South African NATIONAL PARKS

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

LIMPOPO
PROVINCIAL GOVERNMENT

# Mapungubwe Cultural Landscape World Heritage Site

## Environmental Management Framework

# STATUS QUO REPORT

**Final**

**November 2014**

# EXECUTIVE SUMMARY

## Introduction and background

The Department of Environmental Affairs (DEA), in collaboration with the Limpopo Department of Economic Development, Environment and Tourism (LEDET) and South African National Parks (SANParks), embarked on a process to develop an Environmental Management Framework (EMF) for the Mapungubwe Cultural Landscape World Heritage Site (MCLWHS). Nemai Consulting was appointed to prepare the MCLWHS EMF.

An EMF is a study of the biophysical and socio-cultural systems of a geographically defined area to reveal where specific activities may best be practiced and to offer performance standards for maintaining appropriate use of such land. An EMF includes a framework of spatially represented information connected to significant environmental (i.e. ecological, social and economic) parameters, such as ecology, hydrology, infrastructure and services.

This report represents the Status Quo assessment (Volume 1) of the MCLWHS EMF process and serves to understand the current state of the environment and to identify the issues, opportunities and constraints in Mapungubwe. The outcomes of the status quo will provide the foundation upon which the remainder of the EMF deliverables will be built.

The MCLWHS is situated in the northernmost district in the Limpopo Province. It lies on the international borders of South Africa, Zimbabwe and Botswana and falls predominantly within the Vhembe District Municipality and the Musina Local Municipality. A small part of the buffer zone in the south-western corner is situated in the Capricorn District Municipality and the Blouberg Local Municipality.

Over a thousand years ago Mapungubwe represented one of the most powerful African Iron Age states or kingdoms, renowned for its power and trade that dominated southern Africa. The MCL was inscribed on the United Nations Education, Scientific and Cultural Organization's (UNESCO) World Heritage List on the 5$^{th}$ of July 2003 based on a number of criteria including that the Mapungubwe Cultural Landscape contains evidence for an

important interchange of human values that led to far-reaching cultural and social changes in Southern Africa between AD 900 and 1300.

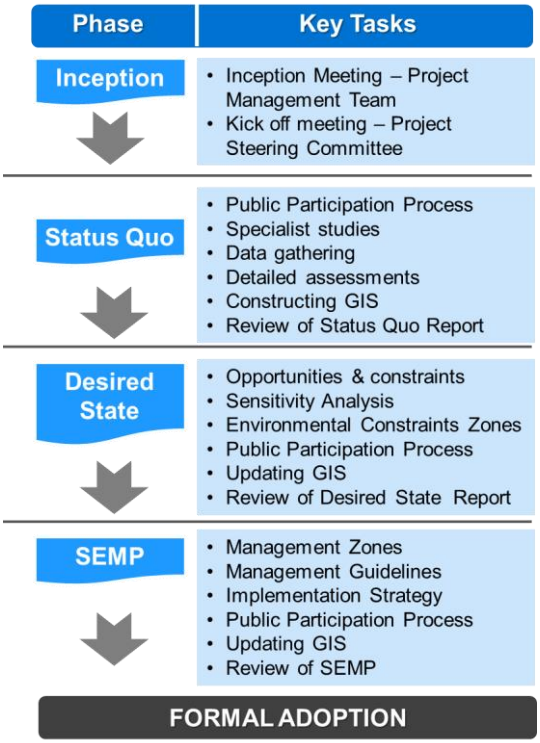
In Government Notice No. 71 of 30 January 2009 (GN 31832) the MCL was declared as a World Heritage Site in terms of the World Heritage Convention Act (Act No. 49 of 1999), and delegated specified powers of management to SANParks.

The catalysts for initiating this EMF fall within the following categories:

1. Significant environmental factors (e.g. protection of natural resources to ensure that the associated environmental goods and services are not jeopardised);
2. Development pressures (e.g. promoting investment initiatives in the identified nodes);
3. Environmental threats (e.g. incompatible land use practices); and
4. Resource management issues (e.g. conservation of cultural heritage resources, land transformation and degradation).

## EMF Development Approach

The EMF development approach, which is outlined in the figure to follow, is consistent with the requirements stipulated in the National Environmental Management Act (Act No. 107 of 1998) and the EMF Regulations (GN No. R547 of 18 June 2010).



## Environmental Profile

The Environmental Profile describes the current state of the environment which was ascertained through *inter alia* baseline evaluations and descriptions, specialist studies (as required), desktop assessments, existing data assimilation and field verification and assessment (as required).

The environment in the MCLWHS is explained in terms of various features and attributes that serve as the building blocks for the (1) Biophysical, (2) Planning and Development, and (3) Social, Economic and Cultural Environments. Where possible, these elements have been spatially represented in the EMF Geographic Information System.

**Environmental Features Assessed during the EMF Status Quo Phase**

| Biophysical Environment | Planning and Development | Social, Economic & Cultural Environment |
|---|---|---|
| ▪ Climate<br>▪ Geology<br>▪ Geohydrology<br>▪ Topography<br>▪ Soils<br>▪ Hydrology<br>▪ Flora<br>▪ Fauna<br>▪ Agricultural Resources<br>▪ Air | ▪ Land Use<br>▪ Local Planning Context<br>▪ MNP Zonal Plan<br>▪ GMTFCA Concept Development Plan | ▪ Demographic Profile<br>▪ Infrastructure, Utilities & Services<br>▪ Economic Overview<br>▪ Institutional<br>▪ Historical & Cultural Resources<br>▪ Tourism |

## Public Participation

As a minimum, the Public Participation Process (PPP) for the MCLWHS EMF aims to comply with Regulation 3(2) of the EMF Regulations (2010). The main purpose of the PPP includes:

1. To inform Interested and Affected Parties (I&APs) of the EMF process and its objectives;
2. To provide an opportunity for inputs from I&APs; and
3. To give feedback to I&APs with the opportunity for them to respond.

The PPP follows the phases of the overall EMF development process, and is executed to coincide with the outcomes associated with each milestone of the framework.

The key tasks undertaken as part of the PPP for the Status Quo Phase include the following:

- Compiling a database of project steering committee (PSC) members;
- Convening a PSC kick-off meeting (29 April 2013);
- Compiling a database of I&APs;
- Notification of I&APs of the EMF development process;
- Convening a public meeting in September 2013 to introduce the process
- Holding targeted meetings with authorities, stakeholders and I&APs;
- Lodging the Draft Status Quo Report in the public domain for review; and
- Creating and maintaining a Comments and Response Report throughout the Status Quo phase.
- Holding a Public Meeting on 16 July 2014 where the Interim Final Report was discussed
- Lodging the Final Status Quo Report in the public domain

## Environmental Management Priorities

This first phase of the EMF development process culminates in the identification of environmental management priorities through an understanding of the environmental issues, constraints and opportunities within the district.

## Transition from Status Quo to Desired State

With the foundation of the EMF set through the Status Quo Phase, the next step is to determine a realistic desired state for the environment in the MCLWHS.

Establishing the desired state includes setting a vision for the study area and providing the environmental management context for the management zones and related requirements for the various environmental features for the Strategic Environsmental Management Plan (SEMP). It will also focus on addessing the imperatives that lead to the instigation of the EMF development process.

## TITLE AND APPROVAL PAGE

***Title:*** *Mapungubwe Cultural Landscape World Heritage Site Environmental Management Framework: Status Quo Report*

***Authors:*** *Donavan Henning, Jean Beater*

***Status of Report:*** *FINAL*

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## AMENDMENTS PAGE

| Date | Nature of Amendment | Amendment No. | Signature |
|---|---|---|---|
| Apr 2014 | First Draft for Public Review | 0 |  |
| Nov 2014 | Final for Client Submission | 1 |  |
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# LIST OF ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| **AU** | Animal Unit |
| **BID** | Background Information Document |
| **CLWHS** | Cultural Landscape World Heritage Site |
| **COGTA** | Department of Cooperative Governance and Traditional Affairs |
| **DAFF** | Department of Agriculture, Forestry and Fisheries |
| **DEA** | Department of Environmental Affairs |
| **DEAT** | Department of Environmental Affairs and Tourism |
| **DMR** | Department of Minerals Resources |
| **DWA** | Department of Water Affairs |
| **ECZ** | Environmental Constraint Zone |
| **EIA** | Environment Impact Assessment |
| **EMF** | Environmental Management Framework |
| **FRAI** | Fish Response Assessment Index |
| **GMTFCA** | Greater Mapungubwe Transfrontier Conservation Area |
| **GIS** | Geographical Information System |
| **GN** | Government Notice |
| **ICOMOS** | International Council on Monuments and Sites |
| **IDP** | Integrated Development Plan |
| **ISCW** | Institute for Soil Climate and Water |
| **I&APs** | Interested and Affected Parties |
| **LC** | Land Capability Class |
| **LEDET** | Limpopo Department of Economic Development, Environment & Tourism |
| **NAEHMP** | National Aquatic Ecosystem Health Monitoring Programme |
| **NEMA** | National Environmental Management Act (Act No. 107 of 1998) |
| **NRHP** | National River Health Programme |
| **NRWC** | National Register of Water User Certificates |
| **PMT** | Project Management Team |
| **PPP** | Public Participation Process |
| **PSC** | Project Steering Committee |
| **RHP** | River Health Programme |
| **SANPARKS** | South African National Parks |
| **SDF** | Spatial Development Framework |
| **SEMP** | Strategic Environmental Management Plan |
| **ToR** | Terms of Reference |
| **VBR** | Vhembe Biosphere Reserve |

# Introduction

Section 1

# 1 INTRODUCTION

## 1.1 Background

The Department of Environmental Affairs (DEA), in collaboration with the Limpopo Department of Economic Development, Environment and Tourism (LEDET) and South African National Parks (SANParks), embarked on a process to develop an Environmental Management Framework (EMF) for the Mapungubwe Cultural Landscape World Heritage Site (MCLWHS). Nemai Consulting was appointed to prepare the MCLMWHS EMF.

According to the EMF Regulations (Government Notice No. R547 of 18 June 2010), an EMF is a *study of the biophysical and socio-cultural systems of a geographically defined area to reveal where specific land uses may best be practiced and to offer performance standards for maintaining appropriate use of such land*. An EMF includes a framework of spatially represented information connected to significant enviornmental (i.e. ecological, social and economic) parameters, such as ecology, hydrology, infrastructure and services. A key function of an EMF is to proactively identify areas of potential conflict between development proposals and critical/sensitive environments (DEAT, 1998).

As shown in **Figure 1**, the two major components of the MCLWHS EMF will entail Public Participation and Technical Development. Once the EMF is finalised, it will undergo promulgation and gazetting in order to render it as a formal decision-making tool in the environmental and planning arenas.

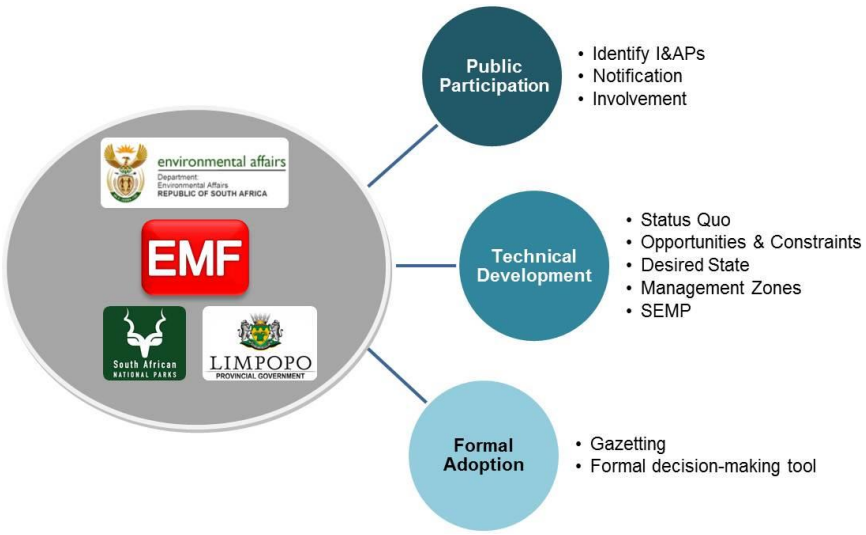



**Figure 1: EMF Components**

As part of the MCLWHS EMF development process, the following deliverables will be produced: Status Quo Report, Desired State Report and Strategic Environmental Management Plan (SEMP).

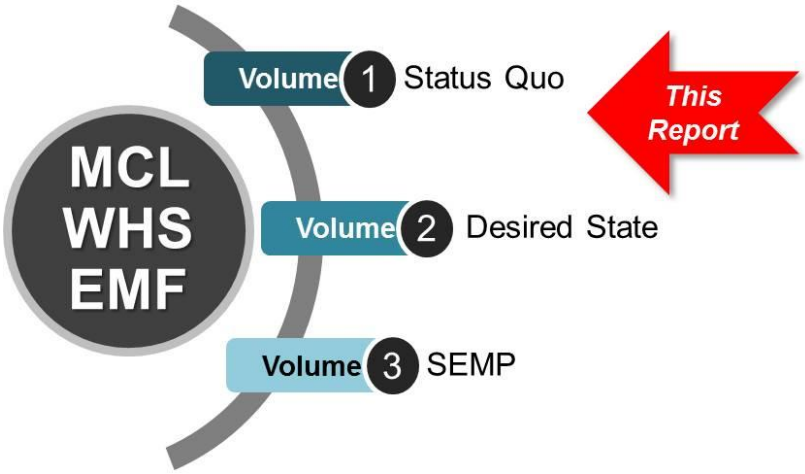



**Figure 2: MCLWHS EMF Building Blocks**

This report represents the Status Quo assessment (**Volume 1**) of the EMF process and serves to understand the current state of the environment and to identify the issues, opportunities and constraints in Mapungubwe. The outcomes of the status quo will provide the foundation upon which the remainder of the EMF deliverables will be built.

**BOX 1**

**Where does the EMF fit into Integrated Environmental Management?**

Chapter 5 of the National Environmental Management Act (NEMA) (Act 107 of 1998), section 23, promotes the application of appropriate environmental management tools in order to ensure the integrated environmental management of activities.

Environmental assessment and management tools are different methods or techniques that can be used to achieve environmental policy goals. Success depends on finding the most effective method for a particular situation. Depending on the situation, one particular tool may be effective on its own, or it may be more effective to combine several tools.

Several mechanisms also exist in various pieces of environmental legislation in our country that allows for the management of specific environmental features, which are also associated with specific assessment and management tools as well as mandated lead authorities.

An EMF strives to pro-actively identify areas of potential conflict between development proposals and critical/sensitive environments. An EMF is founded in NEMA and it serves as a product which is practically implementable and in line with other provisions of NEMA, such as the identification of Geographical Areas and developing management guidelines. An EMF ultimately provides competent authorities (National and Provincial) with a mechanism and decision support tool for the study area. However, it cannot be regarded as the single solution to dealing with all environmental problems in an earmarked area.

## 1.2 EMF Study Area

Mapungubwe (meaning 'hill of the jackal') is situated in the northernmost district in Limpopo (see **Figure** 3). It lies on the international borders of South Africa, Zimbabwe and Botswana.

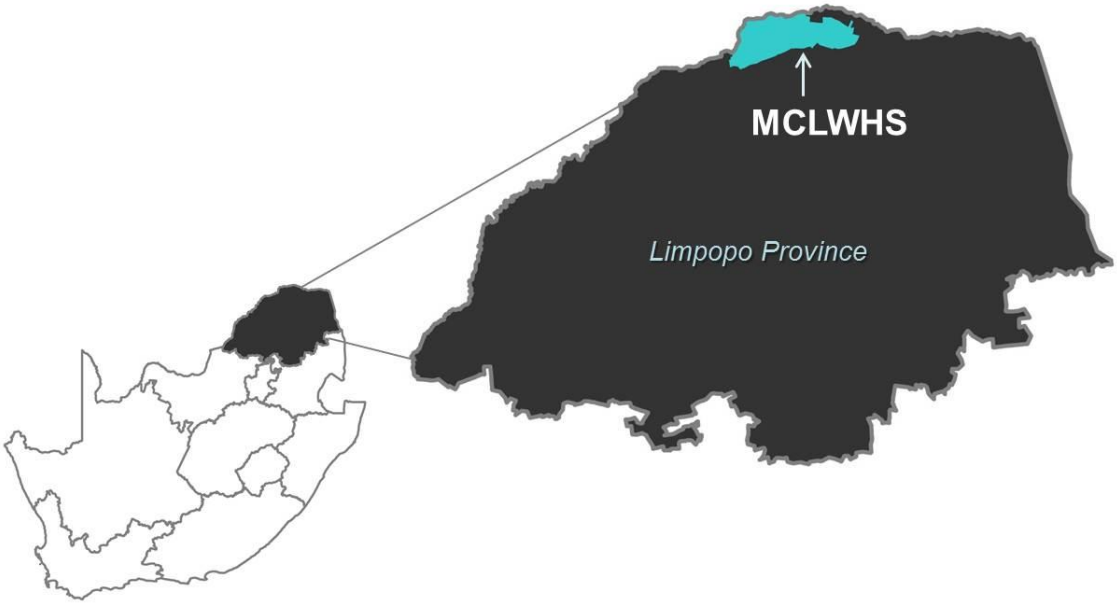



**Figure 3: MCLWHS & Buffer National and Provincial Geographical Context**

Mapungubwe is an open, expansive savannah landscape situated in the physiographic region known as the Lowveld in an ancient valley that includes the confluence of the Shashe and Limpopo Rivers (**Figure 4**).

Mapungubwe falls predominantly within the Vhembe District Municipality and the Musina Local Municipality. A small part of the buffer zone in the south-western corner is situated in the Capricorn District Municipality and the Blouberg Local Municipality.

The coordinates of the MCLWHS are as follows:

- NW corner 22°12’56”S 29°08’22”E;
- NE corner 22°10’10”S 29°29’04”E;
- SE corner 22°14’15”S 29°31’35”E; and
- SW corner 22°17’40”S 29°12’00”E.

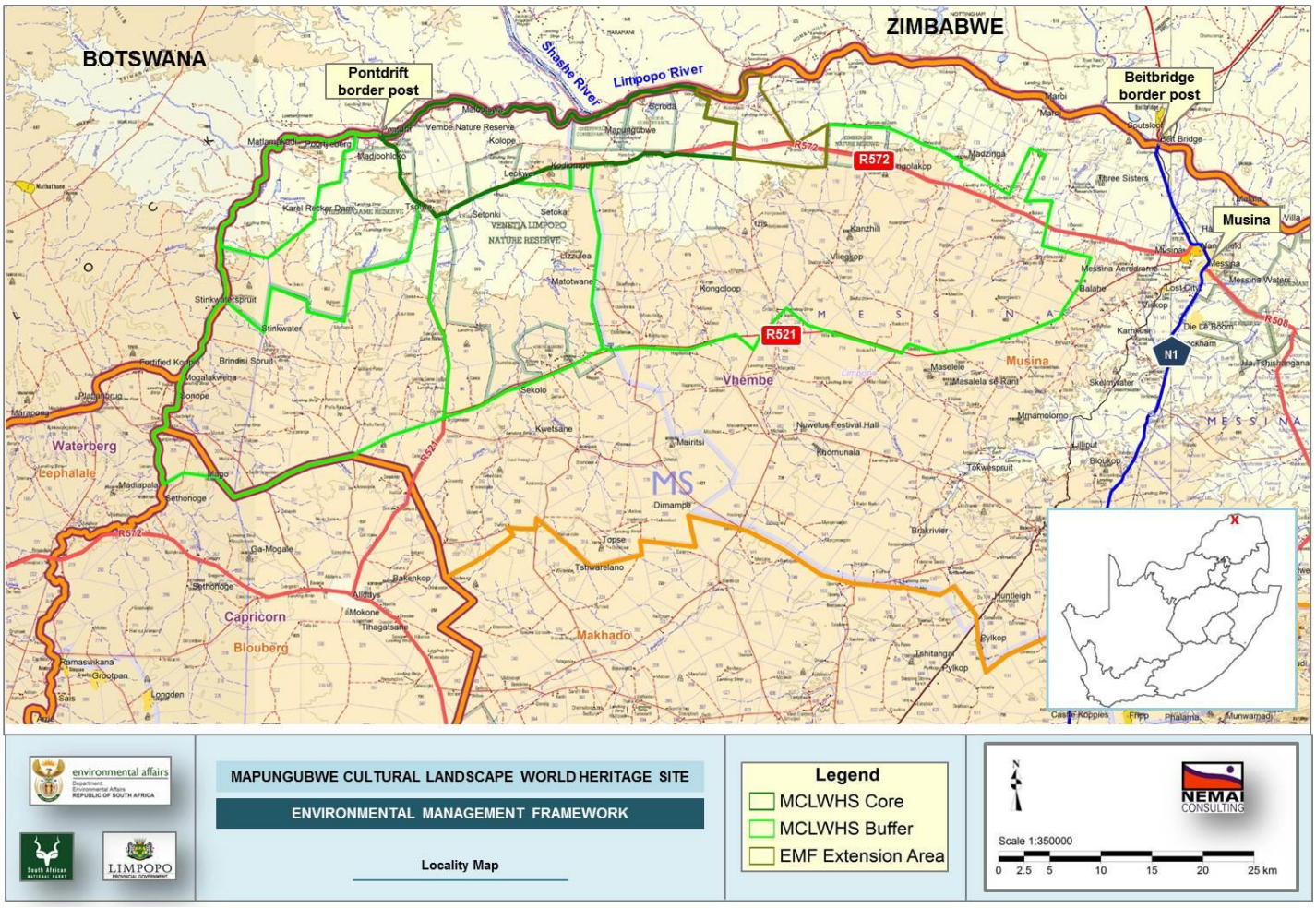



**Figure 4: Localty Map**

## 1.3 MCLWHS Boundaries

### *1.1.1 Core Area*

The core of the WHS is 28 168.66 ha in extent and is made up of 22 original farms (DEA, 2013). According to the WHS nomination dossier (DEAT, 2002), the boundaries of the MCLWHS correspond to the Vhembe-Dongola National Park which was later re-named to the Mapungubwe National Park (MNP). These boundaries are as follows (**Figure 4**):

- North - Limpopo River;
- West - Alldays-Pont Drift road;
- South - Messina-Pont Drift road and the boundary of the farm Riedel; and
- East - the boundary of the farm Riedel and the western side of the irrigated lands on the farm Weipe.

The prominent land uses in the WHS and its buffer include conservation, agriculture and mining as well as the other related developmental activities such as tourism and infrastructure development.

### *1.1.2 Buffer Zone*

The 2009 proclaimed buffer zone is significant in size as it covers approximately 237 100 ha of land on the western, southern and eastern part of the core (DEA, 2013). The buffer zone comprises the following (**Figure 5**):

- Venetia-Limpopo Nature Reserve;
- Vhembe Nature Reserve;
- Limpopo Valley Game Reserve as well as privately owned land including land owned by Anglo American Coal; and
- Privately owned land in the north-western and south-western part of the buffer zone.


**Figure 5: Core Area and Buffer Zone of MCLWHS**

### *1.1.3 Proposed New Buffer Zone*

There is a new proposed buffer zone which is 104 800ha in size which is significantly smaller than the existing buffer zone which is currently 237 000ha in size. See Fig.10 below showing proposed buffer zone.

**BOX 2**

### Mapungubwe's World Heritage Site Status

*Over a thousand years ago Mapungubwe represented one of the most powerful African Iron Age states or kingdoms, renowned for its power and trade that dominated southern Africa. The MCL was inscribed on the United Nations Education, Scientific and Cultural Organization's (UNESCO) World Heritage List on the 5th of July 2003 based on the following:*

- ***Criterion (ii):*** *The Mapungubwe Cultural Landscape contains evidence for an important interchange of human values that led to far-reaching cultural and social changes in Southern Africa between AD 900 and 1300.*
- ***Criterion (iii):*** *The remains in the Mapungubwe cultural landscape are a remarkably complete testimony to the growth and subsequent decline of the Mapungubwe state which at its height was the largest kingdom in the African subcontinent.*
- ***Criterion (iv):*** *The establishment of Mapungubwe as a powerful state trading through the East African ports with Arabia and India was a significant stage in the history of the African sub-continent.*
- ***Criterion (v):*** *The remains in the Mapungubwe cultural landscape graphically illustrate the impact of climate change and record the growth and then decline of the kingdom of Mapungubwe as a clear record of a culture that became vulnerable to irreversible change*

*In Government Notice No. 71 of 30 January 2009 (GN 31832) the then Minister Marthinus van Schalkwyk declared the MCL as a World Heritage Site in terms of the World Heritage Convention Act (Act No. 49 of 1999), and delegated specified powers of management to SANParks. The park name was changed to Mapungubwe National Park (MNP) on 30 July 2004 (GN 900 in GG 26602).*

### *1.1.4 Extended area*

No buffer zone exists to the east of the WHS, where threats exist due to current and proposed land uses (notably mining and to a lesser extent agriculture). The EMF Study area was thus extended to include the gap between the current core area and Vele Colliery (as shown in **Figure 6**).

The extended area incorporates the following properties:

- Bismarck 116 MS;
- Portion 1 of Newmark 121 MS;
- Katina 805 MS;
- Skutwater 115 MS; and
- A portion of the Remainder of Weipe 47 MS, as well as Portions 2, 3, 4, 5 and 6 of Weipe 47 MS.

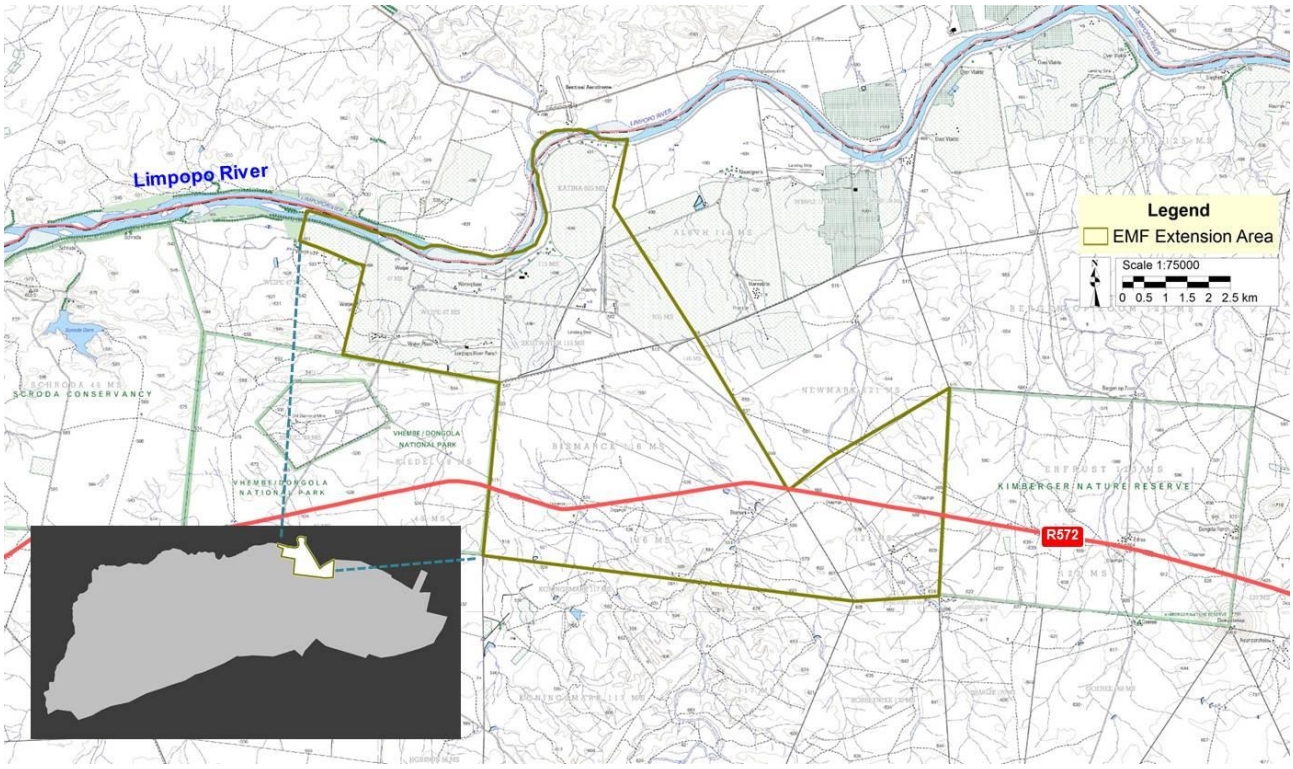



**Figure 6: MCLWHS EMF Extension Area**

### *1.1.5 Land Ownership*

The nature of land ownership within the core and the buffer is diverse and it mostly includes contractual partners, private owners, communal land owners, land claimants, private tourism operators, commercial and subsistence farmers (DEA, 2013).

The State Party is still striving to acquire all the pieces of land in the core where the owners are willing to sell but there are cases of owners who prefer to retain land ownership. The intention is for land use in the WHS to remain that of conservation whether the properties remain under private ownership or are transferred to the state. The farms located in the core area (Mapungubwe National Park) are listed in **Table 1**. The Management Authority (SANParks) has agreements with private landowners whose properties form part of the core. SANParks is responsible for conservation in the WHS and in managing the property. It is noted that in some areas the core boundary doesn't follow existing cadastral boundaries.

**Table 1: Farms within the core of the MCLWHS (DEA, 2013)**

| Farms Name | Farm Description | Land Owner |
|---|---|---|
| **SCHRODA** | Portion 4,7,8 of 46MS | De Beers Consolidated Mines Ltd |
| **DEN STAAT** | Remainder 27MS | South African National Parks |
| **WELTON** | Farm 34MS | Kariba Trust |
| **RIEDEL** | Portion 1 of 48MS | Nasionale Parketrust van Suid-Afrika |
| **GREEFSWALD** | Farm 37MS | Republic of South Africa |
| **BALERNO** | Portion 1 of 18MS | South African National Parks |
| **HAMILTON** | Remainder 41MS | |
| **JANBERRY** | Portion 1 of 44MS | |
| **TUSCANEN** | Remainder 17MS | |
| **SAMARIA** | Portion 4 of 28MS | South African National Parks<br>Mr. S.I Sematla – Machette land claimants |
| **WELTON** | Farm 16MS | *ZZ2* - Mr. B van Zyl |
| | Portion 1 of 17MS | *To be confirmed* |

To expand on the preceding table, the farms within the core can be divided as follows (according to DEA, 2013):

- Inside the core area the farms that have been proclaimed as part of the MNP and WHS and are under the management of SANParks include the following (measuring 15 311 hectares in extent):
  - Welton 16;
  - Tuscan 17;
  - Balerno 18;
  - Remainder of Den Staat 27;
  - Samaria 28;
  - Greefswald 37;
  - Hamilton 41;
  - Janberry 44;
  - Schroda 46 (owned by De Beers);
  - Riedel 48;
- The farms that are privately owned within the core, which were proclaimed in 2009 as part of MNP and the WHS and are under the management of SANParks are as follows (these 12 privately owned farms measure 12 703.31 hectares in extent):
  - Portion 0 & 5 of Pont Drift 12;
  - Portion 0 & 1 of Modena 13;
  - Portion 1 of Tuscan 17;
  - Portion 1 of Den Staat 27;
  - Portion 1 & 2 of Samaria 28;
  - Portion 0 of Machete 29;
  - Portion 0 of Hackthorne 30;
  - Portion 0 of Athens 31;
  - Portion 0 of Welton 34;
  - Portion 0 of Janberry 44;
  - Portion 0 of Weipe 47;
  - Portion 0 of Riedel 48;
- The land that is owned by Friends of Peace Parks has not yet been proclaimed but is managed contractually by SANParks as part of the MNP includes the following land parcels (measuring 4498.958 hectares in extent):

- Mona 19
- Portion 0 & 1 of Armenia 20
- The remainder of Rhodes Drift 22
- Little Muck 26.

Proclaimed private nature reserves within the net extent of the 2009 proclaimed buffer zone include the following (DEA, 2013):

- Balaai PNR gazetted on 21/5/1969 on farm Ehrenbreitstein;
- Boet van der Merwe PNR gazetted on 15/12/1965, on farm Aannstonds;
- Club Ranch PNR, gazetted on 26/02/1958, on farm Tweestroom, Krenggatbok, Roly Poly, Spitskop, Brindisi, Junction, Shangha, Stembok, Cirencester, Suikerfontein and Lintie;
- Dongola Belvedere PNR gazetted on 15/02/ 1967 on farm Belvedere;
- JS Gouws PNR gazetted on 29/08/1962 on farm Lauriston, Fleischerton. Farm Arcadia falls under the proposed buffer area;
- Schulenburg PNR gazetted on 11/7/1956 on farm Eendvogelpan; and
- Kremetfontein PNR gazetted on 11/07/1956 on farm Seldomgezien.

## 1.4 EMF Objectives

As the norm, an EMF aims to achieve the following:

- Promoting sustainability;
- Securing environmental protection; and
- Promoting cooperative environmental governance.

Within this context, the primary objectives of the MCLWHS EMF include the following:

1. To facilitate decision-making to ensure sustainable management of significant cultural and environmental features in the WHS and its buffer zone;
2. To provide strategic guidance on environmental, economic and social issues in the WHS and its buffer;
3. To identify cultural and environmentally sensitive areas;
4. To identify the environmental and development opportunities and constraints;
5. To assess the economic and environmental potential of the area;
6. To provide a decision support system in respect of environmental issues and priorities in the EMF area; and
7. To include existing policies as frameworks for establishing values, guidelines and standards for future developments.

In its formal context, the EMF that is adopted by the Minister or MEC will be taken into consideration when reviewing applications for environmental authorisation in or affecting the areas to which the EMF applies.

# EMF DRIVING FORCES

SECTION 2

# 2 MCLWHS EMF DRIVING FORCES

Before the process of developing an EMF is initiated, it is necessary to understand the reasons for identifying the need for such a management tool within the context of the MCLWHS. This sets the scene for creating an EMF that meets the specific needs of the area in question and which is tailored to relevant environmental priorities and goals.

The main EMF triggers can be categorised as shown in **Figure 7**, which are elaborated on in the subsections to follow.

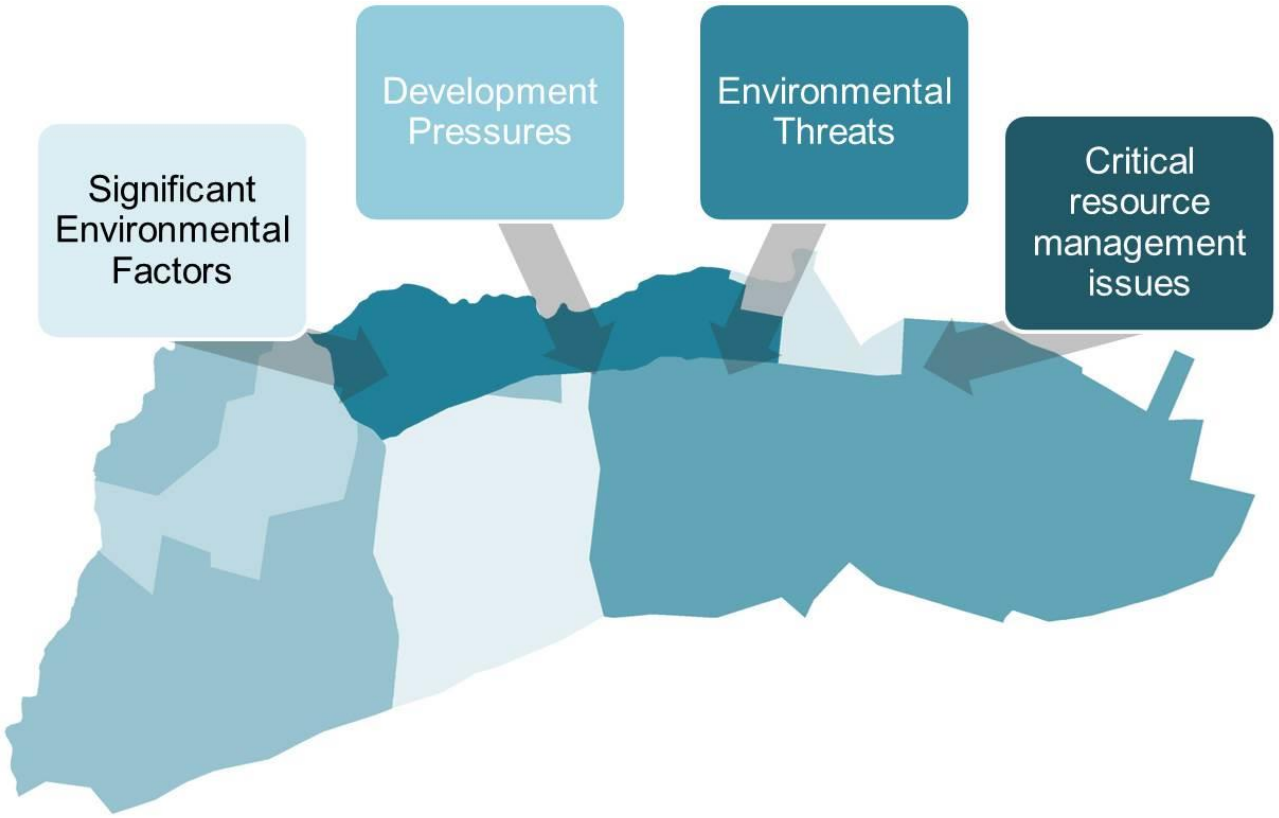



**Figure 7: EMF Triggers**

## 2.1 Significant Environmental Factors

The following significant environmental factors contributed as catalysts for the initiation of the EMF. Further discussions on the environmental strengths, weaknesses, opportunities and threats for the MCLWHS's key environmental features and attributes follow in the Environmental Management Priorities section.

### 2.1.1 *Ecological and Cultural Factors*


- The site of Mapungubwe was inscribed on the World Heritage List in March 2003 (see **Box 2**), on the basis of criteria ii, iii, iv and v. This prestigious status needs to be maintained and supported and the Outstanding Universal Values of the MCLWHS require appropriate safeguarding. Some of the significant features include –
  - Remains of palaces (Mapungubwe period);
  - Archaeological remains testifying to Mapungubwe's growth 900-1200 A.D.;
  - Remains of early settlement - Stone Age, Rock Art, Early Farming Communities and Iron Age;
  - 'Natural' landscape surrounding the built remains;
  - Intangible heritage - Mapungubwe Hill associated with sacredness, beliefs, customs and traditions of local communities;
  - Living heritage - continuing traditions and associations such as rain making, and participation by local communities in reburial ceremonies; and
  - Landscape sharing and interaction between farmers and hunter-gatherers.
  - Demonstrating the interconnectedness between cultural and natural resources
- The core of the WHS is a national park that needs to be conserved.
- The MCLWHS forms one of the core areas of the Vhembe Biosphere Reserve (VBR), with associated high biodiversity.
- A process is underway to establish the Greater Mapungubwe Transfrontier Conservation Area (GMTFCA) between South Africa, Botswana and Zimbabwe, which will serve as an important buffering mechanism for both the core and buffer zones. According to the GMTFCA TTC (2010), the planning domain for the TFCA is based on a combination of catchment, cadastral and cultural boundaries and aims to provide insight into the ecological, environmental and economic parameters within which the TFCA development will take place. A contiguous area within the TFCA consisting of the Mapungubwe National Park, Venetia Limpopo Game Reserve, the Northern Tuli Game

Reserve, the Tuli Circle Safari Area, portions of wildlife management areas in Zimbabwe, as well as Sentinel Ranch; Nottingham Estate and River Ranch, comprise the Transfrontier Park, while the surrounding area makes up the TFCA (GMTFCA TTC, 2010).

- The Limpopo River, which forms the northern border of the WHS, is an important and strategic watercourse.
- The area is afforded substantial visual quality through its topographic features. This also contributes to Mapungubwe's distinctive sense of place.
- Threats to the greater area's biodiversity include mining, habitat loss through fragmentation, agriculture, alien species invasion, climate change, unsustainable harvesting of natural resources and poor land use practices in general.

### *2.1.2 Socio-economic Factors*



- In the greater Musina Local Municipality, agriculture and mining are the main contributors to the economy at 35% and 30%, respectively. Tourism is also a key economic contributor in the EMF study area, which is reliant on the ecological and cultural features in Mapungubwe.
- The study area is strategically located in terms of two international border posts (Pontdrift – Botswana; Beitbridge – Zimbabwe) and the proximity to the town of Musina (approximately 10km to the east).
- The study area is traversed in a west to east direction by two key provincial roads, namely the R512 and R572. The N1 national road also lies less than 15km to the east.
- There is a wealth of scientific knowledge associated with Mapungubwe.
- The general area is underlain by rich deposits of mineral resources.
- Large-scale agricultural practices occur within and around the study area.
- There is a shortage of job opportunities and job creation in the Musina Local Municipality.

### 2.1.3 *Institutional Factors*

- Due to the various environmental features (including heritage, biodiversity, protected areas, water resources, mineral resources, infrastructure, etc.) and land uses (conservation, mining, agriculture, game farming) that are related to Mapungubwe and the associated legislation that governs their management, there are several public sector authorities from the various spheres of government (national, provincial and local) that have a mandated role to play in the greater area.
- Cooperative governance is central to the effective management of the MCLWHS.
- Compliance and enforcement of potential impacting land uses need to be stringently executed and effectively coordinated.
- Stakeholder engagement needs to be adequately pursued and promoted.

### 2.1.4 *EMF considerations*

The EMF will address the Significant Environmental Factors, within the limitations of the functions of the framework stipulated in the EMF Regulations (2010), as follows:

**Significant Environmental Factors**

**EMF SCOPE:**

- ☑ Sensitivity Analysis.
- ☑ Management of significant natural and cultural features.
- ☑ Incorporate exiting policies, strategies, plans and programmes.
- ☑ Alignment with management and planning requirements of the MNP, VBR and GMTFCA.
- ☑ Establish balanced Desired State.
- ☑ Identify sustainability principles.
- ☑ Incorporate exiting policies, strategies, plans and programmes.
- ☑ Approaches to co-operative government.
- ☑ Suggestions for institutionalising the EMF.
- ☑ Allocation of responsibilities between authorities.

## 2.2 Development Pressures & Environmental Threats

The development pressures linked to the MCLWHS stem primarily from the land use potential. The two major driving forces in this regard include the mineral resources and alluvial deposits along the Limpopo River, which are associated with the mining and agricultural industries, respectively. Tourism and game farming, to a much lesser extent, if uncontrolled can also pose a threat to the values of the WHS.

### *2.2.1 Mining*

According to the 2012/13-2016/17 Integrated Development Plan (IDP) for the Vhembe District Municipality, the mining sector is regarded as one of the three pillars of the Limpopo Province, hence its strategic importance to the development of the economy of the district.

Mining potential in the EMF study area, as shown in **Figure 8**, is regarded as high due to rich mineral deposits (primarily coal and to a much lesser extent diamonds).

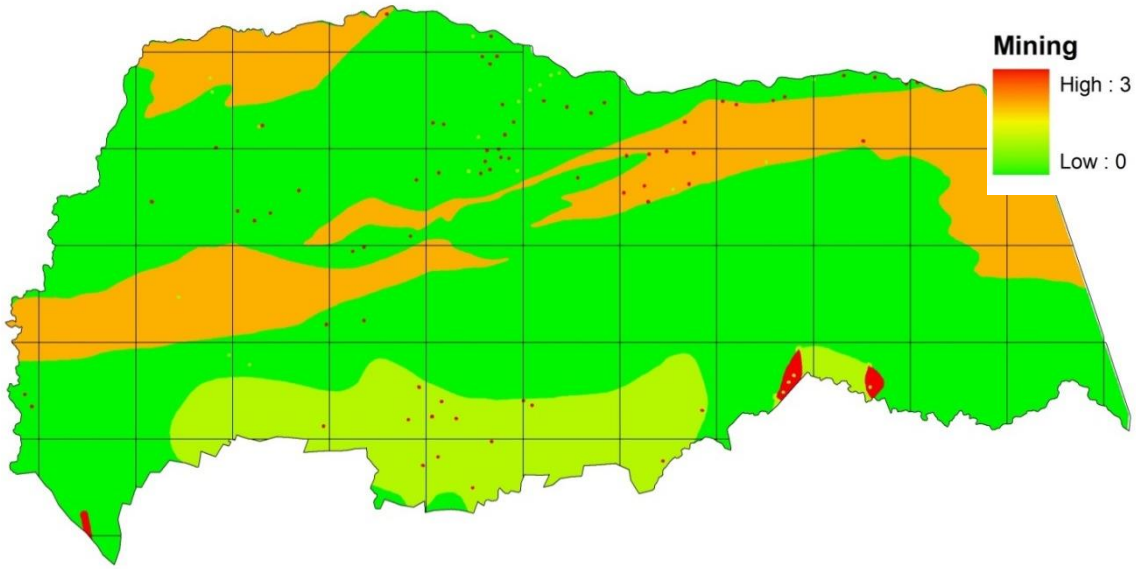



**Figure 8: EMF Triggers**

There are two operational mines in the greater Mapungubwe area, namely Vele Colliery and Venetia Mine. A small portion of the farm Riedel in the eastern part of the Park has been kept on in the hope that it will yield profitable mining operations. A number of

prospecting rights have also been granted in the gazetted buffer of the WHS (refer to **Figure 9**).

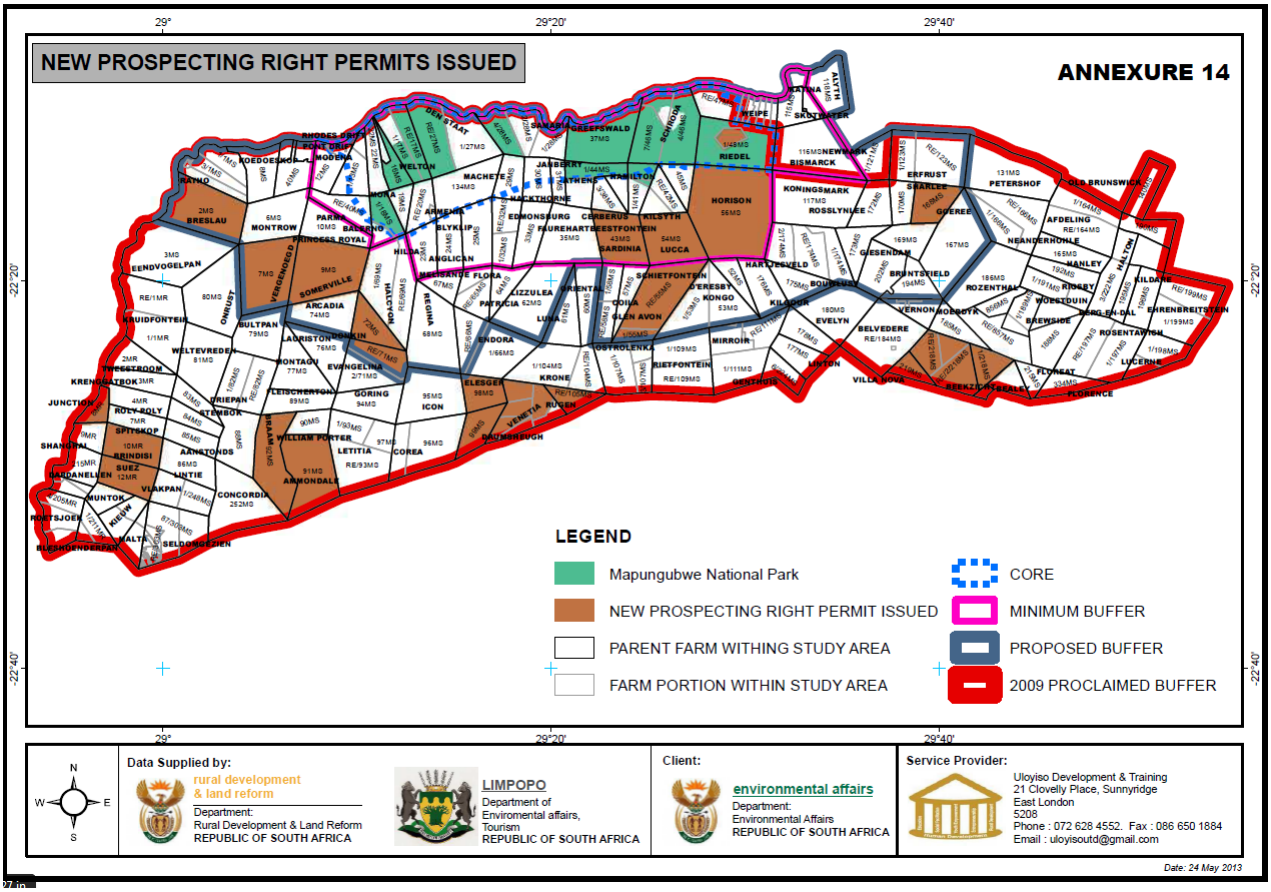



**Figure 9: Mining in Mapungubwe (DEA, 2013)**

Vele Colliery is situated approximately 7 km east from MNP. The mine spans over the farms Overvlakte 125 MS (Portions 3, 4, 5), Bergen op Zoom 124 MS, Semple 155 MS and Voorspoed 836 MS and covers an area of 8,663 ha. The mine is owned by the Limpopo Coal Company (Pty) Ltd is a subsidiary of Coal of Africa Limited. Vele Colliery is located in the Limpopo Coalfield that forms part of the greater Tuli Block Coalfield. It consists of three geological entities - the Limpopo Mobile bet basement (3.4 – 2.0 billion years old), the Karoo sequence (240 – 160 million years) and Quatemary deposits (<10 million years). According to the mine's Environmental Management

Programme (2 009), the economically viable coal reserve to be mined by Vele Colliery is estimated at more than 441 million tonnes and the mine has a planned life of 29 years, with a potential for future expansion.

It has been noted that Vele Colliery is no longer operational. According to a report in Business Day Live (BD Live; 03/02/2014), all operations at the mine were suspended while the plant is modified so that it can produce a number of different coking and thermal coal products. Work is scheduled to be completed by the end of the calendar year.

Venetia Mine, which is located approximately 14 km south of the MNP, is a major diamond mining operation opened in 1992 by De Beers Consolidates Mines. The Venetia kimberlite cluster comprises twelve, Group I kimberlite bodies. The two largest pipes are currently being mined in a single open pit operation. The mine anticipates that its current open pit operations will cease between 2020 and 2023 (Pistorius, 2011). According to input received from SANParks (May, 2014), Venetia Mine has commenced with underground mining.

Venetia Mine is further surrounded to the north, east and west by the De Beers' owned Venetia Limpopo Nature Reserve and to the south lies Gotha Farm which conducts stock and game farming. The Schroda dam, dam wall and pump station which are located on the farm Greefswald 37MS within the MNP is the property of the Venetia Mine. Water is stored and pumped to the mine.

According to a recent land use audit of Mapungubwe (DEA, 2013), the number of mining applications accepted and those issued are an indication of what mining activities will take place in the Core area as well as in the buffer area. The activities shall vary according to the different stages of a mining project, from exploration to pre-feasibility to feasibility to construction and finally to full scale mining. It is interesting that there was a new prospecting right permit issued inside the Core, and that is in Riedel farm. The farms that fall inside the 2009 proclaimed buffer where the new prospecting right permits were issued include:

- Brindisi;
- Suez;
- Braam;
- Ammondale;
- Elesger;
- Drumsheugh;
- Venetia;
- Rugen;
- Beekzight; and
- Millanova.

The Limpopo-Tuli coalfield also contains a substantial amount of energy, mostly in the form of methane gas. Future pressure may arise to mine this resource.

Adverse impacts associated with mining in the context of the WHS and its buffer could include (amongst others):

- Visual impacts and influence to overall sense of place;
- Contamination of surface and groundwater resources;
- Consumptive use water in an area that is already water scarce;
- Impacts to air quality;
- Loss of biodiversity; and
- Damage to heritage sites.

Conversely, mining is a major economic driver in the region and provides employment opportunities. Mining also has a role to play in the maintenance of fences and other offset-type mitigation that could benefit the area.

### *2.2.2 Agriculture*

Agriculture forms part of the history of Mapungubwe, where the combination of soils derived from the rocks of the Karoo System, regular flooding of the Limpopo and its tributaries, good grazing and browsing lands and dry mopane leaves for fodder during the winter, provided the natural resources for both agriculture and stock farming that were

needed to sustain a large population when the leaders at Mapungubwe were at the height of their power. Climatic changes during the Little Ice Age in the fourteenth century AD were accompanied by lower rainfall in this part of Africa. As a consequence, it was no longer possible to sustain agriculture to feed a large population and the inhabitants of Mapungubwe dispersed at the end of the thirteenth century.

According to the nomination dossier, the natural landscape in Mapungubwe has been modified along the Limpopo River where commercial farming has been undertaken during the past century. This has changed the character of the floodplain in certain areas, particularly on farms on the eastern border of the core area. Cattle ranching was the main source of income for the past century or more and since the 1970s has been gradually replaced by game ranching and irrigation crop farming. Farm houses, farm buildings and staff accommodation have been built and various irrigation measures have been installed. Much of this development post-dates 1980 when electricity became available to farmers along the river and when local roads were upgraded and tarred.

The nomination dossier made the following two commitments with regards to agriculture in the WHS:

- Properties in the core area that have been or will soon be acquired in order to avoid conflicting land use, will be managed by SANParks. Any land that is to be included within the core must be submitted to the Department of Agricultural, Forestry and Fisheries (DAFF) for comment as this land is to be 'excluded' from demarcated agricultural land as managed under the Subdivision of Agricultural Land Act (Act No. 70 of 1970);
- Within the Park agricultural land will be decommissioned and gradually rehabilitated, and therefore the Park will halt any further agricultural encroachment; and
- Farming in the core area has either ceased already or will be phased out over the next five years.

According to the land use audit (DEA, 2013), most of that land is under natural grazing (2 751 ha) whilst 1 286 ha lies fallow; citrus takes about 715 ha, maize covers about 523 ha, whilst tomato takes about 351 ha, cotton covers about 46ha and the rest goes to other crops including planted pastures and perennial crops, lucerne, medics, weeds and fallow lands (refer to **Figure 10**). Most of the edible crops are along the Limpopo River.

The MNP Management Plan (SANParks, 2013) acknowledges that localised and surrounding farming activities remain a threat to Mapungubwe, as the park is not consolidated and has large scale commercial farming activities in and around the park.

The impacts of commercial agriculture include the following:

- Water abstraction;
- Eutrophication of the Limpopo River due to nutrient-rich runoff (fertilizers);
- Water born invasive alien plants;
- Bush clearing and ploughing of natural bush (especially the riparian woodland);
- Ploughing of cultural sites; and
- Degradation of wetlands.

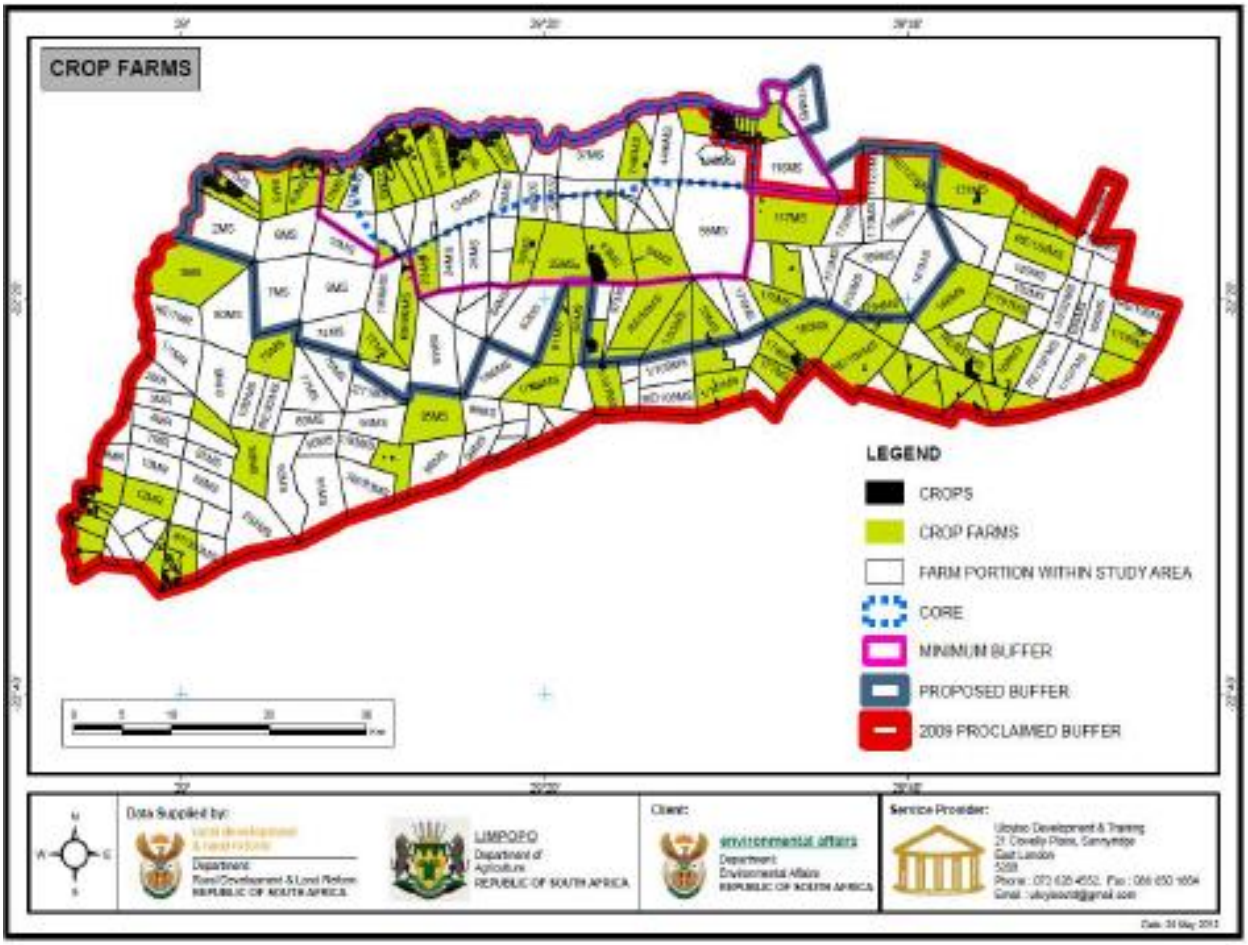



**Figure 10: Crop Farms in Mapungubwe (DEA, 2013)**

Despite the negative aspects associated with agriculture, the labour intensive agricultural practices that take place along the Limpopo River (particularly in the Weipe area to the east of the WHS core) currently provide employment to a high number of local people to service the citrus, vegetable and other crop industries.

From a DAFF perspective, it can also be acknowledged that if the natural agricultural resources and agricultural land uses are management properly, agriculture can complement the conservation status of MNP via the Conservation of Agriculture Resources Act (Act No. 43 of 1983).

### *2.2.3 Game Farming*

Private game farms occur within the buffer zone. This land use is regarded as compatible with the conservation of the WHS core. Current game farming practices need to be conducted in accordance with best practices (e.g. veld management, carrying capacity assessment and stocking, hunting, fences, etc.) to optimise the supportive and functional role of the buffer zone to the core. Collaboration between these private landowners and SANParks is necessary to ensure that the WHS is managed in a coordinated manner.

Comments received indicate that some landowners have not been included in Fig. 12 below. It is noted that land owned by Anglo American Coal South Africa is being managed as private game farming areas. The properties are as follows:

- Sardinia 43MS
- Lucca 54MS
- Coila 58MS (portion 1)

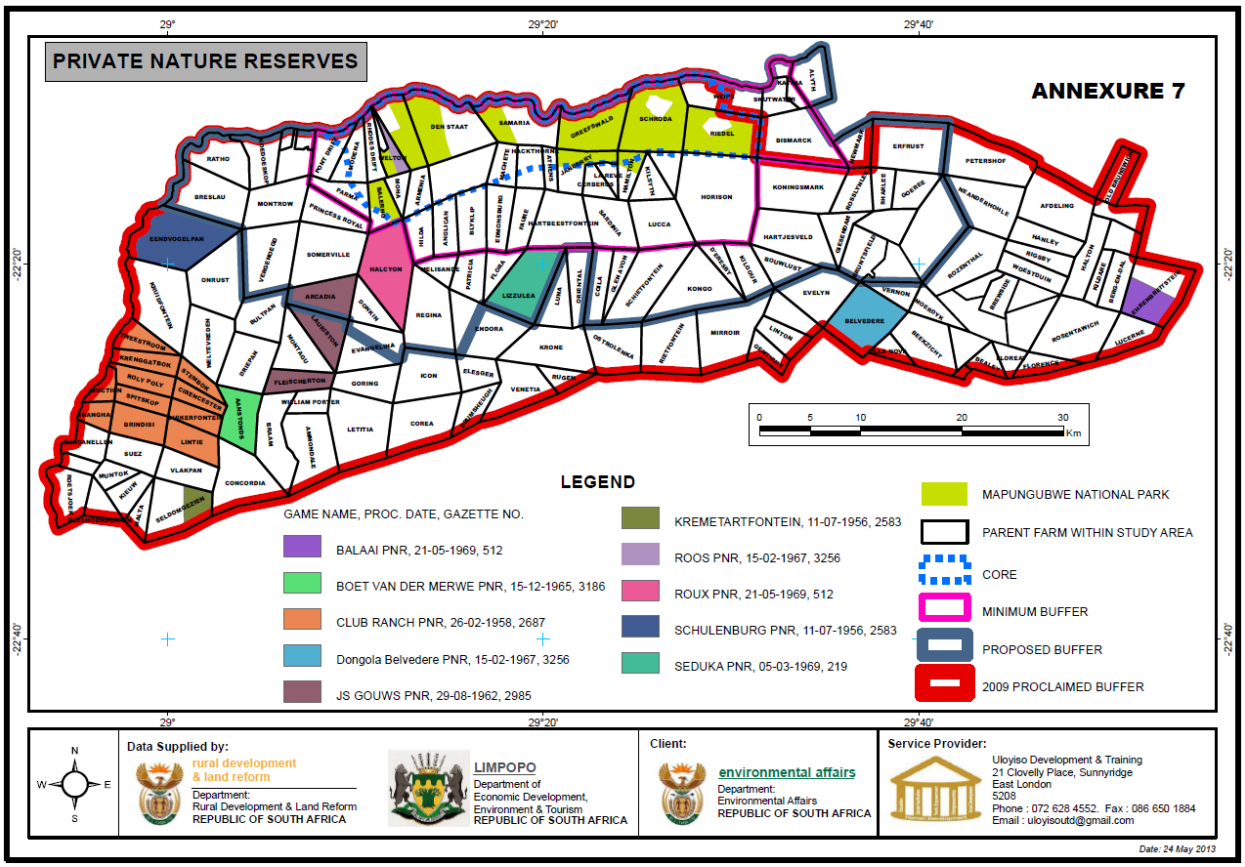



**Figure 11: Game Farms in Mapungubwe (DEA, 2013)**

There is an intention amongst some of the private landowners to drop fences their fences to create a much larger combined private reserve. Further information regarding this venture is required to determine the implications for the EMF.

### *2.2.4 Tourism*

SANParks promotes tourism in the MNP to generate income in support of the conservation of cultural and biodiversity assets, while affording tourists the opportunity to enjoy the nature based products and activities (SANParks, 2013).

Pressures from visitors to the MNP or tourism in general can potentially negatively affect the WHS. Poorly managed tourism could have a substantial impact on the heritage sites, through trampling of deposits, graffiti, damage to paintings and other artefacts, and removal of archaeological material such as pottery and beads. Uncontrolled tourism

development in the buffer zone could potentially also pose threats to the values of the WHS.

The MNP Management Plan makes provision for a Responsible Tourism Programme which strives to strike a balance between providing a range of products and activities for the appropriate use, appreciation and enjoyment by visitors while having minimal impact on cultural and biodiversity assets.

### *2.2.5 Land Claims*

At the time of inscription, there were a number of land claims in the Mapungubwe area of varying levels of credibility.

The land claims in Samaria and Den Staat farms have been settled in part and the outstanding areas of restitution settlement still need to be addressed by the Land Claims Commission and the Department of Rural Development and Land Reform. According to DEA (2013), the claimants have expressly shown that they will continue with agricultural farming practices producing maize, butternut, peppers, watermelons and such crops.

### *2.2.6 Natural Disasters*

Natural disasters, specifically flooding and fires, present a threat to the WHS. The severity of this threat depends on the preparedness for such disasters. The MNP Management Plan strives to address certain of these threats.

DEA (2013) noted that floods during the 2012-2013 summer had a significant adverse impact on Mapungubwe natural landscape and the bridge on the main road between Musina and Mapungubwe was washed away and is still not repaired to date. Animals were also lost as a result of this flood.

SANParks is in the process of developing a disaster management plan that will specifically address floods and fires in the MNP.

### *2.2.7 Climate Change*

Interestingly, it is recorded that climate change forced the large farming population of Mapungubwe to disperse around 1300 AD.

The current and future threat of climate change is compounded by the low rainfall and high evaporation levels encountered in the area. Future threats from climate change to the WHL need to be clearly understood, especially with regards to the impact on the watercourses (including wetlands) and overall biodiversity, as well as the mitigatory measures that need to be put into place. Within the buffer zone, land uses such as agriculture and mining also need to form part of an overall strategy to deal with climate change.

### *2.2.8 EMF considerations*

The EMF will address the Development Pressures and Environmental Threats, within the limitations of the functions of the framework stipulated in the EMF Regulations (2010), as follows:

**Development Pressures & Environmental Threats**

**EMF SCOPE:**

- ☑ Understand pressures and impacts associated with Development Pressure and Environmental Threats.
- ☑ Involvement of related sectors in EMF Public Participation process.
- ☑ Establish balanced Desired State.
- ☑ Identify sustainability principles.
- ☑ Incorporate exiting policies, strategies, plans and programmes.

## 2.3 Critical Resource Management Issues

### *2.3.1 WHS Commitments & ICOMOS Issues*

The table to follow lists the commitments that were made for the WHS at the time of inscription, as well as the issues raised by the International Council on Monuments and Sites (ICOMOS).

**Table 2: WHS Commitments and ICOMOS issues raised at the time of inscription (adapted from DEA, 2013)**

| | Commitment | Status |
|---|---|---|
| **Buffer** | Buffer zone boundaries needed to be addressed to comply with ICOMOS recommendations at the time of the inscription | The following studies were initiated by DEA to address the shortcomings of the gazetted buffer:<br>❖ The audit of land use activities in and around MCLWHS<br>❖ Review of the MCLWHS buffer zone<br>❖ EMF |
| **TFCA** | TFCA with the neighbouring countries needed to be defined as this was stated in the nomination dossier as providing an extra layer of protection beyond the buffer zone. | Process underway to establish TFCA. Signing of treaty pending. |
| **Conservation** | Properties in the core area shall be acquired in order to avoid competing land use. | ❖ A number of Private Nature Reserves and privately owned farms are in the process of inclusion into the Mapungubwe National Park<br>❖ Portion 27/1MS of Den Staat farm is part of the Land Claim & is being acquired to be part of the Park. |
| **Agriculture** | Within the proposed boundary, land currently intensively farmed will in time be decommissioned and gradually rehabilitated, halting any further agricultural encroachment. | Not achieved. Farmers within the core do not want to sell their farms. |
| | Agricultural operations around the site had to be kept under control | To be addressed by EMF (amongst others). |
| **Mining** | Impact of mining shall be closely monitored and footprints shall not be allowed to expand. | Not achieved. New prospecting permit applications were issued and mining rights were approved. |

The EMF will need to consider how the achievement of these commitments can be supported. The underlying issues related to some of these commitments have been identified as the triggers for the initiation of the EMF (e.g. pressures from land uses such mining and agriculture).

### *2.3.2 Buffer Zone*

In order to provide some form of protection to the outstanding universal value of Mapungubwe, the Minister of Environmental Affairs gazetted the World Heritage property together with the buffer zone as a World Heritage Site. The current gazetted buffer zone does not coincide with the buffer zone envisioned in the original nomination dossier of 2003. No buffer zone exists to the east of the WHS, where threats exist due to current and

proposed land uses (notably mining and to a lesser extent agriculture). This area is under private ownership and would require agreements from the relevant landowners if the buffer were to be extended.

A study was commissioned to review the size of the 2009 proclaimed buffer and align land uses to the promotion of conservation and biodiversity in and around the core of the MCLWHS. According to the audit of land use activities (DEA, 2013), there is a strong view that the 2009 Proclaimed buffer zone is too large and therefore not practical for a coherent environmental management plan as well as for a balanced approach considerate of the South African development priorities around the world heritage property, in the context of competing land uses.

The Limpopo River, which serves as the northern boundary of the WHS, forms the frontier between South Africa and the neighbouring states of Botswana and Zimbabwe. A Trilateral Memorandum of Understanding was drawn up with the objective of establishing a TFCA. As was alluded to in the 2003 nomination dossier, this very extensive area (5,040 $km^2$) will constitute a very effective buffer zone. It was intended that each country would concentrate on one facet of protection: cultural heritage in South Africa, wildlife in Botswana, and living cultures in Zimbabwe. To date the TFCA has not yet been established and the WHS cannot yet benefit from the protection that will be afforded by this proposed area. The three countries have already agreed on the final draft of the TFCA treaty at a Ministerial level.

### *2.3.3 Maintaining the MNP's Fence*

The park is responsible for the management and maintenance of the southern, eastern and western perimeter fences. This fence is a 2, 4 m high game proof fence that spans 104 km (SANParks, 2013).

The northern veterinary fence spans almost 47 km along the Limpopo River, and is maintained by the Department of Agriculture, Forestry and Fisheries. The maintenance of the SANDF and veterinary fences does not receive the necessary attention, and certain

portions are in a state of disrepair. SANParks communicated in May 2014 that the northern veterinary fence had been removed.

### *2.3.4 EMF considerations*

The EMF will address the Critical Resource Management Issues, within the limitations of the functions of the framework stipulated in the EMF Regulations (2010), as follows:

**Critical Resource Management Issues**

**EMF SCOPE:**

- ☑ Support WHS commitments.
- ☑ Seek alignment with the study commissioned to review the proclaimed buffer. Make recommendations on buffer zone, based on outcomes of EMF.
- ☑ Incorporate exiting policies, strategies, plans and programmes.
- ☑ Establish balanced Desired State.
- ☑ Incorporate exiting policies, strategies, plans and programmes.

# EMF DEVELOPMENT APPROACH

SECTION 3

# 3 EMF DEVELOPMENT APPROACH

The EMF development approach is consistent with the requirements stipulated in the following primary legislation that governs the process:

- The National Environmental Management Act (Act 107 of 1998) (NEMA), in particular Sections 2, 23 and 24; and
- The EMF Regulations (GN No. R547 of 18 June 2010), which make provision for the development, content and adoption of EMFs as a proactive environmental management decision support tool.

In addition, the MCLWHS EMF will also conform to the Guideline on Environmental Management Frameworks in terms of the EMF Regulations of 2010, Integrated Environmental Management Guideline Series 6 (DEA, 2010).

## 3.1 EMF Development Principles

In accordance with DEA (2010), the following principles have been applied in the development of the MCLWHS:

- The EMF is customised to the context of the WHS and its buffer zone;
- The EMF is undertaken with reference to environmental goals and priorities;
- The EMF strives to encourage sustainable development;
- The scope of the EMF is comprehensive enough to provide assistance to all levels and types of environmental and planning decision-making in the EMF study area;
- The EMF places specific focus on the issues and information that matter in decision-making;
- Bio-physical, social, economic, and other aspects that are relevant are reflected in the EMF;
- The EMF aims to be clear and easy to understand;
- The process of developing the EMF includes an appropriate level of public participation;
- The process of developing the EMF will be conducted impartially; and
- The EMF takes into consideration the legal and policy requirements as well as guidelines that are applicable to the MCLWHS and its buffer.

## 3.2 EMF Content

In accordance with the EMF Regulations (2010), the information contained in the EMF will ultimately reflect the following:

- An identification of the area – whether by map or otherwise;
- A specification of the environmental attributes in the area, including sensitivity, extent, interrelationship and significance of the attributes;
- An identification of any parts in the area to which the attributes relate to;
- An indication of the conservation status of the area;
- A description of the environmental priorities in the area;
- An indication of the kinds of developments and activities that would have a significant impact on those attributes and those that would not;
- An indication of the kinds of developments and activities that would be undesirable in the area or specific parts of the area;
- An indication of information gaps;
- The inclusion of a revision schedule for the EMF; and
- Any matters specified by the relevant or designated Minister or MEC.

## 3.3 EMF Methodology

An overview of the methodology to develop the EMF is contained in the sub-sections to follow, and is broadly presented in **Figure 12**.

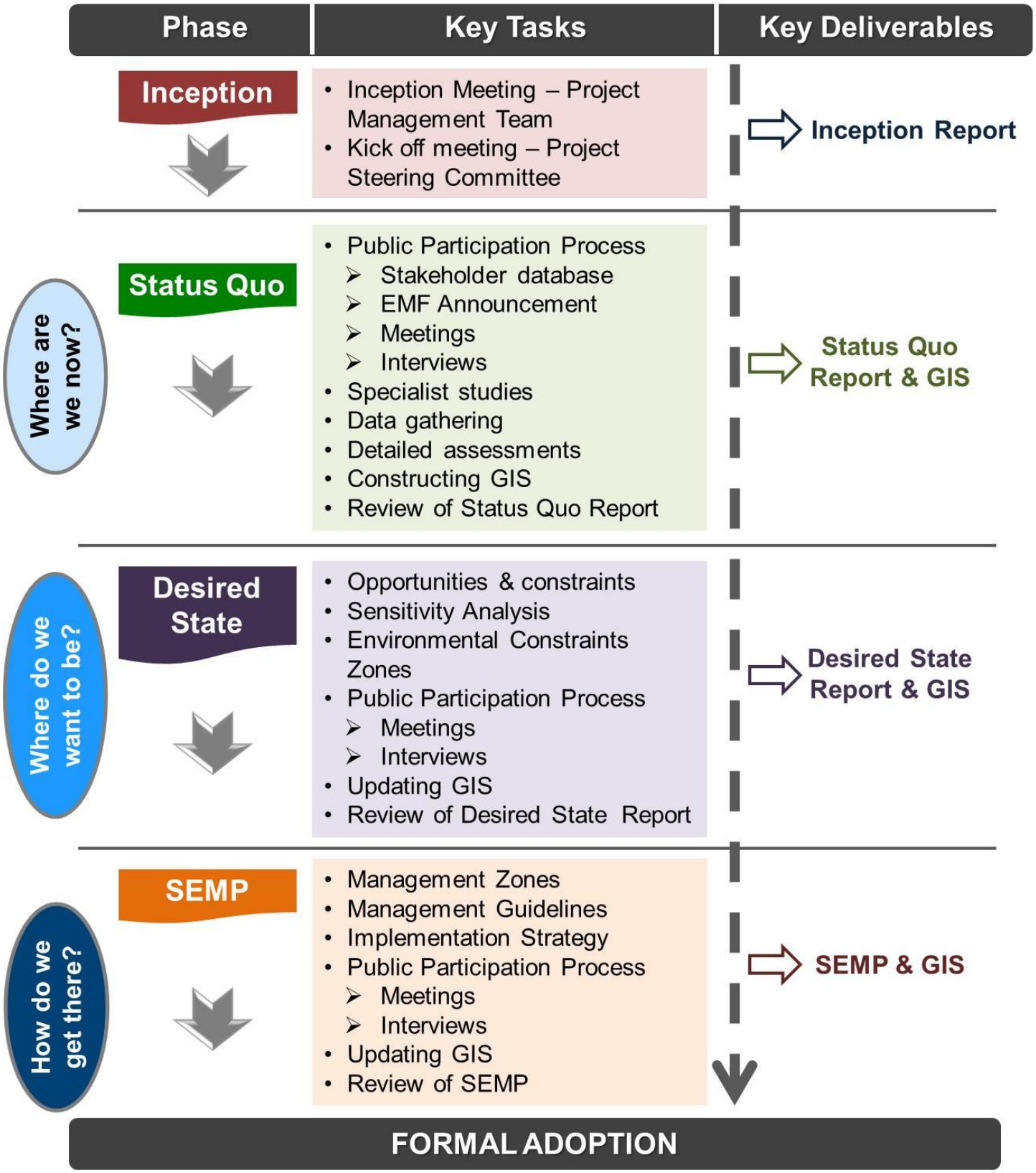
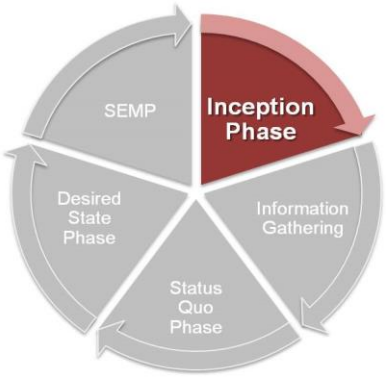



**Figure 12: Broad overview of EMF Development Process**

### 3.3.1 *Project Inception*




During the EMF Inception Phase the project scope was defined and accepted by the Project Management Team (PMT) and the Project Steering Committee (PSC). The PMT includes representatives from DEA, SANParks and LEDET, and are responsible for monitoring the project progress and operational matters. The PSC members include the respective government role-players and decision makers who are directly affected by the implementation of the EMF.

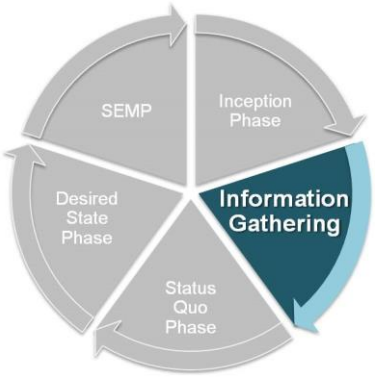
The Inception Report, which serves as a revised comprehensive, technical and financial proposal, includes the following:

- Confirmation of the Terms of Reference (ToR) and scope of work for the project;
- Project Management Plan;
- Project Team and Methodology;
- Project Deliverables;
- Project Programme;
- Project Communication and Stakeholder Engagement Plan;
- Project Budget and Timeframes;
- Skills and Knowledge Transfer Programme;
- Roles and Responsibilities;
- Adoption and Approval of the final product; and
- Project Monitoring and Reporting

The Inception Report was finalised following the requisite amendments, based on comments received from the PMT members.

| **Deliverable:** | Inception Report |
|---|---|

### 3.3.2 *Information Gathering*




Information will be gathered throughout the compilation of the EMF, where the purpose will include:

- Establishing the status quo of the by gathering and interpreting biological, physical, social and economic data;
- Determining the environmental opportunities and constraints,
- Identifying development pressures and trends; and
- Defining management priorities and guidelines.

The data gathering exercise commenced with a comprehensive desktop assessment to uncover existing information. This included targeted engagement with key stakeholders to exhaust possible information sources.

Baseline information sources primarily focused on existing information, where the generation of new data sets was only considered in situations where:

- Required and appropriate spatial information pertinent to the analysis did not exist;
- Where the scale was too broad and not detailed enough for the application; and
- Where significant discrepancies existed with regards to the integrity of existing information.

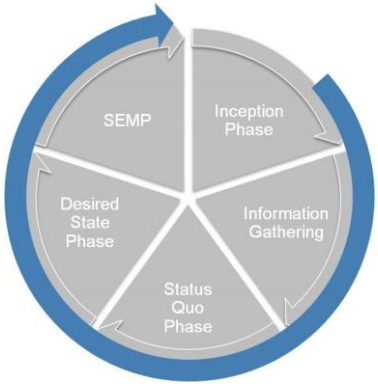
Where existing data sets are used, the information must be from an acceptable source and it must be relevant and accurate.

Data gathering included the collection of information to incrementally build the EMF Geographical Information System (GIS), which serves as the foundation for the evolution of the EMF. All GIS-related information was developed to comply with the requirements of the Client.

Data was managed in accordance with an information metadata matrix.

| **Deliverable:** | All EMF deliverables |
|---|---|

### 3.3.3 Public Participation Process




As a minimum, the Public Participation Process (PPP) will comply with regulation 3(2) of the EMF Regulations (2010). The main aims of the PPP include:

1. To inform Interested and Affected Parties (I&APs) of the EMF process and its objectives;
2. To provide an opportunity for inputs from I&APs; and
3. To give feedback to I&APs with the opportunity for them to respond.

The main tasks associated with the public participation for the EMF are tabulated below.

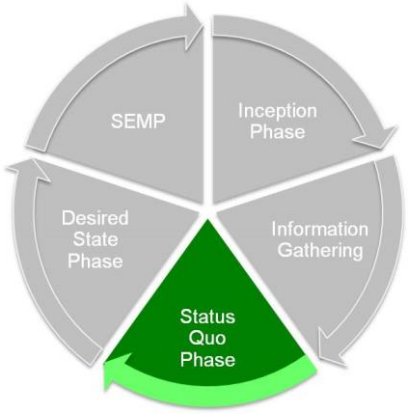
**Table 3:** Public Participation Outline (*Note: activities may be adapted as process unfolds*)

| No. | Activity | Comments | Communication Media & Deliverables |
|---|---|---|---|
| 1. | **Compile database of Interested and Affected Parties (I&APs)** | I&APs to include:<br>• PSC members;<br>• Authorities;<br>• Stakeholders;<br>• Interest groups;<br>• Formal sectors;<br>• Environmental experts;<br>• Civil society;<br>• General;<br>• Other. | Database of I&APs, to be updated as process unfolds. |
| 2. | **Announcement of EMF & Invitation to Public Meetings** | • Overview of EMF;<br>• Invitation to participate (Reply Form, meetings);<br>• Contact details. | • Background Information Documents* and Reply Forms* to I&APs (via registered post, fax and emails).<br>• One-on-one consultation with interest groups.<br>• Newspaper Advertisements.<br>• Public notices.<br>• Direct communication. |
| 3. | **Convene Public Meetings** | • Three public meetings to be held at the CLWHS (one meeting for each phase of the process).<br>• Format will include an initial presentation regarding the study area and the aims of the EMF, followed by a public interaction session whereby concerns and queries could be raised. | • Presentations.<br>• Information packages.<br>• Questionnaires to ascertain environmental issues, opportunities, constraints, priorities, etc.<br>• Minutes. |

| No. | Activity | Comments | Communication Media & Deliverables |
|---|---|---|---|
| 4. | **Targeted Stakeholder Meetings** | • Engaging with key I&APs to obtain information and to discuss specific issues.<br>• Focused group and subject specialist meetings.<br>• Meetings with marginalised groups. | • Interviews.<br>• Minutes.<br>• Information packages.<br>• Questionnaires. |
| 5. | **Notification of review of Draft Status Quo Report** | Allow I&APs to review and comment on draft Status Quo Report | • Notification letters (via registered post, fax and emails).<br>• Newspaper Advertisements.<br>• Direct communication. |
| 6. | **Lodging of Draft Status Quo Report in public domain** | • Grant 30 day review period.<br>• Prepare summary document for distribution to I&APs. | • Summary document.<br>• Website.<br>• Hardcopies for selected I&APs. |
| 7. | **Compile and maintain Comments and Response Report** | • Consider representations and comments.<br>• Review draft Status Quo Report to include relevant comments. | Public Participation Report to include Comments and Response Report. |
| 8. | **Notification of review of Draft Desired State Report** | Allow I&APs to review and comment on draft Desired State Report. | • Notification letters (via registered post, fax and emails).<br>• Newspaper Advertisements.<br>• Direct communication. |
| 9. | **Lodging of Draft Desired State Report in public domain** | • Grant 30 day review period.<br>• Prepare summary document for distribution to I&APs. | • Summary document.<br>• Website.<br>• Hardcopies for selected I&APs. |
| 10. | **Compile and maintain Comments and Response Report** | • Consider representations and comments.<br>• Review draft Desired State Report to include relevant comments. | Public Participation Report to include Comments and Response Report. |
| 11. | **Notification of review of Draft EMF** | Allow I&APs to review and comment on draft EMF. | • Notification letters (via registered post, fax and emails).<br>• Newspaper Advertisements.<br>• Direct communication. |
| 12. | **Lodging of Draft EMF in public domain** | • Grant 30 day review period.<br>• Prepare summary document for distribution to I&APs. | • Summary document.<br>• Website.<br>• Hardcopies for selected I&APs. |
| 13. | **Compile and maintain Comments and Response Report** | • Consider representations and comments.<br>• Review draft EMF to include relevant comments. | Public Participation Report to include Comments and Response Report. |
| 14. | **Notification of formal adoption of EMF** | | • Notification letters (via registered post, fax and emails).<br>• Newspaper Advertisements.<br>• Direct communication. |

**Deliverable:** Public Participation Report for each phase of EMF development process

### 3.3.4 *Status Quo Assessment* (***WHERE ARE WE NOW?***)




Taking stock of the current state of the environment through *inter alia* baseline evaluations and descriptions, specialist studies (as required), desktop assessments, existing data assimilation and field verification and assessment (as required) allows for an appreciation of where we are with the EMF-study environment.

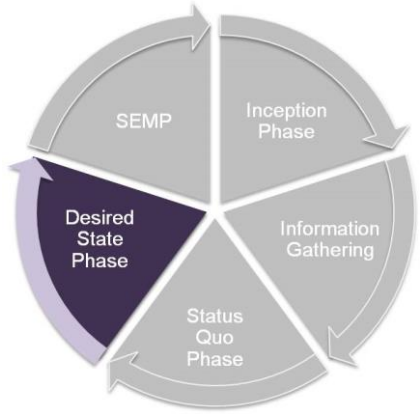
This sets the scene in terms of the environmental issues, constraints and opportunities within the project area, and steers the realistic conception of the desired state.

Where possible, the environmental features and attributes have been mapped in the EMF GIS to serve as a status quo representation of the MCLWHS and its buffer.

Where necessary, based on the sensitivity of the environmental features and attributes and the significance of the issues, ground-truthing will be conducted. Ground-truthing will also depend on the availability, currentness and accuracy of information.

| **Deliverable:** | Status Quo Report & EMF Status Quo GIS |
|---|---|

### 3.3.5 *Desired State of the Environment* (***WHERE DO WE WANT TO BE?***)




Environmental priorities will emanate from the issues, opportunities and constraints identified during the status quo assessment, and through a consultative process with the PSC, authorities and I&APs.

The environmental priorities will be translated into the desired state of the MCLWHS and its buffer, which will determine the destination for ensuing management measures. The desired state will include setting the vision and providing the environmental management context for the management zones and related requirements for the various

environmental features. It will also focus on critical conflict points, such as conservation of sensitive natural environments, protection of cultural and heritage landscapes, natural resource protection, land-use planning, rehabilitation, etc.

The development pressures and trends in the greater area will be investigated to identify and resolve potential conflict areas, to allow for accurate and realistic delineation of management zones in order to bridge the divide between the status quo and desired state of the environment.

Where conflict exists between the desired environmental state and development pressures, solutions will be investigated to attempt to resolve these variances including guidance through legislation. These solutions will be based on the opinions and recommendations of the specialists, perceptions of I&APs, and the balancing of Integrated Environmental Management principles and development priorities. Where necessary, workshops will be held with I&APs, the relevant PSC members and specialists to seek a fair and pragmatic way forward for managing discourse. Conflict management will be measured against the manner in which solutions uphold the environmental vision for the EMF study area.

A sensitivity analysis will be undertaken by integrating spatially represented baseline information from the status quo assessment. During the analysis, the status of the environmental features will be determined based on legislative requirements, accepted norms and quality standards, and through technical and specialist input. Weightings will be allocated to environmental features and attributes based on their intrinsic sensitivity to development pressure or resilience to change.

Following the sensitivity analysis, the weighted features will be assimilated in the GIS to prepare Environmental Constraint Zones (ECZs) that reflect the desired state of the environment.

| **Deliverable:** | Desired State of the Environment Report & updated GIS depicting Environmental Constraint Zones |
|---|---|

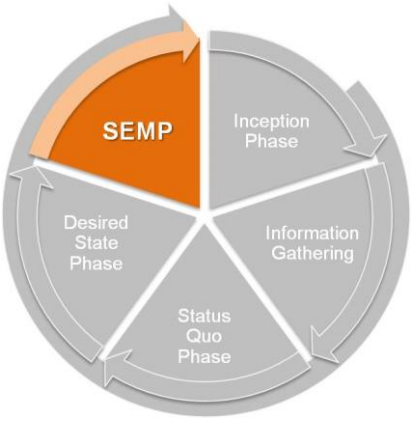
### 3.3.6 *Management Zones* (***HOW DO WE GET THERE?***)

The ECZs will provide the platform and framework for the identification of the Management Zones, where specific categories of homogenous sensitive features will be consolidated and integrated to demarcate these zones.

Management Zones will highlight environmentally significant areas, inform decision-making regarding proposed activities in these zones, and set management requirements for developments that are proposed in these demarcates areas. The Management Zones will also clearly reflect those environmental elements that served as the trigger for the EMF.

| **Deliverable:** | EMF Report & GIS |
|---|---|

### 3.3.7 *Strategic Environmental Management Plan* (***HOW DO WE GET THERE?***)




The Strategic Environmental Management Plan (SEMP) will link management parameters and guidelines to each of the Management Zones. These guidelines will be based on (amongst others):

- The outcomes of PPP;
- Detailed specialist assessments and sensitivity analysis,
- Measures aimed at reaching the desired state and supporting the environmental vision;
- Existing policies, statutory provisions and guidelines relevant to the features incorporated into the Management Zone;
- Environmental best practices and mitigation measures aimed at safeguarding the environmental features and attributes associated with the Management Zone; and
- Measures that strive to overcome constraints and optimise opportunities;

The SEMP introduces a risk-adverse approach to decision-making. In this regard, it will not be prescriptive in terms of land use and will not indicate which land uses must occur in which zones. Instead, the SEMP will indicate specific minimum environmental

requirements, through management parameters, which have to be met satisfactorily before approval of a development application should be considered.

Similarly, the SEMP will indicate the level of environmental assessment expected and required in the Management Zones.

| **Deliverable:** | EMF Report (including SEMP) & GIS |
|---|---|

### *3.3.8 Project Geographic Information System*

A GIS will be developed for the project in order to provide a spatial representation of the status quo, desired state and environmental sensitivity. It will also indicate the Management Zones. The GIS will evolve in complexity and functionality with the EMF development process. All data that can be presented spatially (where information exists or can be generated) will be incorporated into the GIS.

The GIS serves as a tool to use and apply the EMF, where it integrates the spatial data set and a database containing the description of spatial entities, as well as the management guidelines associated with the Management Zones.

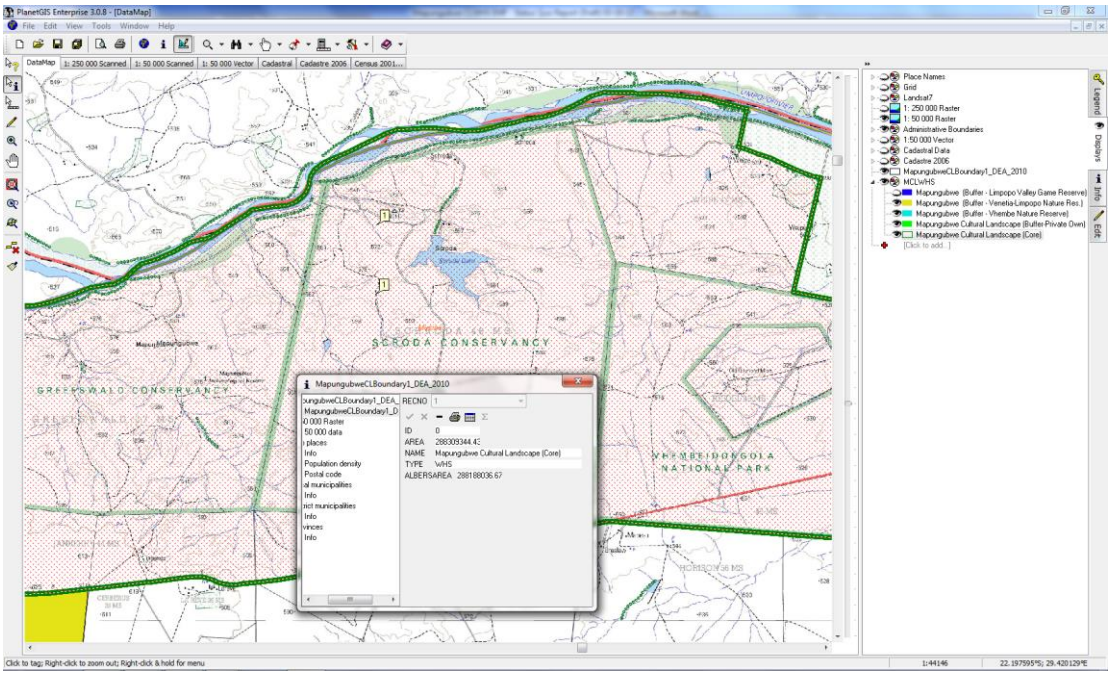
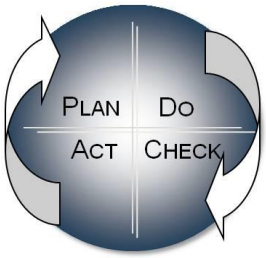



**Figure 13: Screen Print of evolving GIS (example)**

## 3.4 Assumptions and Limitations

The following assumptions and limitations are implicit in this report:

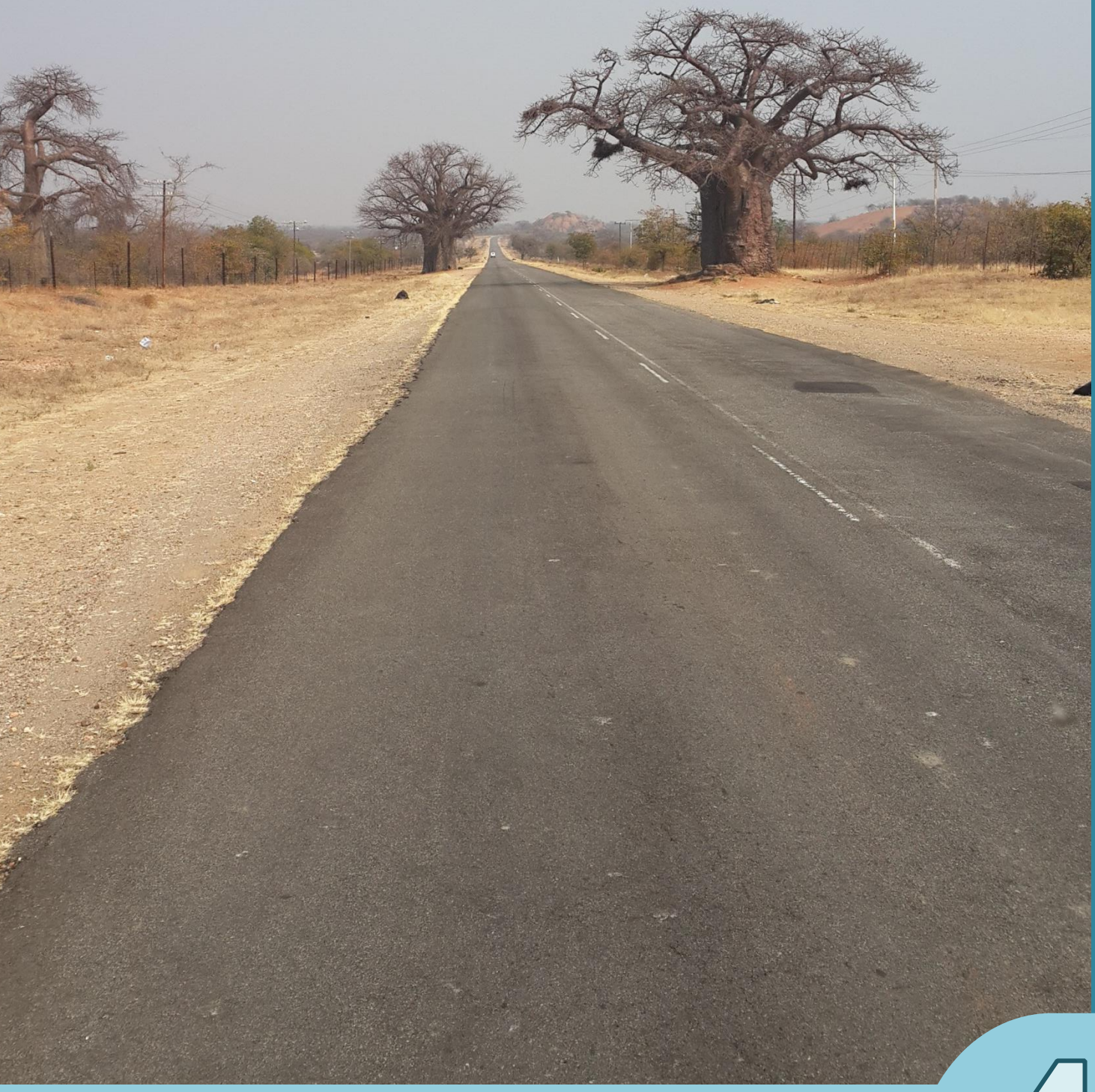
- The Status Quo Report is primarily based on desktop studies. Various available information sources (including reports, stakeholder knowledge, specialist input) were used and it is assumed that the information is accurate. Information gaps and the manner in which these should be attended to will be highlighted in the Strategic Environmental Management Plan (SEMP). It is accepted that more accurate and supplementary information may become available subsequent to the finalisation of the EMF. A plan-do-check-act approach is thus advocated, where the framework will undergo a cycle of planning and implementation which needs to be followed by revisions and updating by DEA. Ground-truthing is also crucial, especially for significant environmental attributes, which needs to feed into the evolving EMF.




- It is expected that the EMF will undergo rigorous review and scrutiny by the relevant stakeholders. Following the requisite amendments and incorporation of comments, this decision-making tool should be regarded as a concept EMF until the requirements of DEA can be adhered to.
- The accuracy of the information pertaning to mineral resources and prospecting rights within the study area needs to be confimed in consultation with DMR.
- Due to the iterative nature of uncovering information for the study area additional spatial data may be acquired during the subsequent phases of the EMF, which is also of relevance to the Status Quo Phase. In such instances, the new information will be incorporated into the GIS and a revised version of this document will be compiled (as deemed necessary).
- Limited information on groundwater was obtained. Further investigation is required regarding the importance of groundwater as a potential water resource in certain areas and the level of protection required for this resource.
- The spatial scale (resolution) of the data contained in the GIS, which will be acceptable for decision-making purposes, will need to be verified in consultation with DEA and LEDET.

- An assessment of cumulative impacts of climate change on all developments in the area has not been undertaken as well as an assessment of the cumulative impacts regarding water uses in the study area

# ENVIRONMENTAL STATUTORY FRAMEWORK



SECTION 4

# 4 ENVIRONMENTAL STATUTORY FRAMEWORK

## 4.1 EMF Enabling Legislation

At the Earth Summit in 1992 the international community agreed on a framework for global sustainable development, which comprises the following two agreements:

- The Rio Declaration on Environment and Development, which sets out the principles for human interaction with the environment; and
- **Agenda 21**, which formed the international guideline and action plan for sustainable development.

Subsequently, all participatory nations adopted **Local Agenda 21**, which translates the Agenda 21 action plan for sustainable development into a participatory, multi-sectoral process to achieve the goals of Agenda 21 through a programme of actions at local level (CSIR, 2002). The goals of Local Agenda 21 are to:

- Raise awareness of environmental and sustainability issues amongst all citizens;
- Maximise the support and involvement of local communities and businesses;
- Pursue economic development and social progress whilst limiting the impact on environmental resources and fragile ecosystems;
- Reduce the consumption of all natural resources;
- Maximise energy efficiency and the proportion of energy from renewable resources;
- Conserve and enhance green space and diversity of wildlife;
- Encourage all organisations and individuals to adopt sustainable practices and lifestyles;
- Minimise levels of pollution; and
- Minimise the environmental impact of waste and to promote the reduction, re-use and recycling of resources.

The principles of sustainable development are enshrined in many national policies and pieces of legislation.

The **White Paper on Environmental Management** (1997), which provides the foundation for our country's environmental policy, contains the following key principles (CSIR, 2002):

- Development must be sustainable so that the needs of the present generation are met without compromising the ability of future generations to meet their own needs;
- Environmental justice shall be pursued so that diverse environmental impacts are not distributed in a manner which unfairly discriminates against any person; and
- Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued;
- Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity, exists throughout its lifecycle;
- Decisions must take into account the interests, needs and values of all interested parties, and this includes recognising all forms of knowledge, including traditional and ordinary knowledge;
- The full social and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated in making decisions. Organs of state must take measures to achieve the progressive realisation of this principle; and
- The right of workers to refuse work that is harmful to human health or the environment must be respected.

The **National Environmental Management Act** (NEMA) (Act No 107 of 1998) serves as the overall template of environmental law in the country and provides guidance to sectoral legislation. It further guides the administration of all environmental legislation in South Africa. Section 2 of NEMA covers the principles that govern environmental management in the country. This section covers the sustainable development factors that should be considered when carrying out environmental planning, which include:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied; that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
- That waste is avoided, or where it cannot be altogether avoided, is minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
- That the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;

- That the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- That negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

Sections 23 and 24 of NEMA deal specifically with EMFs and their legal standing. Section 23 establishes the need for appropriate environmental management tools and lays out the objectives of such tools, which are to:

- Promote the integration of the principles of environmental management set out in section 2 into the making of all decisions which may have a significant effect on the environment;
- Identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management as set out in section 2;
- Ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;
- Ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment;
- Ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment; and
- Identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2.

The final paragraph of the section instructs the Director-General to co-ordinate the development of such tools and to issue guidelines and manuals on how to develop each tool.

One such tool has proven to be the EMF (and accompanying SEMP), the subject of this study. This tool has been relatively widely used in South Africa, especially in sensitive or protected areas and its development is the subject of debate and refinement.

Section 24 gives the Minister and the provincial counter-part, the MEC, the power to regulate which activities need permission to proceed and to accept spatial plans to assist in the authorisation of new activities. The relevant paragraph states:

> *"…prepare compilations of information and maps that specify the attributes of the environment in particular geographical areas, including the sensitivity, extent, interrelationship and significance of such attributes which must be taken into account by every organ of state charged by law with authorising, permitting or otherwise allowing the implementation of a new activity, or with considering, assessing and evaluating an existing activity".*

In the case of the EMF, this is the clause that provides the authority to use such a document as guidance for future environmental decision-making.

The **EMF Regulations** were promulgated in June 2010, and make provision for the development, content and adoption of an EMF as a proactive environmental management decision support tool.

Regulation 3(1) states that the Minister or MEC with the concurrence of the Minister may initiate an EMF for an area. According to regulation 3(3), the development of an EMF must include an assessment of:

- The need for an EMF;
- The status quo of the geographical area that forms the subject of EMF;
- The desired state of the environment; and
- The way forward to reach the desired state.

In accordance with regulation 5(2), if the Minister or MEC adopts with or without amendments an EMF, the framework must be taken into account in the consideration of applications for environmental authorisation in or affecting the geographical area to which the framework applies

According to regulation 5(4), when an EMF has been adopted, notice must be given in the Government Gazette or the official Gazette of the relevant province of:

1. The adoption of the EMF; and
2. The place where the EMF is available for public scrutiny.

## 4.2 Generic Environmental Management Legislation

Development and conservation planning must be contextualised within the international and South African (national, provincial and municipal) legal framework.

Environmental law provides mechanisms for the management and conservation of environmental features and the sustainability of new development. The importance of environmental management is to make responsible use of natural, economic and human resources in ways that protect and improve the environment.

Environment law is divided into various sections and most laws applicable to protection and management of the environment were developed to protect and manage specific sectors.

The most common laws applicable to environment management in SA are succinctly described below.

- **The Constitution of South Africa (108 of 1996)**

**Environmental Rights**

Section 24 of the Constitution deals with Environmental Rights and gives the right to all citizens: *"to an environment that is not harmful to their health and well-being; and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:*

- *Prevent pollution and ecological degradation;*
- *Promote conservation; and*
- *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*".

The Constitution of South Africa is the highest form of law enforceable on any individual or organisation. This section therefore provides the basic environmental rights to all citizens to safe and healthy environment.

- **National Environmental Management Amended Act (Act 62 of 2008)**

The NEMA is considered the overarching act in terms of environmental legislation. Every act that relates to environmental matters is directly or indirectly linked to the NEMA and provisions are made in acts that followed publication of NEMA 1998 to accommodate conditions specified in various acts.

The NEMAA act was promulgated in 2008 and was aimed at substituting certain definitions, further regulating environmental authorisations and to effect certain textual alterations.

NEMAA provides for cooperative governance and establishes principles for decision-making on matters affecting the environment such as:

- People and their needs must be placed at the forefront of environment management;
- Development must be sustainable and therefore requires avoidances of pollution and degradation of the environment, disturbances of landscapes and sites of cultural heritage
- The integrated nature of the environment and that responsibility for environmental management exists throughout the life cycle of an activity (from cradle to grave);
- Public Participation;
- Transparent decision making; and
- Intergovernmental co-ordination and harmonisation of policies, legislation and actions.

Chapter Five of NEMA provides for Integrated Environmental Management and defines the general objectives of IEM. Minimum procedures are laid down with respect to investigating, assessing and communicating the potential impacts of activities.

Section 24 of NEMA provides for EMFs through provisions for the identification of sensitive and geographical areas. Chapter Eight of NEMA specifies the sensitive and geographical areas mentioned above and maps created as a result thereof to be used as EMFs.

- **National Environmental Laws Amendment Act (Act 14 of 2009)**

The above-mentioned act amended various sections of an array of laws related to environmental management. Below is a summary of amended laws:

- Atmospheric Pollution Prevention Act, 1965,;
- Environment Conservation Act, 1989 (ECA);
- National Environmental Management: Protected Areas Act, 2003;
- National Environmental Management: Biodiversity Act, 2004; and
- National Environmental Management: Air Quality Act, 2004.

- **National Environmental Management: Air Quality Act (Act 39 of 2004)**

The purpose of this act was to reform the law regulating air quality by providing measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.

The acts aims to promote justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; and for specific air quality measures.

- **National Environmental Management: Waste Act (Act 59 of 2008)**

This act was developed to reform the law regulating waste management in order to protect health and the environment.

This act places a high liability on waste producers and government to supply adequate waste removal, treatment and disposal facilities to ensure that waste is not threatening the health and safety of citizens.

Waste management was previously conducted in terms of the National Water Act (Act 38 of 1998) and several sections of law have been repealed by NEMWA. This act must be read with NEMA and application must be guided by principles set out in section 2 of NEMA.

- **National Environmental Management: Biodiversity Act (Act 10 of 2004)**

The purpose of the National Environment Management Biodiversity Act (NEMBA) is to provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act (Act 107 of 1998).

The Act allows for the publication of provincial and national lists of ecosystems that are threatened and in need of protection. The list should include:

- **Critically Endangered Ecosystems**, which are ecosystems that have undergone severe ecological degradation as a result of human activity and are at extremely high risk of irreversible transformation.
- **Endangered Ecosystems**, which are ecosystems that, although they are not critically endangered, have nevertheless undergone ecological degradation as a result of human activity.
- **Vulnerable Ecosystems**, which are ecosystems that have a high risk of undergoing significant ecological degradation.
- **Protected Ecosystems**, which are ecosystems that are of a high conservation value or contain indigenous species at high risk of extinction in the wild in the near future.

Similarly, the Act allows for the listing of endangered species, including critically endangered species, endangered species, vulnerable species and protected species. A person may not carry out a restricted activity (including trade) involving listed threatened or protected species without a permit.

- **National Environmental Management: Protected Areas Amendment Act (Act 15 of 2009)**

The purpose of NEMPAA is to amend the National Environmental Management: Protected Areas Act, 2003, so as to provide for:

- A comprehensive list in the schedule of all national parks;
- The assignment of national parks, special nature reserves and heritage sites to the South African National Parks;
- Flight corridors and permission of the management authority to fly over special nature reserve, national park or heritage site; and
- Specific areas available for training and testing of aircraft.

This act creates a national system of protected areas in order to protect and conserve ecologically viable areas representative of biodiversity in the country. It further seeks to achieve co-operative environmental governance and to promote sustainable and equitable utilisation and community participation.

The legislation requires the State to act as trustee of protected areas, and to implement the Act 'in partnership with the people' to achieve the progressive realisation of the environmental rights contained in Section 24 of the Constitution.

Once an area is declared protected, the Minister must appoint management authorities, who in turn must prepare management plans for the special nature reserve, national park, nature reserve or protected environment. These plans must, amongst other things, contain the terms and conditions of any applicable biodiversity management plan, procedures for public participation, including participation by the owner (if applicable), any community or other interested party, and where appropriate, the implementation of community-based natural resource management.

The management authority may enter into an agreement with another organ of state, a local community, an individual or other party for the co-management of the area by the parties, or the regulation of human activities that affect the environment in the area.

- **National Water Act (Act 38 of 1998)**

The purpose of this act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors:

- Meeting the basic human needs of present and future generations;
- Promoting equitable access to water;
- Redressing the results of past racial and gender discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for growing demand for water use; protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;

- Meeting international obligations;
- Promoting dam safety; and
- Managing floods and droughts.

The National Government is responsible for the equitable allocation and use of the scarce and unevenly distributed water resources of the nation. The aim of water resource management is to ensure the sustainable use of water through the protection of the quality of water resources for the benefit of all water users.

- **Environment Conservation Act (Act 73 of 1989)**

The objective of the Environment Conservation Act (ECA) is to provide for the effective protection and controlled utilisation of the environment. This act was historically the main act that governed environmental management in South Africa.

Several sections of ECA have been repealed by various pieces of legislation mentioned in this section. ECA should therefore always be read in conjunction with especially NEMA and other legislation applicable to the subject in question.

- **Mineral and Petroleum Resources Development Act (Act 28 of 2002)**

The purpose of this Act is to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources; and to provide for matters connected therewith. This Act falls under the Department of Mineral Resources (DMR), formerly known as the Department of Minerals and Energy (DME).

Section 22 of the Act specifies that any person who wishes to apply for a mining right must lodge an application with the Regional Director, in the prescribed manner, and with a non-refundable application fee.

Section 23 of this Act indicates that the Minister of DMR may grant a mining right if:

- The mineral can be mined optimally in accordance with the mining work programme;
- The applicant has access to financial resources and has the technical ability to conduct the proposed mining operation optimally;

- The financing plan is compatible with the intended mining operation and the duration thereof;
- The mining will not result in unacceptable pollution, ecological degradation or damage to the environment;
- The applicant has provided financially and otherwise for the prescribed Social and Labour Plan;
- The applicant has the ability to comply with the relevant provisions of the Mine Health and Safety Act, 1996 (Act No, 29 of 1996);
- The applicant is not in contravention of any provision of this Act; and
- The granting of such right will further the objects referred to in section 2(d) and (f) in accordance with the charter contemplated in section 100 and the prescribed Social and Labour Plan.

- **National Heritage Resources Act (Act 25 of 1999)**

The purpose of the NHRA is to protect and promote good management of South Africa's heritage resources, and to encourage and enable communities to nurture and conserve their legacy so it is available to future generations.

The Act makes heritage resources of cultural significance or other special value part of the national estate, and therefore places them under the care of the South African Heritage Resources Agency (SAHRA). The Mapungubwe National Park and WHS was declared a National Heritage Site in 2002 therefore a permit is required from SAHRA before any changes or development is contemplated that might affect the cultural resources.

Heritage resources may include buildings, historic settlements, landscapes and natural features, burial grounds and certain moveable objects, including objects of decorative art or scientific interest. Provincial and municipal authorities also play a role in managing provincial heritage resources and local-level functions.

New landowners should be made aware of any pre-existing heritage sites or objects located on their properties, and be further educated on their responsibilities regarding those sites or objects. They may also wish to approach heritage authorities in order to obtain a designation for a particular site or object under this Act.

- **National Forests Act (Act 84 of 1998)**

The purpose of this Act includes the following:

- To promote sustainable management and development of forests for the benefit of all;
- To create the conditions necessary to restructure forestry in Sate forests;
- To provide special measures for the protection of certain forests and trees;
- To promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes;
- To promote community forestry; and
- To promote greater participation in all aspects of forestry and the forest products industry by persons disadvantaged by unfair discrimination.

- **Conservation of Agricultural Resources Act (Act 43 of 1983)**

CARA seeks to provide for the conservation of natural agricultural resources by maintaining the production potential of land, combating and preventing erosion and weakening or destruction of water resources, protecting vegetation and combating weeds and invader plant species.

CARA generally does not apply to any land situated in an urban area (which is land under the control of a local authority, excluding any commonage or other land used for agricultural purposes; or any land that is subdivided). However, the provisions relating to weeds and invader plants do apply in urban areas.

- **Subdivision of Agricultural Land Act (Act 70 of 1983**

This Act manages the demarcation and subdivision of agricultural land. According to SALA, any change of land use on agricultural land or any activity proposed / demarcated under another act has to be submitted to DAFF and comments have to be obtained as it may have an impact on agricultural land and its associated activities.

## 4.3 Management of Environmental Features

According to Strydom and King (2009), three legislative mechanisms exist at a national level to afford protection to the environment. The first mechanism is the constitutional entrenchment of environmental protection through either a rights-based or regulatory

approach in the Constitution. The second legislative mechanism is environmental protection through framework legislation, namely NEMA. Lastly, the third mechanism is to adopt specific environmental legislation that covers a range of environmental media (e.g. biophysical elements).

The legislative framework governing specific environmental themes, in the context of the MCLWHS and its buffer, is summarised in the table to follow. The table primarily focuses on direct legislative linkages, rather than a comprehensive listing of all legislation that may pertain to a specific feature.

**Table 4: Legal Framework for Specific Environmental Themes, Features and Attributes (*Note – table to be completed as EMF evolves)***

| Environmental Themes, Features & Attributes | Governance Framework | | | | | |
|---|---|---|---|---|---|---|
| | Authority | Legislation | Policies | Strategies | Plans & Programmes | Implementation Mechanisms |
| **World Heritage Site** | ▪ DEA<br>▪ SANParks | ▪ World Heritage Convention Act (Act 49 of 1999)<br>▪ National Environmental Management Act (Act 107 of 1998) (NEMA)<br>▪ National Environmental Management: Protected Areas Act (Act 57 of 2003) (NEMPA)<br>▪ National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA)<br>▪ National Heritage Resources Act (Act 25 of 1999)<br>▪ National Forests Act (Act 84 of 1998)<br>▪ National Water Act (Act 36 of 1998)<br>▪ National Environmental Management: Waste Act, 2008 (Act of 59 2008) | ▪ DEA policy on buffer zones for WHS and national park<br>▪ SANParks buffer zone policy. | ▪ | ▪ MNP Integrated Management Plan (IMP)<br>▪ MNP Zonation Plan | ▪ IMP Implementation Plan<br>▪ Environmental Management System<br>▪ Authorisation of related listed activities in terms of the EIA Regulations (2010).<br>▪ Development permits issued in terms of NEMPA.<br>▪ SANParks may impose conditions in addition to (but consistent with) conditions set by other authorities and legislation.<br>▪ MNP Rules |
| **Terrestrial Biodiversity** | ▪ DEA<br>▪ LEDET<br>▪ SANParks<br>▪ DAFF | ▪ NEMA<br>▪ NEMBA<br>▪ Environment Conservation Act (Act No. 73 of 1989)<br>▪ NEMPA<br>▪ Conservation of Agricultural Resources Act (CARA) (Act No. 43 of | ▪ White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity (1997) | ▪ National Biodiversity Strategy and Action Plan<br>▪ National Biodiversity Framework<br>▪ National Protected | ▪ **National Strategy for Sustainable Development and Action Plan**<br>▪ TFCA Treaty and Integrated Development Plan<br>▪ MNP IMP<br>▪ LEDET C-plan | ▪ Species-based conservation (listed species).<br>▪ Area-based conservation (protected areas, protected eco-systems).<br>▪ Purpose-based conservation |

| Environmental Themes, Features & Attributes | Governance Framework | | | | | |
|---|---|---|---|---|---|---|
| | Authority | Legislation | Policies | Strategies | Plans & Programmes | Implementation Mechanisms |
| | | 1983);<br>▪ National Water Act (Act No. 36 of 1998)<br>▪ National Forests Act (Act No. 84 of 1998)<br>▪ World Heritage Convention Act (No. 49 of 1999)<br>▪ National Veld and Forest Fire Act (Act No. 101 of 1998) | | Area Expansion Strategy<br>▪ National Spatial Biodiversity Assessment<br>▪ National Biodiversity Strategy and Action Plan | ▪ Man and the Biosphere Reserve Programme | ▪ IMP Implementation Plan.<br>▪ State of Environment Reporting.<br>▪ Permitting of activities (threatened species, alien species, listed invasive species).<br>▪ Establishment of a buffer zone.<br>▪ Terrestrial protected areas.<br>▪ Control measures for alien and invasive plant species.<br>▪ Authorisation of related listed activities in terms of the EIA Regulations (2010), and in particular GN No. R546. |
| **Water Resources** | ▪ Department of Water Affairs (DWA)<br>▪ Catchment Management Agencies | ▪ NEMA<br>▪ National Water Act (Act No. 36 of 1998)<br>▪ Water Services Act (Act No. 108 of 1997)<br>▪ Water Services Amendment Act (Act No. 30 of 2004) | ▪ | ▪ National Water Resource Strategy<br>▪ Internal Strategic Perspective<br>▪ Catchment Management Strategy | ▪ Catchment Management Plan<br>▪ River Health Programme<br>▪ Waste Discharge Charge System<br>▪ Working for Water Programme | ▪ Resource Directed Measures (RDM) - clear objectives for the desired level of protection of the resource – Reserve, Classification System, Resource Quality Objectives.<br>▪ Source Directed Controls (SDCs) – measures to control water use, e.g. water quality standards for waste water, waste water discharges, pollution prevention, |

| Environmental Themes, Features & Attributes | Governance Framework | | | | | |
|---|---|---|---|---|---|---|
| | Authority | Legislation | Policies | Strategies | Plans & Programmes | Implementation Mechanisms |
| | | | | | | and waste minimisation technologies.<br>▪ National monitoring and information systems – address the monitoring, recording, assessing and dissemination of information on water resources.<br>▪ Catchment Management Forum.<br>▪ Authorisation of related listed activities in terms of the EIA Regulations (2010).<br>▪ Water Conservation and Demand Management.<br>▪ Disaster Management Plan. |
| **Air** | ▪ DEA<br>▪ LEDET<br>▪ Local Authorities | ▪ NEMA<br>▪ National Environmental Management Air Quality Act (Act No. 39 of 2004)<br>▪ Atmospheric Pollution Prevention Act (Act 45 of 1965) | ▪ National Framework for Air Quality Management in South Africa | ▪ | ▪ Air Quality Management Plan | ▪ Authorisation of related listed activities in terms of the EIA Regulations (2010).<br>▪ Air Emissions License in terms of the National Environmental Management: Air Quality Act (Act No. 39 of 2004).<br>▪ Minimum Emission Standards.<br>▪ Pollution prevention and remediation measures. |
| **Noise** | ▪ DEA<br>▪ LEDET | ▪ Environment Conservation Act (Act No. 73 of 1989) | ▪ | ▪ | ▪ | ▪ SABS Standards.<br>▪ Pollution prevention and remediation measures. |

| Environmental Themes, Features & Attributes | Governance Framework | | | | | |
|---|---|---|---|---|---|---|
| | Authority | Legislation | Policies | Strategies | Plans & Programmes | Implementation Mechanisms |
| **Heritage and Cultural Resources** | ▪ SAHRA<br>▪ Limpopo Provincial Heritage Resources Authority (LIHRA) | ▪ National Heritage Resources Act (Act No. 25 of 1999)<br>▪ National Heritage Council Act (Act No. 11 of 1999)<br>▪ Declaration as a National Heritage Site in 2002 | ▪ | ▪ | ▪ | ▪ Conservation, protection and administration of both the physical and the living or tangible heritage resources.<br>▪ Issuing of permits for protection of heritage resources, graves, archaeological and paleontological sites.<br>▪ Issuing of permits in terms of national heritage site status before any changes or development is contemplated<br>▪ Execution and approval of Heritage Impact Assessments for certain developments (e.g. linear development exceeding 300m in length; development exceeding 5 000m$^2$ in extent). |
| **Mineral Resources** | ▪ Department of Mineral Resources (DMR) | ▪ Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)<br>▪ Mineral and Petroleum Resources Development *Amendment* Act (Act No. 49 of 2008) | ▪ Mineral Policy | ▪ | ▪ Integrated Water and Waste Management Plans | ▪ Authorisation of related listed activities in terms of the EIA Regulations (2010).<br>▪ Mine closure liabilities<br>▪ Water management and pollution control |
| **Agriculture** | ▪ Department of Agriculture<br>▪ DAFF<br>▪ LEDET | ▪ CARA<br>▪ Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act | ▪ | ▪ Strategic Plan for South African Agriculture | ▪ National Land Care Programme (1997) | ▪ Authorisation of related listed activities in terms of the EIA Regulations (2010). |

| Environmental Themes, Features & Attributes | Governance Framework | | | | | |
|---|---|---|---|---|---|---|
| | Authority | Legislation | Policies | Strategies | Plans & Programmes | Implementation Mechanisms |
| | | (36 of 1947)<br>▪ Agricultural Pests Act (36 of 1983)<br>▪ Foodstuffs, Cosmetics and Disinfectants Act (54 of 1972)<br>▪ Subdivision of Agricultural Lands Act (70 of 1970) | | | | ▪ Soil conservation measures.<br>▪ Land capability and suitability assessment.<br>▪ Pollution prevention and remediation measures. |
| **Waste** | ▪ DEA<br>▪ LEDET<br>▪ Local Government | ▪ National Environmental Management: Waste Act (NEMWA) (Act No. 59 of 2008)<br>▪ Integrated Pollution and Waste Management Policy For South Africa, 2000<br>▪ Hazardous Substances Act (Act No. 15 of 1973) | ▪ | ▪ National Waste Management Strategy | ▪ Integrated Waste Management Plan | ▪ Authorisation of related waste management activities in terms of NEMWA.<br>▪ Standard for disposal of waste to landfill; Notice 615 of 2012.<br>▪ Waste classification and management regulations, Notice 614 of 2012. |
| **Tourism** | ▪ Department of Economic Development & Tourism | ▪ The Tourism Act 72 of 1993 | ▪ White Paper for Tourism Development of 1996 | ▪ The National Tourism Sector Strategy (NTSS) 2011<br>▪ National Rural Tourism Strategy<br>▪ South African Domestic Tourism Strategy<br>▪ International Tourism Strategy | ▪ District Tourism Development Plan | ▪ Tourism interventions that emanate from the Tourism Development Plan. |
| **Planning & Development** | ▪ All three spheres of | ▪ The Spatial Planning and Land Use Management | ▪ Accelerated Shared Growth Initiative | ▪ Medium Term Strategic | ▪ Municipal Integrated | ▪ Environmental authorisation - EIA |

| Environmental Themes, Features & Attributes | Governance Framework | | | | | |
|---|---|---|---|---|---|---|
| | Authority | Legislation | Policies | Strategies | Plans & Programmes | Implementation Mechanisms |
| | government<br>▪ Municipal Planning Units | Act (Act No. 16 of 2013) (not yet implemented)<br>▪ Local Government Transition Act (Act No. 209 of 1993)<br>▪ Local Government: Municipal Structures Act (Act No. 117 of 1998)<br>▪ Local Government: Municipal Systems Act (Act No. 32 of 2000) | ▪ National Spatial Development Perspective<br>▪ Breaking New Ground | Framework<br>▪ Provincial Growth and Development Strategy<br>▪ Municipal Turnaround Strategy<br>▪ Local Economic Development (LED) Strategy | Environmental management Programmes<br>▪ Sustainable Livelihoods Framework | ▪ Strategic Environmental Assessment (SEA)<br>▪ Integrated Development Plans (IDPs) (district and local municipalities)<br>▪ Spatial Development Framework (SDFs) (provincial and local)<br>▪ Land Use Management System (LUMS) |
| **Socio-Economic Environment** | ▪ Limpopo Department of Economic Development<br>▪ Municipal LED units | ▪ Constitution of the Republic of South Africa (Act 108 of 1996)<br>▪ National Environmental Management (Act 107 of 1998)<br>▪ Promotion of Administrative Justice Act (Act 3 of 2000)<br>▪ Development Facilitation Act (Act 67 of 1995)<br>▪ Restitution of Land Rights Act 22 Of 1994<br>▪ Traditional Leadership and Governance Act 2005<br>▪ Promotion of Access to Information Act 2 of 2000 | ▪ Limpopo Growth and Development Strategy Report<br>▪ Provincial Spatial Economic Development Strategy | ▪ LED Strategy | ▪ IDPs and SDFs | ▪ Interventions in terms of the LED Strategy |

The table to follow lists the multilateral environmental agreements that are relevant to the EMF study area. Once signed, the GMTFCA treaty will form part of this list.

**Table 5: Multilateral Environmental Agreements**

| Agreement | Lead Institution | Overview |
|---|---|---|
| World Heritage Convention (1972) | The United Nations Educational, Scientific and Cultural Organisation (UNESCO) | The Convention recognised that cultural and environmental heritage sites are being destroyed and the convention is aimed at countries committing to protecting and preserving national heritage. |
| Rio declaration on Environment and Development, 1992 | United Nations Conference on Environment and Development (UNCED) | The Rio Declaration consisted of 27 principles intended to guide future sustainable development around the world. |
| Agenda 21, 1992 | UNCED | Agenda 21 was established at the Rio Conference and provides a policy framework and action plan for sustainable development at global, national and regional levels. Local Agenda 21 entails the participation and co-operation of local authorities to develop their own Local Agenda 21 plans and strategies according to the region's specific priorities and resources available. The plans need to be submitted by DEA and updated every five years. |
| Convention on Biological Diversity, 1992 | United Nations | The Convention on Biological Diversity has three main objectives. These are to:<br>▪ Conserve biological diversity;<br>▪ Use biological diversity in a sustainable manner<br>▪ Fair and equitable sharing of benefits arising from genetic resources. |
| Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), 1979 | United Nations Environment Programme | The Bonn Convention aims to conserve terrestrial, marine and avian migratory species throughout their range. To avoid the migratory species from becoming endangered, the parties must:<br>▪ Conserve or restore the habitats of endangered species;<br>▪ Prevent, remove, compensate for or minimise the adverse effects of activities or obstacles that impede the migration of the species; and<br>▪ Prevent, reduce or control factors (to the extent feasible and appropriate) that are endangering or are likely to further endanger the species.<br><br>Several Agreements have been concluded to date under the auspices of the Convention for specific species or groups of wildlife within a particular area such as the African-Eurasian Migratory Waterbirds. |
| Convention on the Illegal Trade in Endangered Species (CITES), 1973 | International Union for Conservation of Nature (IUCN) | International trade in wildlife and wildlife products is regulated through the Convention on International Trade in Endangered Species of Wild Fauna and Flora which affords varying degrees of protection to more than 30,000 species of animals and plants to ensure that trade does not threaten their survival. South Africa ratified CITES in 1975 and is a significant importer and exporter of CITES-listed species. |
| Ramsar Convention on Wetlands Conservation (1971) | UNESCO | The Ramsar Convention objectives are to curb the progressive loss of wetlands and to protect the ecological, economic, cultural, scientific and recreational value. |

| Agreement | Lead Institution | Overview |
|---|---|---|
| United Nations Framework Convention on Climate Change (UNFCCC), 1992 | United Nations | The UNFCCC entered into force on 21 March 1994, and sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases (GHGs). The Convention enjoys near universal membership, with 192 countries having ratified including South Africa. However, this treaty has no compulsory regulations on GHG emissions for individual countries and contains no mechanisms of enforcement, therefore it is legally non-binding. Under the UNFCCC, governments gather and share information on GHG emissions, national policies and best practices. They also launch national strategies for addressing GHG emissions and adapt to expected impacts, including the provision of financial and technological support to developing countries and cooperate in preparing for adaptation to the impacts of climate change. The treaty provides for updates (protocols) that would set mandatory emission limits such as the Kyoto Protocol. |
| Kyoto Protocol, 1997 | United Nations | The Kyoto Protocol is an international agreement linked to the UNFCCC. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European community for reducing GHG emissions. These amount to an average of 5% against 1990 levels over the five-year period 2008-2012. The Kyoto Protocol is generally seen as an important first step towards a truly global emission reduction regime that will stabilize GHG emissions, and provides the essential architecture for any future international agreement on climate change. The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. One hundred and eighty nations including South Africa have ratified the treaty to date, in terms of which countries must meet their targets primarily through national measures. |
| Protocol on Shared Water Courses (2002) | Southern African Development Community (SADC) 2000 | The objective of this protocol is to foster closer cooperation for sustainable and coordinated management, protection and utilisation of shared water courses and advance the SADC agenda for regional integration and poverty alleviation. The areas of regional cooperation are the harmonisation and monitoring of legislation and policies for planning, development, conservation, and protection of shared watercourses, the establishment of shared watercourse agreements and institutions, the promotion of research and technology development, information exchange, capacity building, and a coordinated and integrated environmentally sound development and management of shared water resources.<br><br>The SADC Protocol on Shared Water Systems was signed by thirteen of the fourteen member states in 1995. The Protocol was subsequently revised to bring it in line with the Convention on the Non-navigational Uses of International Watercourses adopted by the UN General Assembly in 1997. The Revised Protocol on Shared Watercourses was signed by the Heads of State of the SADC member States in 2000, and entered into force in 2003. The objectives of this protocol are to encourage closer co-operation between SADC states for judicious, sustainable and coordinated management, protection and utilization of shared watercourses. |
| African Convention on Nature and Natural Resources (1968) | African Union | The convention agreed to adopt measures to ensure conservation, utilization and development of soil, water, flora and fauna resources in accordance with scientific principles and with due regard to the best interests of the people. |
| Man and Biosphere Programme (1971) | UNESCO | This programme was established to promote interdisciplinary approaches to management, research and education in ecosystem conservation and sustainable use of natural resources. |

| Agreement | Lead Institution | Overview |
|---|---|---|
| SADC Protocol on Wildlife and Law Enforcement (1999) | SADC | The protocol was established to promote the conservation of the shared wildlife resources through the establishment of transfrontier conservation areas. In this Protocol, a TFCA is defined as "the area or component of a large ecological region that straddles the boundaries of two or more countries encompassing one or more protected areas as well as multiple resources use areas". |
| SADC Regional Biodiversity Strategy (2006) | SADC | The Regional Biodiversity Strategy provides a framework for cooperation in biodiversity issues that transcend national boundaries. It is premised on the fact that the state of the environment, including biodiversity, is a major determinant of the growth and development of the region. |

## 4.4 Institutional Roles and Responsibilities

The successful implementation of an EMF hinges on the various institutions adopting and putting into practice (where relevant) this environmental management tool. This section provides an overview of the institutions which play a significant role in environmental management and decision making at the three levels of the government (i.e. national, provincial and local), which will be facilitated by the EMF. The environmental institutions identified at each level of government fulfil specific duties with regards to the critical environmental issues and features associated with the study area. The legal framework also assists in identifying mandated parties with regulatory functions in the environmental arena, as shown in **Table 4**.

### *4.4.1 Environmental Authorities*

The EMF is directly linked to the decision-making framework of DEA, LEDET, SANParks and the district and local municipalities. A high-level overview of the environmental roles and responsibilities of key environmental authorities, which influence and guide environmental policies, strategies and plans in the MCLWHS and its buffer, follows.

**Table 6: Roles and responsibilities**

| Environmental Authorities | Key Objectives / Obligations / Services / Functions |
|---|---|
| **DEA**<br>environmental affairs<br>Department:<br>Environmental Affairs<br>REPUBLIC OF SOUTH AFRICA | ▪ Promote the enhancement of natural resources for sustainable equitable use and protect and enhance the quality and safety of the environment<br>▪ Promoting the conservation and sustainable utilisation of our natural resources to enhance economic growth<br>▪ Protecting and improving the quality and safety of the environment<br>▪ Promoting a global sustainable development agenda<br>▪ Transformation<br>▪ To ensure the regulation and management of all biodiversity, heritage and conservation matters<br>▪ Promote and conserve our biological diversity and cultural and local natural resources and ensure the sustainable utilisation of resources for the benefit of the people of South Africa<br>▪ Protect the environment in the interest of the health and well-being of the people of South Africa<br>▪ Provide environmental information in support of effective environmental management and public participation in environmental governance<br>▪ Manage conservation the Transfrontier Conservation Areas and Protected Areas<br>▪ Promote and conserve our biological diversity and cultural and local natural resources and ensure the sustainable utilisation of resources for the benefit of the people of South Africa<br>▪ To provide programme management support service to Line Managers in managing Poverty Relief project |
| **LEDET**<br>LIMPOPO<br>PROVINCIAL GOVERNMENT | Environmental services Include –<br>▪ Environmental Planning, Governance & Information Management<br>▪ Environmental Impact Assessment<br>▪ Environmental Empowerment & Sustainable livelihoods<br>▪ Coastal & Biodiversity Management<br>▪ Pollution & Waste Management<br>▪ Compliance, Monitoring and Enforcement<br>▪ Air Quality & Climate Change |
| **DMR**<br>mineral resources<br>Department:<br>Mineral Resources<br>REPUBLIC OF SOUTH AFRICA | ▪ Actively contribute to sustainable development - promote sustainable resource management and contribute to skills development and the creation of meaningful and sustainable jobs<br>▪ Promote and transform the minerals sector<br>  ○ Promote and facilitate value addition to mineral resources extracted in the Republic<br>  ○ Redress past imbalances through promoting investment, broader participation in the minerals sector, direct intervention in communities, and increased BEE and SMME participation inclusive of women, youth and the disabled.<br>▪ Regulate the minerals sector - developing new policies, reviewing of existing policies and amending legislation to make them current to evolving an environment and achieving transformation in the minerals and mining industry<br>▪ Promote health and safety in the minerals sector - provide clear policy and regulatory framework to manage health and safety risks and promote best practice in the mining sector<br>▪ Protect the environment – promote the reduction of the impact of mining activities on the environment and public health through management of rehabilitation of ownerless and derelict mines, research and development in mine environmental management and development of mine environmental policies.<br>▪ Efficient and effective service delivery - develop and review internal processes, understand stakeholder needs and improve turn-around times<br>▪ Enhance DMR culture, systems and people - attract, develop and retain appropriate skills, promote good organisational culture and make the Department an employer of choice.<br>▪ Ensure long term financial stewardship – ensure optimal utilisation of resources, manage budges effectively, implement risk management strategies and promote corporate governance |

| Environmental Authorities | Key Objectives / Obligations / Services / Functions |
|---|---|
| **DWA**<br>water affairs<br>Department:<br>Water Affairs<br>REPUBLIC OF SOUTH AFRICA | ▪ Forecasting and balancing of water demand and supply<br>▪ Ensure adequate information and knowledge to sustainably manage water resources<br>▪ Improve water allocation<br>▪ Improve water use efficiency<br>▪ Improved water resource quality<br>▪ Ensure protection of water resource quality and quantity<br>▪ Ensure water service delivery through policy and regulation<br>▪ Regulate Water Services Authorities<br>▪ Develop and construct new infrastructure<br>▪ Asset management<br>▪ Percentage maintenance of infrastructure as per maintenance plan<br>▪ Ensure the provision of regional bulk water<br>▪ Rehabilitation and refurbishment of water resources infrastructure<br>▪ Ensure implementation of cooperation agreements<br>▪ Shape the global agenda on water<br>▪ Strengthen regional institutions of water<br>▪ Organisational growth and development<br>▪ To provide gender equality and woman empowerment solutions<br>▪ Contribute towards poverty alleviation through job creation initiatives |
| **SANParks**<br>South African<br>NATIONAL PARKS | To develop, manage and promote a system of national parks that represents biodiversity and heritage assets by applying best practice, environmental justice, benefit- sharing and sustainable use.<br><br>▪ Percentage maintenance of infrastructure as per maintenance plan<br>▪ To strengthen the outstanding universal value of the Mapungubwe cultural landscape by effectively and holistically managing the cultural heritage and biodiversity in equal measure with the TFCA context |

| Environmental Authorities | Key Objectives / Obligations / Services / Functions |
|---|---|
| **Vhembe District Municipality** | The Vhembe District Municipality has the following powers and functions assigned to it in terms of the provisions of Section 84 (1) of the Municipal Structures Act, no 117 of 1998:<br>▪ Integrated development planning for the district municipality as a whole, including a framework for integrated development plans of all municipalities in the area of the district municipality<br>▪ Bulk supply of electricity that affects a significant proportion of municipalities in the district. This function is currently being rendered by ESKOM whilst the district is subsidizing free basic electricity and reticulations within four local municipalities<br>▪ Domestic waste – water and sewage disposal system<br>▪ Solid waste disposal sites serving the area of the district municipality as a whole<br>▪ Municipal roads which form an integral part of a transport system for the area of the district municipality as a whole<br>▪ Regulation of passenger transport services<br>▪ Municipal airports serving the area of the district municipality as a whole<br>▪ Municipal health services serving the area of the district municipality as a whole<br>▪ Firefighting services serving the area of the district municipality as a whole<br>▪ The establishment, conduct and control of fresh produce markets and abattoirs serving the area of a major proportion of the municipalities in the district<br>▪ The establishment, conduct and control of cemeteries and crematoria serving the area of a major proportion of the municipalities in the district<br>▪ Promotion of local tourism for the area of the district municipality<br>▪ Municipal public works relating to any of the above functions or any other functions assigned to the district municipality<br>▪ The receipt, allocation and, if applicable, the distribution of grants made to the district municipality<br>▪ The imposition and collection of taxes, levies and duties as related to the above functions or as may be assigned to the district municipality in terms of national legislation.<br>▪ Water Services is transferred to the district whilst service level agreements were signed with local municipalities to perform the function of water service providers. |
| SAHRA | The SAHRA is mandated with identifying, protecting, and conserving heritage assets for present and future generations. In terms of the National Heritage Resources Act, No. 25 of 1999, the national estate that should be protected includes:<br>▪ Places, buildings, structures and equipment of cultural significance;<br>▪ Places to which oral traditions are attached or which are associated with living Heritage<br>▪ Historical settlements and townscapes<br>▪ Landscapes and natural features of cultural significance<br>▪ Graves and burial grounds, including<br>  ○ Ancestral graves<br>  ○ Royal graves and graves of traditional leaders<br>  ○ Graves of victims of conflict<br>  ○ Historical graves and cemeteries<br>▪ Archaeological and palaeontological sites |

### *4.4.2 Environmental Management at Local Level*

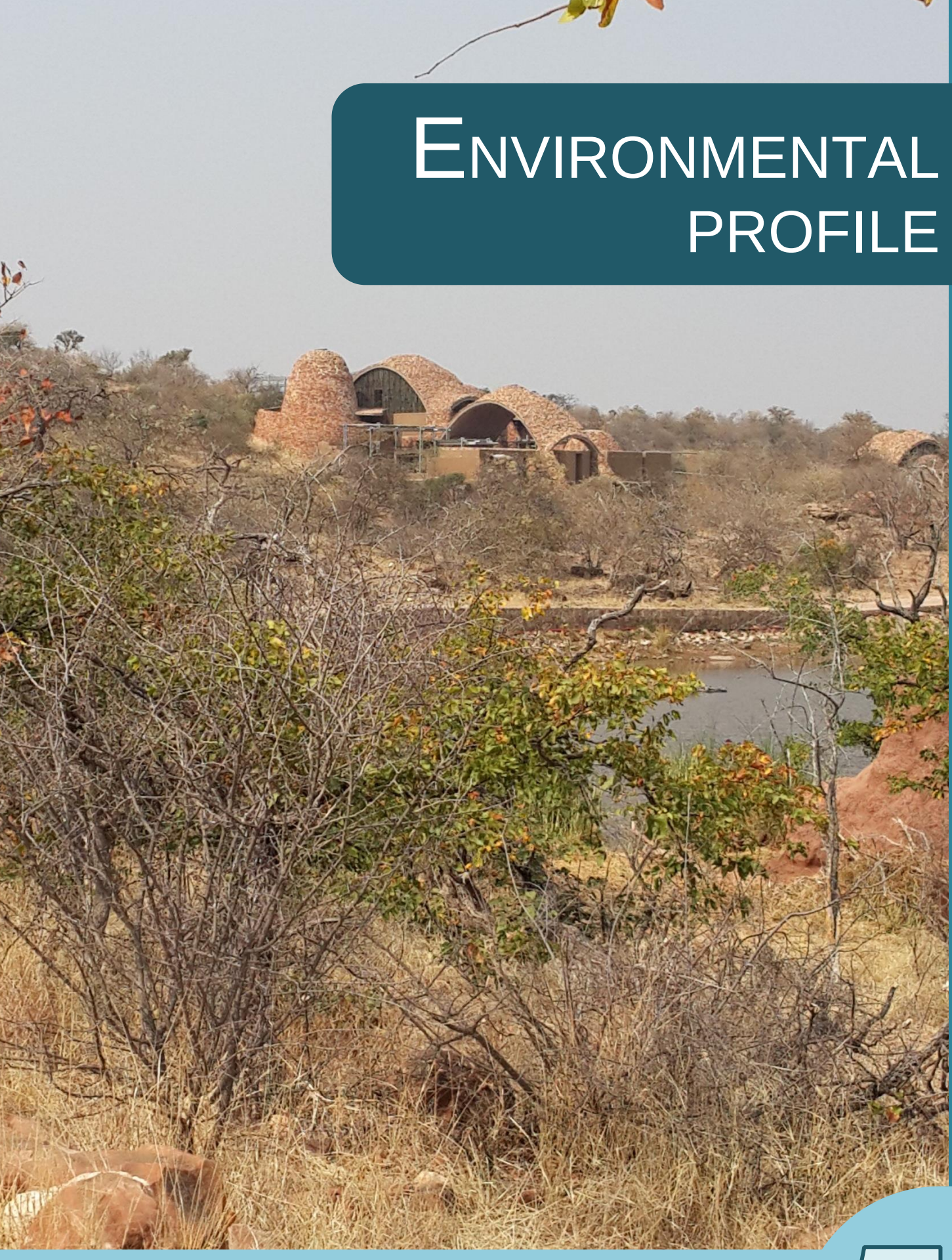
The IDP for the Vhembe District Municipality makes provision in its organogram for an Environmental Impact Assessment Officer. Within the Community Services Department there are several positions including a managerial position for Environmental Health.

Environmental and natural resource management falls within the Social Cluster of the district.

According to the IDP, the Musina Local Municipality has an Environmental Plan and the Municipality is performing the function through a service level agreement with Vhembe District Municipality (Musina Local Municipality, 2012). There is no dedicated unit responsible for environmental planning and management.

From an appraisal of the IDPs and SDFs it appears as if the Vhembe District Municipality and Musina Local Municipality have limited resources to ensure effective Integrated Environmental Management. It was also unclear whether all the necessary Environmental Sector Plans are in place.

# Environmental Profile



Section 5

# 5 BIOPHYSICAL ENVIRONMENT

The biophysical environment is regarded as the biotic and abiotic components of the natural environment, and their interrelationship with each other.

## 5.1 Climate

**GIS Mapping** • *Appendix A1 (Map: RAINFALL)*

According to data from the Musina Weather Station (station ID: 809706.1), peak rainfall occurs in the summer months, between October and March. Mean Annual Precipitation (MAP) is highly variable, ranging between 100 mm and 900 mm per year (see **Figure 14**). The area is generally warm, with summer temperatures peaking at around 37°C in summer and winter temperatures dropping as low as 5°C.

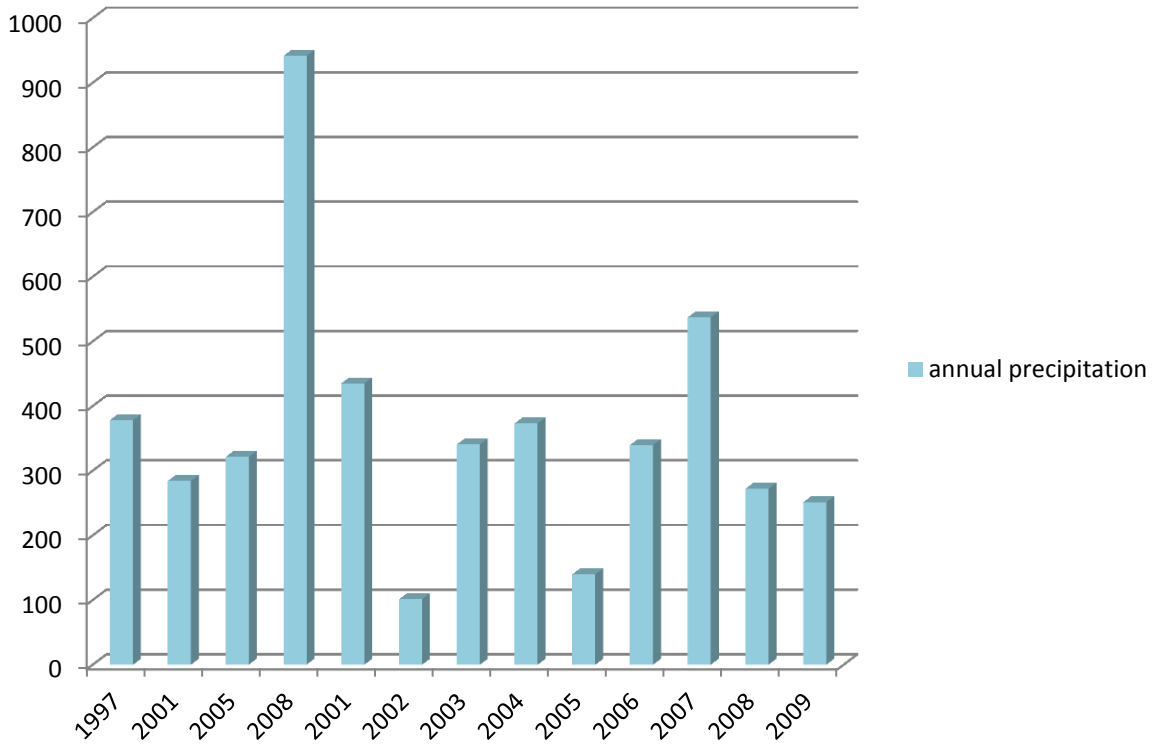



**Figure 14: Annual precipitation at Messina weather station between 1997 and 2009**

It should be noted that on the X axis the 3 years after 1997 are incorrectly reflected as 2001, 2005 and 2008 instead of 1998, 1999 and 2000.

A summary of the climatic conditions measured at the Musina weather station follows:

- Highest monthly total rainfall = 414.9 mm - February 2000;
- Lowest monthly total rainfall = between 1997 and 2009 there has been no rainfall for at least one month per year;
- Highest annual rainfall = 941.5 mm – 2000;
- Lowest annual rainfall = 101.2 mm – 2002;
- Highest temperature = 37.5 ºC – December 2006; and
- Minimum temperature = 5.51 ºC - July 1991.

Three wind systems have a strong influence on the basin's climate. These are the tropical cyclones from the Indian Ocean, the south-easterly wind systems that bring rainfalls from the Indian Ocean and the Inter-Tropical Convergence Zone, which in some years moves sufficiently far southwards to influence rainfall in the northern parts of the basin.

Due to the rural nature of the district, climate change could have drastic implications for a large proportion of the population who depend on agriculture (Benhin, 2006).

A specific study on the implications of climate change on rainfall in Vhembe District Municipality showed that the northern parts of the District, in and around the MCL are likely to experience a decrease in rainfall and an increase in evaporation as a result of climate change (Nenwiini & Kabanda, 2013). The study found that a continuous decrease in rainfall can be explained by lack of strong local influences on rainfall formation like vegetation on mountains, also increase in population that use more land for agriculture and settlement (urban sprawl).

## 5.2 Geology

**GIS Mapping** • *Appendix A2 (Map: GEOLOGY)*

*This section was extracted from the specialist report on Geology and Geohydrology prepared by the Council of Geoscience (CGS).*

The simplified geological map of the EMF study area is shown in **Figure 15**.

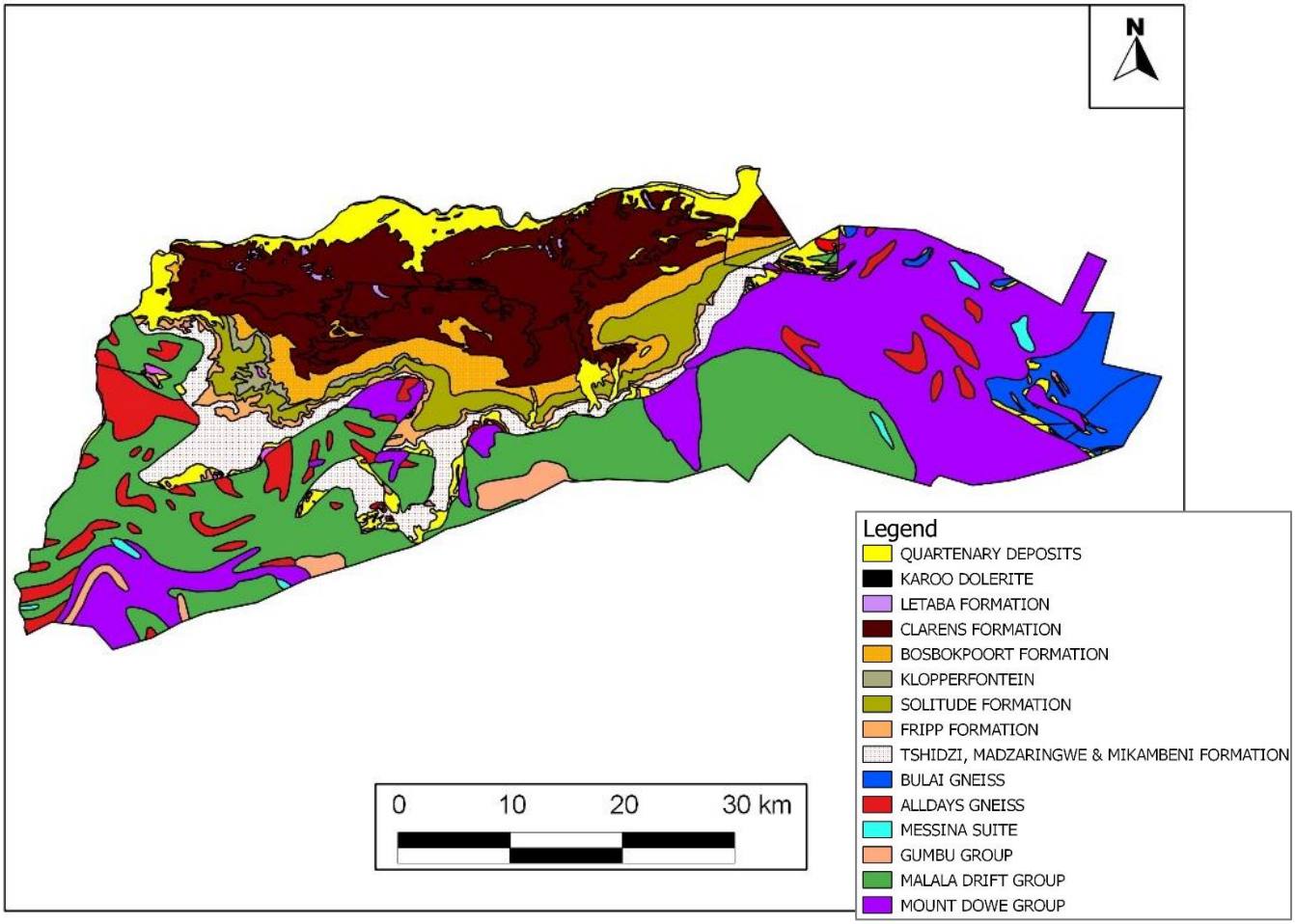



**Figure 15: Simplified geological map**

The MCLWHS is characterized by basal sedimentary and overlying volcanic rocks of the Karoo Supergroup as well as minor quaternary deposits. The buffer zone consists of Archaean rocks that are up to 4 Billion years old. Coal reserves have been identified within the area and also on the neighbouring farms where a coal mine already exists (http://www.coalofafrica.com/our-business/operations/operation-vele). Kimberlite pipes

about ~500 Million years old were discovered in the region in 1980; a diamond mine exists at Venetia about 20 km south of the Mapungubwe National park boundary. In addition a variety of fossils has been identified in the Karoo sediments.

### *5.2.1 Archaean Lithologies*

The park is surrounded by a terrain composed of Archaean granulite-grade rocks of the Central Zone of the Limpopo Belt (Kramers et al., 2006). The Limpopo Belt is believed to have developed during the collisions between two continents, i.e. the Kaapvaal Craton in the south and the Zimbabwe Craton in the north, about 2.0 Billion years ago.

The Central Zone is made up of high-grade metasedimentary rocks and associated leucogneisses collectively known as the Beit Bridge Complex, which cover the gazetted buffer zone (Fig.1). Mount Dowe and Malala Drift Group are the most dominant Archaean Gneiss, followed by patches of Alldays Gneiss and Messina Suite.

Furthermore a rock unit around this region known as Sand River Gneiss is linked to one of the oldest known geological features in the world and this feature is exposed in an area near Musina. It exposes an original crustal material of the earth that is about 3.2 Billion years old.

### *5.2.2 Karoo Supergroup*

The Karoo Supergroup represents a variety of sedimentary environments which reflects the migration of the Gondwana continent from polar to lower latitudes over a period of 200 Million years. The Karoo Supergroup is represented by a basal sedimentary and volcanic unit. The formations making up the Supergroup are:

#### 5.2.2.1 Tshidzi, Madzaringwe and Mikambeni Formations

The Tshidzi, Madzaringwe and Mikambeni Formations were deposited on an uneven floor of Beit Bridge Complex Gneisses. The basal Tshidzi Formation consists of diamictite with clasts ranging up to 2 m in diameter in a sandy matrix. The Formation attains a maximum thickness of 20 m, with only 5 m recorded elsewhere. Locally the diamictite comprises relatively coarse grained sandstone suggestive of deposition in glacial, fluvioglacial and braided stream environments.

The Madzaringwe Formation which contains most of the reported coal resources in this area rest unconformable on the rocks of the Beit Bridge Complex. The formation consists of shale, sandstone and siltstone and alternating bands of coal with mudstone (Snyman, 1998). Thin coal seams and carbonaceous shale are developed in the basal unit of the formation. Another coal seam of about 2-3 m thick has been recorded between 85 and 100 m above the carbonaceous zone.

Mikambeni Formation comprises shale, mudstone and laminated sandstone, attaining a maximum thickness of 150 m. It is subdivided into three distinct units: The lower black shale and grey feldspathic sandstone unit varies in thickness from 15-20 m. The middle unit attains a maximum thickness of 50 m, consisting of dark- grey mudstone with plant remains and sporadic seams of bright coal. An upper unit is similar to the middle unit; however, its thickness varies from 60-70 m and comprises dark- grey mudstone (Johnson et al., 2006).

#### 5.2.2.2 Fripp formation

The Fripp Formation is medium-to coarse-grained, white, feldspathic sandstone with thin pebble layers. A maximum thickness of 110 m is reported from the north- eastern part of the basin.

#### 5.2.2.3 Solitude formation

The Solitude Formation consists of sandstone, siltstone with minor mudstone. This formation attains a maximum thickness of 25 m in western side of the basin and about 3.5 m thick in places.

#### 5.2.2.4 Klopperfontein formation

Klopperfontein Formation is lithologically similar to the underlying Fripp Formation. It is reported to occur in the central part of the basin with a maximum thickness of 10-12 m.

#### 5.2.2.5 Bosbokpoort formation

This formation is characterised by red lithologies; brick- red to purple mudstone with subordinate white siltstone layers and few conglomerate layers. The outcrop of this formation is very rarely exposed but where exposed a maximum of 60 m thickness has been recorded.

#### 5.2.2.6 Clarens formation

This formation is subdivided into the basal Red Rocks Member and the upper Tshipise Member. The Red Rocks Member consists of very fine- to fine- grained pink or red argillaceous sandstone, often mottled in appearance due to the presence of irregular patches of white sandstone. The Tshipise Member is fine- grained, yellowish white sandstone characterised by large scale aeolian cross- bedding. The thickness of the formation ranges from 5 to 14m.

The Clarens Formation is best exposed in the Mapungubwe National Park on the farm Greefswald 37MS where an extensive brick-red mudstone horizon that is up to

5 m thick occurs below the base of the Tshipise sandstone. The pink-red mottled argillaceous sandstone underlies the mudstone horizon, showing an erosional platform over large areas, and forming extensive flat outcrops. The mudstone horizon has yielded dinosaur remains on the farm Greefswald 37MS and Lizzulea 62MS. In addition, dinosaur footprints are preserved on a bedding plane of the Tshipise sandstone on the farm Pont Drift 12MS (Brandl, 2002).

#### 5.2.2.7 Letaba formation

The extrusion of the basaltic lavas of the Letaba Formation overlying the Tshipise sandstone marks the end of Karoo sedimentation, except in isolated areas where contemporaneous deposition of sand and lava occurred (Brandl, 2002). The Letaba lava is generally fine-grained and blackish when fresh; it is often amygdaloidal and contains small crystals and aggregates of yellowish –green minerals. The weathered surfaces are dark reddish brown and often pitted, due to the preferential weathering of the mafic minerals.

The Letaba lava exposed in the park on the farm Greefswald 37MS has no pyroclastic material, which suggests that the lava was of the non-explosive, fissure-flow type. Furthermore the high fluidity of the lava caused initial accumulation in the lee of barchans dunes and in topographic depressions, giving rise to an irregular outcrop pattern. Good examples showing the preservation of barchans dune morphology occur on the same farm.

### *5.2.3 Dolerite*

The outpouring of the Karoo lavas was later followed by the Gondwana break-up (~183 Million years ago) that was accompanied by the intrusions of dolerite dykes. The trend of the major dykes is mainly east-west with a subordinate northeast-southwest trend. A major 5 m wide north-south dyke runs through the park on Schroda 46MS, and a few smaller dykes with the same trend are seen on farm Samaria 28 S. The dykes are more abundant in the area close to the confluence of the Limpopo and Shashe Rivers, and may be called a dyke swarm (Chidley, 1985).

Two types of dolerite dykes are identified in the area, namely a fine-grained melanocratic and a mesocratic coarse-grained porphyritic variety. The coarse-grained type generally forms major continuous dykes that are well exposed, and often a wide zone of thermal metamorphism in the country rocks is observed

### *5.2.4 Quaternary deposits*

The alluvium is confined to the channel and floodplain of the Limpopo River, and clayey soil covers much of the south western part of the park. The alluvium is light-grey to brownish in colour and clay-rich.

### *5.2.5 Economic Geology*

#### 5.2.5.1 Coal

Coal deposits are well developed in the Madzaringwe Formation of the Tuli Basin (De Jager, 1986). Based on the Geological Survey borehole data (1970-1978; unpublished), the borehole BR/5/1958 (Fig 2) intersected approximately 2 m of coal at 146 m and 186 m. The succeeding unit (Mikambeni Formation) is a grey mudstone unit, become purplish in the upper half, and weathers in a blocky manner. This unit appears to have been affected by faulting, and no coal seams have been intersected.

Coal mining on a neighbouring farm started operating in 2012 namely the Vele Colliery. The mine has estimated resources of 721 million tonnes of coal and an estimated life-span of 29 years.

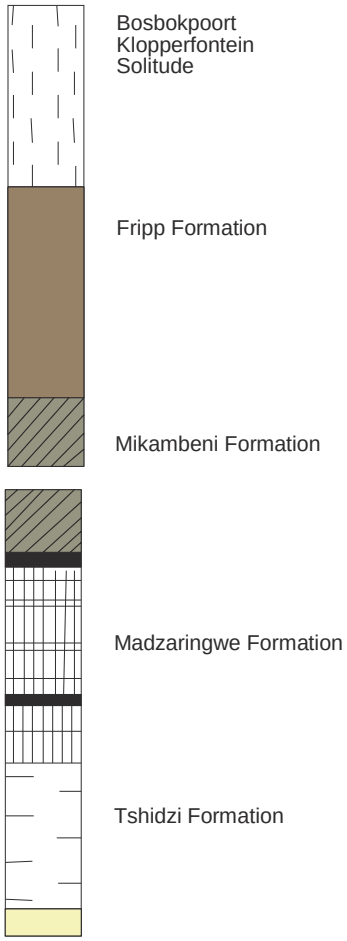



**Figure 16: Geological profile from borehole BR/5/1958 (De Jager, 1986)**

### 5.2.5.2 Diamonds

Diamonds occur in the region mainly in Kimberlite pipes (i.e. the Venetia mine) and also in alluvial gravels. The Venetia mine consists of 12 Kimberlite pipes, which were discovered in 1980 and current mining occurs in two of the largest pipes in an open pit operation. The mine has been operating since 1992 and has an estimated life-span of 25 years. The mine draws water from the Schroda dam that is inside the park.

Alluvial diamonds were discovered on the farm Riedel 48MS in 1903 and the diamonds occur in high-lying gravel covering soft Karoo sediments (Trevor and Mellor, 1908). Mining of these alluvial diamonds took place from 1905 to 1912 and from 1972 to 1973, mainly at the Seta mine (Brandl, 2002).

## 5.3 Topography

**GIS Mapping**

- *Appendix A3 (Map: TOPOGRAPHY)*

The broad terrain pattern in the study area consists of Limpopo Plain. Elevation is generally low with the highest point at 626 m. Besides the steeper slopes found along the Limpopo and Shashe river valleys, the study area is relatively flat with most of the area not exceeding 2 degrees (GMTFCA TTC. 2010).

Some of the broad landscape units in the study area include:

- Soft undulating landscape with plains and isolated koppies;
- Limpopo River valley and associated floodplains and larger drainage lines; and
- Extremely irregular undulating rocky areas with koppies and hills.

## 5.4 Soils

**GIS Mapping**

- *Appendix A4 (Map: SOILS)*

A variety of soils are present, with large areas characterised by sandy, lime-rich soils generally deeper than 750 mm. Soils generally have low agricultural potential, with irrigated alluvium tending to become brackish (SANParks, 2013). Agricultural potential for the area be derived from an agricultural related source / specialist. There is a refined land

capability data set for Limpopo province on which future demarcation of Agricultural Potential Zones will be based.

The dominant soil types of the study area are *Leptosols* found in the north of the study area. Luvisols occur along the Limpopo and Shashe river valleys and *Cambisols* to the south, interspersed with *Arenosols* and *Regosols.* Virtually all of the intensive agriculture (dry-land and irrigated) are located on the fertile and wet *Luvisols* (GMTFCA TTC. 2010).

## 5.5 Geohydrology

**GIS Mapping** • *Appendix A5 (Map: GEOHYDROLOGY)*

*This section was primarily sourced from the specialist report on the Geology and Geohydrology prepared by the CGS.*

The area has low and erratic rainfall, hence groundwater is the only dependable source of water for many users in this area away from the Limpopo River. The presence of groundwater depends upon the hydrological characteristics of the underlying aquifer.

The most prominent rocks in the area are the Beit Bridge Complex Archaean Gneiss, followed by the Karoo Supergroup as discussed on the previous section. Aquifers are developed within the weathered overburden and fractured bedrock of these hard crystalline rocks of an Archaean Age. The Beit Bridge Complex is characterized by very low primary porosity (contain virtually no water) , and almost all groundwater movement and storage take place through fractures, faults, weathered zones and other secondary features that enhance the aquifer potential only locally.

The area of interest falls within Limpopo Karoo Basin (Vegter, 2000) that has lower transmissivities and yields as compared to other basins in the Limpopo Water Management Area.

The confluence of the seasonally flowing Shashe and Limpopo Rivers is the most prominent hydrological feature in the area. The Limpopo and Golope floodplains are the

most dominant wetland types. Occurrence of the dolerite dykes in the area indicates the presence of groundwater since dolerite dykes are generally known to control movement of groundwater. Swarms of the dolerite dykes at the confluence with the Shashe River play an important role of supporting the functioning of the floodplain. Springs are common in the area and associated with dolerite dykes, fault zones as well as contact between different lithologies, and locally weathered sandstones are excellent aquifers.

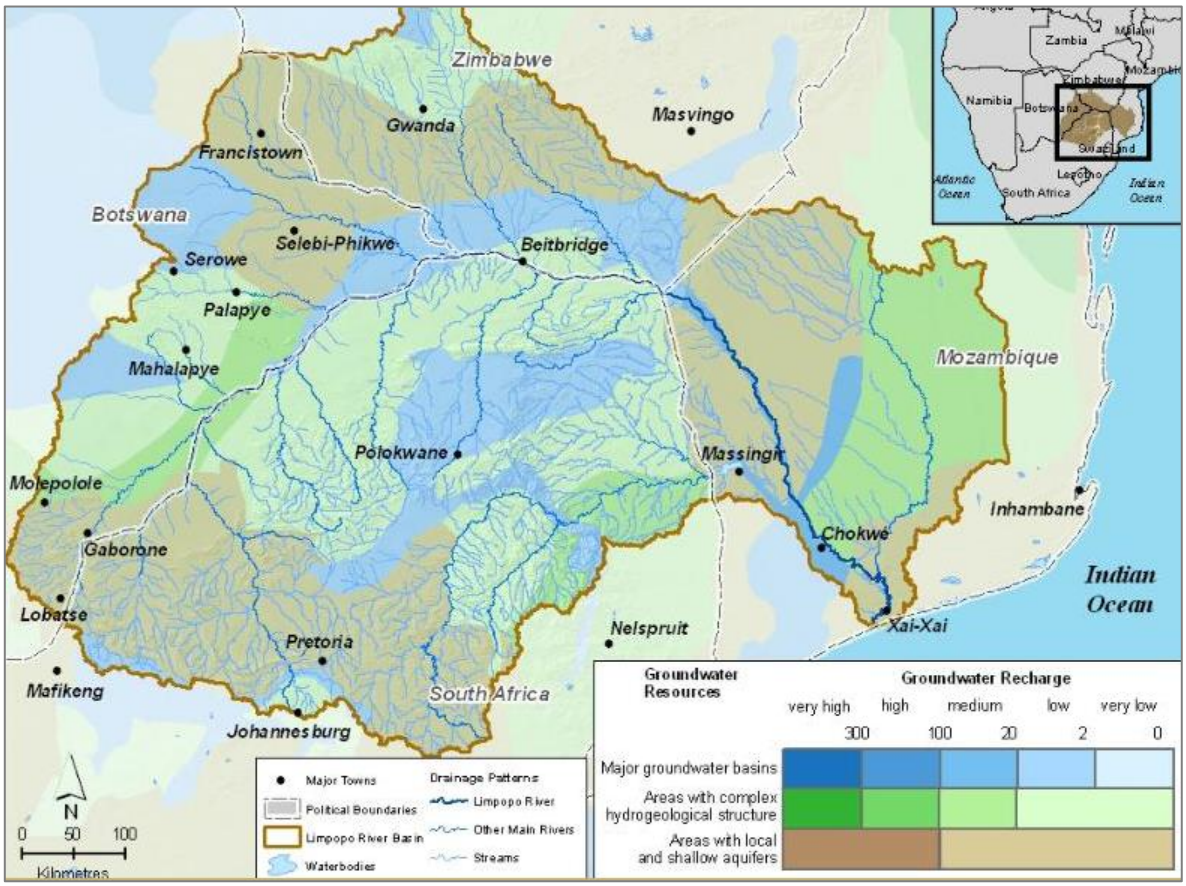



**Figure 17: Groundwater Resources of the Limpopo River basin (WHYMap, 2009)**

DWA in the province has about seven monitoring boreholes in the area (see **Table 7**), and the Groundwater Resource Information Project (GRIP Limpopo) database portal (http://www.griplimpopo.co.za/index.html) has captured one borehole data (H18-0609). The Borehole H18-0609 has a depth of 54.5 m, a maximum daily abstraction of 172.8 $m^3$/day and duty cycle of 24 hours.

Most recent groundwater level data that was captured by DWA during November 2012 until February 2013 in the area showed a significant rise in water level for the latter rainy

season (Verster, 2013). Groundwater level trends of the borehole at station A6 Pontdrift indicated stable conditions from November 2012 until approximately 20th January 2013, where after the groundwater level rose steeply (Verster, 2013). This steep rise in the groundwater was primarily influenced by heavy rains that took place early in January 2013.

**Table 7: Borehole monitoring points in Mapungubwe area**

| Borehole name | Latitude | Longitude |
|---|---|---|
| Mapungubwe V15 | -22.19907 | 29.34827 |
| Greefswald GD26B | -22.19412 | 29.38501 |
| Den Staat MRW1 | -22.18255 | 29.21307 |
| Den Staat WR | -22.18434 | 29.21386 |
| Den Staat Bird Hide | -22.98100 | 29.25102 |
| A7Greefswald | -22.198600 | 29.375000 |
| A6pondtdrift | -22.255840 | 29.301440 |

Vele mine has about seventeen boreholes and three springs; each borehole is monitored and measured physically for pH, water levels and electro-conductivity (Kaleo Consulting, 2011). Furthermore the boreholes were monitored prior to the onset of the mining activities in the area (**Table 8**).

Vele Mine is represented by two aquifers, namely; primary and secondary aquifers of Limpopo River. The primary aquifers comprise of unconsolidated alluvial pebbles within the channel and along the banks in excess of 25 m depth and over 2 km wide in places. Primary aquifer water levels within the alluvial system are commonly between 0-10 mbgl and reflect the level of the river to the surface.

The secondary aquifers are associated with faults zones, dykes or a combination within the consolidated rocks and the water levels varies significantly between 5 – 30 mbgl (Kaleo Consulting, 2011).

**Table 8: Baseline groundwater quality results prior to the onset of mining activities at Vele Colliery (Kaleo consulting, 2011)**

| Bh No | | Mon-1 | Mon-2 | Mon-3 | Mon-5 | Mon-14 | Mon-4 | Mon-6a | Mon-7a | Mon-7b | Mon-8 | Mon-10 | Mon-11 | Mon-12 | Mon-13 | Mon-15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E.C | mS/m | 314 | 336 | 971 | 170 | 282 | 1712 | 421 | 435 | 1289 | 537 | 4240 | 317 | 1016 | 468 | 1700 |
| TDS | Mg/l | 2004 | 2012 | 7066 | 1117 | 1997 | 11830 | 2606 | 2566 | 8940 | 3340 | 35116 | 1954 | 7972 | 3340 | 12210 |
| pH | Mg/l | 9.00 | 7.70 | 8.70 | 8.10 | 8.30 | 7.90 | 7.60 | 7.80 | 7.80 | 7.30 | 7.10 | 7.90 | 7.70 | 7.70 | 7.60 |

| Bh No | | Mon-1 | Mon-2 | Mon-3 | Mon-5 | Mon-14 | Mon-4 | Mon-6a | Mon-7a | Mon-7b | Mon-8 | Mon-10 | Mon-11 | Mon-12 | Mon-13 | Mon-15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NO3 | Mg/l | 0.20 | 0.20 | 20.33 | 0.88 | 29.17 | 1.33 | 0.88 | 1.33 | 269.62 | 0.88 | 7.51 | 0.88 | 0.88 | 0.88 | 26.08 |
| F | Mg/l | 4.00 | 4.30 | 3.90 | 4.20 | 1.70 | 2.50 | 2.90 | 4.50 | 2.00 | 2.10 | 3.40 | 3.90 | 4.00 | 7.20 | 0.60 |
| Fe | Mg/l | 0.01 | 0.52 | 0.01 | 0.32 | 0.05 | 4.54 | 2.97 | 0.32 | 6.83 | 1.14 | 72.00 | 1.08 | 2.20 | 31.00 | 20.00 |
| Mn | Mg/l | 0.01 | 0.11 | 0.49 | 0.07 | 0.03 | 1.30 | 0.03 | 1.03 | 1.22 | 0.70 | 9.09 | 0.69 | 1.70 | 1.83 | 3.12 |
| Ca | Mg/l | 133 | 59 | 95 | 37 | 45 | 150 | 59 | 38 | 185 | 165 | 758 | 85 | 526 | 266 | 409 |
| Mg | Mg/l | 0.20 | 14.00 | 170.00 | 9.74 | 125.00 | 212.00 | 38.00 | 24.00 | 305.00 | 51.00 | 1205.00 | 19.00 | 168.00 | 33.00 | 459.00 |
| Na | | 693 | 628 | 2919 | 444 | 715 | 3702 | 781 | 925 | 2443 | 902 | 8993 | 572 | 1944 | 843 | 2771 |
| Cl | Mg/l | 763 | 760 | 2642 | 320 | 423 | 4300 | 970 | 1040 | 3000 | 1420 | 14200 | 780 | 2100 | 720 | 4700 |
| SO4 | Mg/l | 355 | 342 | 812 | 189 | 148 | 2546 | 489 | 78 | 1685 | 572 | 8126 | 469 | 3143 | 1196 | 1889 |

| | | |
|---|---|---|
| | Class 0 | Ideal |
| | Class 1 | Good |
| | Class 2 | Marginal |
| | Class 3 | Poor |
| | Class 4 | Dangerous |

**Table 9** shows macro chemical analysis of secondary aquifers prior to the onset of mining activities in the area. The groundwater flow in the area is oriented northwards towards the Limpopo River and the flow volumes are very low due to the low recharge and low permeability.

**Table 9: Macro chemical analysis of secondary aquifers prior to the onset of mining activities at Vele Colliery (Dyambwini Project Solutions, 2011**

| Class O | Class I | Class II | Class III or IV | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Borehole Number** | **E.C mS/m** | **TDS Mg/l** | **Hardness Mg/l** | **$NO_3$ Mg/l** | **F Mg/l** | **Mg Mg/l** | **Na Mg/** | **Cl Mg/** | **$SO_4$ Mg/** |
| **AH/BH-1** | 375.0 | 2357.2 | 881.4 | 36.4 | 1.0 | 164.0 | 580.8 | 416.5 | 280.0 |
| **B2/BH-3** | 750.0 | 3723.5 | 773.7 | 33.9 | 1.6 | 149.8 | 1161.3 | 803.7 | 490.0 |
| **B2/BH-1** | 936.0 | 4864.8 | 891.3 | 47.1 | 1.6 | 201.0 | 1596.4 | 1107.5 | 426.0 |
| **BK/BH2** | 318.0 | 1734.6 | 1312.2 | 112.9 | 0.8 | 249.7 | 213.0 | 460.6 | 43.8 |
| **OV/BH-38** | 489.0 | 3024.0 | 949.9 | 0.0 | 2.4 | 152.2 | 487.3 | 779.2 | 384.0 |
| **OV/BH-16** | 466.0 | 2075.2 | 626.7 | 0.0 | 1.9 | 73.6 | 565.2 | 735.1 | 413.0 |
| **OV/BH-16** | 485.0 | 3013.0 | 763.8 | 0.0 | 2.8 | 114.1 | 452.2 | 725.3 | 345.1 |
| **OV/BH-37** | 1338.0 | 7864.0 | 793.2 | 215.3 | 5.6 | 178.3 | 1925.1 | 1881.8 | 820.0 |
| **H18-0678** | 4470.0 | 26914.0 | 4093.2 | 0.0 | 0.2 | 566.0 | 6538.4 | 7938.7 | 4150.0 |
| **H18-0680** | 4180.0 | 24693.0 | 4837.4 | 75.2 | 0.1 | 827.5 | 6015.0 | 6811.6 | 5120.0 |
| **H17-0681** | 682.0 | 4018.0 | 763.8 | 0.0 | 0.2 | 123.7 | 782.6 | 695.9 | 570 |

**Table 9** shows chemical properties such as the electro conductivity of the water and extent of Total Dissolved Solids (TDS), and other elements on those points. The TDS values of the sampled boreholes are normal but those samples with high content of salt ($NO_3$ and Cl) is because the boreholes are situated at the base of the Karoo lithology, where it is thought that NO3 and Cl leach into the groundwater.

## 5.6 Hydrology

**GIS Mapping**

- *Appendix A6 (Map: HYDROLOGY)*
- *Appendix A7 (Map: RIVER FEPAs)*
- *Appendix A8 (Map: WETLAND FEPAs)*

### *5.6.1 General Description*

The MCLWHS falls within the Limpopo Water Management Area (WMA) (**Figure 18**). This WMA shares international boundaries with Botswana and Zimbabwe, where the Limpopo River demarcates the entire length of the international boundaries before flowing into Mozambique where it discharges into the Indian Ocean. The study area falls within the following quaternary catchments: A63D, A63E, A71K and A71L.

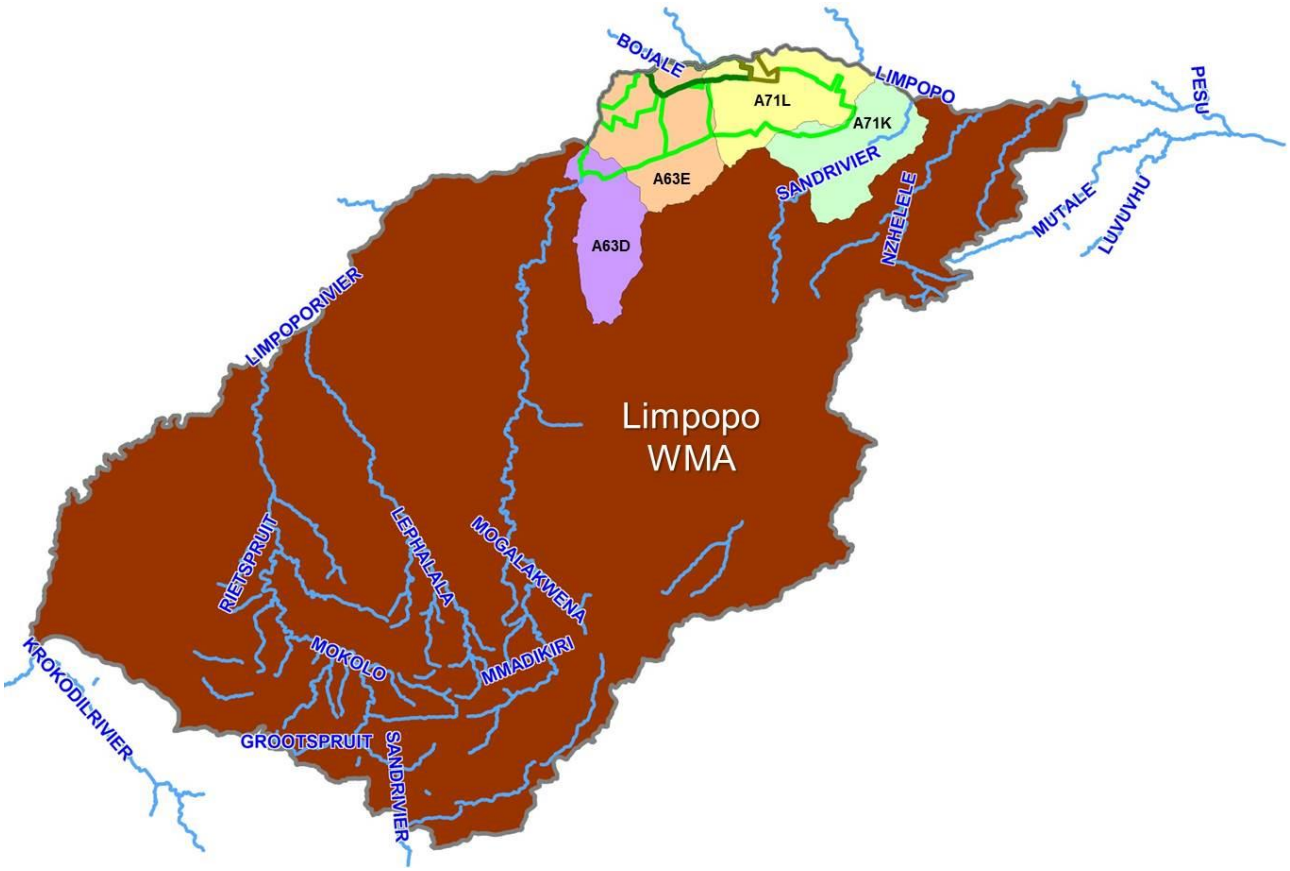



**Figure 18: WMA and Quaternary Catchments**

The main rivers in the Limpopo WMA are the Mokolo, Lephalala, Mogalakwena, Sand and Nzhelele, which together with some smaller tributaries, all flow northwards into the Limpopo River (Basson and Rossouw, 2003).

According to MNP Management Plan (SANParks, 2013), the dominant hydrological feature associated with the park is the confluence of the seasonally-flowing Shashe and Limpopo Rivers and a large ephemeral Kolope/Maloutswa wetland upstream of the confluence. The Limpopo River runs along the northern border of MNP, forming an international boundary. The dolerite features close to the confluence with the Shashe are crucial in the functioning of the floodplain. The weathered sandstones, weathered contacts and fault zones are excellent aquifers (SANParks, 2013).

Water use in the Limpopo WMA is dominated by the irrigation sector, which accounts for nearly 75% of the total water requirements.

According to MCLWHS Management Plan (2013) and Wetland Consulting Services (2012), the wetlands are restricted to:

- Riparian wetlands with the Limpopo River, floodplain and the confluences of some of the tributaries;
- Riparian wetlands in the alluvial tributaries where springs maintain wetland vegetation within the watercourse;
- Seepage wetlands associated with the springs or groundwater discharge;
- Pans or depressions; and
- Artificial wetlands where dams/impounding structures have been constructed to store water.

### *5.6.2 Ecological Status*

The conservation status of the rivers in the study area, as defined by the National Freshwater Ecosystem Priority Areas (NFEPA) assessment, is provided in **Figure 19**. FEPA rivers and wetlands need to stay in a good condition in order to conserve freshwater ecosystems and protect water resources for human use (Nel *et al*, 2011). The current and recommended condition for all river FEPAs is A (unmodified, natural) or B (largely natural) ecological category.

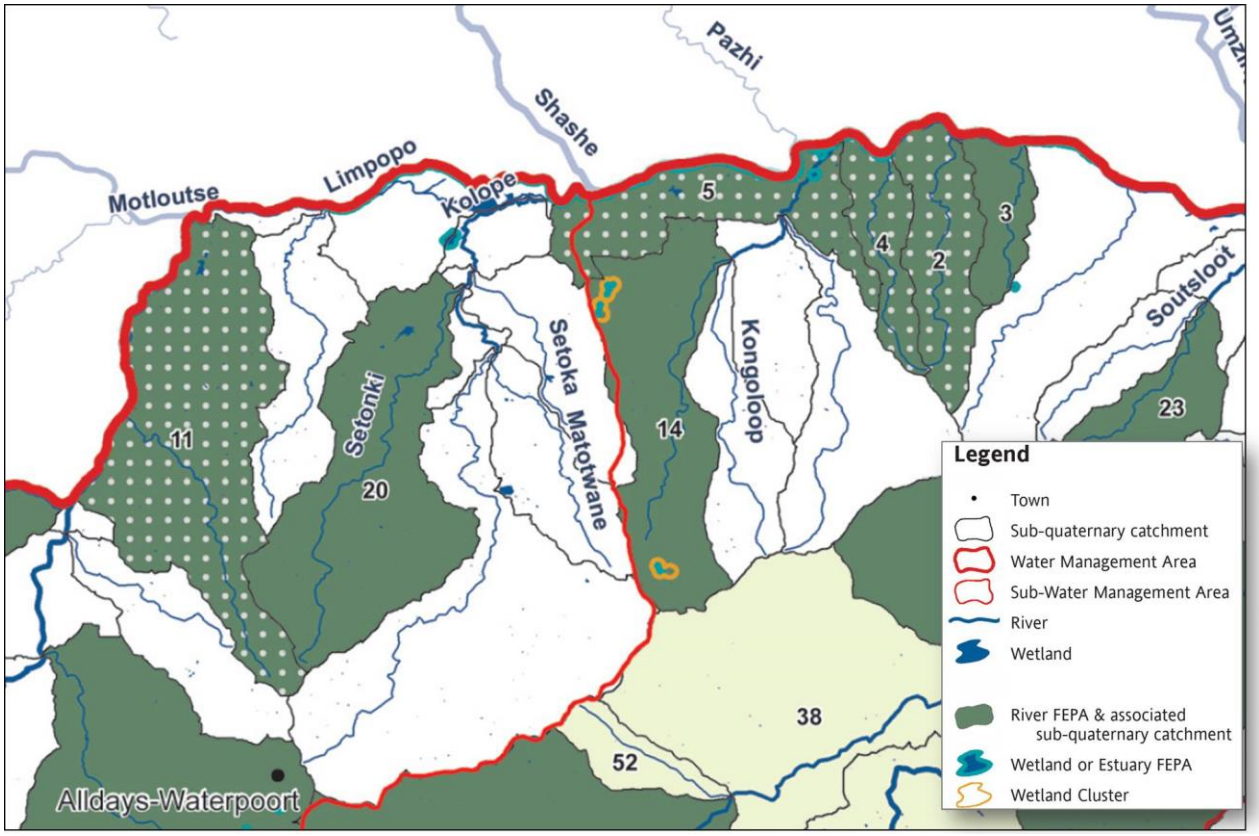



**Figure 19: WMA and Quaternary Catchments**

In terms of the river condition used by NFEPA, the vast majority of rivers in the MCLWHS fall within classes A or B. These categories are considered to be intact and able to contribute towards river ecosystem biodiversity targets. The Limpopo River falls within category C, which reflects that it is moderately modified.

There are at least 30 species found in the Limpopo River System of which cyprinids, catfish, Tilapia, trout and several brakish-water species (found in the estuary in

Mozambique) provide a source of income and protein to the basin people living near these watercourses. These same species are suitable to aquaculture and can be stocked in dams. The Limpopo River Valley also supports a large number of mollusc species that can be harvested (Darwall *et al.* 2009).

Wetlands that are in a natural or good condition occur along the Limpopo River, as well as on tributaries of the Kolope River. Two wetland clusters occurs in the central part of the study area. Wetland clusters allow for important ecological processes such as migration of frogs and insects between wetlands.

### *5.6.3 Factors driving the ecological integrity of rivers and wetlands within the MCLWHS*

Wetlands in the MCLWHS have been impacted upon by a long history of agriculture practices, such as draining, damming, cultivation and grazing. Accelerated erosion and sedimentation are pertinent problems. Recent impacts include exposure to high elephant concentrations and conservation interventions such as water transfer.

The implementation of management guidelines in the MNP should take note of the distribution, type and current ecosystem health of wetlands. It is important to have a grasp of the hydro-geomorphic and biological drivers of these wetlands, the type of wetlands and their status (ecological condition) in order to make sound management decisions (Grundling *et al.,* 2009).

According to SANParks (2013), a long-term and international management issue which will have to be tackled in achievable steps will be the overall flow patterns in the Limpopo and Shashe Rivers.

The Schroda dam, dam wall and pump station which are located on the farm Greefswald 37MS within the MNP is the property of the Venetia Mine. Water is stored and pumped to the mine.

## 5.7 Flora

**GIS Mapping**

- *Appendix A9 (Map: VEGETATION TYPES)*
- *Appendix A10 (Map: CRITICAL BIODIVERSITY AREAS)*

### *5.7.1 Biome and Vegetation Types*

According to Mucina and Rutherford (2006), the MCLWHS falls within the savanna biome and three vegetation types, namely Limpopo Ridge Bushveld, Musina Mopane Bushveld and Subtropical Alluvial vegetation. Each of these is explained futher.

#### 5.7.1.1 Limpopo Ridge Bushveld

Limpopo Ridge Bushveld occurs on hills and ridges, such as Madiapala in the lower Mogalakwena River basin in the west through a cluster of hills in the Pontdrif area including Poortjieberg and Tsolwe, eastwards including Mapungubwe Mountain in the Mapungubwe National Park through to the hills and ridges in the vicinity of the Limpopo River further downstream. It is also found in hills and ridges well away from the river north of the Soutpansberg and generally east of the Sand River (e.g. Tshitangai, Bloukop and Ha-Manenzhe) through to some rugged areas in the far northern Kruger National Park. The altitude ranges from 300 m in the east to 700 m, with the top of a few hills in the west at around 1 000 m (Mucina and Rutherford, 2006).

**Conservation status**

The conservation status of Limpopo Ridge Bushveld is **least threatened** with a national conservation target of 19%. Some 18% of this vegetation type is statutorily conserved, mainly in the Kruger and Mapungubwe National Parks. An additional 2% is conserved in the Baobab Tree Reserve. Only about 1% is transformed, mainly for cultivation and mining (Mucina and Rutherford, 2006

#### 5.7.1.2 Musina Mopane Bushveld

Musina Mopane Bushveld occurs in undulating plains from areas around Baines Drift and Alldays in the west, remaining north of the Soutpansberg and south of the Limpopo River, through Musina and Tshipise to Malongavlakte, Masisi and Banyini Pan in the east. The altitude ranges from 300 m (in the eastern Limpopo Valley) to 800 m (Mucina and Rutherford, 2006).

**Conservation Status**

The conservation status of Musina Mopane Bushveld is **least threatened** with a national conservation target of 19%. Only 2% of this vegetation type is statutorily conserved mainly in the Mapungubwe National Park as well as in Nwanedi and Honnet Nature Reserves. Additionally, about 1% is conserved in the Baobab Tree Reserve. Roughly 3% is transformed, mainly by cultivation (Mucina and Rutherford, 2006).

#### 5.7.1.3 Subtropical Alluvial Vegetation

Subtropical Alluvial vegetation is found in Limpopo, Mpumalanga and KwaZulu-Natal Provinces and in Swaziland. It occurs in broad river alluvia and around some river-fed pans in the subtropical regions of eastern South Africa, in particular in the Lowveld, Central Bushveld and in northern KwaZulu-Natal. The most important alluvia include the Limpopo, Luvubu, Olifants, Sabie, Crocodile, Phongolo, Usutu and Mkuze Rivers. This unit is fully embedded within the Savanna Biome. The altitude ranges from 0–1 000 m (Mucina and Rutherford, 2006).

**Conservation Status**

The conservation status of Subtropical Alluvial vegetation is **least threatened** with a national conservation target of target of 31%. Large patches of this vegetation type are statutorily conserved in the Kruger and Mapungubwe National Parks, Vemre and D'nyala Nature Reserves, Ndumo Game Reserve and Greater St Lucia Wetland Park as well as in a number of private reserves fringing the western borders of the Kruger National Park and the Limpopo River. Much of the area has been transformed for cultivation, urban development and road building. Alien woody species commonly occurring in this vegetation type include *Melia azedarach*, *Chromolaena discolor etc* (Mucina and Rutherford, 2006).

### *5.7.2 Terrestrial Threatened Ecosystems*

The first national list of threatened terrestrial ecosystems for South Africa was gazetted on 9 December 2011. It listed all the threatened or protected ecosystems in South Africa in terms of four categories; Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or protected. The purpose of listing these ecosystems is primarily to reduce the rate of ecosystem and species extinction, as well as preventing further degradation and loss of structure, function, and composition of these ecosystems. It is estimated that threatened ecosystems make up 9.5% of the country, with critically endangered and endangered ecosystems accounting for 2.7%, and vulnerable ecosystems 6.8% (SANBI, 2009).

According to SANBI data, there is one (1) Endangered (EN) and one (1) Vulnerable (Vu) ecosystems in MCLWHS - Lowveld Riverine Forest and Mapungubwe/Greefswald Riverine Forest, respectively. These are explained futher.

#### 5.7.2.1 Lowveld Riverine Forest (FOa 1)

Lowveld Riverine Forest occurs in the forest biome and is found KwaZulu-Natal, Mpumalanga and Limpopo provinces. This typically hydro-pedologic azonal forest occurs imbedded within the Lowveld areas of the Savanna Biome, where it is found on alluvia of rivers (from the Limpopo River in the north to the Amatigulu River in Zululand in the south). The largest and best-developed patches are found in Maputaland and in the Mpumalanga and Limpopo Lowveld.

This forest provides a unique habitat and has high biodiversity value. The forests provide an important food source (browse and fig trees) and serve as a heat avoidance microhabitat for savanna dwelling animals and shelter for riverine animals. An important ecosystem function is provided by the root system, which helps to bind soil promoting stream bank stabilisation and prevents erosion. Approximately 67% of the ecosystem is protected in Kruger and Mapungubwe National Parks, iSimangaliso Wetland Park, Ndumo and Mkuze Game Reserves, Mlawula and Blyde River Canyon National Park (Mucina & Geldenhuys, 2006).

#### 5.7.2.1 Mapungubwe/Greefswald Riverine Forest (FOR4)

The Mapungubwe/Greefswald Riverine Forest ecosystem is found in Limpopo province in the Forest Biome. This ecosystem is found within the Mapungubwe National Park, along the Limpopo River at its confluence with the Shashe River, on the border with Botswana and Zimbabwe, and along streams feeding into the river. It is characterised by tall gallery forests fringing the Limpopo River and tributaries, surrounded by savanna woodland. It is dominated by typical riverine forest species such as *Ficus sycamorus* and *Acacia xanthophloea* and a number of species typical of woodlands such as *Schotia brachepetala*.

The ecosystem is important for a variety of forest and woodland fauna, including Elephant (*Loxodonta africana*) and Black Rhino (*Diceros bicornis*). As the most extensive riverine forest along the Limpopo west of the Kruger National Park, the forest serves as an important migratory route for certain fauna species. This ecosystem is protected in the Mapungubwe National Park. The number of known species of special concern in this ecosystem is 3 Red Data bird species and 1 Red Data mammal species (Von Maltitz, *et al*. 2003).

### *5.7.3 Vhembe Biosphere Reserve*

The Vhembe Biosphere Reserve (VBR) was acknowledged as a biosphere reserve by UNESCO in 2009. VBR covers the Vhembe District, the Blouberg Municipality and the Kruger National Park north of the Shingwedzi River

(http://www.vhembebiosphere.org/about-vbr). It includes part of the Kruger National Park, MNP, the Soutpansberg and Blouberg bio-diversity hot spots, the Makgabeng Plateau, the Makuleke Wetlands and the Mapungubwe Cultural Landscape World Heritage site as well as part of two recognized centres of biodiversity and endemism (the Soutpansberg and Blouberg) (van Wyk and Smith, 2001).

The Reserve has a remarkable diversity of ecosystems, species and cultural resources. The VBR is the sixth South African Biosphere Reserve and the third in Limpopo Province. The aims of VBR is to conserve the areas uniquely bio-diverse environment, while simultaneously supporting and promoting much needed sustainable development.

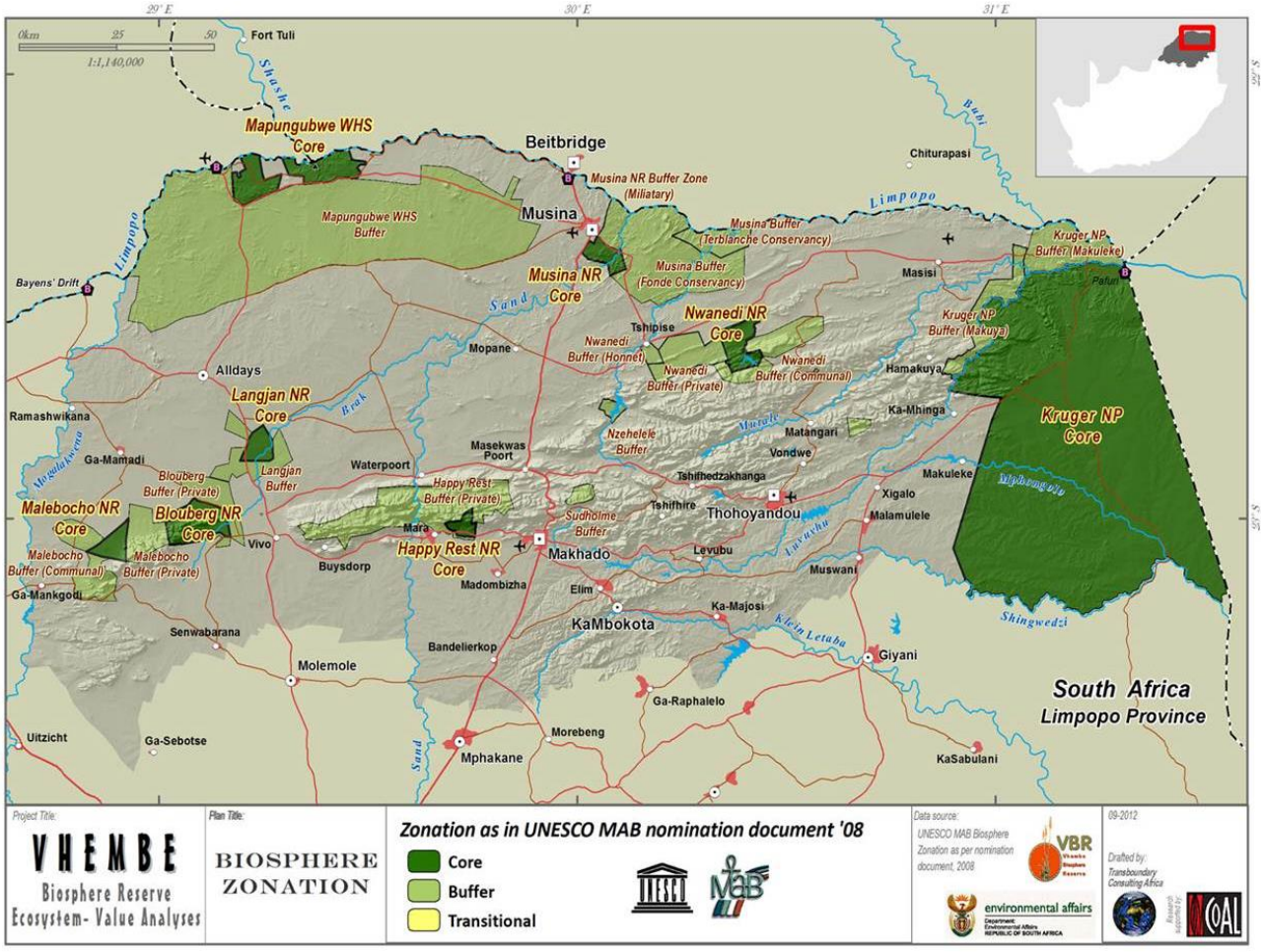



**Figure 20: VBR Zonation**

The VBR include three biomes, namely savanna, grassland, and forest, four bioregions and twenty four different vegetation types (Mucina and Rutherford, 2006). VBR also

contains the only natural inland lake in Southern Africa, Lake Fundudzi in the Soutpansberg Mountains. This is considered as one of the aquatic hotspots in the VBR. The size of the VBR is approximately 30 701 $km^2$ (http://www.vhembebiosphere.org/about-vbr).

The VBR contains 19 families and 161 taxa of reptiles as well as 9 families and 35 taxa of amphibians. One amphibian is endemic and 13 reptiles are endemic or near endemic to the VBR. Five of the endemic reptiles are restricted to the Soutpansberg and 3 are restricted to the Blouberg area. Five of the reptile species occurring in the VBR are currently listed by SARCA as Red Data Species (Linden, 2011).

Fifty six bat species occur in South Africa with 42 % of these are found in the VBR. According to Taylor (2011), the highest diversity occurs in the area between Makhado and Thohoyandou and south of this and in the Pafuri area. All the threatened species occur in the Punda Maria-Pafuri area and is also a diversity hotspot. Fifteen species from this area are listed in the SA Red Data book and 9 of these are only found in the VBR (Taylor, 2011).

All five South African primate species occur in the VBR (Linden, 2011) and only one, the Samango Monkey (*Cercopithecus albogularis*), is listed in the SA Red Data Book of mammals under the category vulnerable (Friedmann and Daly, 2004). Twenty three small mammal species are listed in the SA Red Data Book of which 15 are data deficient, two are near threatened, five are vulnerable and one is endangered. According to Baxter (2011), the population of the two species listed as Least Concern" namely the short tailed Gerbil and the Hairy Footed Gerbil is very isolated and require further investigation.

### *5.7.4 Centre of Endemism*

According to van Wyk & Smith (2001), South Africa contains a number of areas where there are high levels of endemism amongst plant species. Endemism means that high proportions of the species are restricted to that area and occur nowhere else. According van Wyk & Smith (2001), South Africa has at least 19 centres of plant endemism including the Soutpansberg Centre of Plant Endemism.

The Soutpansberg Centre of Endemism is treated as an aggregated centre comprising both the Blouberg and Soutpansberg (van Wyk & Smith, 2001). The Soutpansberg is part of the 'Vhembe Biosphere Reserve'. The Soutpansberg is known for a high level of endemism of its invertebrate fauna of which the Soutpansberg Rock Lizard and the Soutpansberg Flat Lizard are named after (Schönhofer, 2008; Haddad, 2009).

Approximately 10% of the plants occurring within the Soutpansberg can be considered succulent. 55% of the endemic flora of the mountain can be regarded as succulents. The Aloe shows the greatest species diversity. The monotypic genus Zoutpansbergia is the only genus endemic to the mountain, comprising one species (Hahn 2002

### *5.7.5 Plant species of conservation importance recorded in the MCLWHS*

According to SANParks (2013), there are 26 Red Data plant species which occur within the MNP.

The MCLWHS is located within the 2229AA, 2229AB, 2229BA, 2229BB, 2228BD, 2229AC, 2229AD, 2229BC, 2229BD, 2228DB and 2229CA quarter degree square in terms of the 1:50 000 grid of South Africa (http://posa.sanbi.org/searchspp.php). South African National Biodiversity Institute (SANBI) used this grid system as a point of reference to determine any Red Data plant species or any species of conservation importance occurring in South Africa. This can be used to determine lists of species which could potentially occur within an area.

**Table 10** provides details of the Red Data plant species which have been recorded for this quarter degree squares. The status allocated to these species is defined in **Table 11**.

**Table 10: Plant species of conservation importance recorded in the area (SANBI data)**

| c | Species | Threat status | SA Endemic | Growth forms |
|---|---|---|---|---|
| Acanthaceae | *Justicia minima* A.Meeuse | Rare | No | Dwarf shrub |
| Acanthaceae | *Peristrophe cliffordii* K.Balkwill | Rare | No | Suffrutex |
| Acanthaceae | *Peristrophe gillilandiorum* K.Balkwill | Rare | No | Suffrutex |
| Apocynaceae | *Orbea woodii* (N.E.Br.) L.C.Leach | VU | No | Succulent |
| Fabaceae | *Acacia erioloba* E.Mey. | Declining | No | Shrub |
| Fabaceae | *Psoralea repens* L. | NT | No | Dwarf shrub |
| Hyacinthaceae | *Drimia altissima* (L.f.) Ker Gawl. | Declining | No | Geophyte |
| Orchidaceae | *Ansellia africana* Lindl. | Declining | No | Succulent |
| Poaceae | *Elytrophorus globularis* Hack. | VU | No | Graminoid |

***Note**: VU=Vulnerable, NT=Near Threatened*

**Table 11: Definitions of Red Data status (Raimondo *et al.*, 1999)**

| Symbol | Status | Description |
|---|---|---|
| Vu | Vulnerable | A taxon is **Vulnerable** when the best available evidence indicates that it meets any of the criteria of the five IUCN criteria for Vulnerable and it is therefore considered to be facing a high risk of extinction in the wild. |
| NT | Near Threatened | A taxon is **Near Threatened** when available evidence indicates that it nearly meets any of the five IUCN criteria for Vulnerable, and is therefore likely to qualify for a threatened category in the near future. |
| | Rare | A taxon is **Rare** when it meets any of the four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to the five IUCN criteria. |
| | Declining | A taxon is **Declining** when it does not meet any of the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline in the population. |

### *5.7.6 Limpopo Conservation Plan*

Critical Biodiversity Areas (CBAs) within the bioregion are the portfolio of sites that are required to meet the region's biodiversity targets, and need to be maintained in the appropriate condition for their category (Desmet, 2013). An objective of the CBA map is to identify a network of areas which, if managed according to the land use guidelines, would meet the pattern targets for all important biodiversity features, while at the same time

ensuring the areas necessary for supporting necessary ecological processes remain functional.

The systematic conservation planning process resulted in 40% of the province being identified as Critical Biodiversity Areas (CBA1 22% and CBA2 18%). Ecological Support Areas (ESA) cover a further 22% of the province, of which 16% are intact natural areas (ESA1) and 7% are degraded or areas with no natural areas remaining which are nevertheless required as they potentially retain some value for supporting ecological processes (ESA2) (Desmet, 2013). The extent of CBAs and ESAs are shown in **Table 12**.

**Table 12: Extent of CBAs and ESAs in Limpopo Province**

| CBA Category | Extent (ha) | Extent ($km^2$) | Extent (%) |
|---|---|---|---|
| Protected Area | 1 360 410 | 13 604 | 11% |
| CBA1 | 2 780 864 | 27 808 | 22% |
| CBA2 | 2 238 430 | 22 384 | 18% |
| ESA1 | 2 009 053 | 20 090 | 16% |
| ESA2 | 933 802 | 9 381 | 7% |
| **Total** | **9 322 559** | **93 225** | **74%** |

A map of CBAs for Limpopo was produced as part of this plan and sites were assigned to CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes. The general description of CBA map categories and associated land management objectives are listed in **Table 13**.

**Table 13: General description of CBAs and associated land management objectives**

| CBA Map Category | Description | Land Management Objective | Land Management Recommendations | Compatible Land-Use | Incompatible Land-Use |
|---|---|---|---|---|---|
| Protected Areas | Formal Protected Areas and Protected Areas pending declaration under NEMPAA. | Maintain in a natural state with limited or no biodiversity loss. Rehabilitate degraded areas to a natural or near natural state, and manage for no further degradation. Development subject to Protected Area objectives and zoning in a NEMPAA compliant and approved management plan. | Maintain or obtain formal conservation protection. | Conservation and associated activities (e.g. ecotourism operations), and required support infrastructure. | All other land-uses. |
| Critical Biodiversity Areas (1) | Irreplaceable Sites. Areas required to meet biodiversity pattern and/or ecological processes targets. No alternative sites are available to meet targets. | Maintain in a natural state with limited or no biodiversity loss. Rehabilitate degraded areas to a natural or near natural state, and manage for no further degradation. | Obtain formal conservation protection where possible. Implement appropriate zoning to avoid net loss of intact habitat or intensification of land use. | Conservation and associated activities. Extensive game farming and eco--- tourism operations with strict control on environmental impacts and carrying capacities, where overall there is a net biodiversity gain. Extensive livestock production with strict control on environmental impacts and carrying capacities. Required support infrastructure for the above activities. Urban Open Space Systems | Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, power lines, pipelines). Intensive Animal Production (all types including dairy farming associated with confinement, imported foodstuffs, and improved/irrigated pastures). Arable Agriculture (forestry, dry land & irrigated cropping). Small holdings |
| Critical Biodiversity Area (2) | Best Design Selected Sites. Areas selected to meet biodiversity | Maintain in a natural state with limited or no biodiversity loss. Maintain current | Avoid conversion of agricultural land to more intensive land uses, which may have a | Current agricultural practices including arable agriculture, intensive and extensive animal | Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, power lines, |

| CBA Map Category | Description | Land Management Objective | Land Management Recommendations | Compatible Land-Use | Incompatible Land-Use |
|---|---|---|---|---|---|
| | pattern and/or ecological process targets. Alternative sites may be available to meet targets. | agricultural activities. Ensure that land use is not intensified and that activities are managed to minimize impact on threatened species. | negative impact on threatened species or ecological processes. | production, as well as game and ecotourism operations, so long as these are managed in a way to ensure populations of threatened species are maintained and the ecological processes which support them are not impacted. Any activities compatible with CBA1. | pipelines). More intensive agricultural production than currently undertaken on site. Note: Certain elements of these activities could be allowed subject to detailed impact assessment to ensure that developments were designed to CBA2. Alternative areas may need to be identified to ensure the CBA network still meets the required targets. |
| Ecological Support Areas (1) | Natural, near natural and degraded areas supporting CBAs by maintaining ecological processes. | Maintain ecosystem functionality and connectivity allowing for limited loss of biodiversity pattern. | Implement appropriate zoning and land management guidelines to avoid impacting ecological processes. Avoid intensification of land use. Avoid fragmentation of natural landscape. | Conservation and associated activities. Extensive game farming and eco-tourism operations. Extensive Livestock Production. Urban Open Space Systems. Low density rural residential, smallholdings or resorts where development design and overall development densities allow maintenance of ecological functioning. | Urban land-uses including Residential (including golf estates), Business, Mining & Industrial; Infrastructure (roads, power lines, pipelines). Intensive Animal Production (all types including dairy farming associated with confinement, imported foodstuffs, and improved /irrigated pastures). Arable agriculture (forestry, dry land & irrigated cropping). Note: Certain elements of these activities could be allowed subject to detailed impact assessment to ensure that developments were designed to maintain overall ecological functioning of ESAs. |
| Ecological Support Areas (2) | Areas with no natural habitat that is important for supporting ecological processes. | Avoid additional/ new impacts on ecological processes. | Maintain current land-use. Avoid intensification of land use, which may result in additional impact on ecological processes. | Existing activities (e.g. arable agriculture) should be maintained, but where possible a transition to less intensive land uses or ecological restoration should be favoured. | Any land use or activity that results in additional impacts on ecological functioning mostly associated with the intensification of land use in these areas (e.g. Change of floodplain from arable agriculture to an urban land use or from recreational fields and parks to urban). |
| Other Natural Areas | Natural and intact but not required to meet targets, or | No management objectives, land management recommendations or land-use guidelines are prescribed. These areas are nevertheless subject to all applicable town and regional planning guidelines and policy. Where possible existing Not Natural areas should be favoured for development before "Other natural areas" as before "Other natural areas" may later be required | | | |

| CBA Map Category | Description | Land Management Objective | Land Management Recommendations | Compatible Land-Use | Incompatible Land-Use |
|---|---|---|---|---|---|
| | identified as CBA or ESA | either due to the identification of previously unknown important biodiversity features on these sites, or alternatively where the loss of CBA has resulted in the need to identify alternative sites. | | | |
| No natural habitat remaining | Areas with no significant direct biodiversity value. Not Natural or degraded natural areas that are not required as ESA, including intensive agriculture, urban, industry; and human infrastructure. | | | | |

### *5.7.7 Transfrontier Conservation Area*

The GMTFCA was formally established in June 2006 with the signing of a Memorandum of Understanding by Botswana, South Africa and Zimbabwe. The vision for the GMTFCA is that of *"a world-renowned Transfrontier Conservation Area linking the Mapungubwe cultural landscape as well as the ecosystems of the Limpopo and Shashe Valleys across the international borders between Botswana, South Africa and Zimbabwe"* (GMTFCA TTC, 2010).

A contiguous area within the TFCA consisting of MNP, Venetia Limpopo Game Reserve, the Northern Tuli Game Reserve (NOTUGRE), the Tuli Circle Safari Area (TCSA), portions of wildlife management areas in Zimbabwe, as well as Sentinel Ranch; Nottingham Estate and River Ranch, comprise the Transfrontier Park, while the surrounding area makes up the TFCA. The GMTFCA represents the western extremity of the lowveld, an area of low lying land along the east coast of Africa, extending from the contact zone between Mozambique, South Africa and Zimbabwe, along the Limpopo Valley to the confluence with the Shashe River (GMTFCA TTC, 2010). Refer to **Figure 21**.

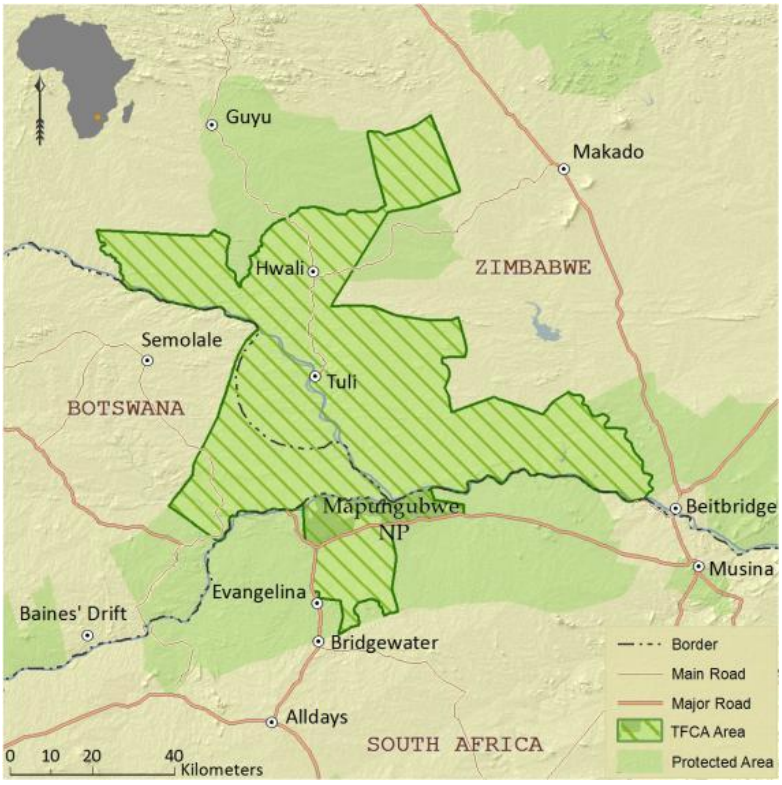



**Figure 21: GMTFCA (http://www.peaceparks.co.za/story.php?pid=1003&mid=1053)**

The planning domain for the TFCA is based on a combination of catchment, cadastral and cultural boundaries and aims to provide insight into the ecological, environmental and economic parameters within which the TFCA development will take place.

### *5.7.8 Protected Trees*

In terms of the National Forests Act (Act No. 84 of 1998) certain tree species can be identified and declared as protected. The Department of Agriculture, Forestry and Fisheries (DAFF) developed a list of protected tree species. Trees are protected for a variety of reasons, and some species require strict protection while others require control over harvesting and utilization.

The protected trees that have a geographical distribution that includes MCLWHS are *Acacia erioloba, Adansonia digitata* (insert), *Balanites* subsp *maughamii*, *Boscia albitrunca, Brachystegia spiciformis, Breonadia salicina, Catha edulis, Combretum imberbe, Curtisia dentata, Elaeodendron transvaalensis, Philenoptera violacea, Pittosporum viridiflorum, Podocarpus falcatus, P. latifolius, Prunus africana, Pterocarpus angolensis, Sclerocarya birrea* subsp*. caffra, Securidaca longepedunculata, Sideroxylon inerme* subsp *inerme* and *Warburgia salutaris*.

### *5.7.9 Invasive Alien Plants in MCLWHS*

Exotic and invasive plant species were categorised according to the framework laid out by The Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983). CARA defines weeds as alien plants, with no known useful economic purpose that should be eradicated. Invader plants, also considered by the Act, can also be of alien origin but may serve useful purposes as ornamental plants, as sources of timber, or other benefits such as medicinal uses (Henderson, 2010). These plants need to be managed and prevented from spreading.

Alien and invasive plant species can be grouped three categories:

- Category 1 plants are weeds that serve no useful economic purpose and possess characteristics that are harmful to humans, animals or the environment. These plants need to be eradicated using the control methods stipulated in Regulation 15.D of the CARA.
- Category 2 plants are plants that are useful for commercial plant production purposes but are proven plant invaders under uncontrolled conditions outside demarcated areas.
- Category 3 plants are mainly used for ornamental purposes in demarcated areas but are proven plant invaders under uncontrolled conditions outside demarcated areas.

The planting of Category 2 and 3 plants should be confined to demarcated areas under controlled conditions of cultivation (Bromilow, 1995 & 2010).

According to the SANParks (2013), the alien invasive plant species listed in **Table 14** below were recorded in MNP.

**Table 14: Invasive alien species in MNP**

| Species | Common Name | Category |
|---|---|---|
| *Achyranthes aspera* | Burweed | Weed 1 |
| *Agave sisalana* | Sisal | Invader 2 |
| *Argemone ochroleuca* subsp. *ochroleuca* | White flowered Mexican poppy | Weed 1 |
| *Aristolochia elegans* | Dutchman's pipe / calico flower | Weed 1 |
| *Arundo donax* | Giant reed, Spanish reed | Weed 1 |
| *Azolla filiculoides* | Red water fern | Weed 1 |
| *Cardiospermum grandiflorum* | Balloon vine, heart pea vine | Invader 3 |
| *Catharanthus roseaus* | Graveyard flower, Madagascar periwinkle | Invader 3 |
| *Cereus jamacaru* | Queen of the night, Peruvian apple cactus | Weed 1 |
| *Cinnamomum camphora* | Camphor tree | Weed 1 |
| *Cuscuta campestris* | Common dodder | Weed 1 |
| *Cylindropuntia fulgida* var. *mamillata* | Rosea cactus | |
| *Datura ferox* | Large thorn apple | Weed 1 |
| *Datura inoxia* | Downy thorn apple | Weed 1 |
| *Datura stramonium* | Common thorn apple | Weed 1 |
| *Delonix regia* | Flamboyant | |
| *Eucalyptus cinerea* (**Figure 22**) | Florist gum | |
| *Flaveria bidentis* | Smelter's bush | Weed 1 |
| *Hedychium spp.* | Ginger lily | Weed 1 |
| *Lantana camara* (**Figure 22**) | Spanish flag, lantana, tickberry | Weed 1 |
| *Macfadyena unguiscati* | Cat's claw creeper | Weed 1 |
| *Melia azedarach* (**Figure 22**) | Chinaberry, pride of India, syringa, seringa | Invader 3 |
| *Nicotiana glauca* | Brazilian tree tobacco, wild tobacco | Weed 1 |
| *Opuntia ficus-indica* (**Figure 22**) | Indian fig opuntia, sweet prickly pear | Weed 1 |
| *Opuntia rosea* | Rosea cactus | Weed 1 |

| Species | Common Name | Category |
|---|---|---|
| *Opuntia stricta* | Erect prickly pear, Australian pest pear | Weed 1 |
| *Pennisetum setaceum* | Fountain grass | Weed 1 |
| *Pinus spp.* | Pines | |
| *Ricinus communis* (**Figure 22**) | Castor oil plant | Invader 2 |
| *Sesbania punicea* (**Figure 22**) | Red sesbania, coffee weed, black *acacia* | Weed 1 |
| *Solanum seaforthianum* | Potato creeper | Weed 1 |
| *Tecoma stans* | Yellow bells, yellow trumpet flower | Weed 1 |
| *Verbesina encelioides* | Golden crownbeard | |
| *Xanthium spinosum* | Spiny cocklebur, burweed | Weed 1 |
| *Xanthium strumarium* | Large cocklebur | Weed 1 |

**Figure 22: Invasive alien species in MNP (top left: *Eucalyptus cinerea*; top middle: *Lantana camara*; top right: *Melia azedarach*; bottom left: *Opuntia ficus-indica*; bottom middle: *Sesbania punicea*; bottom right: *Ricinus communis*)**

## 5.8 Fauna

**GIS Mapping** • *Appendix A10 (Map: CRITICAL BIODIVERSITY AREAS)*

### *5.8.1 Mammals*

The MPN contains a large number of mammals such as elephant, giraffe, hippopotamus, impala, waterbuck, kudu, eland, bushbuck, mountain reedbuck, klipspringer, blue wildebeest, bushpig, warthog, aardvark, leopard, lion, cheetah, zebra, monkey, baboon

and a variety of smaller mammals (SANParks, 2013). Threatened mammal species in MCLWHS are listed in **Table 15**.

**Table 15: Threatened mammal species in MCLWHS**

| Species | Common name | IUCN Red List (2008) | TOPS |
|---|---|---|---|
| *Acinonyx jubatus* | Cheetah | VU C2a(i) | Vulnerable |
| *Atelerix frontalis* | South African hedgehog | | Protected |
| *Ceratotherium simum* | White rhinoceros | NT | Protected |
| *Crocuta crocuta* | Spotted hyaena | | Protected |
| *Hyaena brunnea* | Brown hyaena | NT | Protected |
| *Leptailurus serval* | Serval | | Protected |
| *Loxodonta africana* | African elephant | NT | Protected |
| *Lycaon pictus* | African wild dog | Endangered | Endangered |
| *Manis temminckii* | Pangolin | | Vulnerable |
| *Mellivora capensis* | Honey badger | | Protected |
| *Panthera leo* | Lion | Vulnerable | Vulnerable |
| *Raphicerus sharpei* | Sharp's grysbok | | Protected |
| *Elephantulus myurus* | Rock elephant-shrew | | |
| *Papio ursinus* | Chacma baboon | Least concern | |
| *Galago moholi* | Lesser bushbaby | | |
| *Pronolagus randensis* | Jameson's Red Rock Rabbit | | |
| *Lepus saxatilis* | Scrub hare | Least concern | |
| *Hystrix africaeaustralis* | Porcupine | | Protected |
| *Pedetes capensis* | Springhare | Least concern | |
| *Paraxerus cepapi* | Tree squirrel | | |
| *Proteles cristatus* | Aardwolf | | |
| *Felis lybica* | African wild cat | | |
| *Canis mesomelas* | Black-backed jackal | | Protected |
| *Hyaena brunnea* | Brown hyaena | Near Threatened | Protected |
| *Panthera pardus* | Leopard | Vulnerable | Protected |
| *Felis caracal* | Caracal | | Protected |
| *Felis serval* | Serval | | Protected |
| *Civettictis civetta* | Civet | | |
| *Orycteropus afer* | Aardvark | Least concern | |
| *Hippopotamus amphibius* | Hippopotamus | | |
| *Connochaetes taurinus* | Blue wildebeest | | |
| *Equus burchellii* | Burchell's zebra | | |
| *Tragelaphus scriptus* | Bushbuck | | |
| *Potamochoerus porcus* | Bushpig | | |
| *Sylvicapra grimmia* | Common duiker | Least concern | |
| *Taurotragus oryx* | Eland | Least concern | |
| *Oryx gazelle* | Gemsbok | | |
| *Aepyceros melampus* | Impala | | |
| *Oreotragus oreotragus* | Klipspringer | | |
| *Tragelaphus strepsiceros* | Kudu | | |

| Species | Common name | IUCN Red List (2008) | TOPS |
|---|---|---|---|
| *Raphicerus campestris* | Steenbok | | |
| *Phacochoerus aethiopicus* | Warthog | | |
| *Giraffa camelopardalis* | Giraffe | | |
| *Kobus ellipsiprymnus* | Waterbuck | | |

Note: VU=Vulnerable; NT=Near Threatened

According to Mammal Atlas of Africa, which is collaboration between Animal Demography Unit at University of Cape Town (UCT) and the Mammal Research Institute at the University of Pretoria, the following species (**Table 16**) are recorded in the MCLWHS.

**Table 16: Mammals recorded in grid cells falling within the MCLWHS**

| Species Name | Common Name | Family |
|---|---|---|
| *Loxodonta africana* | African Elephant | Elephantidae |
| *Kobus ellipsiprymnus ellipsiprymnus* | Waterbuck | Bovidae |
| *Phacochoerus africanus* | Warthog | Suidae |
| *Giraffa camelopardalis camelopardalis* | Giraffe | Giraffidae |
| *Genetta maculata* | Common Large-spotted Genet | Viveridae |
| *Papio ursinus* | Chacma Baboon | Cercopithecidae |
| *Oreotragus oreotragus* | Klipspringer | Bovidae |
| *Heterohyrax brucei* | Yellow-spotted Rock Hyrax | Procavidae |
| *Taurotragus oryx* | Eland | Bovidae |
| *Panthera pardus* | Leopard | Felidae |
| *Panthera leo* | Lion | Felidae |
| *Paraxerus cepapi* | Tree Squirrel | Sciuridae |
| *Hippotragus equinus* | Roan Antelope | Bovidae |
| *Sciurus carolinensis* | Eastern gray squirrel | Sciuridae |
| *Hyaena brunnea* | Brown Hyaena | Hyaenidae |
| *Aepyceros melampus* | Impala | Bovidae |
| *Ceratotherium simum* | White Rhinoceros | Rhinocerotidae |
| *Potamochoerus porcus koiropotamus* | Bushpig | Suidae |
| *Civettictis civetta* | African Civet | Viveridae |
| *Sylvicapra grimmia* | Common Duiker | Bovidae |
| *Felis silvestris* | African Wild Cat | Felidae |
| *Mungos mungo* | Banded Mongoose | Herpestidae |
| *Procavia capensis* | Rock Hyrax | Procavidae |
| *Helogale parvula* | Dwarf Mongoose | Herpestidae |
| *Oryx gazella* | Gemsbok | Bovidae |
| *Tragelaphus strepsiceros* | Kudu | Bovidae |
| *Tragelaphus angasii* | Nyala | Bovidae |
| *Hystrix africaeaustralis* | Porcupine | Hystricidae |
| *Raphicerus sharpei* | Sharp's Grysbok | Bovidae |
| *Cercopithecus aethiops pygerythrus* | Vervet Monkey | Cercopithecidae |

### *5.8.2 Birds*

The Important Bird Area (IBA) programme of Southern Africa (Barnes, 1998) identifies 124 IBAs in South Africa. IBAs are places of international significance for the conservation of birds and other biodiversity and are sites that together form part of a wider, integrated approach to the conservation and sustainable use of the natural environment. There is one (1) IBA occurring in the MCLWHS-Vhembe Nature Reserve.

According to Barnes (1998), the terrain away from the river is generally flat and dissected by numerous small normally dry riverbeds, which flow briefly during summer rainstorms. The ephemeral nature of the wetland, and the kind of vegetation and microhabitats it provides, accounts for the floodplain's attractiveness to a wide variety of water-associated birds, many of which appear only in years of suitable rainfall. The riverine forest provides habitat for secretive subtropical river-dependent species such as Pel's Fishing Owl (*Scotopelia peli*) and White-backed Night Heron (*Gorsachius leuconotus*). The taller trees provide nesting sites for other species, particularly raptors, such as the Bat Hawk (*Macheiramphus alcinus*).

The Limpopo and Maloutswa floodplain are important for many wetland-dependent and associated birds, such as the Black Stork (*Ciconia nigra*), Woolly-necked Stork (*Cicona episcopus*), Saddle-billed Stork (*Ephippiorhynchus senegalensis*), White-crowned Lapwing (*Vanellus albiceps*), Great White Pelican (*Pelecanus onocrotalus*), Rufous-bellied Heron (*Ardeola rufiventris*), Lesser Moorhen (*Gallinula angulata*) and Allen's Gallinule (*Porphyrula alleni*) (Barnes, 1998).

Numerous large wide-ranging species that are rare outside large National Parks are found in Vhembe, including Marabou Stork (*Leptoptilos crumeniferus*), White-backed Vulture (*Gyps africanus*), Martial Eagle (*Polemaetus bellicosus*), Bateleur (*Terathopius ecaudatus*) and Tawny Eagle (*Aquila rapax*) (BirdLife International, 2012). The varied woodland communities support Red-crested Korhaan (*Eupodotis ruficrista*), White-throated Robin-

Chat (*Cossypha humeralis*), Burnt-necked Eremomela (*Eremomela usticollis*) and Meve's Starling (*Lamprotornis mevesii*) (Barnes, 1998).

### *5.8.3 Herpetofauna (Reptiles and Amphibians)*

The threatened reptile species that occur in MNP (Skelton, 1977; Branch 1988; IUCN 2008) are listed below.

**Table 17: Threatened reptiles species in MNP**

| Species | Common name | IUCN Red List (2008) | TOPS |
|---|---|---|---|
| *Crocodylus niloticus* | Nile crocodile | LC | Protected species |
| *Python sebae natalensis* | Common African python | | Protected species |
| *Xenocalamus transvaalensis* | Transvaal quillsnout snake | Rare | Data deficient |

**Table 18** lists the reptile species recorded in the grid cells on which MCLWHS falls, as derived from the Southern African Reptile Conservation Assessment (SANBI, 2012).

**Table 18: Reptile species recorded in grid cells falling within the MCLWHS**

| Species | Common Name | Family |
|---|---|---|
| *Lygodactylus capensis capensis* | Common Dwarf Gecko | Gekkonidae |
| *Hemidactylus mabouia* | Common Tropical House Gecko | Gekkonidae |
| *Trachylepis striata* | Striped Skink | Scincidae |
| *Chondrodactylus turneri* | Turner's Gecko | Gekkonidae |
| *Python natalensis* | Southern African Python | Boidae |
| *Platysaurus intermedius rhodesianus* | Zimbabwe Flat Lizard | Cordylidae |
| *Trachylepis margaritifer* | Rainbow Skink | Scincidae |
| *Meroles squamulosus* | Common Rough-scaled Lizard | Lacertidae |
| *Scelotes limpopoensis limpopoensis* | Limpopo Dwarf Burrowing Skink | Scincidae |
| *Megatyphlops mucruso* | Zambezi Giant Blind Snake | Typhlopidae |
| *Pachydactylus punctatus* | Speckled Gecko | Gekkonidae |
| *Gerrhosaurus validus validus* | Common Giant Plated Lizard | Gerrhosauridae |
| *Trachylepis varia* | Variable Skink | Scincidae |
| *Bitis arietans arietans* | Puff Adder | Viperidae |
| *Gerrhosaurus validus validus* | Common Giant Plated Lizard | Gerrhosauridae |
| *Platysaurus intermedius rhodesianus* | Zimbabwe Flat Lizard | Cordylidae |
| *Heliobolus lugubris* | Bushveld Lizard | Lacertidae |
| *Lygodactylus stevensoni* | Stevenson's Dwarf Gecko | Gekkonidae |
| *Trachylepis striata* | Striped Skink | Scincidae |
| *Lygodactylus capensis capensis* | Common Dwarf Gecko | Gekkonidae |
| *Meroles squamulosus* | Common Rough-scaled Lizard | Lacertidae |
| *Trachylepis varia* | Variable Skink | Scincidae |
| *Hemidactylus mabouia* | Common Tropical House Gecko | Gekkonidae |
| *Trachylepis margaritifer* | Rainbow Skink | Scincidae |
| *Trachylepis varia* | Variable Skink | Scincidae |
| *Heliobolus lugubris* | Bushveld Lizard | Lacertidae |

| Species | Common Name | Family |
|---|---|---|
| *Stigmochelys pardalis* | Leopard Tortoise | Testudinidae |
| *Agama armata* | Peters' Ground Agama | Agamidae |
| *Psammophis subtaeniatus* | Western Yellow-bellied Sand Snake | Colubridae |
| *Mochlus sundevallii sundevallii* | Sundevall's Writhing Skink | Scincidae |
| *Gerrhosaurus nigrolineatus* | Black-lined Plated Lizard | Gerrhosauridae |
| *Lygodactylus capensis capensis* | Common Dwarf Gecko | Gekkonidae |
| *Bitis arietans arietans* | Puff Adder | Viperidae |
| *Aspidelaps scutatus scutatus* | Speckled Shield Cobra | Elapidae |

According to Frog Atlas of Southern African, one frog -Olive Toad (*Amietophrynus garmani*) is the only species of the frogs recorded in grid cells.

### *5.8.4 Invertebrates*

**Table 19** lists the butterfly species recorded in the grid cells in which MCLWHS falls, as derived from the Southern African Butterfly Conservation Assessment

**Table 19: Invertebrates species recorded in the grid cells on which MCLWHS is situated**

| SABCA No. | Species Name | Common Name | Family |
|---|---|---|---|
| 13323 | *Leptotes pirithous pirithous* | Common zebra blue | Lycaenidae |
| 13324 | *Azanus jesous* | Topaz babul blue | Lycaenidae |
| 13325 | *Danaus chrysippus orientis* | African monarch | Nymphalidae |
| 1243 | *Acraea natalica* | Natal acraea | Nymphalidae |
| 9742 | *Colotis evenina evenina* | Orange tip | Pieridae |
| 13318 | *Junonia hierta cebrene* | Yellow pansy | Nymphalidae |
| 13319 | *Vanessa cardui* | Painted lady | Nymphalidae |
| 13320 | *Charaxes jasius saturnus* | Foxy charaxes | Nymphalidae |
| 13321 | *Hypolimnas misippus* | Common diadem | Nymphalidae |
| 16343 | *Nepheronia buquetii buquetii* | Buquet's vagrant | Pieridae |
| 16344 | *Aloeides damarensis mashona* | Damara copper | Lycaenidae |

| SABCA No. | Species Name | Common Name | Family |
|---|---|---|---|
| 16346 | *Pinacopteryx eriphia eriphia* | Zebra white | Pieridae |
| 16353 | *Coeliades forestan forestan* | Striped policeman | Hesperiidae |
| 16354 | *Chilades trochylus* | Grass jewel | Lycaenidae |
| 16356 | *Gomalia elma elma* | Green-marbled skipper | Hesperiidae |
| 16357 | *Belenois aurota* | Brown-veined white | Pieridae |
| 16358 | *Teracolus eris eris* | Banded gold tip | Pieridae |
| 16359 | *Colotis regina* | Queen purple tip | Pieridae |
| 16360 | *Sarangesa phidyle* | Small elfin | Hesperiidae |
| 16361 | *Spialia colotes transvaaliae* | Bushveld sandman | Hesperiidae |
| 16362 | *Colotis evagore antigone* | Small orange tip | Pieridae |
| 19343 | *Cigaritis phanes* | Silvery bar | Lycaenidae |
| 19344 | *Cigaritis natalensis* | Natal bar | Lycaenidae |
| 19345 | *Cigaritis ella* | Ella's bar | Lycaenidae |
| 19347 | *Teracolus agoye agoye* | Speckled sulphur tip | Pieridae |
| 19350 | *Myrina silenus ficedula* | Common fig tree blue | Lycaenidae |
| 19358 | *Axiocerses amanga amanga* | Bush scarlet | Lycaenidae |
| 30412 | *Sarangesa ruona* | Ruona elfin | Hesperiidae |
| 32131 | *Charaxes zoolina* | Club-tailed charaxes | Nymphalidae |
| 32138 | *Papilio demodocus demodocus* | Citrus swallowtail | Papilionidae |
| 32143 | *Colotis calais calais* | Topaz arab | Pieridae |
| 3121 | *Telchinia serena* | Dancing acraea | Nymphalidae |
| 16364 | *Kedestes lepenula* | Chequered ranger | Hesperiidae |

### *5.8.5 Road infrastructure and fauna*

The Wildlife and Transport programme of the Endangered Wildlife Trust (EWT) have raised the issue of the impact of the anticipated expansion in tourism, mining and agriculture in the MCLWHS and concomitant increase in traffic volumes on biodiversity especially in terms of roadkill.

The EWT, Rhodes University and Tshwana University of Technology initiated a project in the GMTFCA/MCLWHS that monitored the impacts of roads and traffic thereon on wildlife in the area. The core area of the project comprised paved and unpaved roads within the South African section of GMTFCA/MCLWHS surrounding the VNR and privately owned land to the west, south and east of the VNR.

Over a 120-day period, 1121 roadkill carcasses were identified from 166 species with birds making up 52% of the total sample with mammals, reptiles and amphibians following at 26%, 20% and 2% respectively.

Existing studies have observed more animal-road-deaths at weekends, when traffic flow is usually higher (Bautista *et al*. 2004), whilst a study in Canada (Gunson *et al.* 2003)

detected more animals killed on the road when the road was utilised by larger vehicles (trucks) than by passenger vehicles (cars), as did the EWT data in the GMTFCA/MCLWHS. The anticipated expansion in the mining and agricultural sectors in and around the MCLWHS will probably result in increased numbers of large vehicles that could result in more animals been killed on roads utilised by these large vehicles.

There is growing recognition that roadkill is a real threat to the survival of a variety of species as well as disrupting ecological processes.

The use of signage and roadside fencing to direct wildlife to cross roads through existing culverts is a recognised mitigation measure that has been used effectively in other countries and should be considered by the MCLWHS as a means of reducing the incidents of roadkill in MCLWHS.

## 5.9 Agricultural resources

**GIS Mapping**

- *Appendix A11 (Map: AGRICULTURAL POTENTIAL)*
- *Appendix A12 (Map: CROP FARMS)*

*Part of this section was extracted from the specialist assessment report regarding Agriculture and Agri-business prepared by Mzansi Agriculture.*

### *5.9.1 Existing Agricultural Activities*

From an agricultural perspective the distinguishing feature of this area is its hostility to field crop production. The mean annual rainfall is between 200 mm and 400 mm, precipitated mainly as summer thunderstorms. Further, mean high summer temperatures that range between 31°C and 35°C militate against summer production of most crops.

On the other hand mild winters with mean minimum temperature around 5°C do permit contra-seasonal production of most arable crops, provided there is sufficient irrigation water. These crops are typically high value sub-tropical fruit crops and high value out-of-season vegetable crops.

This part of South Africa is reputed to be home to over 80 % of game farms in the country. Its semi-arid nature limits farming, by and large, to extensive game and beef farming. Close to 98 % of the Core Park itself and the Buffer Zone is made up of this land with the remaining 2% of the land under cultivation.

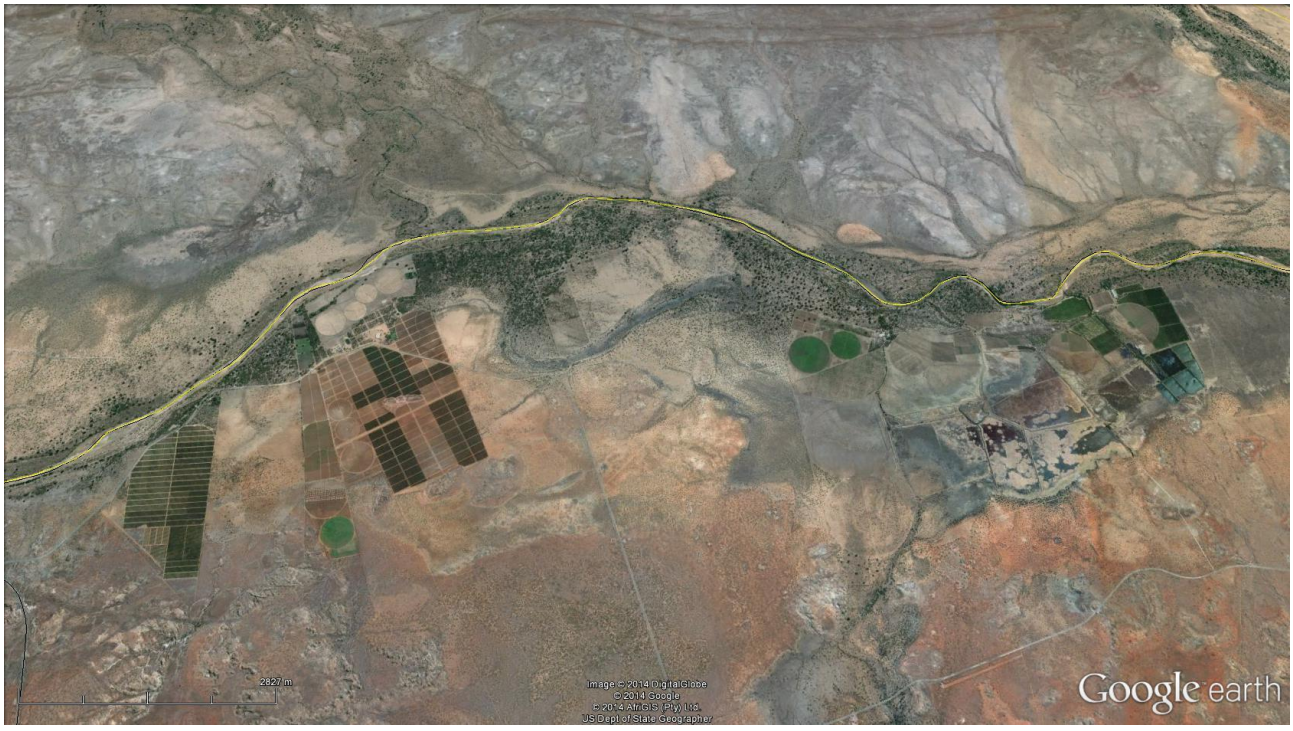



**Figure 23: Agricultural activities along the Limpopo River**

### *5.9.2 Water*

#### 5.9.2.1 Water for irrigation

The use of irrigation water falls under the National Water Act (Act 36 of 1998) and in particular Sections 21(a) and 21(b) which regulate the extraction and storage of irrigation water.

The section of the Limpopo River in which most of the study area occurs typically ceases to flow in April / May and does not flow again until October / November.

The study revealed the existence of large reserves of extractable subterranean water (aquifers) along or near the Limpopo River flood plain, which floodplain also experiences moderately fertile soils of alluvial origin.

Most of the licensed water extraction and storage facilities of agricultural consequence are dams and boreholes. Farms both within the Core area and farms in the Buffer Zone have current or past lawful water use authorizations in the form of National Register of Water User (NRWU) Certificates. An initial evaluation revealed that available data in the form of the NRWU certificates contain information that is inaccurate, out of date, and is sometimes incomplete and contradictory.

Despite these shortcomings, it would appear that approximately 40 000 000 $m^3$ of irrigation water could be available in the Core and Buffer Zone, giving access to irrigation water rights for 5 000 ha. Some of these rights are current, some have lapsed, but could be reinstated.

#### 5.9.2.2 Industrial water

National Register Water Use Certificates also itemized the licensing 4 000 000 000 $m^3$ of industrial water. This water is stored in the Schroda Dam and then pumped to the Venetia Diamond Mine, approximately 50 km away and 15 km south of MPNP. The dam lies within the MNP, towards its eastern end. Water balances for this facility were last determined nearly 20 years ago. Since then there have been changes and improvements in mining methods and mine water use efficiencies.

As a result thereof the water users, DeBeers Consolidated Mines (Ltd), are conducting a detailed and thoroughly professional review of their water balances. This includes monitoring moisture stress levels in the leaves of the trees in the area where they extract water. They have undertaken to interrupt water extraction at times when accepted stress levels are at risk of being exceeded. The De Beers exercise is expected to be completed early in 2014.

In the event of irrigation water becoming available the exercise of establishing irrigated crops can then be taken further towards the east end of the Park. Such a volume of water

carries a factor of 100: 1 compared against total available irrigation water available for both the Core Park and the current Buffer Zone which is a valuable asset.

#### 5.9.2.3 Water demand

Despite the large aquifers in the area, rates of groundwater extraction are very high. The demand for water for proposed open cast coal mine mineral separation wash water will place added demand with minimal return to the local community. Further, water will be required during the life of these mines in order to minimize dust pollution of surrounding areas.

The impact of mining to the groundwater resources requires stringent management. This is particularly important where most irrigation water is extracted from groundwater by means of boreholes. This also applies to livestock water which is 100% dependent on borehole water.

### *5.9.3 Land*

#### 5.9.3.1 Agricultural potential

Ninety eight percent of the land lying within the proclaimed buffer zone is not suited to arable crops. Soil parent materials have over the ages weathered down to light sandy loams. Apart from restraints imposed by a hostile climate and low rainfall, these soils have an available water capacity of less than 20 mm water per one meter soil depth compared with the norm for a good soil of 100 to 140 mm water per one meter soil depth.

It is therefore self-evident that, even with irrigation these soils are not suited to arable agriculture. Most of these soils can support livestock and game farming and there are areas where only game will survive.

DAFF is the custodian of the Agricultural Geo-referenced Information System (AGIS). The system is also managed by the same Department. AGIS describes the land capability for the area as “Non arable, low potential grazing land”.

However along the Limpopo River Valley there are areas of land devolved from alluvial deposits the soils of which have a moderate to good yield potential provided that they are irrigated. These arable fields represent approximately 2% of the 266 000 ha making up the whole of the proclaimed Mapungubwe complex. Most of the farms fronting onto the Limpopo River enjoy irrigated, contra-seasonal, high value crop production.

The land component of crop selection and crop yield potential is measured in terms of Land Capability Class (LCC) which is measured on a scale of I to VIII with I being prime agricultural land and VIII being land suitable for conservation only. Less than 2 % of the soils in South Africa fall into LCC I.

The soils without river frontage fall into LCC VII and VIII. The alluvial soils on the Limpopo floodplain and adjacent areas typically fall into Classes III and IV. Where irrigation water is available the Capability Class determined by the physical characteristics of the soil is usually stepped up by one Class. The soils that have access to irrigation water will thus fall into LCC II and III, which Classes are suitable for cultivated annual and long term crops.

Soils, other than those of alluvial origin have a very poor moisture holding capacity (20 mm/m), a poor organic carbon content (< 0.5 %), only a moderate nutrient holding and conversion capacity (CEC 6 to 10 cmols) and a moderate to high erodability.

Outside of the irrigated areas the only sustainable agricultural activity is livestock and game. The sparseness of the local population is also indicative of the poor potential of the soil.

#### 5.9.3.2 Land ownership

At an early stage of the assessment it became apparent that there were land claims affecting the MCLWHS. According to data received from DRDLR in October 2013, of the 16 farms and farm portions that from previous studies appear to have irrigated crops / legitimate water rights, the current situation is as follows:

Land Claim status farms outside the Core within the gazette Buffer:

| | |
|---|---|
| Status not Known | 6 |
| Claims gazetted | 5 |
| Claims under Research | 5 |
| Total | 16 |

The above broad situation is further aggravated by the following:

- Some of the farms and portions of farms that have been gazetted in favour of the Machete Community may be transferred to the State instead of to Machete because of conflict within the Machete Community.
- Within some of the Tshivhula claims currently under research there are conflicting claims between the Tshivhula Traditinal Authority (TA) and the Tshivuhla Community Property Association (CPA), claiming as separate entities.
- In another instance the claimants are the Tshivhula TA and the Babirwa Tribe, who are claiming only one farm.
- It is unknown when the gazetted Tshivula claims will be finalised.
- The research into the validity of the as yet ungazetted Tshivuhla claims is currently being undertaken by the University of Venda. Their findings are expected to be completed soon, at which time they will be put before the Land Claims Commission.

### *5.9.4 Climate*

Climate Capability Class can best be measured and described on a limitation rating scale of Climate Capability Class C1 to Climate Capability C8. Climate Capability Class C1 occurs when 'Local climate is favourable for good yields for a wide range of adapted crops throughout the year', in other words climate will impose no limitation or a very slight limitation on crop production. This would apply to a temperate climate with high rainfall and no frost.

Climate Capability Class C8 occurs when 'Very severely restricted choice of crops due to heat and moisture stress. Suitable crops at high risk of yield losses.

A rainfall of 200 to 400 mm per annum, most of it in the form of thunderstorms, combined with summer temperatures ranging from 31 - 35°C ensure that the farms under review fall into Climate Capability Classes 7 and 8.

### *5.9.5 Livestock and veld*

1993 Grazing Capacity Regulation published under CARA records livestock carrying capacity as 18 to 21 ha per animal unit (AU) (an AU is defined as a bovine with a body mass of 450 kg – a big ox or 10 big goats) for the area. This is a poor carrying capacity, suitable only for extensive beef or game or mixed game / beef.

### *5.9.6 Crops*

Crops grown are mainly citrus and high value sub-tropical fruit crops, grown under irrigation. 300 ha of tomatoes are grown by ZZ2, who own over 30 farms and supply over 25 % of the total tomato demand in the country.

Most of the land is under natural grazing (2751 ha) whilst 1286 ha lies fallow; citrus takes about 715 ha, maize covers about 523 ha, whilst tomato takes about 351 ha, cotton covers about 46ha and the rest goes to other crops including planted pastures and perennial crops, Lucerne, medics, weeds and fallow lands.

## 5.10 Air Quality

Currently no air quality data is available for Vhembe District Municipality. A municipal Air Quality Management Plan and its associated Bylaws are currently under development.

A recent Air Quality Impact Assessments conducted by SSI Consulting (now Royal Haskoning DHV) for the Vhele Mine used ambient air quality standards as no other status quo was available. The study found a low dispersion potential of pollutants due to high atmospheric stability associated with low winds, clear skies and cold night-time conditions.

Key potential sources of air pollution in the area are vehicle emissions as well as dust generated from vehicles driving on dirt roads. In addition, agricultural and mining activities surrounding Mapungubwe and veld fires associated with human activities in the area contribute to air pollution.

Census 2011 found that out of 20 042 households, only 10 727 had access to electricity, with over 5000 households using wood fires as an energy source. This could also significantly impact air quality, particularly if growth in the greater area is not partnered with new infrastructure for electricity supply.

# 6 PLANNING AND DEVELOPMENT

## 6.1 Land use

**GIS Mapping**

- *Appendix A13 (Map: LAND COVER)*
- *Appendix A14 (Map: LAND USE)*

The area around the MCLWHS is characterised by a sparse human population, and long distances for infrastructural lines of support. Land use and ownership within the MNP and the buffer is unusually diverse and includes contractual partners, land owners and land claimants, private tourism operations, game farms and local communities.

The nearest larger populations of people are in the towns of Alldays and Musina and the Venetia Diamond Mine arranges daily transport for workers from these centres. Coal mining is likely to develop in the surrounding region over the next five years, bringing changing in population distribution and in traffic. Influx of people from Zimbabwe and to a lesser extent Botswana exacerbates the social problems in the area (SANParks, 2013).

Threats to the environment are mainly as a result of conflicting land use activities. These include large scale irrigation, farming and mining which compete with wildlife and the tourism habitat (Uloyiso Training and Development, 2013).

## 6.2 Local Planning Context

The information to follow was sourced from the IDP (Musina Local Municipality, 2012).

The Musina Local Municipality falls within the Vhembe District Municipality, which is made up of four local municipalities, namely Musina, Makhado, Thulamela and Mutale. Musina Local Municipality is located in the very north of the Limpopo Province, bordering Botswana and Zimbabwe. Musina Local Municipality covers an area of approximately 757 829 ha that extends from the confluence of the Mogalakwena and Limpopo Rivers in the west to the confluence of the Nwanedi and Limpopo Rivers in the east and from Tshipise

and Mopane in the south to Botswana/Zimbabwe borders in the north. The municipal area consists mainly of commercial farms and only 0.08% of the total area is urban in nature.

According to the Limpopo Employment, Growth and Development Plan, the main economic sectors for growth in the province are agriculture, mineral reserves, and tourism resources. The mining sector has become increasingly important to the region, surpassing manufacturing and agriculture.

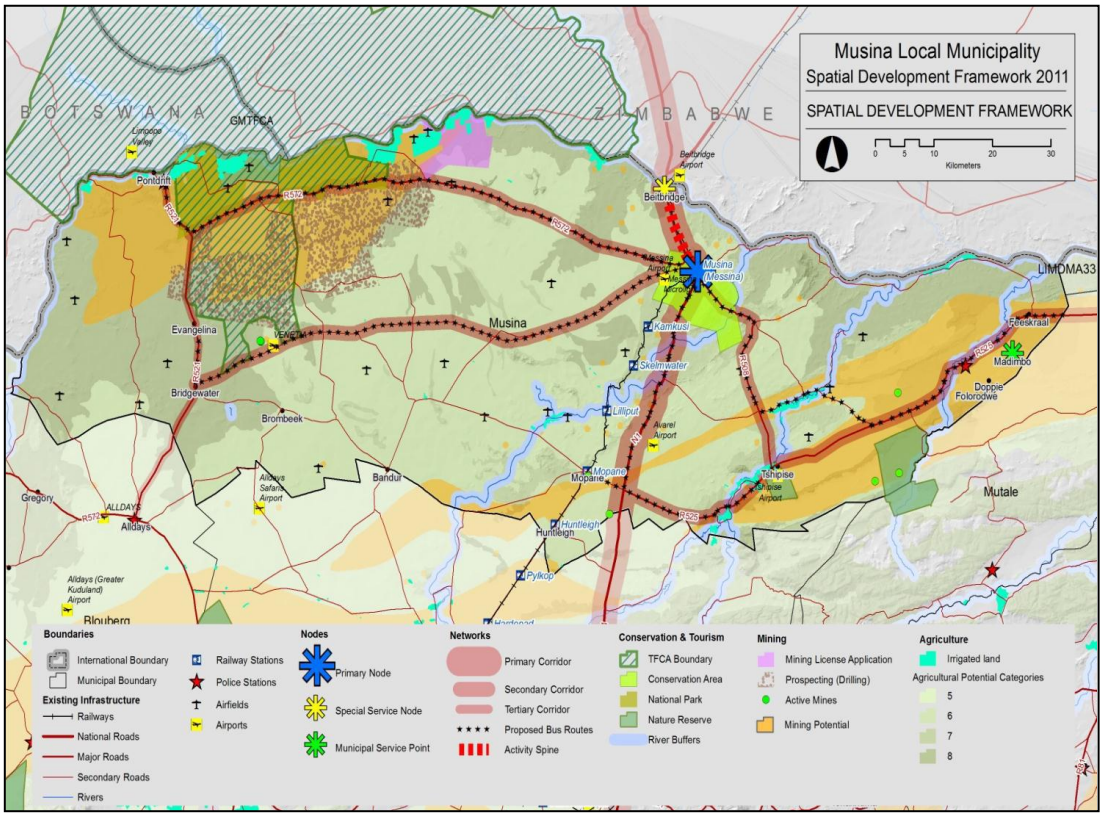



**Figure 24: Musina Local Municipality SDF**

The settlement hierarchy of Musina municipal area, in terms of the Spatial Rationale is as follows

- Musina (Musina and Nancefield) can be described as a provincial growth point (1st order settlement) due to their relative high level of economic activity and rendering of services to local and surrounding communities.
- Madimbo, Malale,Domboni, Tanda and Tshikhudini can be described as 5th order settlements due to their small population and the fact that they are only functioning as

residential areas with no economic base. The potential of these settlements for future self-sustainable development is extremely limited.

- Tshipise can be described as a 3rd order settlement (local service points) due to its function in terms of limited service delivery to the surrounding commercial farming areas, tourism attraction and nature conservation. Tshipise does not have a residential or business component and can therefore not be regarded as a growth point


**Figure 25: Town of Musina**

Musina has a Town Planning Scheme which has been used since 1983. This town planning scheme concentrated on urban areas in the previous jurisdiction area of Musina. There was a need to update or create a Town Planning Scheme, now called Musina Land Use Management Scheme (LUMS) which will cover the whole jurisdiction area of Municipal area. The purpose of LUMS is not to inhibit development but rather to have controlled and ordered development with regard to land users (zonings) of different areas of land. A new LUMS was adopted by Council in 2009 which incorporates the previous Town Planning Scheme and provision was made for the whole jurisdiction area of Musina.

The only nodal point within the municipality is the town of Musina. This node is a growth point within the municipality, which is continuing to grow despite indications of out migration. Industrial nodes are found in Musina Ext. 1; Musina Ext. 3 and Musina

township. The industrial area has rail facilities and caters mainly for heavy and noxious industries.

Overall there appears to be a greater provision of infrastructure and facilities in the Eastern area creating a spatial imbalance between the West and Eastern areas in terms of settlement and infrastructure development, which may need to be addressed should tourism development around Mapungubwe/Dongola complex develops.

In alignment with the Northern Spatial Development Perspective the bulk infrastructure investment is to be focused/prioritised in Musina as the growth point, while in rural settlement clusters and service centres infrastructure should be focused on the provision of basic services.

## 6.3 MNP Zonal Plan

In addition to internal use zoning, the MNP zoning plan describes how the park interacts with the processes which control land use and activities in the buffer zones around national parks (e.g. SDFs and IDPs). The buffer zones identify the area within which activities such as land use change may have an influence on the park (current and future extent), describe responses at a strategic level, and serve to define the buffer zone in terms of the DEA policy on buffer zones for national parks and the SANParks buffer zone policy.

SANParks has adopted a dual zoning system for its parks. The system comprises:
a) Visitor use zones covering the entire park, and
b) Special management overlays, which designate specific areas of a park that require special management interventions.

The use zones in MNP (as shown in **Figure 26**) include the following:

- **Primitive** –
  Generally retains wilderness qualities, but with basic self-catering facilities (concession facilities may be more sophisticated). Access is controlled. Provides access to the Remote Zone, and can serve as a buffer.

- **Low Intensity Leisure** –

  The underlying characteristic of this zone is motorised selfdrive access with basic facilities. The numbers of visitors are higher than in the Remote and Primitive Zones.

- **High Intensity Leisure** –

  The main characteristic is that of a high density tourist development node, with modern amenities, where more concentrated human activities are allowed

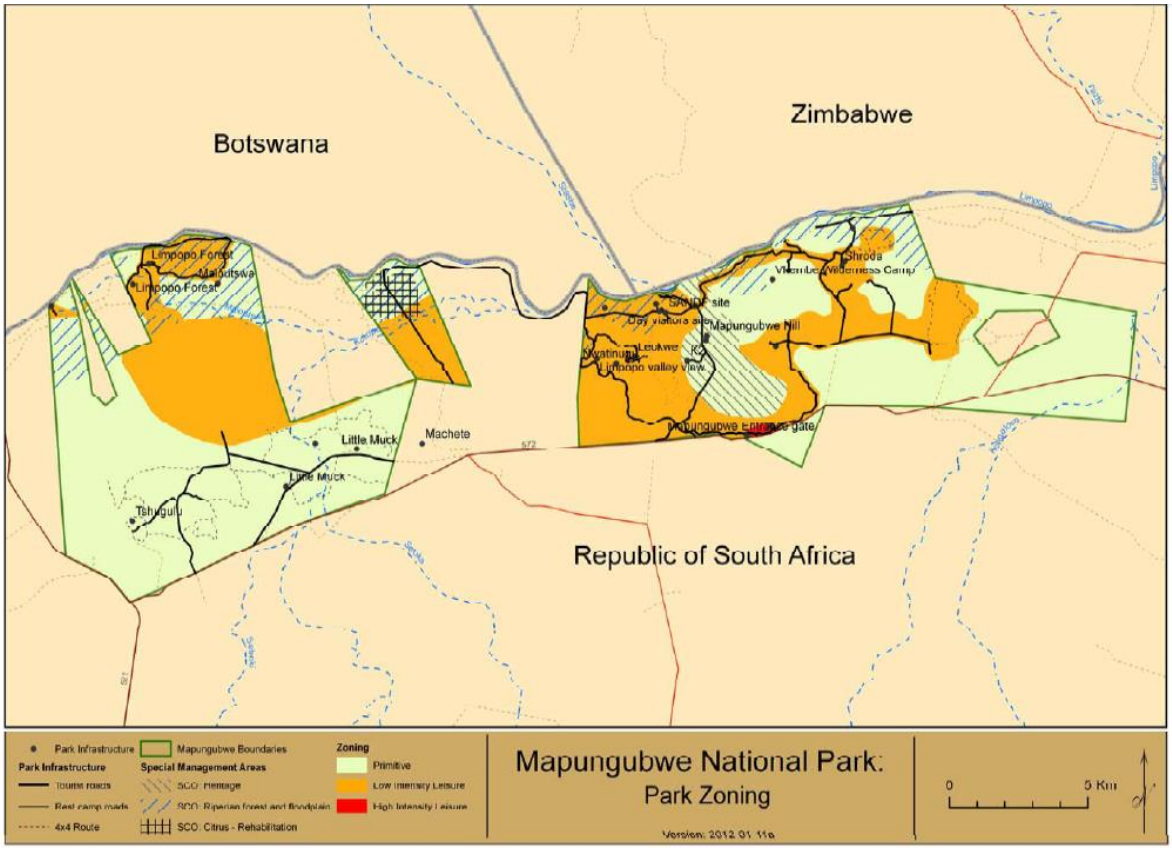



**Figure 26: MNP Zoning (SANParks, 2013)**

## 6.4 GMTFCA Concept Development Plan

The GMTFCA can be divided into two distinct areas – (1) a Core Area and (2) Expansion Zone – where the Core Area focuses primarily on conservation, with strict and clear operational procedures and management standards, while the Expansion Zone allows for multiple and mixed land use options. The South African components of these areas include the following:

- **Core Area** –
  - MNP;
  - Contracted freehold land that is not owned by SANParks but constituted into the MNP and WHS;
  - Venetia Limpopo Nature Reserve;
- **Expansion Zone** –
  - Vhembe Game Reserve;
  - Limpopo Valley Game Reserve (Conservancy);
  - Magalakwena Estate; and
  - Freehold land along the Limpopo River and to the south within the secondary catchments of the Limpopo.

The Concept Development Plan for GMTFCA (refer to **Figure 27**) spatially represents the Access, Use, Development and Infrastructure management interventions for the TFCA and has been prepared for Phase 1 of the TFCA with a view on guiding the attainment of the Strategic Business Plan.

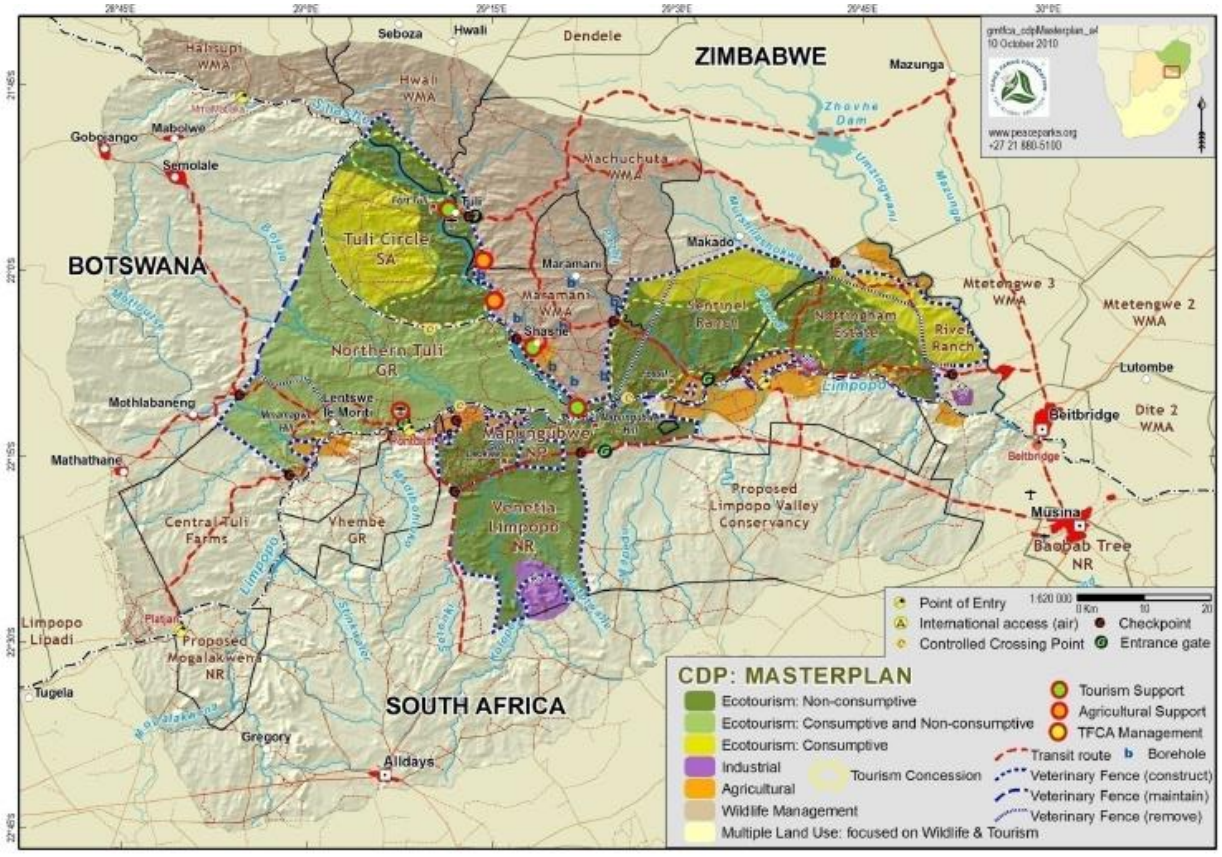



**Figure 27: GMTFCA Concept Development Plan Phase 1 (GMTFCA TTC, 2010)**

# 7 SOCIAL AND ECONOMIC ENVIRONMENT

## 7.1 Social environment

**GIS Mapping**

- *Appendix A15 (Map: POPULATION DENSITY)*
- *Appendix A16 (Map: SETTLEMENTS)*

### *7.1.1 Population, Age and Ggender*

The total population in the study area is 5 751. **Table 20** below shows the population data for the study area by age and gender. Age and gender are important to understand the level of economic activity that is likely to occur, as well aspects of migration and gender-headed households.

**Table 20: Population, Age and Gender (Institute for Security Studies, 2011)**

| Age Group | Male | Female | Total |
|---|---|---|---|
| 0 – 14 | 489 | 519 | **1 008** |
| 15 – 34 | 1 596 | 1 536 | **3 132** |
| 35 – 64 | 771 | 702 | **1 473** |
| 65+ | 78 | 60 | **138** |
| **Total** | **2 934** | **2 817** | **5 751** |
| 0 – 14 | 17% | 18% | **18%** |
| 15 – 34 | 54% | 55% | **54%** |
| 35 – 64 | 26% | 25% | **26%** |
| 65+ | 3% | 2% | **2%** |
| **Total** | **100%** | **100%** | **100%** |

At birth the male and female populations are almost equal at seventeen percent and eighteen percent for males and females respectively. The female population declines slightly in comparison to males as the age groups increase. Thus the male population slightly exceeds the female population in the study area.

Fifty four percent of the population are aged from 15 to 34 and twenty six percent are aged 35 – 64. Eighty percent of the population are of working age 15 – 64 and thus are economically active.

The increase in the male population together with the rise high percentage of working age population may indicate migration into the area. The surrounding mines may be the trigger for migration to the study area.

### *7.1.2 Household Size*

The household size provides insight into the family structure and migration. In total there are 2 097 households in the study area. **Table 21** shows the household size data for 2011.

**Table 21: Household size (Statistics South Africa, 2013)**

| Household Size | Total | Percentage |
|---|---|---|
| One Occupant | 1 065 | 51% |
| Two Occupants | 576 | 27% |
| Three Occupants | 258 | 12% |
| Four Occupants | 123 | 6% |
| Five or more Occupants | 75 | 4% |
| **Total** | **2 097** | **100%** |

Fifty one percent of households have only one occupant and a further twenty seven percent of households have two occupants. This is an indication that there are more migrant workers in the area than families.

### *7.1.3 Dwelling Types*

Dwelling types were classified as formal or informal in the Census 2011. Formal housing is classified as follows:

- House or brick/ concrete block structure on a separate stand or yard or on a farm
- Traditional dwelling/hut/structure made of traditional materials
- House/flat/room in backyard
- Other
- Other (Grouped)
    - Flat or apartment in a block of flats
    - Cluster house in complex

- Townhouse (semi-detached house in a complex)
- Semi-detached house
- Caravan/tent

Informal housing is classified as

- Informal Dwelling (shack; in backyard)
- Other
  - Informal Dwelling Shack; not in backyard; e.g. in an informal/squatter settlement or on a farm
  - Room/flat let on a property or larger dwelling/servants quarters/granny flat

The type of dwellings for the study area for 2011 is shown **Table 22** below:

**Table 22: Type of dwelling (Statistics South Africa, 2013)**

| Type of Dwelling | Total | Percentage |
|---|---|---|
| **Formal Dwelling Types** | **1 983** | **95%** |
| Structure on a separate stand | 1 437 | 69% |
| Traditional dwelling | 429 | 20% |
| Flat or apartment | 39 | 2% |
| Semi-detached house | 3 | 0% |
| House; flat or room in backyard | 12 | 1% |
| Caravan/tent | 15 | 1% |
| Other | 48 | 2% |
| **Informal Dwelling Types** | **114** | **5%** |
| In backyard | 30 | 1% |
| Not in backyard | 48 | 2% |
| Room or flatlet | 36 | 2% |
| **Total** | **2 097** | **100%** |

Ninety five percent of households are formal house. Sixty nine are household structures on a separate stand. Twenty percent of households are traditional dwellings.

Five percent of households in the study area are informal housing types, majority of which are backyard dwellings or rooms on a property

### *7.1.4 Education*

Education levels are assessed in order to understand the level of employment as well as livelihood of the community. Furthermore, it indicated the functional literacy levels of a community.

Functional illiteracy is defined as a person who has received education on how to read and write but they are not fully capable of doing so. Thus, while having the ability to read; there is difficulty in comprehending the material. Usually persons who have a low level of education such as primary education only are classified as functionally illiterate.

Table 23 below shows the highest level of education reached by persons in the study area in 2011. Education levels have been grouped by Stats SA to show primary, secondary and higher education

**Table 23: Highest education level reached (Statistics South Africa, 2013)**

| Highest Education Level | Total | Percentage |
|---|---|---|
| No schooling | 558 | 10% |
| Some primary | 687 | 12% |
| Completed primary | 780 | 14% |
| Some secondary | 2 583 | 45% |
| Grade 12/Std 10 | 351 | 6% |
| Higher | 99 | 2% |
| Unspecified | 3 | 0% |
| Not applicable | 642 | 11% |
| **Total** | **5 703** | **100%** |

Thirty six percent of the population in the study area are functionally illiterate (no education or having completed primary school). Forty five percent of students have dropped out of secondary school leaving. Thus only six percent of the population have completed secondary school and two percent of the population having obtained higher education.

Economic theory suggests that education improves the level and quality of human capital, in turn increasing the productivity of individuals. Thus increasing the output generated per worker. Education facilitates long term growth and is often described as a tool to escape the poverty trap.

A study conducted by Altbeker and Storme (2013) shows that while the number of graduates in South Africa has more than doubled in the past fifteen years; the unemployment rate amongst graduates has declined to around five percent.

Furthermore, the study shows that the change of employment increases as the years of education increase. **Figure 28** below is a graph taken from the Altbeker and Storme study that shows the labour force participation (LFP), employment and unemployment rates by years of education in 2007 (Evelien & Altbeker, 2013).

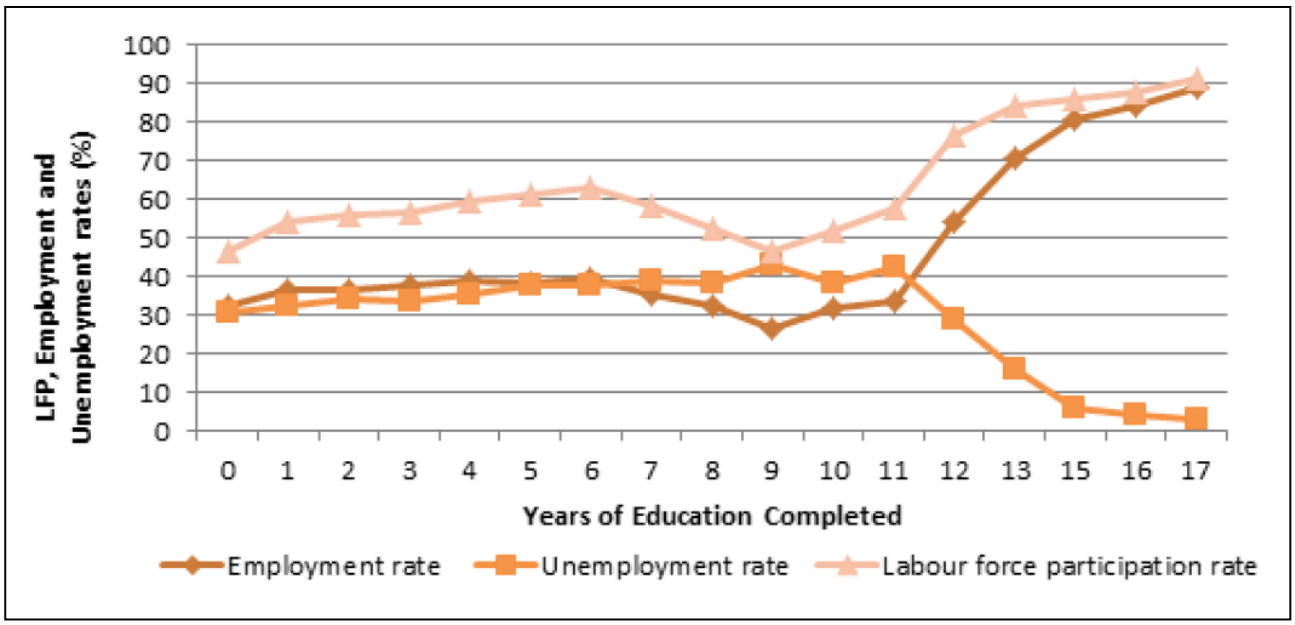



**Figure 28: Labour force participation, employment and unemployment rates by years of education (2007) (Evelien & Altbeker, 2013)**

**Figure 28** demonstrates that only thirty three per cent of those who had less than secondary education (eleven years or fewer) had jobs. This rose by twenty percent on completion of secondary school. With one extra year of education after secondary school, employment increased to seventy one per cent. Those with higher education again enjoyed ten percent rise in employment while post-graduate degree holder's employment was the highest at ninety six percent (Evelien & Altbeker, 2013).

The Altbeker and Storme study in conjunction with the data shown above reveal that education levels in the study area so low that the communities in these two wards are structurally geared towards unemployment and poverty. The community is economically

dependent on the twenty one percent of the population who have completed high school. However eighteen percent of the population have not proceeded to higher education and are highly unlikely to earn an income in the middle or high income bracket, resulting in a perpetuating cycle of low education and low income levels.

### *7.1.5 Annual household income*

Annual income is important to assess as it provides information on the poverty level of the community. Income brackets have been defined to facilitate analysis. The annual income brackets are defined as follows:

- No Income R0
- Low Income R1 – R76 400
- Middle income R 76 401 – R307 600
- High Income R307 601 +

Annual household income by income bracket is provided in **Table 24** shown below. Both the number of households and the percentages are provided.

**Table 24: Annual household income (Statistics South Africa, 2013)**

| Annual Income Group | Total | Percentage |
|---|---|---|
| No Income | 78 | 4% |
| Low Income | 1 932 | 92% |
| Medium Income | 72 | 3% |
| High Income | 18 | 1% |
| **Total** | **2 100** | **100%** |

Four percent of households have no annual income and ninety two percent of households in the study area earn an income in the low income category. It is clear that the households in the study area are poor.

## 7.2 Infrastructure

### *7.2.1 Water*

Understanding the water supply provides insight into the level of service of a community. Access to water is not only an indicator into the standard of living but also the level of health. Inadequate access to water contributes to disease and sickness thus increasing the population's vulnerability to disease and reducing productivity. **Table 25** shows the level of water services that is provided in 2011.

**Table 25: Household access to piped water (Statistics South Africa, 2013)**

| Piped Water | Total | Percentage |
|---|---|---|
| Inside Dwelling/institution | 405 | 19% |
| Inside yard | 651 | 31% |
| Community stand: distance less than 200m | 729 | 35% |
| Community stand: distance between 200m and 500m | 225 | 11% |
| Community stand: distance between 500m and 1000m | 24 | 1% |
| Community stand: distance greater than 1000m | 18 | 1% |
| No access to piped (tap) water | 60 | 3% |
| **Total** | **2 112** | **100%** |

Fifty percent of households in the study area have piped water inside a dwelling or yard. Eighty five percent of household's access to water services that is equal or high than the basic level of service. Three percent of households do not have access to water services in the study area.

### *7.2.2 Sanitation services*

**Table 26** below provides information on sanitation services in the study area for 2011. Like water services, access to sanitation services improves cleanliness leading to an improvement in health.

Twenty four percent of households in the study area have no access to sanitation services. Thirty six percent of households have flush toilets while twenty four percent of households make use of pit toilets

**Table 26: Household access to sanitation services (Statistics South Africa, 2013)**

| Toilet Facilities | Total | Percentage |
|---|---|---|
| None | 504 | 24% |
| Flush toilet with sewerage system | 540 | 26% |
| Flush toilet(with septic tank | 219 | 10% |
| Pit toilet with ventilation (VIP) | 291 | 14% |
| Pit toilet without ventilation | 438 | 21% |
| Bucket toilet | 48 | 2% |
| Other | 51 | 2% |
| **Total** | **2 091** | **100%** |

Sanitation levels in the study area are low as only fifty percent of households have access to sanitation services that are equal to or above the basic level of service.

### *7.2.3 Energy*

**Table 27** provides information on energy sources for various domestic uses in the study area. The household fuel source for cooking; lighting; and heating are provided.

**Table 27: Household access to energy sources (Statistics South Africa, 2013)**

| Energy Usage | Cooking | Heating | Lighting | Percentage |
|---|---|---|---|---|
| Electricity | 58% | 46% | 66% | 57% |
| Gas | 7% | 2% | 0% | 3% |
| Paraffin | 1% | 1% | 4% | 2% |
| Wood | 33% | 25% | 0% | 19% |
| Coal | 0% | 0% | 0% | 0% |
| Solar | 0% | 0% | 1% | 0% |
| Candles | 0% | 0% | 27% | 9% |
| None | 1% | 25% | 2% | 9% |
| **Total** | **100%** | **100%** | **100%** | **100%** |

Electricity usage in households is highest for lighting purposes at sixty six percent, while forty six percent of households use electricity for heating. For cooking and heating, wood is the second source of energy at thirty three percent and twenty five percent respectively. Twenty seven percent of households make use of candles for lighting.

Electricity usage by households in the study area averages fifty seven percent. The use of reliable electricity is important for economic growth. Low electricity supply is bound to deter

big business from entering the area. Thus the municipality should aim to provide electricity for development. Also, the provision of electricity increases the standard of living for households and communities and also reduces vulnerability.

### *7.2.4 Health*

There are four healthcare in the Musina LM. The most prevalent health service provider limitations are identified in the Musina 2013/2014 IDP as:

- Overcrowding in clinics and hospitals;
- Poor road surface to reach healthcare facilities;
- Influx of immigrants increasing pressure on existing healthcare infrastructure;
- Lack of qualified pharmacists and related officials;
- General shortage of personnel; and
- Old and outdated equipment and buildings.

The most prevalent health issues are identified as:

- Malaria;
- Rabies; and
- HIV/AIDS.

The International Organisation for Migration found Musina to be highly vulnerable to HIV transmission due to the large transient portion of society, such as soldiers, miners and truck drivers regularly passing through the municipality (International Organisation for Migration in partnership with Sida, 2003).

## 7.3 Economic Environment

### *7.3.1 Land Ownership*

State land makes up eight percent of land holdings in the municipality, the bulk of which is around the town of Musina. Private land makes up fifty six percent. The institutional land is mainly owned by de Beers Consolidated Mines and the South African Development Trust, located around the Venetia diamond mine and the Domboni/Madimbo areas respectively (Musina Local Municipality, 2012).

There are 351 land claims lodged of which twenty one are on state land, located mainly along the National road; rail routes; and adjacent to Mapungubwe. These claims will have a significant impact on spatial developments within the municipality and around Mapungubwe.

### *7.3.2 GVA and Employment*

Gross Value Added (GVA) is defined as the total value of all the goods produced in a specific area during a specific period.

According to Quantec Research data, Musina contributes 12 percent to the Vhembe District Municipality GVA in 2011. GVA per capita allows for the determining the overall welfare of the population. While it is not a comprehensive measure and provides no indication of the distribution of welfare, it is still important an important indicator.

In order to generate GVA per capita the following equation has been used to determine population growth rates between 2001 and 2012:

$$P_n = CP\ (1+I)^n$$

Where:

P – Estimated Population Figure for the specified time

CP – Population at start

*I* – Growth rate as decimal degree of percentage

n – Years over which growth is determined

Quantec Research defines the major sectors into Primary Sector, which is extractive, Secondary Sector made up of manufacturing and the Tertiary Sector, which comprises Services.

- Primary Sector-
  - Agriculture, forestry and fishing; and
  - Mining and Quarrying
- Secondary Sector –
  - Manufacturing. this includes food, beverages and tobacco; textiles, clothing and leather goods; wood, paper, publishing and printing; petroleum products, chemicals, rubber and plastic; other non-metal mineral products; metals, metal products, machinery and equipment; electrical machinery and apparatus; radio, TV, instruments, watches and clocks; transport equipment; and furniture and other manufacturing.
  - Electricity, gas and water; and
  - Construction
- Tertiary Sector –
  - Wholesale and retail trade, catering and accommodation. This sector represents the tourism sector through catering and accommodation and the sale of goods through trade.
  - Transport, storage and communication;
  - Finance, insurance, real estate and business services;
  - Community, social and personal services; and
  - General Government

**Table 28** shows the 2005 and 2011 GVA for Musina Local Municipality in percentage. The figures below are based on 2005 constant prices. The table also shows the 2011 employment data per sector for Musina LM.

**Table 28: Total Gross Value added for Musina Local Municipality (Quantec Research (Pty) Ltd, 2012)**

| Industry | 2005 | 2011 | Employment |
|---|---|---|---|
| Agriculture, forestry and fishing | 9% | 6% | 18% |
| Mining and quarrying | 39% | 31% | 17% |
| Manufacturing | 2% | 4% | 5% |
| Electricity, gas and water | 1% | 1% | 0% |
| Construction | 1% | 2% | 6% |
| Wholesale and retail trade, catering and accommodation | 10% | 15% | 25% |
| Transport, storage and communication | 12% | 13% | 4% |
| Finance, insurance, real estate and business services | 12% | 16% | 6% |
| Community, social and personal services | 2% | 2% | 9% |
| General government | 11% | 11% | 11% |
| **Total** | **100%** | **100%** | **100%** |

The following sectors contribute the most to the Musina LM GVA:

- Mining and quarrying remains the highest contributing sector to the Musina LM economy although there has been a decline in this contribution. With Vele Colliery having opened and an increase in mining explorations, this sector is expected to grow.
- Finance and trade has increased to sixteen percent from fourteen percent in 2010. Business services include finance, insurance and real estate and may be driven by the manufacturing sector.
- Trade and accommodation contributes fifteen percent to local GVA also increasing over the period from 2005 to 2011. Mapungubwe is the main tourist attraction that would boost catering and accommodation in this region.

Looking at the data from 2005 to 2011, the structure of the economy has not changed significantly. The major industry to see a decline is agriculture where the 2005 contribution to GVA was nine percent and fell to six percent in 2011.

Musina LM contributes twelve percent to Vhembe District GVA. Thulamela Local Municipality is the highest contributing municipality at forty three percent. Motale LM contributes eight percent to Vhembe GVA. Makhado LM contributes the remainder thirty seven percent

In terms of employment the biggest sector contributing to employment is trade and accommodation at twenty five percent. Agriculture contributes eighteen percent of GVA. Agriculture as shown in **Table 29** is declining. There municipality needs to ensure that jobs are retained.

The mining sector contributes seventeen percent to GVA. In Musina LM 20 578 persons were employed in 2011 while 1 602 persons we unemployed. The municipal unemployment rate in 2011 was 7 percent.

Employment data for study area is shown below in **Table 29** for 5 445 persons.

**Table 29: Employment (Statistics South Africa, 2013)**

| Employment | Total | Percentage |
|---|---|---|
| Employed | 3 714 | 68% |
| Unemployed | 174 | 3% |
| Discouraged work-seeker | 57 | 1% |
| Other not economically active | 384 | 7% |
| Not applicable | 1 116 | 20% |
| **Total** | **5 445** | **100%** |

Sixty eight percent of the population are currently employed while three percent are unemployed. Seven percent to the population are not economically active. Ninety two percent of households earn in the low income bracket thus those that are employed are likely to be unskilled and semi-skilled workers.

### *7.3.3 Spatial development comparative advantage*

According to the Musina IDP, the spatial development comparative advantage for the municipality is that it contains a number of nature reserves, conservancies and game farms, which is comparative advantage over other municipalities (Musina Local Municipality, 2012).

There are initiatives to expand the tourism industry in the municipality through initiatives as the Golden Horse Shoe Initiative which "*is a conceptual spatial framework that aims to provide a receptacle for a diverse portfolio of tourism and related activities is a major*

*opportunity in the area"* (Musina Local Municipality, 2012). The area extends from the Western, Northern and Eastern borders of the Limpopo Province.

According the Musina IDP the municipality has comparative advantages in agriculture, mining, manufacturing and transport industries, compared to the District. The focus will be on agriculture and mining and tourism due to its relevance to this EMF and proximity to the MCLWHS.

The Limpopo Government Local Economic Development (LED) unit has the following development programs in the Vhembe District Municipality. These LED projects are centred around the agriculture, tourism and mining sectors.

**Table 30: LED projects (Limpopo Local Economic Development Resource Centre, 2013)**

| APPLICANT | TITLE OF THE PROJECT |
|---|---|
| The Village Tourism Trust | Development of a competitive action plan for a heritage based arts, crafts and tourism cluster |
| Vhembe District Municipality | Enhancement of Market Opportunities resulting in improved agricultural activity of emerging fruit and vegetable farmers on Vhembe District Municipality |
| Safcol Ecotourism | Safcol Limpopo Ecotourism |
| Vhembe Macadamia Farmers | Vhembe Macadamia Project: Shirley, Ha-Davhana and Ha-Mashau |
| Green Nut Farms | Joint venture initiative, within the macadamia cluster, to produce process and market macadamia nuts |
| Agridevelopments International | Golwe Eco-Tourism Project |
| Khulile Africa | Development of a Higher Order Community Based Eco, Cultural, Heritage, Sport and Agri-Tourism Activity Centre in Rural Makhado |
| Novafrica | Sweet potato commercialisation project in Vhembe |
| Limpopo Tourism and Parks | Greater Nwanedi Eco-tourism Cluster (GNEC) |
| Vhembe Colourstone Mining Co-op | Open Cast Colourstone Mining Operation and Beneficiation by Rural Women |
| Nzhelele Valley Initiative (Pty) Ltd | Land Restitution Capacity Building Programme: Nzhelele Valley Initiative (MCAP) |
| LHA Management Consultants | Community Development Programme for the Establishment of Agricultural Clusters in Venda |

### *7.3.4 Tourism*

The tourism sector is a multifaceted industry as it is a contributor to a number various economic sectors like trade, business and property and even manufacturing. In 2010 tourism contributed 3 percent of gross domestic products and employment of around 5 percent.

Looking at **Table 31**, a trend analysis of tourism adapted by the South African Domestic Tourism Growth Strategy 2012, highlights the multidimensional nature of tourism. Some of these trends will apply and serve to guide the development of a growing tourism sector in MCLWHS.

**Table 31: Trend Analysis of Spheres of influence on tourism (The National Department of Tourism, 2012-2020)**

| TRENDS | OVERVIEW |
|---|---|
| Competition Trends | Product diversification enhanced marketing, affordability, access and service excellence.<br>Tourism becoming a regional/ national rather than a global phenomenon. |
| Economic Trends | Fluctuating state of economies will affect travel demand<br>Favourable interest rates, debt reduction focus and increase in disposable income.<br>Increasing adoption of tourism as a leisure activity.<br>Increasing demand for benefits from tourism resources by host communities. |
| Political/Legal Trends | Political stability affects travel choices and decisions.<br>Legislative environment in a destination, such as the Consumer Protection Act does impose obligations on destinations and products, and raise expectations from tourists. |
| Tourism Markets and Emerging Industry Trends | Niche markets and special interest tourism<br>Increased and frequent shorter holidays and increased use of new technology<br>Low cost travel will influence travel demand.<br>The oversupply of undifferentiated travel products in a destination will impact on competitiveness. |
| Technology Trends | Rapid development and use of technology<br>Innovations in transportation will impact on speed, comfort and safety |
| Natural Environment Trends | Mass tourism declining due to awareness on the impact that tourism has on the environment.<br>Increased involvement of NGOs and CBOs in tourism and environmental issues.<br>Potential impact of natural disasters on travel behaviour.<br>Emerging approaches and perspectives of efficiency measures |
| Social and Cultural Trends | Risks of diseases and other pandemics.<br>Ageing, affluent and middle class will influence travel demand.<br>Perceptions and concerns for safety and security will influence travel decisions. |

There are many different markets of tourism. These are dependent of the reason of tourism, the socio-economic profile of tourists and it's the length of the visit etc. The MCLWHS would attract tourism for culture, heritage, eco-tourism and as activity based tourism of game farming.

### 7.3.4.1 Current activities

The MCLWHS has a number of tourism attractions. These include nature reserves, game farms and conservancies and resorts. There are number of nature reserves and game reserves in the buffer region which include:

- Mapungubwe National Park;
- Mashatu Game Reserve;
- Nitani;
- Mopane Bush Lodge;
- Tuli Safari Lodge;
- Venetia Limpopo Nature Reserve

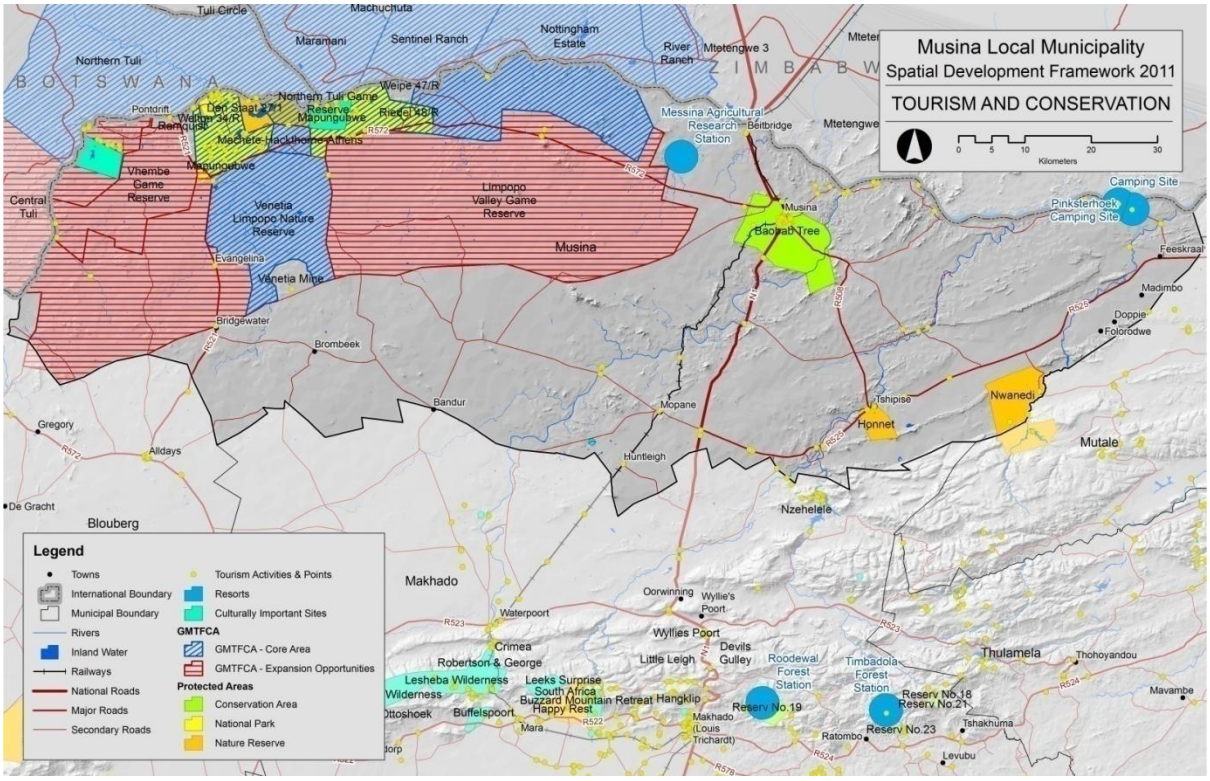



**Figure 29: Tourism and conservation Musina SDF 2011**

The world famous Mapungubwe archaeological site is located on the “hill of jackals” in the Mapungubwe Nature Reserve. It is situated at the confluence of the Shashe and Limpopo rivers, where golden artefacts, most notably the golden rhino, were found in ancient royal graves. Within in the park, a number of facilities and attractions are found, including:

- Mapungubwe Hill and site museum;
- A crossing used by elephants coming from Botswana;
- A tree top boardwalk at the confluence of the Limpopo and Shashe Rivers;
- Relics of SANDF occupation of the area;
- Historic building reputed to have been built by JC Smuts;
- Rock art and archaeological sites; and
- A variety of accommodation facilities

In addition to the cultural resources, there is also a large diversity of plant and animal life. Most of the big five animals roam the area. Sandstone formations, mopane woodlands and unique riverine forest and baobab trees add to the area (SouthAfrica.info, 2014).

#### 7.3.4.2 Comparative/competitive advantage of cultural and heritage tourism as opposed to eco-tourism and game farms

The MCL is significantly unique to the rest of South Africa's tourism destinations as it is the single largest area in the country to have such cultural heritage. The primary reason for the site being proclaimed as a World Heritage Site was because of the cultural and heritage value the site provides.

The cultural heritage of the landscape serves as a comparative advantage to Mapungubwe. The Limpopo government should exploit the opportunities that this proclaimed UNESCO site offers. As a cultural site MCLWHS does not need to compete with other tourism destinations in the country.
Those who visit the GMTFCA will automatically enter MCLWHS. This should be viewed as a competitive and comparative advantage when marketing Mapungubwe and it should be used to generate more interest into the area.

The site will need to be efficiently managed and controlled in order to avoid trampling of deposits, graffiti, damage to paintings and other artefacts, and removal of

archaeological material such as pottery and beads. The area will require monitoring and signage of where visitors will be allowed. Conservation is intrinsic to tourism. If the cultural and heritage resources at the MCLWHS are not conserved, there will be no tourism attraction to the area.

If tourism development is uncontrolled it may result in a high risk for conservation and biodiversity. Development needs to take place in a sustainable manner so that the natural landscape is not altered.

Current plans to develop the area will likely contradict the cultural value of the land. Development of game farming in the area will require the introduction of elephants; lion and rhino. Large animals like elephant may inflict damage to rock art sites, damaging and destroying the history and value of the landscape.

In addition the presence of such animals will require all tours to involve game vehicles and armed game rangers. Visitors will not be able to tour the landscape on foot thus changing the visitor experience and taking away from the rich cultural attraction.

On the other hand, game farming has the highest revenue potential for tourism in the area. Game farming will attract a large number of local and international visitors to the area. If managed efficiently it is highly likely that the MCLWHS can sustain itself through game farming.

Business tourism should also be explored in the area. Accommodation facilities should cater for business travel in order to attract more people to the area. The fact that there are two operational mines in the area and future mining activities are likely to occur, serves as an incentive to have business tourism facilities.
In terms of future plans, there is a move away from ‘traditional’ agriculture to other agricultural activities such as game farming in the area. At present farmers in the core area are negotiating to form one large game farm that would significantly increase the value of area

### *7.3.5 Mining*

According to the Musina LM IDP, mining and quarrying is currently experiencing negative growth within the municipality. The only active mine is Venetia mine while there are a plethora of closed and derelict mines throughout the municipality which in some cases constitute an environmental problem (Musina Local Municipality, 2012).

The Musina Local Municipality SDF mentions a number of areas where there are mining opportunities. Some of these mining opportunities surrounding the Mapungubwe region, including:

- Beit Bridge Complex / Limpopo Belt: This complex hosts a number of minerals, the most important of which includes Dolomite, Diamonds,
  - Dolomite/limestone: The Gumbu Group has significant reserves. However, the long distances to markets marginalize the economy of these reserves. Deposits that have been exploited include that on the farm Steenbok (565 MT) and Naus (178 MT).
  - Diamonds: The Limpopo River is known to have significant alluvial diamonds. However, no deposits are mined at present and the only deposit mined in the past is located on the farm Riedel (48 MS).
  - Prospecting has indicated diamonds to occur on the farms Krone (104 MS), Blyklip (25 MS), Halcyon (21 MS), Little Bess (70 MS), Skutwater (115 MS), Bismark (116 MS), and River (141 MS).
  - The only active diamond mine at present is the Venetia Mine located in Musina Municipality owned by De Beers. The Venetia mine is located approximately 80km to the west of Musina town.
- Vele colliery: coal occurs next to MCLWHS. The deposits are being explored by Coal of Africa.
- Limpopo Eco-Industrial Park: The project is at feasibility studies and is part of the Limpopo Economic Growth Development plan (LEGDP).

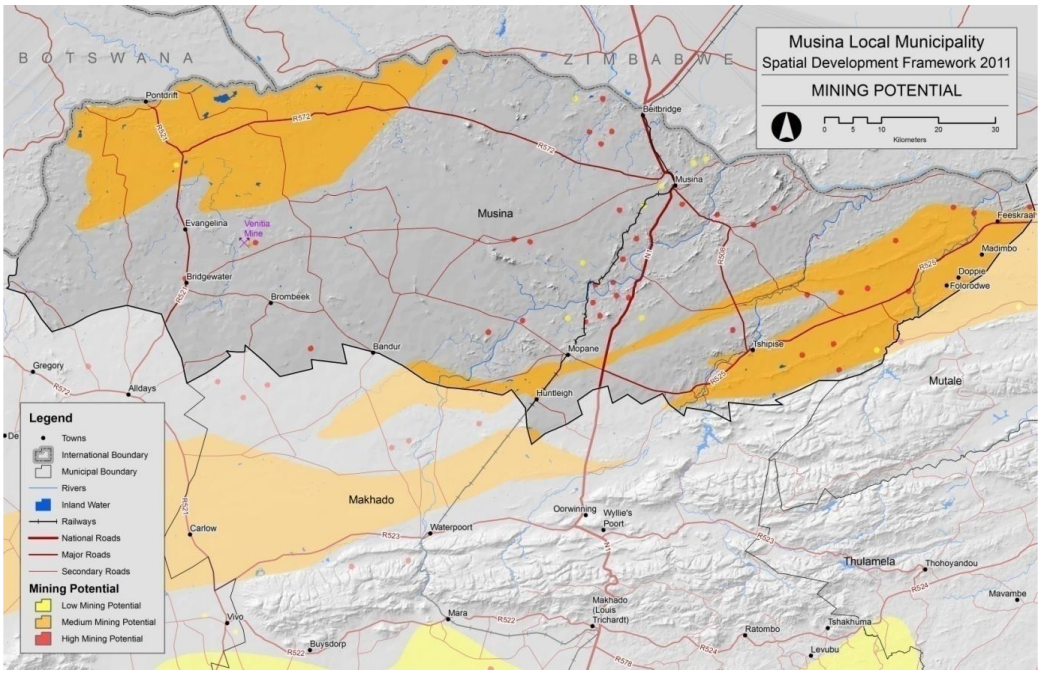



**Figure 30: Mining potential**

### 7.3.5.1 Current activities

Vele Colliery owned by Coal of Africa, is the closest mine to the study area. It falls in the buffer region and could have a direct impact on the development of MCLWHS. Vele Colliery intends to mine using both opencast and underground mining methods concurrently for twenty nine years.

According the Macroeconomic Impact Assessment of the Proposed Vele Colliery, during the construction phase 2 500 workers are expected to be employed and 826 jobs are expected to be created during the operational phase. Currently the 8 663 hectares which comprise the proposed Vele Colliery mining area are being used for game and citrus farming. Mining this area will affect 580 agricultural jobs and 255 tourism related jobs (Conningarth Economists, 2009).

The. Venetia Mine, owned by De Beers, straddles the southern boundary of the MCLWHS buffer area. Venetia mine employed 955 people and is currently the largest producer of diamonds in South Africa.

Venetia Mine has taken a number of steps to reduce and alleviate some of the environmental impacts associated with open-cast mining. These include the burial of

the 35km water supply pipeline; the mine runs a dust control system, as well as minimising both noise and lighting impacts (Naledi Development, 2009).

Vele Colliery can learn from Venetia Mine to implement similar activities suitable for coal mining in an attempt to limit the environmental impacts of opencast and underground mining.

### 7.3.5.2 Mining potential

The figure taken from the GMTFCA shows the existing and prospecting mining rights that have been issued in the GMTFCA boundary. The yellow shaded area shows the coal prospecting rights which fall directly in the WHS buffer region outlined in blue. The brown shaded areas are new order mining rights that have been issues before 2010.

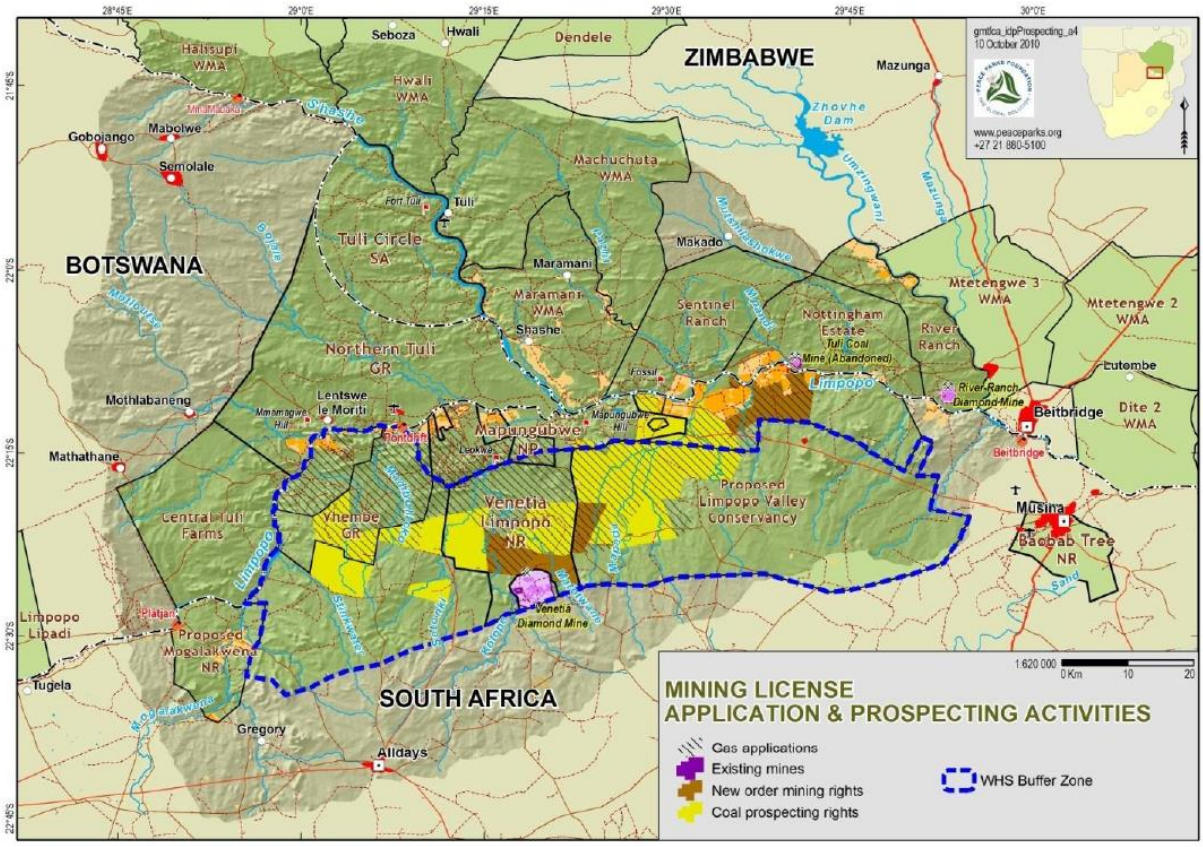



**Figure 31: Mining licence application and prospecting activities (GMTFCA TTC, 2012)**

The Mapungubwe area is facing increasing interest in mining activities. The DMR has provided companies such as Anglo American Thermal Coal exploration rights as the quality of the coal found in the region had generated a lot of interest.

Mining in the area will significantly change the social and economic environment of the Mapungubwe region. An increase in mining will stimulate economic activity in the surrounding communities and generate wealth in the area. Accommodation and retail space will be required if mining takes place.

At the same time, the area will expect an influx of people and rapid development to take place. This will change the social structure of the area and potentially increase social ills and daily nuisance factors for those living close to mining activities. The burden on municipal services will also increase.

The local people, who are currently employed in agricultural and tourism industries, will be required to develop skills required by the mining sector. Those who undergo training in mining related skills will then have to compete for employment with migrant workers who have experience working on mines.

Prospective mining companies will likely make use of opencast and underground mining methods. Opencast mining requires a continuous blasting and has a lasting impact on the landscape. The surrounding communities will also be affected by rising dust levels and noise.

#### 7.3.5.3 Conflict between mining and tourism

In order to realise the tourism potential in the area, the natural environment needs to be conserved and remain undisturbed. Mining requires disturbance to the natural environment and is thus in direct conflict with tourism. Blasting activities will cause vibrations which may cause structural damage to cultural and heritage resources.

Conservation areas, nature reserves and private game farms may have to be closed down in order for the area to be mined. Mines can also have a visual impact on game

farms and tourism faculties that surround them and can also experience a negative economic impact should mining take place.

In the Vele Colliery area alone, there are several proclaimed private nature reserves, namely Sighetti, Skudwater and Vercueil Ranch that are situated in and adjacent to the mine and could be required to shut down (Naledi Development, 2009). More nature reserves and game farms might be similarly affected should other mines be opened up in the Buffer zone.

Tourism facilities that surround mining activities will also be negatively affected as the visual impact of the area will change. A negative change in the visual appeal of the area will be detrimental to the growth of the tourism market. Rising dust levels from blasting activities may also affect the tourism potential in the area.

Mining is in direct conflict with the tourism industry. The value of properties used for tourism will devalue with the introduction of mining in the Mapungubwe area. This economic decline will be exacerbated by the decline in the number of tourist visiting the area. Thus mining is in direct conflict with the tourism industry.

### *7.3.6 Agriculture*

There is a large agricultural sector in the study area, particularly along the banks of the Limpopo River where game farming and horticulture takes place in the area. Citrus, watermelon are grown in the area. According to the municipal IDP commercial farming along the Limpopo River may not see any substantial increase in the future due to rising costs of production.

The Mapungubwe Nominations Dossier states that agriculture in the buffer region will be phased out over a five-year period (Department of Environmental Affairs and Tourism, 2002). It was also noted that development pressures for commercial agricultural production along the Limpopo River created a number of challenges for the MCLWHS including:

- Water removal

- Eutrophication due to fertilizers
- Water borne invasive alien plants
- Bush clearing and ploughing of natural bush
- Ploughing of cultural sites.

The economic impact of agriculture in the Musina Municipality is significant. The agricultural sector is well developed and generates one of the most important employment opportunities in the municipality (Musina Local Municipality, 2012). According to Quantec Research EasyData, eighteen percent of employment in the Musina LM is generated by the agricultural sector.

The majority of labourers live on the farms where they work with their families. During harvesting season, additional temporary labourers are employed.

According to the Vele Colliery SEIA the total number of temporary and permanent labourers employed by the seven farms surrounding the mine total 5 780 a year. The majority of the labourers are from Zimbabwe and only eighteen percent are South African.

Thus agriculture is an important industry for the development of the local economy. However it is in conflict with the MCLWHS as it disturbs the natural environment as well as certain cultural resources that generate interest for tourists in the area.

#### 7.3.6.1 Future plans

There is an increase in the number of game farms in the area as farmers move away from agriculture to game farming. In particular cattle farms make the transition to game as game is far more adapted to the semi-arid environment found in the Mapungubwe area.

At present, game farms in the Mapungubwe area are in talks to consolidate the farms to facilitate large-scale eco-tourism operations. This will allow for multiple consumptive (hunting and meat production) and non-consumptive (tourism activities)

utilisation of these areas that will provide a significant economic boost to the area (Naledi Development, 2009).

The area will have the potential to become a top tourist destination comparable to the likes of Phinda and Timbavati Game Reserves which cater to higher end consumers. Although the MCLWHS could potentially sustain tourism activities if game farming is part of the tourism package, game should not be allowed to enter areas where the animals will place the cultural and environmental resources at risk. Conservation should take priority over game farming as the comparative advantage of the area lies in the cultural resources of the area.

### *7.3.7 Transport*

Transport networks play a crucial role in our local, regional and national economies. The pace of development of a country in part relies on the development of its transport network.

The existence of roads and adequate transport systems (public and private) provides other socio-economic benefits. Public and private use of it underpins our ability to participate in employment, shopping, recreation and social activities, making access to it not just of economic importance, but an important equity issue (International Road Federation Research Council, 2007).

However, it should also be noted that a joint study between EWT, Rhodes University and the Tshwane University of Technology has highlighted the impact that increased road infrastructure and vehicles have on biodiversity through roadkill. Increased traffic volumes may lead to increased incidents of roadkill that could impact on the survival of a variety of species. It is recommended by EWT that the environmental sustainability of the development of road infrastructure within the MCLWHS be ensured.

The MCLWHS is strategically located as it is located close to the two international border posts namely; Pontdrift linking South Africa to Botswana and Beitbridge connecting South Africa to Zimbabwe. Thus it has an advantage to transport goods and services to the

neighbouring countries. It is also in close proximity to the town of Musina (Uloyiso Training and Development, 2013).

The study area is traversed in a west to east direction by two key provincial roads, namely the R512 and R572. The N1 national road is also close to the region (Uloyiso Training and Development, 2013).

- The main access route in the area is the existing N1 which was built for through traffic and as an access road to Zimbabwe from south of South Africa.
- The secondary road network links the municipality internally which includes the R521, R525 and the R572. These roads should pass through the settlements and serves as a local trading and tourism route providing access to the MCLWHS.
- The bridge on the R572 was severely damaged during the January - February rains of 2012 and has not been repaired. This road is therefore not able to link Musina to the WHS. Further, the road surface is poorly maintained with large numbers of deep potholes which pose a risk to motorists.

## 7.4 Institutional

There are number of institutional factors that require addressing in the Musina Local Municipality. These include:

- Vacancies in the municipality which need to be filled. It is important for the municipality to have capacity in order to run efficiently;
- The municipality is required to develop and review its policies and by-laws.
- The municipality needs aid to narrow the skills gap between different economic classes;
- Cooperative governance is central to the effective management of the MCLWHS.
- Compliance and enforcement of potential impacting land uses need to be stringently executed and effectively coordinated.
- Stakeholder engagement needs to be adequately pursued and promoted.

# 8 CULTURAL, HISTORICAL AND ARCHAEOLOGICAL ENVIRONMENT

**GIS Mapping** • *Appendix A17 (Map: CULTURAL & HERITAGE SITES)*

*This section was extracted from the Heritage Survey of the Mapungubwe Landscape prepared by Professor T.N. Huffman.*

## 8.1 Physical terrain

The Mapungubwe landscape covers parts of present-day Botswana, Zimbabwe and South Africa (**Figure 32**), centred on the confluence of the Shashe and Limpopo rivers. These two rivers flow within the Limpopo Mobile Belt, in between two ancient continents known as the Zimbabwe and Kaapvaal cratons (McCarthy and Rubidge 2005: 108-111). As it lies between these two continents, the terrain consists of various Karoo sandstones derived from continental erosion that have been interrupted by mafic intrusions caused by continental movements. The area is still seismically active, and Mapungubwe Hill stands only some 45 km east of an earthquake epicentre in Botswana. Generally, these mafic intrusions created basalt sheets and dolerite dykes visible today.

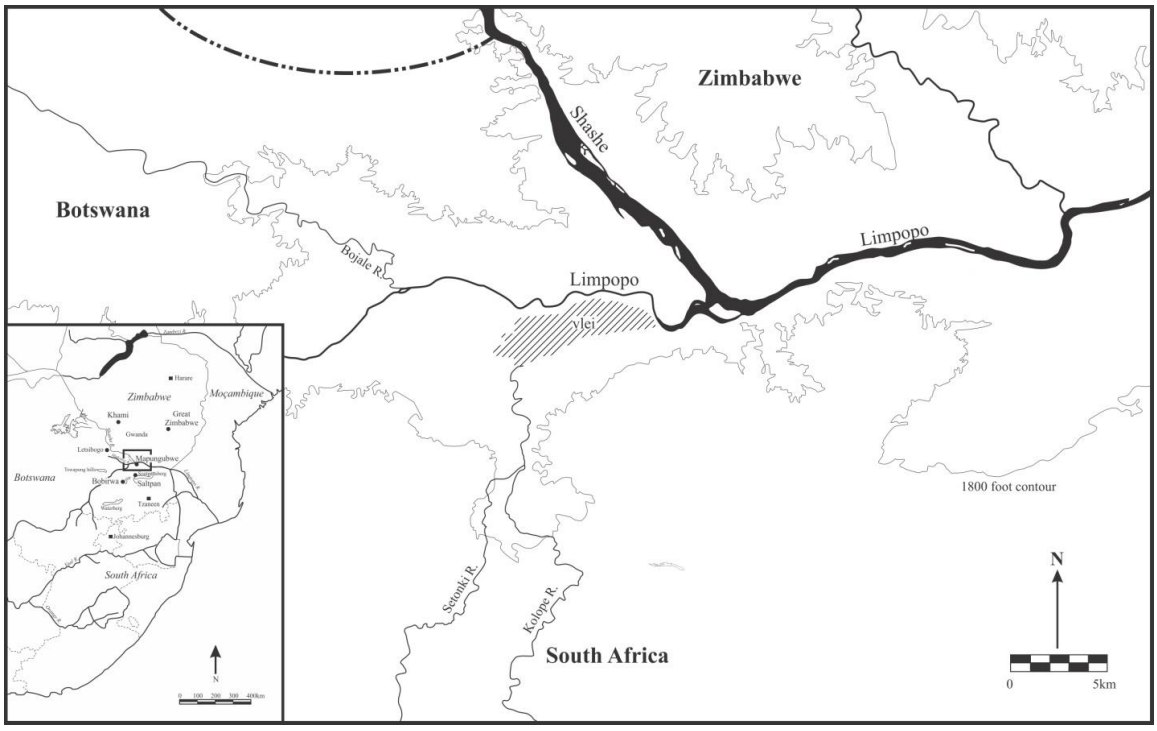



**Figure 32: The Shashe-Limpopo confluence area; note large vlei**

The landscape between the two continents only rises some 600 m above sea level and therefore lies within a rainfall trough. The present-day average of 320-350 mm per year is not sufficient for traditional cultivation, but it clearly was adequate when Mapungubwe was at its peak. For this reason, prehistoric climates have received considerable attention. The major reconstruction for the summer rainfall region comes from the stalagmite record at Makapansgat to the south (Holmgren et al. 2003; Huffman 2008a).

In addition, Jeannette Smith (2005) reconstructed a climate sequence for the last 1100 years in the Mapungubwe landscape using stable carbon, nitrogen and oxygen isotopes as well as radiogenic strontium to analyse modern faunal samples collected in different rainfall regimes. The results then became a datum to assess prehistoric remains.

Whatever the rainfall, the landscape was capable of supporting large herds of elephants. Today, dry-land trees such as mopane and dry-land grasses, coupled with permanent water, create ideal conditions for them. Moreover, an enormous vlei supports a huge stand of elephant grass (*Sporobolus pyramidalus*) that makes the area extraordinarily good for large herds. This vlei is fed by the Kolope delta at the west end and backwater flooding of the Limpopo to the east. Hydrological data (AquaTech Consultants, pers. comm. 1999) indicate that the Limpopo would be permanent even now if it were not for the numerous dams and boreholes scattered throughout the catchment area.

The Shashe is also important. When the Shashe floods (**Figure 32**), it deposits silts, and there are fairly extensive floodplains downstream of the confluence. The Shashe in flood also acts as a dam wall against the Limpopo, forcing it to back up and inundate its tributaries. The large vlei itself is largely clay, but the margins consist of loams with high agricultural potential. It would have been possible to produce cereal crops along this margin from floodwater alone. Multiple yields would have also been possible, especially because different varieties of sorghum and millet are adapted to different soils and moisture conditions (Simmonds 1976).

Further, if higher rainfall extended the rainy season, then the warm temperatures would have simultaneously extended the growing season. Furthermore, once burnt, young shoots of the elephant grass could provide winter grazing for cattle (Mashimbye 2013)

## 8.2 Cultural terrain

Archaeologists from the Universities of Pretoria and the Witwatersrand have been investigating the prehistory of the Mapungubwe landscape since the 1930s. Some of the early publications are well known internationally (e.g. Fouché 1939; Gardner 1963), as well as newer excavations at the sites of Schroda (Hanisch 1980), K2 (Voigt 1983) and Mapungubwe (Eloff and Meyer 1981; Meyer 1998). Other projects include excavations on Skutwater (Van Ewyk 1987), archaeozoology (Cain 2008; Plug 2000; Plug et al. 1979) and human skeletal analysis (Boshoff and Steyn 2000; Steyn 2007; Steyn and Nienaber 2000).

Systematic surveys of the National Park and Buffer zone have now recorded over 1100 Iron Age sites (Huffman 2000; Huffman and Du Piesanie 2011). Using these data, various archaeologists have investigated ethnic stratification (J. Calabrese 2007), climate change and herding strategies (J. Smith 2005; Smith et al. 2010), glass beads and international trade (M. Wood 2000, 2005, 2011), the ethno-archaeology (M. Murimbika 2006) and archaeology of rainmaking (S. Brunton et al. 2013; M.H. Schoeman 2006, 2009), the relationship of settlements to the landscape (J. du Piesanie 2008), as well as faunal remains (K. Fatherley 2009), agricultural production (C. Chandler 2009) and spherulites in cattle dung (M. Mashimbye 2013). Thus, interest in the archaeology of the Mapungubwe Landscape has been and continues to be high.

Due to the huge extent of the Mapungubwe landscape, the delimitation of a ‘Core Area’ is problematic. For practical purposes it will be convenient to include the whole of the 1: 50 000 map sheets 2229AA-AD, BA and BC, and the portion of 2228BD that extends east of the Mogalakwena River. It then stretches from the bend of the Limpopo at the Farm Ratho east to the granites near Dongola and south just beyond the Venetia Mine.

It includes the upstream flood zone on Ratho, the vlei zone in the Park, and the downstream flood zone that begins on Weipe: each was a focus of Iron Age agriculture. Moreover, it includes examples of every time period and type of site, as well as the two major environments associated with sandstone and granite formations. This Core Area is somewhat larger than the World Heritage site and present Buffer zone.

### 8.2.1 Stone Age

Hunter-gatherers lived mostly in the open, and pans were a focal point in the Mapungubwe landscape. Outcrops of fine-grained stone suitable for manufacturing tools were other areas of concentrated activity. On the other hand, the repeated use of rock shelters created deeper deposits and better conditions than surface sites for the preservation of flora and fauna remains. This is why shelters are important to Stone Age research.

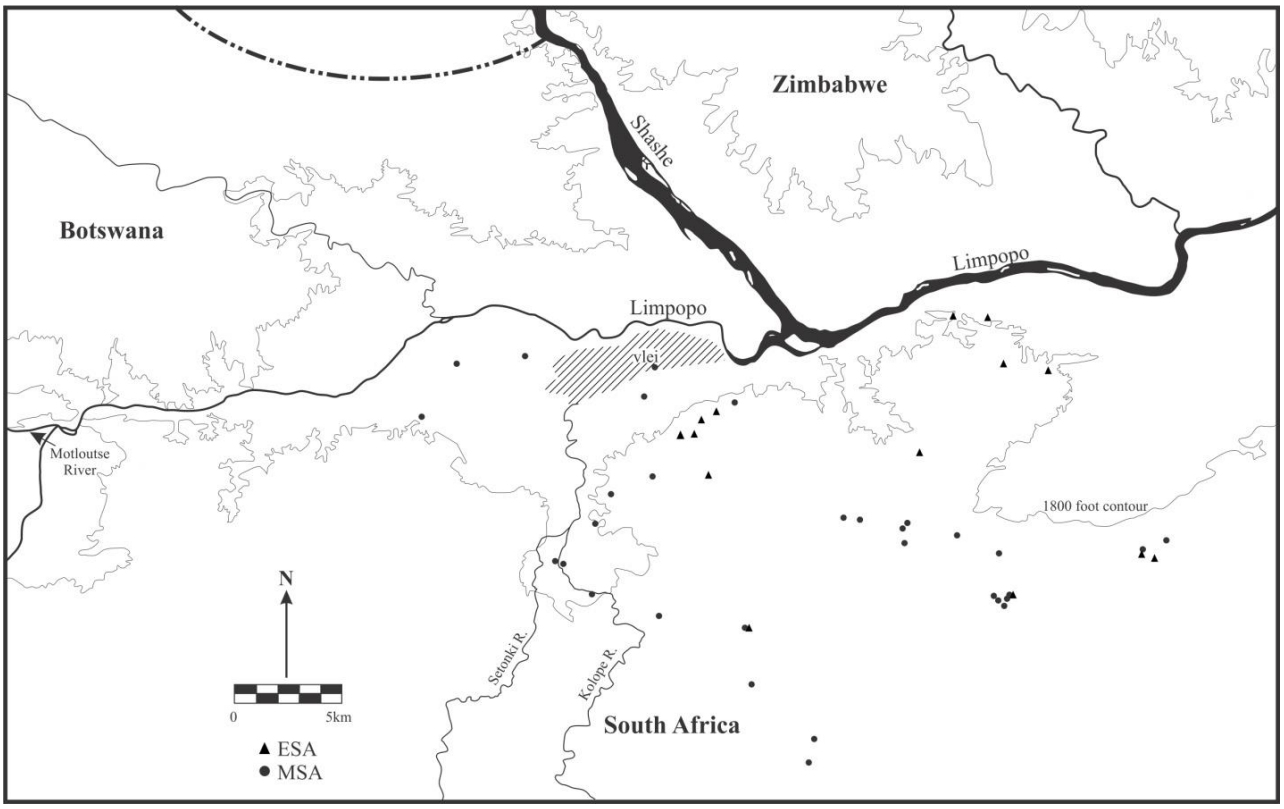



**Figure 33: Distribution of Earlier and Middle Stone Age sites.**

Kudu Kopje, on Samaria within the MCLWHS, was probably such a rock shelter 100 000 years ago, and other prominent outcrops may have served the same purpose before natural forces removed the overhangs. Furthermore, many existing shelters show signs of human activity. Little Muck shelter appears to have been used by Later Stone Age people and then taken over by ritual specialists associated with farming communities.

### *8.2.2 The Iron Age (AD400 – AD1800)*

Bantu-speaking people moved into Eastern and Southern Africa about 2000 years ago (Mitchell 2002). Because metalworking represents a new technology, archaeologists call this period the Iron Age. By convention, this sequence is divided into three arbitrary periods: the Early Iron Age (AD 100-900), the Middle Iron Age (AD 900-1300) and the Late Iron Age (AD 1300-1840).

Characteristic ceramic styles units (called *facies*) with space and time boundaries form the basis of the culture-history sequence (**Figure 34**). By convention, archaeologists apply the facies name to the group of people who produced the style: thus, Mapungubwe people produced the *Mapungubwe* style; while Leopard's Kopje people produced the various facies in that cluster.

Other than for ritual, farming communities tended not to live in the rough terrain where rock shelters are located. Instead, they settled in areas with easy access to cultivatable land, such as the vlei, or to good grazing on plateaus between the main drainages, such as on Hamilton and Sardinia. Clearly then, the core area was heavily occupied at different times, and most of the region contains archaeological remains.

Some of the most important include the capital complex of K2, Mapungubwe and Bambandyanalo, as well as Schroda and Leokwe Hill, all in the Park, and the Edmondsburg range in the Venetia Reserve. The Middle Iron Age (AD 900-1300) was the centre of farming activity in the valley, when the Limpopo flooded on a seasonal basis and the East Coast gold and ivory trade was in operation.

The second important time period is the Late Iron Age. During this period, Sotho-Tswana people (with *Icon* pottery) interacted with Western Shona (*Khami* pottery) to such a degree that a new language and ethno linguistic identity may have been created.

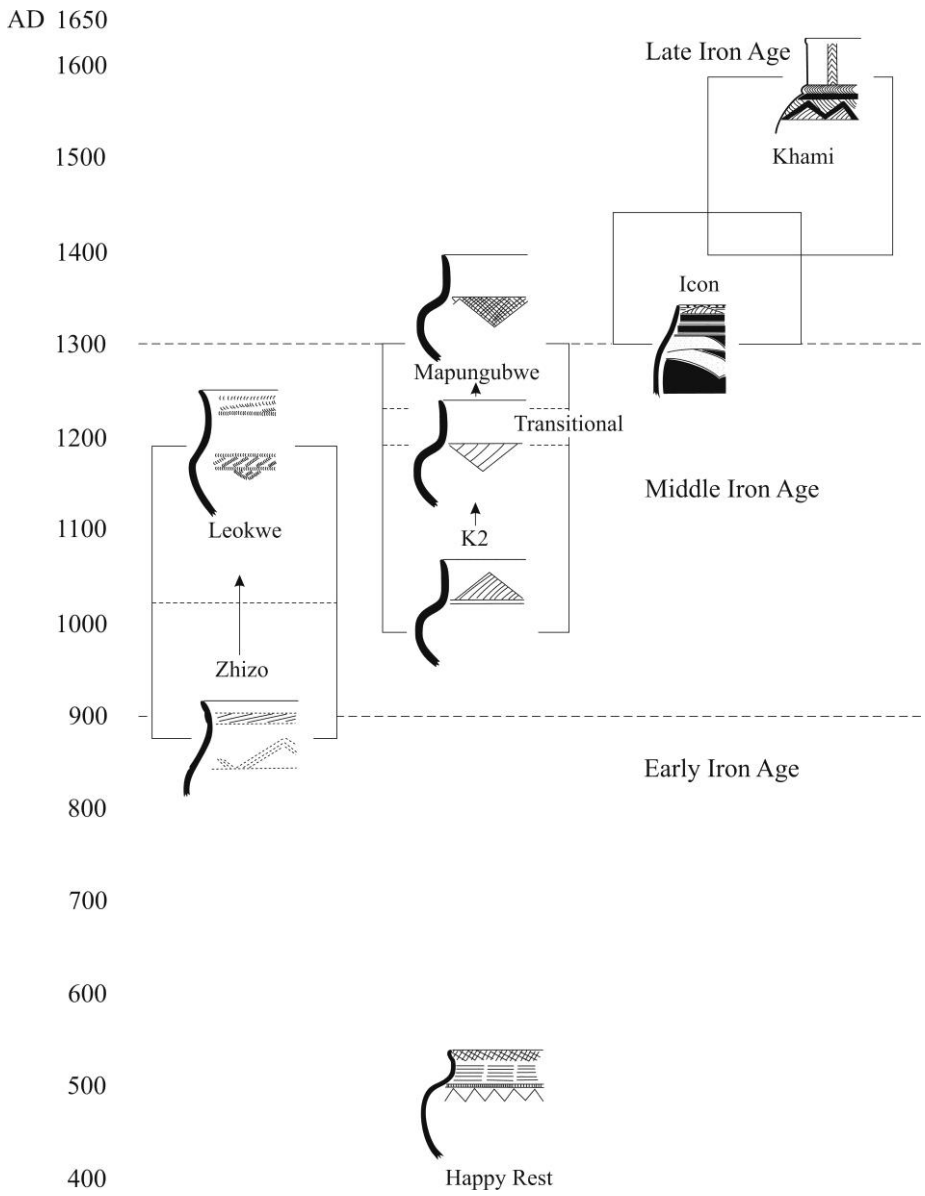



**Figure 34: Iron Age ceramic sequence for the Mapungubwe Cultural Landscape.**

For the origins of Mapungubwe, the most important period is the Middle Iron Age. Even though only a small proportion of Middle Iron Age sites have been radiocarbon dated, stratigraphic relationships have helped to produce a definitive ceramic sequence. This sequence includes the ceramic facies known as *Zhizo* (AD 900-1020), *Leokwe* (AD 1020-1200), *K2* (AD 1020-1200), *Transitional K2* (AD 1200-1250) and *Mapungubwe* (AD1250-1320).

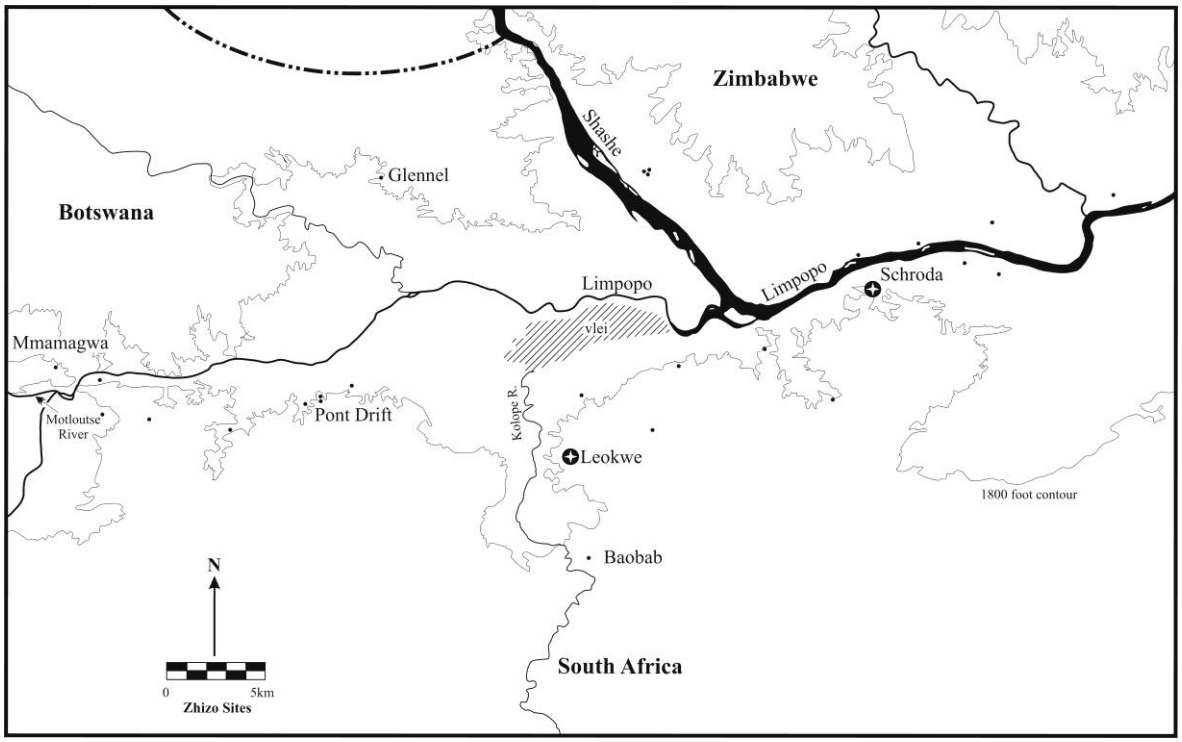



**Figure 35: Distribution of recorded Zhizo sites**

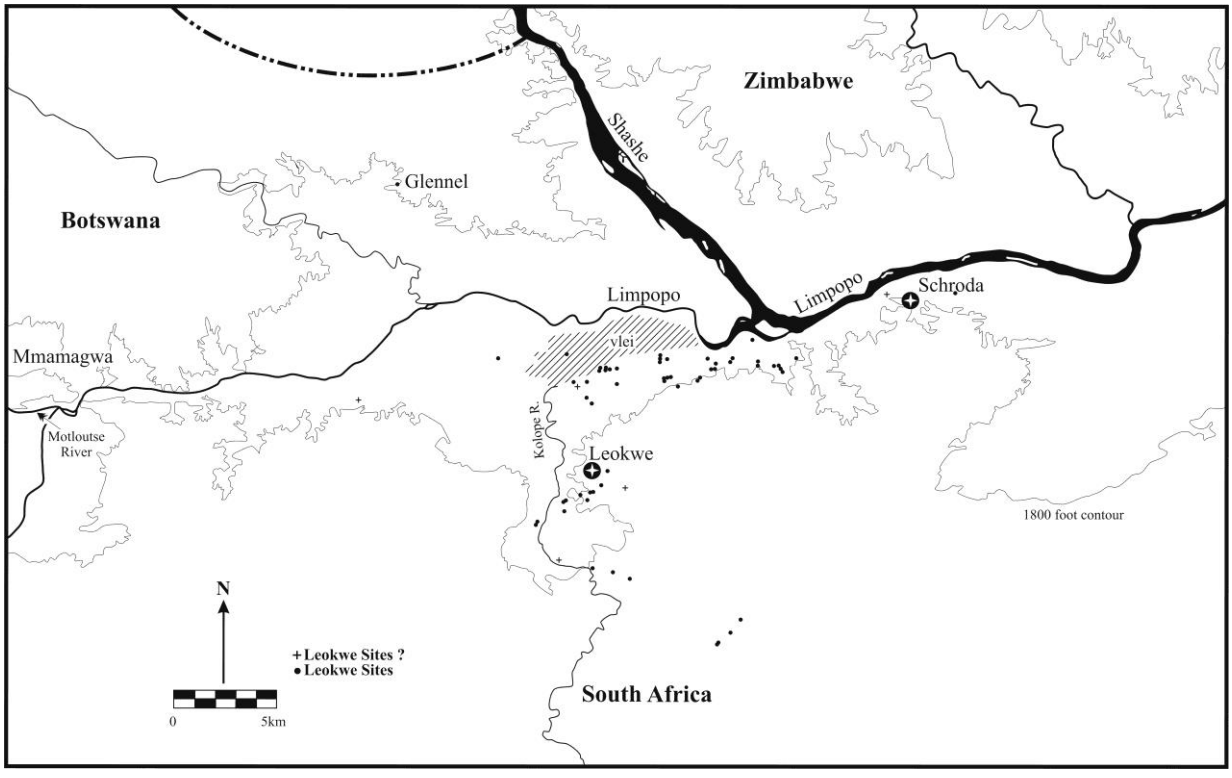



**Figure 36: Distribution of Leokwe sites**

Table 32 below illustrates, populations increased tenfold from the Zhizo phase to the end of Mapungubwe.

**Table 32: Population dynamics for the South African portion of the Shashe-Limpopo valley.**

| Phase | Homesteads | Time span | General population | Capital | Total |
|---|---|---|---|---|---|
| **Mapungubwe** | 114 | 50 | 5750 | 5000 | 10 750 |
| **Transitional** | 140 | 50 | 7000 | 2500 | 9 500 |
| **K2** | 156 | 200 | 1950 | 1500 | 3450 |
| **Leokwe** | 64 | 200 | 800 | none | 800 |
| **Zhizo** | 22 | 100 | 550 | 300 | 850 |

The K2 population was able to expand because the climate had improved substantially. Known as the Mediaeval Warm Period (Holmgren et al. 2003; Tyson et al. 2000), rainfall probably increased to 500 mm a year, and it was consistent throughout the rainy season. These good conditions lasted from about AD 1000 to 1200, with a variable period between AD 1200 and 1250, before returning to high rainfall until shortly after AD 1300.

Mapungubwe was inhabited for only some 80 to 100 years, from about AD 1220 to 1320. In this short time, the spatial organization continued to evolve into the new elite pattern. In addition to the palace, other stonewalling demarcated entrances to elite areas, noble housing and boundaries of the town centre.

At about AD 1300, or shortly afterwards, Mapungubwe people abandoned the valley. Climatic data show that temperatures cooled and rainfall decreased. Consequently, the agricultural base would have been in jeopardy. Several thousand people living in the region were more-or-less dependent on flood plain agriculture, and agricultural production was probably tightly scheduled. Lower rainfall and erratic flooding would therefore make a greater impact at this time than similarly poor conditions would have earlier.

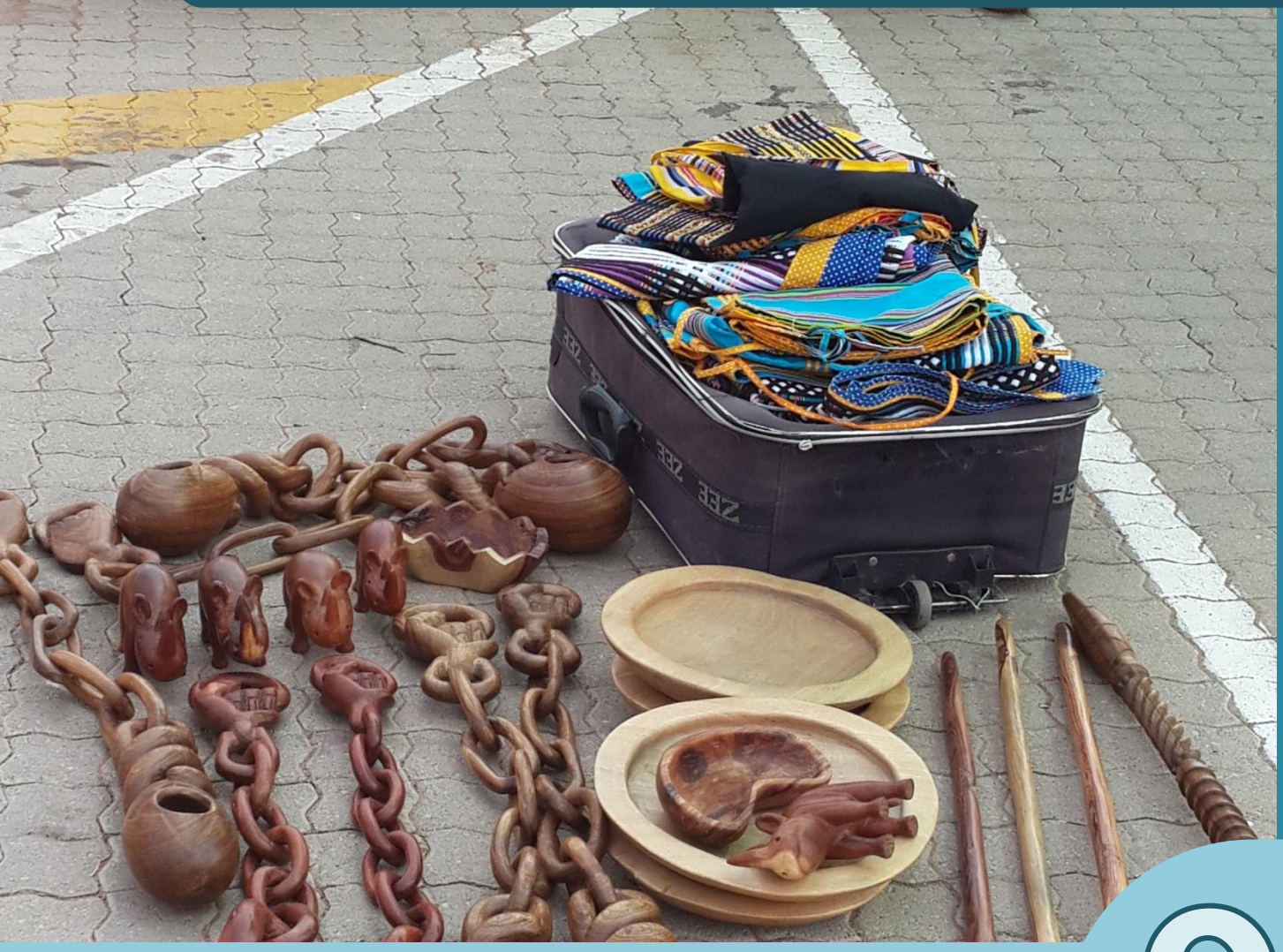
### *8.2.3 Historic*

Despite poor climatic conditions in the 19th century, the Mapungubwe landscape was occupied simultaneously by Birwa, Sotho-Tswana as well as Venda. They each have different archaeological signatures: a cattle kraal in front of a midden and residential terraces characterised a Birwa homestead; a cattle kraal in front of a bi-lobial arrangement

of houses, granaries and then midden designates a Sotho-Tswana settlement; while a stonewalled palace with loopholes marks a Venda capital. Sites of all three groups cluster around the Kolope River because it was the most reliable source of water and cultivatable soil at the time.

African people in the 19th century lived in a variety of places: hidden among rocks or on hillsides (Birwa), on hill tops (Venda capitals) and in open but isolated areas (Sotho-Tswana). Due to the poor climate, few people lived in the area, and some of them may have moved into this arid landscape to avoid persecution elsewhere.

# PUBLIC PARTICIPATION



SECTION 9

# 9 PUBLIC PARTICIPATION

As a minimum, the Public Participation Process (PPP) for the MCLWHS EMF aims to comply with Regulation 3(2) of the EMF Regulations (2010).

The main purpose of the PPP includes:

4. To inform Interested and Affected Parties (I&APs) of the EMF process and its objectives;
5. To provide an opportunity for inputs from I&APs; and
6. To give feedback to I&APs with the opportunity for them to respond.

The PPP follows the phases of the overall EMF development process, and is executed to coincide with the outcomes associated with each milestone of the framework

The key tasks undertaken as part of the PPP for the Status Quo Phase include the following:

- Compiling a database of PSC members;
- Convening a PSC kick-off meeting (29 April 2013);
- Compiling a database of I&APs;
- Notification of I&APs of the EMF development process;
- Convening a public meeting;
- Holding targeted meetings with authorities, stakeholders and I&APs;
- Lodging the Draft Status Quo Report in the public domain for review; and
- Creating and maintaining a Comments and Response Report throughout the Status Quo phase.

Some of the above tasks are elaborated on in the sub-sections to follow.

## 9.1 Database of Interested and Affected Parties

A database of I&APs was prepared at the onset of the EMF development process, which is contained in **Appendix B**. The database remains dynamic throughout the EMF development process, and it may grow and evolve as more information regarding the study area comes to the fore and input is received from known I&APs.

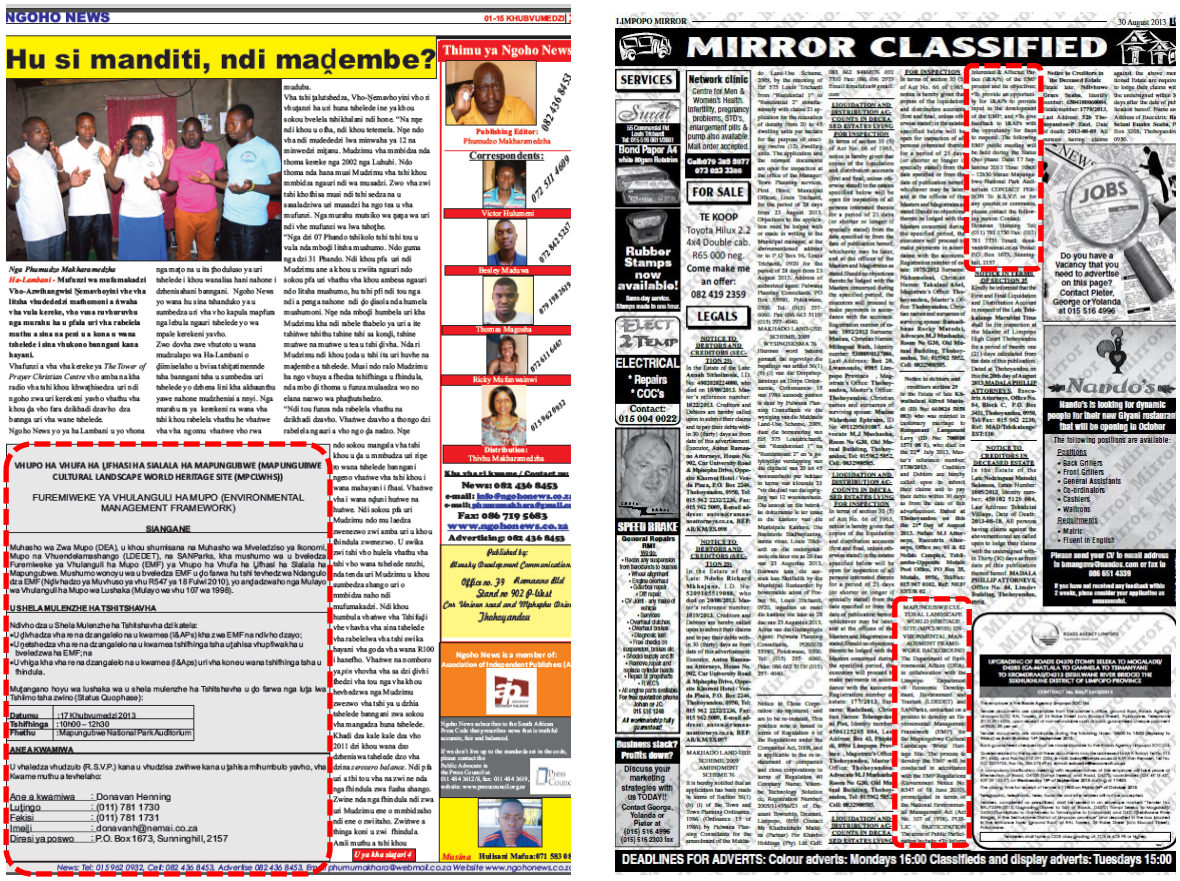
## 9.2 Notification of I&APs

The following methods and media were employed to notify I&APs of the EMF Development process, details of the public meeting and how they could become involved:

1. Background Information Documents (BIDs) were forwarded to I&APs on the database;
2. The BID was accompanied by a Questionnaire, which served to garner an understanding of the key environmental issues and management priorities from the perspectives of the I&APs;


**Figure 37: BID (left) and Questionnaire (right) cover pages**

3. Newspaper advertisements were placed in August 2013 in the following newspapers – Ngoho News (Venda) and Limpopo Mirror (English).


NGOHO NEWS

Hu si manditi, ndi maḓembe?

VHUPO HA VHUFA HA LIFHASI HA SIALALA HA MAPUNGUBWE (MAPUNGUBWE CULTURAL LANDSCAPE WORLD HERITAGE SITE (MPCLWHS))

FUREMIWEKE YA VHULANGULI HA MUPO (ENVIRONMENTAL MANAGEMENT FRAMEWORK)

SIANGANE

LIMPOPO MIRROR

MIRROR CLASSIFIED

DEADLINES FOR ADVERTS: Colour adverts: Mondays 16:00 Classifieds and display adverts: Tuesdays 15:00

**Figure 38: Notice - Ngoho News (left) and Limpopo Mirror (right)**

## 9.3 Public Meetings

The details of the public meeting that was held at the start of the Status Quo phase are as follows:

- **DATE:** 17 September 2013
- **TIME:** 10H00 – 12h30
- **VENUE:** Mapungubwe National Park Auditorium

Another public meeting was held on 16 July 2014 where the Interim Final Status Quo Report was presented as was well as providing an opportunity for I&APs to provide input in regard to establishing a realistic desired state for the MCLWHS and Strategic Environmental Management Plan (SEMP). The details of this meeting are as follows:

- **DATE:** 16 July 2014
- **TIME:** 09H00 – 11h30
- **VENUE:** Mapungubwe National Park Auditorium

The minutes of this meeting are appended to this Report as Appendix C1

## 9.4 Review of Draft Status Quo Report

The Draft Status Quo Report was made available for public review from 30 April – 10 June 2014. A copy of the report was lodged at the Mapungubwe National Park Auditorium and the Musina Public Library and it was also made available via http://www.nemai.co.za/environmental.html. The Final Status Quo Report will also be made available on the same website.

Notification of the public review period included letters to authorities, stakeholders and I&APs, as well as newspaper adverts.

All comments received were incorporated into the Comments and Response Report and the Status Quo Report was revised accordingly where necessary prior to its finalisation. The Comments and Response Report are appended to this report as Appendix C2.

## 9.5 Final Status Quo Report

The interim Final Status Quo Report was also uploaded to the following website: http://www.nemai.co.za/environmental.html.

# ENVIRONMENTAL MANAGEMENT PRIORITIES

SECTION 10

# 10 ENVIRONMENTAL MANAGEMENT PRIORITIES

The Status Quo phase serves to establish the current state of the environment in MCLWHS through *inter alia* baseline evaluations and descriptions, specialist studies, desktop assessments, existing data assimilation and field verification and assessment.

This first phase of the EMF development process culminates in the identification of environmental management priorities through an understanding of the environmental issues, constraints and opportunities within the district – see **Table 33**.

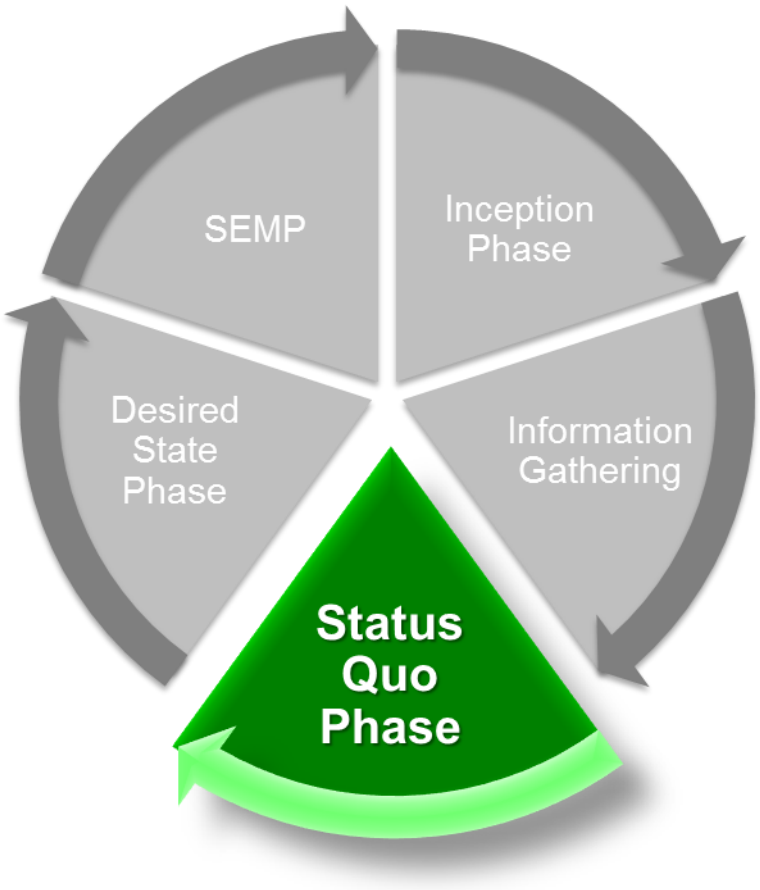


**Table 33: Compilation of MCLWHS' Environmental Status Quo in terms of (a) Constraints, Weaknesses and Issues, (b) Strengths and Opportunities, and (c) Management Priorities**

| CLIMATE | | *Weather conditions (temperature, humidity, atmospheric pressure, wind, rainfall, etc.) averaged over a long period* |
|---|---|---|
| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Inadequate understanding of the full impacts of climate change to the MCLWHS, e.g.<br>▪ Biodiversity;<br>▪ Watercourses including wetlands<br>▪ Agriculture;<br>▪ Availability of water sources;<br>▪ Human health.<br>▪ Employment<br>• Vulnerability of rural communities to climate change including flooding of Limpopo and Shashe rivers | • Favourable climate supports tourism and agricultural development. | • Create climate change awareness. Develop strategy to combat climate change and promote sustainable energy solutions. Develop strategies to protect farmers without access to irrigation systems.<br>• Air quality monitoring to include greenhouse gasses.<br>• Manage impacts of climate change on water resources.<br>• Stormwater harvesting to be promoted.<br>• Implement Water Conservation and Demand Management.<br>• Areas important for climate change resilience (e.g. riparian corridors and buffers, wetlands, areas of high plant endemism, refuge sites including southfacing slopes and kloofs and priority large unfragmented landscapes) need to be managed and conserved. |

| TOPOGRAPHY | | *Graphic representation of surface features of a place on a map, indicating relative positions and elevations* |
|---|---|---|
| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Impacts of activities such as mining and associated infrastructure (e.g. roads, pipelines, etc), tourism infrastructure, etc., to topographical features.<br>• Poor land use management practices.<br>• Accelerated erosion.<br>• Land transformation. | • The area is afforded substantial visual quality through its topographic features. This also contributes to Mapungubwe's distinctive sense of place<br>• Landforms offer eco-tourism potential. | • Conservation of sensitive topographical features that support biodiversity and contribute towards the visual quality.<br>• Establish corridors for alignment of linear-type developments especially mining infrastructure such as pipelines.<br>• Place linear infrastructure underground where possible such as pipelines. |

| GROUNDWATER | | *Water located beneath ground surface in soil pore spaces and fractures of rock formations* |
|---|---|---|
| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Despite large aquifers in the area, rates of groundwater extraction are disturbingly high. This will be exacerbated by increased mining activities in the area<br>• Potential groundwater pollution problems in the vicinities of mines<br>• Due to low and erratic rainfall, groundwater only dependable source of water for may water users. | • The quality of groundwater in general is good and suitable for domestic use without treatment apart from disinfection.<br>• Occurrence of dolerite dykes at the confluence with the Shashe River play an important role in supporting the functioning of the floodplain. | • Optimal use of groundwater resources. Underground water utilization investigation. Determine fitness for use.<br>• Regulate and prohibit land-based activities which may affect the quantity and quality of groundwater once site specific studies have been conducted and the results known.<br>• Establish an understanding of the groundwater resources' vulnerability to pollution. |

| | | |
|---|---|---|
| • The groundwater flow volumes are very low due to the low recharge and low permeability of the geology<br>• The area of interest falls within Limpopo Karoo Basin that has lower transmissivities and yields as compared to other basins in the Limpopo Water Management Area | • Springs are common in the area and associated with dolerite dykes, fault zones as well as contact between different lithologies, and locally weathered sandstones are excellent aquifers<br>• Importance of groundwater in sustaining the ecological functioning of important surface water systems, such as wetlands. | • Institute adequate source-directed controls to manage potential impacts to groundwater resources, which could include:<br>▪ Authorisations, licences and permits;<br>▪ Standards to regulate quality of waste discharges;<br>▪ Requirements for on-site management practices (e.g. to minimise waste at source and to control diffuse pollution);<br>▪ Requirements for clean-up and remediation of water resources that have already been polluted.<br>• Groundwater monitoring programme.<br>• Prevent intrusion of polluted surface water.<br>• Provision of adequate sanitation and waste management services. |

| **GEOLOGY** | | *Study of the earth, the materials of which it is made, the structure of those materials and the processes acting upon them* |
|---|---|---|
| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Occurrence of unsuitable geological conditions which impose excessive cost or environmental constraints to development.<br>• Geology of area contains large reserves of coal and to a lesser degree diamonds.<br>• Potential impacts associated with the mining of the mineral resources to the environment. | • Undeveloped mineral resources that can contribute to future economic growth (depending on the future viability of exploiting the minerals). | • Development to consider Development Potential Zones, based on the geology, soil land types, drainage and slope gradients.<br>• Detailed geotechnical assessments to be conducted, based on the types of developments.<br>• Coordinated compliance enforcement and monitoring of mining activities. |

| **WATERCOURSES** | | *A river or spring; a natural channel in which water flows regularly or intermittently; a wetland, lake or dam into which, or from which, water flows. A reference to a watercourse includes, where relevant, its bed and banks* |
|---|---|---|
| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Limpopo River is a shared water system with neighbouring countries therefore there are many demands made on it<br>• Unsustainable use of water resources including Limpopo River & associated goods and services<br>• Poverty within neighbouring communities, leading to non-sustainable land use practices such as over grazing, over burning and unsustainable use of natural resources such as medicinal and food plants on the periphery.<br>• The impacts of commercial agriculture include:<br>◦ Water abstraction;<br>◦ Eutrophication of the Limpopo River due to | • The Limpopo River that forms the northern boundary of the MCLWHS is an important & strategic watercourse which South Africa shares with neighbouring countries.<br>• SADC Protocol on Shared Water Systems in place to manage pressures on the River.<br>• The vast majority of rivers in the MCLWHS falls within Class B (largely natural) and Class C (largely modified), with Limpopo River classified as Class A (unmodified | • To manage the biodiversity within the expansive Limpopo-Shashe Transfrontier Park initiative.<br>• To encourage MCLWHS participation in relevant water use fora and to ensure that communication channels are established between the park and other stakeholders sharing groundwater<br>• Develop an adaptive management programme for wetlands;<br>• The most important areas requiring restoration or rehabilitation are the terrestrial field layer, redundant infrastructure, and the Kolope / Maloutswa wetlands;<br>• Developing the Golope/Maloutswa wetland as a key biodiversity feature in MCLWHS |

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| nutrient-rich runoff (fertilizers);<br>• Water born invasive alien plants;<br>• Degradation of wetlands<br>• According to the Park's Management Plan (2013), a total of 21,061 ha are infested with alien invasive plants<br>• Mining and agriculture produce contaminants which are flushed into the Limpopo system with the onset of rains.<br>• Water quality problems exist in the Limpopo system.<br>• The wetlands are impacted by agriculture practices, including draining, damming, and cultivation and grazing.<br>• Accelerated erosion and sedimentation are a pertinent problem in catchments.<br>• Bush encroachment<br>• Climate change and associated impacts<br>• Unregulated water use by mines, local communities, farmers, etc<br>• Activities undertaken within the regulated area of a watercourse that are not licensed in terms of section 21 of the National Water Act (Act No. 36 of 1998) | natural).<br>• In the MCLWHS, the riparian wetland along the Limpopo river is categorised as AB (natural or good condition)<br>• There is a possibility that the Golope /Maloutswa wetland could be considered for future designation in terms of the Ramsar convention on wetlands of international importance<br>• | |

| **SOIL** | | *The unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants* |
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| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • The soil landtypes form an important component of the development potential assessment of the MCLWHS where the geotechnical characteristics of the different soil forms can be interpreted in terms of soil activity, drainage, collapse potential or erodibility.<br>• Soil contamination, for example –<br>▪ Mining activities<br>▪ Absence of sanitation and waste services<br>▪ Spills from accidents or leaking underground tanks<br>• Soil erosion through land clearing activities and over-grazing.<br>• Dominant soils are Leptosols that can only support livestock and game farming<br>• Depletion and degradation of soils may lead to unproductive soils, as well as a decrease of water infiltration with a resultant increase the water run-off. | • Certain areas along the Limpopo and Shashe Rivers provide arable soils for cultivation. The soils have good physical characteristics including good fertility and moist soil conditions.<br>• Favourable conditions for livestock and game farming. | • Education and training on best practices in subsistence farming.<br>• Agricultural development to consider soil conditions especially as much of the soils can support livestock and game farming only.<br>• Mining activities should not extend onto soils that can support crop farming. Assessments should be undertaken that determine the relative impacts of the proposed activities on the environment and economy in order to direct what activities should or should not take place<br>• Provision of adequate sanitation and waste management services.<br>• Identify and avoid disturbing areas where the soil has a high erodibility factor.<br>• Maintain adequate stocking rates and veld management. Prevent overgrazing to curb erosion and soil degradation.<br>• Pollution prevention and remediation measures. |

- Loss of topsoil.
- Sheet and gully erosion encountered, which is exacerbated by the removal of vegetative cover, over-grazing, poor farming practices
- Salinisation of soil through inappropriate irrigation.
- Capacity to identify requirements and obligations in terms of the Conservation of Agricultural Resources Act (Act No. 43 of 1983).

| AIR | | *Mixture of gases that makes up the Earth's atmosphere* |
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| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Sources of emissions include vehicle emissions as well as dust generated from vehicles driving on dirt roads.<br>• Agricultural and mining activities surrounding the MCLWHS and veld fires associated with human activities contribute to air pollution<br>• Households using wood fires as an energy source could also significantly impact air quality, particularly if growth in the greater area is not partnered with new infrastructure for electricity supply<br>• Air quality monitoring.<br>• Capacity to identify requirements and obligations in terms of the National Environmental Management: Air Quality Act (Act No. 39 of 2004). | • Due to its predominantly rural nature the air quality is generally good as there are limited air contaminating sources.<br>• Low dispersion potential of pollutants due to high atmospheric stability associated with low winds, clear skiers and cold night time conditions | • Finalise and implement Air Quality Management Plan for the district.<br>• Institute air quality monitoring programme especially mining areas and other areas that are pollution sources.<br>• Detailed emissions inventory to be developed for the district.<br>• Growth in the greater area must be partnered with new infrastructure for electricity supply to prevent use of wood fires as an energy source.<br>• Promotion of energy efficient heating and lighting.<br>• Awareness campaigns to be conducted regarding the dangers of local communities burning waste, as a means of disposal.<br>• Establishment of municipal by-laws governing the burning of waste. |

| TERRESTRIAL ECOSYSTEMS | | *Land-based living (biotic) and non-living (abiotic) factors which make up a functional ecological unit.* |
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| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Undesirable development patterns that impact on environmentally sensitive areas.<br>• Lack of authentic traditional experiences which leads to over-harvesting of medicinal plants and other natural resources.<br>• Lack of funding in conservation programmes.<br>• Lack of conservation resources<br>• Loss of habitat, degradation and habitat fragmentation. | • Contains one Transfrontier Conservation Area; namely the Greater Mapungubwe Transfrontier Conservation Area.<br>• Contain centres of endemism- Blouberg and Soutpansberg<br>• Availability of nature conservation areas and a World Heritage Site.<br>• Unspoiled natural environment. | • Support and facilitate land planning and practices that enhance the overall biodiversity values and the role the region can plan in conserving the Soutpansberg Centre of Endemism.<br>• Support and facilitate land planning and practices that enhance the overall objectives of the Greater Mapungubwe Transfrontier Conservation Area.<br>• Support and facilitate land planning and practices that enhance the overall economic objectives based on wildlife industries that are compatible with the regions overall biodiversity values |

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| • Harmful land management practices / planning in high biodiversity areas, which has negative consequences in the region's role in adhering to the biodiversity conventions of the country and internationally.<br>• Infestation of alien invasive species in and around conservation areas are threat to the important biodiversity species.<br>• Pollution<br>• Harvesting of firewood for energy cooking and heating purposes in the VBR due to lack of electricity.<br>• Increase in plantations in the VBR.<br>• Illegal harvesting of medicinal plants.<br>• Human population growth potential in the VBR.<br>• A changing climate threatens species and ecosystems as the distribution of species is largely determined by climate.<br>• Extensive agricultural activities.<br>• Habitat diversification due to water flow, alien invasions and injudicious herbivory.<br>• Overgrazing which leads to changes in plant community by eliminating certain species (often palatable) and encourages bush encroachment.<br>• Ring barking of canopy tree species such as *Acacia nigrescens, Adansonia digitata, Ficus sycomorous, Acacia xanthophloea* and *Faidherbia albida* by elephants.<br>• Fragmentation of habitat required by the Southern Ground-Hornbill population<br>• Increase in incidents of road kill due to increase in traffic volumes and expansion of road infrastructure<br>• Capacity to identify requirements and obligations in terms of National Environmental Management Act (Act No. 107 of 1998) (NEMA), National Environmental Management: Biodiversity Act (Act No. 10 of 2004), National Water Act (Act No. 36 of 1998), National Forests Act (Act No. 84 of 1998) and Conservation of Agricultural Resources Act (Act No. 43 of 1983) (amongst others). | • Pristine ecological environment.<br>• High levels of species diversity and ecosystems in the area.<br>• Diverse habits in terms of terrestrial ecosystems hold potential for meeting biodiversity targets only if regional planning and managed cohesively meet.<br>• Good conservation practices and expertise.<br>• Research and monitoring programmes<br>• The IUCN based Management Effectiveness Tracking Tool (METT) assessment has been carried out on the MCLWHS and it has a total percentage score of 75% which is a score higher than the 67% guideline score for soundly managed protected areas<br>• TFCA offers a potential opportunity for animals to occupy larger areas.<br>• TFCA's also offers opportunities to broaden the region's economies based on wildlife and ecotourism industries.<br>• Establishment of ecological corridors/buffers.<br>• Development of environmental management tools.<br>• Sustainable utilisation of natural resources such as wood and fishing.<br>• The extensive wetlands and floodplains provide reeds and hygrophilous for weaving purposes; although need to be managed sustainably.<br>• Promote environmental education and awareness.<br>• Employment opportunities in conservation areas for local people.<br>• Employment opportunities in the developing ecotourism industries for local people.<br>• Rehabilitation and conservation.<br>• Investigation of potential for sustainable harvesting of medicinal and flowering plant species. | including ecotourism developments.<br>• Conserve and maintain the fence that protects the gallery forest (which is listed as *Critically Endangered*) from elephants.<br>• Restore and conserve biodiversity and ecosystem patterns and processes.<br>• To promote the restoration of the Limpopo/Shashe River system and its tributaries to deliver basic ecosystem functions to surrounding environments.<br>• Rehabilitation of old lands, with particular emphasis on re-establishment of riparian woodland.<br>• Restoration of the wetlands to as large an extent as possible, or to their natural state.<br>• Conserve long-term viable and representatives of sensitive and threatened vegetation types and control development pressure in the key sensitive areas.<br>• Any irreconcilable activities in close proximity to ecologically sensitive habitats or initiatives / wildlife industries compatible with regions overall biodiversity objectives (e.g. wetlands, rivers and conservation areas) should be discouraged or strictly controlled.<br>• Rehabilitate Kalopi/Maloutswa wetland and pans, which were threatened by water-use locally and upstream; agriculture and fish-farming and all the structures erected to manipulate water flow; and fragmentation of the aquatic features themselves.<br>• Remove and control invasive alien vegetation because the invasion of alien invasive species is a major problem affecting Protected Areas.<br>• Implement effective veld fire management strategies and guidelines in accordance with requirements to maintain biodiversity.<br>• Control illegal harvesting, particularly in and adjacent to important biodiversity hotspots.<br>• Control and prevent the illegal removal of terrestrial species.<br>• Harvesting of medicinal plant species must be confined to areas where the plant populations are large enough to sustain commercial harvesting.<br>• Ensure that the habitat required for the Southern Ground-Hornbill remains intact as this species population in the Limpopo Valley is extremely valuable as populations to the south are locally extinct.<br>• The use of signage and roadside fencing to direct wildlife to cross roads through existing culverts to reduce incidents of road kill |

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| | | • National and local government structures must facilitate sustainable trade in medicinal plants and continue to monitor and regulate the use of medicinal plant species. |

| **PROTECTED AREAS** | | *Areas of land or sea that are formally protected by law and managed mainly for biodiversity conservation.* |
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| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| ***See further input under Terrestrial Ecosystems*** | | |
| • Encroachment of disparate land uses and activities within buffer zones of protected areas, which are not sustainable and potentially jeopardise the integrity of sensitive habitat and species.<br>• Current reserve/protected area network does not encompass full spectrum of protection–worthy species and habitats.<br>• Risks posed by extensive tourism, mining and agricultural developments.<br>• Lack of funding in conservation programmes.<br>• Poaching. | • Rich biodiversity and high levels of endemism are encountered within the MCLWHS, which is as a result of diversity of ecosystem and habitat types.<br>• Various environmentally sensitive areas are not formally protected. Future potential for contributing towards provincial biodiversity targets.<br>• Good conservation practices and expertise.<br>• Employment opportunities in conservation areas for local communities.<br>• Protected areas afford opportunities for environmental education.<br>• Wealth of knowledge with regards to MCLWHS's protected areas. | • Support and facilitate land planning and practices that safeguard and enhance the following:<br>  ○ Overall biodiversity values in the district;<br>  ○ Ecological corridors;<br>  ○ Ecotourism developments<br>• Protection of core and buffer zones and transitional zones.<br>• Advocate community conservation ventures and commensurate activities in buffers. Alignment with Buffer Policy of MCLWHS.<br>• Maintain working relationships between the various spheres of government to ensure a collaborative effort to conserve MCLWHS protected areas and adjoining buffer zones. |

| **SOCIO-ECONOMIC ENVIRONMENT** | | *The combination of the social and economic conditions in a region, that form part of the overall environment* |
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| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Social vulnerability is thought to be high due to the following driving forces:<br>  ○ Poverty rates are high with 92% of the population earning an income in the low income category;<br>  ○ Education levels are low, with 36% classified as functionally illiterate and 45% having dropped out of secondary education perpetuating a cycle of low education & low income levels<br>• High migration levels to the area that is attributed to mines hence locals missing out on work opportunities | • In the greater Musina Local Municipality, agriculture and mining are the main contributors to the economy at 35% and 30%, respectively.<br>• Tourism is also a key economic contributor in the EMF study area, which is reliant on the ecological and cultural features in Mapungubwe.<br>• The MCLWHS is strategically located in | • EMF to be aligned with Provincial strategies including LED Strategies<br>• The cultural heritage of the landscape serves as a comparative advantage and the Provincial government should exploit the opportunities that this proclaimed UNESCO site offers. As a cultural site MCLWHS does not need to compete with other tourism destinations in the country<br>• Those who visit the GMTFCA will automatically enter MCLWHS. This should be used when marketing Mapungubwe and it should be used to generate more interest into the area. |

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| • There is a shortage of job opportunities and job creation in the Musina Local Municipality<br>• Current plans to develop tourism and agriculture in the area will likely contradict the cultural value of the land. Development of game farming in the area could involve the introduction of elephants; lion and rhino. Large animals like elephant will inflict considerable damage to rock art sites, damaging and destroying the history and value of the landscape.<br>• In addition the presence of such animals will require all tours to involve game vehicles and armed game rangers. Visitors will not be able to tour the landscape on foot thus changing the visitor experience and taking away from the rich cultural attraction.<br>• The essentially rural character of the district and its economic dependency on the region's economic centres.<br>• Backlogs in service provision.<br>• The majority of the population has little to no skills which limits the job opportunities that they can pursue.<br>• Balancing economic development with environmental protection.<br>• Lack of public environmental awareness.<br>• Impacts of environmental pollution on human health.<br>• Environmental legal process delay implementation of development. | terms of two international border posts (Pontdrift – Botswana; Beitbridge – Zimbabwe) and the proximity to the town of Musina (approx. 10km to the east).<br>• The study area is traversed in a west to east direction by two key provincial roads, namely the R512 and R572. The N1 national road also lies less than 15km to the east.<br>• There is a wealth of scientific knowledge associated with Mapungubwe.<br>• The general area is underlain by rich deposits of mineral resources.<br>• Large-scale agricultural practices occur within and around the study area<br>• The MCLWHS is significantly unique to the rest of South Africa's tourism destinations as it is the single largest area in the country to have such cultural heritage.<br>• Opportunities in the eco-tourism and game farming business.<br>• Vast tourism potential of MCLWHS in terms of biodiversity, recreational opportunities, visual appeal, heritage and culture, etc.<br>• Since SMMEs contribute to job creation, there is an opportunity, particularly in the tourism sector to increase support and encourage SMMEs. | • The site must be efficiently managed and controlled in order to avoid trampling of deposits, graffiti, damage to paintings and other artefacts, and removal of archaeological material such as pottery and beads.<br>• The area will require monitoring and signage of where visitors will be allowed. Conservation is intrinsic to tourism. If the cultural and heritage resources at the MCLWHS are not conserved, there will be no tourism attraction to the area.<br>• Development needs to take place in a sustainable manner so that the natural landscape is not altered.<br>• Settle land claims expeditiously<br>• Provision of adequate services and social amenities.<br>• Poverty alleviation and job creation.<br>• Growing the economy (Local Economic Development).<br>• Developments that serve the people of the Vhembe DM in terms of their psychological, physical, developmental, cultural and social interests equitably.<br>• Ensure good governance in environmental management, including ensuring openness and transparency, participation, accountability, effectiveness, coherence and consistence.<br>• Focus environmental education initiatives initially around sensitive areas. Where appropriate, build educational component into tourism attractions to ensure proper environmental management of sensitive areas.<br>• Optimise tourism potential. |

**INFRASTRUCTURE & MUNICIPAL SERVICES**

*The basic facilities, services, and installations needed for the functioning of a community or society*

| Constraints, Weaknesses & Issues | Strengths & Opportunities | Management Priorities |
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| • The provision of infrastructure and facilities in the eastern area of the Musina LM is creating a spatial imbalance between the western and eastern areas in terms of settlement and infrastructure development<br>• Limited spatial, economic and social planning in the Vhembe District and its local municipalities | • EMF intended to facilitate development in terms of the EIA process in areas where the environment permits.<br>• Improved service delivery would speed up development and enable economic investment in the greater area. | • Priority infrastructure development initiatives and intentions to be integrated into the EMF, where possible. Consideration to be given to the establishment of service corridors.<br>• Eradicate imbalances in terms of settlement and infrastructure development<br>• Eradicate services backlogs. |

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| • Influx of people looking for work on mines will potentially change the social structure of the area and increase social ills and daily nuisance factors for those living close to mining activities.<br>• The burden on municipal services including healthcare will also increase<br>• Aged infrastructure.<br>• Service backlogs in rural areas.<br>• Lack of capital funds for infrastructure development.<br>• Environmental legal processes delay development.<br>• Lack of maintenance of infrastructure.<br>• Lack of capacity and resources within municipalities;<br>• Lack of by-laws;<br>• Low income levels of population makes payment for services difficult.<br>• Need for basic water, sanitation, electricity and healthcare infrastructure.<br>• Poor roads inhibit ability of people to reach services including healthcare<br>• Lack of infrastructure inhibits growth and development.<br>• Lack of capital to fund proposed infrastructure costs<br>• Capacity to identify requirements and obligations in terms of NEMA, National Water Act (Act No. 36 of 1998), Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) and National Environmental Management: Waste Act (Act No. 59 of 2008) (amongst others). | • The main access route in the area is the existing N1 which was built for through traffic and as an access road to Zimbabwe from south of South Africa. This brings an influx of people into the area increasing the needs for accommodation, food outlets<br>• The secondary road network links the municipality internally which includes the R521, R525 and the R572. These roads should pass through the settlements and serves as a local trading and tourism route providing access to the MCLWHS.<br>• Improved infrastructure and support services especially directed at tourism will generate high return rates and boost economic activity, create jobs and raise skill levels in the area as well as diversify the market. | • Vacancies in the local municipality need to be filled in order to run efficiently.<br>• The municipality is required to develop and review its policies and by-laws.<br>• Cooperative governance is central to the effective management of the MCLWHS.<br>• Compliance and enforcement of potential impacting land uses need to be stringently executed and effectively coordinated.<br>• Stakeholder engagement needs to be adequately pursued and promoted.<br>• Implementation of Integrated Waste Management Plan for the district.<br>• Empower local rural communities to dispose of waste in an environmentally sustainable manner instead of dumping or burning waste material.<br>• Creation and improvement of transport linkages to provide access to isolated areas, to support potential economic activity (increased tourism and movement of goods) and to improve social activities (recreation, access to health and education).<br>• Action plan for promoting renewable energy within the MCLWHS and in the greater district area.<br>• Waste disposal sites and WWTWs to be operated in accordance with legal requirements.<br>• Water conservation and demand management strategy.<br>• Enforcement of Local-, Regional- and National Legislation and Policies.<br>• Waste recycling to be encouraged. |

| **AGRICULTURE** | | *The science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food and other products* |
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| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Commercial farming in and around the MCLWHS has created pressures including:<br>  ○ Water removal<br>  ○ Eutrophication of watercourses<br>  ○ Water born invasive alien plants<br>  ○ Clearing of natural bush<br>  ○ Ploughing of cultural sites | • Agriculture constitutes one of the key drivers of local economy in the district.<br>• Most the soils can support livestock and game farming<br>• Move away from agriculture to game farming<br>• Rising numbers of game farms in the area | • EMF to facilitate the harnessing of the agricultural potential in the district.<br>• Invest in better agricultural education and land care programmes. Build capacity surrounding farming methods to local subsistence farming.<br>• High potential agricultural land set aside for agricultural purposes.<br>• Sustainable and environmental friendly irrigation practices. |

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| • Climatic and soil conditions are not conducive to crop farming. Crop farming limited to areas with alluvial deposits along the major rivers that can be irrigated.<br>• 98% of the land lying within the proclaimed buffer zone is not suited to arable crops. Land compatibility class of most soils falls in the VII and VIII level<br>• Agriculture as an economic driver is declining within the local municipality<br>• Unresolved land claims that hinder development due to uncertainty around affected farms<br>• Rising costs of production<br>• Agricultural activity in environmentally sensitive land.<br>• Loss of productive agricultural land.<br>• Threats from climate change.<br>• Poor soils in a large part of the MCLWHS.<br>• Shortfalls in terms of post settlement support.<br>• Conversion of farms from agriculture to game farming can result in significant decrease in employment opportunities<br>• Capacity to identify requirements and obligations in terms of NEMA, National Water Act (Act No. 36 of 1998) and Conservation of Agricultural Resources Act (Act No. 43 of 1983) (amongst others). | as farmers have moved away from agriculture to game farming.<br>• In particular cattle farms make the transition as game are far more adapted to the semi-arid environment found in the Mapungubwe area.<br>• Game farms in the Mapungubwe area are in talks to consolidate the farms to facilitate large-scale eco-tourism operations allowing for multiple consumptive (hunting and meat production) and non-consumptive (tourism activities) utilisation of these areas that will provide a significant economic boost to the area<br>• The consolidation of game farms around the Mapungubwe region will have a large impact on the property values of the farms.<br>• MCLWHS could potentially sustain tourism activities if game farming is part of the tourism package.<br>• LED projects centred around agriculture, mining and tourism | • Sustainable grazing practises<br>• Enforcement of livestock carrying capacity for the area.<br>• Settling of land claims as expeditiously as possible<br>• Providing the necessary support to emeging farmers.<br>• Support development of game farms but ensure that game is not allowed to enter areas which will place the cultural and environmental resources at risk. Conservation should take priority over game farming as the comparative advantage of the area lies in the cultural resources of the area.<br>• |

| **HERITAGE RESOURCES** | | *Any place or object of cultural significance (i.e. aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance)* |
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| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Capacity to conserve and maintain heritage resources.<br>• Vandalism and disrepair to heritage resources.<br>• Capacity to comply with National Heritage Resources Act (Act No. 25 of 1999) and the requirements of UNESCO in terms of a World Heritage Site.<br>• Current plans to develop the area will likely contradict the cultural value of the land. Development of game farming in the area will require the introduction of elephants; lion and rhino. Large animals like elephant can inflict considerable damage to rock art sites, damaging and destroying the history and value of the landscape.<br>• Limited awareness of legislation that governs the protection | • The MCLWHS is significantly unique to the rest of South Africa's tourism destinations as it is the single largest area in the country to have such cultural heritage.<br>• Internationally recognised site<br>• Heritage resources serve as tourist attractions.<br>• Potential to generate income for community.<br>• Benefits to academic research.<br>• Provides insight to the communities who lived there previously and a historical | • Preservation of MCLWHS.<br>• Heritage impact assessments to accompany all developments including mining, eco-tourism ventures, etc.<br>• The Limpopo government should exploit the opportunities that this proclaimed UNESCO site offers. As a cultural site MCLWHS does not need to compete with other tourism destinations in the country.<br>• Those who visit the GMTFCA will automatically enter MCLWHS. This should be viewed as an advantage when marketing Mapungubwe and it should be used to generate more interest in the area.<br>• The site must be efficiently managed and controlled in order to avoid trampling of deposits, graffiti, damage to paintings and other artefacts, and removal of archaeological material such as pottery and |

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| and conservation of heritage resources.<br>• There is no cohesive heritage management plan to guide and assist District and Local municipal officials.<br>• High rates of unemployment and poverty that could lead to the desecration of heritage sites including the vandalizing of sites within the MCLWHS.<br>• Natural processes such as flooding and soil erosion could lead to the exposure and damage of heritage sites (rock art, archaeological sites, graves, etc) | reminder of impacts of climate change on communities.<br>• The importance of the area from a cultural heritage perspective is acknowledged in Districts IDPs, LEDs, etc.<br>• Strong heritage legislation is in place to protect heritage and cultural sites. | beads.<br>• The area must be monitored and signage must be evident of where visitors will be allowed.<br>• If tourism development is uncontrolled it may result in a high risk for conservation and biodiversity. Development needs to take place in a sustainable manner so that the natural landscape is not altered.<br>• Incorporate heritage considerations into development proposals.<br>• Clear institutional responsibilities at a municipal level not only for heritage preservation but for interaction with MCLWHS management in terms of developments adjacent / close to the WHS so that negative impacts are limited as much as possible<br>• Compilation of a Vhembe District heritage management plan that should tie in with that of the MCLWHS so that there are no areas of conflict or uncertainty. |

| **TOURISM** | | *Travel for predominantly recreational or leisure purposes or the provision of services to support this leisure travel* |
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| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Lack of adequate infrastructure and municipal services.<br>• Pressures from visitors or tourism in general can potentially negatively affect the WHS.<br>• Inadequately managed tourism could have a substantial impact on the heritage sites, through trampling of deposits, graffiti, damage to paintings and other artefacts, and removal of archaeological material such as pottery and beads.<br>• Uncontrolled tourism development in the buffer zone could potentially also pose threats to the values of the WHS.<br>• Threats to tourism as a result of conflicting land use activities. These include large scale irrigation, farming and mining which compete with wildlife and the tourism<br>• Conflict between tourism and mining:<br>  ○ Mining requires disturbance to the natural environment and is thus in direct conflict with tourism. Blasting activities will cause vibrations which may cause structural damage to cultural and heritage resources.<br>  ○ Conservation areas, nature reserves and private game farms may have to be closed down in order for the area to be mined. | • Host of tourism activities available in MCLWHS.<br>• Prominent development activities in the WHS and its buffer include tourism and infrastructure development.<br>• Exceptional biodiversity and heritage resources afford the MCLWHS a high tourism potential.<br>• Tourism is also a key economic contributor in the EMF study area, which is reliant on the ecological and cultural features of Mapungubwe.<br>• Acknowledgement within Provincial plans that tourism resources one of the main economic sectors (Limpopo Employment, Growth and Development Plan).<br>• The Limpopo Government Local Economic Development (LED) unit has development programs in the Vhembe District Municipality that are centred around the agriculture, tourism and mining sectors.<br>• Game farming has the highest revenue | • Diversification of tourism opportunities and target markets especially in terms game farms and eco-tourism initiatives.<br>• Improve accessibility by improving signage and information boards throughout the destination.<br>• Manage tourism closely to prevent damage to heritage sites, through trampling of deposits, graffiti, damage to paintings and other artefacts, and removal of archaeological material such as pottery and beads.<br>• Management of WHS so that status is not threatened by uncontrolled tourism development.<br>• Business tourism should be explored in the area. Accommodation facilities should cater for business travel in order to attract more people to the area especially as there are two operational mines in the area and future mining activities are likely to occur.<br>• Game should not be allowed to enter areas which will place the cultural and environmental resources at risk. Conservation should take priority over game farming as the comparative advantage of the area lies in the cultural resources of the area.<br>• Have an environment conducive to the development of SMME's.<br>• The tourism industry must be accessible to previously marginalised communities and particularly rural communities where there are natural resources readily available but low income levels. |

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| ○ Alone, in the Vele Colliery area, there are private nature reserves that were proclaimed in and adjacent the mine, namely; Sighetti; Skuldwater Ranch; and Vereuell Ranch. Should other mines open up in the Buffer region, more nature reserves and game farms may be required to shut down.<br>○ Tourism facilities that surround mining activities will also be negatively affected as the visual impact of the area will change. A negative change in the visual appeal of the area will be detrimental to the growth of the tourism market.<br>○ Dust levels from blasting activities may also affect the tourism potential in the area.<br>○ Property values of tourism will devaluate with an increase in mining in the Mapungubwe area. This economic decline will be exacerbated by the decline in the number of tourist visiting the area.<br>• Poor road conditions and lack of adequate public transport<br>• Limited access by rural communities to tourism opportunities and craft markets.<br>• Lack of benefits to local communities from tourism opportunities.<br>• Inadequate marketing of heritage resources.<br>• Risks of loss of sense of place through incongruent tourism development.<br>• History of conflict regarding land ownership, conflict between land conservation bodies and communities<br>• The environmental impact of future tourism developments could undermine the natural beauty of the area.<br>• Limited support for SMMEs. | potential for tourism in the area. Game farming will attract a large number of local and international visitors to the area. If managed efficiently it is highly likely that the MCLWHS can sustain itself through game farming<br>• Diversification of tourism opportunities and target markets especially in terms game farms and eco-tourism initiatives.<br>• The game farms in the Mapungubwe area are in talks to consolidate the farms to facilitate large-scale eco-tourism operations. This will allow for multiple consumptive (hunting and meat production) and non-consumptive (tourism activities) utilisation of these areas that will provide a significant economic boost to the area<br>• The consolidation of game farms around the Mapungubwe region will have a large impact on the property values of the farms. Thus the MCLWHS could potentially sustain tourism activities if game farming is part of the tourism package.<br>• There is a rich historical and cultural background to the area.<br>• Tourism related activities provide an economic incentive to safeguard the cultural resources of the MCLWHS.<br>• Opportunity to develop community tourism activities especially eco-tourism initiatives<br>• Transport corridors including the N1 run through the district thus there are large movement of people passing through that could be potential tourists | • Make use of local historical resources to expand tourism products in the district.<br>• Create a safe and crime free environment conducive for tourism development and appealing to visitors.<br>• Promote environmentally responsible tourism development that is sensitive to the natural environment and attractions. |

| PLANNING & DEVELOPMENT | | *Spatial Planning = planning process that is inherently integrative and strategic, takes into account a wide range of factors and concerns and addresses how those aspects should be arranged on the land* |
|---|---|---|
| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Sustainability of successful land claims<br>• The provision of infrastructure and facilities in the eastern area of the Musina LM is creating a spatial imbalance between the western and eastern areas in terms of settlement and infrastructure development<br>• Threats to the environment are mainly as a result of conflicting land use activities.<br>• Influx of people from neighbouring countries exacerbates the social problems in the area<br>• Poor condition of the roads within the district hampers access and economic development.<br>• Land that is subject to competing forces, where opposing parties have different requirements for land utilisation.<br>• Significant areas under land claims. | • Spatial, economic and social planning in the district and its local municipalities with unified goals and objectives.<br>• The Province has the opportunity to use the MCLWHS to grow economic development of the area.<br>• The MCLWHS is significantly unique to the rest of South Africa's tourism destinations as it is the single largest area in the country to have such cultural heritage | • EMF to consider SDFs. EMF to be integrated into next generation SDFs.<br>• Maintain working relationships between the various spheres of government to ensure a collaborative effort to conserve MCLWHS protected areas and their adjoining buffer zones, through prudent planning.<br>• The spatial imbalance between the Western and Eastern areas in the Musina LM in terms of settlement and infrastructure development, will may need to be addressed should tourism development around Mapungubwe/Dongola complex develop. |

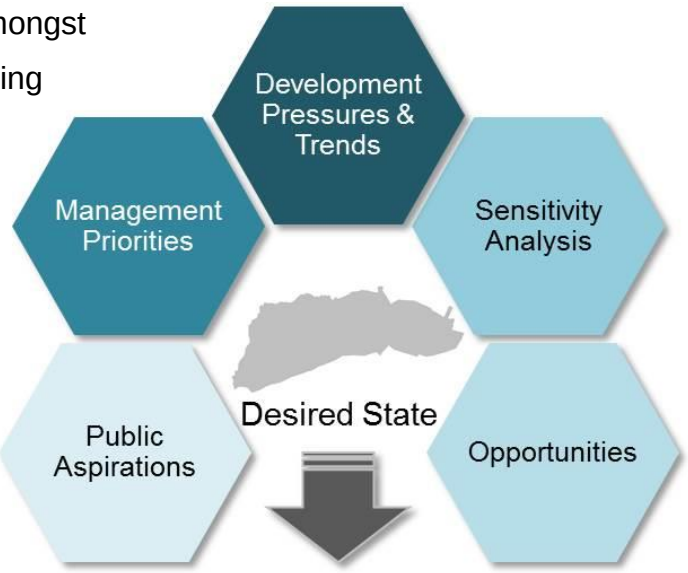
| INSTITUTIONAL ENVIRONMENT | | *Organisational structure and the conditions, forces, and factors that affect it* |
|---|---|---|
| **Constraints, Weaknesses & Issues** | **Strengths & Opportunities** | **Management Priorities** |
| • Review environmental assessments (e.g. Environmental Impact Assessments) and specialist studies.<br>• Execution of functions without requisite environmental authorisations or compliance with conditions.<br>• Municipal compliance and enforcement for environmental matters required.<br>• Environmental monitoring of sustainability indicators.<br>• Integration of environmental aspects in IDP.<br>• Lack of cooperative governance with other government departments on environmental matters. | • EMF to address certain institutional shortfalls.<br>• EMF to recommend measures to institutionalise the management framework. | • Provisions in the EMF to address certain institutional problems associated with environmental management in the district.<br>• Cooperative governance is central to the effective management of the MCLWHS.<br>• Compliance and enforcement of potential impacting land uses need to be stringently executed and effectively coordinated.<br>• Pursue and promote stakeholder engagement.<br>• Environmental awareness and training required for municipal officials to create capacity.<br>• Address resource shortcomings to allow the Local and District Municipality to fulfil their environmental management functions.<br>• Micro organisational restructuring to allow for the EMF roll-out.<br>• Improved cooperative governance for environmental matters.<br>• Establish a District Environmental Forum. |

# 11 TRANSITION FROM STATUS QUO TO DESIRED STATE

With the foundation of the EMF set through the Status Quo Phase, the next step is to determine a realistic desired state for the environment in the MCLWHS.

Establishing the desired state includes setting a vision for the study area and providing the environmental management context for the management zones and related requirements for the various environmental features for the SEMP. It will also focus on addressing the imperatives that lead to the instigation of the EMF development process.

The approach to defining a desired state is based on evaluating and integrating the aspects presented in the accompanying figure. The desired state will be established based on the environmental management priorities amongst others, in terms of addressing issues, overcoming constraints and harnessing opportunities. This will include finding a balance between land use potential, management endeavours and human aspirations. The aforementioned elements will also steer the ensuing management measures towards reaching a destination of sustainable development.




The development pressures and trends will be investigated to identify and resolve potential conflict areas, to allow for accurate and realistic delineation of management zones in the SEMP in order to bridge the divide between the status quo and desired state of the environment.

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# APPENDIX A

## MCLWHS EMF STATUS QUO MAPS

# APPENDIX B

## DATABASE OF INTERESTED & AFFECTED PARTIES

# APPENDIX C

## PUBLIC PARTICIPATION – EMF STATUS QUO PHASE