			

74. Are those assets in question 73 important than woodland resources in dealing with shock in your household	Y es	no
--	---------	----

75. Of all the resources mentioned below which ones is/are the most important resources for your <u>household</u> (more than one answer is possible)		
Wild Vegetables (Vowa, delelele etc)		Wooden utensils
Edible insects		Wood for housing poles
Wild fruits (mazulu, Nombelo, Maramba, Mafula etc)		Thatching grass
Wild mushrooms		Grass Brushes
Bush meat		Reeds for (construction, Decoration and for making sleeping and sitting mats)
Wild Honey		Weaving Materials
Medicinal plants		Other (specify)
Fuel wood		

76. Form the resources that you have marked as important, please indicate the coping mechanisms in case those resources are on the decrease.....

.Comments:.....

Appendix B

Clearance certificate from WITS human research ethics committee (non-medical)



Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

R14/49 Ramatshimbila

CLEARANCE CERTIFICATE

PROTOCOL NUMBER H13/06/03

PROJECT TITLE

Assessing the poverty-environment nexus in rural Limpopo

INVESTIGATOR(S)

Mrs T Ramatshimbila

SCHOOL/DEPARTMENT

APES

DATE CONSIDERED

21/06/2013

DECISION OF THE COMMITTEE

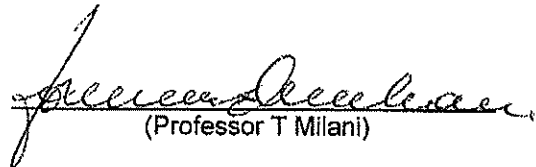
Approved unconditionally

EXPIRY DATE

26/06/2015

DATE 27/06/2013

CHAIRPERSON

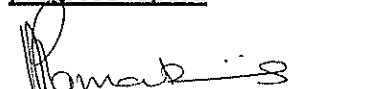

(Professor T Milani)

Cc: Supervisor: Dr WC Twine

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**


Signature

01 / 07 / 2013
Date

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES