Perspectives on Wetlands' Cultural Ecosystem Services and Indigenous Wetland Management Practices in the Limpopo Province, South Africa.

By

Botete Carol Metwane

Student No: 11540197

Dissertation submitted in fulfilment of the requirements for the degree of Master of Environmental Sciences in Ecology and Resource Management

Supervisor: Dr. L. Mugwedi

Co –Supervisor: Dr. FM. Murungweni

DECLARATION

I Botete Carol Metwane (student number 11540197) declare that this dissertation titled "Perspectives on wetlands' cultural ecosystem services and indigenous wetland management practices in the Limpopo Province, South Africa" is my work and it was not submitted for any degree in this University or any University. This research project was conducted at the University of Venda, Limpopo Province under the supervision of Dr. L. Mugwedi and the co-supervision of Dr. FM. Murungweni.

_____  _____ ____10/03/2023_____

Signature Date

DEDICATION

I dedicate this work to my beloved family. My lovely husband, Magane Dennis Makola Ngwato A' Phaahla, and my daughters Lehumo, Lereko, the twins Lesedi and Letago. My mother, Mogale Gertrude Metwane Modipadi A' Phaahla, and my mother-in-law Nape Makola Ngwatomosadi A' Monare.

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ABSTRACT

The cultural ecosystem services of wetlands are the least researched category of ecosystem services because they are not tangible and difficult to quantify for material and non-material benefits. Cultural ecosystem services are non-material benefits communities get from ecosystems and are very important for their well-being. This study assessed people's perspectives on wetland cultural ecosystem services and indigenous wetland management practices in Sekhukhune District, Limpopo Province, South Africa. The objectives of the study were to identify wetland cultural ecosystem services, to investigate local communities' perspectives on wetland cultural ecosystem services, and to determine indigenous wetland management practices in Makhuduthamaga Local Municipality. The study was conducted at seven villages whereby each village had a wetland associated with it. A stratified random sampling technique was used at the selected seven villages whereby each village was considered. A simple random sampling approach was used to select the participants to be interviewed for the study in all seven villages. A calculated sample size of 197 of which 119 were male, 76 were female, and 2 others (who are not classified as males or females) participated in the study. Data were collected using individual face-to-face interviews with an interview guide consisting of open-ended and closed questions. Qualitative data were analysed using Atlas ti version 8, while quantitative data were analysed using Stata version 15. The key findings of the study were that: (1) wetlands provide cultural ecosystem services such as religious, spiritual, recreational, and educational services; (2) wetlands are the most respected ecosystems where the gods, ancestors, and water spirits reside, the place of worship and performance of rituals; (3) wetlands are holy with supernatural powers for healing and to drive away evil spirits, bad luck, and witchcraft; (4) traditional leaders are the key stakeholders in the management of wetlands in villages; (5) traditional leaders set taboos and protocols for the sustainable use of wetlands. It was also revealed that non-adherence to taboos and protocols pronounced by traditional authorities' leads to the anger of the gods, ancestors, and water spirits, resulting in calamities to society. In conclusion, the study showed that there is a positive relationship between community and wetland cultural ecosystem services and between indigenous knowledge and wetland management practices. Then, indigenous knowledge of wetlands conservation must be promoted. There should be continuous community awareness and capacity-building for traditional authorities on wetland management.

Keywords: Awareness, Local communities, Sustainable use, Traditional leaders, Traditional healers.

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ABBREVIATIONS AND ACRONYMS

CES	Cultural Ecosystem Services
DFFE	Department of Fisheries, Forestry, and Environment
ES	Ecosystem Services
IDP	Integrated Development Plan
IKS	Indigenous Knowledge System
LEDET	Limpopo Economic Development, Environment, and Tourism
MLM	Makhuduthamaga Local Municipality
MA	Millennium Ecosystem Assessment
NRM	Natural Resource Management
SDF	Spatial Development Framework
SDM	Sekhukhune District Municipality
WES	Wetland Ecosystem Services

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CHAPTER ONE: GENERAL INTRODUCTION

1.1 Background

Wetlands are among the most productive ecosystems on the earth and provide vital ecosystem services to human society. In this study, wetlands are defined as areas of marsh, fen, peatland, or water, whether natural or artificial, permanent or temporary, with water that is static, flowing, fresh and brackish or salt, including marine water, the depth of which at low tide does not exceed 6 meters (Ramsar, 2013). Ecosystem services are goods and services that the ecosystem provides to society (Costanza et al., 2011).

Ecosystem services are categorized into four, namely the provisioning services (e.g., food and water), regulating services (e.g., removal of pollutants and flood protection), Cultural services (e.g., cultural heritage and spiritual enrichment), and supporting services (e.g., nutrient cycling and primary productivity) (MEA, 2005; Pedersen et al., 2019).

The non-material benefits that communities receive from ecosystems known as "cultural ecosystem services" are crucial for their well-being. (Milcu et al., 2013, Bosma et al., 2017, Gladkikh et al., 2019). They provide mental, emotional, and physical benefits that are skilful, inherent, and expressed through direct demonstration (Milcu et al., 2013). According to (Satz et al., 2013), attributes of wetlands within the cultural ecosystem services were mainly related to educational, spiritual enrichment, cognitive development, and reflection of recreational and aesthetic experiences, including spiritual and religious value, cultural heritage, and cultural diversity.

To sustain wetland management, stakeholders' perception of the ecosystems and their management is required (Bosma et al., 2017). Understanding how people appreciate and benefit from ecosystems depends on their interactions with them and their day-to-day activities (Food et al., 2021). To create sustainable management strategies, it is essential to comprehend local

people's perceptions and attitudes on ecological value (Cottet et al., 2013). Wetland conservation and management is based on the insight into attributes or perceptions of local people (Sinthumule, 2021).

Religious and spiritual opinions often contribute to social norms and are potentially significant tools to protect the environment. It can only be achieved if positive religious and spiritual associations are promoted within nature protection, which will motivate environmental awareness (Reuben and Kquofi, 2015). There is a connection between cultural practices and biodiversity conservation by indigenous people concerning resource use (Berkes and Davidson-Hunt, 2006). Indigenous people are mostly regarded as stakeholders with a wider range of knowledge regarding ecosystem change (Bataille et al.,2021). Their traditional practices can bring solutions to the complex environment (Reed et al., 2021). Conservationists can understand the beliefs of the public by foreseeing their actions. Beliefs are concepts deeply rooted in traditions, society's material culture, institutions, and collective activities (Manfred et al., 2017). Indigenous Knowledge System (IKS) and its practices do and can contribute to natural resource management (Chettri et al., 2021). Indigenous peoples around the world have extensive traditions of protecting the environment through their socio-religious practices and socio-cultural appreciation of natural resources (Khan et al., 2008). If Natural Resource Management (NRM) practitioners and Scientists can collaborate effectively with indigenous people using indigenous knowledge systems nature conservation will be assured (Pyke et al., 2018).

1.2 Conceptual framework

The conceptual framework of the research is shown in Figure 2.1 below, adapted from Rendon et al. (2019). According to this concept, the ecosystem approach refers to the interdependence between nature and human well-being. Human well-being refers to the positive social, physical, and mental condition. There are two approaches to objectives for well-being that derive from the economic field:

i. The primary need approach attempts to classify the minimum requirements, health, and anatomy that must be satisfied for long well-being.

ii. The capabilities approach recognises the importance of people's ability to do the things they want to do (capabilities)as well as achieving things (functioning) (Rendón et al., 2019)

There is a link between ecosystem services and primary material for a good life, security, and health. Fisher et al., 2013 describe the five components of well-being as follows:

- A good livelihood requires a sufficient supply of food, money, assets, a stable and sufficient means of subsistence, a place to live, furniture, clothing, and access to commodities.
- Having a healthy physical environment, feeling good, and being strong are all aspects of health.
- Security includes having safe access to natural resources and other resources, being able to live in a predictable and regulated environment, and being protected from both natural and man-made disasters.
- The capacity to assist others and care for children, social cohesion, and mutual respect are all examples of healthy social interactions.
- Achieving what a person values doing or implying having physical influence over what occurs. This is what is meant by freedom of choice and action.

The importance of distinguishing between the services (means) and benefits (ends) is now broadly recognised. The benefits are defined as the actual contributions made to human well-being (Environment, 2011). The benefits (good things) and disbenefits (bad things) directly link ecosystems and human well-being. Disbenefits are included in the framework to connect nature to human well-being (Rendón et al., 2019). Disbenefits are perceived as unwanted, unpleasant, or economically damaging effects that humans may experience from nature, for example, the risk of drowning, allergy to pollen, or mosquito bites. Most disbenefits grow at the local scale, and

main local disbenefits are mostly linked to human well-being, domains of connection to nature and health. At the same time, benefits have a broader scale and impact that can be perceived locally up to a global scale and are linked to the health and living standard domain (Rendón et al., 2019).

The environment and poverty are linked because poor people in developing nations frequently rely more heavily on natural resources for their livelihoods. With the development of agriculture, for instance, poverty can be a driving force behind the degradation of ecosystem services. Those who live in poverty are frequently disproportionately susceptible to environmental change and pressures. Although there is a strong connection between poverty and the environment, it is important to consider how ecosystem services can reduce poverty (Fisher et al., 2013).

Communities often develop a unique relationship with ecosystem services through rich human-environment interaction and culture continuity histories. Environmental sustainability and livelihoods can both be improved by using ecosystem services to ensure that resource governance institutions are properly planned and targeted. (Dou, 2021).

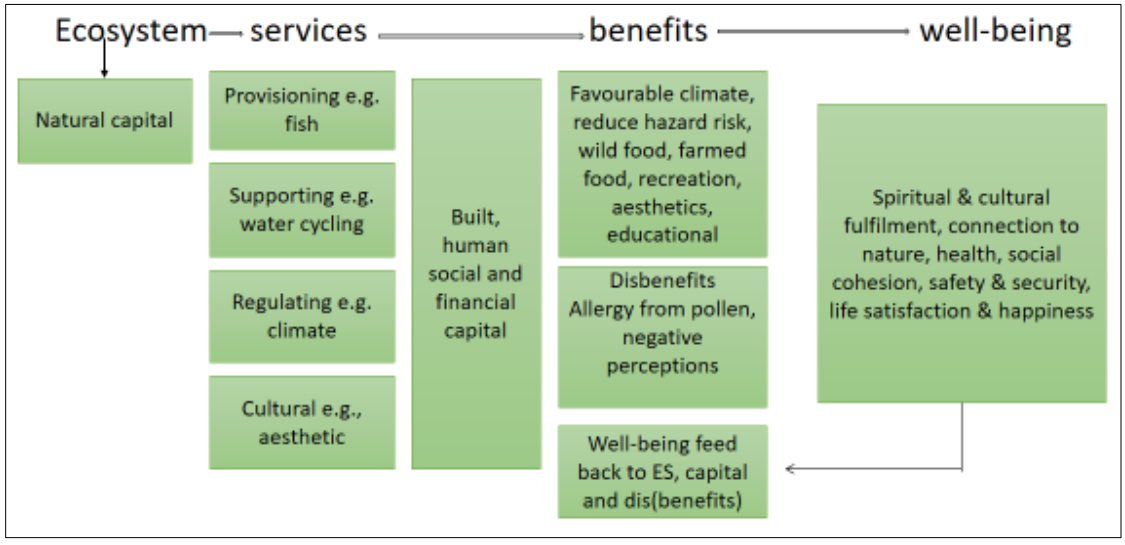


Figure 1.1 Interdependence between nature and people. Source: Adapted from Rendon et al. (2019)

1.3 Problem statement

The Ramsar convention estimates that 12.8 million km^2 of the global wetlands area and more than half of these world wetlands have disappeared since 1990 (Li et al., 2020). This means that wetlands are degrading at an alarming rate. In the United States, 54% of its original wetlands have been lost with 87% of agricultural development and 8% for urban development. Wetland loss is primarily caused by human activities (Craft, 2015). In France, 67% of wetlands have been lost in the period 1900 to 1993, while the Netherlands lost 55% of wetlands between the years 1950 and 1985 (Kingsford et al., 2016). In the year 1850, the wetlands in China were about 6 635 km^2, which kept on degrading in the periods 1911,1949, and 1980 with 73,9%,62,7%, and 40,6%, respectively (Li et al., 2020). In South Africa, approximately 300 000 wetlands are remaining make up only 2,4% of its surface area (1221, 04 km^2). Whereby 65% of wetlands ecosystems are threatened, 48% are critically endangered, 12% are endangered and 5% vulnerable (Macfarlane et al., 2014). Wetlands all over the world were considered by many to be of little, or no value or negative value (Turner et al., 2000).

In European culture, wetlands have been associated with a negative description as places of danger and mystery, polluted by demons and evil spirits (Margaryan et al., 2018). Scandinavians used the wetlands to discard “unclean” objects, such as those related to death ceremonies and the burial of offenders, and offer sacrifices (Margaryan et al., 2018).

Ndaruga and Irwin (2003) noted that wetlands have socio-cultural attributes which include but are not limited to indigenous knowledge, culture, heritage, transhumance, spiritual beliefs, and rites as well as settlement of people. In South Africa, most of the studies on wetland cultural ecosystem services focused more on educational, recreational, and aesthetic services but not on religious or spiritual services. This problem inspired the study to assess the local communities’ perspective

on wetlands cultural ecosystem services and indigenous wetland management practices in Limpopo Province South Africa.

1.4 Motivation for the study

Wetlands ecosystems are less visible and not easily captured like forest ecosystem and their cultural ecosystem services remain a highly under-researched topic. There is little research on cultural ecosystem services on wetlands because they have historically been among the least understood and appreciated ecosystems (Margaryan et al., 2018). Literature has shown that it is difficult to integrate cultural services fully into the developed general models for understanding and valuing ecosystem services (Pedersen et al., 2019).

The literature revealed that various studies have been done on wetlands' cultural ecosystem services in Nigeria (Orijemie, 2020), Europe (Margaryan et al., 2018), Netherlands (Verschuuren, 2006), Zimbabwe (Ndlovu and Manjeru, 2016), Kenya (Ndaruga and Irwin, 2003). However, only fewer studies have been done on communities' perceptions of wetland cultural ecosystem services and indigenous wetland management practices in South Africa. This study, therefore, offers new insights into the topic.

The significance of this study is to better understand how community members relate to wetlands ecosystems in terms of their culture, spiritual beliefs, or values and how they use indigenous knowledge to manage or conserve their wetlands. This study investigated the sustainability of wetlands cultural ecosystem services to the Bapedi and Swati people of Makhuduthamaga Local Municipality.

1.5 Aim and Objectives

This research aims to assess the perspective on wetlands' cultural ecosystem services and indigenous wetland management practices in Limpopo Province, South Africa.

Based on this aim, the following objectives are spelled out:

i To identify wetlands and cultural ecosystem services in the Makhuduthamaga Local Municipality.

ii To investigate the local communities' perspectives on wetlands cultural ecosystem services in the Makhuduthamaga Local Municipality.

iii To determine indigenous wetland management practices in the Makhuduthamaga Local Municipality.

1.6 Hypotheses

i A positive relationship exists between the wetland's cultural ecosystem services and the people.

ii The incorporation of an indigenous knowledge system into wetland management can result in the overall improvement in the management of ecosystem services.

1.7 Research outline

The study is comprised of five chapters. Chapter one introduces the study in terms of background, research problem, the significance of the study, research objectives, and hypothesis.

Chapter two presents a review of the literature which starts with the conceptual framework, the concept of ecosystem services, drivers of wetland loss and degradation, the future of wetlands ecosystem services, people's perspectives on wetland cultural ecosystem services, and indigenous wetland management practices.

Chapter three covers the overview of the research methodology used in the study. It starts with the description of the study area, research design, population and sampling strategy, data collection and analysis, and ethical considerations.

Chapter four presents the results and discussion on people's perspectives on wetland cultural ecosystem services and indigenous wetland management practices.

Chapter five highlights the summary, conclusion, and recommendations. Furthermore, a reference to the sources used in this study is provided. Appendices attached include a data collection tool, ethical consideration document, and a sample of codes and quotations from Atlas ti 8.

CHAPTER TWO: REVIEW OF LITERATURE

2.1 Introduction

This chapter reviews the literature and discusses ecosystem services (ES) provided by wetlands. The literature is thematically presented as follows: Concept of ES, categorisation of ES, the history of wetland ecosystem services (WES), benefits of WES, drivers to loss and degradation of wetlands, future of WES, people's perspectives on wetland cultural ecosystem services, and the indigenous wetland management practices.

2.2 The Concept of Ecosystem Services

Ecosystem Services (ES) are benefits that people obtain from ecosystems and sustain human well-being in everyday life (Finlayson et al., 2005). Ecosystem services are produced by ecosystems and utilized by people. Most of the ecosystem services are public goods meaning that many users can benefit from using them concurrently, and it is difficult to exclude the local people from benefiting from these services (Carpenter et al., 2009).

The concept of ES has been developed to address the idea of the relationship between ecosystems and human welfare (Dłużewska, 2016). Ecosystems are referred to as 'Natural Capital" as they are evaluated according to the goods and services they provide to individuals and communities (Costanza et al., 2011). The economic valuation of ecosystem services made the ecologists express their values to ecosystems through metrics, and that gave meaning to the public and the policymakers (Chan et al., 2012).

In the literature, the concept of ES emerged in the 1990s. It was recognised by the Millennium Ecosystem Assessment (MEA) in 2005, and from that time, the number of publications about ecosystem landscape functions and services increased (Dłużewska, 2016). The MEA introduced a new conceptual framework for documenting, analysing, and understanding the effect of

environmental changes on ecosystems and human well-being (Carpenter et al., 2009). The conceptual framework defines human-well-being as basic material for a good life, health, security, good social relations, and freedom of choice and action (Carpenter et al., 2009).

2.3. Categories of Ecosystem services

Ecosystem services can be defined as the capacity of ecosystems to provide goods and services that satisfy human needs directly and indirectly (Costanza et al., 1997). The MEA mentions four categories of ES as follows:

2.3.1. Provisioning services

The provisioning services are goods and products that people acquire directly from nature (Chan et al., 2012). The most used provisioning services are normally wild foods, water, firewood, and building material. These natural resources are harvested from different places such as protected areas, forests, woodlands, remnant vegetation, urban parks, riparian zones, and informal green spaces (Shackleton, 2021). These ecosystems also provide medicines for healing purposes (Mukaria, 2021)

2.3.2 Regulating services

These are services that regulate different parts of the integrated system. The services include flood control, storm protection, water purification, water regulation, human diseases regulation, air quality maintenance, pollution, pest control, and climate control (Clarkson et al., 2013).

2.3.3 Supporting services

These services maintain basic ecosystem processes and functions such as soil formation, carbon fixation, and habitat for animals. These services affect human well-being indirectly by maintaining processes necessary for provisioning, regulating, and cultural services. For example, net primary production is an ecosystem function that supports carbon sequestration and removal from the

atmosphere to provide the benefit of climate regulation. They also provide the service of nutrient recycling and maintenance of biological diversity (Clarkson et al., 2013).

2.3.4 Cultural Ecosystem Services

Cultural ecosystem services are defined as “non-material value or intangible benefits that people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and tourism, and aesthetic experience” (Ryfield et al., 2019). Cultural ecosystem services are generally included under non-consumptive direct-use values and suffer from poor quantification and integration in the management plan. The Millennium Ecosystem Assessment (2005) categorised cultural ecosystem services as follows:

2.3.4.1 Spiritual and knowledge system

Many faiths include references to ecosystems and the parts of them in their spiritual practices (Finlayson et al., 2005). Most people search for spiritual connections to their environment through personal thoughts and experiences, for instance, rituals, traditional taboos, and religious rules. Ecosystems provide an important measure for this orientation in time and space, which is reflected by spiritual values such as holy forests, sacred animals, and plants' landscape features like mountains and waterfalls (Rudolf de Groot et al., 2005). Some sacred trees, plants, and animals have exceptional preferences regarding divination, divinity, healing, and peace making. The natural environment is considered sacred for ancestral and God’s resting place. It also provides prayer, scrutiny, reflection, completeness, and health services. The knowledge system, whether traditionally or officially, reflects the historical concepts and collection of knowledge (Finlayson et al., 2005).

2.3.4.2 Educational and inspirational value

Educational value acknowledges that ecosystems and their components give the basics to formal and traditional education in many societies. Inspirational value also inspires folklore, art, architecture, national symbols, and advertising (Hernández-Morcillo, 2013).

2.3.4.3 Social relations and sense of place

Ecosystems have inspiration for characters and types of social relations that are established in a particular culture (Finlayson et al., 2005). Sense of place is classified as a cultural service that develops a deep connection between people, places, and ecosystems. Since the late 1990s, the sense of place has been used in literature. The combination of placed experience, stories, feelings, sights, and theories makes sense of place (Rayfield et al., 2019). By way of understanding, anticipating, and responding to people's relationships with their places prepares managers to develop management activities that will gain public support and avoid conflicts (Hausmann et al., 2016).

2.3.4.4 Cultural heritage value

Cultural heritage assists in understanding that many people place a high value on the maintenance of cultural significance species and landscapes. A large part of cultural heritage is connected with ecosystems and landscapes with special features that remind society about its historic roots both collectively and individually (Rudolf de Groot et al., 2005).

2.3.4.5 Recreational, ecotourism, and aesthetic value

People regularly choose where they want to spend their holidays based on the natural characteristics or cultural landscape in a chosen area. People recognise the ecosystem as a place where people go for rest, relaxation, refreshment, and recreation. The natural environment

provides many opportunities for nature-based recreational activities such as walking, bird–watching, swimming, camping, fishing, and nature study (Rudolf de Groot et al., 2005). The general public finds beauty in several features of ecosystems as reflected in the support from parks, location for housing, forests, and sea (Gee and Burkhard, 2010). The highest aesthetic value of nature is reflected in many areas of human behaviour, like the usage of plants and flowers for interior decoration and the demarcation of beautiful routes (Rudolf de Groot et al., 2005).

Cultural services are influenced by emotional and attachment-related factors. For instance, the presence of indoor plants, the environment at work, and the view outside the window might reduce employee mental illness and boost productivity (Hausmann et al., 2016). The benefits of being in nature are beneficial to one's physical, mental, and emotional health. It enhances people's quality of life in ways that cannot be met by any other method. Exposure to nature has been shown to speed up recovery from surgery, lower blood pressure, boost mood, relieve stress, lessen mental weariness, and lessen the propensity for aggressive behaviour (Hausmann et al., 2016).

2.4 Wetland ecosystem services

Wetlands are among the planet's most valuable ecosystems and are the centre of livelihood around the globe. In South Africa, people are directly reliant on wetlands for subsistence use (Mabule and Baloyi, 2019). The assessment of the ecosystems estimates that wetlands, especially inland swamps, and floodplains, are more valuable than rivers, lakes, forests, and grassland (Costanza et al., 2011). Wetland ecosystem services have global and local significance value and extensive support for their conservation value (Asselen et al., 2013). They provide a variety of benefits, such as water regulation services and habitats for various species (Maniatakou et al., 2020).

2.4.1 The history of wetland ecosystem services

In the early 1970s, wetlands were the first ecosystems to be recognised for their implicit values because they have been viewed for a long time in the western world as systems that need to be drained for human progress. Mitchs et al (2009) classify wetland values into three levels, i.e., population, ecosystem, and global population values.

- Population values – include those related to specific ecological populations providing habitat for animals harvested for pelts, waterfowl, hunted and watched birds, fish and shellfish production, timber, peat harvesting, and support of endangered and threatened species.
- Ecosystems values – require the whole wetland ecosystem, not just a few species of plants, animals, or microbes, to improve water quality, mitigate storm and flood damage, recharge aquifers, and even sustain human cultures.
- Global values – include the maintenance of water and air quality, which influences a much broader scale than the ecosystem level, particularly in the regional and global cycles of nitrogen, sulphur, and carbon.

2.4.2 Wetland supporting services

Wetlands sustain exceptional and high levels of biodiversity, including numerous terrestrial and aquatic creatures that are supported indirectly by wetland productivity, freshwater, nursery, and habitats. Certain plants can only survive in wet environments, and they can be distinguished from other plants by their preference for a particular type of wetness. As a result, some plants grow in, rivers. Marshes and lakes (Kingsford et al., 2016). The wetlands are also called “nature’s supermarkets” as they support extensive food chains and rich biodiversity. They play a primary role in the landscape by providing a unique habitat for various flora and fauna (Mitsch et al., 2015).

The other most valuable ecosystem service of wetlands is nutrient cycling. Wetlands also contribute to other parts of the nitrogen cycle by releasing molecular nitrogen into the atmosphere

following denitrification, an essential ecosystem service (Kingsford et al., 2016). The peatlands are the predominant sink of sequestered carbon. Wetlands account for 20-25% of the world's organic carbon (Kingsford et al., 2016).

2.4.3 Wetland regulating services

Wetlands provide many services that allow humans to exist on the planet, known as regulating services. Wetlands are a significant part of hydrological systems. They function as "sponges" that store water during the wet season and maintain it during the dry season. At times wetlands are referred to as the "kidneys" of the landscape since they function as downstream receivers of waste and water equally from natural and human sources (Kingsford et al., 2016). Wetlands play a significant role in treating and purifying various waste products. They have been found to cleanse polluted water, protect shorelines, and recharge groundwater aquifers. It was established that some wetlands reduce nitrate concentration by more than 80%. It has also been found that wetlands stabilize the water supply by preventing floods and drought (Mitsch et al., 2015). Wetlands act as a habitat for pollinators like bees and other insects. Mangroves are perfect sites for apiculture (beekeeping), and the honey attracts high prices (Lamsal et al., 2015)

2.4.4 Wetland provisioning services

Wetlands provide various provisioning services, and communities can depend on those services or benefits. The services obtained from wetland ecosystems are:

- Water

  Wetlands are sources of clean drinking water for people and livestock. They also provide non-drinking water for domestic purposes, such as water for energy production (hydroelectricity) and irrigation in subsistence and commercial agricultural activities (McInnes, 2013).

- Food

Food nutrition and food security for humans, e.g., fish farming for subsistence and commercial use (McInnes, 2013), attract game species that promote hunting (Maniatakou et al., 2020).

- Non-food products

Wetlands provide fodder for livestock, fuel wood as a source of energy for cooking and heating the house reeds for making baskets, mats, roofing, and fencing (Dixon and Wood, 2003), and an ornament resource collection and algae production (Rojas et al., 2017).

- Medicinal products

Wetlands provide medicinal products that give health benefits to society. The medicinal products include herbs, animals, fungi, and algae, which are used for various health reasons and are continued to be valued by indigenous people (Horwitz and Finlayson, 2011).

2.4.5 Wetland cultural services

Wetland ecosystems provide cultural services, which include but are not limited to spiritual, inspirational, scientific, educational, recreational, and tourism benefits.

- Spiritual and inspirational

  Spiritual and inspiration services include inspiration, cultural heritage, contemporary cultural significance, spiritual, and religious values, aesthetics, and a sense of place.

- Contemporary cultural significance relates to the archaeological site. Peat wetlands are significant for providing a historical legacy by preserving remains of great archaeology. For example, in the North-west of Europe and the United Kingdom, archaeological remains were found at the peat wetland, and that gave evidence of the diet, clothing, physical features, and culture of bog people who lived more than 2000 years in that place (Clarkson et al., 2013).

- A sense of place is formed and sustained through activities conducted within the ecosystems, including walking, shellfish harvesting, walking, swimming, boating, and bird watching (Rayfield et al., 2019).
- Spiritual - the spiritual significance of water from wetlands gives both physical and mental health benefits, providing human attraction to wetlands and watercourses (Horwitz and Finlayson, 2011).
- Wetlands provide locations that serve as laboratories for formal and informal environmental education. Scientists also do research on the wetlands (Maniatakou et al., 2020). The knowledge system is gained through various ongoing research and educational establishments that are carried out (McInnes, 2013).
- Recreational tourism includes recreational hunting and fishing. Water sports such as sailing and windsurfing, picnics, outings, touring, and nature observation in the form of bird watching (McInnes, 2013). Furthermore, the appreciation of fauna and flora for mental recreation, relaxation, and stress reduction (Rojas et al., 2017).

2.5 Drivers of wetland loss and degradation

Wetland loss and degradation occur worldwide at an extremely high rate (Asselen et al., 2013). Wetland loss is the transformation of wetlands to other land use types such as agricultural fields and residential areas. Asselen et al. (2013) argue that wetland loss and degradation occur due to human and natural causes. Wetlands have been severely degraded for decades due to irresistible exploitation (Zekarias et al., 2021). The studies agree that their loss and degradation are more extensive than in other ecosystems and are more severe in freshwater and coastal wetlands (Rojas et al., 2017). The rate at which wetlands have been degraded and lost is more significant compared to other ecosystems due to the following six drivers; infrastructure development, land conversion, water withdrawal, eutrophication and pollution, overharvesting, and overexploitation and introduction of invasive species (Galatowitsch, 2018).

2.5.1 Infrastructure development

Roads and flood control infrastructure interrupt wetland connectivity, disrupting aquatic habitat, reducing the wetland's functions of removing pollutants and the absorption of floodwaters, and possibly increase of loss when floods occur. The construction of dams disturbs fish breeding. Dams with large reservoirs change seasonal flood regimes and keep the sediment needed to maintain the productivity of floodplain agriculture (MEA, 2005).

2.5.2 Land conversion

Land conversion activities might include agriculture, afforestation, mining, and oil and gas exploration. Agricultural expansion is often achieved by converting natural inland water systems, reducing aquatic biodiversity and natural flood control functions, and increasing soil salinity through evaporation (MEA, 2005). Agricultural development modifies flow patterns to protect irrigated crops and divert water for crop irrigation (Kingsford et al., 2016).

2.5.3 Water withdrawal

Drainage and cultivation of wetlands have severe impacts, which cause a reduction in water storage, and more flexible stream flows are initiated in response to local food storage (Dixon and Wood, 2003). Withdrawal of freshwater is the leading cause of loss and degradation of inland wetlands such as swamps, marshes, rivers, and associated floodplain water bodies. It is estimated that 56-65% of inland coastal marshes, with the inclusion of small lakes and ponds, had been drained for intensive agriculture in Europe and North America, 27% in Asia, 6% in South America, and 2% in Africa (Finlayson et al., 2005).

2.5.4 Pollution and eutrophication

The discharge of pollutants into water bodies severely affects biodiversity. They include herbicides, fertilizers, human and animal waste, and toxic elements from the mines (Kingsford et al., 2016). Pollutants from mines include but are not limited to lead (Pb), Uranium (U), copper (Cu), and zinc (Zn). The central Rand Goldfield, which operates in Witwatersrand in South Africa, is an example of a mine that discharges into the Klip River wetlands (Humphries et al., 2017). When mines and industries release raw pollutants into the aquatic environment, it reduces the water quality, negatively affecting the variety and large quantity of marine organisms and human health (Kingsford et al., 2016). The study by Letsoalo and Potgieter (2021) found that community members intentionally dispose of their waste in the wetland due to not receiving waste removal services. This activity has caused wetlands to be viewed as dumping sites.

2.5.5 Overharvesting and overexploitation

Overharvesting and overexploitation happen when poor communities that reside near the wetlands depend entirely on the wetland's resources and have limited livelihood alternatives (Lamsal et al., 2015). The wetlands' natural resources, including fish, birds, mammals, and vegetation, are all under pressure. Foliage may be over-extracted for fuel, grazing, art, and craft material for baskets, ropes, and mats (Chaudhry, 2010). Overgrazing contributes to the overexploitation of vegetation. It happens when the livestock exceeds the carrying capacity, thus degrading the wetlands. Hunting for animals and shooting migratory waterfowl for sports or subsistence use reduce the population of mammals and birds (Chaudhry, 2010).

2.5.6 Introduction of invasive species

In wetland ecosystems, invasive plants change the abundance of both primary producers and secondary consumers in food webs (McCary et al., 2016). Invasive species in wetlands can alter nutrient cycles, fish, and other aquatic animal community structures and lessen recreation and

commercial uses. The extreme growth of invasive aquatic plants has increased a favourable habitat for vectors of human diseases (Zekarias et al., 2021, Wetzel, 2005).

In the Northern Cape, Kamiesburg uplands and Niewoudville wetlands are dominated by invasive plants, *Prosopis glandulosa* (*Honey mequite*) and *Prosopis veluntina* (velvet mequite). They are prolific woody species from arid regions of America. They are highly palatable and have indigestible seeds, making it easy for the cattle to spread them in the rangelands. The *Prosopis* trees multiply and replace indigenous species in the landscape. They also have a deep root system that quickly taps into the groundwater, making less water available for indigenous plant species, especially in the riparian zone (Kotze et al., 2019).

2.6 The future of wetland ecosystem services

2.6.1 Wetland scenarios

The Millennium Ecosystem Assessment (2005) predicted four scenarios to explore possible ecosystems and human well-being futures. The scenarios explored are global orchestration, techno garden, order from strength, and adapting mosaic.

- Under the reactive Global orchestration and order form scenario, wetlands degradation is anticipated to worsen until 2050.
- The demand for regulating wetlands' flood and storm protection and denitrification services will rise, but the supply of these services is likely to decline.
- The development of technologies and expertise for agro ecosystem management could result in the restoration of wetlands for the proactive Techno Garden and Adaptive Mosaic scenarios.
- Under the *Adaptive Mosaic* scenario, wetland protection might be highly successful due to the emphasis on enhancing ecosystem knowledge through adaptive management.

2.6.2 Future of wetlands

The degradation of wetlands is likely to increase as the global area of wetlands is predictable to decrease with the increase in human population, especially in coastal zones and with the expansion of agricultural land. Land-use change is expected to remain a significant driver of changes in ecosystem services up to 2050. Climate change scenarios anticipate that new stressors on wetlands will occur, mostly as a result of changes in hydrology, temperature, and seal level rise (Čížková et al., 2013). Extreme multiannual and short-term climate phenomena such as El Nino and La Nina, torrential rainfall, droughts, and heat waves are becoming more common. A shift in rainfall distribution, with precipitation increasing during rainy seasons and decreasing during dry seasons, could have a greater impact (Junk et al., 2013). Water demand will most certainly rise as the human population grows. Human climate change responses, such as dam and reservoir construction to store water and create hydropower, may also be conflicting with biodiversity conservation (Taylor et al., 2021). Increased aggregate extraction, particularly for buildings, is expected to continue, with serious effects on physical wetland habitat.

Rising sea levels are estimated to lead to the loss of coastal wetlands such as estuaries, tidal flats, and deltas. Climate change has begun to have a significant impact on wetlands. It will change ecosystem services, for instance, cultivated productivity and growing zones. Water quality is projected to decrease by 30% in the world's rivers. Deterioration of the services delivered by freshwater resources like aquatic habitat, fish production, and water supply for households, industry, and agriculture is expected (Assessment, 2005).

2.7 People's perspectives on wetlands cultural ecosystem services

People's perceptions and preferences regarding ES are influenced by a variety of personal, geographic, and social characteristics, including gender, age, income, political association, environmental organizations, moral convictions, use of and lack of use of a particular area, life

experience, and living conditions (Rojas et al., 2017). Individuals may not place value on ecosystem services if they do not know the role played by these services in their well-being (Costanza et al., 2011).

Exploring people's perceptions of natural resources is crucial to reveal what they know, understand, and disclosing their misunderstandings (Ndaruga and Irwin, 2003). People value nature in three critical ways: domestication, inheritance, and community building.

- Domestication, people become familiar with species and ecosystems through regular contact with their daily activities, creating a sense of stewardship (Flood et al., 2021).
- In inheritance, people incorporate these elements into their lives through connections to past generations and communities (Flood et al., 2021).
- Community building is how they weave this relationship together to build a complex community (Flood et al., 2021). The literature proposes that playing and exploring a natural environment during childhood may lead to environmental awareness (Hausmann et al., 2016)

In New Zealand, people regard wetlands as assets for their spiritual importance. They consider wetlands and associated inland waterways as "treasures of significant value," which is linked to their identity as "people of the land" (Clarkson et al., 2013). While in Australia, "creator spirits" dwell or reside in the spring, and they serve as the spiritual source of the health of the nearby water places. The spirit children from the wetland might choose to dry the waters or cause water shortage unless visitors respect and adhere to cultural protocols (Pyke et al., 2018). People get cultural services from wetlands like sites for pilgrimage and spiritual satisfaction, and their waters are used in rituals and for healing purposes. In India, approximately 250 million people perform pilgrimages to waters and wetlands every year (Verschuuren, 2006).

The study conducted by Ndlovu and Manjeru (2016) in Zimbabwe explored that killing aquatic species within the wetland and surrounding area is prohibited. It is believed that some spirits reside in aquatic species and killing them is equivalent to killing the “gods” that protect the natural resources and the community around them. Some activities are prohibited from being undertaken at the wetlands or near them, referred to as” taboos.” As the wetlands are taken as the dwelling place of the “gods,” no activities such as pollution and drawing water by using dirtied containers, bathing, or doing laundry from the wetland are considered taboo.

It is a norm in Niger Delta for people who experience terrible death, such as those who commit suicide, those who die from sustained injuries, and women who die during pregnancy or childbirth buried within the mangrove swamp forest. Such exercise is performed to clean the evil spirits from the community (Orijemie, 2020). The study in Kenya by Ajwang’ Ondiek et al. (2016) revealed that wetlands are used for spiritual or religious purposes, such as for water baptism, spiritual purification, and cultural rituals involving "pushing evil spirits" into the wetlands. Since wetlands' are seen as cleaners, traditional healers advice their patients to wash into them at dawn to be cleansed from specific diseases.

In South Africa in Limpopo Province, Lake Funduzi is one of the most significant sacred places. Ancestral spirits, an albino python god, a guardian white crocodile, bio-indicators of seasonal weather changes, and noticeable moods of the ancestors inhabit it (Anyumba and Nkuna, 2017). It is believed that former residents have become half-human zombies that inhabit the lake and those who perform rituals claim to have seen these zombies (Anyumba and Nkuna, 2017).

The Soutini-Baleni wetland in Limpopo Province is a Natural Heritage Site where salt making is practiced. Women only practice salt making, and customs govern it. Formal rituals and specific terminology to pay tribute to ancestral spirits are performed by the priestess. The priestess is the only presiding person who can allow access after performing an appeasement ritual. The rituals

involve laying twigs and sticks at the base of an old lead wood tree and reciting incantations to introduce visitors (Matthews, 2016).

2.8 Indigenous wetland management practices

Indigenous wetland management practices protect wetlands and reserve valuable goods and services for local communities and people outside wetlands. The loss of wetland ecosystem services harms people's health and well-being both individually and collectively. (Zekarias et al., 2021). The wise use of wetlands was publicised under the Ramsar Convention on wetlands. It intends that services delivered to the people through ecosystem services are maintained and, where possible, restored. The wise use of wetlands was promoted in the original text of the Ramsar Convention on wetlands more than four decades ago. The wise use of wetlands is the same as maintaining the provisioning of ecosystem services that are critical for the well-being of many people locally and globally (McInnes, 2013).

The perception of "wise use" is essential in determining how often communities misuse services and in preventing the degradation of the wetland. Many traditional management techniques influenced and enhanced the characteristics of wetlands. (Zekarias et al., 2021).

In Pulicat, China, there is a traditional system of fishing practiced called the “Padu system” it is practiced by granting permission to qualified members of the particular community to undertake fishing activities on the specific ground on a rotational basis. It is regulated by native people representing self-governed fisheries. The indigenous governance system of coastal management for fishing practices has assisted in coastal ecosystem management (Jayaraj and Pandey, 2021).

In the area of Ga Mampa, situated in Limpopo Province in South Africa, the headman, the traditional head of the people, is responsible for authorizing the harvesting of natural resources

within the wetland. The community members use the area for hunting, wild plant collection, grazing, and fuel wood collection (Mabule and Baloyi, 2019).

2.9 Conclusion

This chapter has elaborated on the current status quo on the ecosystem and wetland services. It is of note that many studies on ES have emerged. Wetlands loss and degradation will compromise wetland ecosystems' services to the people and the environment.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the study area and the methods applied in this study. The study was carried out at Makhuduthamaga Local Municipality (MLM) in Sekhukhune District Municipality, Limpopo Province of South Africa. Section 3.1 gives an overview of MLM, Section 3.2 explains the methods used, and 3.3 elaborates on data management and analysis.

3.2 Study Area

Makhuduthamaga Local Municipality (MLM) is located within Sekhukhune District Municipality (SDM) with the coordinate's latitude: -24° 44' 59.99" S Longitude: 29° 44' 59.99". According to the MLM Spatial Development Framework (SDF), 98% of the land in municipal areas is the custodian of traditional authorities (Monakedi, 2012). The MLM is completely rural and comprises a land area of approximately 209 695 hectares with 283 958 population and 64769 households. Land use is characterised by a mixed-use of subsistence farming and residential uses (MLM IDP, 2021/2022). Figure 3.1 shows the geographic location of seven study areas in MLM in South Africa.

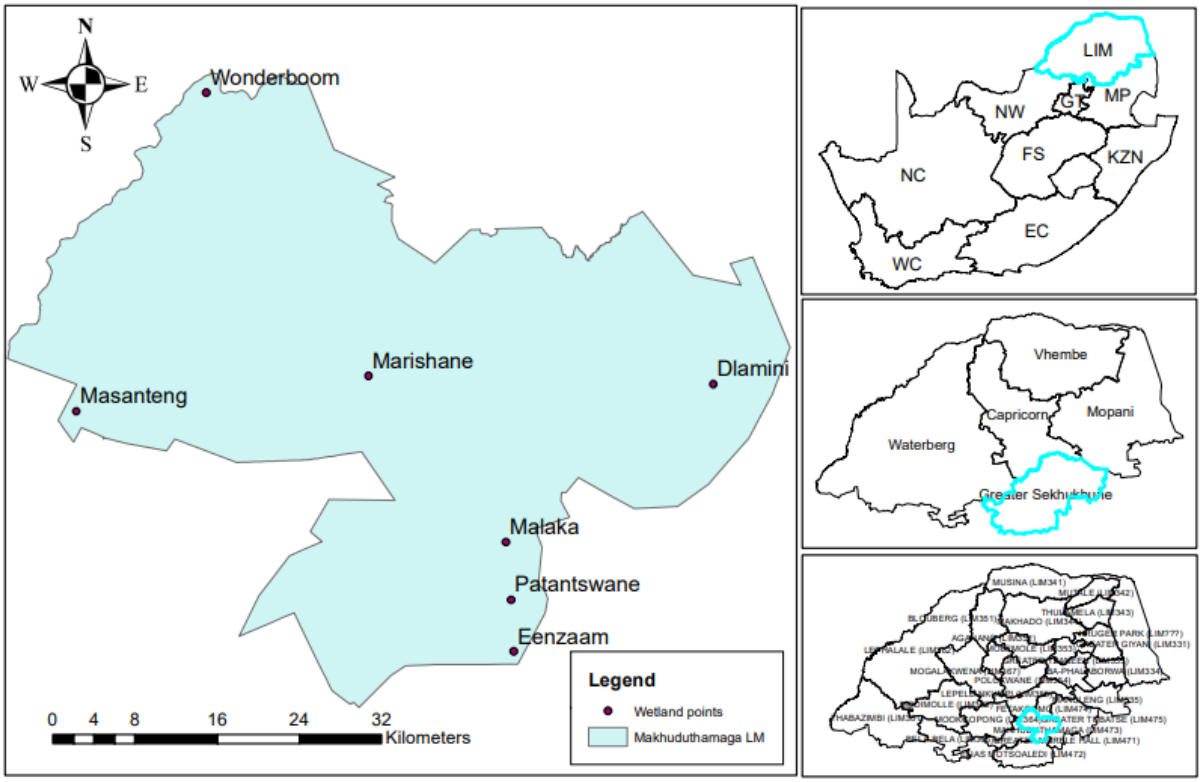


Figure 3.1 Location of the seven study areas in Makhuduthamaga Local Municipality

3.2.1 Environmental analysis

3.2.1.1 Climate

Makhuduthamaga Local Municipal area is characterised by a hot climate, with average summer temperatures of 23°C, a maximum of 28°C, and a minimum of 18°C. In winter, the average is 13°C with a maximum of 20°C and a minimum of 7°C. MLM has a typical annual rainfall of 500–800 mm from September to March. (MLM IDP, 2021/2022).

3.2.1.2 Biodiversity

The municipality is rich in biodiversity, with protea flowers in the Leolo Mountains. The area is dominated by grassland with Graminoids (grass and sedges) and some savannah on the north-

western side. According to Mogale et al. (2019), some of the vegetation found in the study areas are *Aloe arborescens, Aloe Castanea, Vachelia tortilis, Senegalia melifera subsp.detinens, Argemone mexicana, Artemisia afra, Cladium mariscus, Grewia sp, Peltophorum africanum, and Scotia brachypetala.*The role of biodiversity in agricultural and natural ecosystems is to ensure food security and sustainable agricultural production through the direct and indirect provision of food to humans and their livestock, provisions of ecosystem services, such as fiber, and medicinal plants, and the maintenance of the ecosystem functions (MLM IDP,2021/2022).

3.2.1.3 Geology and water sources

The soil types include dolomites, limestone, iron formation shale, and quartzite (Mogale et al. 2019). Various water sources transverse the municipal area, which flows during rainy seasons and dries out when it does not rain. The area suffers from water scarcity which constrains both economic and social activities. The municipality is rich in wetlands ecosystems. It has identified wards and villages which consist of wetlands that need to be preserved (MLM IDP,2021/2022)

3.3. Methods

3.3.1 Research design

The study followed both qualitative and quantitative research designs. Qualitative research explores one key concept by asking broad general questions. It also collects a comprehensive perspective from words or images (Creswell and Clark, 2004). It emphasises the outcome of the events and the results of those events from the perspectives of those involved (Teherani et al., 2015). Qualitative research aims to understand the social reality of individuals, groups, and cultures as nearly as possible as participants feel or live it. People and groups are studied in their natural settings (McLeod, 2008). Quantitative research contrasts with qualitative research, which deals with data that are numbers or that can be converted into numbers (Sheard, 2018).

3.3.2 Sampling strategy

The study participants/households in all seven villages were selected using a simple random sampling approach. Simple random sampling is the method where every member of a population has an equal chance of being included in the sample. The sample of a given size has the same chance of selection (Taherdoost, 2016, West, 2016). There is assurance that the population will be evenly sampled (Bernard, 2017). This method is easily understood, and the results are projectable. It provides unbiased and better estimates of the parameters if the population is similar (Singh and Masuku, 2014).

The sample size of 197 participants comprised of community members, traditional leaders, and traditional healers was chosen to allow for a more similar group since the study is about perspectives on cultural ecosystem services. The researcher used the community registry from the Municipal Planning Section, which listed the number of households and their stand numbers. Excel was used to record the stand numbers, which enabled the software to randomly select the households in each village.

Traditional leaders or village heads from the seven study areas were part of the study as the custodians of the land in villages. Traditional healers were randomly selected from the database of the municipality according to their location using simple random sampling. All the key informants were interviewed in this study. The participation of traditional leaders and healers in this study is supported by Gadzirayi et al. (2006) who noted that traditional experts are chiefs and spirit mediums who are believed to know the characteristics of wetlands, sacred caves, woodlands, and graves in bio cultural diversity management. To calculate the sample size in each group, the researcher divided the population into different sub-groups (strata) and which will cover every member of the population (Bhardwaj, 2019). Proportional area sample size = area population/total study population x 197. For instance, the Dlamini village has an area population of 291 persons, the total study population (of seven study areas) =10442 persons, and the sample

size =197. To get the number of sample sizes per village= 291/10442 x 197= 5 samples. The sample size directly relates to the total strata population (Bhardwaj, 2019). Table 3.1 below illustrates the study areas with population size, no of households, the sample size of each village, and their location.

Table 3.1 Sampled villages, their location, and population size.

Name of the village	**Spatial location**	**Population size**	**No of households**	**Sample size**
Dlamini	-24.522722S 29.602546E	291	77	5
Eenzaam	-24.572567S 29.533607E	2315	521	44
Malaka	-24.503647S 29.534327E	1618	318	31
Marishane	-24.716772S 29.733303E	1640	421	30
Masanteng	-24.450010S 29.300027E	1435	336	27
Patantswane	-24.566284S 29.534577E	2496	521	47
Wonderboom	-24.516729S 29.296025E	647	154	13
Total		**10442**	**2348**	**197**

3.4 Data collection methods and materials

Data collection is described as using various sources, including interviews, documents, records, archives, observations, and audio-visual materials. Before obtaining approval, the researcher had briefing sessions with the tribal council members of the several villages to explain the study to them. The permission to conduct the study was obtained from Makhuduthamaga Local

Municipality (Appendix 4) and verbal approval was secured from the seven villages' tribal leaders and village heads. After getting the consent, primary data was collected using the interview guide between April and August 2022. Interviews were used to gather information from individuals face to face using a sequence of predetermined questions on the area of interest (Paradis et al., 2016).

The interview guide used to collect data in this study contained closed and open-ended questions (Appendix 2). Closed questions were used to manage the demographics of the respondents, and the open-ended questions allowed the participants to express themselves in their own words. The interview guide was designed to gather demographic information, community, and the wetlands, pressures on wetlands, and indigenous management practices. During the interviews, the interview guide was written in English and verbally translated into the local languages, Sepedi and Siswati. The translation was essential to ensure the easiness of communication with the respondents. The participants were able to express themselves in their vernacular. During data collection, the researcher explained the purpose of the study, procedures, and ethical considerations to the participants. Participants were given consent forms to sign before they started the interview to show that they understood the study's purpose and process. All the responses were transcribed during the interviews. Before the survey piloting, the interview guide was carried out by asking five people at Jane Furse village, which is not part of the study area. This piloting was done to identify ambiguous or conflicting questions and difficulty in wording that may affect the questions' consistency, reliability, and logic. This piloting was to give an idea of the responses that could be expected from the participants.

3.5 Data management and analysis

A project was created in Atlas ti 8.2.32, which contained the primary data collected in the study. The researcher captured the data in an excel spreadsheet, which was exported into Atlas. ti 8.2.32 in the form of survey data, with data already organised and pre-coded (Friese, 2019). A thematic analysis method was used to analyse qualitative data gathered from open-ended questions. This

is a type of qualitative analysis used to classify and present themes related to the data (Alhojailan, 2012). The participants were given anonymous codes in the form of numbers for ethical purposes. The researcher used the quotations and networks generated by Atlas ti 8 to illustrate the opinions and attitudes of the participants as revealed by the interviews. The results are a true reflection of the participants, as they articulated themselves easily during the interviews.

The quantitative data was analysed using the Stata version 15. The data file in the form of a responder's survey is already set up such that each case's information is in a row and each variable is shown in a column (Longest, 2019). Descriptive data analysis was used to analyse demographic data of the respondents. The researcher was able to gain insight from this analysis into the respondents' ages, genders, income levels, levels of education, and perspectives on the cultural ecological services provided by wetlands. To evaluate a relationship, two variables are simultaneously analysed in bivariate analysis. The frequency distribution explains how different aspects of a variable are seen in a sample (Auspurg & Hinz 2015). This makes it possible to compare several variables (Franke and Christie 2012). To study the independence of the variables age, gender, level of education, and income status in the context of bivariate analysis, statistical tests of significance were conducted on perspective levels. The data was presented in frequency and percentage tables.

Chi-square is a test that determines if categorical variables are independent. It evaluates how well a sample fits the distribution of a known population (Franke and Christie 2012). The Chi-square test was used to assess the association between perspectives on wetland cultural ecosystem services regarding age, gender, educational level, and income status. The following cultural ecosystem services were categorised to evaluate the association: spiritual ceremonies, religious ceremonies, recreational, educational, collection of indigenous plants, hunting, and fishing. Although the collection of indigenous plants, fishing, and hunting are provisioning services in this

study they were categorised as cultural ecosystem services by the respondents due to their use for rituals. For the Chi-square test, the interpretation is as follows $p > 0.05$ is not significant (ns), and $p < 0.05$ is significant (Auspurg & Hinz 2015).

Cramer's V is most frequently used to measure the strength relationship, regardless of the sample size of the data set. For each size of the contingency table, Cramer's V provides accurate norming values from 0 to 1 to analyse the strength relationship. For the Cramer's V between 0.0 to 0.30, the strength is considered no relationship to weak, for Cramer's V between 0.31 to 0.70, the strength is considered a moderate relationship, and Cramer's V between 0.71 to 1.0, the strength of the relationship is considered strong (Franke and Christie 2012).

The purpose of analysing and interpreting the data was to test the hypothesis and to attain the research objectives. The analysis was categorised according to the objectives of this study. The first objective was to identify wetland cultural ecosystem services. A qualitative data method was used and analysed using Atlas ti 8 through thematic data analysis for this objective. The second objective was to investigate the local community's perspectives on wetland cultural ecosystem services. Both qualitative and quantitative methods were used. Descriptive statistical analysis was employed to determine the significance at the perspective level using Stata version 15, while thematic analysis was used to present themes with the use of Atlas ti 8. The third objective was to determine indigenous wetland management techniques whereby the thematic data analysis method with the use of Atlas ti 8 software was implemented. Figure 3.2 demonstrates the methodological process that was followed in data management and analysis.

Figure 3.2 Methodological flow chart

Source: Author

3.6 Ethical Consideration

An application was submitted to the University of Venda Research Ethics Committee for approval. The application was approved with ethics number FSEA/22/GES/0/1103 (Appendix 3). A request for permission to conduct the study was submitted to the Municipal Manager of Makhuduthamaga Local Municipality and the Tribal Authorities of the seven study areas. The researcher explained to the participants their right not to participate in the study, or they participate voluntarily. Participants were also advised that they may refuse to answer some questions or withdraw from participating and will not be penalised. All participants were assured anonymity and confidentiality by not including their names in the interview guide.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results of the study and its discussions. The results were presented, interpreted, and discussed according to each objective of the study.

4.2 Demographic information of respondents

This section gives the demographic information of the respondents concerning age, gender, home, language, level of education, employment status, and years stayed in the village.

4.2.1 Gender of respondents

The findings show that most of the participants were male, representing 60% (119) of the respondents, 39% (76) were female respondents and 1% (2) were presented as others who are neither classified as male nor female (Figure 4.1).

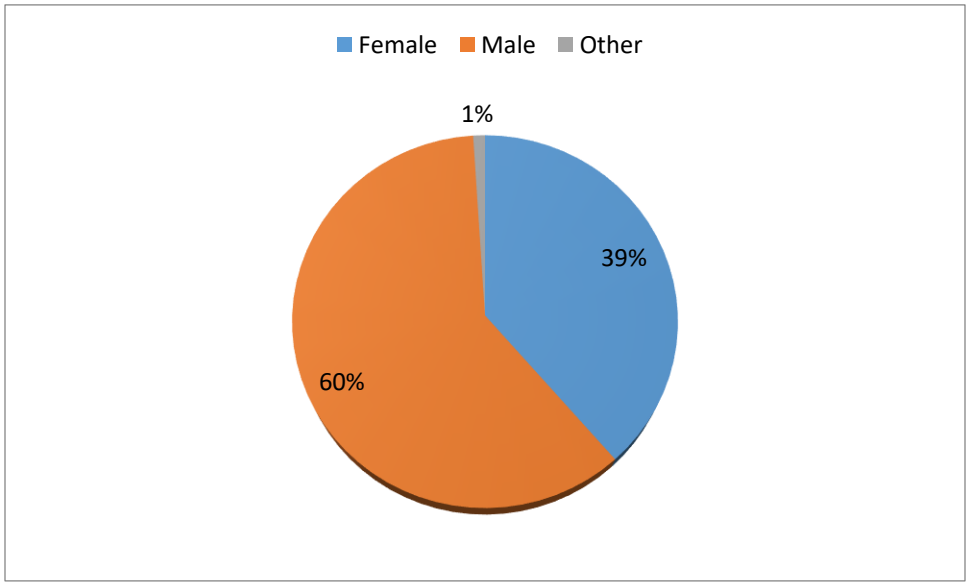


Figure 4.1: Gender of respondents.

4.2.2 The age group of the respondents

The study participants were 197 drawn from the Makhuduthamaga Municipal database and the community register. The youngest participants were 18 years old, and the eldest was 72 years old (Figure 4.2). This assisted the researcher in getting different perceptions from different age groups of the respondents. The results from Figure 4.2 demonstrate that out of 197 Participants, the majority of the respondents were older, 60+ representing 28% (55), 17% (34) in the 51-60 years group, 21% (42) in the 41-50 years group, 18% (35) in the 31-40 years group and 15% (29) in the 18-30 years group while 1% (2) did not disclose their age group.

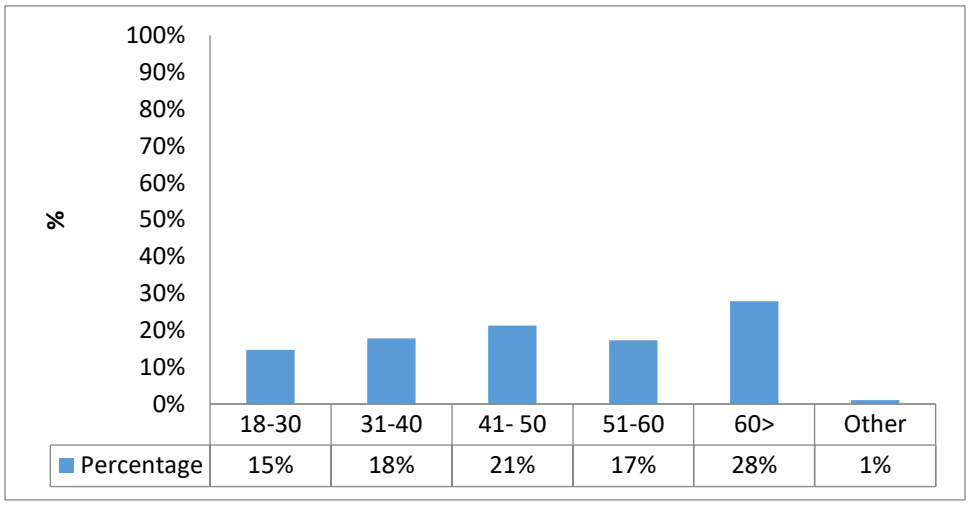


Figure 4.2: Age group of respondents.

4.2.3 Home language of the respondents

The results in Figure 4.3 show that 176 (89%) of the respondents are Sepedi speaking, 13 (7%) of the respondents are siSwati speaking, 2 (1%) is IsiNdebele speaking and 5 (3%) belonged to other. The other group whose home language is IsiNdebele and others could speak siSwati and Sepedi fluently, hence there was no need to interview them in their home language. It was relevant for the researcher to know the home language of the respondents because Makhuduthamaga

Local Municipality is comprised of different tribes, namely Bapedi, AmaSwati, and AmaNndebele, which are the most dominant languages. They all benefit from wetland cultural ecosystem services, although they have different home languages.

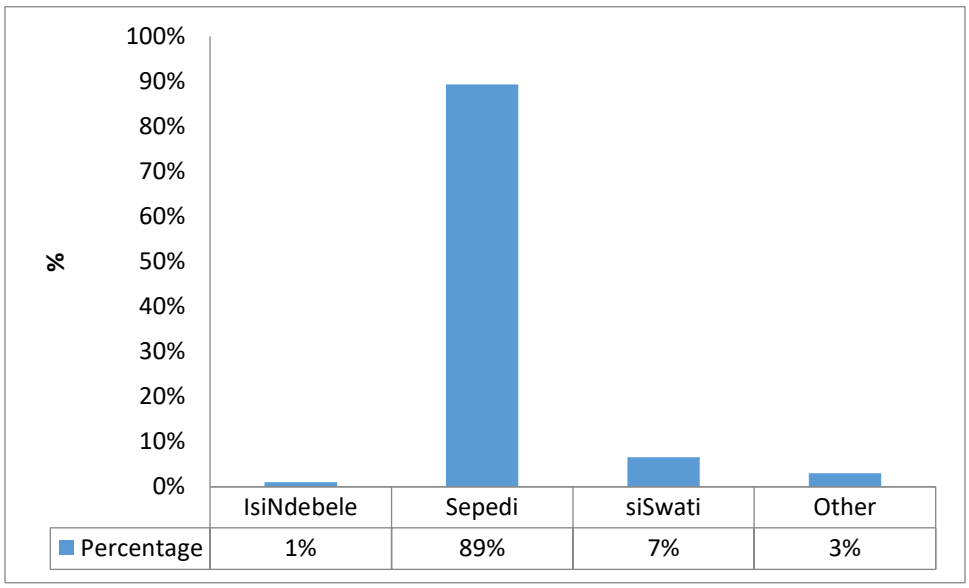


Figure 4.3: Home languages of respondents.

4.2.4 Income status of respondents

The findings of the study in Figure 4.4 shows that most of the respondents 34 (27%) received social grants, those who are self-employed represent 46 (23%), respondents with salary employment were 35 (18%), 30 (15%) of the respondents were unemployed, respondents receiving pension were 20 (10%) while 11 (6%) respondents received allowances from both government and private sectors.

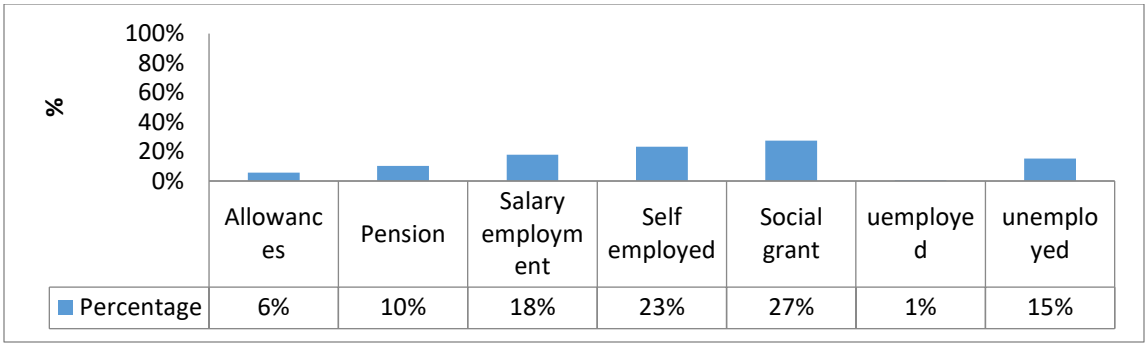


Figure 4.4: Income status of respondents.

4.2.5 Demographic of respondents

The demographic characteristics of the respondents were measured by age, gender, educational level, and income status. The results of the study showed that males dominated the study more than females. This might be a result of taboos in other villages whereby women are not allowed to visit the wetlands this was observed in Nigeria and Zimbabwe respectively by Rim-Rukeh et al.(2013) and (Mavhura and Mushure 2019) support these findings. Women of reproductive age who are in menstruation are prohibited from fetching water from the wetlands (Mavhura and Mushure, 2019; Rim-Rukeh et al., 2013). The results demonstrate that the elderly people dominated the study while the youth was less represented. In support of these findings, the study by Dalu et al. (2022) in Thulamela, South Africa demonstrated that middle-aged and older people represented the majority of wetland users than young people.

4.3 Respondent's perspectives on cultural ecosystem services

The results below show different perspectives on cultural ecosystem services based on age, gender, level of education, and income status. Hunting and fishing and harvesting of indigenous plants fall under-provisioning ecosystem services. However, in this study, they were included under cultural ecosystem services because some respondents mentioned that they fish and hunt for recreation while plants are used for rituals.

4.3.1 Perspectives of cultural ecosystems services by gender

The Chi-square test results indicated that there was a significant difference between gender in hunting as well as fishing perspectives ($p<0.05$). There were significantly more males than females with positive perspectives on hunting and fishing. However, there were no significant differences between genders on other cultural ecosystem services (spiritual ceremonies, religious ceremonies, collection of indigenous plants, recreational and educational) perspectives ($p> 0.05$). The Cramer's V test showed that the relationship is weak (Table 4.1)

Table 4.1 Positive perspectives on cultural ecosystem services by gender.

Response	The proportion of respondents: (frequency) (%), (n=197)		Cramer's V	P-value	Significance
	Male (n=119)	Female (n=76)			
Religious ceremonies	(54) 45.4%	(29) 38%	0.1118[1]	0.292	not significant
Spiritual ceremonies	(60) 50.4%	(40) 52.6%	0.0216[1]	0.955	not significant
Hunting and fishing	(23) 19.3%	(4) 5.3%	0.2025[1]	0.018	*
Collection of indigenous plants	(30) 25.2%	(23) 30.3%	0.0827[1]	0.51	not significant
Recreational	(27) 22.7%	(13) 17.1%	0.0988[1]	0.383	not significant
Educational	(20) 16.8%	(7) 9.2%	0.1145[1]	0.275	not significant

p-value = probability-value, * = p-value < 0.05, not significant = p-value > 0.05, [1] = no relationship to weak, [2] = moderate relationship, [3] = strong relationship, () = frequency and proportion outside the ().

4.3.2 Perspectives of cultural ecosystems services by Age

The Chi-square test results showed that there were no significant differences across age groups on perspectives on the collection of indigenous plants ($p> 0.05$). There were significant differences across age groups on religious ceremonies, spiritual ceremonies, hunting and fishing, and recreational and educational perspectives. The results of Cramer's V showed that there was a weak relationship between age and religious ceremonies, collection of indigenous plants, and educational cultural ecosystem services. Whereas there was a moderate relationship across age groups on spiritual ceremonies, recreational, fishing, and hunting.

Table 4.2: Perspectives of cultural ecosystem services by age.

Response	The proportion of respondents in (count) (%), (n=197)					Cramer's V	P-value	Significance
	18-30 (n=29)	31-40 (n=35)	41- 50 (n=42)	51-60 (n=34)	60> (n=55)			
Religious ceremonies	(8) 27.6%	(9) 25.7%	(17) 40.5%	(16) 47.1%	(33) 60.0%	0.28[1]	0.009	*
Spiritual ceremonies	(9) 31.0%	(9) 25.7%	(27) 64.3%	(21) 61.8%	(34) 61.8%	0.324[2]	0.001	*
Hunting and fishing	(11) 37.9%	(7) 20.0%	(5) 11.9%	(3) 8.8%	(1) 1.8%	0.344[2]	0.000	*
Collection of indigenous plants	(4) 13.8%	(6) 17.1%	(9) 21.4%	(13) 38.2%	(20) 36.4%	0.227[1]	0.071	Not significant
Recreational	(9) 31.0%	(13) 37.1%	(7) 16.7%	(7) 20.6	(3) 5.5%	0.345[2]	0.000	*
Educational	(5) 17.2%	(7) 20.0%	(10) 23.8%	(4) 11.8%	(1) 1.8%	0.248[1]	0.033	*

P-value = probability-value, * =p-value < 0.05, not significant = p-value > 0.05, [1] = no relationship to weak, [2] = moderate relationship, [3] = strong relationship, () = frequency and proportion outside the ().

4.3.3 Perspectives of cultural ecosystems services by education level

The Chi-square test results indicated that there were no significant differences across education levels and perspectives on religious ceremonies, as well as hunting and fishing (p > 0.05). However, there were significant differences across education levels and perspectives on spiritual ceremonies, the collection of indigenous plants, and recreational and educational ecosystem services (p< 0.05). The results of Cramer's V showed that there was no association between educational levels and religious ceremonies, and hunting and fishing ecosystem services. Whereas there is a moderate relationship between education level and spiritual ceremonies, the collection of indigenous plants, and recreational and educational wetland cultural ecosystem services. A significant proportion of the respondents without schooling (72.2%), abet (72.2%), and primary education, respectively, performed spiritual ceremonies in wetlands compared to (45.2%) of those with secondary education and (36.1%) of those with tertiary education. The results also show that respondents with no formal education collect medicinal plants from the wetlands,

followed by those with primary education (39.1%), as compared to those with tertiary education (16.4%) and those with no formal education (11.1%). Recreational, wetland cultural ecosystem services are more valued by people with tertiary education (41%), than by those with no formal education (6.1%), informal education (5.6%), or primary education (8.7%). A similar observation was made when it comes to educational ecosystem services, with respondents with tertiary education (27.9%) having received educational services and none of the respondents with no formal education having received the services.

Table 4.3 Perception of cultural ecosystem on the educational level

Response	The proportion of respondents: (Frequency) (%), (n=197)					Cramer's V	P-value	Significance
	ABET (n=18)	None (n=33)	Primary education (n=23)	Secondary education (n=62)	Tertiary education (n=61)			
Awareness	(17) 94.4%	(33) 100.0%	(23) 100.0%	(60) 96.8%	(59) 96.7%	0.1261[1]	0.668	not significant
Religious ceremonies	(11) 61.1%	(15) 45.5%	(13) 56.5%	(24) 38.7%	(20) 32.8%	0.1918[1]	0.123	not significant
Spiritual ceremonies	(13) 72.2%	(24) 72.7%	(14) 60.9%	(28) 45.2%	(22) 36.1%	0.2908[1]	0.002	*
Hunting and fishing	(2) 11.1%	(1) 3.0%	(4) 17.4%	(14) 22.6%	(6) 9.8%	0.2071[1]	0.076	not significant
Collection of traditional plants	(2) 11.1%	(18) 54.5%	(9) 39.1%	(14) 22.6%	(10) 16.4%	0.3255[2]	0.000	*
Recreational	(1) 5.6%	(2) 6.1%	(2) 8.7%	(11) 17.7%	(25) 41.0%	0.3517[2]	0.000	*
Educational	(3) 16.7	(0) 0.0%	(1) 4.3%	(6) 9.7%	(17) 27.9%	0.3046[2]	0.001	*

P-value = probability-value, *=P-value <0.05, not significant = p-value > 0.05, [1] = no relationship to weak, [2] = moderate relationship, [3] = strong relationship, () = frequency and proportion outside the ().

4.3.4 Perspectives of cultural ecosystems services by Income

The Chi-square test results indicate that there are no significant differences across income and perspectives on religious ceremonies and the collection of indigenous plants. There was a significant difference across income and spiritual ceremonies, hunting and fishing, and recreational ecosystem services. Whereas there is a moderate relationship between income and

educational cultural ecosystems services. A significantly higher proportion of the unemployed respondents (61.3%), social grant beneficiaries (61.1%), pensioners (55.0%), and self-employed perform spiritual ceremonies than the respondents with salaried employment (37.1%) or receiving allowances (18.2%). The results revealed that unemployed respondents (28%) and self-employed respondents (23.9%), receive hunting and fishing services from the wetlands compared to respondents getting salaries (11.4%) and pensioners (15.0%). Respondents getting a salary receive more recreational and educational services than employed, pensioners, and self-employed respondents. The results of Cramer's V, show that there was no association between income and cultural ecosystem services (i.e., awareness, religious ceremonies, and collection of traditional plants), whereas there was no relationship to weak relationship between spiritual ceremonies, hunting, and fishing, recreational, and educational.

Table 4.4 Perspectives of cultural ecosystem services by Income

Response	The proportion of respondents in (Frequency) (%), (n=197)						Cramer's V	P-value	Significance
	Allowances (n=11)	Pension (n=20)	Salary Employment (n=35)	Self-employed (n=46)	Social grant (54)	unemployed (n=31)			
Religious ceremonies	(4)36.4%	(11)55.0 %	(14)40.0%	(18)39.1 %	(24)44.4 %	(12)38.7 %	0.101[1]	0.848	not significant
Spiritual ceremonies	(2)18.2%	(11)55.0 %	(13)37.1%	(23)50.0 %	(33)61.1 1%	(19)61.3 %	0.2373 [1]	0.05	*
Hunting and fishing	(0)0.0%	(3)15.0%	(4)11.4%	(11)23.9 %	(1)1.9%	(8)25.8%	0.2871 [1]	0.006	*
Collection of traditional plants	(0)0.0%	(5)25.0%	(8)22.9%	(12)26.1 %	(22)40.7 %	(6)19.4%	0.2314 [1]	0.061	not significant
Recreational	(4)36.4%	(3)15.0%	(12)34.3%	(14)30.4 %	(5)9.3%	(3)9.7%	0.2775 [1]	0.010	*
Educational	(2)18.2%	(3)15.0%	(12)34.3%	(4)8.7%	(1)1.9%	(5)16.1%	0.321[2]	0.001	*

P-value = probability-value, * = p-value < 0.05, not significant = p-value > 0.05, [1] = no relationship to weak, [2] = moderate relationship, [3] = strong relationship, () = frequency and proportion outside the ().

4.4 Respondent's Perspectives on Awareness and cultural ecosystem services

The results show the level of awareness of cultural ecosystem services based on the age, gender, educational level, and income status of the respondents.

4.4.1 Perspectives of Awareness and cultural ecosystem services by Gender

The Chi-square test shows that there were no significant differences across gender and awareness of cultural ecosystem services (p> 0.05). The Cramer's V test showed a weak relationship (Table 4.5).

Table: 4.5 Perspectives of Awareness and cultural ecosystem services by Gender

Response	The proportion of respondents: (frequency) (%), (n=197)		Cramer's V	P-value	Significance
	Male (n=119)	Female (n=76)			
Awareness	(117) 98.3%	(73) 96.1%	0.166[1]	0.069	not significant

P-value = probability-value, * = not significant = p-value > 0.05, [1] = no relationship to weak, [2] = moderate relationship, [3] = strong relationship, () = frequency

4.4.2 Perspectives of Awareness on the cultural ecosystem by Age

The Chi-square results indicated that there were no significant differences across age groups in awareness of cultural ecosystem services (p>0.05). The Cramer's V test shows that there was a week relationship between age and cultural ecosystem services (Table 4.6).

Table 4.6 Perspective's on Awareness on cultural ecosystem services by Age

Response	The proportion of respondents in (count) (%), (n=197)					Cramer's V	P-value	Significance
	18-30 (n=29)	31-40 (n=35)	41- 50 (n=42)	51-60 (n=34)	60> (n=55)			
Awareness	(27) 93.1%	(34) 97.1%	(40) 95.2%	(34) 100.0%	(55) 100.0%	0.162[1]	0.419	Not significant

P-value = probability-value, * not significant = p-value > 0.05, [1] = no relationship to weak, [2] = moderate relationship, [3] = strong relationship, () = frequency and proportion outside the ().

4.4.3 Perspectives of Awareness on cultural ecosystem services by educational level

The Chi-square test results show that there were no significant differences across educational levels and perspectives on awareness (p>0.05). The Cramer's V showed that there was no association between educational levels and awareness of cultural ecosystem services (Table 4.7).

Table 4.7 Perspectives of Awareness on cultural ecosystem services by educational level

Response	The proportion of respondents: (Frequency) (%), (n=197)					Cramer's V	P-value	Significance
	ABET (n=18)	None (n=33)	Primary education (n=23)	Secondary education (n=62)	Tertiary education (n=61)			
Awareness	(17) 94.4%	(33) 100.0%	(23) 100.0%	(60) 96.8%	(59) 96.7%	0.1261[1]	0.668	not significant

P-value = probability-value, not significant = p-value > 0.05, [1] = no relationship to weak, [2] = moderate relationship, [3] = strong relationship, () = frequency and proportion outside the ()

4.4.4 Perspectives of Awareness on cultural ecosystem services by income status

The Chi-square test results indicated that there were no significant differences across income status and awareness (p>0.05). The results from the Cramer's V test showed that there was no association between income and awareness of cultural ecosystem services (Table 4.8).

Table 4.8 Perspectives of Awareness on cultural ecosystem services by income status

Response	The proportion of respondents in agreement: (Frequency) (%), (n=197)						Cramer's V	P-value	Significance
	Allowances (n=11)	Pension (n=20)	Salary Employment (n=35)	Self-employed (n=46)	Social grant (54)	unemployed (n=31)			
Awareness	(11)100.0 %	(20)100.0 %	(33)94.3%	(45)97.8 %	(52)96.3 %	(31)100.0 %	0.1462 [1]	0.631	not significant

P-value = probability-value, not significant = p-value > 0.05, [1] = no relationship to weak, [2] = moderate relationship, [3] = strong relationship, () = frequency and proportion outside the ().

4.5 Wetland cultural ecosystem services in Makhuduthamaga Local Municipality.

The study revealed that the community members of Makhuduthamaga Local Municipality have cultural values for the wetlands. They believe that wetlands have cultural benefits for their day-to-day activities and their beliefs.

This 1st objective sought to find out the wetland cultural ecosystem services that benefit the communities of the Makhuduthamaga Local Municipality. In this study, most participants perceived having different cultural values to the wetland ecosystems. Figure 4.5 presents a summative picture of wetland values.

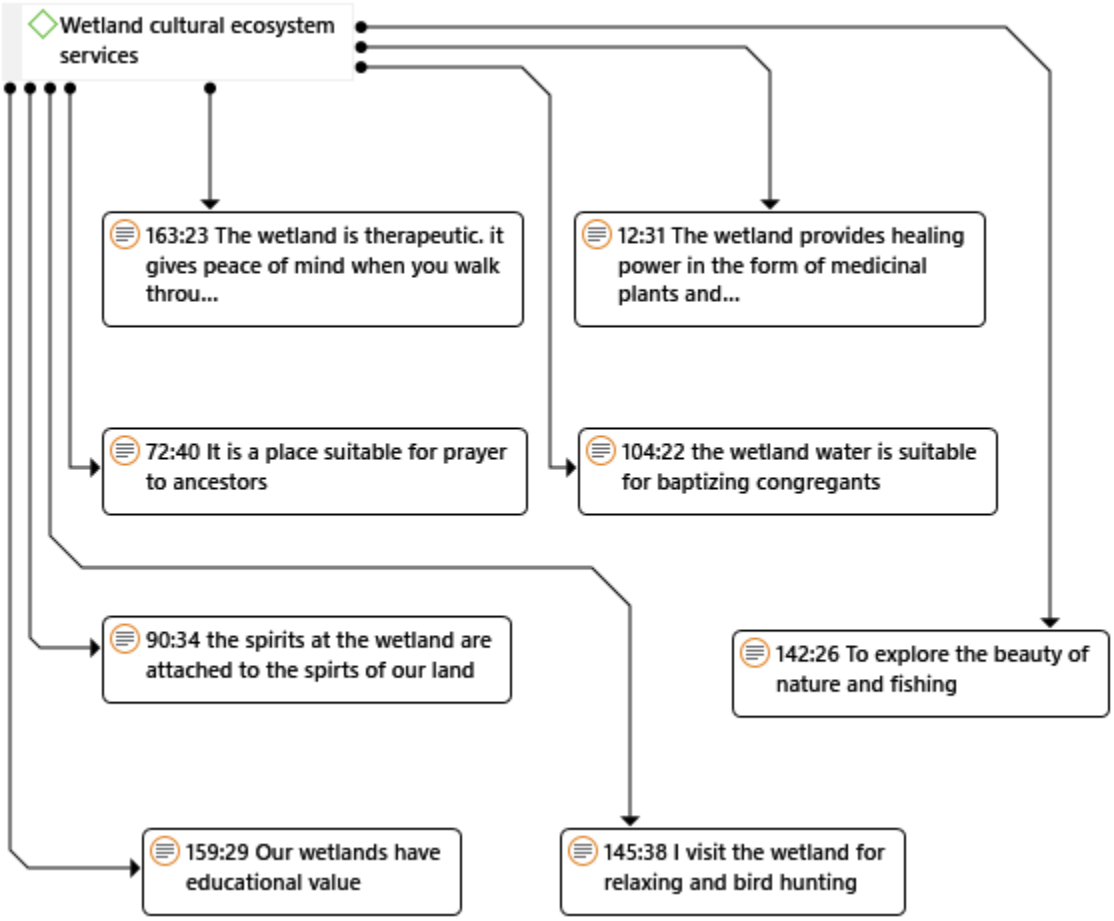


Figure 4.5: Wetland cultural ecosystem services.

Key: 145:38: 145 = the participant number, 38 = the quotation code number.

4.5.1 Theme 1: Spiritual and religious services

The participants believe that the wetlands are where the gods and the ancestors dwell or reside. It is where they perform ancestral worship. The wetland water is regarded as holy to cure different sicknesses and remove evil spirits and bad luck. Participant 42 (Traditional healer) "It is a place of the gods. It is where you get the answers. Wetland is good for mediation for people with spiritual callings or gifts. It is where they meet with their "gods" for information sharing and taking instructions. Traditional leaders think that the spirits or the gods at the wetland are linked to the ancestors of their land and have rainmaking power. “The wetland has power for rainmaking. The gods at the wetland are linked with the gods at our neighbouring mountain. After every rainmaking ritual, a cloud will be formed from that adjacent mountain, and rain will soon come" (Participant 19: Headman). "Our wetlands portray the spirit of peace, hope, and oneness" (Participant 153). "The spirit of unity is practiced when using this wetland" (Participant 15). Other participants believe that the wetland has the power of healing and that its water is holy; it can heal every sickness and remove evil spirits. Participants 32 and 35: "The wetland water has healing power or supernatural power. You will not get sick when you drink it, and when you take a bath with it, you will not be attacked by witchcraft or evil spirits". The wetlands are also a place where medicinal plant collection happens. The wetlands are also perceived as a place to perform rituals. It is a source of water for rituals in African indigenous churches. The wetland is essential to spiritual churches; you can get a prophecy instructing you to perform rituals in the wetland". Other Christians do not use the wetland for rituals but for water baptism. Participants 67 and 110*: "*It is a suitable place for baptism. Participant 170: "People get baptised and cleansed in the wetlands due to its clean and pure water". Respondents also mentioned other religious activities such as vigils take place in the wetlands. Participant 183 highlighted that the wetland water presents purity, and it is where people wash away sins and evil spirits. Cleansing from bad luck and evil spirits (Participants 130 and 157). Participants 1 and 82 (Traditional healers) “As a traditional healer, a wetland is a place

that connects us with our ancestors and the spiritual owner of water. The ancestors require that I drink the wetland water as a traditional healer, which connects me directly with them.

4.5.2 Theme 2: Recreational and tourism services

Respondents demonstrated recreational and tourism values from their wetlands. "The wetland has recreational values, such as taking photos during wedding celebrations, bird watching, and just relaxing", (Participants 150, 155 155, and 169). “The wetland is therapeutic. It gives peace of mind when you walk through it "(Participants 132 and 164). The interviews also revealed that the wetland visits helped reduce stress and refresh the mind (Participant 117). "If I feel stressed, I visit the wetland; it serves as therapy. It gives mental fulfilment" (Participant 152). "I visit the wetland to explore the beauty of nature and fishing" (Participant 143). Participant 63 (Traditional leader) "This wetland is our heritage site as the Bapedi tribe".

4.5.3 Theme 3: Educational value and collection of medicinal plants

The interviews also revealed that respondents get educational values from their wetlands. "As a Natural Science teacher, the wetlands have educational value. I take my learners to visit and learn about our neighbouring wetland" (Participant 163). "It is an educational place for students from various tertiary institutions" (Participant 117). Furthermore, the wetlands are regarded as collection points for medicinal plants. Participant 54 (Traditional healer) "There is a specific herb found in the wetland used by traditional healers to treat mental disorders". "This herb only grows in the water depth where sun rays cannot reach ", said participant 34 (a traditional healer).”The wetland is a home to different species useful to us as traditional healers. Our ancestors brought them together for us so that we could use them." We get medicinal herbs for treating *hlogwana* diarrhoea with green stools in toddlers" (Participant 45).

4.5.4 Theme 4: Recreational Hunting and fishing services

Participants felt that hunting and fishing are another way wetland cultural ecosystem services are provided. "The visit to the wetlands is to explore the beauty of nature and fishing" (Participant 142). The respondents also believe that the wetland is home to different plant and animal species, which makes hunting easy. "We get healthy wild animals that are good for our bodies "(Participants 170 & 171).

4.6 Local community's perspectives on wetland cultural ecosystem services.

The 2nd objective is meant to explore the attitude that the communities of MLM had toward their wetlands concerning cultural ecosystem services. Figure 4.6 presents a protocols to follow at the wetlands.

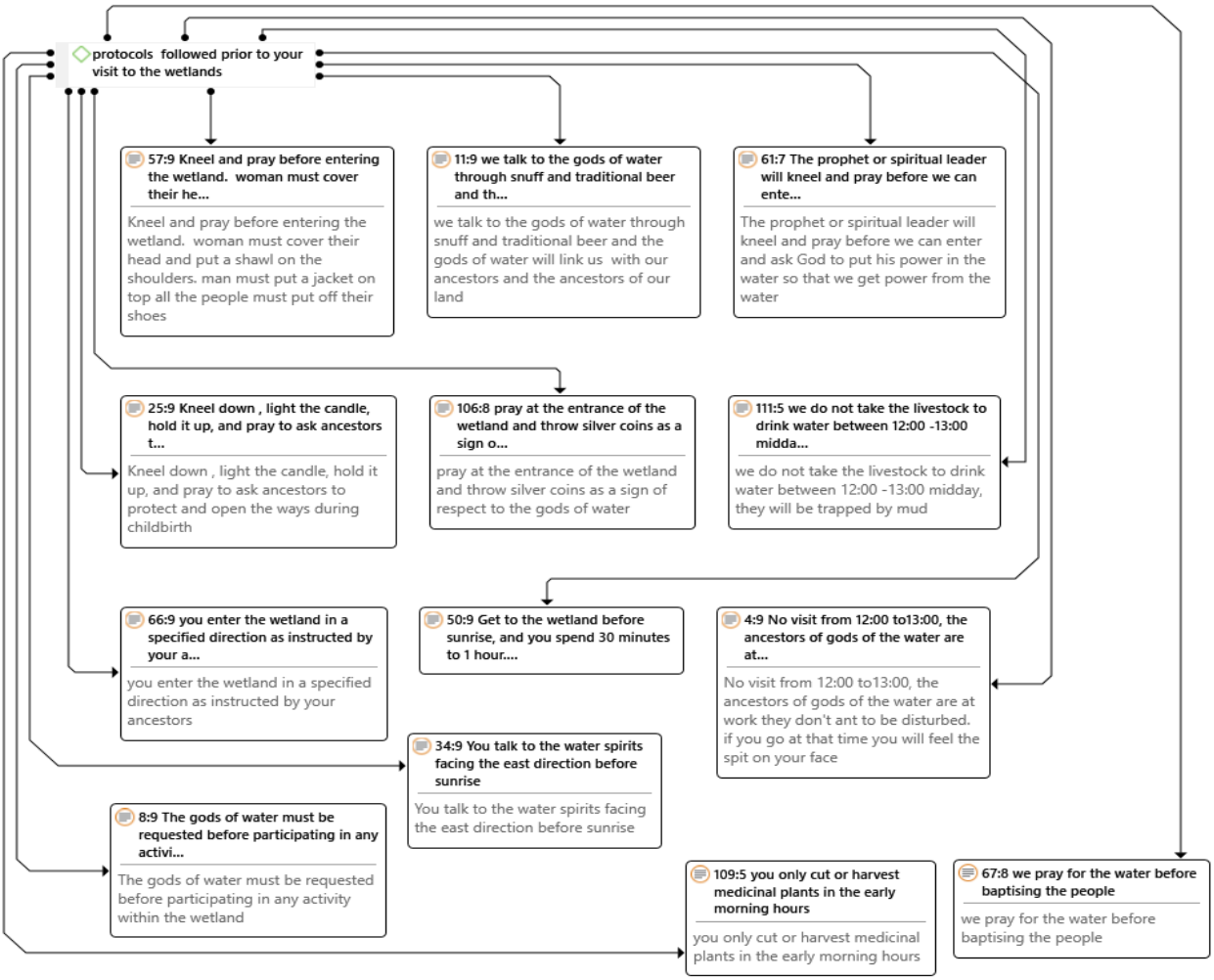


Figure 4.6: Protocols to follow at the wetlands.

Key: 57:9: 57 = the participant number, 9= the quotation code number.

4.6.1 Theme1: Taboos related to their wetlands

Taboos are "avoidance rules that forbid members of the human community from performing certain actions such as eating some kinds of food, walking on or visiting some sites that are regarded as sacred" (Chemhuru and Masaka, 2010). Participants revealed that visiting the wetlands' during midday is taboo. It disturbs the spiritual owner of the water from doing their day-to-day work. They are of the view that the spiritual owner of the wetland does not want to be disturbed, so no visits are allowed during that particular time, from 12:00 to 14:00. They do not

visit the wetland at this time, and no noise is allowed as a sign of respect to the gods of water or the spiritual owner of the wetland. Some respondents believe that you will see or find strange things if you insist on going at that time. One of the participants had this to say;

"No visits during midday. The spiritual owner of water does not allow visits at that time. If you insist on going during that time, you might find the water turned reddish. If you visit the wetland at that time, you disturb the gods of water from doing their work. They might splash the water over your face, or it can just turn dirty." It was revealed that there is a dedicated spot within the wetland where the gods reside. The place is dominated by *lesehu* in Sepedi and bulrush in English (*Typha Capensis Typhaceae)* it is evergreen, wet, and with stagnant water.

The participants are also of the view that women who are still reproductive are not allowed to visit their wetlands. All pregnant women, breastfeeding, or on menstrual periods are regarded as impure, so their visit to the wetlands will make them spiritually unclean. "Pregnant or menstruating women are not allowed at the wetland". Other people classified as impure are those who come from the funeral, hold grudges or are sad or angry. "When you visit the wetland, you must be pure, e.g., not on your menstrual period, not from the funeral, or not have had any sexual activity for a while*".*

It is believed that if pregnant women visit the wetlands, they might get a miscarriage or give birth to a stillborn because the wetlands have supernatural powers that might overpower the foetus. "Pregnant women are not allowed to visit the wetland. The spirit's powers will overpower the foetus, and that might cause a miscarriage. Moreover, certain medicinal plants are not harvested by women".

The participants also revealed that wetlands are respected ecosystems. They are of the view that not everybody is allowed to visit the wetlands, and you do not visit as often as you like.

> *"The wetland is not supposed to be accessible to everybody but only to those with ancestral gifts. You do not just visit the wetland as you wish. It should be when the spirit leads. If you visit the wetland without valid reasons, you will see signs that you are not allowed, e.g., you can find an older man you will try to greet him he will keep quiet and suddenly vanish".*

This was emphasised by one participant who is a traditional healer. It was highlighted that if you visit the wetland to fetch holy water, you must be holy. If you are not holy, you might not find water at all. The following was explained by a participant who is a pastor,

> *"You must be holy before approaching the wetland. If you visit the wetland to fetch holy water, you might not find it if you are impure. You must take a few days praying to purify yourself spiritually before you visit the wetland."*

4.6.2 Theme 2: Protocols that are followed at wetlands

During the interviews, it also emerged that there are protocols that are followed before visiting or performing any activity within the wetland. It was highlighted that if protocols are not followed, the gods can retaliate, and the neighbouring communities will suffer the consequences, such as natural disasters. The participants are of the view that the gods or the spiritual owner of the wetland are praying during midday. "The gods of water are praying from 12:00 to 14:00, so there is no access during that time. You should stop everything you are doing around the wetland and go away" *(*Participant *92:* Village head*).* Participant 93 (the farmer) said the following: "When you are working in the fields next to the wetland, at noon, you stop your work and move from the wetland. You will come back at 15:00". Furthermore," livestock is not taken to the wetland to drink water between 12:00 and 14:00 midday" (Participant 108: livestock feeder*).*

The issue of attire is crucial when visiting their wetlands. If you dress improperly, it is a sign of disrespect for the gods. This is illustrated in the quotation by some of the participants: "You should dress properly when you visit the wetland. Women must put hats on their heads and shawls on their shoulders, and they should not wear trousers. Men should wear a jacket with pants" (Participant 32: Traditional leader).

Protocols are followed differently depending on the nature of the ceremony or activity that is to be performed. If it is for a religious ceremony, a pastor participant emphasised that "the prophet or spiritual leader will kneel and pray before we enter the wetland and ask God to put his power in the water so that we get power from the water". We pray for the water before baptising the people (Participants 65 and 67: Pastors).

Although for spiritual ceremonies or rituals, one participant *stressed that "*we talk to the gods of water by putting snuff and traditional beer, and the gods of water will link us with our ancestors and the ancestors of our land." You kneel and pray before you enter for access. You ask the "gods of water," and they will contact your ancestors, and the ancestors will finally contact God on your behalf (Participant 23, a community member). "Put silver coins in a calabash a few minutes before you can start with your activity, and then throw a silver coin into the wetland, which symbolizes respect to the gods of water" *(*Participant 42: traditional healer). Kneeling at the entrance of the wetland to request permission, you throw silver coins, clap your hands, and make incantations" *(*Participant 46*:* traditional healer). Moreover, "some perform rituals before giving birth; they kneel, light the candle, hold it up, and pray to ask the ancestors for protection and open the ways during childbirth" *(*Participant 25, a female community member).

Many of the respondents indicated that you first ask permission from the gods of the wetland before you perform any activity. In explaining this fact, Participant 64 (the traditional leader) said "No activity should be done without the permission of the gods*".* The municipality once drilled a

borehole without getting consent from the gods, and the following day the water drilling machinery was broken".

4.6.3 Theme 3:Rituals and ceremonies performed at the wetlands

This study's respondents highlight some rituals performed at the wetlands for various reasons, such as rainmaking, cleansing, burying, and thanksgiving. "Before the cleansing ceremony, the elderly people will visit the wetland before sunrise to inform the gods of our land that on this specific day, they are going to perform cleansing so that the gods are not irritated but welcoming" (Participant 13). "The cleansing of our village is done by collecting herbs and water from the wetland". "They are mixed and sprinkled throughout the whole village" (Participant 137). "We talk to our ancestors in the wetlands." There is a certain herb that you get from the wetland; you plant it at home; that is where you will talk to your ancestors" (Participant 125). Thanksgiving ceremonies are also performed in the wetlands. "We pronounce a newly born baby to our ancestors in the wetland. The older women will take a newborn baby to the wetland in the early morning hours before sunrise to introduce him or her to the gods so that they can protect him or her" (Participate 140). Participants 56 and 146 indicated that "every year in September, the village head, traditional council members, and the elderly people visit the wetland to make a sacrifice by slaughtering chickens." They also bring sorghum beer to the gods as a token of appreciation after harvesting". It was noted during the interviews that it is a norm to bury people in the wetlands. "We bury people who died as a result of infectious diseases such as TB and measles" (Participants 28 and 31). The spiritual burying of traditional healers also takes place in the wetlands. Participants 130 and 131 (Traditional healers): "We perform the spiritual burial of the traditional healer at the wetland, but the body will be buried at the grave. Burying the spirit of the traditional healer will make him or her join other ancestors in the wetland".

4.7 Identify indigenous wetland management practices within Makhuduthamaga Local Municipality.

This 3rd objective is intended to identify indigenous methods practiced by the Makhuduthamaga Local Municipality community (MLM) to manage wetland ecosystems.

4.7.1 Indigenous wetland management practices

Results from this study revealed that out of 197 respondents, 114 (57%) believed that wetlands are managed by traditional leaders, 36 (18%) believed that community members manage the wetlands, 24 (12%) believed that farmers manage the wetlands, 18 (9%), said that government (national, provincial, or local) is responsible for the management of wetlands, and 5 (3%), believed that the management of wetlands is with environmental organisations.

The taboos practiced by the MLM community serve as indigenous methods of managing the wetlands. Traditional leaders overemphasise these taboos as the custodians of the land in rural areas. The following activities are restricted in the wetlands as another way of managing and protecting them: no washing, fishing, playing, making noise, the killing of wetland animals, building, or construction is allowed.

> *"Children are not allowed in the wetland, and throwing foreign objects is also prohibited" (Participant 3). "No noise is allowed. You are not allowed to pick any species such as fish or tadpoles" (Participant 4). "No excavations or installation of machines are allowed in the wetland. The farmers once installed the machines for irrigation system and the following day the machines were found outside the wetland" (Participants 9 & 55). "No cutting off any vegetation or fishing is allowed at the wetland" (Participant 15). "No baptizing, fishing, or washing within the wetland. The killing of animals in the wetland is prohibited" (Participant 19). "No killing of chickens or throwing of rubbish like plastics, bottles, or cans in the wetland" (Participant 21). "Noise at the wetland is prohibited" (Participant 24).*

It also came up during the interviews that cutting some of the wetland vegetation is restricted by the traditional authorities. Moreover, there is a dedicated time for cutting. The wetlands vegetation such as l*esehu* (*Typha capensis)*, *mohlahla* (*Cyperus sexangularis Nees)*, *leswielo* (*Aristida diffusa Trin.subsp.diffusa*), and *legogwa* (*Cladium mariscus*) are only allowed to be harvested in May after harvesting from the fields, and the traditional leader will do the formal announcement. "Some wetland vegetation has a dedicated time for harvesting." (Participant 74)

"The cutting of *qoboza or legogwa* is only allowed in May. The traditional leader will visit the wetland in the early morning and request that the gods of water remove any dangerous animals within the wetland. The following day, in the morning, around 6:00, they will make a formal announcement allowing the community to cut the grass *qoboza"* (Participant 2: Village head).

The respondents mentioned other methods of managing the wetlands, like cleaning them.

> ***"***They cover the area dominated by *"legogwa* and *lesehu"* with thorn trees. This is to protect the people from going into that spot because it is regarded as the place where the gods are*"* (Participant 42). "*We cut thorn trees and place them around the wetland to disturb the livestock from trampling into the wetland. It allows farmers and grazers to get clean water* (Participant 47).

When the wetlands are dry, older men and young boys take their dogs and visit a specified mountain to ask for rain. If they can get any wild animal, it is killed, burned, and mixed with herbs. As a result, the rain will come immediately or later (Participant 43).

4.8 Discussion

4.8.1 Respondent's Perspectives on cultural ecosystem services

The respondent's perspectives on cultural ecosystem services were measured based on age, gender, educational level, and income status**.** The results revealed that hunting, fishing, and collection of indigenous plants were perceived as cultural ecosystem services because the respondents indicated that they used indigenous plants for rituals while fishing and hunting provided recreational services. There were more males with a positive perspective on hunting and fishing than females. Different age groups have different perspectives regarding religious ceremonies, spiritual ceremonies, hunting, and fishing, as well as educational and recreational cultural ecosystem services.

The results demonstrated that education significantly influenced perspectives on cultural ecosystem services such as recreation, education, and spiritual ceremonies. The respondents with tertiary education received educational ecosystem services from the wetlands. They might have wetlands as part of their curriculum or legislation. These findings are supported by the study conducted by Turyahabwe et al.(2017) showed that those who are educated are more likely than those who are not to understand information on wetlands more quickly. Additionally, recreational services are received for leisure. Furthermore, those who are educated are more likely than those who are not to understand information on wetlands more quickly. The results revealed that all respondents were aware of the cultural ecosystem services provided by wetlands.

4.8.2 Wetland cultural ecosystem services found in Makhuduthamaga Local Municipality

The study identified various wetland cultural ecosystem services perceived by the Makhuduthamaga Local Municipality community. The cultural services are spiritual, religious, recreational, the collection of medicinal plants, fishing, and hunting.

4.8.2.1 Spiritual and religious services

The study revealed that many spiritual and religious services are obtained for various reasons. It is a place where communication and reconnection with the ancestors take place. Communication happens in the form of prayer and rituals. Spiritual cleansing and bathing also occur in the wetland. The purpose of spiritual cleansing is to remove bad luck, evil spirits, and witchcraft. Ajwang Ondiek et al. (2016)'s study revealed that wetlands keep evil spirits away. Because wetlands are seen to be cleansing, traditional healers encourage their patients to take a dawn bath in wetlands to be cleaned of particular sicknesses.

Moreover, spiritual healing is meant to cure various sicknesses such as "*selesho*" food poisoning, "*hlogwana"* diarrhoea with green stools in babies, and mental disorders. The cure for food poisoning is performed at the wetland by inducing vomiting with a concoction made from different herbs. Furthermore, the treatment of diarrhoea with green faeces in children is done in the early morning hours before sunrise. The sickness is treated with "*mohlahla*" (*Cyperus sexangularis Nees)*. The other wetland plant that is used to treat sickness is "*lesehu*" (*Typha capensis*). It is used by pregnant women and women with infertility problems. It is also used to treat several infections as an antibiotic, to treat diarrhoea, and used during pregnancy to ensure an easy delivery. The study by Masoko et al. (2008) concurs with the findings of this study. They found that *Typha capensis* is used as a traditional medicine for the treatment of both humans and domestic animals (Masoko et al., 2008).

As for spiritual sickness, it is normal for those with an ancestral calling, and their symptoms include vivid dreams, visions, somatic complaints, and headaches. A traditional healer or spiritual guide does the treatment for this spiritual sickness. This activity is performed at the wetland, where they will beat drums and dance. The study by Taringa (2014) found that wetland water is thought to

have healing powers and can be used by traditional healers to start spirit possession and calm angry spirits.

Some participants mentioned that water baptism of congregants is done for the removal of sins, and the bible directs it. These findings are supported by the study of Marambanyika et al. (2021) that people gather for worship in the quiet areas of the wetland where baptisms can be performed. The study shows that spiritual and religious activities are performed to renew the relationship with God and the gods/ancestors. This study's results showed that 40 (20%) of the participants performed religious or spiritual activities sometimes, 23 (12%) of the respondents performed them yearly, 22 (11%) of the respondents performed ceremonies quarterly, 16 (8%) of the respondents performed the events monthly while 7 (4%) performed them weekly.

4.8.2.2 Recreational and Tourism

Findings from the interviews established that the community of MLM gets recreational and tourism services from the wetlands. The services include mental fulfilment, giving peace of mind, and stress relief. Walking around the wetland seems to be therapeutic. The findings of this study concur with those of Hausmann et al. (2016), who noted that exposure to nature helps people feel better physically and mentally by lowering their blood pressure, relieving stress, and boosting their mood.

Participants visit the wetland for relaxing, bird watching, and taking photos during wedding celebrations. During fieldwork at Marishane Wetland, it was discovered that a private park is fully operational next to the wetland. The wetlands portray the spirit of peace. Fishing and hunting are being undertaken as ways of recreation for pleasure and stress relief. According to Horwitz and Finlayson (2011), lifestyle factors, particularly leisure, recreation, and sports activities, are linked to ecosystem services since they promote physical and mental health.

4.8.2.3 Educational and medicinal collection services

During the interviews, it was learned that Masanteng, Marishane, and Dlamini wetlands have educational value for the community, learners, and students. The study found that in 2020, various eco-schools visited Marishane wetlands to celebrate World Wetlands Day, which was organised by Sekhukhune District Municipality. Masanteng Wetland attracts students from higher tertiary institutions such as the Tshwane University of Technology, the University of Pretoria, and the Tompi Seleka College of Agriculture. The findings of this study relate to the study conducted by Marambanyika et al. (2021) that institutions of higher learning and research utilise wetlands for study. Traditional healers teach their trainees about medicinal plants in the wetlands by identifying, digging, and cutting them off. Hence, the wetland is a place for various medicinal plants where trainees get knowledge of how different plants are used to cure various sicknesses. This corresponds with the findings from Mandishona and Knight (2022) that wetland medicinal plants are taken and used to treat a variety of illnesses, using them following traditional and indigenous knowledge. The wetlands are the centre of learning about the birds, animals, and plants found in them (Mandishona and Knight 2019).

4.8.3 Local community's perspectives on wetland cultural ecosystem services

4.8.3.1 Taboos related to the wetlands

The results of the study showed that there are taboos that are set for wetlands. It was emphasised by one traditional healer that not everybody is allowed to visit the wetlands but only those with ancestral gifts should visit. The following taboos were identified: No noise is allowed, picking of wetlands species is prohibited, no throwing of foreign objects, and no visit by people who regarded to be impure. The finds of this study concur with the findings by Gadzirayi et al., 2006 that no

pollution or dirt should be caused to the wetlands while making laundry or bathing in the wetland is taboo.

Wetlands are declared "holy places" where everybody who visits them should be "holy" or "pure". The people who are regarded as pure should be the ones who are not coming from the funeral, who was not involved in sexual activities in the last seven days, and women who are not in menstrual periods, pregnancy, or breastfeeding. There is a belief that wetlands cannot be visited between 12:00 and 14:00 midday as this is the time for the gods to pray and work and they do not want to be disturbed. It is believed that if the gods are at work you will see strange things then you are forced to leave immediately. If the gods or water spirits can get angry, they might cause calamities such as excessive heat waves, thunderstorms, droughts, or diseases. It was stated that in 2021 at Wonderboom, natural disasters occurred in the form of thunderstorms that blew away houses and damaged agricultural irrigation systems. The wetlands are currently dry. This is caused by the anger of the gods or spirits of water in the neighbouring wetlands.

The study discovered other events that happened as a result of the gods' anger. At Eenzaam, between 2013 and 2016, children were drowning in the wetland during the day. Those with spiritual gifts can see the signs if the gods are at work during midday. For example, at noon, you can see a big black cow moving within the wetland as if it is grazing; this is a warning that you should not pass by. The gods complained about the noise from the school children who pass at the bank of the wetland; as a result, one will drown, and after three days, the child will be found floating without eyes and a brain. It is believed that the owner of the water is the one responsible for the removal of the eyes and the brain.

At Ga Malaka in 2017, the tribal authority identified a wetland where children were drowning and requested the municipality fence off that wetland. On the day of the site visit and measurement taking, a big angry snake came out of nowhere and approached the people who were there. The

people were the ward councillor, ward committee, municipal official, and a representative from *Moshate*, and they dispersed. A few minutes later, a whirlwind came from the wetland straight to the tribal office. The gods, through the mouth of a prophet, warned the tribal authority members not to continue with fencing, as they did not want any foreign objects and did not want to be irritated.

In 2018, at Dlamini Wetland, children entered the wetland and picked tadpoles and small fish, but suddenly a very strong wind emanated from somewhere else, which forced everybody to be indoors. The following day, they found a hill made of mud covering the road adjacent to the wetland, and nobody was able to pass by for a few days. The study by Reuben and Kquofi, 2015 agrees with the results of this study that strict taboos such as restricting activities and behaviours contribute directly to conservation.

4.8.3.2 Protocols that are followed

The results of this study show that there are protocols that have to be followed when visiting or performing any activity in the wetlands. It is believed that if the protocols are not followed, the gods can retaliate, and the neighbouring communities will suffer the consequences, such as natural disasters. The gods can also cause the wetlands to dry up or cause a water shortage if they are angry. Ndlovu and Manjeru (2016) support this finding by emphasising that if the gods become angry, they can dry the wetlands as a punishment to the communities. Furthermore, the study by Pyke et al. (2018) states that if wetland visitors do not respect and follow cultural protocols, the wetland spirits may decide to dry the waters or cause a water shortage The fear and respect of gods protect humans from suffering the consequences, such as diseases and natural disasters (Onyekwelu, 2021).

The participants are of the view that no one should visit the wetlands between 12:00 and 14:00 because it is the time when the gods are praying and do not want to be disturbed. Every activity,

such as livestock feeding, working in the fields, cutting wetlands plants, fishing, or performing rituals, is strictly prohibited during that time. It was revealed that before any activity can be performed, permission from the gods must be obtained. Permission is requested in different ways, such as by throwing silver coins, pouring traditional beer and snuff, or making incantations to the gods, while others kneel and pray before entering the wetland. If permission is granted, the gods will put power in the water of wetlands plants so that they can be effective in every use.

4.8.3.3 Rituals and ceremonies performed at the Wetlands

This study established that wetlands are a place of worship where people connects with their ancestors. It is believed that the gods or water spirits act as mediators between the community and God. "Traditional philosophers explained that one could not formally worship the Supreme Being without the agency of the divinities or ancestors. That is the reason why they bow to rivers, trees, and animals" (Godwin, 2006). Furthermore, it is where the rituals are performed. Traditional healers, or sangoma, train their initiates at the wetland. Trainee sangoma who has water spirits are taken to the wetland to connect with their gods. The trainee will enter the wetland for some hours and return with extra powers and a bag full of bones from his or her ancestors. The study by Bernard (2003) established that "the training of sangoma usually involves the physical submersion of the trainee under the water of a certain river or sea for a few hours, days, or even years, after which it is alleged that the individual emerges wearing the full regalia of a healer, with a symbolic snake wrapped around his/her body and medicines". The study also identified that the spirits of traditional healers are buried in the wetlands. Before the actual burial, they will take the body of the traditional healer to the wetland, place it on "*legogwa la mohlahla*," a traditional mat, and perform rituals; then the spirit is buried.

The findings of this study also showed that rainmaking rituals are also executed on wetlands. These rituals are undertaken by elderly people together with a representative from the traditional

authority. The elders will wear Sepedi traditional attire and visit the wetland early in the morning before sunrise. The study by Marambanyika et al. (2021) supports these findings by demonstrating that older people continue to practice rainmaking rituals. The ritual is performed with the use of traditional sorghum beer, which is kept in a clay pot, snuff, and silver coins that are used as tokens of introduction to the gods before the rain-making rituals. The findings of this study correspond with the findings by Bernard (2003) that people frequently make a gift of beads and silver coins when they approach freshwater. This ritual is normally performed when the wetlands are dry as a result of drought or when it is a ploughing season. Ndlovu and Manjeru (2016) note that the rain-making ceremony is for worshipping the ancestors and sustaining the wetlands. The ritual is conducted by the chief and the members of the community.

The wetland water is regarded as “holy water” which is very crucial for performing rituals, healing, and baptising. Traditional healers emphasised that wetland water is used for cleansing as part of healing. This finding agrees with the study by Ajwang’ Ondiek et al. (2016) that, due to the belief that wetlands are purifying and can drive away evil spirits, traditional healers advice their patients to bath in them at dawn to be cleansed from specific diseases. Members of the African Indigenous Churches depend on wetland waters for rituals and spiritual cleansing or bathing. Verschuuren (2006) concurs with the study that in many societies, wetland water has spiritual interests that strongly feature in some religious practices and faiths. Medicinal plants are boiled in wetland water, which makes the healing process more effective. The results show that wetland water has supernatural powers that provide total protection. Taking a bath and drinking wetland water gives protection from witchcraft and evil spirits. Bernard (2003) asserts that water spirits have the power to purify, protect one from evil, and heal one from illness to health.

4.8.4 Indigenous wetland management practices

Local communities recognise traditional leaders as having a greater responsibility to ban the draining of wetlands for cultivation than government institutions (Dalu et al., 2022). The study conducted by Taringa (2014) in Harare revealed that community members in rural areas engage in wetland conservation initiatives led by traditional authorities.

This study found that harvesting and movement within the wetlands are restricted. If the cutting of wetland vegetation cannot be controlled, it is believed that natural disasters will strike their land. Chemhuru and Masaka (2010) indicate that "people are forced to avoid going against the prescription of taboos because doing so brings about undesirable consequences not only for the offender but to society". During fieldwork, two wetlands at Wonderboom and Dlamini villages were found to be protected by a fence with a lockable gate. The keys to the gate are kept at the tribal office at Dlamini and the village head at Wonderboom. This finding corresponds with the study by Taringa (2014) that found that to promote sustainable use, wetlands should be fenced. The purpose of keeping the gate keys is to monitor the visitors. Every visitor is forced to go to the traditional authority office to introduce themselves and request the keys. Everybody who visits the wetland to perform rituals is recorded before they can get the keys. Many people from far away flock to the Mabodibeng wetland at Wonderboom to perform rituals. The visitors are given someone to accompany them. This helps to avoid making the gods angry, which may result in drowning or getting hurt at the wetland if they do not know the protocols of that wetland. At Wonderboom village, there is a notice board placed before you reach the gate of the wetland that informs the visitors to ask for permission from the village head and has the contact numbers.

In all the wetlands, the cutting of some wetland vegetation is restricted, and it is controlled by the traditional authorities. During initiation school, the harvesting of reeds and sedges is strictly prohibited, while the harvesting of *legogwa* (*Cladium mariscus), mohlahla* (*Cyperus*

sexangularis), and *leswielo* (*Aristida diffusa .subsp.diffusa* subsp. diffusa) are only allowed in May every year after the harvesting season. The study conducted at Mohlapetsi wetland by Mabule and Baloyi (2019) found that the head man oversees approving the harvesting of natural resources inside the wetland, including gathering wild plants, hunting, and fuel wood collection, which concurs with the findings of this study. At Masanteng village, there are dedicated days for irrigation by farmers next to the wetland: Monday, Wednesday, and Friday. This allows the water to be enough for all the wetland users. The findings are supported by Mavhura and Mushure (2019), who suggest that taboos may be implemented on specific days of the week or seasons. Fishermen are permitted to catch no more than five fish per day. Malaka and Marishane village's wetlands are demarcated. There is a designated spot for the livestock to drink water; the other part is for other wetland users. It is believed that if livestock and other animals trample within the wetland, it disturbs the water spirits and their functionality. When the water spirits are irritated, the animal can be trapped by mud and will suddenly disappear within the wetland. The livestock feeders cut the thorn trees and put them next to the wetland to discourage or disturb the animals from entering it. Furthermore, the findings revealed that picking or killing any animal species, such as fish and tadpoles, is prohibited. These aquatic species are considered the medium of the gods, so killing or picking them might cause calamities. Bernard (2003) supports this by stating that killing or injuring the messengers of the water spirits, such as frogs, snakes, crabs, or water birds, is a great offense. The contravention of such taboos will possibly result in water sources and droughts drying up. Traditional management techniques influence and shape the characteristics of wetlands (Clarkson et al., 2013).

Traditional authorities from Malaka, Masanteng, Eenzaam, and Wonderboom villages sometimes organise mass gatherings for the cleaning of the wetlands. This activity is conducted by men only. This finding contradicts the study by Mandishona and Knight (2022) found that traditional leaders believe it is improper for older people to clean sacred water sources. In Zimbabwe, girls and young

mothers are assigned to clean up the area around the water source. The cleaning of the wetlands includes, but is not limited to, the removal of invasive alien plants, algae, debris, and all illegally disposed waste. The spiritual cleansing of the wetland is also performed by members of the traditional authority and selected traditional healers. At Dlamini village wetland, a cow is slaughtered at a specified spot, which acts as a sacrifice to cleanse it and ask the gods to forgive the community of any wrongdoing. While at Masanteng Wetland, the village head and elderly women cleanse the wetland by killing chickens in the morning before sunrise to plead with the gods on behalf of the community members. In support of these findings, Mavhura and Mushure (2019) stated that traditional leaders and healers are recognised for carrying out rituals and rites that are believed to be actions of worshipping their gods.

The allocation of land and construction of houses next to the wetland is strictly prohibited. When the traditional authorities are demarcating sites, a buffer zone is maintained to avoid allocating sites next to the wetland. Moreover, the drilling of boreholes within the wetlands is not acceptable. If such an activity can take place, the water spirits will leave, and the wetland will be dry. Findings from the interviews also shed light on the fact that the illegal disposal of waste is prohibited. No throwing of cans, bottles, or plastics is permitted. The killing of chickens and other animals in the wetlands for ritual purposes is prohibited; only traditional authorities can do that. Traditional tactics induce fear in the community and thereby help preserve wetland ecosystems (Orijemie, 2020). Traditional ecological knowledge and techniques may help conserve biodiversity (Khan et al., 2008).

CHAPTER 5: SUMMARY, CONCLUSION, AND RECOMMENDATION

5.1 Introduction

This chapter presents the main conclusions of the research based on the research objectives and hypothesis. It also presents the recommendations following the conclusion.

The study was conducted at Makhuduthamaga Local Municipality in Sekhukhune District. The study aimed to assess people's perspectives on wetland cultural ecosystem services and indigenous wetland management practices in Limpopo Province, South Africa. The aim was achieved through three objectives as follows:

5.1.1 Objective 1: To identify wetland cultural ecosystem services in Makhuduthamaga Local Municipality.

The respondents seem to clearly understand what wetlands are and their benefits or services. From objective one, it can be concluded that the people of Makhuduthamaga Local Municipality receive cultural wetland ecosystem services from the wetlands. The cultural ecosystem services that are received include spiritual, religious, recreational, educational, and the collection of medicinal plants.

5.1.2 Objective 2: To investigate the local community's perspectives on wetland cultural ecosystem services.

Objective two reveals that the participants have different perspectives on wetlands ecosystems. Most participants think wetlands are respected ecosystems where the gods, ancestors, and water spirits reside. Furthermore, it is where communication with the gods, ancestors, and water spirits takes place. Traditional healers are of the view that wetlands are where the training to become "sangoma" is undertaken and where medicinal plants are collected. Additionally, it is a place for

the spiritual burial of a sangoma before the actual grave burial. Through spiritual burial, they meet with their ancestors. Traditional leaders think that the gods of their land reside in wetlands. It is a place to perform rainmaking rituals and spiritual land cleansing. Moreover, the participants believe that wetlands have supernatural powers for healing sicknesses and driving away evil spirits, bad luck, and witchcraft. Finally, the wetland water is regarded as "holy water," which is suitable for water baptism and the performance of rituals.

5.1.3 Objective 3: To identify indigenous wetland management practices in Makhuduthamaga Local Municipality

This objective established that traditional authorities are major players in protecting the wetlands. Tribal authorities have set protocols and taboos to be followed when visiting the wetlands. These taboos and protocols are for the sustainable use of wetlands and to avoid angering the gods. The study found that if the god's ancestors or water spirits are angry, calamities such as storms, sicknesses, floods, and wetland dryness occur. It was established that cutting of wetland vegetation is only allowed in April to May after harvesting from the fields. The cultural and religious importance of wetland flora and fauna promotes sustainable use. Furthermore, fetching wetland animal species, excavation, the usage of machinery, noise, and the throwing of foreign objects are strictly prohibited. Visiting the wetlands between 1200 and 14h00 midday is forbidden, as this is the time for the gods to be at work and do not want to be disturbed. The study established that two wetlands of the seven study areas are fenced with lockable gates. The keys to the gates are kept at tribal offices to control the movement within the wetland. Additionally, everybody who visits the wetland requests permission from the village head or the traditional leader. The visitors are accompanied by a representative from the tribal authority, who will inform them about the terms and conditions of the wetland. Furthermore, when the wetlands are dry, elderly women dressed in Sepedi attire, together with a representative from the traditional authority, visit the wetland in the morning before sunrise to perform rain-making rituals. Immediately after the rituals or later in

the afternoon, heavy rain shall follow. Another method of managing wetlands is to clean them. Men and boys visit the wetland to remove invasive alien plants, debris, and illegally disposed waste. Beliefs and taboos are very crucial in protecting the wetlands' plants and animals. Wetland species that have religious and cultural importance promote their sustainable use.

5.1.4 Hypotheses testing

The study concludes by testing the following hypothesis that was stated for the research.

5.1.4.1 A positive relationship exists between the wetland's cultural ecosystem services and the people.

The findings of this study accept the stated hypotheses because most of the participants in the study proved to receive wetlands' cultural ecosystem services. For this study, the Chi-square test with a P-value of less than 0.05 was the significance level for testing the hypothesis. The Chi-square test results for the following cultural ecosystem services: religious ceremonies, spiritual ceremonies, hunting, and fishing recreational, educational, and collection of indigenous plants showed a P-value less than 0.05, which had a significant value. The wetland's cultural ecosystem services were perceived differently by different categories of respondents according to the demographic results.

5.1.4.2 The incorporation of indigenous knowledge system into wetland management can result in the overall improvement in the management of ecosystem services

The results of this study accept the stipulated hypothesis because most of the participants in the study identified traditional authorities as major contributors to wetland management. The protocols and taboos set by tribal authorities promote the sustainable use of wetlands.

5.1.5 Conclusion

The study aimed to assess people's perspectives on wetland cultural ecosystem services and indigenous wetland management practices in Limpopo Province, South Africa. The results

indicate that the community of Makhuduthamaga Local Municipality has several perspectives on wetland cultural services, such as wetlands being the place where the gods reside, having supernatural powers for healing, being where spiritual and religious ceremonies are performed, and providing medicinal plants. Furthermore, the findings show that some taboos and protocols are set by the traditional leaders to manage wetland ecosystems. Cultural and religious beliefs play a role in the conservation of wetlands. Several studies on cultural ecosystem services have been conducted globally, but little research has been done on how South Africans perceive the cultural ecosystem services provided by wetlands. This study offered new insights into this topic. The significance of the study was to better understand how community members relate to wetland ecosystem services in terms of culture, spirituality, and religious beliefs, and how indigenous knowledge contributes to the conservation of wetlands. The study revealed that there is a positive relationship between the community and the wetland cultural ecosystem services. Moreover, there is a positive relationship between indigenous knowledge and wetland management practices. The study was only conducted in seven villages in Makhuduthamaga Local Municipality; there is a need for further studies in other areas. The results of this study shall be used to close the gap between the cultural ecosystem services, which were more focused on recreation, tourism, and education. The results of the study will act as a baseline during the review of the Municipal Environmental Management Plan. Furthermore, the results shall contribute to the development of other sector plans which will be incorporated within the Municipal Integrated Development Plan (IDP).

5.2 Recommendations

The following are made based on the view of the findings of the study and the conclusion is drawn:

- Makhuduthamaga Local Municipality has many traditional leaders and healers but only a few were sampled in this study due to limited resources and time. Further studies need to be conducted with traditional leaders, traditional healers, spiritualists, and prophets on cultural ecosystem services received from wetlands.
- Makhuduthamaga Local Municipality has numerous wetlands within its jurisdiction, but only seven were investigated. There is a need to conduct further studies on other wetlands to identify other cultural ecosystem services.
- Local communities need to be educated about cultural ecosystem services that are supplied by the wetlands and adherence to protocols set by tribal authorities.
- Not all wetlands that the study covered have prescribed taboos and protocols that are to be followed when visiting them, other studies should be conducted to identify the actual wetlands with known protocols and taboos. This will make it easier for visitors from far to adhere to them and to protect the wetland visitors and the community surrounding the wetland to avoid calamities.
- The wetland users such as traditional healers (sangomas), prophets, spiritualists, and traditional leaders should be engaged continuously to share views on how wetlands can be conserved to sustain the cultural ecosystem services they supply.
- Department of Fisheries, Forestry, and Environment (DFFE) together with Limpopo Economic Development, Environment, and Tourism (LEDET) must conduct capacity-building workshops for traditional leaders and healers about the sustainable use of wetlands.

References

ANYUMBA, G. & NKUNA, M. 2017. Lake Funfudzi: A Sacret Lake in South Africa that is not open for Tourism Development. *African Journal of Hospitality, Tourism, and Leisure,* 6**,** 1-20.

AJWANG' ONDIEK, R., KITAKA, N. & OMONDI ODUOR, S. 2016. Assessment of provisioning and cultural ecosystem services in natural wetlands and rice fields in Kano floodplain, Kenya. *Ecosystem Services,* 21**,** 166-173.

ALHOJAILAN, M. I. 2012. Thematic analysis: A critical review of its process and evaluation. *West east journal of social sciences,* 1, 39-47.

ASSESSMENT, M. E. 2005. Synthesis report. *Island, Washington, DC,* 748.

ASSELEN, S. V., VERBURG, P. H., VERMAAT, J. E. & JANSE, J. H. 2013. Drivers of wetland conversion: a global meta-analysis. *PloS one,* 8**,** e81292.

AUSPURG, K. & HINZ, T. 2015. Statistical Data Analysis with Stata

BERKES, F. & DAVIDSON-HUNT, I. J. 2006. Biodiversity, traditional management systems, and cultural landscapes: examples from the boreal forest of Canada. *International Social Science Journal,* 58**,** 35-47.

BERNARD, H. R. 2017. Research methods in anthropology: Qualitative and quantitative approaches, Rowman & Littlefield.

BERNARD, P. S. 2003. Ecological implications of water spirit beliefs in Southern Africa: The need to protect knowledge, nature and resource rights. *USDA Forest Service Proc. RMS,* 27**,** 148-153.

BHARDWAJ, P. 2019. Types of sampling in research. *Journal of the Practice of Cardiovascular Sciences,* 5, 157.

BOSMA, C., GLENK, K. & NOVO, P. 2017. How do individuals and groups perceive wetland functioning? Fuzzy cognitive mapping of wetland perceptions in Uganda. *Land Use Policy,* 60**,** 181-196.

CARPENTER, S. R., MOONEY, H. A., AGARD, J., CAPISTRANO, D., DEFRIES, R. S., DÍAZ, S., DIETZ, T., DURAIAPPAH, A. K., OTENG-YEBOAH, A. & PEREIRA, H. M. 2009. Science for managing ecosystem services: Beyond the Millennium Ecosystem Assessment. *Proceedings of the National Academy of Sciences,* 106**,** 1305-1312.

CHAN, K. M. A., SATTERFIELD, T. & GOLDSTEIN, J. 2012. Rethinking ecosystem services to better address and navigate cultural values. *Ecological Economics,* 74**,** 8-18.

CHAUDHRY, A. A. 2010. Wetlands in Pakistan: What is happening to them. *World Environment*

Day, 5.

CHEMHURU, M. & MASAKA, D. 2010. Taboos as sources of Shona people's environmental ethics. *Journal of Sustainable Development in Africa,* 12**,** 121-133.

CHETTRI, N., ARYAL, K., THAPA, S., UDDIN, K., KANDEL, P. & KARKI, S. 2021. Contribution of ecosystem services to rural livelihoods in a changing landscape: A case study from the Eastern Himalaya. *Land Use Policy,* 109**,** 105643.

ČÍŽKOVÁ, H., KVĚT, J., COMIN, F. A., LAIHO, R., POKORNÝ, J. & PITHART, D. 2013. Actual state of European wetlands and their possible future in the context of global climate change. Aquatic Sciences, 75, 3-26.

CLARKSON, B. R., AUSSEIL, A.-G. E. & GERBEAUX, P. 2013. Wetland ecosystem services. *Ecosystem services in New Zealand: conditions and trends. Manaaki Whenua Press, Lincoln***,** 192-202.

COHEN, L., MANION, L. & MORRISON, K. 2002. *Research methods in education*, Routledge.

COSTANZA, R., D'ARGE, R., DE GROOT, R., FARBER, S., GRASSO, M., HANNON, B., LIMBURG, K., NAEEM, S.,O'NEILL, R. V. & PARUELO, J. 1997. The value of the world's ecosystem services and natural capital. *nature,* 387**,** 253-260.

COSTANZA, R., KUBISZEWSKI, I., ERVIN, D., BLUFFSTONE, R., BOYD, J., BROWN, D., CHANG, H., DUJON, V., GRANEK, E. & POLASKY, S. 2011. Valuing ecological systems and services. *F1000 biology reports,* 3.

COTTET, M., PIÉGAY, H. & BORNETTE, G. 2013. Does the human perception of wetland aesthetics and healthiness relate to ecological functioning? *Journal of environmental management,* 128**,** 1012-1022.

CRAFT, C. 2015. Creating and restoring wetlands: from theory to practice, Elsevier.

DALU, M. T., MUKHUWANA, O., CUTHBERT, R. N., MARAMBANYIKA, T., GUNTER, A. W., MURUNGWENI, F. M. & DALU, T. 2022. Understanding communities' perceptions, demographics, and uses of wetlands in Vhembe Biosphere Reserve, South Africa. *Wetlands Ecology and Management,* 30**,** 1231-1244.

DIXON, A. B. & WOOD, A. P. Wetland cultivation, and hydrological management in eastern Africa: Matching community and hydrological needs through sustainable wetland use. Natural resources forum, 2003. Wiley Online Library, 117-129.

DŁUŻEWSKA, A. 2016. Cultural ecosystem services–framework, theories, and practices. *Problemy Ekorozwoju,* 11.

DOU, Y., LIU, M., BAKKER, M., YU, X., CARSJENS, G. J., DE GROOT, R. & LIU, J. 2021. Influence of human interventions on local perceptions of cultural ecosystem services

provided by coastal landscapes: A case study of the Huiwen wetland, southern China. *Ecosystem Services,* 50**,** 101311.

ENVIRONMENT, A. D. O., DEVELOPMENT, S. R., WANG, Y., NEUPANE, A., VICKERS, A., KLAVINS, T. & BEWER, R. 2011. *Ecosystem services approach pilot on wetlands: Economic valuation technical report*, Government of Alberta.

ETIKAN, I. & BALA, K. 2017. Sampling and sampling methods. *Biometrics & Biostatistics International Journal,* 5**,** 00149.

FINLAYSON, M., CRUZ, R. D., DAVIDSON, N., ALDER, J., CORK, S., GROOT, R. S. D., LÉVÊQUE, C., MILTON, G. R., PETERSON, G., PRITCHARD, D., RATNER, B. D., REID, W. V., REVENGA, C., RIVERA, M., SCHUTYSER, F., SIEBENTRITT, M., STUIP, M., THARME, R., BUTCHARD, S., DIEME-AMTING, E., GITAY, H., RAAYMAKERS, S. & TAYLOR, D. 2005. *Millennium Ecosystem Assessment: Ecosystems and human well-being: wetlands and water synthesis,* Washington DC, Island Press.

FISHER, J. A., PATENAUDE, G., MEIR, P., NIGHTINGALE, A. J., ROUNSEVELL, M. D., WILLIAMS, M. & WOODHOUSE, I. H. 2013. Strengthening conceptual foundations: analysing frameworks for ecosystem services and poverty alleviation research. *Global Environmental Change,* 23**,** 1098-1111.

FLOOD, K., MAHON, M. & MCDONAGH, J. 2021. Assigning value to cultural ecosystem services: The significance of memory and imagination in the conservation of Irish peatlands. *Ecosystem Services,* 50**,** 101326.

FRANKE, T. M., HO, T. & CHRISTIE, C. A. 2012. The chi-square test: Often used and more often misinterpreted. *American Journal of Evaluation,* 33**,** 448-458.

FRIESE, S. 2019. ATLAS. ti 8 Mac-User Manual UPDATED FOR PROGRAM VERSION 8.4. *ATLAS. ti, Berlin*.

GADZIRAYI, C. T., MUT, E., CHIHIYA, J. & MARY, C. 2006. Indigenous knowledge systems in sustainable utilization of wetlands in communal areas of Zimbabwe: a case of Hwedza district. *African Journal of Agricultural Research,* 1**,** 131-137.

GALATOWITSCH, S. M. 2018. Natural and anthropogenic drivers of wetland change. *The wetland book II: Distribution, description, and Conservation.* Springer Nature.

GEE, K. & BURKHARD, B. 2010. Cultural ecosystem services in the context of offshore wind farming: a case study from the west coast of Schleswig-Holstein. *Ecological Complexity,* 7**,** 349-358.

GODWIN, O. K. 2006. *The Concept of God in the Traditional Religion of the Akan and Ewe Ethnic Groups Compared the Bible*, Viademica-Verlag.

HAUSMANN, A., SLOTOW, R. O. B., BURNS, J. K. & DI MININ, E. 2016. The ecosystem service of sense of place: benefits for human well-being and biodiversity conservation. *Environmental Conservation,* 43**,** 117-127.

HERNÁNDEZ-MORCILLO, M., PLIENINGER, T. & BIELING, C. 2013. An empirical review of cultural ecosystem service indicators. Ecological indicators, 29, 434-444.

HORWITZ, P. & FINLAYSON, C. M. 2011. Wetlands as settings for human health: incorporating ecosystem services and health impact assessment into water resource management. *BioScience,* 61**,** 678-688.

HUMPHRIES, M. S., MCCARTHY, T. S. & PILLAY, L. 2017. Attenuation of pollution arising from acid mine drainage by a natural wetland on the Witwatersrand. *South African Journal of Science,* 113**,** 1-9.

JAYARAJ, P. & PANDEY, R. 2021. Investigating SES variables causing changes in sense of place in the context of coastal wetland conservation - A case of Pulicat lagoon. *Current Research in Environmental Sustainability,* 3**,** 100061.

JUNK, W. J., AN, S., FINLAYSON, C., GOPAL, B., KVĚT, J., MITCHELL, S. A., MITSCH, W. J. & ROBARTS, R. D. 2013. The current state of knowledge regarding the world's wetlands and their future under global climate change: a synthesis. Aquatic sciences, 75, 151-167.

KINGSFORD, R. T., BASSET, A. & JACKSON, L. 2016. Wetlands: conservation's poor cousins. *Aquatic Conservation: Marine and Freshwater Ecosystems,* 26**,** 892-916.

KHAN, M., KHUMBONGMAYUM, A. D. & TRIPATHI, R. 2008. The sacred groves and their significance in conserving biodiversity: an overview. *International Journal of Ecology and Environmental Sciences,* 34**,** 277-291.

KOTZE, D., MILNE, B., MULLER, H. & NIEUWOUDT, H. 2019. Pressures on the wetland hotspot regions of the Northern Cape. *Water Wheel,* 18**,** 27-31.

LAMSAL, P., PANT, K. P., KUMAR, L. & ATREYA, K. 2015. Sustainable livelihoods through conservation of wetland resources: a case of economic benefits from Ghodaghodi Lake, western Nepal. *Ecology and Society,* 20.

LETSOALO, J. M. & POTGIETER, M. J. 2021. Domestic waste disposal in a small urban wetland area by Ga-Makanye Community, Limpopo Province, South Africa. *South African Geographical Journal,* 103**,** 374-380.

LI, Y., YE, Y., FANG, X., ZHANG, C. & ZHAO, Z. 2020. Loss of wetlands due to the expansion of polder in the Dongting Plain, China, AD 1368–1980. *The Holocene,* 30**,** 646-656.

LONGEST, K. C. 2019. *Using Stata for quantitative analysis*, SAGE Publications.

MABULE, P. & BALOYI, D. Wetlands, and Sustainable Livelihoods: Alternative Means of Water Security in the Drought Season Within the Rural Communities in Limpopo Province of South Africa. 2019. International Conference on Public Administration and Development ….

MACFARLANE, D., HOLNESS, S., VON HASE, A., BROWNLIE, S., DINI, J. & KILIAN, V. 2014. Wetland offsets: a best-practice guideline for South Africa. *South African National Biodiversity Institute and the Department of Water Affairs. Pretoria*.

MAKHUDUTHAMAGA LOCAL MUNICIPALITY (2021) Integrated Development Plan 2021-2022

MANDISHONA, E. & KNIGHT, J. 2019. Users' Perceptions and Understanding of two urban wetlands in Harare, Zimbabwe. *South African Geographical Journal= Suid-Afrikaanse Geografiese Tydskrif,* 101**,** 326-348.

MANDISHONA, E. & KNIGHT, J. 2022. Feedback and Trade-Offs in the Use of Wetland Ecosystem Services by Local Communities in Rural Zimbabwe. *Sustainability,* 14**,** 1789.

MANFREDO, M. J., BRUSKOTTER, J. T., TEEL, T. L., FULTON, D., SCHWARTZ, S. H., ARLINGHAUS, R., OISHI, S., USKUL, A. K., REDFORD, K., KITAYAMA, S. & SULLIVAN, L. 2017. Why social values cannot be changed for the sake of conservation. *Conservation Biology,* 31**,** 772-780.

MANIATAKOU, S., BERG, H., MANEAS, G. & DAW, T. M. 2020. Unravelling Diverse Values of Ecosystem Services: A Socio-Cultural Valuation Using Q Methodology in Messenia, Greece. *Sustainability,* 12**,** 10320.

MARAMBANYIKA, T., MUPFIGA, U. N., MUSASA, T. & NGWENYA, K. 2021. Local perceptions on the impact of drought on Wetland Ecosystem services and associated household livelihood benefits: the case of the Driefontein Ramsar Site in Zimbabwe. *Land,* 10**,** 587.

MASOKO, P., MOKGOTHO, M., MBAZIMA, V. & MAMPURU, L. 2008. Biological activities of Typha capensis (Typhaceae) from Limpopo Province (South Africa). *African Journal of Biotechnology,* 7.

MATTHEWS, S. 2016. Worth their salt-determining the value of Limpopo's water ecosystems: ecosystem services-cover feature. *Water Wheel,* 15**,** 14-16.

MAVHURA, E. & MUSHURE, S. 2019. Forest and wildlife resource-conservation efforts based on indigenous knowledge: The case of Nharira community in Chikomba district, Zimbabwe. *Forest Policy and Economics,* 105**,** 83-90.

MCCARY, M. A., MORES, R., FARFAN, M. A. & WISE, D. H. 2016. Invasive plants have different effects on the trophic structure of green and brown food webs in terrestrial ecosystems: A meta-analysis. *Ecology letters,* 19**,** 328-335.

MONAKEDI, T. A. 2012. *Consolidating Developmental Local Government through the Local Government Turnaround Strategy: The Case Study of Makhuduthamaga Local Municipality.* The University of the Witwatersrand, Faculty of Engineering and the Built ….

MCINNES, R. J. 2013. Recognising wetland ecosystem services within urban case studies. *Marine and Freshwater Research,* 65**,** 575-588.

MCLEOD, S. 2008. Qualitative Quantitative-Simply Psychology. *Qualitative Quantitative*| *Simply Psychology,* 1.

MILCU, A. I., HANSPACH, J., ABSON, D. & FISCHER, J. 2013. Cultural Ecosystem Services A Literature Review and Prospects for Future Research. *Ecology and Society,* 18.

MILLENIUM ECOSYSTEM ASSESSMENT. 2005. Ecosystems and human well-being: Wetlands and water synthesis. A report of the Millennium Ecosystem Assessment. World Resources Institute, Washington, DC.

MITSCH, W. J., GOSSELINK, J. G., ZHANG, L. & ANDERSON, C. J. 2009. *Wetland ecosystems*, John Wiley & Sons.

MITSCH, W. J., BERNAL, B. & HERNANDEZ, M. E. 2015. Ecosystem services of wetlands. Taylor & Francis.

MOGALE, M. M. P., RAIMONDO, D. & VANWYK, B.-E. 2019. The ethnobotany of Central Sekhukhuneland, South Africa. *South African Journal of Botany,* 122**,** 90-119.

MOWAT, S. & RHODES, B. 2020. Identifying and assigning values to the intangible cultural benefits of ecosystem services to traditional communities in South Africa. *South African Journal of Science,* 116, 1-6.

MUKARIA, A. 2021. Healing through Nature. A Lesson from the Traditional Ameru Culture in Kenya. *Academia Letters***,** 2.

NDARUGA, A. & IRWIN, P. 2003. Cultural perceptions of wetlands by primary school teachers in Kenya. *International Research in Geographical and Environmental Education,* 12**,** 219-230.

NDLOVU, C. & MANJERU, L. 2016. The influence of rituals and taboos on sustainable wetlands management: The case of Matobo District in Matabeleland South Province.

ONYEKWELU, J. 2021. Can the fear of the gods sustain biodiversity conservation in sacred groves? *Academia Letters***,** 2.

ORIJEMIE, E. A. Cultural practices and Sustainable management of Wetlands in Nigeria. 5th International Young Earth Scientists (YES) Congress “Rocking Earth’s Future”, 2020. German YES Chapter, GFZ German Research Centre for Geosciences.

PARADIS, E., O'BRIEN, B., NIMMON, L., BANDIERA, G. & MARTIMIANAKIS, M. A. 2016. Design: Selection of Data Collection Methods. *Journal of Graduate Medical Education,* 8**,** 263-264.

PEDERSEN, E., WEISNER, S. E. B. & JOHANSSON, M. 2019. Wetland areas' direct contributions to residents' well-being entitle them to high cultural ecosystem values. *Science of The Total Environment,* 646**,** 1315-1326.

PYKE, M., TOUSSAINT, S., CLOSE, P., DOBBS, R., DAVEY, I., GEORGE, K., OADES, D., SIBOSADO, D., MCCARTHY, P. & TIGAN, C. 2018. Wetlands need people: a framework for Understanding and Promoting Australian indigenous wetland management. *Ecology and Society,* 23.

RAMSAR, P. 2013. The Ramsar Convention Manual: a guide to the Convention on Wetlands (Ramsar, Iran, 1971) Ramsar Convention Secretariat. Gland.

RENDÓN, O. R., GARBUTT, A., SKOV, M., MÖLLER, I., ALEXANDER, M., BALLINGER, R., WYLES, K., SMITH, G., MCKINLEY, E. & GRIFFIN, J. 2019. A framework linking ecosystem services and human well-being: Saltmarsh as a case study. *People and nature,* 1**,** 486-496.

REUBEN, G. & KQUOFI, S. Direct and indirect conservation benefits of religious and spiritual beliefs in traditional Ghanaian communities.

RIM-RUKEH, A., IRERHIEVWIE, G. & AGBOZU, I. 2013. Traditional beliefs and conservation of natural resources: Evidence from selected communities in Delta State, Nigeria. *International Journal of Biodiversity and Conservation,* 5**,** 426-432.

ROJAS, O., ZAMORANO, M., SAEZ, K., ROJAS, C., VEGA, C., ARRIAGADA, L. & BASNOU, C. 2017. Social perception of ecosystem services in a coastal wetland post-earthquake: A case study in Chile. *Sustainability,* 9**,** 1983.

RUDOLF DE GROOT, P., VAN DE BERG, A. & AMELUNG, B. 2005. Cultural and amenity services. *Ecosystems and Human Well-Being: Current State and Trends: Findings of the Condition and Trends Working Group,* 1**,** 455.

RYFIELD, F., CABANA, D., BRANNIGAN, J. & CROWE, T. 2019. Conceptualizing 'sense of place in cultural ecosystem services: A framework for interdisciplinary research. *Ecosystem Services,* 36**,** 100907.

SHACKLETON, C. M. 2021. Ecosystem provisioning services in Global South cities. *Urban ecology in the Global South. Springer, Cham***,** 203-226.

SHARMA, G. 2017. Pros and cons of different sampling techniques. *International journal of applied research,* 3**,** 749-752.

SHEARD, J. 2018. Chapter 18 - Quantitative data analysis. *In:* WILLIAMSON, K. & JOHANSON, G. (eds.) *Research Methods (Second Edition).* Chandos Publishing.

SINTHUMULE, N. I. 2021. An analysis of communities' attitudes towards wetlands and implications for sustainability. *Global Ecology and Conservation,* 27**,** e01604.

SINGH, A. S. & MASUKU, M. B. 2014. Sampling techniques & determination of sample size in applied statistics research: An overview. *International Journal of Economics, commerce, and Management,* 2**,** 1-22.

TAHERDOOST, H. 2016. Sampling methods in research methodology; how to choose a sampling technique for research. *How to choose a sampling technique for research (April 10, 2016)*.

TARINGA, N. T. 2014. *Towards an African-Christian environmental ethic*, University of Bamberg Press.

TAYLOR, N. G., GRILLAS, P., AL HREISHA, H., BALKıZ, Ö., BORIE, M., BOUTRON, O., CATITA, A., CHAMPAGNON, J., CHERIF, S. & ÇIÇEK, K. 2021. The future for Mediterranean wetlands: 50 key issues and 50 important conservation research questions. Regional environmental change, 21, 1-17.

TURYAHABWE, N., TUMUSIIME, D., YIKII, F., KAKURU, W. & BARUGAHARE, V. 2017. Awareness and perceptions of legal provisions on wetlands in Uganda.

VERSCHUUREN, B. 2006b. Sociocultural importance of wetlands in northern Australia. *Conserving Cultural and Biological Diversity: The Role of Sacred Natural Sitesand Cultural Landscapes.*

VERSCHUUREN, B. An overview of cultural and spiritual values in ecosystem management and conservation strategies. International Conference on Endogenous Development and Bio-Cultural Diversity, 2006a. 299-325.

WEST, A. 2015. Ecosystem services Core Concept. *Proceedings of the National Academy of Sciences of the United States of America,* 112**,** 7337-7338.

WEST, P. 2016. A simple random sampling of individual items in the absence of a sampling frame that lists the individuals. *New Zealand Journal of forestry science,* 46**,** 1-7.

WETZEL, R. G. 2005. Invasive plants: the process within wetland ecosystems. *Invasive plants: Ecological and agricultural aspects.* Springer.

ZEKARIAS, T., GOVINDU, V., KEBEDE, Y. & GELAW, A. 2021. Degradation of wetlands and livelihood benefits of Lake Abaya-Chamo wetland, southern Ethiopia. *Current Research in Environmental Sustainability,* 3**,** 100060. WEST, P. 2016. A simple random sampling of individual items in the absence of a sampling frame that lists the individuals. *New Zealand Journal of forestry science,* 46**,** 1-7

Appendices

Appendix 1: Consent letter/ Covering letter

Dear Participant

My name is Botete Carol Metwane. I am currently enrolled for the Master of Science (MSc) in Environmental Sciences degree at the University of Venda. I hereby invite you to participate in a research study titled "**People's Perspectives on Wetlands Cultural Ecosystem Services and Indigenous Wetland Management Practices in Limpopo Province, South Africa"** under the supervision of Dr. L Mugwedi and Dr. F Murungweni.

This study aims to assess the community's perspectives on wetland cultural ecosystem services and indigenous management practices within Makhuduthamaga Local Municipality. The study will assist in understanding the relationship between people and ecosystem services and how they benefit from them. Participation in the study is voluntary. You may refuse to answer some questions or withdraw from participating, and you will not be penalised. If you agree to participate in this study, it might take you approximately 30-35 minutes to complete.

Your responses will remain confidential and anonymised. Your answers will only be known to the researcher. There are no risks for participating in this study and no incentives.

Your participation in this study is highly appreciated.

Kind regards

Metwane BC

Appendix 2: Interview guide

This interview guide is intended to assess the cultural ecosystem services that the community gets from the wetlands and how they are managed.

Section A. Demographic Information

1. Gender

1. Male	
2. Female	
3. Other	

2. Age of participant

1. 18-30	
2. 31-40	
3. 41- 50	
4. 51-60	
5. 60+(specify)	

3. Home language

1. Sepedi	
2. SiSwati	
3. IsiNdebele	
4. English	
5. Other(specify)	

4. Marital status

1. Single	
2. Married	

3. Widower	
4. Divorced	
5. Other (specify)	

5. Level of education

1. Primary education	
2. Secondary education	
3. Tertiary education	
4. ABET	
5. None	

6. Source of income

1. Salary Employment	
2. Social grant	
3. Pension	
4. Allowances	
5. Self-employed	
6. Other (specify)	

7. Location (Name of the village)

1. Dlamini	
2. Marishane	
3. Masanteng	
4. Wonderboom	
5. Malaka	
6. Patantswane	
7. Eenzaam	

8. How long have you been staying in that village?

1. 1-5 years	
2. 6-10 years	
3. 11-15 years	
4. 16- 20 years	
5. 20+ (specify)	

Section B: Community and the Wetlands

This section is about how you benefit from the wetlands.

9. Do you know what a wetland is?

1. Yes	
2. No	
3. Not sure	

10. Are you aware of any wetlands in your area?

1. Yes	
2. No	
3. Not sure	

11. Do you know the benefits of wetlands in your area?

1. Yes	
2. No	
3. Not Sure	

11.1 If yes, what are the benefits?

12. Which of the following provisioning ecosystem services do you obtain from the wetlands? (Multiple answers are allowed)

Provisioning services

1. Water	
2. Fuelwood	
3. Medicinal	
4. Farming	
5. Grazing	
6. Fishing	
7. Art and craft material	
8. Hunting	
9. Other (specify)	
10.	
11.	
12.	

12.1 Farming

Are you farming next to the wetland?

1. Yes	
2. No	
3. Not sure	

12.1.1 If yes, what is your type of farming?

1. Subsistence farming	
2. Commercial farming	

12.1.2 What are you farming?

1. Crops farming	
2. Livestock farming	
3. Mixed farming	

12.2 Grazing

12.2.1 What kind of livestock do you graze in your wetland?

1. Cattle	
2. Sheep	
3. Goat	
4. Donkeys	
5. Horses	
6. Others not listed above	
7.	
8.	

12.3 Medicinal

12.3.1 Do you get medicinal plants from the wetlands?

1. Yes	
2. No	
3. Not sure	

12.3.2 If Yes, Explain

_____

_____

12.3.3 What do you normally use the medicinal plants for? (Multiple answers are allowed)

1. Rituals	
2. Mental disorder	
3. Cough	
4. Fertility purposes	
5. Healing of infections or allergies	
6. Others not listed above	
7.	
8.	
9.	
10.	

1. Household consumption	
2. Sell	
3. Other (specify)	

12.3.4 Are these plants available throughout the year?

1. Yes	
2. No	
3. Not sure	

12.3.5 If No, what might be the cause?

_____

_____

12.4 Water

12.4.1 Do you use water from the wetland?

1. Yes	
2. No	
3. Not sure	

12.4.2 What do you use the water for? (Multiple answers are allowed).

1. Rituals	
2. Drinking	
3. Irrigation	
4. Household use or washing	
5. Others not listed above	
6.	
7.	
8.	
9.	

12.5 Building, art, and craft material

12.5.1 Do you get building, art, and craft material for the wetlands?

1. Yes	
2. No	
3. Not sure	

12.5.2 If yes, what type of building, art, and craft material do you get? Explain

_____

_____

12.5.3 What do you use the materials for?

1. Roofing or thatch	
2. Making clay pots	
3. Making mats	
4. Making baskets	
5. Others not listed above	
6.	
7.	
8.	

12.6 Fishing

12.6.1 Do you fish from your wetland?

1. Yes	
2. No	
3. Not sure	

12.6.2 How often do you go fishing?

1. Daily	
2. Weekly	
3. Monthly	
4. Quarterly	
5. Sometimes	
6. Never	

13. Regulating or supporting services

13.1 What environmental services have you observed from the wetlands? (Multiple answers are allowed).

1. Water purification	
2. Habitat for species	

3. Soil fertility	
4. Flood and storm protection	
5. Erosion control and soil protection	
6. Others not listed above	
7.	
8.	
9.	

13.2 How are they important to the environment and people? Explain.

_____

_____

14. Cultural Ecosystem Services

14.1. Which of the following cultural services do you receive? (Multiple answers are allowed).

1. Religious ceremonies	
2. Spiritual ceremonies	
3. Hunting and fishing	
4. Collection of traditional plants	
5. Recreational and tourism	
6. Educational	
7. Others not listed above	
8.	
9.	
10.	

14.2 **Spiritual or religious values**

14.2.1 What spiritual or religious values are attached to your neighbouring wetland? Explain

_____

_____

14.2.2 What taboos are related to your wetlands?

_____

_____

14.2.3 Which rituals are performed at your neighbouring wetland?

_____

_____

14.2.4 How often do you perform your rituals?

1. Daily	
2. Weekly	
3. Monthly	
4. Quarterly	
5. Yearly	
6. Sometimes	
7. Never	

14.2.5 Why do you perform such rituals during the time chosen? Explain

_____

_____

14.2.6 Which spiritual or religious ceremonies do you perform at your wetland?

_____

_____

14.2.7 How often do you perform your spiritual or religious ceremonies?

1. Daily	

2. Weekly	
3. Monthly	
4. Quarterly	
5. Yearly	
6. Sometimes	
7. Never	

14.2.8 Why such spiritual or religious ceremonies are done during the time chosen? Explain

_____

_____

14.2.9 Which protocols are followed before you visit the wetlands?

_____

_____

Section C: Pressure on wetlands ecosystems

15. Have you noticed any changes in your neighbouring wetland?

1. Yes	
2. No	
3. Not sure	

15.1 If yes, what are the changes?

_____

_____

15.2 How have these changes affected you? Explain

_____

_____

15.3 What might be the causes of these changes? (Multiple answers are allowed).

1. Water pollution	
2. High temperatures	
3. Overgrazing	
4. Overharvesting	
5. Invasive alien species	
6. Construction of roads and dams	
7. Cultivation	
8. Others not listed above	
9.	
10.	

15.4 Which ecosystem services have been affected as a result of such changes?

_____

_____

15.5 What is the current status of your nearby wetland?

1. Good condition	
2. Deteriorating	
3. Degraded	
4. Lost	
5. Others not listed above	
6.	
7.	

15.7 In your opinion what is the future status of the wetlands? Explain

_____

_____

Section D: Indigenous management practices

16. Who is responsible for the management of wetlands in your area or village? (Multiple answers are allowed).

1. Traditional leaders or Authorities	
2. Community members	
3. Environmental organisations	
4. Farmers	
5. Government (national, provincial, or local)	
6. Others not listed above	
7.	
8.	

17. Which indigenous methods are practiced in managing your wetlands and how effective are they? Explain

_____

_____

18. How long have these methods been in practice? Explain

_____

_____

19. Do you believe there is a need to protect your wetland?

1. Yes	
2. No	
3. Not sure	

19.1 Please, explain.

_____

_____

20. Which ways will you suggest conserving wetland ecosystems?

_____

_____

Appendix 3: Ethical clearance certificate

ETHICS APPROVAL CERTIFICATE

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Ms BC Metwane

STUDENT NO:
11540197

PROJECT TITLE: People's perspectives on wetland cultural ecosystem services and indigenous wetlands management practices in Limpopo Province, South Africa.

ETHICAL CLEARENCE NO: FSEA/22/GES/01/1103

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Dr L Mugwedi	University of Venda (Geography and Environmental Sciences)	Supervisor
Mrs F Murungweni	University of Venda (Geography and Environmental Sciences)	Co- Supervisor
Ms BC Metwane	University of Venda	Investigator – Student

Type: **Masters Research**
Risk: **Straightforward research without ethical problems (Category 1)**
Approval Period: **March 2022 – March 2024**

The Animal, Environmental and Biosafety Research Ethics Committee (AEBREC) hereby approves your project as indicated above.

General Conditions
While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following.

- The project leader (principal investigator) must report in the prescribed format to the REC:
  - Annually (or as otherwise requested) on the progress of the project, and upon completion of the project
  - Within 48hrs in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.
  - Annually a number of projects may be randomly selected for an external audit.
- The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the REC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date; a new application must be made to the REC and new approval received before or on the expiry date.
- In the interest of ethical responsibility, the RECs retains the right to:
  - Request access to any information or data at any time during the course or after completion of the project,
  - To ask further questions; Seek additional information; Require further modification or monitor the conduct of your research or the informed consent process.
  - withdraw or postpone approval if:
  - Any unethical principles or practices of the project are revealed or suspected.
  - It becomes apparent that any relevant information was withheld from the REC or that information has been false or misrepresented.
  - The required annual report and reporting of adverse events was not done timely and accurately.
  - New institutional rules, national legislation or international conventions deem it necessary

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE
Date Considered: February 2021

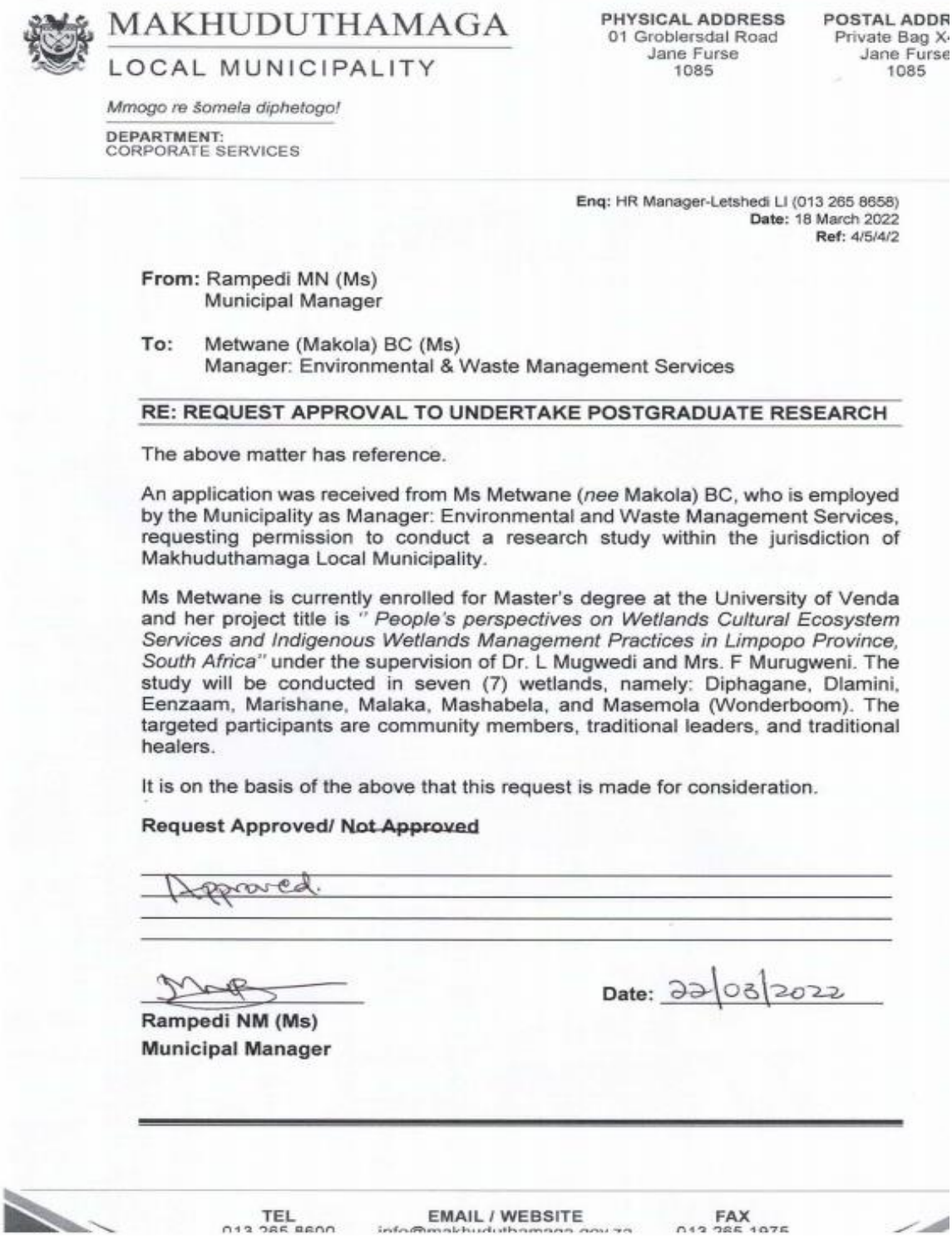
Name of the AEBREC Chairperson of the Committee: **Prof Irene Barnhoorn**

Signature

UNIVERSITY OF VENDA
OFFICE OF THE DIRECTOR
RESEARCH AND INNOVATION
2022 -03- 1 4
Private Bag X5050
Thohoyandou 0950

PRIVATE BAG X5050, THOHOYANDOU, 0950, LIMPOPO PROVINCE, SOUTH AFRICA
TELEPHONE (015) 962 8504/8513 FAX (015) 962 8060
"A quality driven financially sustainable, rural-based Comprehensive University"

Appendix 4: Permission letter



MAKHUDUTHAMAGA
LOCAL MUNICIPALITY

Mmogo re šomela diphetogo!

DEPARTMENT:
CORPORATE SERVICES

PHYSICAL ADDRESS
01 Groblersdal Road
Jane Furse
1085

POSTAL ADDR
Private Bag X
Jane Furse
1085

Enq: HR Manager-Letshedi LI (013 265 8658)
Date: 18 March 2022
Ref: 4/5/4/2

From: Rampedi MN (Ms)
Municipal Manager

To: Metwane (Makola) BC (Ms)
Manager: Environmental & Waste Management Services

RE: REQUEST APPROVAL TO UNDERTAKE POSTGRADUATE RESEARCH

The above matter has reference.

An application was received from Ms Metwane (*nee* Makola) BC, who is employed by the Municipality as Manager: Environmental and Waste Management Services, requesting permission to conduct a research study within the jurisdiction of Makhuduthamaga Local Municipality.

Ms Metwane is currently enrolled for Master's degree at the University of Venda and her project title is *'' People's perspectives on Wetlands Cultural Ecosystem Services and Indigenous Wetlands Management Practices in Limpopo Province, South Africa''* under the supervision of Dr. L Mugwedi and Mrs. F Murugweni. The study will be conducted in seven (7) wetlands, namely: Diphagane, Dlamini, Eenzaam, Marishane, Malaka, Mashabela, and Masemola (Wonderboom). The targeted participants are community members, traditional leaders, and traditional healers.

It is on the basis of the above that this request is made for consideration.

Request Approved/ ~~Not Approved~~

Approved.

Date: 22/03/2022

Rampedi NM (Ms)
Municipal Manager

TEL 013 265 8600 EMAIL / WEBSITE FAX 013 265 1975

Appendix 5: Sample of quotations from Atlas ti

Project: Metwane MENVSC Project

Report created by Metwane BC on 2022/09/01.

Code Report

Selected codes (1)

○ **taboos that are related to your wetlands**

112 Quotations:

1:2 No visits during noon midday. the spiritual owner of water does not al…… (257:434) - D 1: case 1.

No visits during noon midday. the spiritual owner of water does not allow visits at that particular time. if you insist on going during that time you might find the water turned reddish.

2:2 No washing, no visit from 12:00 to 13:00 midday. Children are not allo…… (269:501) - D 2: case 2.

No washing, no visit from 12:00 to 13:00 midday. Children are not allowed. If you visit the wetland at that time, you disturb the gods of water from doing their work. he might splash the water over your face, or it can just turn dirty.

3:2 No noise is allowed. you are not allowed to pick any species such as f…… (294:378) - D 3: case 3.

No noise is allowed. you are not allowed to pick any species such as fish or tadpoles.

4:2 children are not allowed in the wetland, and throwing foreign objects…… (193:281) - D 4: case 4.

children are not allowed in the wetland, and throwing foreign objects is also prohibited.

5:2 Children are not allowed to visit the wetland. no visit from noon to…… (188:269) - D 5: case 5.

Children are not allowed to visit the wetland. no visit from 12:00 to 13:00 midday

6:2 when you visit the wetland you must be pure e.g., not on menstrual perio…… (281:416) - D 6: case 6.

when you visit the wetland, you must be pure e.g., not in your menstrual period, not from the funeral, or not had any sexual activity for a while.

7:2 No cutting or digging any vegetation from the wetland. the cutting of…… (311:480) - D 7: case 7.

No cutting or digging of any vegetation from the wetland. the cutting of qoboza is only allowed during May after harvesting, this is to avoid natural disasters.

8:2 No building or construction is allowed at the wetland. the farmers onc…… (310:563) - D 8: case 8.

No building or construction is allowed at the wetland. the farmers once build a brick wall to mound irrigation systems to be used by wheat farmers. the following day the wall and the pervert were destroyed by the forces of nature used by the gods of water.

9:2 No excavations or installation of machines are allowed in the wetland……. (335:533) - D 9: case 9.

No excavations or installation of machines are allowed in the wetland. The farmers once installed the machines for the irrigation system and the following day the machines were found outside the wetland.

10:2 No noise is allowed at the wetland and no washing of clothes or slaugh…… (276:383) - D 10: case 10.

No noise is allowed at the wetland and no washing of clothes or slaughtering of chickens or any other animal.

11:2 "As a sangoma when I visit the wetland, I must be pure spiritually, phy…… (284:473) - D 11: case 11.

"As a sangoma when I visit the wetland, I must be pure spiritually, physically, and emotionally. I must not hold grudges, not be angry, not from the funeral, or not had any sexual activity."

12:2 Unclean people should not visit the wetland. it means those who come f…… (214:339) - D 12: case 12.

Unclean people should not visit the wetland. it means those who come from the funeral, who is not sad, angry or hold grudges.

13:2 No visit between 12:00-13:00 midday. The gods are at work, and they do…… (225:318) - D 13: case 13.

No visit between 12:00-13:00 midday. The gods are at work, and they don't want to be disturbed.

14:2 The owner of the wetland or the gods does not allow any visit from 12…… (277:451) - D 14: case 14.

The owner of the wetland or the gods does not allow any visit from 12:00 -13:00 midday. It is their time to be at work, so they don't want to be disturbed. no noise is allowed.

15:2 No cutting of any vegetation or fishing is allowed at the wetland (235:299) - D 15: case 15.

No cutting of any vegetation or fishing is allowed at the wetland.

16:2 No visit at noon midday. Ladies are not allowed to visit the wetland…… (178:368) - D 16: case 16.

No visit at noon midday. Ladies are not allowed to visit the wetland wearing trousers. Pregnant women are also not allowed. If you visit the wetland, you might get a miscarriage or stillborn.

17:2 Women do not visit the wetland while on menstrual periods. No cutting…… (275:386) - D 17: case 17.

Women do not visit the wetland while on menstrual periods. No cutting of reeds, grasses, or sedges on the wetland.

18:2 The wetland water is not used for anything except for rituals and live…… (193:276) - D 18: case 18.

The wetland water is not used for anything except for rituals and livestock drinking.

19:2 No baptizing, fishing, or washing within the wetland. the killing of a…… (365:469) - D 19: case 19.

No baptizing, fishing, or washing within the wetland. the killing of animals in the wetland is prohibited.

20:2 Women are not allowed to visit the wetland wearing trousers and are no…… (219:322) - D 20: case 20.

Women are not allowed to visit the wetland wearing trousers and men are not allowed without wearing a jacket.

21:2 No killing of chickens or throwing of rubbish like plastics, bottles…… (189:280) - D 21: case 21.

No killing of chickens or throwing of rubbish like plastics, bottles, or cans in the wetland.

22:2 Pregnant or menstruating women are not allowed at the wetland (296:356) - D 22: case 22.

Pregnant or menstruating women are not allowed in the wetland.

23:2 Not everybody is allowed at the wetland. you must be pure before have…… (278:426) - D 23: case 23.

Not everybody is allowed in the wetland. you must be pure before harvesting some herbs, and you need to face a specific direction when gathering them.