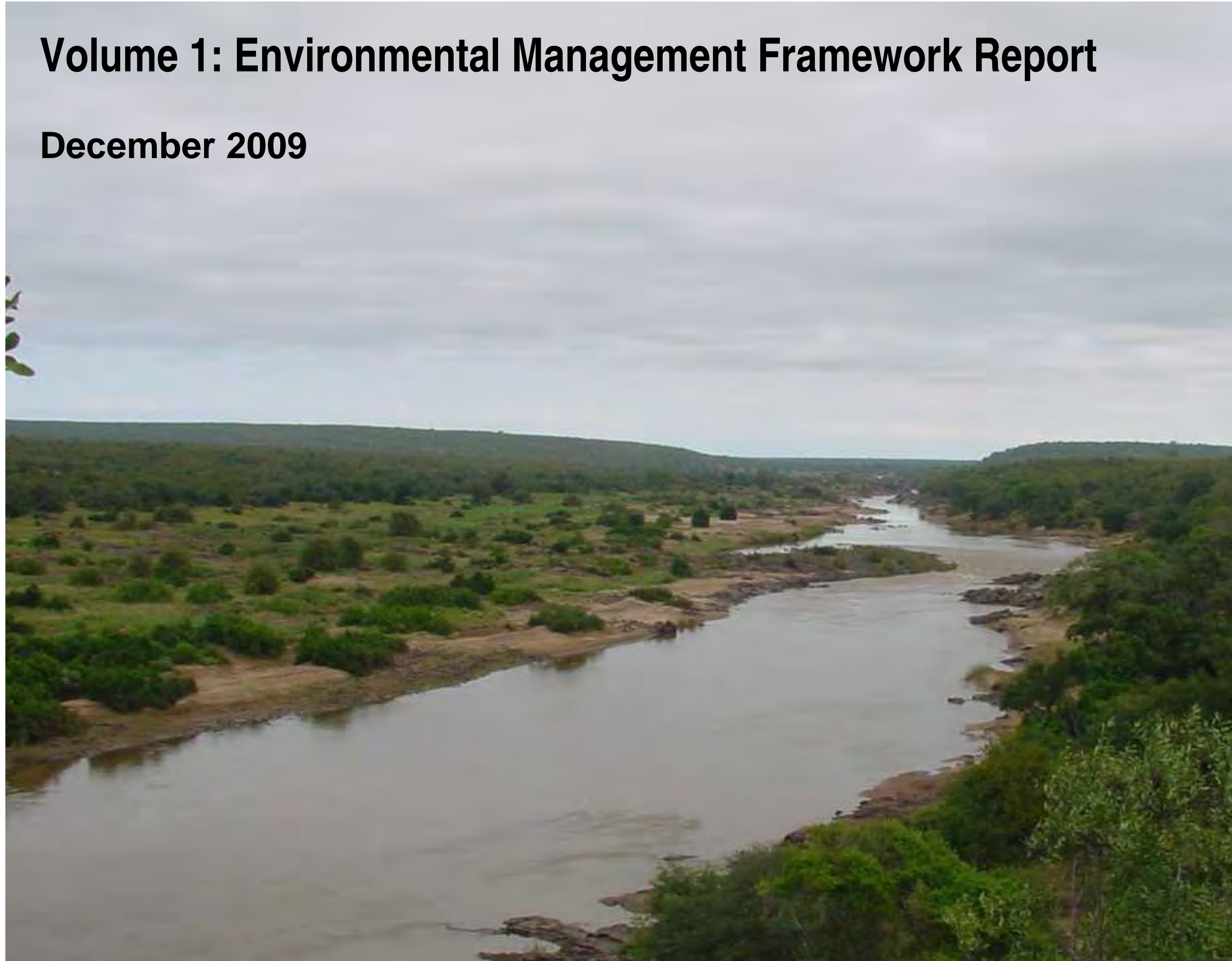


Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas (OLEMF)

Volume 1: Environmental Management Framework Report

December 2009



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Environmental Management Framework Report
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TABLE OF CONTENTS

VOLUME 1: EMF REPORT

	Executive Summary	Page
	1. Introduction	vi
1.1	Purpose of the EMF	1
1.2	Location of the EMF area	1
1.3	Choice of the EMF area	1
	2. The Status Quo	1
2.1	Introduction	1
2.2	The Physical Environment	3
2.3	The Biological Environment	19
2.4	Human Settlement and Development	29
2.5	Cultural and Historical Features	35
2.6	Population Characteristics	41
2.7	Economic Characteristics	43
	3. Environmental Management Zones	47
3.1	Introduction	47
3.2	The Need for EMZs	47
3.3	The Identification of EMZs	47
	4. Strategic Environmental Assessment	49
4.1	Introduction	49
4.2	Key Issues	49
4.3	Guiding Principles	50
4.4	An Asset Management Approach	50
4.5	Environmental Sensitivity	51
4.6	Constraints, Opportunities and Potential Conflicts Between Opportunities	51
4.7	Proposals from Anglo Platinum	59
	5. Desired State	61
5.1	Introduction	61
5.2	Management Zone A: Higveld/Energy Hub Area	61
5.3	Management Zone B: Highveld to Bushveld Transition Area	63
5.4	Management Zone C: Groblersdal/Marble Hall Irrigated Agriculture Area	64
5.5	Management Zone D: Springbok Flats Rural Area	65
5.6	Management Zone E: Rural Sekhukhune/Platinum Mining Focus Area	65
5.7	Management Zone F: Nature Conservation/Tourism Focus Area	67
5.8	Management Zone G: Tzaneen/Phalaborwa Activity Corridor	69
5.9	Management Zone H: Dry Rural Lowveld Area	70
	6. Strategic Environmental Management Plan	71
6.1	Introduction	71
6.2	Implementation of NEMA Section 24	71
6.3	Management Guidelines	77
	7. Bibliography	84

LIST OF FIGURES

Figure 1:	The EMF area	2
Figure 2:	Lithology (rock types)	4
Figure 3:	Geological systems	4
Figure 4:	Mine intensity, commodities and mining rights for the platinum group metals	5
Figure 5:	Physical geography/terrain morphological description	6
Figure 6:	Slope analysis	6
Figure 7:	Soils	7
Figure 8:	Land capability for arable agriculture	8
Figure 9(a):	Irrigated agriculture in the Groblersdal area	8
Figure 9(b):	Irrigated agriculture in the Tzaneen area	8
Figure 10:	Rainfall	10
Figure 11:	Runoff	10
Figure 12:	Rivers and major dams	12
Figure 13:	Principal groundwater occurrence	14
Figure 14:	Tertiary catchment areas	14
Figure 15:	Olifants River segments	16
Figure 16:	Vegetation	20
Figure 17:	Threatened Ecosystems	22
Figure 18:	Protected areas and conservation planning	24
Figure 19:	The current use of land	30
Figure 20:	Temperature inversion risk area	32
Figure 21:	Cultural historical features	38
Figure 22:	Population density per Census ward	41
Figure 23:	Population density per Sub-place	41
Figure 24:	Population structure	42
Figure 25:	Broad income distribution per household	42
Figure 26:	Education and literacy	42
Figure 27:	Employment in the agricultural centre	44
Figure 28:	Employment in the mining sector	44
Figure 29:	Employment in the manufacturing sector	46
Figure 30:	Employment in the trade and tourism related sectors	46
Figure 31:	Environmental Management Zones	48
Figure 32:	Environmental Sensitivity	52
Figure 33:	Environmental attributes: threatened ecosystems	72
Figure 34:	Environmental attributes: focus areas for contributing to biodiversity	72
Figure 35:	Environmental attributes: important topographical features	72
Figure 36:	Environmental attributes national and provincial protected areas & private and local conservation areas	73
Figure 37:	Environmental attributes: national park viewshed protection areas	73
Figure 38:	Environmental attributes: priority areas in the vicinity of national	73

	parks	
Figure 39:	Environmental attributes: rivers, wetlands and other water bodies	74
Figure 40:	Environmental attributes: steep slopes	74
Figure 41:	Built-up areas	76

LIST OF TABLES

Table 1:	Municipalities in the EMF area	2
Table 2:	The general occurrence of metals and minerals	5
Table 3:	Soils that occur in the EMF area	7
Table 4:	Land capability for arable agriculture	7
Table 5:	Evaporation and rainfall in the tertiary catchments of the EMF area	9
Table 6:	Factors that have a significant impact on the production of water in the EMF area catchments	13
Table 7:	Naturalised flow (1920-2004) in tertiary flows	13
Table 8:	Naturalised flow (1920-2004) quaternary catchments with significant declines	13
Table 9:	Water quality of river reaches in the Olifants River catchment	15
Table 10:	Conservation status and coverage of vegetation in the EMF area	19
Table 11:	Commonly used medicinal plants that occur in the area	21
Table 12:	Use of land/land cover	29
Table 13:	Important historic personalities of the catchments area	37
Table 14:	Environmental management zones	48

VOLUME 2: APPENDICES (SEPARATE VOLUME)

1	Appendix:	Ecoregion Maps
2	Appendix:	Vegetation
3	Appendix:	Specification of activities in geographical areas
4	Appendix:	Public Participation Report
5	Appendix:	Reference Documents

ABBREVIATIONS

AD:	Anno Domini means after Christ	KNP:	Kruger National Park
APPA:	Air Pollution Prevention Act	LDEDET:	Limpopo Department of Economic Development, Environment and Tourism
AQA:	Air Quality Act	LSA:	Late Stone Age
AQMP:	Air Quality Management Plan	MAE:	Mean Annual Evaporation
BP:	Before Present	MAP:	Mean Annual Precipitation
CDM:	Capricorn District Municipality	MAR:	Mean Annual Runoff
C-Plan:	Conservation Plan	MBCP:	Mpumalanga Biodiversity Conservation Plan
CSIR:	Council for Scientific and Industrial Research	MDC:	Maputo Development Corridor
ESA:	Early Stone Age	MDEDET:	Mpumalanga Department of Economic Development, Environment and Tourism
DEA:	Department of Environmental Affairs	MSA:	Middle Stone Age
DDT:	Dichloro Dyphenyl-Trichloroethane	MY:	Million Years
DS:	Desired State	NEMA:	National Environmental Management Act
DWA:	Department of Water Affairs	NWMS:	National Waste Management Strategy
DVD:	Digital Video Disk	OLEMF:	Olifants and Letaba Environmental Management Framework
EIA:	Environmental Impact Assessment	PES:	Present Ecological State
EIA:	Early Iron Age	SANBI:	South African National Biodiversity Institute
EMF:	Environmental Management Framework	SANPARKS:	South African National Parks
EMZ:	Environmental Management Zone	SANRAL:	South African National Road Agency Limited
ESA:	Early Stone Age	SEA:	Strategic Environmental Assessment
GDP:	Gross Domestic Product	SEMP:	Strategic Environmental Management Plan
GIS:	Geographical Information System	SDF:	Spatial Development Framework
HRA:	Heritage Resources Act	SQR:	Status Quo Report
I&APs:	Interested and Affected Parties	ZAR:	Zuid-Afrikaansche Republiek
IDP:	Integrated Development Plan		
IP&WM:	Integrated Pollution and Water Management		

GLOSSARY OF TERMS

Afromontane means a plant or animal species common to the mountains of Africa.

Agri-processing means the subset of manufacturing that processes raw materials and intermediate products derived from the agricultural sector. Agriprocessing industry thus means transforming products originating from agriculture, forestry and fisheries.

Alluvium means clay or silt or gravel carried by rushing streams and deposited where the stream slows down.

Amphibolite means a grouping of metamorphic rocks composed mainly of amphibole (as hornblende) and plagioclase feldspars, with little or no quartz. It is typically dark-colored and heavy, with a weakly foliated or schistose (flaky) structure. The small flakes of black and white in the rock often give it a salt-and-pepper appearance.

Anno Domini (A.D.) means The Year Of Our Lord in Latin and is used in the Gregorian Calendar to refer to the current era.

Anticyclonic cells means a body of moving air of higher pressure than the surrounding air, in which the pressure decreases away from the centre. Winds circulate around the centre in an anticlockwise in the S hemisphere.

Arable land means land that is fit to be cultivated.

Biodiversity means the totality of genes, species, and ecosystems of a region.

Confluence means a place where rivers flow into one another.

Conglomerate rocks means sedimentary rocks which are made up of large sediments like sand and pebbles. The sediment is so large that pressure alone cannot hold the rock together; it is also cemented together with dissolved minerals.

Dryland cultivation means an agricultural technique for cultivating land, which receives little rainfall. Dryland farming has evolved as a set of techniques and management practices used by farmers to continually adapt to the presence or lack of moisture in a given crop cycle.

Endemism means a species that is prevalent in or peculiar to a particular locality; Endemism is the ecological state of being unique to a particular geographic location, such as a specific island, habitat type, nation, or other defined zone. To be endemic to a place or area means that it is found only in that part of the world and nowhere else.

Escarpment means a steep slope or long cliff that results from erosion or faulting and separates two relatively level areas of differing elevations.

Eutrophication means a process whereby water bodies excess nutrients that stimulate excessive plant growth (algae, periphyton attached algae, and nuisance plants weeds). This enhanced plant growth, often called an algal bloom, reduces dissolved oxygen in the water when dead plant material decomposes and can cause other organisms to die.

Fish Assemblage Integrity Index (FAII) means a categorisation of a fish communities according to an intolerance rating which takes into account trophic preference and specialisation, requirement for flowing water during different life-stages, and association with habitats with unmodified water quality. Results of the FAII are expressed as a ratio of observed conditions versus conditions that would have been expected in the absence of human impacts.

Headwater means the water from which a river rises; a source. Often used in the plural.

Ironstone means a fine-grained, heavy and compact sedimentary rock. Its main components are the carbonate or oxide of iron, clay and/or sand. It can be thought of as a concretionary form of siderite. Ironstone also contains clay, and sometimes calcite and quartz.

Irrigated agriculture means a type of farming where an artificial application of water to the soil occurs usually for assisting in growing crops.

Lava means molten rock expelled by a volcano during an eruption. When first expelled from a volcanic vent, it is a liquid at temperatures from 700 °C to 1,200 °C (1,300 °F to 2,200 °F). Although lava is quite viscous, with about 100,000 times the viscosity of water, it can flow great distances before cooling and solidifying, because of its thixotropic and shear thinning properties.

Leachate means water that has percolated through soil, carrying with it dissolved contaminants or pollution.

Limestone means a sedimentary rock composed largely of the mineral calcite (calcium carbonate: CaCO₃). The deposition of limestone strata is often a by-product and indicator of biological activity in the geologic record. Calcium (along with nitrogen, phosphorus, and potassium) is a key mineral to plant nutrition: soils overlying limestone bedrock tend to be pre-fertilized with calcium.

Lithology means the scientific study and description of rocks, especially at the macroscopic level, in terms of their colour, texture, and composition.

Long term means at least a hundred years from now.

Mean Annual Runoff (MAR) means the total amount of surface water within a catchment area can consist of runoff from precipitation falling within that area, and water flowing into that area from adjacent areas. The total amount of water in that area is referred to as the mean annual runoff (MAR). MAR can also be defined as the average annual stream flow passing a specified point or the maximum average annual flow observed in a river basin.

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

Medium term means between fifty to hundred years from now.

Monotypic means to a taxonomic group with only one type: in botany it means that a taxon has only one species.

Non-perennial means something that does not last throughout the year.

Overgrazing means to permit animals to graze (vegetational cover) excessively, to the detriment of the vegetation and so that it no longer provides nourishment.

Palaeoendemics means endemics which are evolutionary older than Quaternary period.

Phyllites means a type of foliated metamorphic rocks primarily composed of quartz, sericite mica, and chlorite; the rock represents a gradation in the degree of metamorphism between slate and mica schist. Minute crystals of graphite, sericite, or chlorite impart a silky, sometimes golden sheen to the surfaces of cleavage (or schistosity). Phyllite is formed from the continued metamorphism of slate.

Plateau, means an area of highland, usually consisting of relatively flat terrain.

Quartzite means a hard metamorphic rock which was originally sandstone. Sandstone is converted into quartzite through heating and pressure usually related to tectonic compression within orogenic belts. Pure quartzite is usually white to grey, though quartzites often occur in various shades of pink and red due to varying amounts of iron oxide (Fe_2O_3). Other colors are commonly due to impurities of minor amounts of other minerals.

Riparian vegetation means plant communities along the river margins and are a buffer between terrestrial and aquatic ecosystems.

Riparian Vegetation Index (RVI) means the status of riparian vegetation within river segments based on the qualitative assessment of a number of criteria in the riparian zone. These criteria are vegetation removal, cultivation, construction, inundation, erosion/sedimentation and exotic species. The output is expressed as percentage deviation from natural or unmodified riparian conditions.

Schist means a group of medium-grade metamorphic rocks, chiefly notable for the preponderance of lamellar minerals such as micas, chlorite, talca, hornblende, graphite, and others. By definition, schist contains more than 50% platy and elongated minerals, often finely interleaved with quartz and feldspar. Schist is often garnetiferous.

Sediment means solid fragments of inorganic or organic material.

Shale means a fine-grained sedimentary rock whose original constituents were clay minerals or muds. It is characterised by thin laminae breaking with an irregular curving fracture, often splintery and usually parallel to the often-indistinguishable bedding plane. This property is called fissility and where it is not present the rocks are called mudstones or siltstones. Shale is the most common sedimentary rock.

Short term means up to fifty years from now.

Subsistence farming means farming, in which most of the produce of the farm is consumed by the farmer and his family.

South African Scoring System (SASS) means the biological index used for assessing aquatic invertebrate fauna. This index is based on the presence of families of aquatic invertebrates and their perceived sensitivity to water quality changes. SASS results are expressed both as an index score (SASS score) and the average score per recorded taxon (ASPT value).

Topography means a representation, usually graphic of the surface features of a place or region on a map, indicating their relative positions and elevations.

Tributary means a stream that flows into a larger stream or other body of water.

Ubiquitous means being present everywhere at once.

Undulating means moving up and down like waves or forming a series of regular curves.

Weir means dam placed across a river or canal to raise or divert the water, as for a millrace, or to regulate or measure the flow.

Executive Summary

1. Introduction

It was decided by the governing authorities that an Environmental Management Framework should be created. This decision was made in order to manage future development to be sustainable as well as monitor and control the cumulative impacts of human activity on the natural environment. The EMF is meant to be a guideline to assist the decision-making process. It integrates frameworks, policies and different government mandates. The EMF presents important information in a format that is easy to access and understand.

2. Status quo

2.1 Information contained in this report

A large volume of data was collected during the compilation of this report. This data covered aspects of the area such as the physical environment, the biological environment, human settlement and development, cultural and historical features, population characteristics and economic characteristics.

2.2 Physical environment

Information pertaining to the geology of the area was collected. This information covered the geological systems, describing their formation processes and relativity within the geological timeline. The lithology of the EMF area and how the various rock types related to the geological formations was also investigated.

The topography of the area was measured in a slope analysis, and a map created of the results. A map showing the terrain morphological description was also compiled. The general occurrence of metals and minerals within the various District Municipality areas is also mentioned and a map showing the location and types of mines within the EMF area is included.

The various soils and the soil suitability for agriculture were analysed. A map containing the land capability for arable agriculture was composed. It shows arable land according to an index and also indicates where irrigated agriculture takes place.

The general climate of the area was looked at and maps indicating the rainfall as well as the mean annual runoff per quaternary catchment. Overviews of the tertiary catchments' mean annual precipitation and mean annual evaporation is presented in a table format.

A description of the hydrology of the area, of the rivers and their courses through the EMF area were included under the heading of hydrology. All the major dams along the rivers were mentioned and indicated on a map. A table indicating the factors that have a significant impact on the production of water in the EMF area catchments was included. The naturalised flow was tabulated for the tertiary

catchments. The quaternary catchments that showed a significant decline in naturalised flow are also indicated in a table form.

Water quality of the different segments of the Olifants River, in terms of the Present Ecological State are summarised in a table as well as presented on a map. This clearly indicates the segments of the river, which need immediate attention.

2.3 Biological environment

The different vegetation types and biomes occurring within the EMF area, and their current conservation status were investigated and the findings summarised within a table. The most common medicinal plants and their uses were also investigated.

Three centres of endemism fall partly or wholly within the EMF area. Each centre has unique characteristics and vegetation compositions found nowhere else. This makes the centres of endemism especially important in terms of conservation.

A map was created using available sets of data to indicate the position and occurrence of threatened ecosystems in the EMF area. Conservation and conservation targets were discussed. A map indicating statutory and private reserves, areas of natural heritage, important catchment areas, and possible park expansion areas was compiled. The Kruger to Canyons Biosphere Reserve initiative and its implications were briefly discussed.

The general health of the rivers occurring within the EMF area was investigated. Specific issues regarding river health along certain sections of the Olifants and Letaba Rivers were pointed out.

2.4 Human settlements

The current use of land in the EMF area was investigated. A table and map indicating where mining, agriculture, urban areas, natural areas, water bodies and other uses are currently found was compiled. The legislation, definition and a few general remarks on solid waste were included. Air pollution sources, and the climatic conditions that lead to the temperature inversion risk were noted. The declaration of the Highveld Priority Area and what implications this may have were briefly discussed.

The EMF area is rich in historical features, with many finds dating from the Stone Age and Iron Age. These include crude stone tools, rock art and pottery fragments. The cultural history of the area is rich as it is varied. The historic period of this area saw many conflicts taking place, and also the development of important infrastructure. Most important to note is that heritage is not static and new important sites are identified continually.

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

2.5 Population characteristics

Using the available census data maps indicating the population density, the population structure, the broad income distribution per household, and the education and literacy levels of people living within the EMF area were compiled.

2.6 Economic characteristics

The EMF area has a diverse economy. The different sectors such as mining, industry, agriculture and tourism were investigated. Information on the relative employment in the various sectors were compiled into maps. Although they do not give an exact representation of the situation, it allows for a general picture to be formed.

3. Environmental Management Zones

Based on the information gathered in the status quo process, the EMF area was divided up into 8 management zones as indicated in table 1 below and Figure 31 in the report.

Table 1: Environmental management zones

	Surface Area	Percentage
ZONE A: The highveld/energy hub area	8 897.714 km ²	12.10%
ZONE B: The highveld to bushveld transition area	13 717.860 km ²	18.60%
ZONE C: The Groblerdal/Marble Hall agricultural area	1 804.082 km ²	2.45%
ZONE D: Springbok flats rural area	6 212.659 km ²	8.44%
ZONE E: Rural Sekhukhune/platinum mining focus area	8 799.746 km ²	12.00%
ZONE F: Nature conservation/tourism focus area	23 083.580 km ²	31.35%
ZONE G: Tzaneen/Phalaborwa activity corridor	4 667.603 + 385.858 = 5 053.461 km ²	6.86%
ZONE H: Dry rural lowveld area	6 060.817 km ²	8.23%
Total Area	73 629.919 km ²	100.00%

The Strategic Environmental Assessment, Desired State and Strategic Environmental Management Plan was re-evaluated in terms of these zones.

4. Strategic Environmental Assessment

The purpose of the Strategic Environmental Assessment (SEA) is to assess the information that has been gathered in the previous sections in order to:

- Determine the key issues in the EMF area;
- set guiding principles for the EMF area;
- define an overall management approach that would be appropriate and practical to focus the outcomes of the EMF towards long term sustainable development in the EMF area;

- define the relative environmental sensitivity of the EMF area in order to highlight areas that would be most affected by change if development is allowed to proceed in an uncontrolled manner; and
- The identification of constraints, opportunities and potential conflicts between different opportunities.

4.1 Key issues

The following the key issues were identified:

- Water in the EMF area is already over-allocated and further allocations must come from reallocation of existing rights;
- Impoundments of rivers have huge environmental impacts;
- Pollution of water has a negative effect on the user value of water;
- Erosion, turbidity and sediment deposition diminish the potential of the hydrological system;
- Mining activities have a huge negative impact on the scenic quality of the environment;
- Extreme levels of air pollution on the Highveld pose health risks to people;
- Poverty is a major problem over large parts of the EMF area;
- Inadequate services and infrastructure remains a significant problem in certain areas;
- The use of indigenous trees for firewood is not sustainable;
- Medicinal plant harvesting is causing severe damage in certain vegetation types; and
- The uncertain future impacts of climate change make planning for contingencies difficult.

4.2 Guiding principles

The following guiding principles have been adopted for the EMF:

- Sustainable development;
- pro-poor;
- capture value;
- support local economic development;
- focus on what is important, appropriate and possible in the area; and
- internalise externalities.

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

4.3 An asset management approach

The EMF area as a whole and each environmental management zone has a “basket” of current assets, some of which can be maintained over the long term and even indefinitely and some that are temporary and will be depleted some time in the short to medium term future. The aim is to promote long term sustainability which means that as short to medium term assets are depleted, the development of additional long term assets are promoted to the extent possible to ensure a continued asset base for people to live off in the area

4.4 Environmental sensitivity

The environmental sensitivity is based on the following carefully selected environmental elements:

- Protected areas;
- threatened ecosystems;
- remaining natural vegetation;
- steep slopes; and
- hydrological features.

In addition it was decided to also get a spatial perspective of areas that required specific management intervention to prevent further disastrous degradation. The criteria used for this are:

- Air and water pollution control priority zones;
- water pollution management priority zones; and
- soil conservation priority zones (areas in process/danger of desertification).

In addition, because tourism is regarded as a key industry for long term sustainable development in large parts of the EMF area it was also appropriate to define areas where impacts on the scenic environment could have significant impacts on tourism.

4.5 Constraints, opportunities and potential conflicts between opportunities

Zone A: Highveld/energy hub area

The major constraints in this zone are:

- Over-allocation of water;
- limited scenic value; and
- very little remaining natural habitat.

The major opportunities in this zone are:

- Strong income base from coal mining and associated activities; and

- high agricultural potential.

There is an obvious potential conflict between the opportunities that are provided by mining and agriculture respectively.

Zone B: Highveld to Bushveld transition area

The major constraints in this zone are:

- Over allocation of water;
- critically endangered and endangered vegetation that is located outside conservation areas; and
- low water quality in the rivers.

The major opportunities in this zone are:

- Significant platinum deposits;
- high visual quality;
- extensive areas of remaining natural vegetation with high conservation potential; and
- good location for tourism and recreation from Gauteng.

The mining of platinum deposits has the potential to have major conflicts with the scenic qualities and conservation potential of the area.

Zone C: Groblersdal/Marble Hall irrigated agriculture area

The major constraints in this zone are:

- Over-allocation of water; and
- bad water quality that may affect the export potential of agricultural produce.

The major opportunities in this zone are:

- The Loskop Dam irrigation scheme that underpins agriculture in the zone; and
- a number of platinum deposits.

There is a potential conflict between agriculture and mining in the area.

Zone D: Springbok Flats rural area

The major constraints in this zone are:

- Over allocation of water;
- little remaining natural habitat; and
- over exploitation of natural remnant through firewood harvesting and collection of medicinal plants.

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

The major opportunities in this zone are:

- Good potential for rain fed agriculture; and
- some potential for ecotourism at the protected areas in the vicinity of the Flag Boshielo Dam.

Zone E: Rural Sekhukhune/platinum mining focus area

The major constraints in this zone are:

- Over-allocation of water;
- low agricultural potential;
- high rural population; and
- poverty.

The major opportunities in this zone are:

- Extensive platinum and related mineral deposits; and
- potential conservation areas with high ecosystems values.

The mining that is proposed in the area will have very negative impact on the potential for nature conservation areas.

Zone F: Nature conservation/tourism focus area

The major constraints in this zone are:

- Due to over allocation of water in the other zones the ecological reserve requirements are not being met with negative results for conservation; and
- excessive medicinal plant harvesting especially in indigenous forests.

The major opportunities in this zone are;

- A large portion of the Kruger National Park and large areas of provincial and private conservation areas;
- high scenic value;
- high nature conservation value; and
- relatively low human population pressure.

There are no apparent major conflicts between opportunities in this area with the possible exception of plantation expansion that may conflict with conservation.

Zone G: Tzaneen/Phalaborwa activity corridor

The major constraints in this zone are:

- Over-allocation of water; and
- limited lifespan of current mining activities.

The major opportunities in this zone are:

- A diversified economy that have expansion possibilities at various levels; and
- location in relation to Zone F, which makes it the ideal area to act as service centre for the conservation zone that almost encircles it.

Competition for water between sectors will become more severe over time.

Zone H: Dry rural Lowveld area

The major constraints in this zone are:

- Over-allocation of water;
- frequent droughts;
- high, poor rural population; and
- over dependence on government as an “economic resource”.

The major opportunity in this zone is:

- The proximity of the zone to the Kruger National Park.

There are no apparent major conflicts between opportunities in this zone.

5. Desired state

The desired state as reflected in this report has been reworked completely from the draft version in order to focus on the EMZ. It has also been structured to give an overview of the desired state in respect to key issues in the EMZ and also to give effect to the principles of this EMF.

This has been done in each environmental management zone and includes the following aspects as appropriate for each zone:

- Water utilisation;
- conservation;
- tourism;
- mining;
- electricity generation (only for Zone A);
- industry;
- agriculture and commercial plantations;

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

- transportation;
- business, services and government; and
- poverty.

6. Strategic environmental management plan

The main purpose of the EMF is to put a decision-making support system in place that provides the following:

- A context that includes, acknowledges and understands the challenges of the area;
- an understanding of the need to utilise resources in the area to its full potential with a long-term sustainability outlook;
- an implementation resolve that is strict but at the same time also compassionate and sensitive to the principles that have been adopted for this EMF;
- an approach that is practical, uncomplicated and easy to implement; and
- an indication of the implications of decisions, especially where such decisions have the potential to result in high opportunity costs.

The National Environmental Management Act, 1998 (Act 107 of 1998) and its suite of supporting legislation provides the basis for the making of development decisions in the EMF area where development has the potential to impact on the environment. The SEMP is therefore first and foremost targeted to the effective and efficient implementation of this legislative base and propose the following environmental attributes within which additional activities are proposed to be listed for authorisation in terms of NEMA:

- Focus areas for contributing to biodiversity thresholds;
- threatened ecosystems;
- important topographical features;
- National and Provincial Parks and Reserves;
- National Parks view-shed protection areas;
- priority areas in the vicinity of National Parks;
- rivers, wetlands and other water bodies;
- steep slopes consisting; and
- private and local protected areas.

All built up areas in the EMF area have been delineated and are proposed as areas where service and infrastructure activities on the national list of activities that require basic assessment are proposed for exclusion.

Guidelines are also provided for each of the environmental management zones on:

- Water allocation;
- water quality;
- conservation;
- air pollution;
- cooperative government; and
- EMF principles.

1. INTRODUCTION

1.1. PURPOSE OF THE EMF

In addition and in support of the regulatory requirements for the EMF the purpose of this EMF is to develop a framework that will integrate policies and frameworks, and align different government mandates in a way that will streamline decision-making to improve cooperative governance and guide future development in an environmentally responsible manner.

The specific objectives of the EMF include:

- Encourage sustainable development;
- establish development priorities;
- identify strategic guidance and development management proposals;
- identify the status quo, development pressures and trends in the area;
- determine opportunities and constraints;
- identify geographical areas in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- specify additional activities within identified geographical areas that will require EIA based on the environmental attributes of such areas;
- specify currently listed activities that will be excluded from EIA within certain identified geographical areas based on the environmental attributes of such areas; and
- develop a decision support system for development in the area to ensure that environmental attributes, issues and priorities are taken into account.

1.2. LOCATION OF THE EMF

The study area comprises of the Olifants River catchment, the Letaba River catchment and the Shingwidzi sub-catchment areas as indicated on the map. It covers approximately 74 000 km². The area stretches from the continental divide in eastern Gauteng and the Mpumalanga Highveld to the border with Mozambique in the Kruger National Park.

The EMF area falls mainly within the Limpopo and Mpumalanga provinces, with small areas of the Gauteng Province also included. There are 11 District Municipality areas that fall within the EMF area, either wholly or partially. Three of the District Municipality areas are within Mpumalanga, five within Limpopo and three small sections within Gauteng. There are around 30 Municipality areas that fall either wholly or partially within the EMF area.

1.3. THE CHOICE OF THE EMF AREA

The EMF was initiated as a result of issues raised regarding the cumulative impacts to the environment associated with, inter alia, further development pressure and water demands on the catchment and the Kruger National Park. These issues came under the spotlight during the decision regarding the development of the De Hoop Dam.

The Minister directed the Department of Environment to initiate a process in partnership with the Department of Water Affairs and other relevant authorities to create a guide for future development and inform levels of acceptable change for the area. It was agreed that it is logical to develop an Environmental Management Framework as such a guide.

The EMF area was chosen in order to comprehensively cover all factors that may influence the Olifants, Letaba & Shingwidzi Rivers. The area includes 17 tertiary catchments further divided into several quaternary catchments.

2. THE STATUS QUO

2.1 INTRODUCTION

The purpose of the status quo is not to provide a state of the environment report but rather to determine the issues and priorities resulting from the environment/development interaction in order to set a context for informed decision-making.

The information that was selected, included and summarised in this report, is a reflection of key elements as well as human activities that shaped the EMF area into what it is today. Data has also been gathered and captured in a manner that makes spatial representation possible. This means it is also suitable to the incorporation into a GIS system, which can support decision-making.

Built up areas in the study area have been captured in detail from recent satellite images. This has been done in order to identify such areas as areas where EIA requirements, especially in respect of services and infrastructure can be relaxed in order to make development more affordable with fewer administrative hurdles.

In the compilation of this EMF the project team did not attempt to include all the information from every available source. Instead the project team focused on the results of other research and the combination of such results to form higher value secondary information.

A list of available reference documents is included to serve as a data access point for any person who does environmental work in the EMF area. This is further supported by an extensive bibliography.

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

Figure 1: The EMF area



Table 1: Municipalities in the EMF area

Municipality	Province	Area in EMF area (KM ²)
Gert Sibande	MP	1 818.662
Albert Luthuli Local Municipality	MP	15.802
Msukaligwa Local Municipality	MP	645.914
Govan Mbeki Local Municipality	MP	1 156.946
Nkangala	MP	13 949.569
Delmas Local Municipality	MP	1 492.483
Emalahleni Local Municipality	MP	2 677.608
Steve Tshwete Local Municipality	MP	3 971.107
Highlands Local Municipality	MP	2 023.531
Thembisile Local Municipality	MP	2 384.350
Dr JS Moroka Local Municipality	MP	1 400.490
Ehlanzeni	MP	6 885.635
Thaba Chweu Local Municipality	MP	3 388.138
Bushbuckridge Local Municipality (MPDMA32)	MP	353.899
	MP	3 143.598
Mopani	LIM	23 069.272
Greater Giyani Local Municipality	LIM	2 985.076
Greater Letaba Local Municipality	LIM	1 890.884
Greater Tzaneen Local Municipality	LIM	3 240.223
Ba-Phalaborwa Local Municipality	LIM	3 004.374
Maruleng Local Municipality (LIMDMA33)	LIM	3 244.301
	LIM	8 704.414
Vhembe	LIM	2 170.565
Thulamela Local Municipality	LIM	979.706
Makhado Local Municipality	LIM	1 190.859
Capricorn	LIM	5 025.768
Molemole Local Municipality	LIM	291.028
Polokwane Local Municipality	LIM	1 329.748
Lepele-Nkumpi Local Municipality	LIM	3 404.992
Waterberg	LIM	4 469.031
Mookgopong Local Municipality	LIM	3 228.846
Modimolle Local Municipality	LIM	46.712
Bela-Bela Local Municipality	LIM	1 144.807
Mogalakwena Local Municipality	LIM	48.666
Sedibeng	GT	42.339
Lesedi Local Municipality	GT	42.339
Metsweding	GT	2 743.114
Nokeng tsa Taemane Local Municipality	GT	964.494
Kungwini Local Municipality	GT	1 778.620
Greater Sekhukhune	LIM	13 426.228
Makhuduthamaga Local Municipality	LIM	2 096.621
Fetakgomo Local Municipality	LIM	1 107.479
Greater Marble Hall Local Municipality	LIM	1 909.797
Elias Motsoaledi Local Municipality	LIM	3 713.331
Greater Tubatse Local Municipality	LIM	4 599.000
Ekurhuleni	GT	24.927
Ekurhuleni Metropolitan Municipality	GT	24.927

2.2 THE PHYSICAL ENVIRONMENT

2.2.1 Geology

The geology of the study area is widely varied. The area contains exposed rocks from the early Precambrian Era 4600 millions years ago (MY) all the way through to the Cenozoic Era 1.65 MY. It contains three of the basic rock types, namely sedimentary, igneous and metamorphic.

Sedimentary rock is formed from grains and fragments of weathered rock that are deposited layer upon layer. This deposition usually happens in large bodies of water. The layers exert increasing pressure until the fragments of rock are compressed and cemented together to form solid rock. Organic and chemical deposits may occur in sedimentary rock.

Igneous rock is formed when molten rock or magma reaches the earth's surface, erupting as lava from volcanoes. When lava cools down, it solidifies to form lava flows. Alternatively, magma may cool down and solidify before it has reached the surface. This forms igneous intrusions surrounded by pre-existing rocks. Igneous intrusions are only exposed if erosion strips off the overlying rocks.

Metamorphic rocks are formed deep below the earth's surface, when existing rocks are altered and take on new characteristics. Thermal metamorphism occurs when heat given off by igneous intrusions alters the surrounding rock. Regional metamorphism is when structural deformation occurs, for example during the formation of mountains. The last type of metamorphism, dislocation metamorphism, affects rocks lying adjacent to fault planes.

The following descriptions should be viewed in conjunction with the map of the Geological Systems. Archaean Granite and Gneiss Basal Complex is the oldest exposed rock formations in the area. This igneous rock was formed around 4600 MY to 2500 MY. It forms the basement rock complex for other rock systems. It occurs in the eastern Lowveld part of the study area and consist mainly of old Granite and Gneis formations and primitive groups of schistose¹ rocks including metamorphosed sediments such as phyllites², banded ironstone³, quartzite, conglomerate⁴ and limestone⁵, together with rocks of

¹ *Schist* is a group of medium-grade metamorphic rocks, chiefly notable for the preponderance of lamellar minerals such as micas, chlorite, talc, hornblende, graphite, and others. By definition, schist contains more than 50% platy and elongated minerals, often finely interleaved with quartz and feldspar. Schist is often garnetiferous.

² *Phyllites* are types of type of foliated metamorphic rocks primarily composed of quartz, sericite mica, and chlorite; the rock represents a gradation in the degree of metamorphism between slate and mica schist. Minute crystals of graphite, sericite, or chlorite impart a silky, sometimes golden sheen to the surfaces of cleavage (or schistosity). Phyllite is formed from the continued metamorphism of slate.

³ *Ironstone* is a fine-grained, heavy and compact sedimentary rock. Its main components are the carbonate or oxide of iron, clay and/or sand. It can be thought of as a concretionary form of siderite. Ironstone also contains clay, and sometimes calcite and quartz.

⁴ *Conglomerate* rocks are sedimentary rocks. They are made up of large sediments like sand and pebbles. The sediment is so large that pressure alone cannot hold the rock together; it is also cemented together with dissolved minerals.

⁵ *Limestone* is a sedimentary rock composed largely of the mineral calcite (calcium carbonate: CaCO₃). The deposition of limestone strata is often a by-product and indicator of biological activity in the geologic record. Calcium (along with nitrogen, phosphorus, and potassium) is a key mineral to plant nutrition: soils overlying limestone bedrock tend to be pre-fertilized with calcium.

igneous origin such as amphibolites⁶, greenstone lavas⁷, and chlorite-schists. The most important economic potential lies in the mining of granite and gneiss for use as polished stone and the occurrence of gold and other minerals in the greenstone lavas.

The Transvaal Sequence was formed around 2400 MY to 1800 MY. It consists of sedimentary rock laid down in a basin. There are igneous intrusions in places as well as fault lines, which caused the formation of metamorphic rock. In the study area it consists of the so-called Pretoria Series (after its typical form in the Pretoria area) composed of three quartzite⁸ layers (Timeball Hill, Daspoort and Magalies) with intervening shales⁹ and lavas. It forms the mountains of Sechukuneland (eastern Bankenveld) at the edge of the Bushveld Basin as well as the bold escarpment of the Transvaal Drakensberg consisting of Black Reef Quartzite where the dramatic change in topography gives rise to dramatic scenic views and vistas.

The Bushveld Igneous Complex was formed in a series of magma surges around 2100 MY to 1800 MY. It is spread over the central part of the Transvaal basin. The area contains Red Granites and the Rooiberg Series in the central parts, as well as Norite in the east. The Bushveld Igneous Complex contains important minerals such as large quantities of platinum, small quantities of gold and silver and a variety of base metals.

The rocks of the Soutpansberg Group and Waterberg Basin were formed around 1800 MY. The rocks of the Soutpansberg Group are mostly sedimentary, but may have intrusive volcanic rocks in places. The Waterberg Basin is also composed mostly of sedimentary rocks and is covered in several localities by outliers of Karoo rocks. Intrusive volcanic rocks may also be present in the Waterberg Basin.

The Karoo Sequence was formed around 400 MY to 120 MY. It consists mainly of sedimentary rocks deposited horizontally in a vast basin, with a few satellite basins to the north. It is a relatively young plateau¹⁰ system that is in the slow process of being removed by erosion from the sub-Karoo surface. The Karoo Sequence contains bands of coal within the central sedimentary layers.

Alluvial Deposits in the area have been formed as recently as 65 MY. They consist of sand created by the weathering of older rocks. The composition of these small loose grains varies depending on the source of rock.

⁶ *Amphibolite* is a grouping of metamorphic rocks composed mainly of amphibole (as hornblende) and plagioclase feldspars, with little or no quartz. It is typically dark-colored and heavy, with a weakly foliated or schistose (flaky) structure. The small flakes of black and white in the rock often give it a salt-and-pepper appearance.

⁷ *Lava* is molten rock expelled by a volcano during an eruption. When first expelled from a volcanic vent, it is a liquid at temperatures from 700 °C to 1,200 °C (1,300 °F to 2,200 °F). Although lava is quite viscous, with about 100,000 times the viscosity of water, it can flow great distances before cooling and solidifying, because of its thixotropic and shear thinning properties.

⁸ *Quartzite* is a hard metamorphic rock which was originally sandstone. Sandstone is converted into quartzite through heating and pressure usually related to tectonic compression within orogenic belts. Pure quartzite is usually white to grey, though quartzites often occur in various shades of pink and red due to varying amounts of iron oxide (Fe₂O₃). Other colors are commonly due to impurities of minor amounts of other minerals.

⁹ *Shale* is a fine-grained sedimentary rock whose original constituents were clay minerals or muds. It is characterized by thin laminae breaking with an irregular curving fracture, often splintery and usually parallel to the often-indistinguishable bedding plane. This property is called fissility and where it is not present the rocks are called mudstones or siltstones. Shale is the most common sedimentary rock.

¹⁰ *Plateau*, is an area of highland, usually consisting of relatively flat terrain.

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

Figure 2: Lithology (rock types)

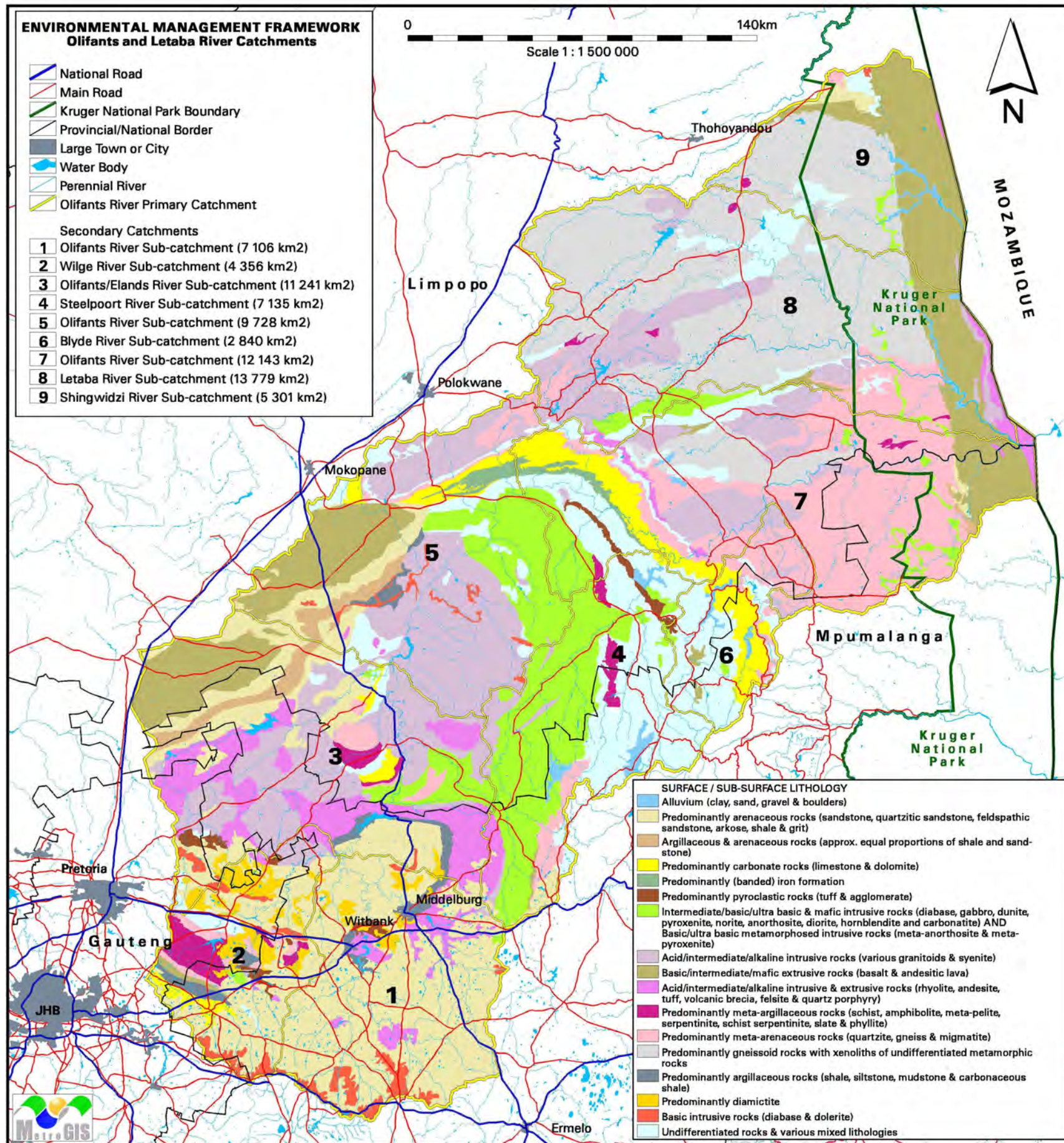
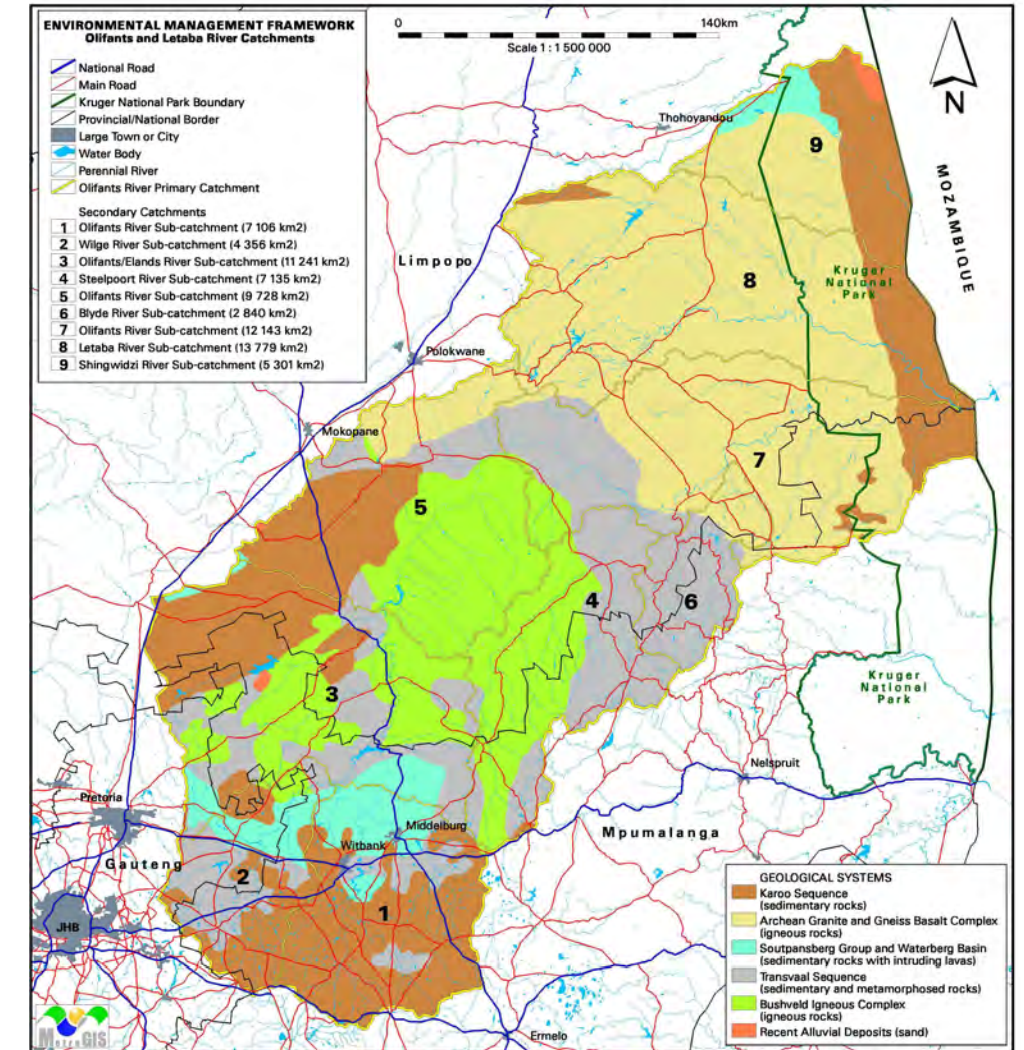


Figure 3: Geological systems



Cliff face



Photo: P. Claassen

2.2.2 Topography

The EMF area is large and the topography across the area is very varied. Parts of the Highveld, Lowveld as well as mountainous terrain can all be found. The topographical information correlates closely with the geological information.

The area contains Highveld, which is composed of undulating plains and pans. A large open flat area, referred to as the Springbok Flats. These areas are divided from the Lowveld by the escarpment, which consists of various hills and mountain terrain. The Lowveld consists mainly of plains and undulating plains.

A slope analysis of the area reveals very clearly how the escarpment divides the Highveld from the Lowveld.

2.2.3 The general occurrence of metals and minerals

According to the map of Simplified Geology, Selected Mines and Mineral Deposits of the Council for Geoscience, South Africa, Lesotho and Swaziland have, the following metals and mineral deposits occur in economically viable quantities in the Districts as indicated by Table 2.

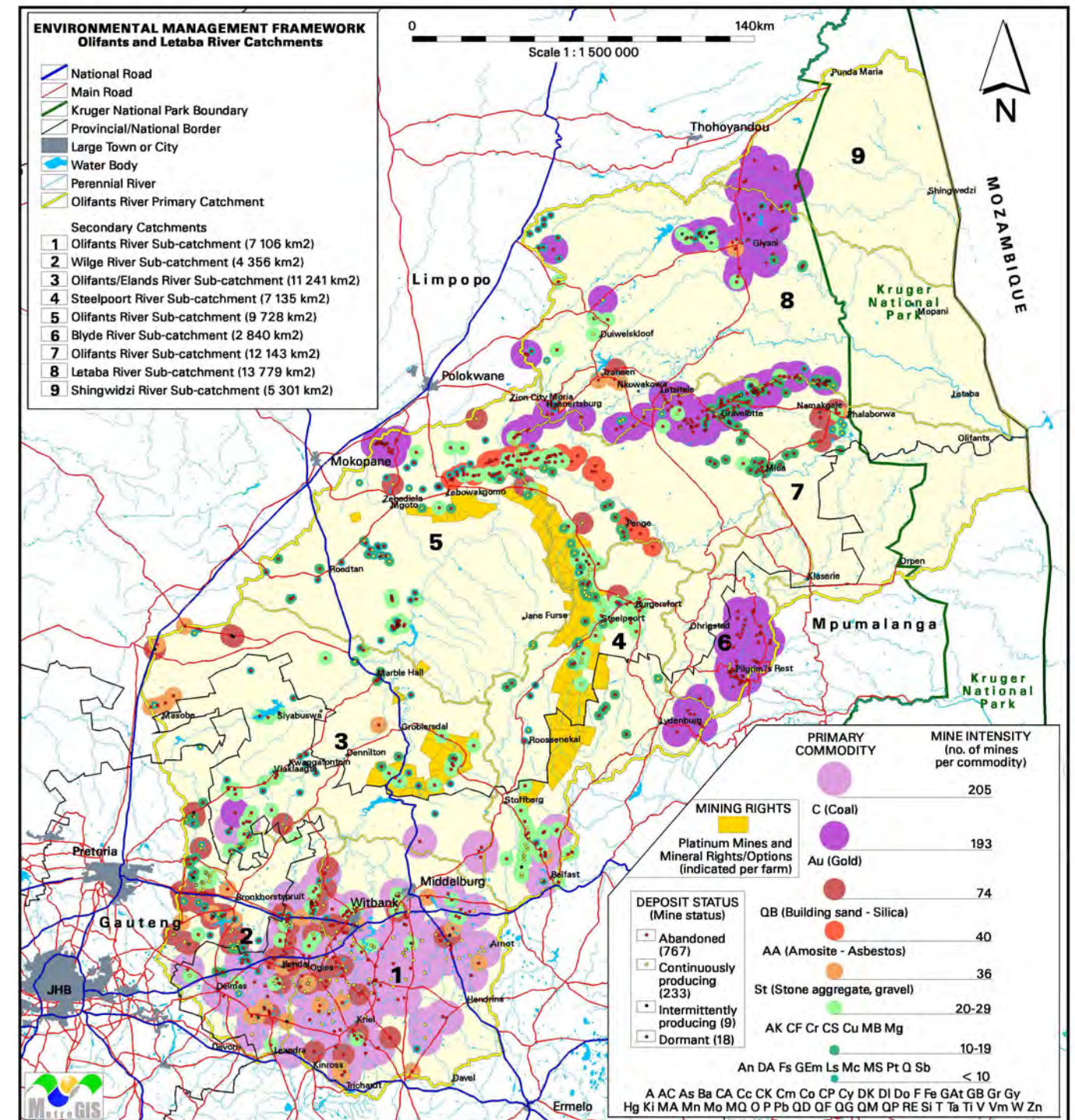
District	Metals and Minerals
Mopani District	gold; vermiculite; antimony; copper; phosphate; andalusite; and asbestos.
Vhembe District	gold; vermiculite; and phosphate.
Ehlanzeni District	gold; chromium; and copper.
Greater Sekhukhune District	platinum; chromium; vanadium; copper; iron; phosphate; and diamond (in Kimberlite).
Capricorn District	platinum; gold; copper; diamond (in Kimberlite); phosphate; and vanadium.
Waterberg District	copper; fluorspar; and zinc.
Nkangala District (the "powerhouse" of South Africa)	coal; copper; lead; and silicon.
Gert Sibande District	coal; gold; and zinc.
Metsweding District	fluorspar; manganese; diamond (in Kimberlite); and copper.

2.2.4 Issues

The issues related to the geology and topography of the EMF area are listed as follows:

- The geology and topography forms the base of which other aspects of the EMF area may be viewed;
- the lack of faults on the Highveld area around Middelburg and Witbank, means the formation of smaller rivers which form the headwaters of the Olifants and wetlands. For this same reason, the higher quality coal deposits are found in this area;
- the geological formations created protected areas, which affected certain vegetation types or isolated them, forming the basis for centres of endemism;

Figure 4: Mine intensity, commodities and mining rights for the platinum group metals



- erosion is more likely to be a problem in areas containing more clay based soils such as the Sekhukhune area, than areas that have sand based soils; and
- land formations may form the basis of areas with scenic value, such as areas in the escarpment, which may contribute to the ecotourism sector.

Figure 5: Physical geography/terrain morphological description

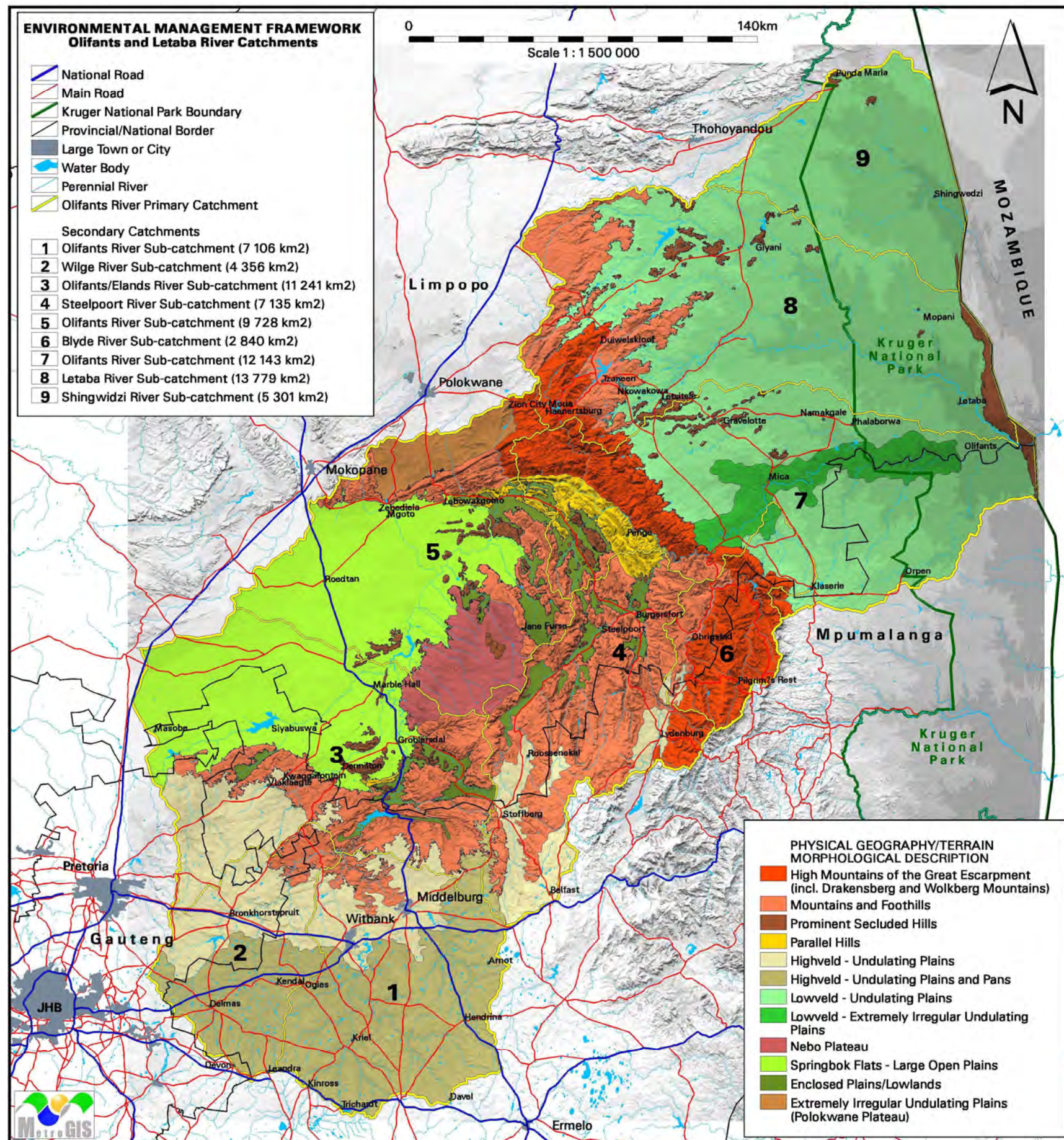
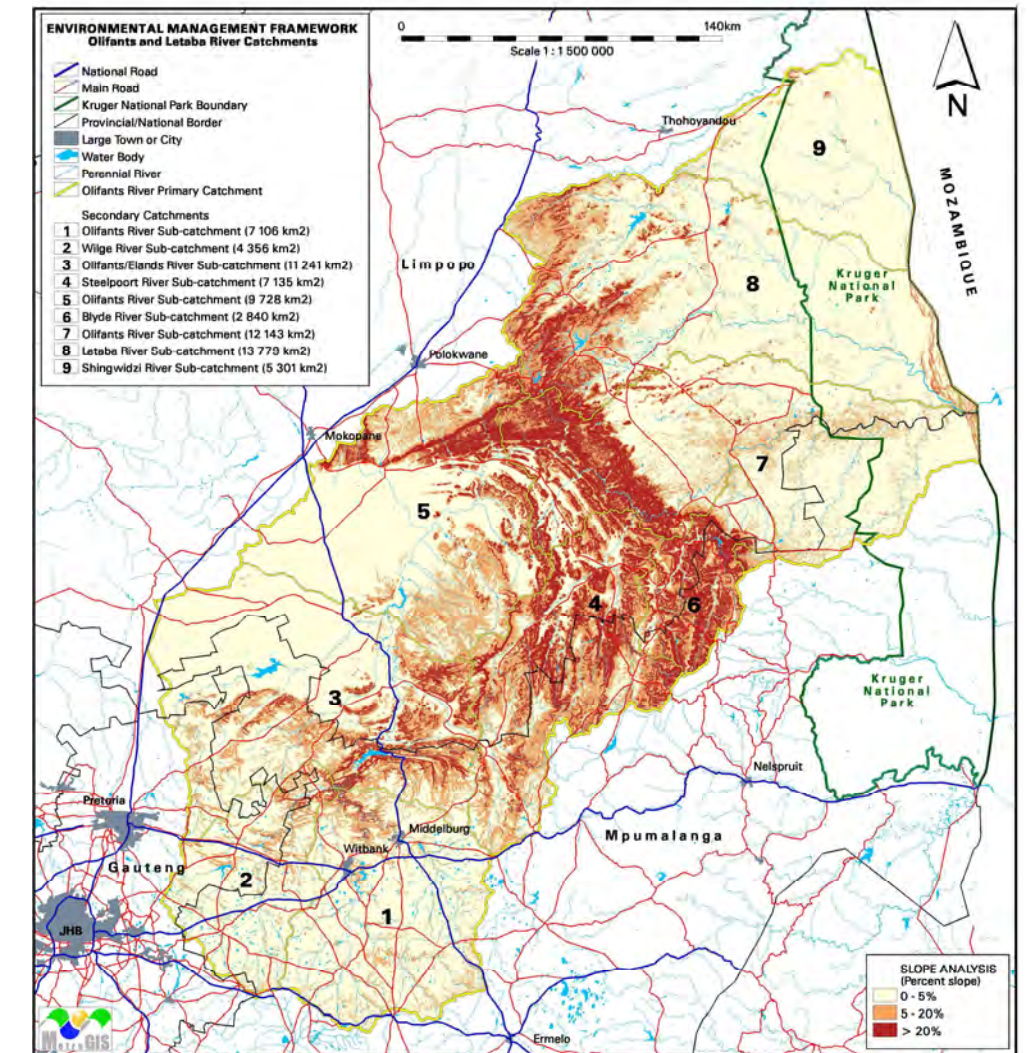


Figure 6: Slope analysis



Escarpment



Photo: S. Taljaardt

2.2.5 Soils

The soils that occur in the area are also closely related to the geology and landforms of the area. There is a wide variety of soil types distributed throughout the EMF area. The land use for various activities is dependent on the soil type.

A short summary of the different soil types found in the EMF area is listed in the table below.

SOIL DESCRIPTION	Area (km ²)	Percentage (%)
Glenrosa and/or Mispah forms (other soils may occur)- lime generally present in the entire landscape	697.01	0.95%
Glenrosa and/or Mispah forms (other soils may occur)- lime rare or absent in the entire landscape	7 601.97	10.33%
Glenrosa and/or Mispah forms (other soils may occur)- lime rare or absent in upland soils but generally present in low-lying soils	11 831.19	16.07%
Grey regic sands and other soils	126.36	0.17%
Miscellaneous land classes- rocky areas with miscellaneous soils	8 766.57	11.91%
Miscellaneous land classes- undifferentiated deep deposits	1 158.20	1.57%
Miscellaneous land classes- very rocky with little or no soils	498.33	0.68%
One or more of: vertic- melanic- red structured diagnostic horizons- undifferentiated	6 768.32	9.19%
Plinthic catena: dystrophic and/or mesotrophic; red soils not widespread- upland duplex and marginalitic soils rare	6 160.34	8.37%
Plinthic catena: dystrophic and/or mesotrophic; red soils widespread- upland duplex and marginalitic soils rare	6 974.62	9.47%
Plinthic catena: eutrophic; red soils not widespread- upland duplex and marginalitic soils rare	2 484.12	3.37%
Plinthic catena: eutrophic; red soils widespread- upland duplex and marginalitic soils rare	1 159.25	1.57%
Plinthic catena: undifferentiated- upland duplex and/or marginalitic soils common	541.70	0.74%
Prismacutanic and/or pedocutanic diagnostic horizons dominant- B horizons mainly not red	514.00	0.70%
Prismacutanic and/or pedocutanic diagnostic horizons dominant. In addition- one or more of: vertic- melanic- red structured diagnostic horizons	608.33	0.83%
Red-yellow apedal- freely drained soils- red- high base status- < 300 mm deep	335.64	0.46%
Red-yellow apedal- freely drained soils; red and yellow- dystrophic and/or mesotrophic	1 846.66	2.51%
Red-yellow apedal- freely drained soils; red and yellow- high base status- usually < 15% clay	1 378.58	1.87%
Red-yellow apedal- freely drained soils; red- dystrophic and/or mesotrophic	2 621.67	3.56%
Red-yellow apedal- freely drained soils; red- high base status- > 300 mm deep (no dunes)	11 479.37	15.59%
Red-yellow apedal- freely drained soils; yellow- dystrophic and/or mesotrophic	37.37	0.05%
No Data/Surface Water	33.39	0.05%
Total	73 622.98	100.00%

Different soils

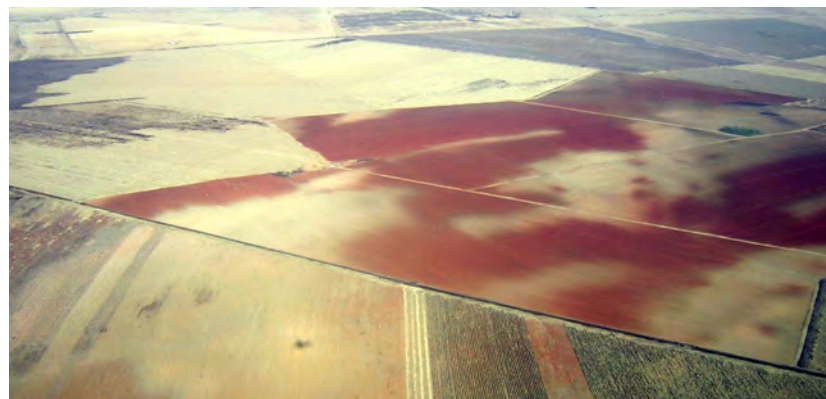


Photo: S. Taljaardt

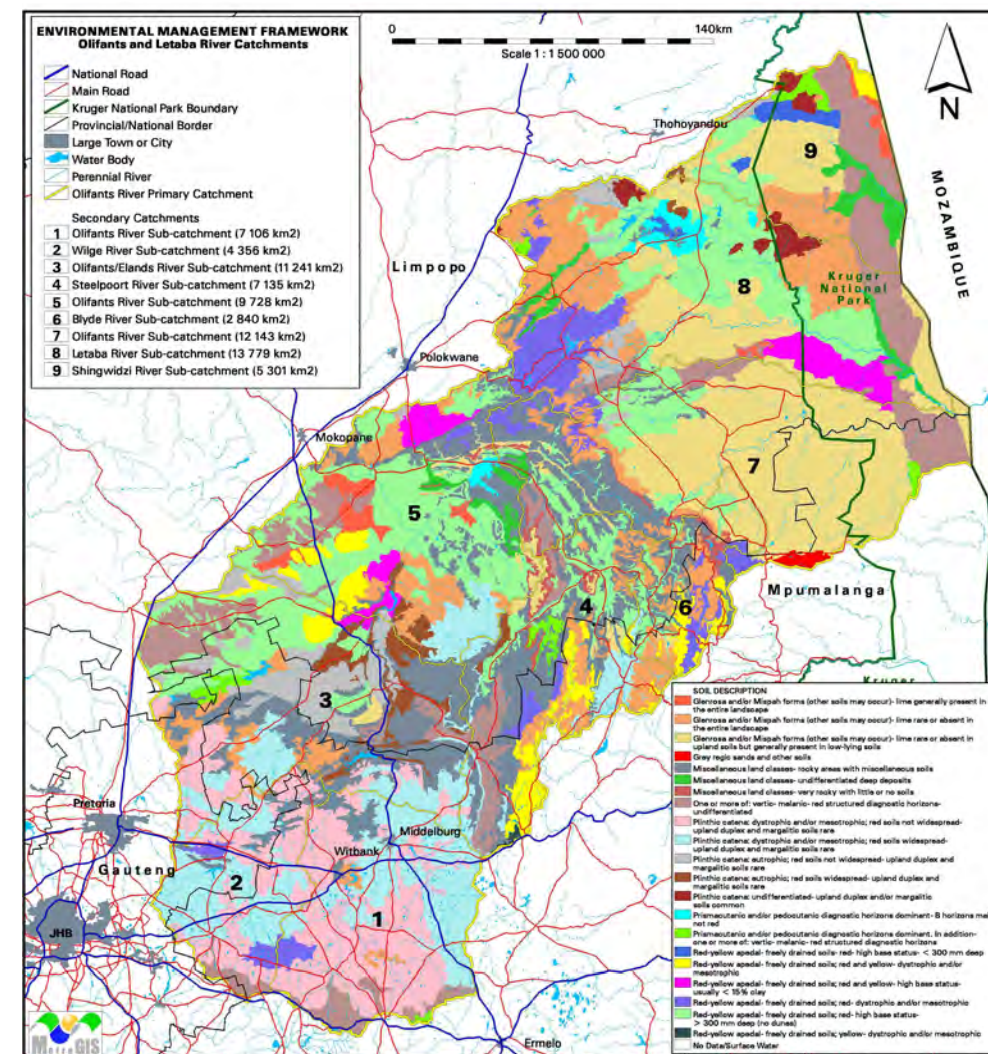
2.2.6 Soil Suitability for Agriculture

The soil type of a specific area is a large influence on the type of agricultural activities that are feasible. The following table summarises the land capability for arable agriculture in the EMF area.

Table 4: Land capability for arable agriculture

Landtype/Soil Capability Index	Surface Area in (km ²)	Percentage %
ARABLE LAND (classes below)		
2 Higher capability for arable agriculture	7255.460	9.85%
3 Medium capability for arable agriculture	17760.296	24.12%
4 Lower capability for arable agriculture	13380.454	18.17%
5 Higher capability for grazing	10122.695	13.75%
6 Medium capability for grazing	14727.933	20.00%
7 Lower capability for grazing	1081.910	1.47%
8 Wildlife	9263.952	12.58%
WATER (included in dataset)	35.850	0.05%
Total area	73628.550	100.00%
Irrigated Agriculture (agricultural field boundaries)	1571.934	

Figure 7: Soils



Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

Figure 8: Land capability for arable agriculture

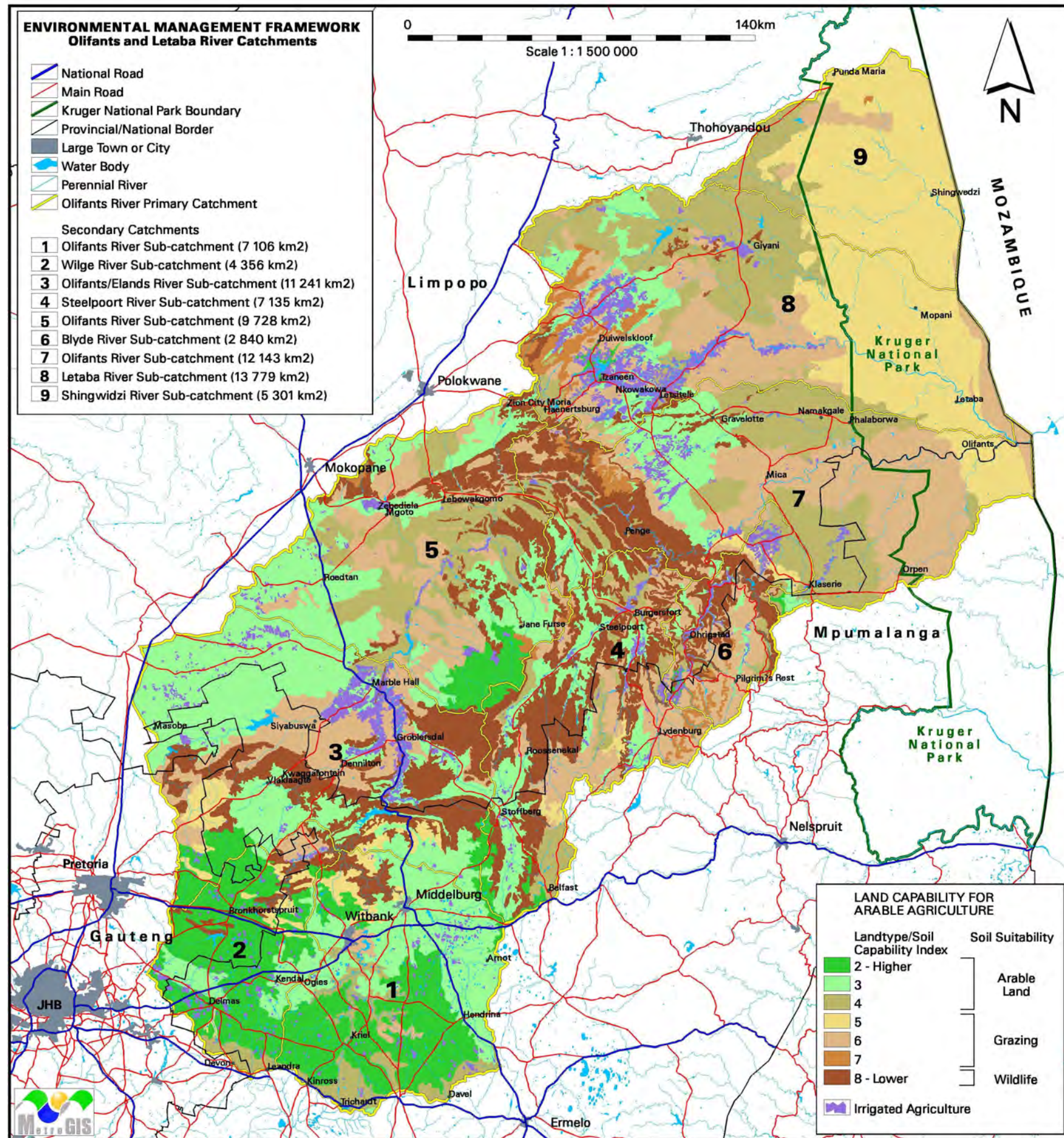


Figure 9(a): Irrigated agriculture in the Groblersdal area

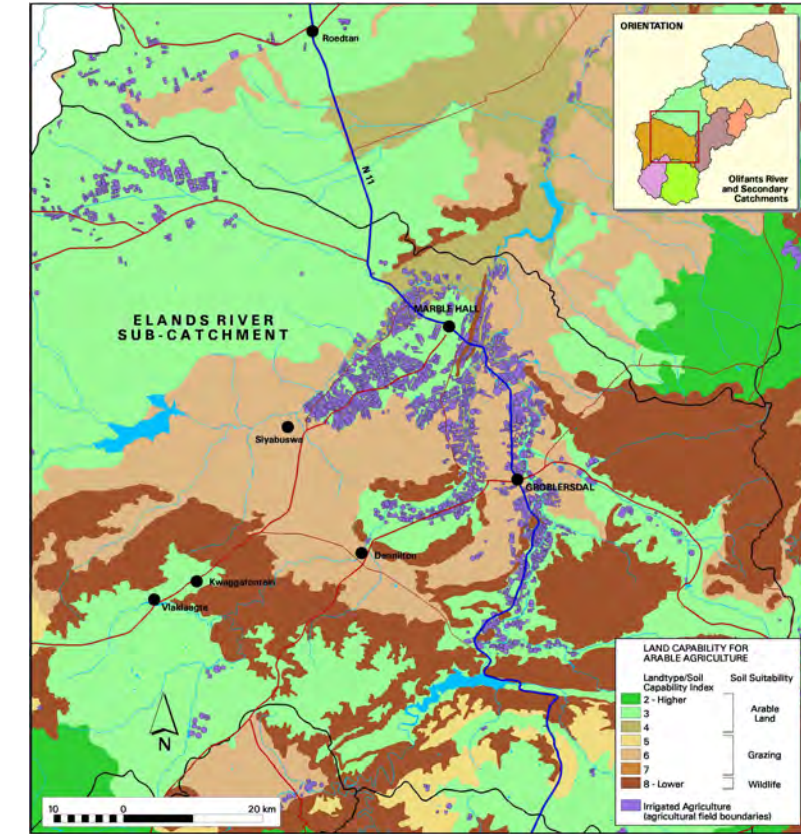
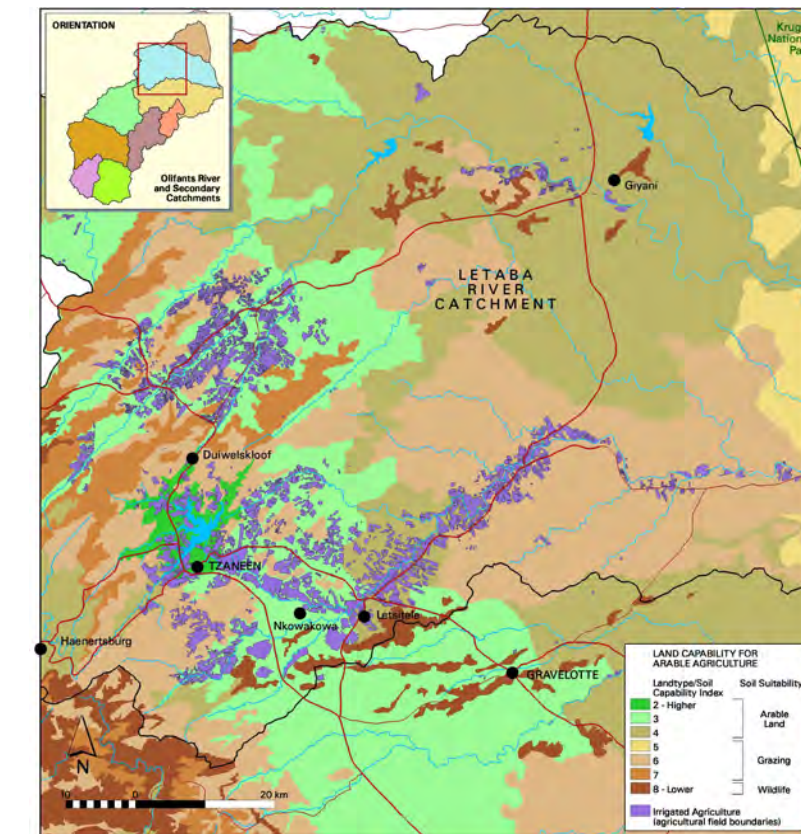


Figure 9(b): Irrigated agriculture in the Tzaneen area



2.2.7 Climate

The study area falls across four climatic regions, which include:

- The Highveld, with moderate maximum temperatures and cold winter nights, with severe frost occurring regularly;
- the Bushveld, with high maximum temperatures and cool winter nights without severe frost occurring;
- the escarpment, which partly lies in the mist belt, with moderate maximum temperatures and cool winter nights; and
- the eastern Lowveld with a hot sub-tropical climate.

The whole study area falls within the summer rainfall region. The mean annual precipitation within the study area varies greatly.

- Dry areas with 325 mm/annum to 550 mm/annum occur in parts of Sekhukhune and the northern parts of the eastern Lowveld;
- In the Highveld region and the southern part of the eastern Lowveld the rainfall varies between 550 mm/annum to 750 mm/annum;
- The escarpment receives a higher rainfall of between 750 mm/annum to 1000 mm/annum; and
- The Wolkberg area receives an annual rainfall exceeding 1000mm.

Detailed climactic information has been collated from five selected weather stations spread over the EMF area. They are Witbank, Marble Hall, Graskop, Phalaborwa and Punda Maria. The detailed information is available in the Draft Status Quo Document.

Witbank is on the Highveld and shows temperature averages accordingly. It receives around an average of 600mm/annum rainfall, placing it in the above average rainfall category. The wind speed averages for Witbank station are the highest recorded of the different stations. Marble Hall is on the edge of the Highveld and has higher average temperatures than Witbank. Rainfall is slightly less than Witbank. Wind speed is not measured at Marble Hall Station. Graskop is situated on the escarpment and as such has cooler temperatures. Graskop receives a high annual rainfall and medium wind speeds. Phalaborwa lies in the bushveld area and receives an average rainfall of around 400 mm/annum. The wind speed is medium. Punda Maria lies within the northern reaches of the Kruger National Park and falls within the Bushveld. It receives an average rainfall of around 600 mm/annum. The wind speed is medium with the winds reaching their maximum during the middle part of the day.

An overview of the tertiary catchments’ mean annual precipitation (MAP) and mean annual evaporation (MAE) reveals that Tertiary B60 and B42 receive the highest annual precipitation, which coincides with the high rainfall on the escarpment, while Tertiary B73 and B90 receives the lowest annual precipitation.

Both Tertiary B81 and B90 show a significant increase in MAE between 1990 and 2005.

Table 5: Evaporation and rainfall in the tertiary catchments of the EMF area

Tertiary catchment (refer to figure 10)	S-pan evaporation		Rainfall
	MAE WR2005 (mm)	MAE WR90 (mm)	MAP (mm)
Tertiary B11	1596	1597	687
Tertiary B12	1456	1567	695
Tertiary B20	1711	1708	522
Tertiary B31	1832	1828	596
Tertiary B32	1780	1784	644
Tertiary B41	1514	1530	658
Tertiary B42	1467	1430	727
Tertiary B51	1851	1869	557
Tertiary B52	1851	1813	548
Tertiary B60	1400	1419	824
Tertiary B71	1566	1562	686
Tertiary B72	1549	1573	563
Tertiary B73	1486	1491	465
Tertiary B81	2077	1585	684
Tertiary B82	1611	1619	609
Tertiary B83	1797	1802	544
Tertiary B90	2817	1708	502

The influence of topography on the mean annual runoff is very clear as the areas with the most runoff coinciding with the escarpment.

2.2.8 Issues

- The Highveld around Witbank and Middelburg area where major coal mining activity takes place and several large power stations are situated is an area with climatic conditions, which prevent the dispersal air pollution generated by these activities, therefore the pollution is retained in the air of the area; and
- this same area which forms the headwaters of the Olifants River, receives reasonably high rain and the resulting runoff from the mining activities in the area lead to pollution of the river.

Rain clouds

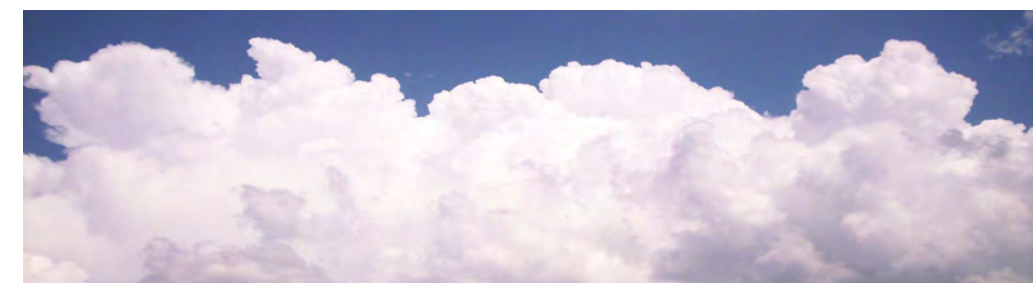


Photo: S. Taljaardt

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

Figure 10: Rainfall

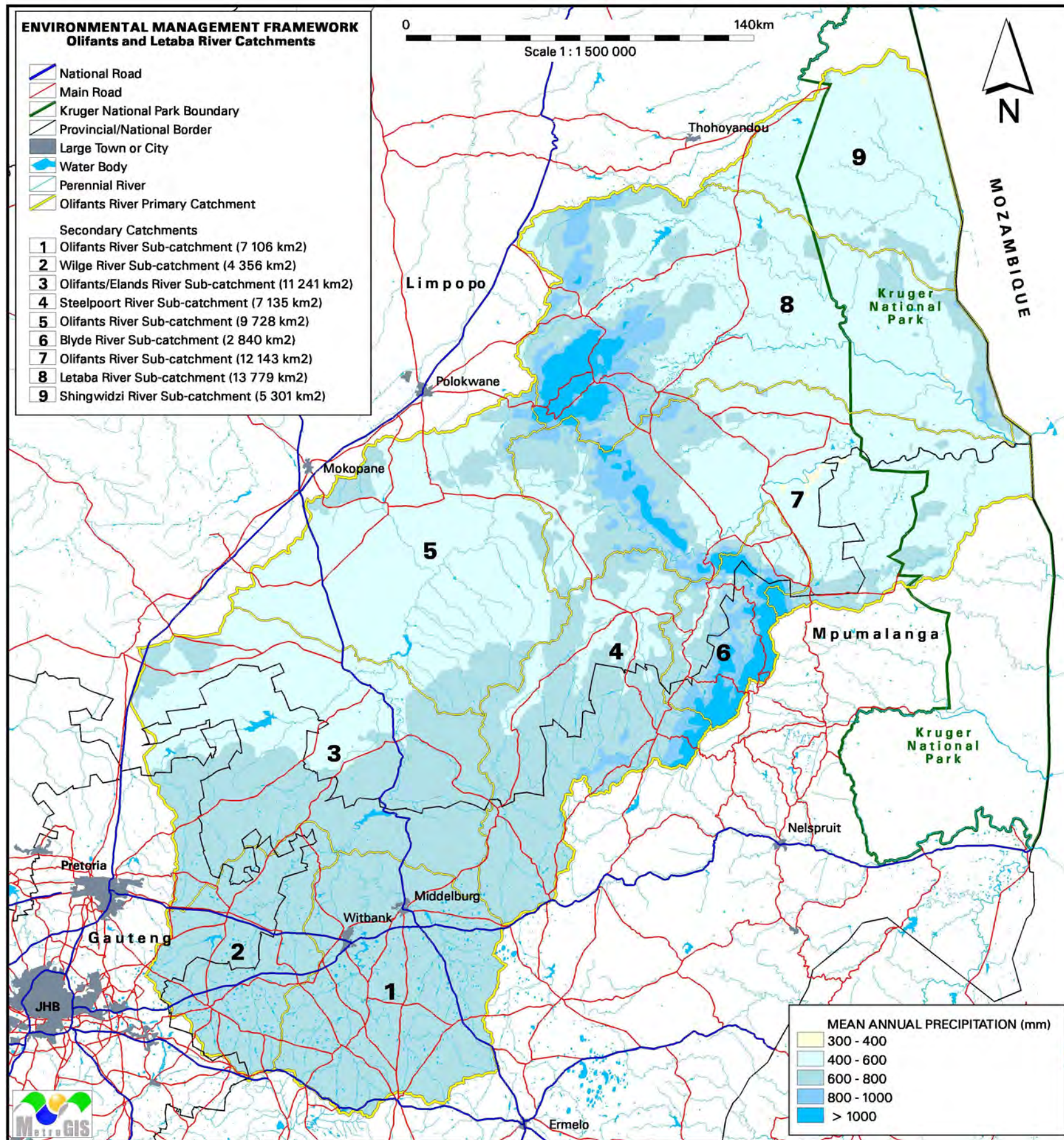
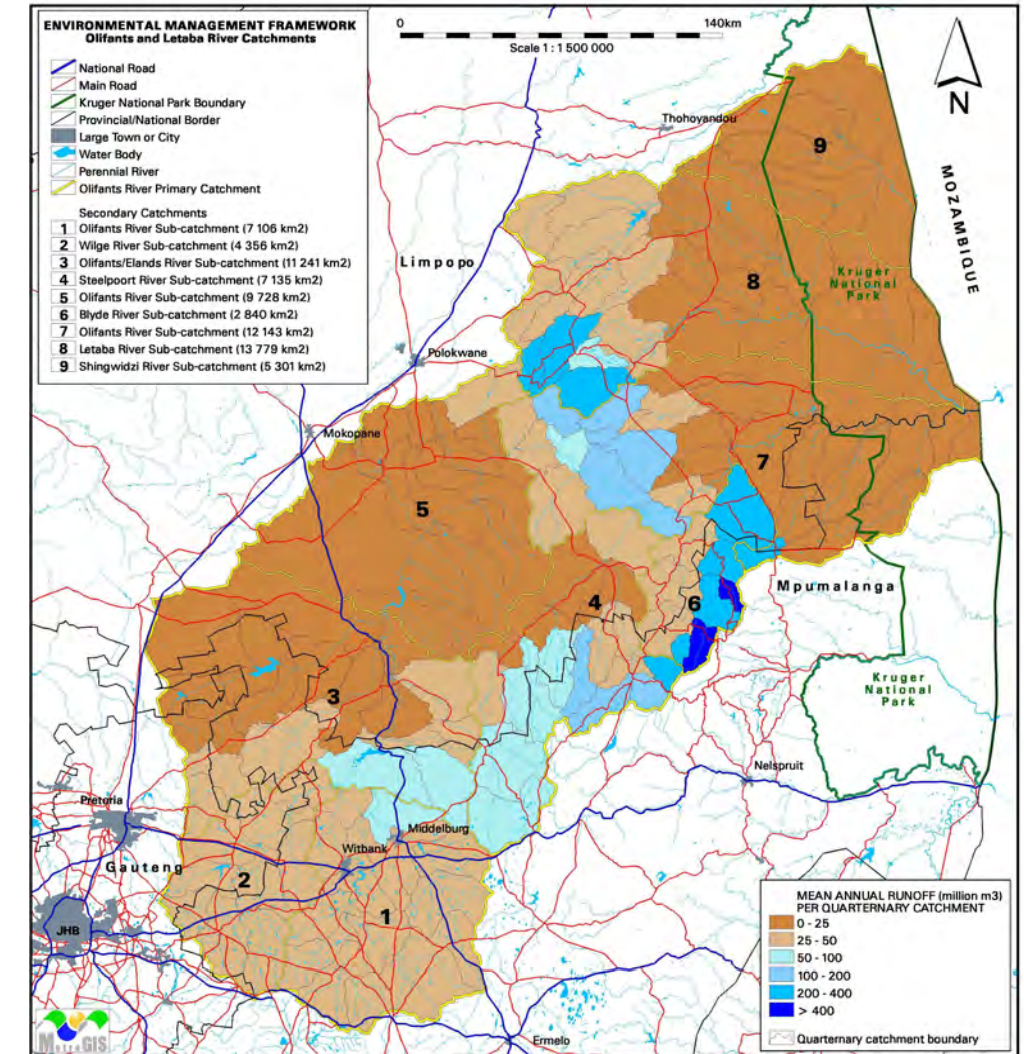


Figure 11: Runoff



Waterfall



Photo: S. Johnston

2.2.9 Hydrology

The Olifants River catchment (including the Letaba and Shingwedzi catchments) is a sub-catchment of the Limpopo Basin and is the largest tributary of the Limpopo River. The Olifants River runs a long course from the Highveld across varying terrain and geology to meet with the Limpopo River in Mozambique. The rivers in the EMF area have been extensively dammed and there are also places with major irrigation schemes. Part of the area has extensive groundwater resources, which are currently being utilised by rural communities.

The headwater of the Olifants River rises on the continental divide and flows northward. The character of the river here is generally that of an open valley, narrowing and deepening as the river cuts through harder sandstones. The gradient is fairly gentle in this part of the course from Davel to the railway bridge east of Witbank.

The river enters the second part of its course from here, where the character of the river changes. The Olifants valley becomes narrower and increasingly takes on the character of a gorge, and due to the drop to the Bushveld Basin, the gradient of the river rapidly increases northwards towards the Loskop Dam.

In the lower part of its course through the Waterberg Formation the river winds into a deep gorge. It is an example of a superimposed river with deeply incised meanders. Before it reaches the Loskop Dam, the Olifants River is joined by the Wilge River. The Wilge River rises in the main dolerite watershed near Leslie. To the east of Bronkhorstspuit, at the old Premier Mine Dam, the Wilge River enters the Waterberg Formation and, like the Olifants, cuts a valley which deepens and becomes increasingly narrower in a northern direction. When it emerges from this gorge the stream flows through open granite country and then plunges again into the plateau to join the parent stream. Some distance below the confluence of the Wilge and Olifants Rivers, the main river is dammed at Loskop.

From this point the valley gradually widens, and terraces of alluvium on the left bank of the main stream, as well as in the tributary valleys of the Moses and Elands Rivers, are irrigated from the long channel leading from the Loskop Dam. A distributary weir at Herefort also supplies the lower lands near the river course with water. The river flows northwards through the flattest part of the Bushveld Basin, which lies mostly to the west of its course, while to the east the surface rises rather steeply to the Bushveld granite country of the Pokwani Highveld, culminating in the Sekhukuni Mountains.

The western part of the Olifants valley is demarcated very indifferently from the Nyl basin, whereas the eastern part of the basin, is effectively bordered by the Pokwani plateau. The river course flows transverse to the ridges of the eastern Bakenveld and transects many mountain ranges, including the Drakensberg itself.

Several tributaries join the Olifants in the transverse zone. From the north of the Strydpoort in the Chunies Mountains come the Zebediela, Chunies, Mphatlele, Malips and Mithlipitsi Rivers. The sources of the first four of these streams are on the granite not far from the Chunies Mountains and their headwaters have hollowed out catchment basins of considerable size north of the range.

In the middle and lower part of its course the Steelpoort has cut a wide and deep valley, oblique in direction to the trend of the main ridges of the Eastern Bankenveld. The same is true of the Spekboom River and its tributary, the Waterval River. Parts of their courses are parallel to the structural ridges and wide valleys are formed in the softer shales. Other parts of their courses lie behind the ridges and deep gorge like chasms take the place of the wide, flat-floored moat-like valley in shales. The gorge type is most perfectly developed in the middle and lower course of the Blyde River where the stream has cut a canyon some 90m deep in Black Reef Quartzite before escaping to the open granite country where it joins the Olifants.

At Olifantspoort, the Olifants begins the last stage of its course to join the Limpopo in Mozambique. The river winds its way over the somewhat uneven surface of the Lowveld plain. The most significant tributary to join the Olifants in this section is the Letaba River that joins it close to the Mozambique border in the Kruger National Park, a few kilometres from the Massingir Dam. The Letaba River with its two main tributaries, the Groot Letaba and Klein Letaba Rivers drains the northern part of the eastern lowveld plain. The Shingwedzi River that drains the plain below the Soutpansberg joins the “Elephanties” a few kilometres below the Massingir Dam before the main river joins the Limpopo River at Estivana.

The rivers in the EMF area have been dammed extensively and major irrigation schemes occur in the

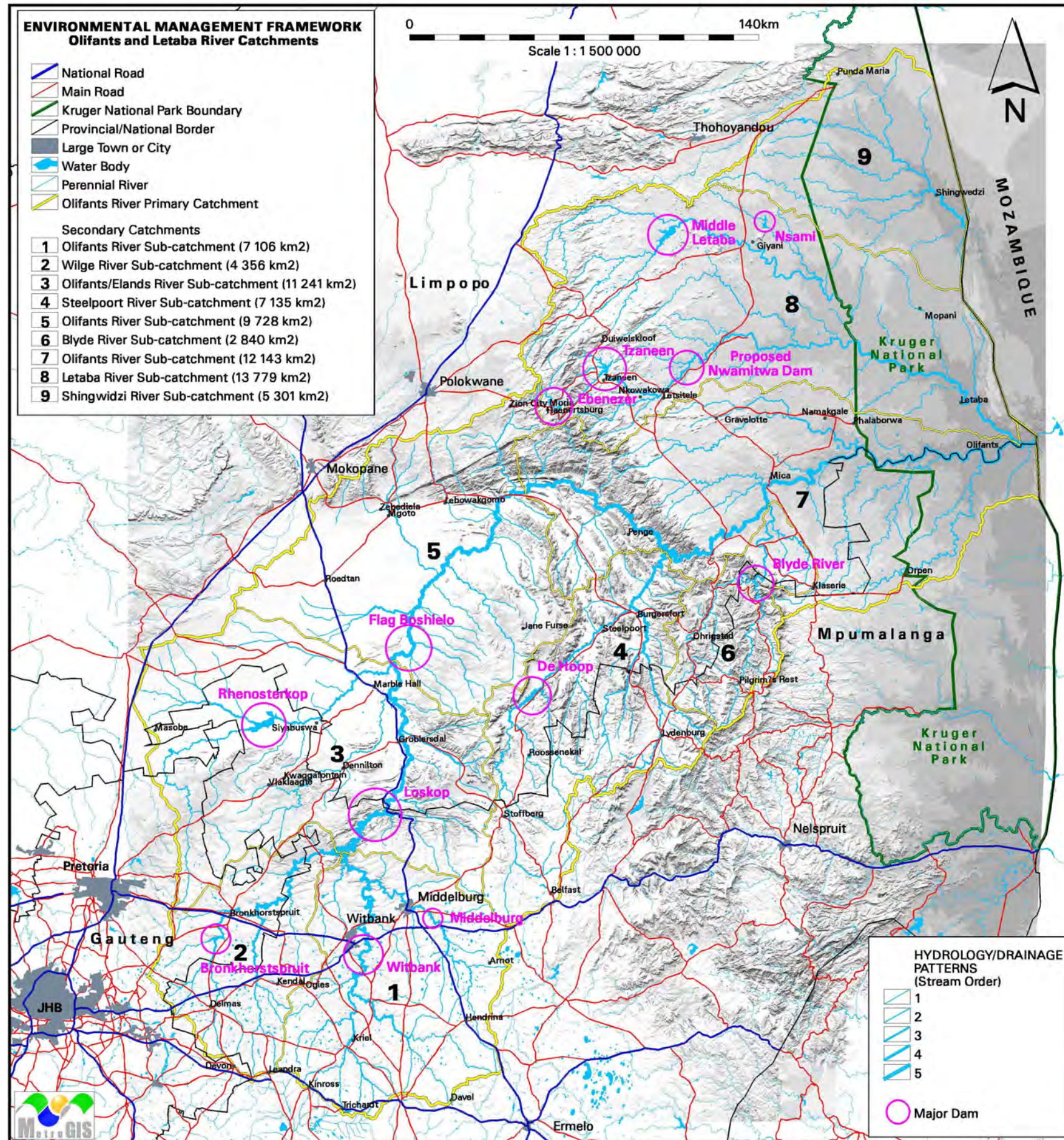
Loskop Dam



Photo: E. Chembeya

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Area

Figure 12: Rivers and major dams



Groblersdal/Marble Hall and the Tzaneen areas. Major dams in the Olifants River Catchment include:

- The Bronkhorstspuit Dam;
- the Witbank Dam;
- the Middelburg Dam;
- the Loskop Dam;
- the Rhenosterkop Dam;
- the Flag Boshelo Dam;
- the De Hoop Dam (under construction); and
- the Blyde River Dam.

Major dams in the Letaba River Catchment include:

- The Ebenezer Dam;
- the Tzaneen Dam;
- the Middle Letaba Dam; and
- the Nsami Dam.

A number of smaller dams also occur in both catchments.

The Shingwedzi River Catchment is non-perennial and no major dams are located in it.

With the exception of the Highveld and parts of the escarpment, the area has significant ground water resources. Groundwater is stored within surface layers of the earth and is therefore available for use where it occurs.

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Area

Table 6: Factors that have a significant impact on the production of water in the EMF area catchments

Tertiary catchments	Catchment area		Forestry area (km ²)	Alien veg. area (km ²)	Irrigation area (km ²)	Farm dams area (km ²)	volume (mcm)
	Gross (km ²)	Net (km ²)					
Tertiary B11	4714	4380.8	15.90	116.26	54.99	32.82	86.13
Tertiary B12	2391	2150.3	20.3	12.7	46.366	16.33	45.65
Tertiary B20	4356	4260.4	30.5	78.8	77.41	16.2	27.34
Tertiary B31	6148	4900	29.4	222.5	171.4	20.27	9.88
Tertiary B32	4293	4293	0	0	342.31	9.4	37.69
Tertiary B41	5043	5043	54.7	0	37.21	0.4	1.38
Tertiary B42	2093	2093	7.6	0	39.01	0	0
Tertiary B51	6170	3916	0	0	81.24	3.6	14.81
Tertiary B52	3558	3558	27.4	0	3.25	4.07	14.91
Tertiary B60	2843	2843	148.2	257.12	129.24	1.48	6.61
Tertiary B71	3007.8	3007.8	12.9	0	23.13	1.18	3.2
Tertiary B72	4464	4464	0	1.7	66.67	2.64	11.21
Tertiary B73	4652	4652	20.1	11.1	7.64	1.32	3.84
Tertiary B81	4952	4957.3	530.4	0	58.33	6.47	27.41
Tertiary B82	6213	5453	126.4	0	38.44	5.43	35.87
Tertiary B83	3264	3167	0	0	0	0	0
Tertiary B90	5310	5113	2.9	0	0	0	0

Table 7: Naturalised flow (1920-2004) in tertiary flows

Tertiary catchments	COMPARISON OF MAR AGAINST WR90		
	MAR ¹ (WR90) Net (mcm)	MAR (WR2005) Net (mcm)	Change in MAR (percent)
Tertiary B11	175.9	222.9	26.7
Tertiary B12	81.6	95.12	16.6
Tertiary B20	166.9	174.84	4.8
Tertiary B31	75.4	84.1	11.5
Tertiary B32	123.8	99.8	-19.4
Tertiary B41	233	193.78	-16.8
Tertiary B42	164.9	148.97	-9.7
Tertiary B51	46.6	25.3	-45.7
Tertiary B52	59.6	57.99	-2.7
Tertiary B60	402.5	385.69	-4.2
Tertiary B71	202.4	179.99	-11.1
Tertiary B72	137.4	129.76	-5.6
Tertiary B73	78.8	85.83	8.9
Tertiary B81	380.9	430.74	13.1
Tertiary B82	151.9	163.42	7.6
Tertiary B83	41.3	51.17	23.9
Tertiary B90	86.5	84.4	-2.4

¹ MAR means mean annual runoff.

Table 8: Naturalised flow (1920-2004) quaternary catchments with significant declines

Quaternary catchments	COMPARISON OF MAR AGAINST WR90		
	MAR (WR90) Net (mcm)	MAR (WR2005) Net (mcm)	Change in MAR (percent)
Total B20 A & B	33.5	39.45	-12.9
B20C	13.9	13.06	-6
B20E	21	19.28	-8.2
B32A	41.4	35.41	-14.5
B32B	31.3	26.19	-16.3
B32C	11	9.88	-10.2
B32D	11.8	8.1	-31.4
B32E	6.9	4.17	-39.6
B32F	19.4	12.98	-33.1
B32G	24.9	22.37	-10.2
B32H	14	13.17	-5.9
B32J	4.5	2.94	-34.7
B41A	49.5	41.97	-15.2
B41B	48.2	40.55	-15.9
B41C	17.8	14.84	-16.6
B41E	4.2	3.57	-15
B41F	28	17.34	-38.1
B41G (total)	29.1	24.48	-15.9
B41H	7.4	6.32	-14.6
B41J	15.2	13.3	-12.5
B41K	17	15.33	-9.8
B42B (total)	33.4	29.48	-11.7
B42C	8.2	6.54	-20.2
B42D	34.6	28.03	-19
B42E	5.8	5.25	-9.5
B42G	10.6	9.42	-11.1
B42H	9.2	7.98	-13.3
B51A	5.3	2.76	-47.9
B51B	7.9	4.13	-47.7
B51C	6.2	3.29	-46.9
B51E	4.6	2.71	-41.1
B51F	6.4	3.75	-41.4
B51G	7.1	3.95	-44.4
B51H	9.1	4.71	-48.2
B52B	8.9	8.43	-5.3
B60A	92.6	87.14	-5.9
B60B	105.5	96.64	-8.4
B81A	63.9	56.89	-11
B81B (total)	155.6	144.05	-7.4
B81E (total)	29.5	19.59	-33.6
B82A	23.2	17.32	-25.3
B82B	18.1	14.29	-21
B82C	14.2	11.16	-21.4
B82D	16.5	13.22	-19.9
B82E	13.6	12.03	-11.5
B83B	8.6	5.98	-30.5
B90A	6.5	5.07	-22
B90C	9	2.09	-76.8
B90D	5.3	1.1	-79.2
B90E	5.1	1	-80.4
B90G	15.5	10.83	-30.1
B90H (total)	16.2	15.02	-7.3

Figure 13: Principal groundwater occurrence

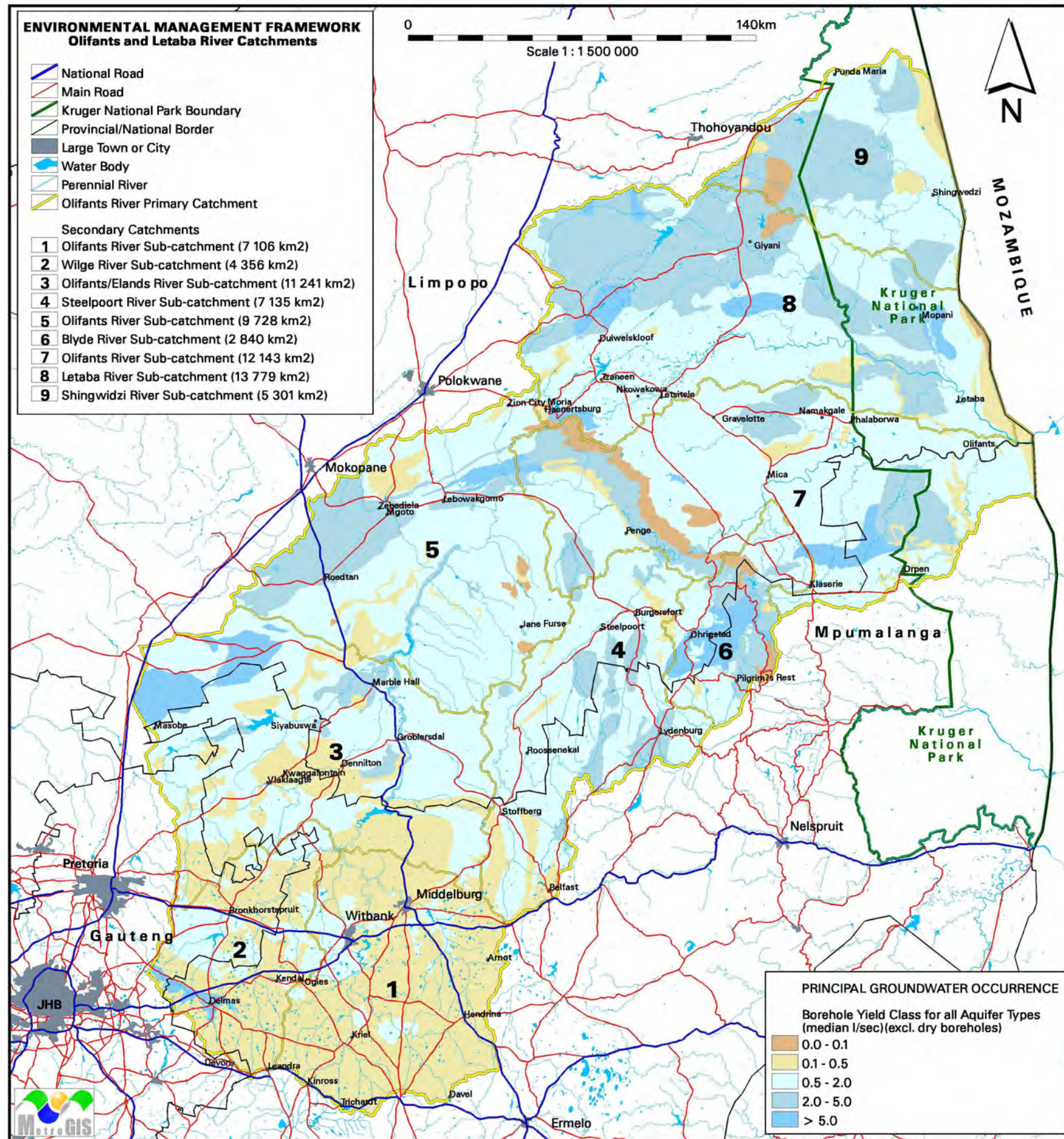
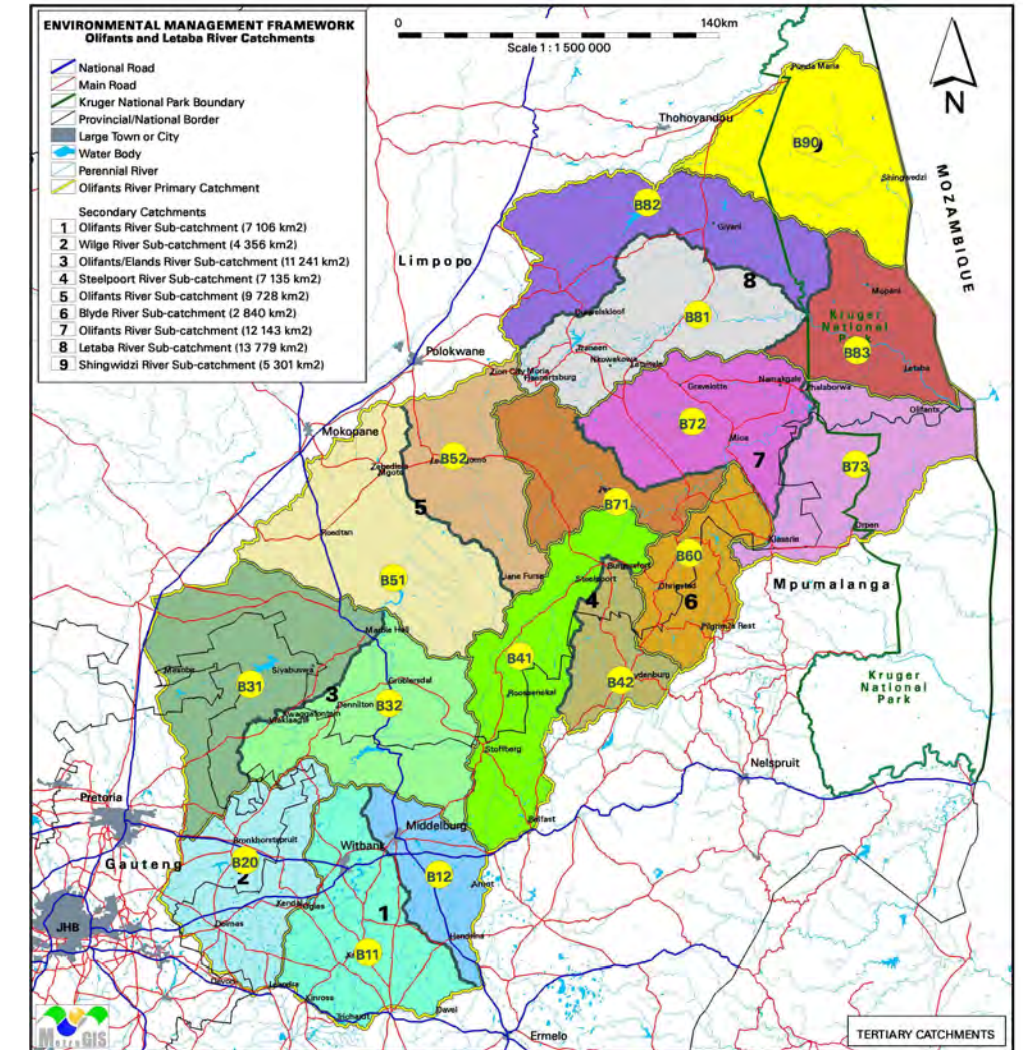


Figure 14: Tertiary catchment areas



Blyde River



Photo: S. Johnston

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

2.2.10 Water Quality

The water quality for the EMF area is summarised in the Table below. Significant and volumes of information in respect to the ecological water requirement of the system is available in a number of DWA documents that will be appended to the EMF documentation (on DVD). The most important findings are listed below:

Table 9: Water quality of river reaches in the Olifants River catchment

Upper Olifants

River reach-delineated by segment numbers	Description	Comments
Olifants 1-8	Olifants river from its source to the confluence with the Steenkoolspruit.	The upper reaches of the Olifants River are relatively undisturbed with dry land Agriculture being the main land-use and some coal mining at the bottom, end of the reach. Reference site : B1H006Q01 PES site: B1H018Q01
Olifants 9-13	Olifants river from the Steenkoolspruit confluence to the inflow into Witbank Dam	This reach of the Olifants is highly impacted by coal mining and power generation activities in the catchment it flows through as well as poor quality water in the Steenkoolspruit. Reference site : B1H018Q01 PES site: B1H005Q01
Olifants 14-27	Olifants River downstream of Witbank Dam to the Klipspruit confluence	This river reach is negatively impacted by water from the Spookspruit (due to coal mining activities) and the Klein Olifants River. There are no routine DWAF monitoring stations in this reach which can be used to assess the PES.
Olifants 28	Olifants River from the Klipspruit confluence to Wilge River confluence.	This river reach is negatively impacted by the poor water quality in the Klipspruit (due to old coal mining activities). There are no routine DWAF monitoring stations in this reach which can be used to assess the PES.
Olifants 29-37	Olifants from the Wilge River confluence to the inflow into Loskop Dam	This reach is positively impacted by good water quality in the Wilge river. There are no routine DWAF monitoring stations in this reach which can be used to assess the PES although the water quality in the Loskop dam was used to estimate the PES
Klein Olifants 1-4	Klein Olifants upstream of Middleburg Dam	The Klein Olifants river is highly affected by coal mining and power generation activities in its catchment. Reference site : B1H026Q01 PES site: B1H012Q01
Klein Olifants 5-12	Klein Olifants from downstream Middleburg dam to the confluence with the Olifants river	There are no routine DWAF monitoring stations in this reach which can be used to assess the PES and the weir downstream of Middleburg Dam was used for this purpose. Reference site : B1H026Q01 PES site: B1H015Q01
Wilge 1-6	Bronkhorstspruit from Bronkhorstspruit Dam to Premier Mine Dam	This reach is relatively un-impacted and agriculture is the main land- use activity Minor treated domestic sewage discharges at Bronkhorstspruit. Reference site : B2H007Q01 PES site: B2H003Q01
Wilge 7-20	Wilge River from the Premier Mine Dam to the confluence with the Olifants river	This reach of the Wilge River is in good conditions. The main land-use is agriculture. Reference site : B2H014Q01 PES site: B2H015Q01

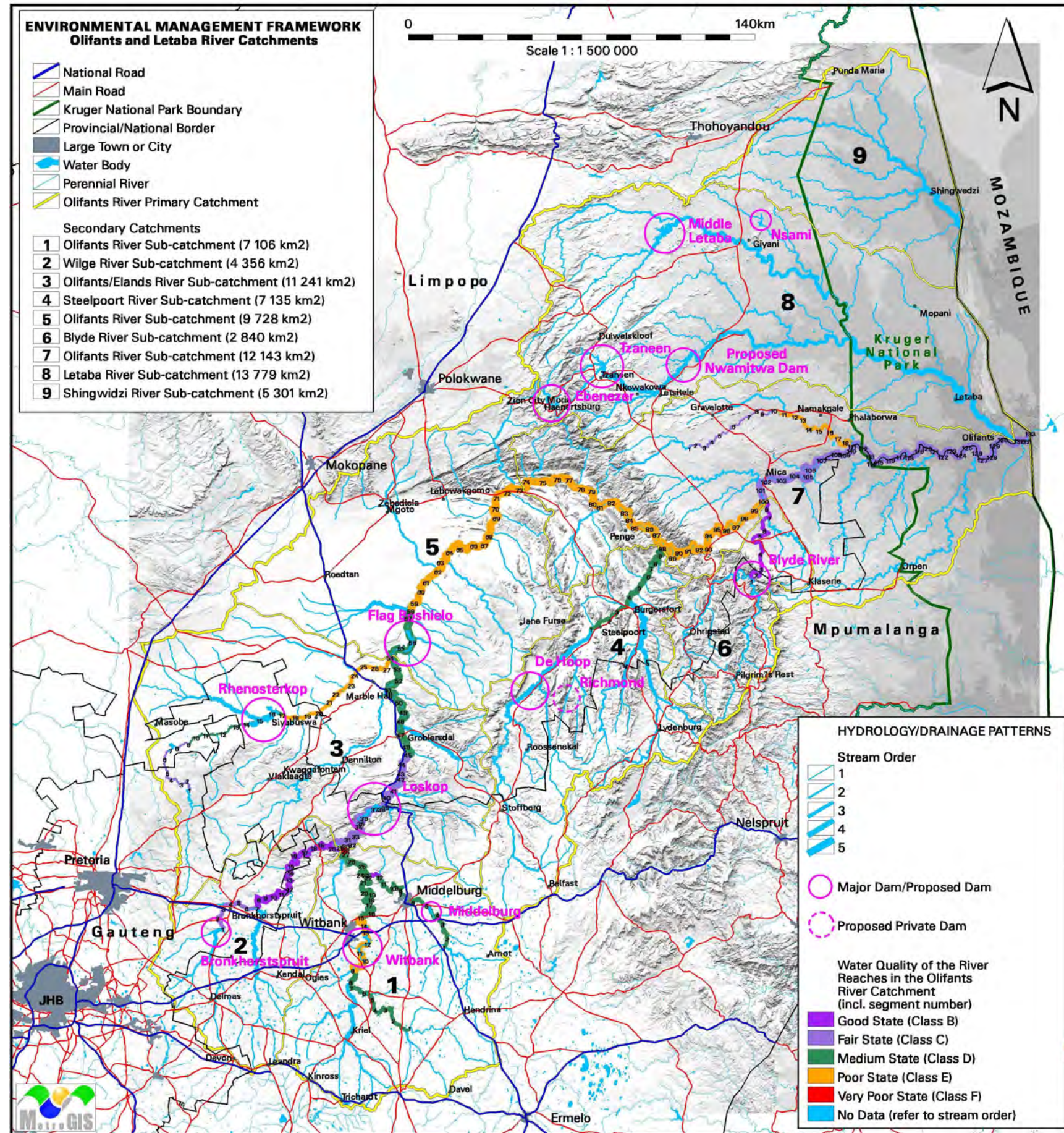
Middle Olifants

River Segments	Descriptions	Comments
Olifants 39-57	Olifants River from Loskop Dam to Arabie Dam	This reach of the Olifants river is highly impacted by irrigation activities at the Loskop irrigation Scheme as well as the Moses and Elands Rivers which will also receive irrigation return flows Reference site : B3H015Q01 PES site: B3H001Q01
Olifants 58-84	Olifants River from Arabie Dam to Segment 84 downstream of Mohlapitse confluence	This Reach of the Olifants has the worst water quality. It is probably the result of irrigation return flows, poor land use practices adding substantial suspended sediment loads and evaporation losses concentrating salts in the river Reference site : B5H004Q01 PES site: B5H002Q01
Elands 1-15	Elands river from source to inflow into Rhenosterkop Dam	The upper Elands is in a moderately good condition with irrigation return flows, Below rust de Winter dam adding some salts to the system Reference site : B3H014Q01 PES site: B3H010R01
Elands 16-27	Elands river from downstream of Rhenosterkop Dam to the Confluence with the Olifants River	The lower Elands is highly impacted by irrigation return flows from the Loskop irrigation Scheme (Which Drains to the Olifants and Elands Rivers and Semi urban development at Siyabuswa. Reference site : B3H008Q01 PES site: B3H004Q01

Lower Olifants

River Segments	Descriptions	Comments
Olifants 85-99	Olifants river from Segment 84 to Blyde River confluence	This reach of the Olifants river is mostly affected by water quality in the Steelpoort River Reference site : B5H004Q01 PES site: B7H009Q01
Olifants 100-110	Olifants river from the Blyde River confluence To Selati River confluence to Selati River confluence	The Blyde River improves water quality in this reach of the Olifants Rive, Especially during the low Flow months. Reference site : B7H009Q01 PES site: B7R002Q01
Olifants 111-132	Olifants river from the Selati Confluence to Downstream border in the Kruger National Park	This reach of the Olifants river is negatively impacted by poor water quality in the Selati River as a result of Mining Activities at Phalaborwa. Reference site : B7H002Q01 PES site: B7H018Q01
Steelpoort 1-8	The whole of the Steelpoort River	Water quality in the Steelpoort river is affected by mining activities in the Steelpoort area and irrigation activities in Spekboom Catchment in the Burgersfort area Reference site : B4H007Q01 PES site: B4H011Q01
Blyde 1-8	The whole of the Blyde River	Water quality in the Blyde river is generally good and it has a positive impact on the Olifants River. Reference site : B6H001Q01 PES site: B6H004Q01
Selati 1-9	Upper Selati River from its source to Selati Ranch	Water quality in the upper Selati river is generally good. Irrigation is a major water use in this part of the catchments which has made a moderate impact on water quality. Reference site : B7H002Q01 PES site: B7H009Q01
Selati 10-18	Lower Selati river from Selati ranch to the confluence with the Olifants River	Water Quality in the bottom end of the Selati river is very poor as a result of water discharges from slimes of Dams and domestic effluents discharges in the Phalaborwa area. It has a large negative impact on the Olifants river water quality Reference site : B7H002Q01 PES site: B7H019Q01

Figure 15: Olifants River segments



Polluted Stream



Photo: P. Claassen

Return Flow Channel



Photo: P. Claassen

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Area

2.2.11 Issues

- Water is a natural resource subject to natural fluctuations and therefore its availability is not always guaranteed or constant;
- the impact of climate change is uncertain and it is likely that the seasonal variations as well as variations between wet and dry periods may also become more pronounced and severe;
- most rural communities in the area, more than two million people, depend on groundwater resources for their basic water needs;
- on the Springbok Flats, ground water resources are also used for irrigation farming;
- surface water is relatively unusable in rivers and streams, it has to be dammed to make it useful;
- dams do not increase the volume of water in the system but allows for the storage and the distribution management of water as well as the evening out of supply between seasons and to a certain extent also between wet and dry periods;
- a dam that is not properly managed restricts the natural flow of water and impacts on the availability of water in the system as a whole because it retains significant portions of the flow, especially in dryer periods;
- smaller dams have a significant impact because they most often are not built to the same standards and specifications as the bigger dams;
- the only remaining viable dam sites on the Olifants and Letaba Rivers, namely Rooipoort and Nwamita respectively, do not seem feasible economically or in terms of water quantity deliverable;
- the water resource in the EMF area is already over allocated;
- the ecological reserve requirements of the EMF area as a whole and of most rivers and streams that constitute it are not being met and any further allocation of water must come from the redistribution of existing water allocations;
- one method of increasing the volume of available water is to import water from external sources, but this will prove very costly and will have to be taken into account fully in the valuation of projected future economic contributions of the various sectors as well as in the determination of the viability of proposed activities in the area;
- water is already imported into the area from the Vaal catchment to supply the needs of the ESKOM coal fired power stations and mines in the Highveld area and it is likely that once the mines are depleted and the power stations closed down this water will be reallocated to other areas; and

- the water volume in the system will become even less than what it is at present.

Island in the Letaba River



Photo: S. Taljaardt

Catch of the day



Photo: P. Claassen

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Area

Dam with settlement



Photo: P. Claassen

Untreated water being released into the natural system



Photo: E. Chembeya

Bronkhorstspuit Dam



Photo: P. Claassen

Stand pipe



Photo: P. Claassen

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

2.3 THE BIOLOGICAL ENVIRONMENT

2.3.1 VEGETATION

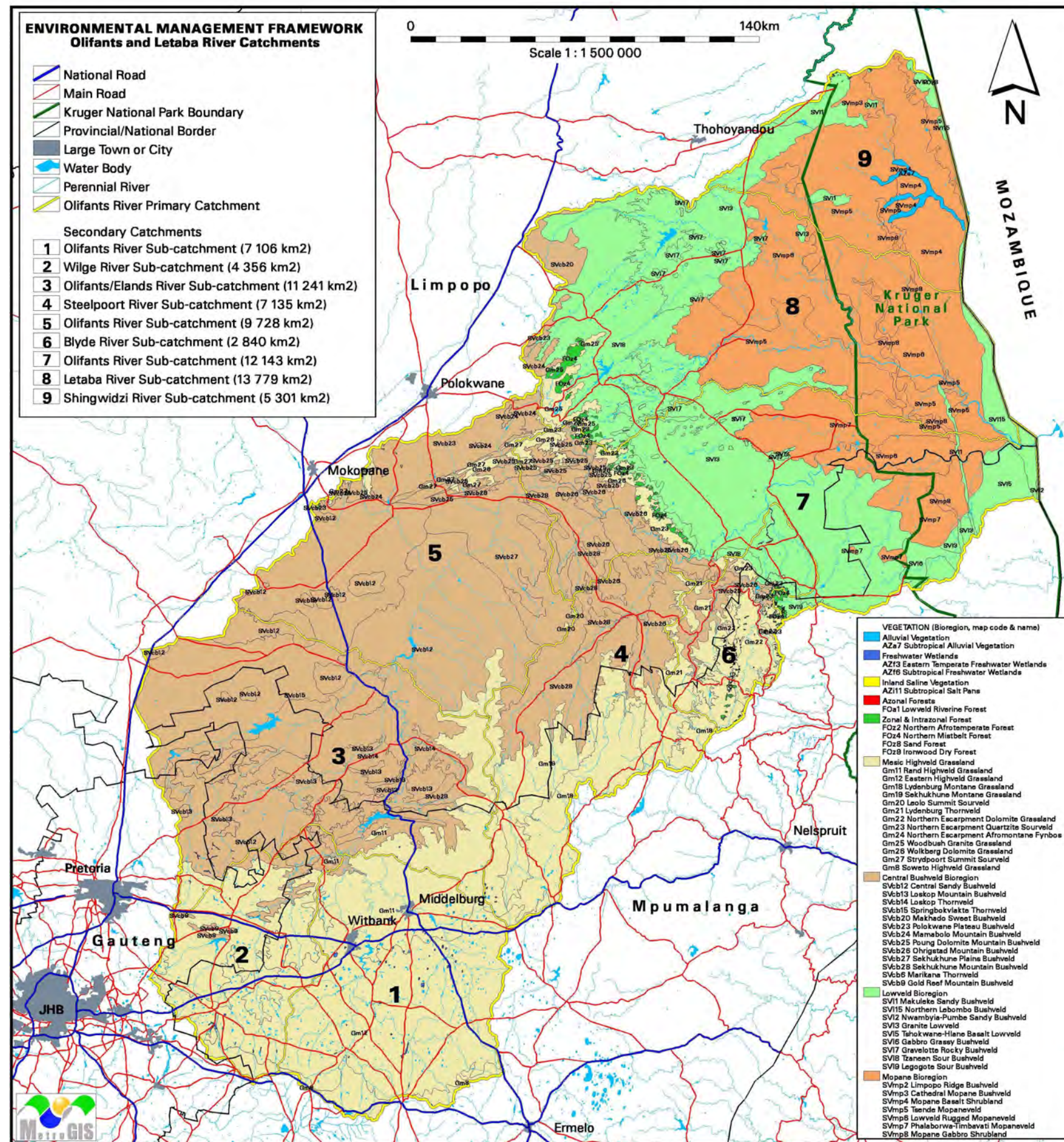
There are 52 vegetation types occurring within the Olifants and Letaba EMF area. Of these, 29 occur in the Savanna Biome, 13 in the Grassland Biome and 5 in the Forest Biome. There are also 4 wetland vegetation types that are considered to be azonal or not limited to a single biome.

The biomes and vegetation types occurring within the Olifants Letaba EMF area are summarised in the table below. The table also contains their conservation information. More detailed information on the vegetation types can be found in the Draft Status Quo Report.

Vegetation type	Biome	Coverage (Km ²)	Coverage in %	Cons. target	Protected	Remain	Conservation status
Cathedral Bushveld	Mopane Savanna Biome	180.633	0.245	19%	100%	99.60%	Least threatened
Central Sandy Bushveld	Savanna Biome	7 906.65	10.738	19%	2.4% (+2.2%)	75.90%	Vulnerable
Eastern Grassland	Highveld Grassland Biome	6 264.644	8.508	24%	0.30%	56%	Endangered
Eastern Freshwater Wetlands	Temperate Azonal Vegetation	49.263	0.067	24%	4.60%	85.10%	Least threatened
Gabbro Grassy Bushveld	Savanna Biome	219.909	0.299	19%	95.9% (+3.7%)	99.60%	Least threatened
Gold Reef Bushveld	Mountain Savanna Biome	58.474	0.079	24%	22.1% (+1.2%)	84.60%	Least threatened
Granite Lowveld	Savanna Biome	8 470.518	11.504	19%	17.5% (+17.3%)	79.20%	Vulnerable
Gravelotte Bushveld	Rocky Savanna Biome	309.489	0.42	19%	0% (+6.9%)	85.50%	Least threatened
Ironwood Dry Forest	Forests	3.986	0.005	100%	77.80%	99.90%	Critically endangered
Legogote Sour Bushveld	Savanna Biome	124.243	0.169	19%	1.6% (+2.3%)	50.40%	Endangered
Leolo Summit Sourveld	Grassland Biome	20.344	0.028	24%		See text	Vulnerable
Limpopo Ridge Bushveld	Savanna Biome	0.463	0.0006	19%	18.1% (+1.8%)	99.10%	Least threatened
Loskop Bushveld	Mountain Savanna Biome	2 044.407	2.777	24%	14.5% (+1.9%)	97.60%	Least threatened
Loskop Thornveld	Savanna Biome	759.911	1.032	19%	11.30%	75.80%	Vulnerable
Lowveld Riverine Forest	Forests	5.528	0.008	100%	50% (+3%)	97.60%	Critically endangered
Lowveld Mopaneveld	Rugged Savanna Biome	3 154.105	4.284	19%	34.4% (+5.6%)	80.20%	Least threatened
Lydenburg Grassland	Montane Grassland Biome	2 122.306	2.882	24%	2.5% (+5.9%)	77.70%	Vulnerable
Lydenburg Thornveld	Grassland Biome	1 207.783	1.64	24%	1.90%	78.70%	Vulnerable
Makhado Sweet Bushveld	Savanna Biome	370.419	0.503	19%	0.80%	72.80%	Vulnerable
Makuleke Sandy Bushveld	Savanna Biome	512.62	0.696	19%	31.50%	73.30%	Vulnerable
Mamabolo Bushveld	Mountain Savanna Biome	395.141	0.537	24%	7.60%	93.90%	Least threatened
Marikana Thornveld	Savanna Biome	1.456	0.002	19%	0.7% (+1.5%)	52.10%	Endangered

Mopane Basalt Shrubland	Savanna Biome	2 761.235	3.75	19%	100%	99.60%	Least threatened
Mopane Shrubland	Gabbro Savanna Biome	310.462	0.422	19%	100%	99.70%	Least threatened
Northern Forest	Afrotemperate Forests	1.22	0.002	31%	28.8% (+2.8%)	98.50%	Least threatened
Northern Afromontane Fynbos	Escarpment Grassland Biome	8.108	0.011	27%	56.1% (+5.8%)	99.30%	Least threatened
Northern Dolomite Grassland	Escarpment Grassland Biome	449.866	0.611	27%	2.1% (+8.5%)	47.70%	Endangered
Northern Quartzite Sourveld	Escarpment Grassland Biome	654.765	0.889	27%	15.3% (+9.2%)	61.60%	Vulnerable
Northern Bushveld	Lebombo Savanna Biome	548.704	0.745	24%	98.80%	99.80%	Least threatened
Northern Mistbelt Forest	Forests	280.783	0.831	30%	10% (+25.2%)	83.70%	Least threatened
Nwambyia-Pumbe Bushveld	Sandy Savanna Biome	94.438	0.1283	19%	98.70%	99.60%	Least threatened
Ohrigstad Bushveld	Mountain Savanna Biome	1 998.128	2.714	24%	7.6% (+4.2%)	90.70%	Least threatened
Phalaborwa-Timbavati Mopaneveld	Savanna Biome	2 225.556	3.023	19%	See text	95.10%	Least threatened
Polokwane Bushveld	Plateau Savanna Biome	1147.28	1.558	19%	1.4% (+0.7%)	83.20%	-
Poung Dolomite Bushveld	Mountain Savanna Biome	846.795	1.15	24%	9.9% (+6.2%)	94.10%	Least threatened
Rand Highveld Grassland	Grassland Biome	6 027.493	8.186	24%	0.90%	58.50%	Endangered
Sand Forest	Forests	6.736	0.009	100%	42.10%	98.50%	Critically endangered
Sekhukhune Grassland	Montane Grassland Biome	1 381.194	1.876	24%		72%	Vulnerable
Sekhukhune Bushveld	Mountain Savanna Biome	2 316.118	3.146	24%	(+0.4%)	86.30%	Least threatened
Sekhukhune Bushveld	Plains Savanna Biome	2 522.240	3.425	19%	0.8% (+1%)	74.50%	Vulnerable
Soweto Grassland	Highveld Grassland Biome	704.58	0.957	24%	0.20%	52.70%	Endangered
Springbokvlakte Thornveld	Savanna Biome	5 341.311	7.254	19%	1% (+2.6%)	50.70%	Endangered
Strydpoort Sourveld	Summit Grassland Biome	184.877	0.251	24%	17.2% (+1.7%)	99.40%	Least threatened
Subtropical Vegetation	Alluvial Azonal Vegetation	166.448	0.226	31%	See text	84.50%	Least threatened
Subtropical Wetlands	Freshwater Azonal Vegetation	12.939	0.176	24%	40%-50% (+10.5%)	96.40%	Least threatened
Subtropical Salt Pans	Azonal Vegetation	2.972	0.004	24%	42%	89.50%	Least threatened
Tsende Mopaneveld	Savanna Biome	5 274.542	7.164	19%	63.3% (+4.8%)	88.40%	Least threatened
Tshokwane-Hlane Lowveld	Basalt Savanna Biome	463.24	0.629	19%	64.4% (+3.4%)	83.50%	Least threatened
Tzaneen Sour Bushveld	Savanna Biome	3 123. 146	4.242	19%	1.3% (+2.1%)	59.20%	Endangered
Wolkberg Grassland	Dolomite Grassland Biome	260.845	0.354	27%	48.6% (+6.2%)	96.70%	Least threatened
Woodbush Grassland	Granite Grassland Biome	331.682	0.45	27%	0% (+14.9%)	-	Critically endangered

Figure 16: Vegetation



Baobab tree



Photo: S. Johnston

Sekhukhune vegetation



Photo: P. Claassen

2.3.2 Medicinal Plants

There are several medicinal plants growing within the Olifants and Letaba EMF area. They are harvested wherever they occur, but indigenous forests are most often targeted due to the density of plants growing there.

The following table summarises the common medicinal plants found within the OLEMF and their uses.

Table 11: Commonly used medicinal plants that occur in the area

SPECIES	USE	SPECIES	USE
Abrus precatorius	Medicinal	Harpephyllum caffrum	Medicinal
Acacia burkei	Medicinal, fuel	Huernia hystrix	Medicinal
Acacia nilotica	Medicinal, fuel, tanning	Kigelia africana	Medicinal, food, beer
Acacia robusta	Medicinal, twine, tanning	Lonchocarpus capassa	Medicinal. pots, timber
Acacia xanthophloea	Medicinal, fuel, building	Manilkara mochisa	Medicinal
Adenia gummifera	Medicinal	Mentha longifolia	Medicinal
Adenium multiflorum	Medicinal	Mimusops zeyheri	Medicinal, food
Afzelia quanzensis	Medicinal, fuel	Munulea sericea	Medicinal, rope
Albizia adianthifolia	Medicinal, fuel	Ocotea bullata	Medicinal, ornaments
Alepidea amatymbica	Medicinal	Ocotea keniensis	Medicinal
Antidesma venosum	Medicinal	Pachycymbim rogersii	
Balanites maughamii	Medicinal, fuel, food	Pachypodium saundersii	Medicinal
Baphia racemosa	Medicinal	Peltophorum africanum	Medicinal, ornaments
Berchemia zeyheri	Medicinal, fuel, ornaments	Protorhus longifolia	Medicinal
Bersama lucens	Medicinal	Pterocarpus angolensis	Medicinal, furniture
Bolusanthus speciosa	Medicinal, ornaments	Rauvolfia caffra	Medicinal
Bowiea volubilis	Medicinal	Rhus chirindensis	Medicinal
Bridelia micrantha	Medicinal	Scadoxus multiflora	Medicinal
Capparis tomentosa	Medicinal	Schotia brachypetala	Medicinal, food
Clivia miniata	Medicinal	Sclerocarya birrea	Beer, food, cultural
Combretum erythrophyllum	Medicinal, fuel, timber	Sczobasis intricata	Medicinal
Combretum molle	Medicinal	Spirostachys africana	Medicinal, furniture
Curtisia dentata	Medicinal	Strychnos spinosa	Medicinal, food
Ekebergia capensis	Medicinal, furniture	Syzygium cordatum	Medicinal, food
Erythrina lysistemon	Medicinal	Trichilia emetica	Medicinal, furniture
Euclea divinorum	Medicinal	Vangueria cyanescens	Medicinal
Ficus sur	Medicinal, drums	Ximenia caffra	Medicinal, food
Garcinia livingstonei	Medicinal	Ziziphus mucronata	Medicinal, timber
Gardenia volkensii	Magic, timber, fuel		

2.3.3 Centres of Endemism

There are three Centres of Endemism that occur within the Olifants River catchment, namely the Sekhukhuneland, Wolkberg and Soutpansberg Centres of Endemism. The Sekhukhuneland Centre of Endemism is entirely within the catchment. Approximately half of the Wolkberg Centre of Endemism is within the catchment. Only a small part of the Soutpansberg Centre of Endemism occurs within the catchment. These Centres of Endemism contain high levels of diversity with many species restricted entirely to these areas. As such they are of high priority in terms of conservation.

The centres of Endemism found within the study area are of special concern. The high biodiversity and the many unique plant species restricted to these areas means that they are particularly vulnerable.

2.3.3.1 Wolkberg Centre

The Wolkberg Centre flora is extremely floristically rich. More than 40 species or endemic/near endemic to the dolomites and more than 90 to the quartz- and shale-derived substrates occur in the area. These figures are conservative, with more taxa likely to be added as knowledge of the flora improves.

The three families with the largest number of endemics on the quartzitic and related rock types are the Asteraceae, Iridaceae and Liliaceae. The asteraceous genus *Helichrysum*, with 10 species being the most prolific in producing endemics. *Gladiolus* has more than ten species endemic to the region as a whole. The Liliaceae is the family with the largest number of dolomite endemics to the region as a whole, followed by the Euphorbiaceae, Lamiaceae and Acanthaceae. For mosses, the Wolkberg Centre is one of the main southern African centres of diversity and a secondary centre of endemism.

Significantly, nearly all the endemics (notably the quartzitic ones) are grassland species. Most of the taxa endemic to the Wolkberg Centre appear to be palaeoendemics.

The Wolkberg Centre, especially the arid dolomite areas, shares many species with the adjacent Sekhukhuneland Centre, several of which are endemic to the combined region.

2.3.3.2 Sekhukhuneland Centre

The vegetation of the Sekhukhuneland Centre has never been studied in detail. It is usually mapped as Mixed Bushveld. However, floristically the bushveld of Sekhukhuneland Centre is quite unique and certainly deserves recognition as a separate type. The *Kirkia wilmsii*, a species that is relatively rare in other parts of the Mixed Bushveld is a characteristic tree of this area. Vegetation differences between the north- and south-facing aspects of the mountains are often striking. Intriguing vegetation anomalies associated with heavily eroded soils are present throughout the region.

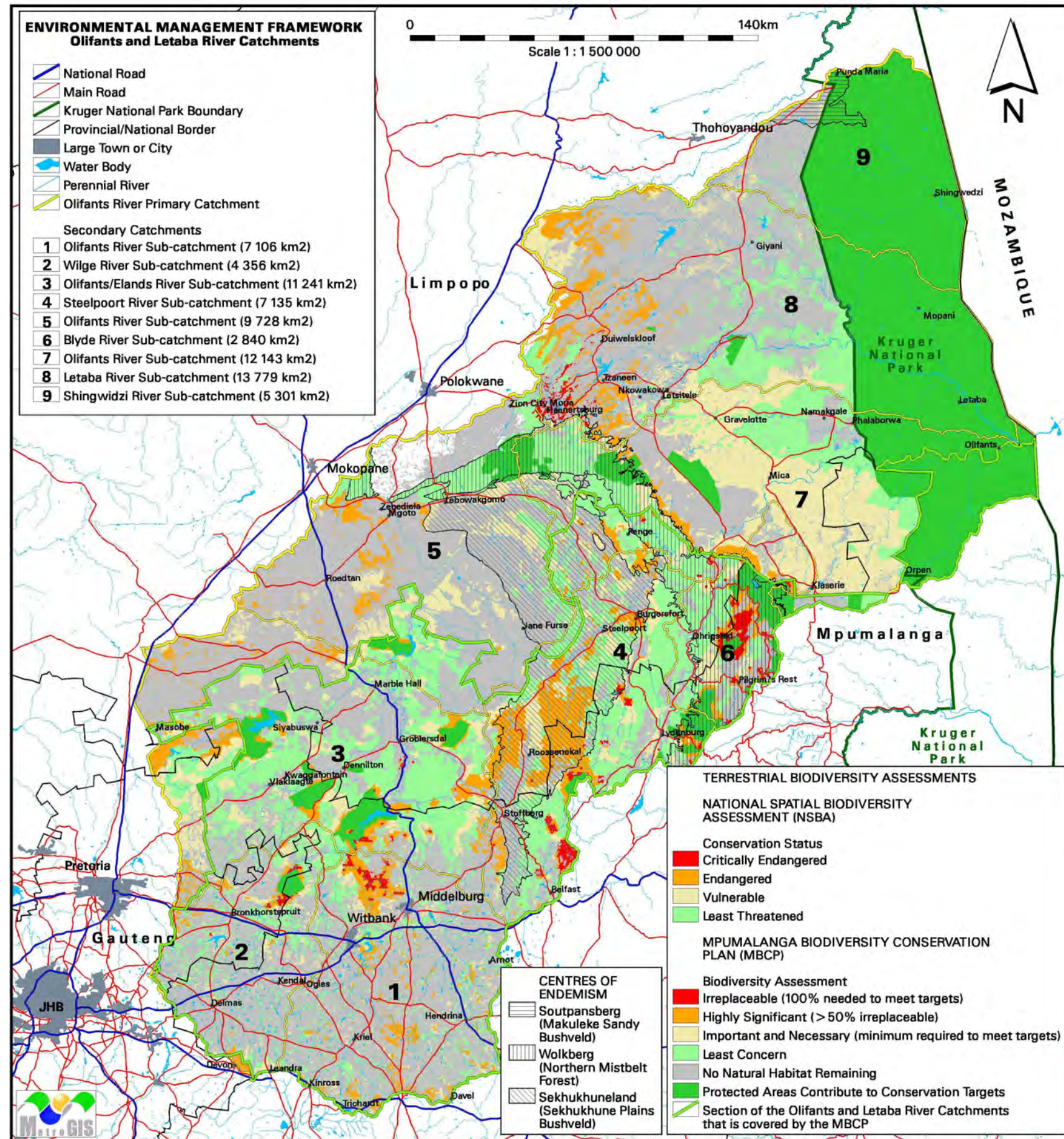
The flora of the Sekhukhuneland Centre is still poorly known, with many apparently endemic species awaiting formal description. Families particularly rich in Sekhukhuneland Centre endemics include the Anacardiaceae, Euphorbiaceae, Liliaceae, Lamiaceae and Vitaceae. A still-to-be-described monotypic genus of the Alliaceae is endemic also. The area around Burgersfort is reputed to have the highest concentration of *Aloe* species in the world.

The Leolo Mountains harbour relic patches of Afromontane Forest, Fynbos-type vegetation and several Sekhukhuneland Centre endemics. There are also some rare wetlands in the summit area.

2.3.3.3 Soutpansberg Centre

The eastern boundary of the centre is diffuse and merges with the northern extension of the Lebombo Mountains as well as the river gorges and sandstone ridges and areas of deep aeolian sand in the northern Kruger National Park.

Figure 17: Threatened Ecosystems



Nearly all the endemics are confined either to grassland, fynbos or bushveld. The Asclepiadaceae (Stapeliaceae) and genus *Aloe* are well represented in the centre. Succulents comprise the largest portion of endemics in the Soutpansberg Centre. The pronounced climatic/habitat gradients over relatively short distances in the Soutpansberg contribute the floristic and vegetation diversity. Despite many years of botanical exploration, exciting new discoveries are still being made.

2.3.4 Threatened Ecosystems

The map created to show the threatened ecosystems used two sets of data. The first set of data was that obtained from SANBI and looked at the region on a national level. The second set of data was obtained at a provincial level and allowed for greater detail to be included.

Areas coloured in red on the map are of extreme concern as they show critically endangered eco-systems or centres of endemism. The orange areas are also of concern as these areas are endangered. Most of the areas containing eco-systems that have been classified and least threatened on the map fall within areas that are currently conserved.

2.3.5 Issues

- The Wolkberg Centre of Endemism remains botanically poorly explored and new species are still being discovered, even in relatively well-collected areas;
- the high-rainfall grasslands of the Wolkberg Centre are seriously threatened by mainly commercial afforestation and less than 1% of the montane grasslands is conserved;
- there is a great need for closer taxonomic scrutiny of the taxa in the Sekhukhuneland Centre to ensure the appropriate labelling of ecotypes and endemic species. Botanically the Sekhukhuneland Centre remains one of the least known parts of the former Transvaal; and
- extensive harvesting of medicinal plants and collection of firewood from indigenous areas are causing a collapse of ecological habitats from within.

2.3.6 Conservation and Conservation Targets

Four vegetation types are listed as Critically Endangered meaning these vegetation types face an extremely high risk of extinction in the wild in the immediate future. Eight vegetation types are listed as Endangered meaning they are at risk of becoming critically endangered if the situation is not changed. Eleven vegetation types are listed as Vulnerable.

Based on the conservation status of vegetation types, SANBI has identified areas of high conservation priority. The intention is to indicate areas in need of immediate conservation effort. There may be other areas that have been afforded high levels of protection, which are also high in diversity or are sensitive and deserve continued future protection.

The Park Interface Zones shows the areas outside a park within which land use changes could affect a national park. The zones, in combination with guidelines, will serve as a basis for a.) identifying the focus areas in which park management and scientists should respond to EIA's, b.) helping to identify the sort of impacts that would be important at a particular site, and most importantly c.) serving as the basis for integrating long term protection of a national park into the spatial development plans of municipalities (SDF/IDP) and other local authorities. In terms of an EIA response, the zones serve largely to raise red-flags and do not remove the need for carefully considering the exact impact of a proposed development. In particular, they do not address activities with broad regional aesthetic or biodiversity impacts. Mapungubwe National Park has three Park Interface Zone categories. The first two are mutually exclusive, but the final visual/aesthetic category can overlay the others.

The priority natural areas or Park Expansion Zone aims to ensure the long term persistence of biodiversity, within and around the park, by identifying the key areas upon which the long term survival of the park depends. This includes areas important to both biodiversity pattern (especially reasonably intact high priority natural habitats) and processes (ecological linkages, catchments, intact hydrological systems, etc.). This does not imply any loss of existing rights (e.g. current agricultural activities or legal extractive biodiversity use such as fishing) within the area, but rather aims to ensure the parks survival in a living landscape.

Priority natural areas include areas identified for future park expansion as well as reasonably natural areas of high biodiversity value, which are critical for the long-term persistence of biodiversity within the park. These include adjacent natural areas (especially high priority habitats), which function as an ecologically integrated unit with the park, as well as areas critical for maintaining ecological links and connectivity with the broader landscape.

Inappropriate developments and negative land use changes (such as additional ploughing of natural veld, development beyond existing transformation footprints, urban expansion, intensification of land use through golf estates etc) should be opposed within this area. Developments with site specific

impacts (e.g. a lodge on a game farm) should be favourably viewed if they contribute to ensuring conservation friendly land use within a broader area. Guidelines applicable for the Catchment Protection Section would also apply to these areas.

The Catchment Protection Areas are areas important for maintaining key hydrological processes (surface and groundwater) within the park. Within these areas inappropriate development such as dam construction, loss of riparian vegetation, and excessive aquifer exploitation should be opposed. In addition, the control of alien vegetation, the control of soil erosion, and appropriate land care (e.g. appropriate stocking rates) should be promoted.

Viewshed Protection Areas are areas where developments could impact on the aesthetic quality of a visitors experience in a park. This zone is particularly concerned with visual impacts (both day and night), but could also include sound pollution. Within these areas any development proposals should be carefully screened to ensure that they do not impact excessively on the aesthetics of the park. The areas identified are only broadly indicative of sensitive areas, as at a fine scale many areas within this zone would be perfectly suited for development. In addition, major projects with large scale regional impacts may have to be considered, even if they are outside the Viewshed Protection Area.

2.3.7 The Kruger to Canyons Biosphere Reserve

The Kruger to Canyons Biosphere reserve falls within the EMF study area and therefore requires specific mention. The primary objectives of biosphere reserves are:

- The conservation of biological diversity;
- sustainable use of its components; and
- fair and equitable sharing of benefits arising from the utilisation of genetic resources (in accordance with the Convention on Biological Diversity).

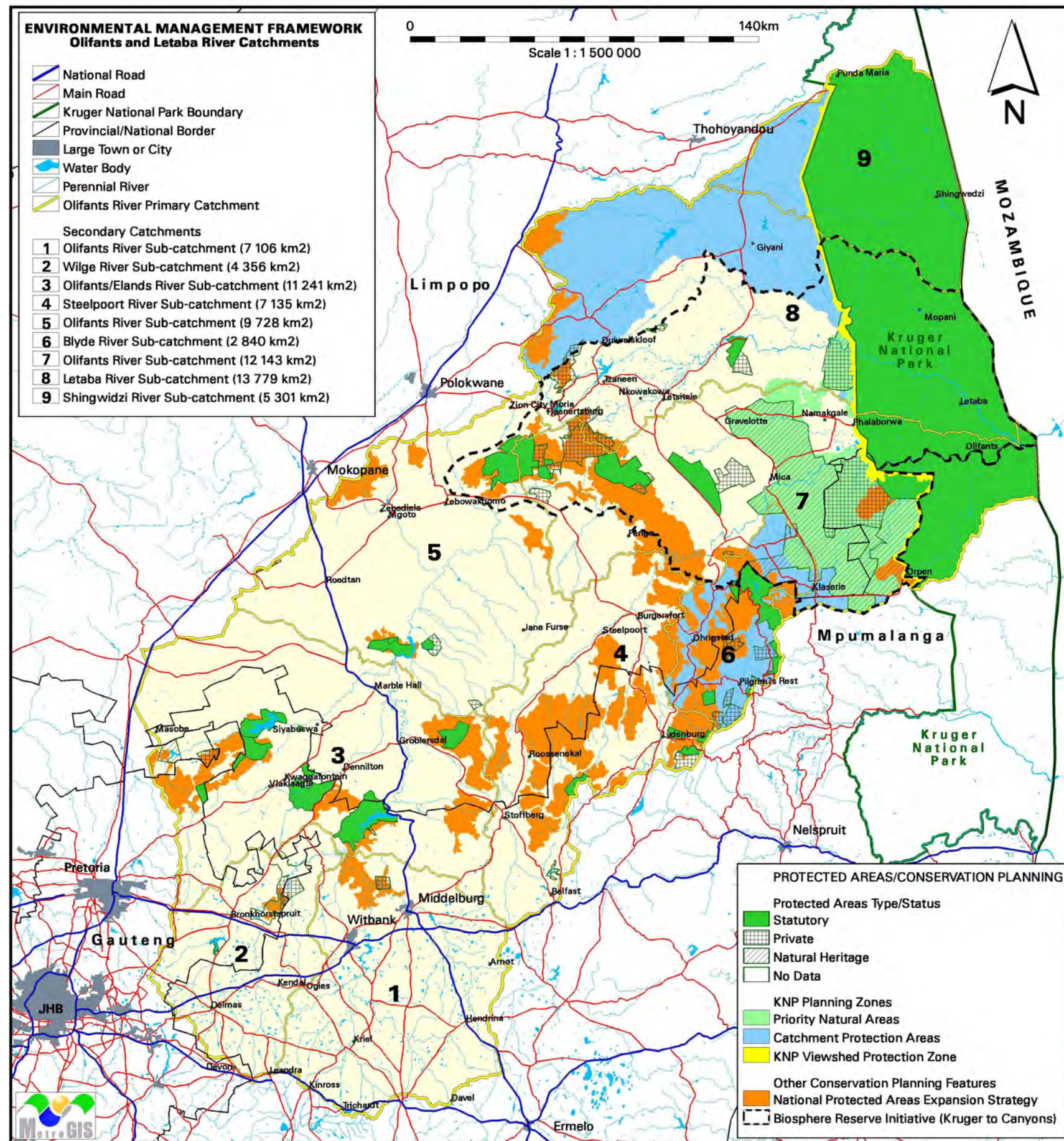
Furthermore, a biosphere reserve is intended to fulfill three functions namely:

- Conservation - to preserve genetic resources, species, ecosystems and landscapes;
- development - to foster sustainable economic and human development; and
- logistic support - to support demonstration projects, environmental education and training as well as research and monitoring related to local, national and global issues of conservation and sustainable development.

A biosphere reserve is organised into the following three elements:

- Core areas - securely protected sites for conserving biological diversity, monitoring minimally disturbed ecosystems, and undertaking non-destructive research and other low-impact uses;

Figure 18: Protected areas and conservation planning



- buffer zones - surrounds or adjoins the core areas, and is used for co-operative activities compatible with sound ecological practices, including environmental education, recreation, ecotourism and applied and basic research; and
- transition areas - may contain a variety of agricultural activities, settlements and other land uses.

In addition, biosphere reserves are placed to provide the means for people to attain a balanced relationship with the natural world, to contribute to the needs of society, and to show a way to a more sustainable future.

Biosphere reserves should be used to develop alternative means of livelihoods and to conduct research, but in such a way that benefits should be shared with all stakeholders. Activities in biosphere reserves should therefore create some direct benefits to the people that live within the designated area.

2.3.8 Issues

- Conservation targets of various vegetation types are not yet being fulfilled;
- the Kruger to Canyons biosphere reserve borders may prove to be problematic and a possible revision of the area to be included should be considered; and
- uncontrolled alien invader plants still pose a threat to natural vegetation and use excessive amounts of water in some places.

2.3.9 River Health

The following section was adapted from extractions from the State of the Rivers Reports for the Olifants and Letaba River Systems. (These are available as reference documents to the EMF). For greater details concerning the current status of the Rivers, please consult these documents.

The Olifants Catchment covers about 54 570 km² and is subdivided into 9 secondary catchments. The total mean annual runoff is approximately 2400 million cubic metres per year. The Olifants River and some of its tributaries, notably the Klein Olifants River, Elands River, Wilge River and Bronkhorstspuit, rise in the Highveld grasslands.

The upper reaches of the Olifants River Catchment are characterised mainly by mining, agricultural and conservation activities. Over-grazing and highly erodible soils result in such severe erosion, in parts of the middle section that, after heavy rains the Olifants River has a red-brown colour from all the suspended sediments.

There are thirty large dams in the Olifants River Catchment. The important dams are, the Witbank Dam, Renosterkop Dam, Rust de Winter Dam, Blyderivierspoort Dam, Loskop Dam, Middelburg Dam, Ohrigstad Dam, Arabie Dam and the Phalaborwa Barrage. In addition, many smaller dams in this catchment have a considerable combined capacity.

The Olifants River meanders past the foot of the Strydpoort Mountains and through the Drakensberg, descending over the escarpment. The Steelpoort and Blyde tributaries, and others, join the Olifants River before it enters the Kruger National Park and neighbouring private game reserves. Crossing the Mozambique border, the Olifants River flows into the Massingir Dam.

The Letaba Catchment comprises an area of approximately 13 670 km² with a mean annual precipitation (MAP) of 612 mm, a mean annual evaporation of 1 669 mm and a mean annual runoff (MAR) of 574 million m³ (ranging from 100 to 2 700 million m³).

The mean annual runoff (MAR) in the Letaba Catchment varies from more than 10% of the mean annual precipitation (MAP) in the wet mountainous zone to less than 2% in the drier parts of the catchment. More than 60% of the MAR in this catchment derives from only 6% of the area.

More than 20 major dams have been constructed in the Groot Letaba River catchment. The Tzaneen Dam on the Groot Letaba River and the Middle Letaba Dam are the two largest dams in the Limpopo Province. Other large dams in the catchment include the Ebenezer, Magoebaskloof, Nsami and Modjadji Dams.

As mountain and foothill streams, the Groot Letaba, Letsitele, Thabina, Debengeni and Magoebaskloof rivers have very diverse in-stream habitats. The river channels contain steep bedrock and fixed boulder

rapids with cascades and occasional waterfalls. Cobble riffles occur in lower gradient sections. Deep pools are present in all river sections. These perennial rivers rise in the Great Escarpment Mountains.

The Klein Letaba, Nsama and Molototsi Rivers are typical sandy Lowveld rivers, with deeply incised river channels. Wide sandy runs are interspersed with occasional gravel riffles. Bedrock dykes cross these rivers at infrequent intervals, occasionally causing deep pools on their upstream sides. River flows vary considerably during a single annual cycle.

Below the confluence of the Groot and Klein Letaba Rivers, (at the KNP border) the Letaba River channel takes on the characteristics of the Klein Letaba River. The Letaba River passes through a steep confined gorge just before joining the Olifants River near the Mozambique border.

2.3.10 Issues

2.3.10.1 Olifants River Catchment Area

- The Steelpoort River is in a fair to unacceptable ecological state;
- overgrazing, and dryland cultivation throughout the area surrounding the Spekboom, Steelpoort, Beetgekraal, and Waterval Rivers including within the riparian zone, leads to erosion, which causes high silt levels in the rivers;
- high silt levels in the aforementioned rivers, increases the risk of flooding and leads to the smothering of in-stream habitats and fish gills resulting in loss of invertebrate and fish species;
- runoff from mines and other activities lowers the water quality in the Steelpoort River;
- on the Olifants River the riparian vegetation is overgrazed and over utilised. As a result, riverbanks are collapsing due to erosion and sedimentation occurs in the riverbed;
- downstream of the Rust de Winter Dam, on the Elands River, flow is extremely regulated with very infrequent releases which has a severe impact on in-stream biota because the river is often dry;
- artificial flow regimes in the Elands River caused by is ecologically insensitive releases of water from the Rhenosterkop Dam change the riverbed, causes erosion and results in undesirable habitat conditions for in-stream biological communities;
- the Olifants River, upstream of the Arabie Dam, is impacted by agricultural activities, runoff from commercial agricultural areas contains agro-chemicals, which cause eutrophication or contamination of water, either of which can impair the health of invertebrates and fish;
- riparian vegetation on both the Elands River and the Olifants River is in a very degraded state due to overgrazing and over utilization and as a result, riverbanks are collapsing due to erosion, and sedimentation occurs in the riverbed;

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

Riparian vegetation



Photo: P. Claassen

Agricultural practice along a river



Photo: S. Taljaardt

- alien vegetation along the banks of the Olifants and Elands River include Eucalypts (*Eucalyptus spp.*) Sesbania (*Sesbania punicea*) and Seringa (*Melia azedarach*);
- mining, predominantly for coal, and other industrial activities around the Wilge, Bronkhorstspuit, Klein Olifants and Olifants Rivers are the main contributors to poor in-stream and riparian habitat conditions where acid leachate from mines is a primary contributor to poor water quality and in-stream conditions;
- in some parts around the above mentioned rivers, access roads, mostly related to mining and industrial activities, have resulted in severe disturbance of riparian habitats, and increased erosion of both land and riverbed;
- the riparian vegetation around the Wilge, Bronkhorstspuit, Klein Olifants and Olifants Rivers is under pressure from overgrazing in some parts, and alien plants such as wattles that occur within the riparian zone, competing with indigenous vegetation and reducing available water;
- water quality in the Olifants River is negatively impacted by the high acidity and high concentrations of dissolved salts in some of the tributaries, especially the Klip River;
- the Klipspruit receives mine effluent and a long term management plan will be required to cope with the problem, because contaminant loads inherited from mining activities are likely to persist for many years;
- intensive irrigation of crops (including fruit trees) extends from the Loskop Dam to Marble Hall and the heavy abstraction of water that this causes may reduce the water available for ecological functioning downstream;
- commercial agricultural activities reach up to the riverbanks of the Olifants River downstream of the Loskop Dam and the clearing of ground cover associated with these activities increases the potential for erosion as well as sedimentation in the river channel;
- aseasonal and ecologically insensitive releases from, or retention in, the Loskop Dam have an adverse impact on in-stream biological communities and cause erosion of the riverbed, through scouring; and
- the quality of the water in the Witbank Dam is poor, affecting the rivers downstream.

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

2.3.10.2 Letaba River Catchment Area

- The Broederstroom River has a serious siltation problem originating from forestry roads and an improvement in the management of timber felling practices, especially during the rainy season, would reduce wash-off of soil into the river;
- predatory trout have destroyed the indigenous fish populations in the Broederstroom River;
- sandmining for building purposes has disrupted the river channel and riparian zone of the Broederstroom River;
- roads next to the Politsi River and bridges across it cause erosion of the riparian zone and siltation;
- along the Politsi River, agriculture, forestry and informal settlements encroach on the riparian zone;
- alien plants along the Politsi River include bramble, lantana, bugweed, pines and eucalyptus;
- the Debengeni Waterfalls on the Debengeni River attracts tourists which could be of great economic benefit to this area, provided authorities incorporate environmental considerations into their planning;
- bridge construction has disturbed bank vegetation on the Groot Letaba River, causing erosion;
- Magoebaskloof Dam, despite its small size, interrupts the natural flow pattern of the river. It is an irrigation dam with little capability for water releases, resulting downstream flow pattern which modifies river habitats;
- in the upper Letsitele River the riparian vegetation is in good condition, but invaded with numerous alien plants such as the castor-oil plant, sesbania, wild tobacco, large cocklebur and sugar cane;
- in the lower Letsitele River alien plants invading the riparian habitat include peanut butter cassia, castor-oil plant, sesbania, ageratum and large cocklebur;
- a rail bridge and small weir dominate the lower Letsitele River and solid waste pollution occurs as well as irrigation and washing of clothes;
- in the Thabina River the riparian vegetation is under threat from excessive use by local communities and invasion by a host of alien plants, such as trifid weed (paraffin bush);
- no water is released from the Thabina Dam for ecological purposes;
- the seepage from the dam, the tributaries and the runoff that feeds the Thabina River downstream of the dam appears to be sufficient to maintain the in-stream habitat in good health;
- in the upper Groot Letaba River, bananas compete with invasive alien plants like lantana, castor-oil plant, bugweed, large cocklebur and peanut butter cassia for a place amongst the natural riparian vegetation;
- in the middle Groot Letaba River towards the eastern part, local communities over-utilise the vegetation in the riparian zone through cutting and grazing and alien plants have invaded the remaining riparian vegetation;
- agricultural pesticides and fertilisers affect water quality and are the biggest threat to the western section of the Groot Letaba River;
- large weirs throughout the Groot Letaba River, disrupt flows in river systems and apart from impeding fish migration, they cause bank scouring, sedimentation and loss of riparian vegetation;
- around the upper Nsama River vegetation cutting by local communities and occurrence of alien invasive vegetation have negative impacts on the riparian habitats;
- rural communities and their cattle impact on water quality of the lower Nsama River, especially during the dry season;
- fishing with shade nets on the Nsama River is not a sustainable harvesting practice;
- no releases are made from the Nsami Dam;
- the Modjadji Dam, which stores water for domestic use, restricts flow downstream affecting the upper Molototsi River and because the dam management programme does not include water releases that benefit the river ecology, the loss of flow is detrimental to the next 20-30km of the river;
- around the lower Molototsi River, environmentally unsustainable land-use practices result in accelerated erosion;
- in the area of the Klein Letaba River, its tributaries like the Soeketse and Koedoes and the Middle Letaba River, lantana and trifid weed are the most serious alien invader plants, with other alien invasive plants including large cocklebur, castor-oil plant and thistle;
- agriculture consists of small-scale farming by rural communities and large commercial banana, papino, paw-paw and mango plantations upstream from Giyani and the commercial fruit farms are fed by the Middel Letaba Canal irrigation scheme;
- the Middel Letaba Dam dates from the 1980s and has no facility to provide water releases that could benefit river ecology;
- the eastern area around the Klein Letaba River has the potential to be incorporated into the Kruger National Park;

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

Overgrazing along a river bank



Photo: P. Claassen

- Soutini-Baleni, a geothermal wetland, is a Natural Heritage Site on the Ivory Route;
- downstream of Soutini, the river has more permanent water and the river is close to natural with exceptionally good indigenous vegetation and almost no human impacts;
- part of the Letaba River falls within the Kruger National Park, which is a wilderness area with Shimuwini being the only tourist camp. Tourism impacts are therefore minimal;
- the Klein Letaba carries high sediment loads because of erodible soils and poor land management in the catchment;
- at the confluence of the Groot and Klein Letaba Rivers the gradient decreases and lower flow rates allow sediment to settle, aggravating the natural sand deposition on the Letaba River bed;
- impoundment and abstraction, mainly for agriculture, reduce the flow of the Groot Letaba River, causing further settling of sediment;
- there have been no recordings of the tiger fish in the Letaba River outside of the Kruger National Park since 1990 as this temperature sensitive species dies at temperatures below 15°C. Dam walls obstruct migration towards warmer waters during cold spells;
- KNP in collaboration with Northern Province Environmental Affairs and private sponsors has recently begun reintroducing tiger fish into selected Northern Province dams;
- many Matumi, Sycamore Fig and Jackalberry trees occur along the lower Letaba River, the Natal mahogany is also present, but some distance away from the river edge;
- both dams in this area, the Mingerhout Dam and the Engelhardt Dam further downstream near Letaba Camp, have good fishways; and
- the Kruger National Park's Letaba camp overlooks the Letaba River and is one of the most popular camps in the park. This is a wilderness area, with only a few hiking trails and the river is in a near natural state.

Sediment and infrastructure



Photo: S. Taljaardt

2.4 HUMAN SETTLEMENT AND DEVELOPMENT

2.4.1 The Current Use of Land

As part of the EMF, all (several thousand) “urban” areas have been identified and demarcated on a GIS layer. This enables the EMF to identify areas within which activities can be excluded in terms of NEMA section 24(2)(c), thereby streamlining EIA’s in the area to a significant extent.

This information has been collated with land cover and other land use information to produce Figure 19: The current use of land/landcover.

The current situation concerning mines as well as their positions can be seen in more detail in the reference document (presentation) Q.

Table 12: Use of land/land cover

	Surface Area in (km ²)	Percentage %
Indigenous Forest	374.157	0.51%
Woodland	14 643.211	19.89%
Thicket and Bushland (incl. Herbland)	21 656.643	29.41%
Grassland	11 066.547	15.03%
Planted Grass	17.389	0.02%
Forest Plantation	1 231.863	1.67%
Water Body/Wetland	580.843	0.79%
Bare Rock and Soil (Natural)	180.490	0.25%
Degraded Land	7 229.180	9.82%
Irrigated Agriculture	1 941.989	2.64%
Dryland Agriculture	11 886.193	16.14%
Urban/Built-up (Residential)	2 236.441	3.04%
Urban/Built-up (Smallholdings)	84.268	0.11%
Mining/Industrial	495.973	0.67%
Total area	73 630.049	100.00%

2.4.2 Solid Waste

Waste management in South Africa is based on the principles of the White Paper on Integrated Pollution and Waste Management (IP&WM) and the National Waste Management Strategy (NWMS) published by the Department of Environmental Affairs and Tourism in 1999 and 2000. The waste management sector has long been legislated under various pieces of legislation and more recently National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), has been signed into Law. The Waste Act seeks to encourage the prevention and minimisation of waste generation, whilst promoting reuse and recycling of the waste and only consider disposal of waste as a last resort.

Waste is currently defined as "an undesirable or superfluous by-product, emission, or residue of any process or activity which has been discarded, accumulated or been stored for the purpose of discarding or processing. It may be gaseous, liquid or solid or any combination thereof and may originate from a residential, commercial or industrial area. This definition includes industrial waste water, sewage,

radioactive substances, mining, metallurgical and power generation waste." (White Paper of IP&WM, 2000) or as "any matter, whether gaseous, liquid or solid or any combination thereof, which is from time to time designated by the Minister by notice in the Gazette as an undesirable or superfluous by-product, emission, residue or remainder of any process or activity." (Environmental Conservation Act, Act 73 of 1989).

Waste is divided into two classes based on the risk it poses, namely general waste and hazardous waste. Landfills are classified according to the type of waste requiring disposal, the size of the waste stream and the potential for significant leachate generation. Waste sites are required to register with the Department of Environmental Affairs and need to be issued with a permit. It appears that less than 50% of the known private and public landfill sites are duly authorised through permits and of those permitted, compliance with permit conditions is seldom audited and often unknown. Of the non-permitted/unknown permit status landfill sites, in excess of 90% are thought to be municipal landfills. The biggest culprit of non-compliance in the landfilling of waste would therefore appear to be government itself. (Godfrey & Oelofse, 2008).

By far the biggest contributor to the solid waste stream is mining waste (72.3%), followed by pulverized fuel ash (6.7%), agricultural waste (6.1%), urban waste (4.5%) and sewage sludge (3.6%) (van der Merwe & Vosloo, 1992).

It has been noted that the public is complaining about the current management of landfills. The Groberlersdal area landfills were reported to have been practising the unhealthy and illegal habit of regularly setting fire to the waste. Residents and farmers of the area complain of the smell and smoke resulting from these fires as well the potential health hazard to people and contamination of crops.

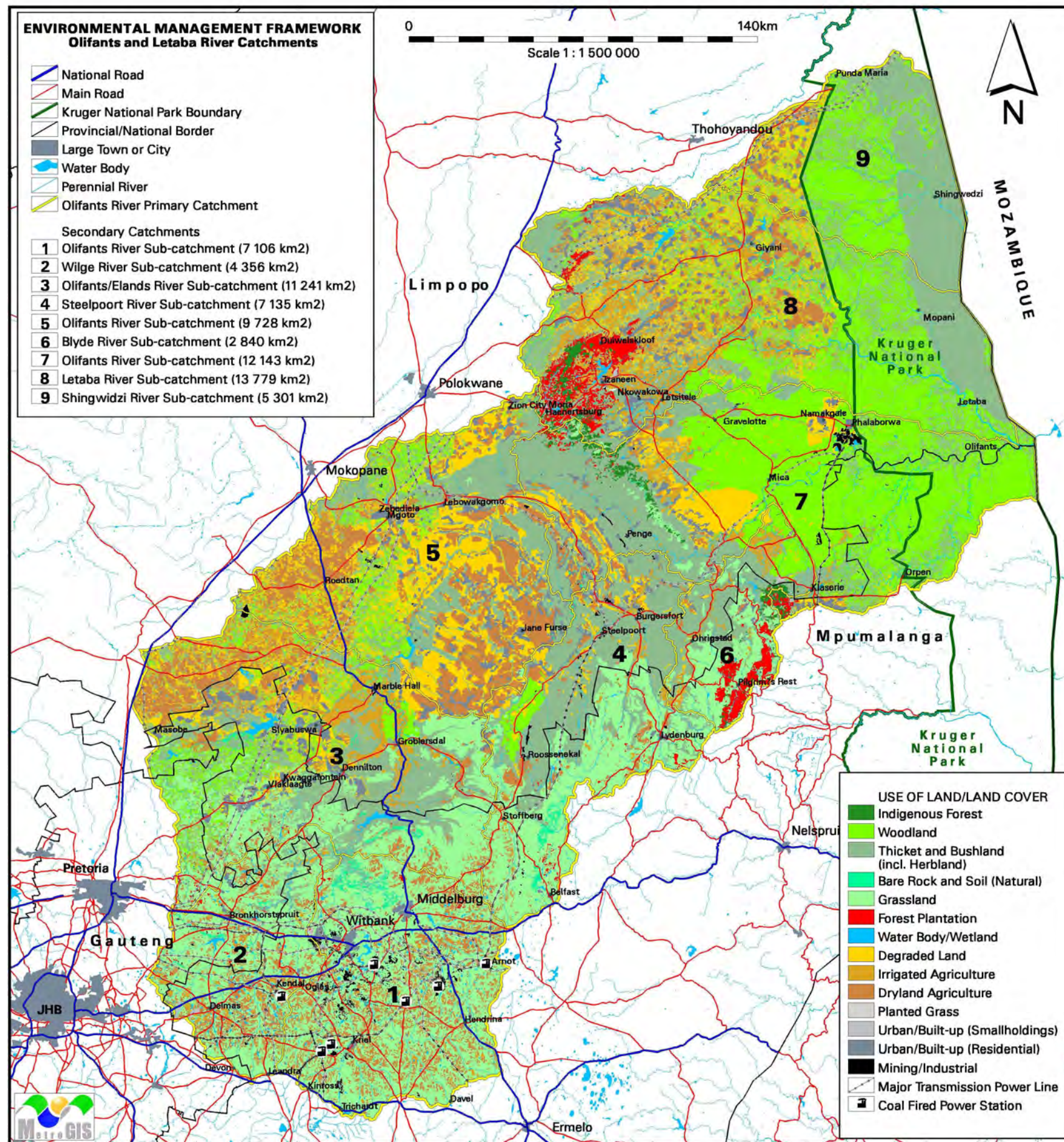
Currently there appears to be no complete and up to date registry concerning the landfill sites. The information that is available is limited.

Recycling Collection Point



Photo: P. Claassen

Figure 19: The current use of land



Agricultural activities



Photo: P. Claassen

Tzaneen

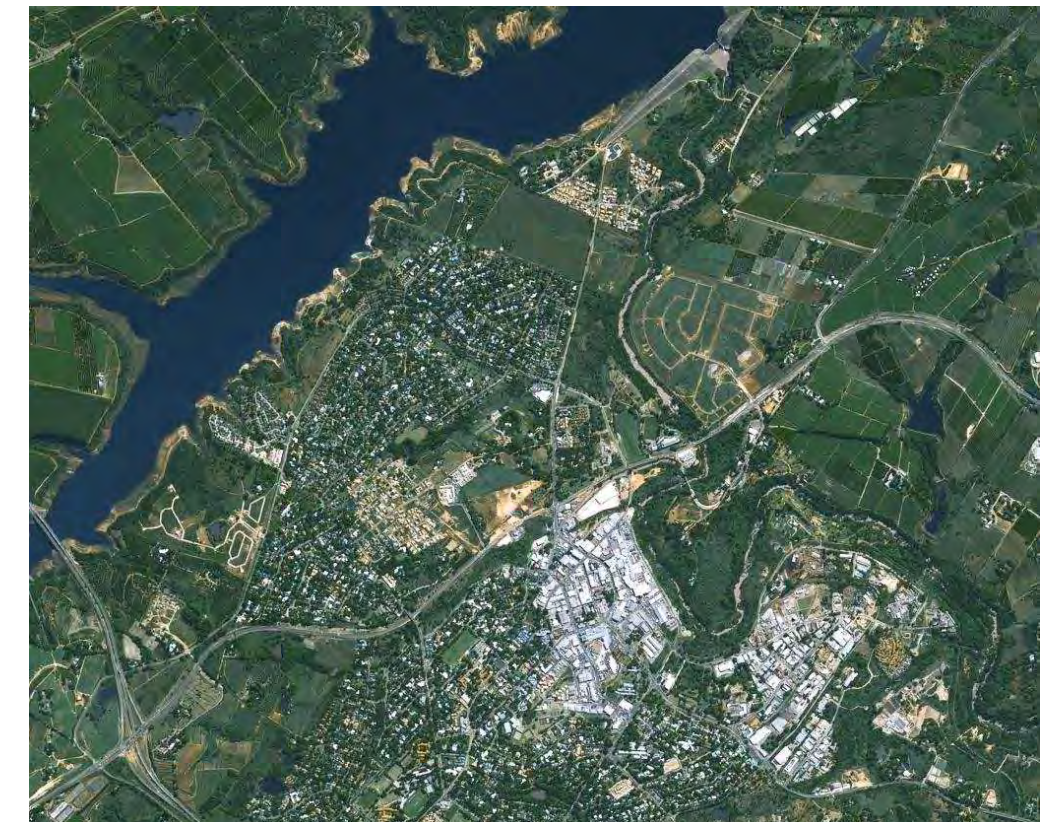


Photo: Google Earth 2009

2.4.3 Air Pollution

2.4.3.1 Sources of Air Pollution

The main air pollution sources in the area include:

- Industrial emissions (including coal fired electricity generation);
- domestic fuel burning (coal, wood and liquid fuels);
- mining (underground fires in old coal mines, dust and chemicals released in blasting processes);
- transportation (emissions from vehicles, dust arising from mainly the transportation of coal and construction materials as well as dust generated from driving on unsurpassed roads); and
- veld fires (natural and deliberate).

While air pollution occurs across the EMF area it is only a critical factor on the Highveld portion at this stage.

2.4.3.2 Climactic Conditions on the Highveld

The climatic conditions on the Highveld have a large impact on the air pollution factor. It is situated in the belt of atmospheric circulation of the southern hemisphere that is dominated by recurrent, semi permanent anticyclonic cells. Subsidence of air prevails over the region throughout the year but is most pronounced during winter. That ensures that the atmosphere is highly stable for most of the time. Surface inversions are about 150 to 300m deep, are ubiquitous in winter and occur frequently in summer. The elevated subsistence inversion occurs at a height of about 1200m to 1400m above ground and prevents vertical diffusion above this level for most days during the year. This is compounded by the fact that near-surface, stable, local winds, with little dispersion power and with the ability to transport pollution over long distances, dominate the low-level wind field. At the top of the surface inversion, decoupling of the stable boundary level from the less stable air above is associated with a wind maximum and a region in which horizontal transport of pollution is maximised. Between the subsidence inversion and the top of the mixing layer, there is a layer in which pollution trapping produces a regional pollution hazard. These factors mean that the Highveld part of the EMF area has an atmospheric pollution climate that is among the most adverse in the southern hemisphere and by far the worst in South Africa.¹

2.4.3.3 The Impact of Coal

The occurrence of extensive coal fields within this area meant that the bulk of South Africa's coal fired power stations were constructed either within (6 currently operating, 1 being recommissioned and 1 new

power station being constructed at the moment) or to the south of the area. The coal as well as the electricity in the area also stimulated significant industrialisation in the area with some of the countries most polluting industries like Highveld Steel occurring in the area. Urban development and especially the development of under serviced townships during the apartheid years contributed significant areas where primarily coal is being burnt for cooking and space heating.

This combination of high levels of pollutants within the least favourable environment possible has led to very high levels of ambient air pollution over the entire Highveld portion of the EMF area. This was already recognised by government as a high priority in the 1980's and was investigated and documented in the *South African National Scientific Programmes Report No. 150, Atmospheric pollution and its implications in the Eastern Transvaal Highveld, 1988*. Since that time significant further work were undertaken including:

- The Eskom Highveld SO₂ study (conducted by Airshed);
- the CSIR/Eskom/Sasol O₃ study (conducted by the CSIR);
- the APPA review database with detailed emission parameters (developed by DEA); and
- the Ekurhuleni Emissions Inventory.

In, or close to, the EMF area there are also a number of measuring points for ambient air quality including:

- Witbank, Belfast and Lydenburg (South African Weather Service); and
- Kendal, Leandra and Elandsfontein (Eskom).

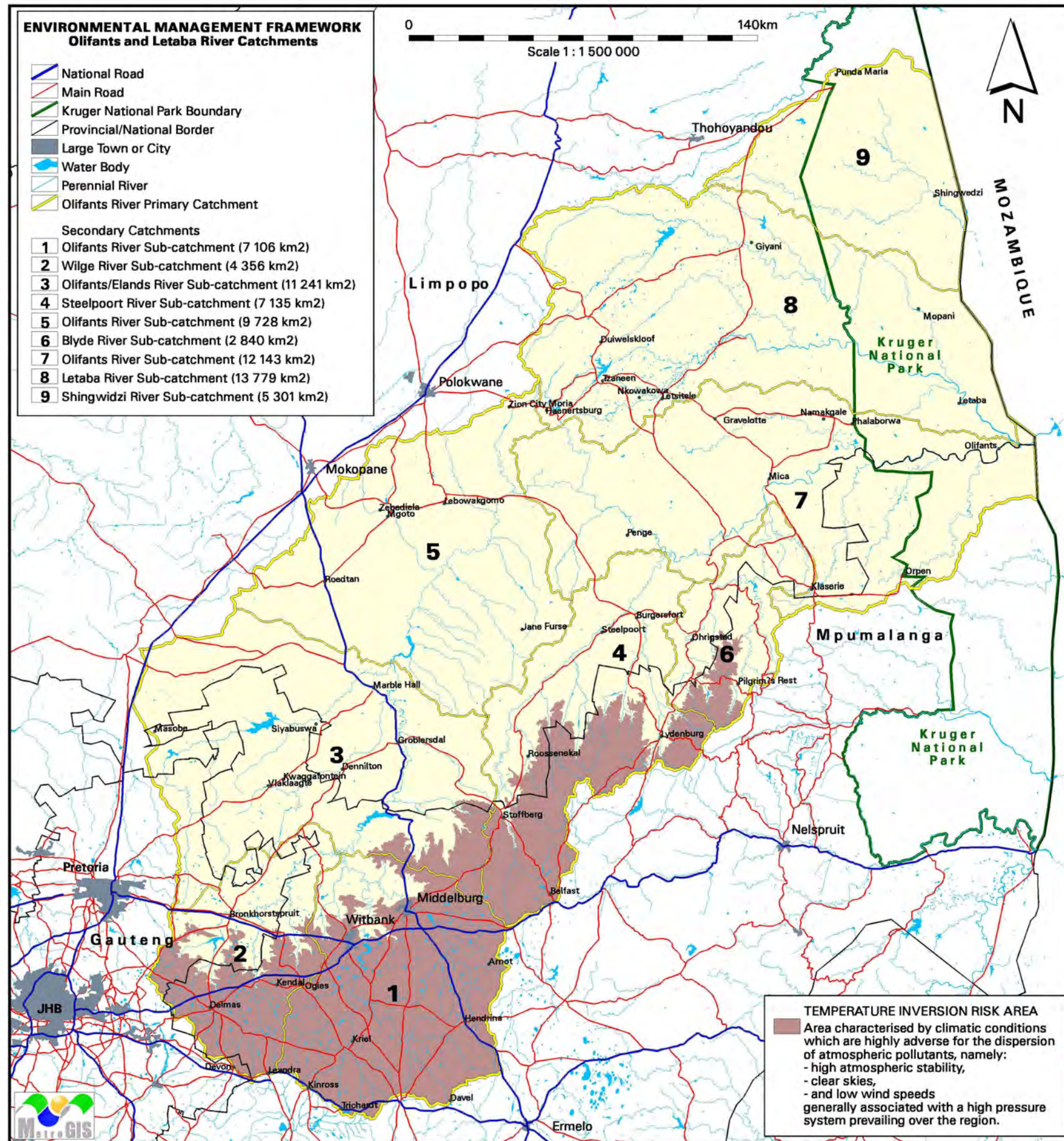
Factory emissions



Photo: P. Claassen

¹ Tyson P.D., Kruger F.J. and Louw C.W.. 1988. *Atmospheric pollution and its implications in the Eastern Transvaal Highveld*. South African National Scientific Programmes Report No. 150. national Programme for Weather, Climate and Atmosphere Research of the Foundation for Research Development. Pretoria.

Figure 20: Temperature inversion risk area



Power station 01



Photo: S. Johnston

Power station 02



Photo: S. Taljaardt

2.4.3.4 The Highveld Priority Area

The Minister of Environmental Affairs and Tourism formally declared an area known as the “Highveld Priority Area” as a national air pollution hotspot in terms of Section 18(1) of the National Environmental Management: Air Quality Act 2004 (Act No. 39 of 2004) (AQA) on 23 November 2007. The declaration gives recognition to the fact that people living and working in this area are exposed to air quality conditions that are harmful to their health and well-being.

The priority area provides for the following key strategic elements for air quality management:

- Focusing limited resources into dealing with recognised hot-spots as a first priority and, in doing so, building the necessary capacity to deal with other problem areas in a pragmatic, step-wise, fashion;
- formalising interdepartmental cooperation in a manner that allows for the management of air quality in problem areas that cross municipal boundaries to be coordinated by province and for problem areas that cross provincial boundaries to be coordinated by the national department; and
- air-shed management to ensure that pollutants that are emitted from areas that are not part of hot spot areas but that contribute to the problems in the hot spot areas are also taken into account.

In declaring the Highveld Priority Area, the Minister confirmed that a situation exists within the area which is causing or may cause, a significant negative impact on air quality and that the area requires specific air quality management action to rectify the situation.

In order to address the Minister’s concerns, the department, together with the affected provincial and municipal departments, is currently in the process of developing an air quality management plan for the area that is:

- Aimed at co-coordinating air quality management in the area;
- addressing issues related to air quality in the area; and
- providing for the implementation of the plan by a committee representing relevant role-players.

The Minister also indicated that the plan must be developed to his satisfaction by November 2009.

Until the management plan is finalised and available it is not possible to indicate the following in the EMF:

- The ambient concentrations of different pollutants;
- the sources of pollutants;
- the level of compliance of polluters with current permit conditions; and

- the extent to which permits conditions are to be revised, changed or re-issued.

2.4.4 Current Developments

Air pollution in dense, low-income communities, largely resulting from the burning of coal and wood for cooking and space heating, has been one of the most pressing air quality area issues in South Africa as early as 2002. People living and working in these areas are often exposed to air quality that is harmful to their health.

There have been interventions by the Department of Minerals and Energy to implement the so-called “Household Clean Air Strategy”. Numerous other interventions, limited in scope and focus have been implemented over the years by different spheres of government. An effect strategy is now currently under development by the DEA and service providers that will be able to function across the various spheres and levels of government.

As from March 2010 the Air Quality Act (AQA) will be brought into full effect. The new licensing authorities will be the Districts, Metros as well as the Municipalities. A publication will be released which will include the details of the relevant authorities, and details of the process. There will be a licensing fee, which will be calculated based on variables such as the volume and nature of pollutants, site and size of the industry and history of compliance.

Veld fire



Photo: L. Du Plessis

Highveld Steel factory



Photo: S. Taljaardt

Sun through smog



Photo: P. Claassen

2.4.5 Issues

Since 1 July 2009 the government started to impose a 2.25c/kWh “environmental levy” (carbon/pollution tax) on electricity users. It is anticipated that at least a part of the income from this will be used in support of the management plan.

It is, however, not likely that the air quality in the area will improve rapidly after the introduction of the management plan for the following reasons:

- The adverse environmental conditions will remain the same;
- the household use of coal for cooking and space heating is likely to continue for the foreseeable future as there does not seem to be cost effective alternatives and initiatives to use cleaner burning technologies;
- while there may be a gradual decline of pollution emanating from coal fired power stations, they will continue to produce pollutants for the duration of their operational lives which varies from 10 to 60 years depending on the current age of the stations;
- it will take time to refurbish or close down polluting industries;
- the dust pollution emanating from the transport of coal is likely to increase as distances between mines and coal users increase; and
- the occurrence of veld fires in the Highveld grasslands is a natural and necessary process that will continue.

Air pollution is, therefore, likely to remain a significant constraint for the development of economic opportunities that relies on clean air on the highveld part of the EMF area in the foreseeable future.

Specific activities that are likely to be affected negatively include:

- Tourism and recreation activities of any kind;
- higher order residential development;
- industrial development (due to limited capacity for additional air pollution); and
- agricultural activities that is sensitive to air quality and sunlight.

It can be expected that the situation may gradually improve over the next 20 years and change significantly thereafter as coal start to run out on the Highveld.

2.5 CULTURAL AND HISTORICAL FEATURES

2.5.1 Introduction

The EMF area has a rich and diverse cultural history. Each region faces possibilities as well as challenges which influence various heritage resources that can be expected in the regions. For example, the Lowveld area's hot and humid climate made it prone to diseases such as Malaria and sleeping sickness. This made human settlement difficult and as a result this area has limited cultural and historical features. In contrast, the Highveld did not have such diseases. However, the cold weather and lack of resources such as firewood made it unfavourable for human settlement which puts it in the same category as the Lowveld. The Bushveld area has a complex geology and occurrence of various minerals which gave rise to significant endeavours and influenced the kind of heritage resources found here. Cultural and historical remains from four historical phases can be found in different parts of the EMF area.

2.5.2 Stone Age

In most parts the EMF area has been inhabited by people since the Early Stone Age period (ESA). Tools dating to this period although not exclusively, are found in the vicinity of water courses. These artifacts are considered to hold little significance as the method used for their interpretation has been refuted.

The oldest of these tools are known as the choppers, crudely produced from large pebbles found in the river. The *Homo erectus* and early *Homo sapiens* people made stone tools that were shaped on both sides known as the bifaces.

During the Middle Stone Age (MSA) period (150 000-30 000 BP), people became mobile, occupying areas formerly avoided. According to Thakeray (1992) the MSA is a period that still remains somehow murky, as much of the MSA lies beyond the limit of convention radiocarbon dating. However, this period is still useful as a means of identifying a technological stage characterised by flakes and flake-blades with faceted platforms produced from prepared cores.

Most tools of this period are also commonly found near water courses. These sites served as hunting grounds during wild animals' migration season. As a result tools normally occur in open or erosion dongas. Like the ESA tools, these tools also hold little significance.

The Late Stone Age (LSA) period was more technologically advanced compared to the MSA period. People living during this period occupied diverse habitats compared to their previous predecessors. Evidence of their way of life can be widely seen by the artifacts of this period, which include beads, ostrich eggs, ground bone arrowheads, small bored stones and wood fragments with incised markings traditionally linked to the LSA.

The Late Stone Age people lived mostly in caves and rocky shelters. It is in these places that they left behind rock art that depicts their complex social and spiritual beliefs.

A number of stratified sites, of varying size and significance, are known to exist in the EMF area. One of the sites is the Bushman Rock Shelter located a few kilometers north of Orighstad. Archaeological excavations revealed that early humans had lived at the site continuously for thousands of years, from Early Stone age, through Middle Stone Age into the Late Stone Age and part of the historic times. Various top layer excavation on sites revealed findings of rich legacy of artifacts going back to more than 400 000 years ago. These included complex tool assemblage, bone tools, ostrich egg shell beads, some organic material, pigments used for painting as well as faunal remains (Plug 1979).

2.5.3 Iron Age

The Early Iron Age (EIA) people began to settle in Southern Africa around 300 AD. One of the oldest known sites is the Silver Leaves south of Tzannen, which dates back to 270 AD. The EIA people practiced subsistence farming and mostly cultivated grains such as sorghum, millet that needed summer rainfall. This determined where they had to live.

Other sites in the EMF area are believed to belong to the Doornkarp Phase of the Early Iron Age dating between 600 and 900 AD. These sites were identified through the preliminary identification of pottery belonging to this period. The people that inhabited these sites are the same group of people believed to have produced the remarkable clay masks found near Lydenburg in the 1960s. These settlements seem to have been slightly followed at a later date by the settlements linked to the Eiland Facies of the Middle Iron Age (c.AD 1000-1200), first identified in the Hans Merensky Nature Reserve.

Occupation in the larger part of the geological area (including the EMF area) did not begin until the 1500s. Towards the end of the first millennium AD, the Early Iron Age communities went through a drastic change brought on by the increased trade on the East African coast. This led to the rise of elite and powerful African Kingdoms such as the Mapungubwe Kingdom. The abandonment of Mapungubwe (c. AD 1270) and other contemporaneous settlements could be attributed to the widespread drought that also led to the decline and eventual disintegration of this state.

The Iron Age people preferred to settle near rivers with rich alluvial soils. These sites provided them with resources such as water and firewood as well as fertile soils. The sites were clustered along larger rivers and become younger as one moves further into the interior. Over time, these rivers and associated settlements became trade routes with the outside traders where they exchanged ivory, metals and slaves for glass beads, porcelain and cloth. Up until this point, the status of individuals in the communities was judged by the number of cattle one possessed. The growing trade changed this,

Biface Acheulean hand-axe



Rock engraving dating to the Late Iron Age



individuals started owning other possessions (trade merchandise) which were seen as a sign of prestige. Trade was further exploited as a means to gain more political power and wealth. Soon centres of trade developed, for example Mapungubwe which mainly traded in ivory and gold, and other sites such as Palaborwa and Musina regions traded in copper.

By the 16th century, areas that were previously considered as unsuitable for human settlement were beginning to be occupied, for example the Mpumalanga Highveld. This was attributed to the change in climatic conditions, places that were cold were becoming warmer and wetter, paving the way for the Late Iron Age farmers. This period of consistent high rainfall began around 1780 AD. At that time the maize was introduced from Maputo and was grown extensively. Given the good rains, maize crops yield far more than millets and sorghum. This increase in food production probably led to the increase of population in the coastal areas as well as the central Highveld interior by the beginning of the 19th century.

This was also a period of great military tension in the area. Military pressure from the Zulu was spilled on the Highveld by 1821. Various marauding groups of displaced Sotho-Tswana moved across the plateau around 1820. Mzilikazi raided the plateau extensively between 1825 and 1837, entering for example the Steelpoort valley in the early 1830s. The Boers also trekked into these areas in the 1840s.

The Late Iron Age people preferred to settle on steep mountain slopes. This gave them protection as well as provided grazing pasture for their enormous herds of cattle. Their shelters were built in stones due to a lack of trees. Hundreds of these sites can still be found on escapements around the EMF area. The sites are linked to the Koni, a loose attribution that included people of probable diver's origin. It is suggested that they occupied these sites sometime after 1600 AD, and the sites are associated with rock engravings that depicts the layout of the settlements.

2.5.4 Ethno-history

The Late Iron Age people were eventually replaced by the Bantu speakers known in modern day. These included the Pedi and Kwena on the central plateau area, the Lebodu, Phalaborwa, Lestwalo and Kgaga on the escarpment, the Nguni-speakers, such as Tau, Koni and Swazi on the plateau area, and the Tsi Tsonga speakers, such as the Nkuna in the Lowveld region. Although located further away, the Vendas also had an influence in the EMF area especially amongst the Lobedu. The Ndebele-speakers are located to the east and south of the EMF area whilst the Swazi-speakers are found on the eastern edge.

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

2.5.5 Historic Period

The historic period is seen as the time of drastic changes in the South African history. It is the time when the first white settlers arrived around the 19th century.

Most of the modern towns in the study area have existed since the 19th century. Middelburg, Burgersfort and Lydenburg are some of the oldest towns. Others such as Balfour, Witbank, Standerton and Ermelo followed later. Old buildings such as churches, schools, shops, cemeteries and other infrastructures (bridges) of heritage importance can still be found in these towns to date. Much of the heritage potential in the area is located within the many farmsteads.

During the 1840s up till the 1880s, the area was sporadically visited by prospectors, scientists, hunters and other explorers most notably St Vincent Whitshed Erskine (1868 and 1871). These people were followed by missionaries (Merensky, Winter.) administrators (Erasmus) and traders (Albasini).

The tropical climate and associated diseases such as malaria, bilharzia, nagana, sleeping sickness and other human and animal diseases prevented wide spread colonial occupation of the Lowveld region. The rinderpest of the 1890s (which decimated large numbers of wild animals and cut down the distribution of tsetse flies), the advent of the railways, planned land settlement of white farmers, the development of agriculture and the establishment of nature conservation areas changed this situation and resulted in increasing numbers of colonists settling in the region. One individual who played a prominent role in this was Dr L Annecke, whose work on the eradication of malaria in the 1930s onward contributed much in this regard.

When white farmers entered the area, land had to be demarcated for farming purpose. This gave rise to conflicts between the whites and the local tribes, for example there was conflict between the white and the Tsonga and Sotho, the *Kgoši* Makgoba, occupying Magoebas Kloof, and the Zuid-AfriKaansche Republiek (ZAR government). Other significant centres of conflict between white and black were between the Pedi and the British (during the first annexation of the ZAR), followed by a siege against the Ndzundza-Ndebele somewhat later. The local population that lost their anatomy were divided up and employed as labourers on farms.

In 1875 the first survey to determine the best route for the Pretoria-Maputo railway line was undertaken by Richard Thomas Hall. Later in 1883, Major Joachim Machado embarked on a similar survey and came up with the Komatipoort route. This route is still largely used today and its long section follows the N14 national route. The railway line between Pretoria and Maputo (formerly Lorenzo Marques) also known as the eastern line was completed in July 1895.

The Anglo-Boer war (1899-1902) also had an impact on the heritage resources in the EMF area. It left a legacy of sites scattered across the veld. Fortification and war cemeteries can be found all over. The war was mostly centered along the railway line, for example the failed attempt to destroy the Komati railway bridge which prompted Gen. Buller to assemble his own special unit that was eventually

commanded by Baron Francis Christian Ludwig von Steinaecker. The unit was known as the Steinaecker's Horse, by the end of the war, most of its members settled in the area and found employment at the Sabi Game Reserve which later grew into the Kruger National Park.

2.5.6 Important People

Important personalities of the EMF area are listed in Table 13.

Table 13: Important historic personalities of the catchments area

Albasini, Joao	Portuguese trader from Delagoa Bay who settle close to Pretoriuskop at the Sabie River
Annecke, Ludwig Dr.	Medical doctor, worked on eradication of malaria
Buchan, John	Author and later Canadian politician
Burgers, T.F.	President of the ZAR, town of Burgersfort named after him
Button, E	Early prospector
Caldiera, Antonio	Provided the earliest known record of copper trade between Rooiberg and Delagoa Bay, 1544
Chamusso, Patrick (Thibedi, Patrick)	ANC comrade responsible for the bombs at Sasol 2 (1981)
Dick, B.H.	Trader, author and native administrator
Dinkwanyane, Kgalema (Johannes)	Leader of the group of Christian converts who left Botshabelo in 1873 and built Mafolofolo (Spectboom River, Lydenburg Region)
Dinkwanyane, Micha	Chief of a group of descendants of Kgalema Dinkwanyane who bought the farm Boomplaats outside Lydenburg (1906)
Dinkwanyane, Victoria Thorometsana	Leader of the group of families who relocated from Boomplaats to Sterkspruit (Phiring) on 12 November 1956
Ekho, Nils	Norwegian timber expert responsible for the plantation in the Pilgrim's Rest district (1947) for the Transvaal Gold Mining Estates
Erasmus, Johannes Abel	Field cornet and later native commissioner of the ZAR in the Lydenburg district
FritzPatrick, Percy Glynn, Henry	Transport rider between Transvaal and Delagoa Bay and author of the "Jock of the Bushveld" Wildlife hunter, prospector, farmer and early settler at Sabi, helped to develop the roads from Lydenburg and Pilgrim's Rest to Spitzkop
Haigh, Richmond Hall, Hugh Lanion	Acting commissioner for the Pedi during the Pedi internecine and the second Anglo-Boer war Farmer and leading agriculturalist in the lowveld. His farm Mataffin, was owned by H.L. Hall and Sons until 2004 when it was sold as part of land restitution
Hart, Sue	Veterinarian and conservationist who established Ecolink EarthCare Programme in Mpumalanga (1986)
Joubert, P.J.	Commandant-General of ZAR forces
Lazarus, Esrael	A Lithuanian immigrant and successful farmer in the Bethal district (1911)
Lovedale, Richard Kelsey	English speaking Volksraad member for Barberton, 1891 to 1900 and member of the Legislative Council of the Transvaal, 1903 to 1907
MacLaglan, T	Early prospector
Makhushane	Phalaborwa chief
Mampuru	Pedi chief
Mauch, K	Early prospector
Merensky, Alexander	Missionary who established the mission station Botshabelo near Middelburg
Merensky, Hans	Son of the former and famous geologist
Modjadji	Lobedu chieftainess
Muzila	Tsonga chief
Nchabeleng, Peter	Leader of the UDF in Lebowa (1985) who was killed after been arrested by the police in April 1986
Ntuli, Piet	A key figure in the KwaNdebele Government and the vigilante organisation Mbokodo
Nyabele	Ndzundza chief
Phatudi, Cedric Dr	Chief minister of Lebowa, 1973 to 1987
Phosa, Matthews	ANC stalwart and author
Sekhukhune	Pedi chief
Sekwati	Pedi chief
Sibande, Gert	Political activist and last president of the Transvaal ANC
Skosana, S.S.	Chief minister of KwaNdebele and with Ntuli a key figure in Mbokodo
Stevenson-Hamilton, James	Chief warden of the Sabie Game Reserve for 40 years (1902 – 1942)
Trechardt, K	Voortrekker leader and explorer
Trechardt, L	Voortrekker leader
Winter, J.H.	Missionary, established BaPedi Lutheran Church
Wolhuter, H	Conservationist

2.5.7 Issues

The issues involving heritage sites and features can be categorised as follows:

- Ignorance as to the importance and value of heritage sites and their protection through legislation.

Land and property owners are, in most cases, ignorant about the value of heritage or their legal obligation to protect it. Current legislation is very clear as to the obligation of the land or property owner with regards to heritage management and preservation.

- Ignorance as to the nature and distribution of heritage resources.

There is very little information available on heritage in the area. This can be overcome by a number of actions, e.g.

- A system whereby members of the public can record the heritage sites in their communities or on their properties should be established. This can be achieved, for example by keeping a register at the local library.
 - The municipality and other authorities should make funds available for systematic surveys by which sites can be documented.
- Lack of information on heritage resources on the side of the authorities responsible for planning.

This is the direct result of the above-mentioned problem. More information is needed.

- Tourism drive

Tourism is seen as a big driving force for development in the region under review. However, it is not always beneficial to heritage sites and should therefore be carefully managed. If sites are to be used as part of a tourism drive, i.e. the interpretation of the sites through interpretative plaques, guided tours (by trained guides) and interpretative exhibitions and centres, a permit must be obtained in terms of Section 44 of the HRA Act, No. 25 of 1999. This will only be issued on compliance of the operator to the standards set down by the Heritage Authority.

- Heritage is not static

New heritage sites are continuously being created, due to events that take place, or, simplistically seen, because existing features and structures become older with the passage of time and all should be considered for their contribution to retelling the story of the past. The process of identifying and documenting heritage features would therefore, in theory, never stop.

A contemporary photograph, showing the construction of one of the bridges during the building of the railway line in the 1880s



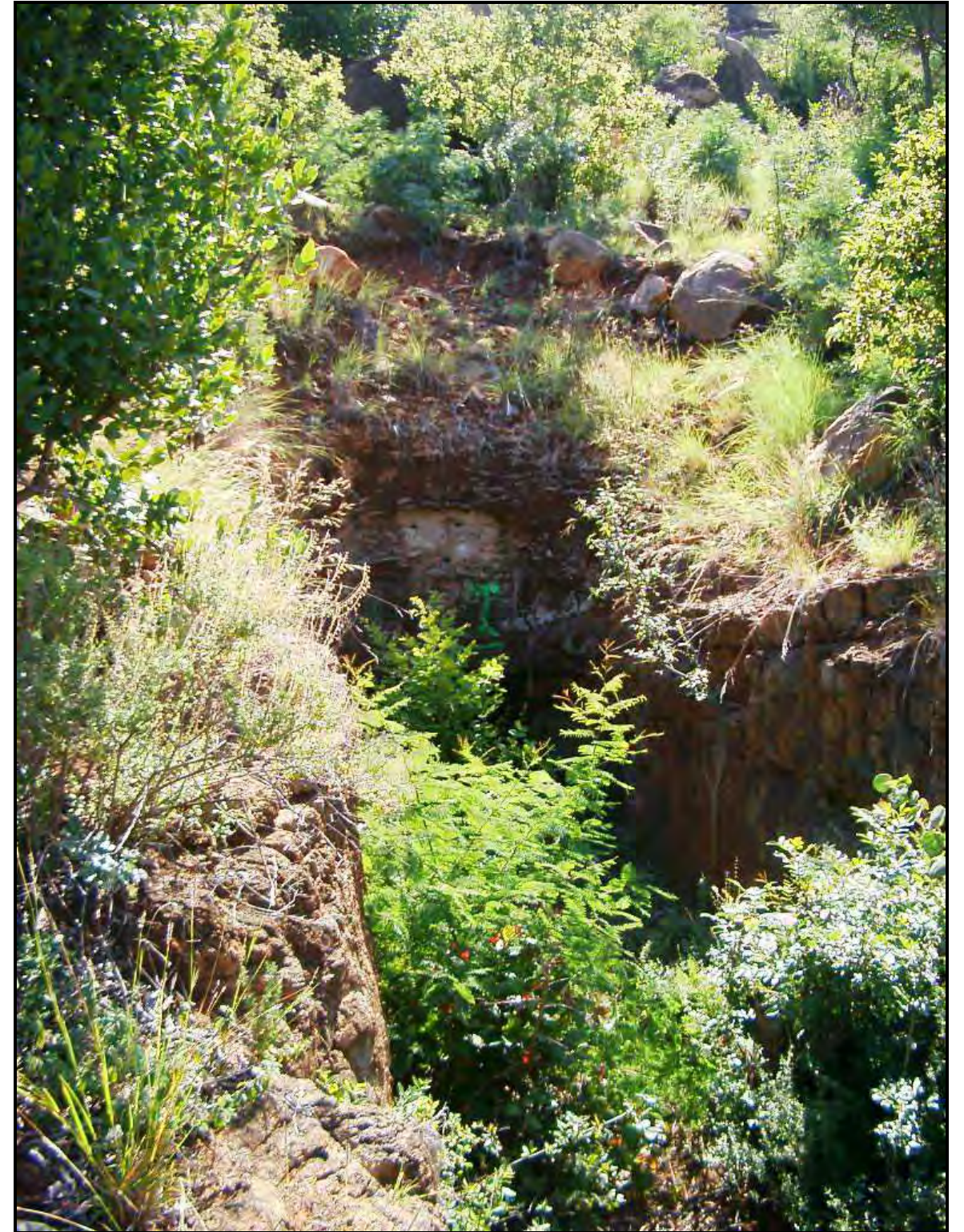
Typical farm labourer homestead



Monument to the dead British soldiers at Signal Hill, Machadodorp



Adits excavated by Hans Merensky during his platinum exploration



2.6 POPULATION CHARACTERISTICS

2.6.1 Description

According to the 2007 population data, the EMF area has an estimated total population of 8,881 727 with 59% of the population distributed within the Greater Sekhukhune, Vhembe, Mopani, Capricorn and Waterberg districts.

The highest percentage population of the people in the area fall under the age of 24, (58% falls within the age category of 0-24). The Greater Sekhukhune district has the largest percentage of people within this age category in the EMF. More than 60% of the district's total population falls within the aforementioned category.

Most of the EMF area has a high poverty rating with the majority of the economically active people earning an annual income of not more than R19200 or R1600 per month. According to the 2001 economic data, a combined total population of 66% of economically active people of Nkangala, Enlanzeni and Gert Sibande districts earn not more than R1600 per month.

In the Greater Sekhukhune, Mopani, Vhembe, Capricorn, and Waterberg districts, the 2007 economic data indicate that a combined total population of 88% of economically active people earn not more than R1600 per month. Of this, 60% do not have an income.

A combined total population of 19% of the Greater Sekhukhune, Mopani, Vhembe, Capricorn and Waterberg Districts has no schooling, whilst 17% has Grade 12 and 6% has post-high school qualifications.

In the Nkangala, Enlanzeni, and Gert Sibande districts, 67% of the combined total population has no schooling, whilst 14% has Grade 12 and 3% has post-high school qualifications.

2.6.2 Issues

Some of the main issues associated with the population characteristics include:

- The migration of people to economically active urban areas from the rural areas which has added more pressure on service delivery;
- the sparsely populated rural areas have become unsustainable to develop;
- an increase of informal settlements in urban areas due the influx of people from the rural areas;
- an increase of a young population in the rural parts of the EMF area which survives on government grants; and
- high levels of illiteracy which is coupled with low income and poverty.

Figure 22: Population density per Census ward

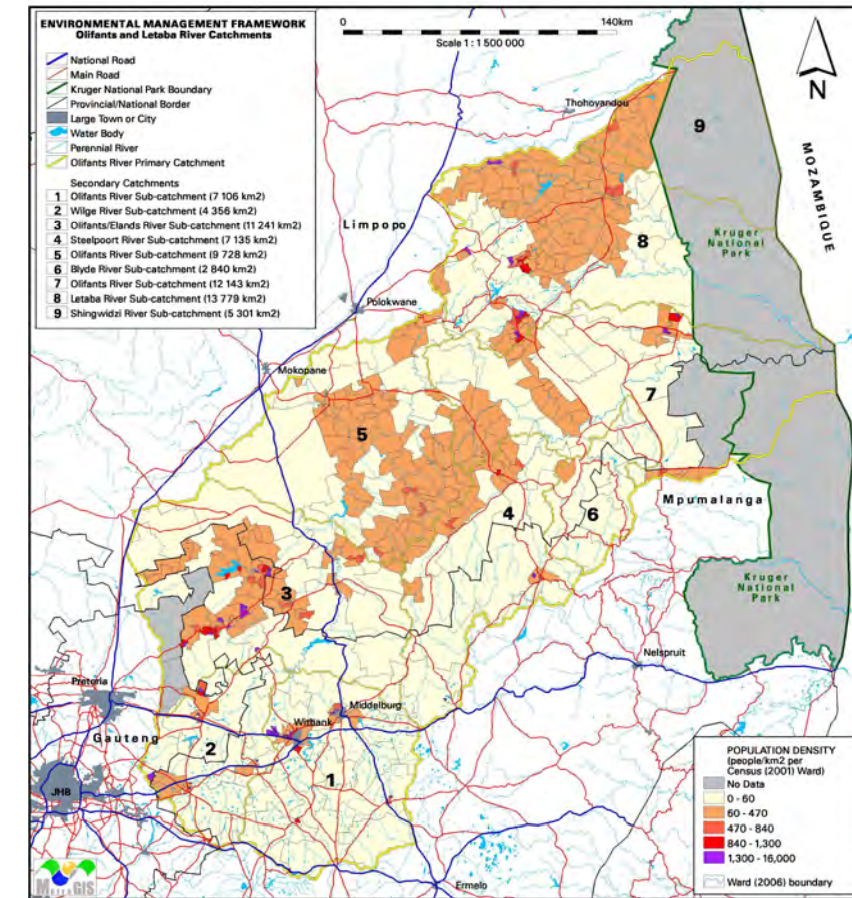
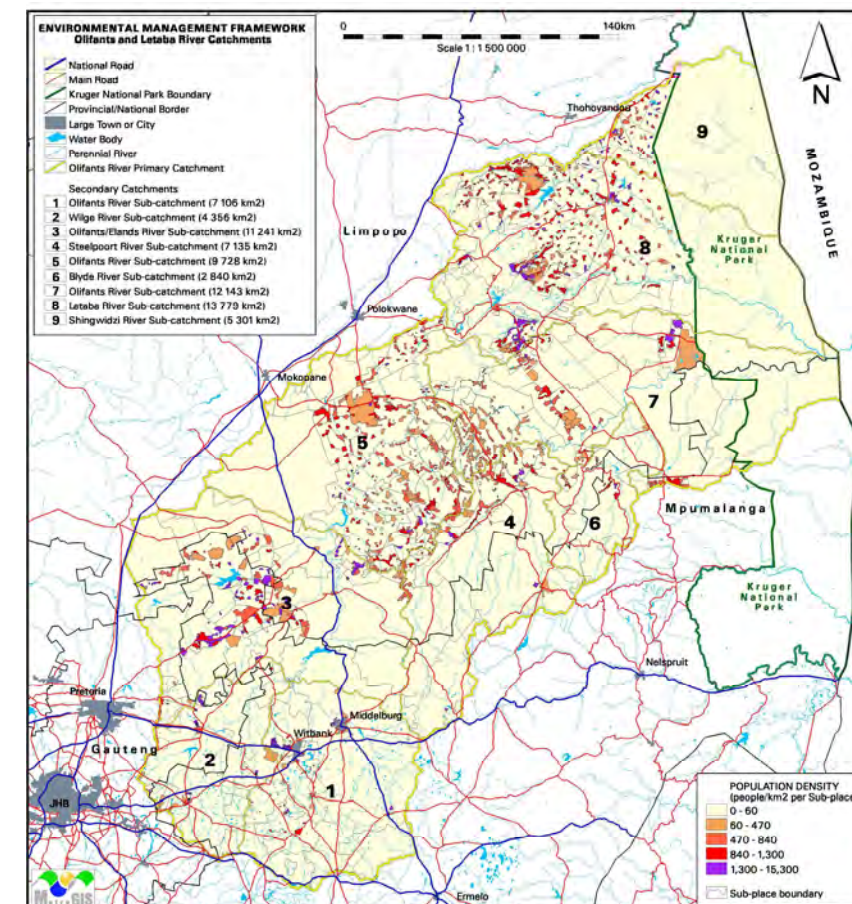


Figure 23: Population density per Sub-place



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Figure 24: Population structure

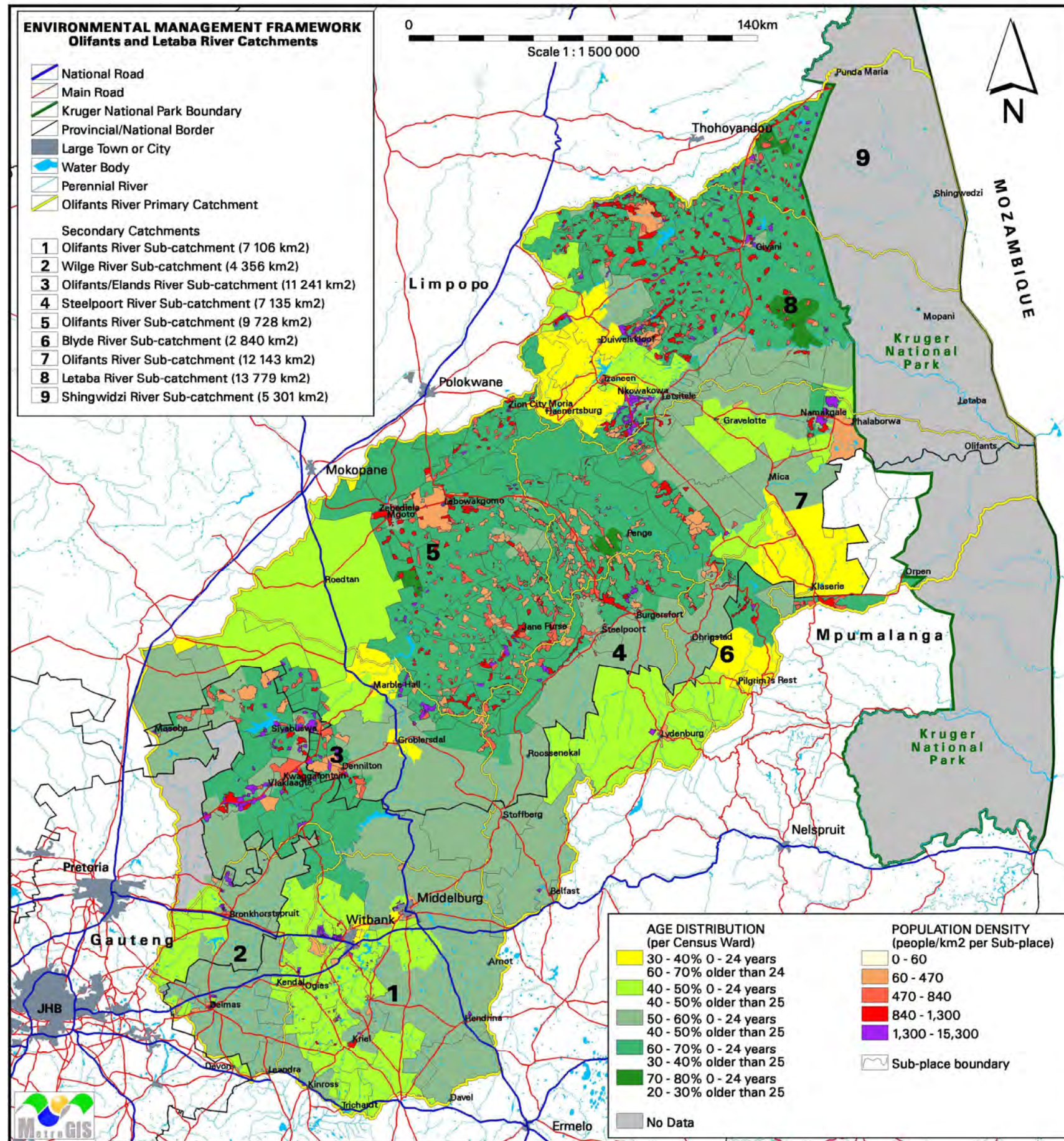


Figure 25: Broad income distribution per household

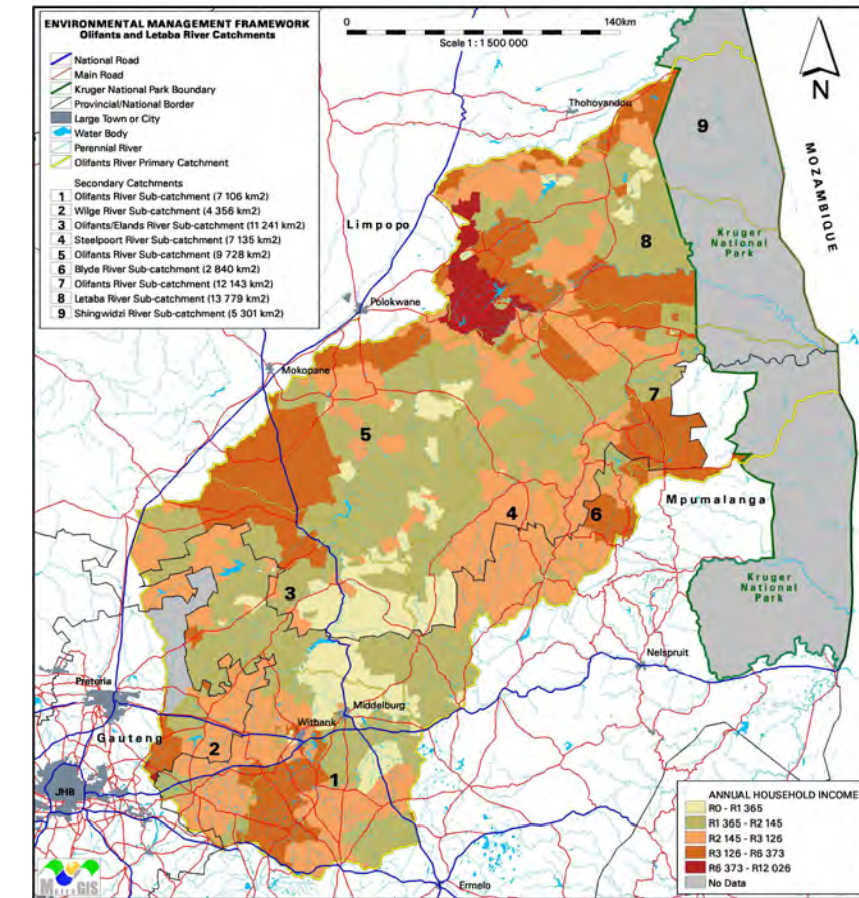
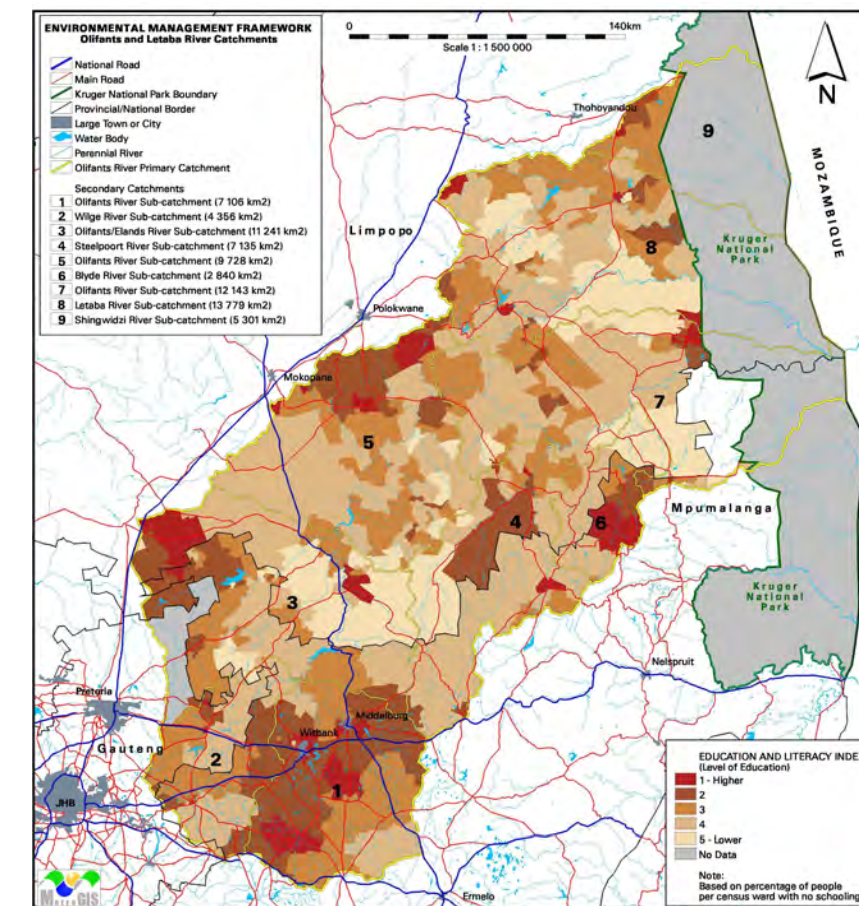


Figure 26: Education and literacy



2.7 ECONOMIC CHARACTERISTICS

The EMF area has diverse natural characteristics and is rich in natural resources. It is these resources that foster positive economic opportunities. The main economic sectors in the EMF area include:

- Mining;
- agricultural activities and forestry; and
- tourism.

2.7.1 Mining sector

The broad mining of precious and base metals has acted as a catalyst to economic growth and has also been the main source of employment in the area. Mining activities are mainly found in the Sekhukhune and Enlanzeni District Municipalities. The mining belt in the districts stretches in a north-south direction to link up with that of the Nkangala district (coal reserves), which is associated with the rich and diverse Bushveld Igneous Complex deposits.

The Dilokong mining corridor is the main mining cluster in the mining belt. It is located between Polokwane and Burgersfort with platinum, chromite and vanadium being the main minerals mined in the cluster. There is hope that the proposed mining corridor that is planned south of Dilokong corridor (between Jane Furse and Lydenburg) will also positively contribute as a key economic driver.

Mining is also prominently found in the Witbank area of the Enlanzeni district. The area's rich coal reserves contributes towards other associated drivers such as the Eskom coal-powered stations that generate over 60% of Southern Africa's electricity.

The Phalaborwa area also has important mining clusters. These include the Phalaborwa Mineral Complex, which mostly produces copper, iron ore and phosphate resources. The Giyani Green Stone Belt and Murchison Green Belt are small clusters and they produce gold and antimony.

2.7.2 Agriculture and livestock activities

The EMF area supports various agricultural activities in different regions. The diverse landscape and climatic conditions as well as water scarcity makes various agricultural activities suitable in one part of the catchments and not in the other.

Generally commercial and subsistence farming are widely practiced in the area. Commercial farming is mainly concentrated in the following areas:

The greater Witbank area and around Middelburg, which practices dry cultivation for the production of maize, wheat and sunflower.

Loskop Dam Scheme, with the Globlersdal area and the Orighstad Scheme extensively associated with irrigation activities for the production of citrus fruits and vegetables. The Globlersdal area is located in a central position where it fully benefits from the 5 irrigation schemes around the area. The irrigation scheme covers a total surface area of 28 800 ha.

The Olifants River System, the Blyde Irrigation Scheme as well as greater Tzaneen produces the majority of the country's citrus and sub-tropical fruits.

Informal or subsistence smallholder farming in the EMF area is an important aspect of the area's economy. It provides employment and food to the rural community. Secondary opportunities exist in these areas by means of empowering the disadvantaged farmers and encouraging the small scale farmers that have been integrated into the commercial industry so that they can also fully participate and contribute towards the GDP. Mobilising subsistence farmers also fosters rural development and alleviates poverty.

The agriculture sector is interrelated to the manufacturing industry. This creates an atmosphere where agro-processing can flourish and encourage the production of secondary goods such as:

- Processed red meat, poultry, fruits and vegetables;
- leather products ; and
- agro-tourist clusters.

The EMF area also has prominent plantation especially around the greater Tzaneen and Orighstad regions. Small plantations are also evident east of Middelburg and in the vicinity of Soutpansberg. Globlersdal and the area south-west of Lydenberg have been identified as potential areas for plantations. Plantations provide opportunities for secondary economic drivers such as saw-mills. The Tzaneen area alone has 40 saw-mills which are a source of employment to the area and they contribute towards skills development.

There is an opportunity for implementing various green programmes such as:

- The establishment of sustainable wood harvesting clusters which consist of fast growing indigenous trees in densely populated areas where there is a continued demand for wood as a source of energy for cooking, lighting and heating.
- the rehabilitation of decommissioned mine sites by means of greening with appropriate species.
- education and awareness raising; and
- the initiation of forestation programmes where feasible.

Figure 27: Employment in the agricultural centre

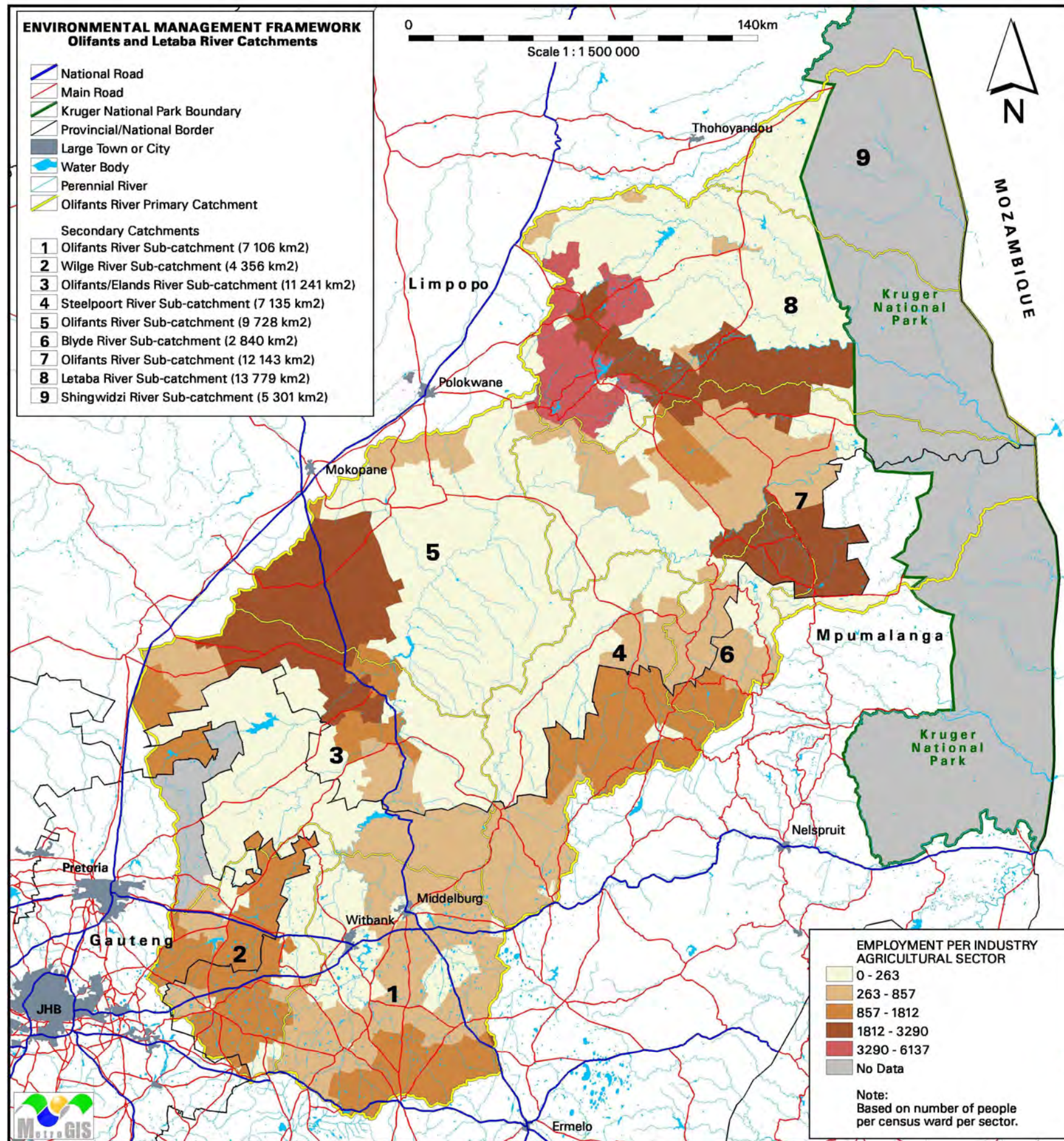
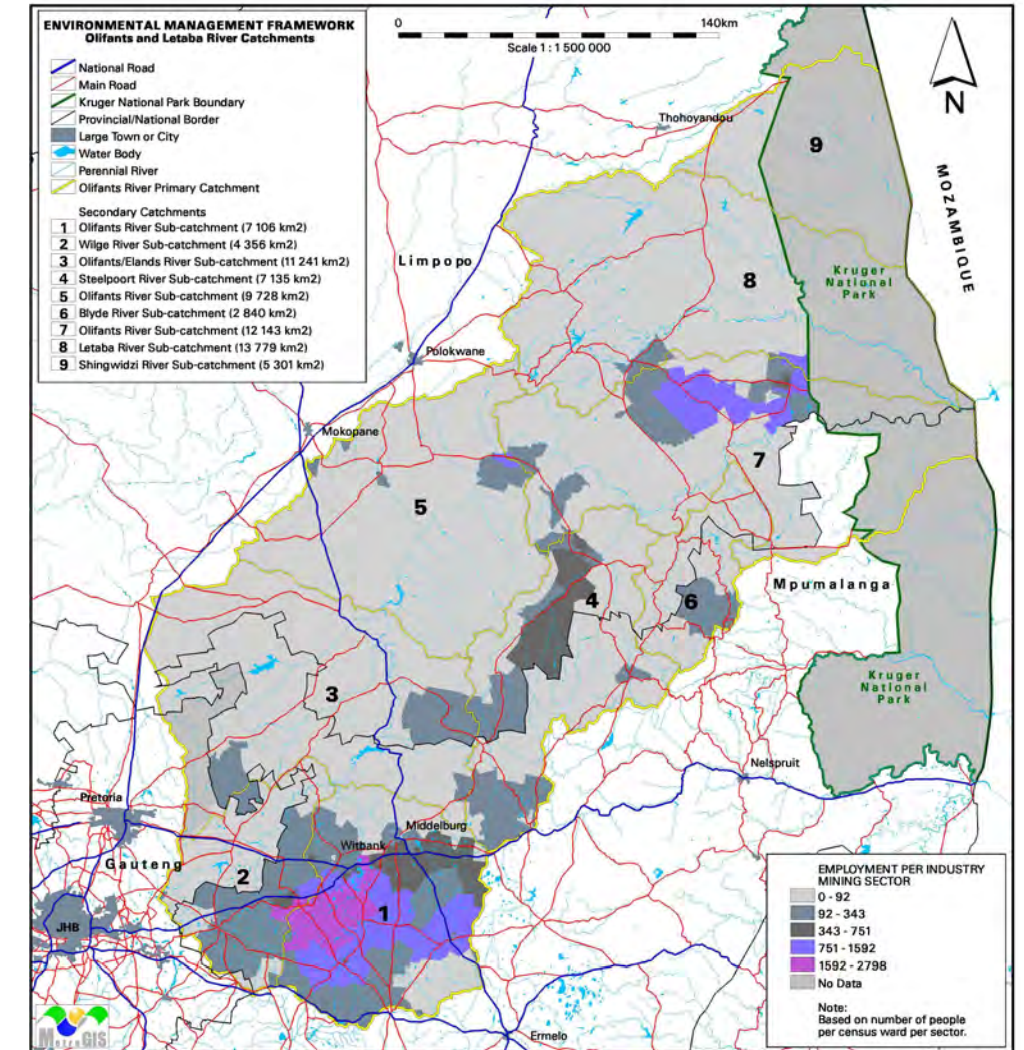


Figure 28: Employment in the mining sector



Irrigation



Photo: P. Claassen

2.7.3 Tourism sector

The tourism sector has been identified as one of the growing sectors in the EMF area. The Kruger National Park (KNP) is the major economic driver of this sector. The Kruger National Park is situated along the easternmost edge of the EMF area. The park includes the Sabi Sabie Game Reserves, Timbavatie and Manyeleti Reserve, Thornbush Game Reserve and the Klaserie Reserve which have been integrated with the KNP as private concessions enabling animals to move freely without the fencing. Measures are being put in place to safe-guard the KNP which is facing threats of encroachment from mining and agricultural activities as well as the formal and informal housing schemes around the area.

The Blyde River Canyon has also been identified has a potential tourism destination. It is a majestic area which forms part of the Trasvaal-Drakensberg Escarpment with breathtaking views of the Blyde River Canyon and gorge, Blyde Dam, the three Rondawels, Bourkes Luck Potholes, Gods Window and Pinnacle. Past investigations review that the Blyde Canyon and Mariepskop (state forest) are to be proclaimed as one National Park, as well as to acquire National Heritage status due to their ecological diversity and unique geology. This initiative will also help conserve the over-stressed Olifants River Catchment. Other opportunities in this regard include:

- The generation of income and employment linked to eco-tourism; and
- the initiation of programmes of forestation at Mariepskop where commercial timber is produced.

The Loskop Dam also has great potential as a tourist destination. This however, has not been capitalised on. To realise its full potential the main focus must centre on the following:

- Tourism marketing and awareness; and
- development of future tourism plans that focus on agri- and eco-tourism attraction that safe-guard cultural and natural heritage of the area whilst creating employment opportunities and developing skills.

There is a need to fully exploit other sectors in the EMF area besides mining, agriculture and tourism. The aforementioned economic sectors must capitalise on promoting labour intensive secondary sectors such as manufacturing and agri-processing, construction, transport and communication sectors. These sectors will help maximise the development potential in the area and stimulate growth, which will eventually lead to an improvement in basic provision, roads and infrastructure as well as housing and dwelling. This will in turn benefit the development of the retail and commercial sectors and contribute towards skills development within the area.

2.7.4 Issues

- Some of the main issues associated with the economic characteristics include:
- The mining sector is sensitive to macro economic conditions such as the exchange rate and this can result in job losses;
- Some areas with active mining sectors have high poverty and unemployment levels in the EMF area;
- the mines have production expectancy (they will not be around forever);
- the mining sector tends to put pressure on the land and the environment;
- the mining sector can also be affected by external decisions regarding water investments;
- increased water scarcity faced by the agriculture sector;
- land use conflict between the tourism and the agriculture sector which hampers tourism growth; and
- lack of proper marketing in the tourism sector.

Phalaborwa mine



Photo: P. Claassen

Figure 29: Employment in the manufacturing sector

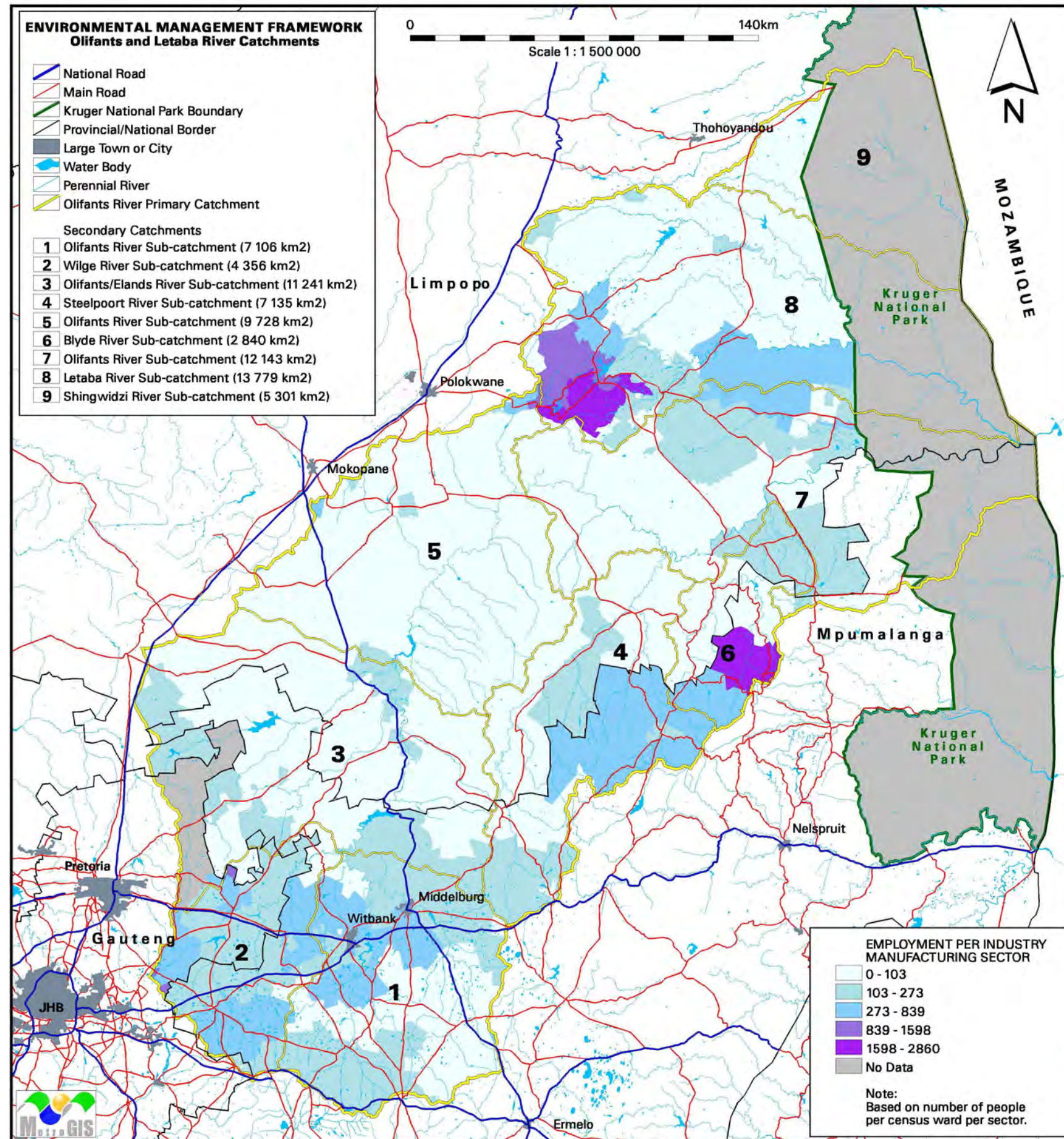
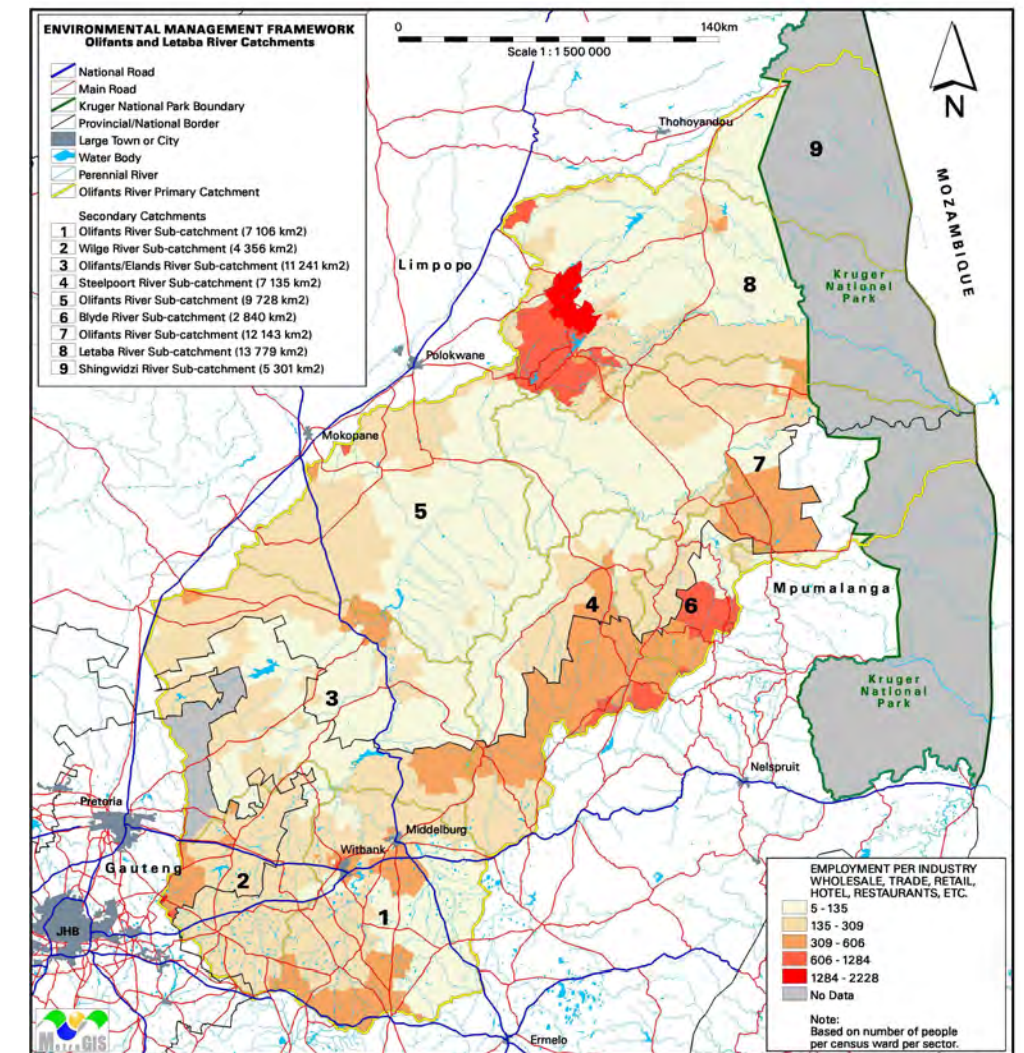


Figure 30: Employment in the trade and tourism related sectors



Fruit stall on the side of the road



Photo: P. Claassen

3. ENVIRONMENTAL MANAGEMENT ZONES (EMZ)

3.1 INTRODUCTION

In the EMF process the Environmental Management Zones were defined much later in the process than what is reflected in the EMF Report. The reason for bringing it forward in the EMF Report is that it makes much more sense to deal with and describe the Strategic Environmental Assessment (SEA), the Desired State (DS) and the Strategic Environmental Management Plan (SEMP) in the context of the EMZ. These elements were therefore re-evaluated in terms of the EMZ in order to provide a perspective that is relevant and focussed on each zone.

3.2 THE NEED FOR EMZS

During the Status Quo phase of the project it soon became clear that the EMF area had distinct sub-areas that were defined by biophysical, economic and social factors. It therefore made sense to pursue an approach that would be able to focus on the characteristics and context of each of these areas instead of an approach that would look at the EMF area as one big management zone. The reason for this is that the areas have distinct environmental features and it was also clear that each area has very specific opportunities and constraints as well as expectations of stakeholders. Each of these areas also requires a different set of management interventions.

3.3 THE IDENTIFICATION OF EMZS

Based on the information layers contained in the Status Quo Report (SQR), the project team developed preliminary EMZs for discussion purposes. These EMZs were presented and discussed at focus group meetings with the conservation, tourism, agriculture, mining and ESKOM focus groups. It was also presented and discussed at the public open days that were held in Giyani, Tzaneen, Phalaborwa, Burgersfort, Middelburg and Groblersdal. Based on these interactions several changes were made to the delineation of preliminary EMZs even though there was a general consensus on the areas and the approach followed. After the completion of the environmental sensitive analysis (discussed later in this report) the EMZs were revisited and refined further to ensure that the most accurate boundaries possible between the different zones were identified.

The following eight EMZs were identified and are also indicated on Figure 31.

Zone A: The Highveld/energy hub area

The zone represents the current powerhouse of South Africa with extensive coal fields that cover almost all of the area, numerous large coal mines, 6 coal fired power stations (soon to be 7), several major industries and towns that are located in the area. It is also the area where the sensitive headwaters of the Olifants River catchment occur and water quality impacts that originate in the areas have significant

implications for downstream areas. The natural vegetation of the areas has been almost completely destroyed and the remaining pans and wetlands are important refuges for natural life.

Zone B: The Highveld to Bushveld transition area

This area comprises mostly of the hilly areas between the Highveld and the flat areas on the Bushveld Igneous Complex. It is a relatively unspoilt natural environment with good opportunities for conservation, recreation and tourism. Mineral economic significance occurs in places but is not dominant in the area.

Zone C: The Groblersdal/Marble Hall agricultural area

This zone occurs on the fertile soils of the Bushveld Igneous Complex in a climate that is suitable for food production area. The irrigation scheme that gets its water from the Loskop Dam led to the creation of a strategically important irrigated agricultural production area.

Zone D: Springbok Flats rural area

The zone is located on fertile soils in a relatively mild climate. It is dependent on extensive dry land agriculture, limited irrigated agriculture as well as limited mineral resource extraction. The area is rural in nature with a few settlement scattered across it.

Zone E: Rural Sekhukhune/platinum mining focus area

It is an area with beautiful mountains, rare vegetation, rich culture/history, high density impoverished rural communities and very high platinum mining extraction possibilities in a presidential poverty node.

Zone F: Nature conservation/tourism focus area

This area of natural beauty includes the Kruger National Park, the majestic mountains of the escarpment and exclusive private nature reserves in a relatively sparsely populated area.

Zone G: Tzaneen/Phalaborwa Activity corridor

This is an important agricultural area supported by mining, manufacturing and nature orientated tourism in an area that is transitional between Zone F and Zone H.

Zone H: Dry rural Lowveld area

This area is rural in nature with a high level of poverty that depends on subsistence farming. The government and education sectors are important in this area.

Figure 31: Environmental Management Zones

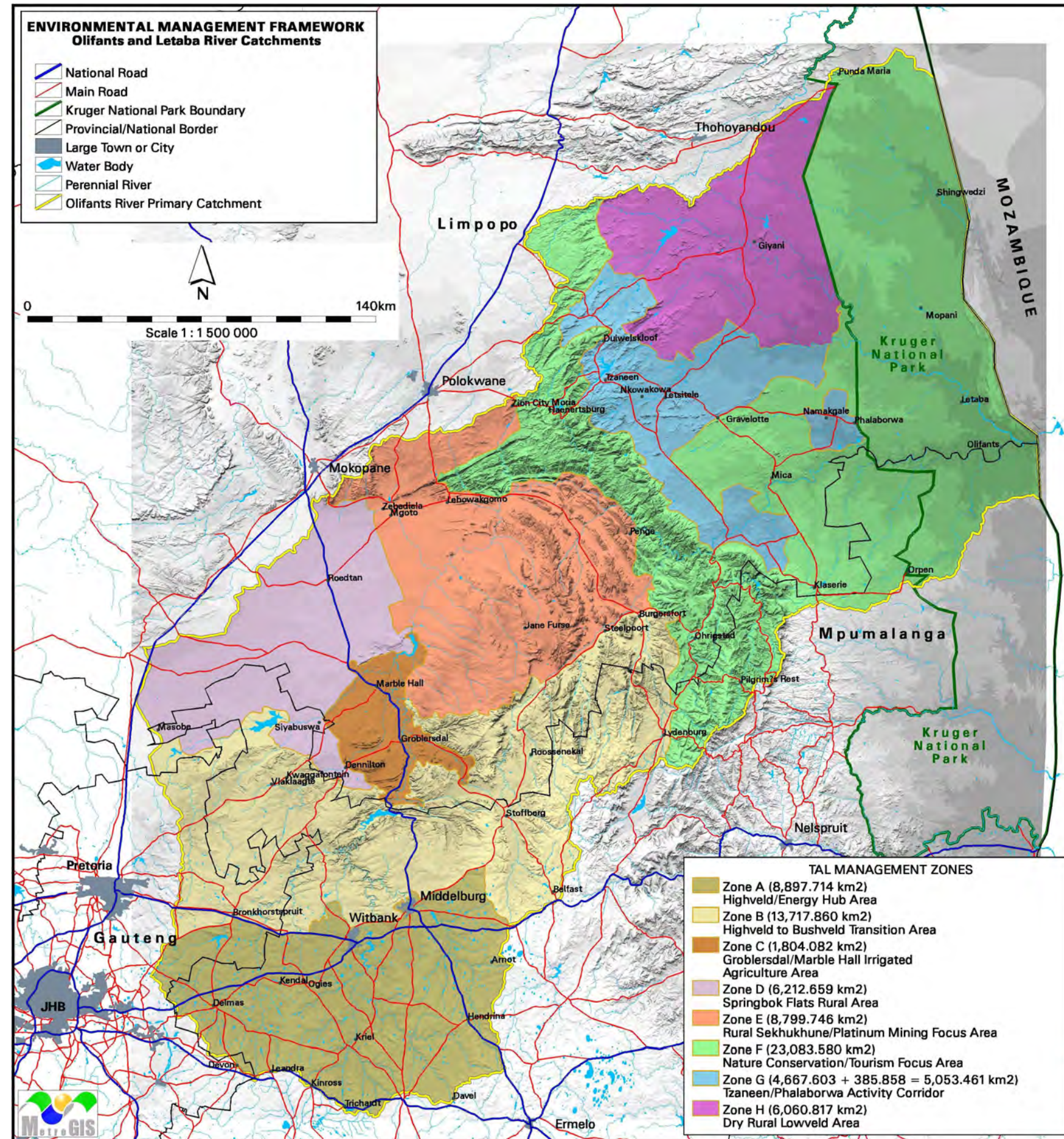


Table 14: Environmental management zones

	Surface Area	Percentage
ZONE A: The Highveld/energy hub area	8 897.714 km ²	12.10%
ZONE B: The Highveld to bushveld transition area	13 717.860 km ²	18.60%
ZONE C: The Groblersdal/Marble Hall agricultural area	1 804.082 km ²	2.45%
ZONE D: Springbok flats rural area	6 212.659 km ²	8.44%
ZONE E: Rural Sekhukhune/platinum mining focus area	8 799.746 km ²	12.00%
ZONE F: Nature conservation/tourism focus area	23 083.580 km ²	31.35%
ZONE G: Tzaneen/Phalaborwa activity corridor	4 667.603 + 385.858 = 5 053.461 km ²	6.86%
ZONE H: Dry rural Lowveld area	6 060.817 km ²	8.23%
Total Area	73 629.919 km ²	100.00%

Rural Lands



Photo: Google Earth 2009

Mines near Middelburg



Photo: Google Earth 2009

4. STRATEGIC ENVIRONMENTAL ASSESSMENT

4.1 INTRODUCTION

The purpose of the Strategic Environmental Assessment (SEA) is to assess the information that has been gathered in the previous sections in order to:

- Determine the key issues in the EMF area;
- set guiding principles for the EMF area;
- define an overall management approach that would be appropriate and practical to focus the outcomes of the EMF towards long term sustainable development in the EMF area;
- define the relative environmental sensitivity of the EMF area in order to highlight areas that would be most affected by change if development is allowed to proceed in an uncontrolled manner; and
- the identification of constraints, opportunities and potential conflicts between different opportunities.

4.2 KEY ISSUES

During the course of the public participation process, as detailed in the public participation report, the following key issues have been identified in the EMF area:

- The water resource in the EMF area is already over-allocated and any further significant allocation of water must come from the redistribution of existing water allocations;
- impoundment of rivers (especially in the mountainous areas) may cause irreversible damage to the hydrological regime as well as the ecosystems and human enterprises that depend on it;
- excessive pollution of water bodies and rivers has a negative impact on the user value of the water in the system and in some instances even have potential disastrous effects on ecological and economic processes that depend on the quality of the water;
- erosion, turbidity and sediment deposition in hydrological systems that result from practices that remove vegetation cover in the catchment areas significantly diminish the potential of the hydrological system;
- mining activities (often inadequately rehabilitated) occurs in scenic areas and impacts unnecessarily on the value that such areas has for tourism because their impacts have not been internalised to the extent where rehabilitation is adequate to retain or replace the original value of the site and area for tourism;

- extreme levels of air pollution, especially on the Highveld originating from heavy industry, electricity generation and burning of coal for space heating and cooking pose health risks to the people who stay in the affected areas and has a devastating effect on the scenic qualities of the affected areas, especially during winter months;
- poverty and its associated impacts occur over extensive parts of the EMF area;
- inadequate services and infrastructure remains a significant problem in certain areas;
- the extensive use of indigenous trees for firewood is not sustainable;
- the unsustainable harvesting of medicinal plants especially in indigenous forests is causing severe damage to the vegetation in certain parts of the area; and
- the uncertainty about the potential future impacts of climate change makes it difficult to plan for contingencies.

Letaba River



Photo: P. Claassen

4.3 GUIDING PRINCIPLES

The following guiding principles have been adopted for the EMF:

- Sustainable development that include:
 - o meeting the basic requirements for natural water catchment basin functioning across all sub-catchments;
 - o meeting biological conservation targets;
 - o protecting and using the natural resource base optimally to ensure benefits over the long term;
 - o ensuring that the ecosystem function is not compromised by inappropriate development;
 - o ensuring the equitable and appropriate allocation of available water to competing needs; and
 - o promoting development (including mining and industries) that would secure long term sustainable income without excessive unmitigated impacts on the environment.
- Pro-poor that include:
 - o not allowing any activity that will impact negatively on the poor in the region;
 - o planning activities to be positively biased towards the poor even if it requires intervention from the state; and
 - o placing the poor at the centre of strategies and guidelines for the development of the area.
- Capture value that should include:
 - o ensuring that public investment in infrastructure and services is directed to increase the value of local private land and the potential value of entrepreneurial enterprise that can occur on such land; and
 - o ensuring that public policy and investment support the creation of competitive advantages for local communities.
- Support local economic development that include:
 - o developing local skills for new employment opportunities;
 - o obtaining supplies for enterprises locally or through local agents; and
 - o forming partnerships with local entrepreneurs.
- Focus on what is important, appropriate and possible in the area including:

- o making sure that development initiatives are feasible in all respects including having adequate licensed access to water;
 - o ensuring that conservation initiatives contribute to national and provincial targets or to the development potential (tourism etc.) of the area;
 - o allocating water to users that are willing to pay a market price for water and that will use it effectively to achieve and promote government policies and objectives for the area; and
 - o allocating water to users that will have the least negative effect on other legitimate users.
- internalise externalities by:
 - o enforcing the polluter pays principle to ensure that negative impacts of activities is internalised as part of the cost of those activities during the planning and authorisation stage.

4.4 AN ASSET MANAGEMENT APPROACH

The approach that was adopted for addressing these principles for the area as a whole as well as for the different management zones that is an “asset base” management approach. The EMF area as a whole and each environmental management zone (discussed later in the report) has a “basket” of current assets, some of which can be maintained over the long¹ term and even indefinitely and some that are temporary and will be depleted some time in the short² to medium³ term future. The aim is to promote long term sustainability which means that as short to medium term assets including coal, copper and other minerals are depleted, the development of additional long term assets are promoted to the extent possible to ensure a continued asset base for people to live of in the area. The maintenance and rehabilitation of natural and cultural/historical resources in the process is vital in retaining long term sustainable development.

¹ *Long term* means at least a hundred years from now.

² *Short term* means up to fifty years from now.

³ *Medium term* means between fifty to hundred years from now.

One of the problems in the fields of planning and environmental management is that the short term indicates 10 years, medium term indicates 10 to 30 years and long term indicates longer than 30 years. This results in planning and development that fails to have an adequate focus on longer term sustainable development as environmental effects often only manifest themselves after 50 or 100 years.

4.5 ENVIRONMENTAL SENSITIVITY

Environmental sensitivity is a concept that is dependent on human values. The old proverb that “value is in people and not in things” is also relevant in the determination of environmental sensitivity.

It is nonetheless important to at least provide a fact based assessment of environmental sensitivity for the EMF area which spatially indicates sensitivity in an index of higher sensitivity to lower sensitivity. The purpose of defining sensitivity is not to provide a be all and end all analysis of the vulnerability of the environment and the risks it is exposed to. It merely summarises the facts that are already established in the status quo phase of the project in a visually comprehensible manner.

The environmental sensitivity as depicted in Figure 32: Environmental sensitivity is based on the following carefully selected environmental elements:

- Protected areas;
- threatened ecosystems;
- remaining natural vegetation;
- steep slopes; and
- hydrological features.

In addition it was decided to also get a spatial perspective of areas that required specific management intervention to prevent further disastrous degradation. The criteria used for this are:

- Air and water pollution control priority zones;
- water pollution management priority zones; and
- soil conservation priority zones (areas in process/danger of desertification).

In addition, because tourism is regarded as a key industry for long term sustainable development in large parts of the EMF area it was also appropriate to define areas where impacts on the scenic environment could have significant impacts on tourism.

4.6 CONSTRAINTS, OPPORTUNITIES AND POTENTIAL CONFLICTS BETWEEN OPPORTUNITIES

4.6.1 Management Zone A: Highveld/energy hub area

Govan Mbeki and Msukaligwa (of the Gert Sibande District Municipality area) as well as Delmas and large parts of Emalahleni and Steve Tshwete (of the Nkangala District Municipality area) and part of Kungwimi (of the Metsweding District Municipality area) municipal areas fall within Management Zone A.

4.6.1.1 Constraints

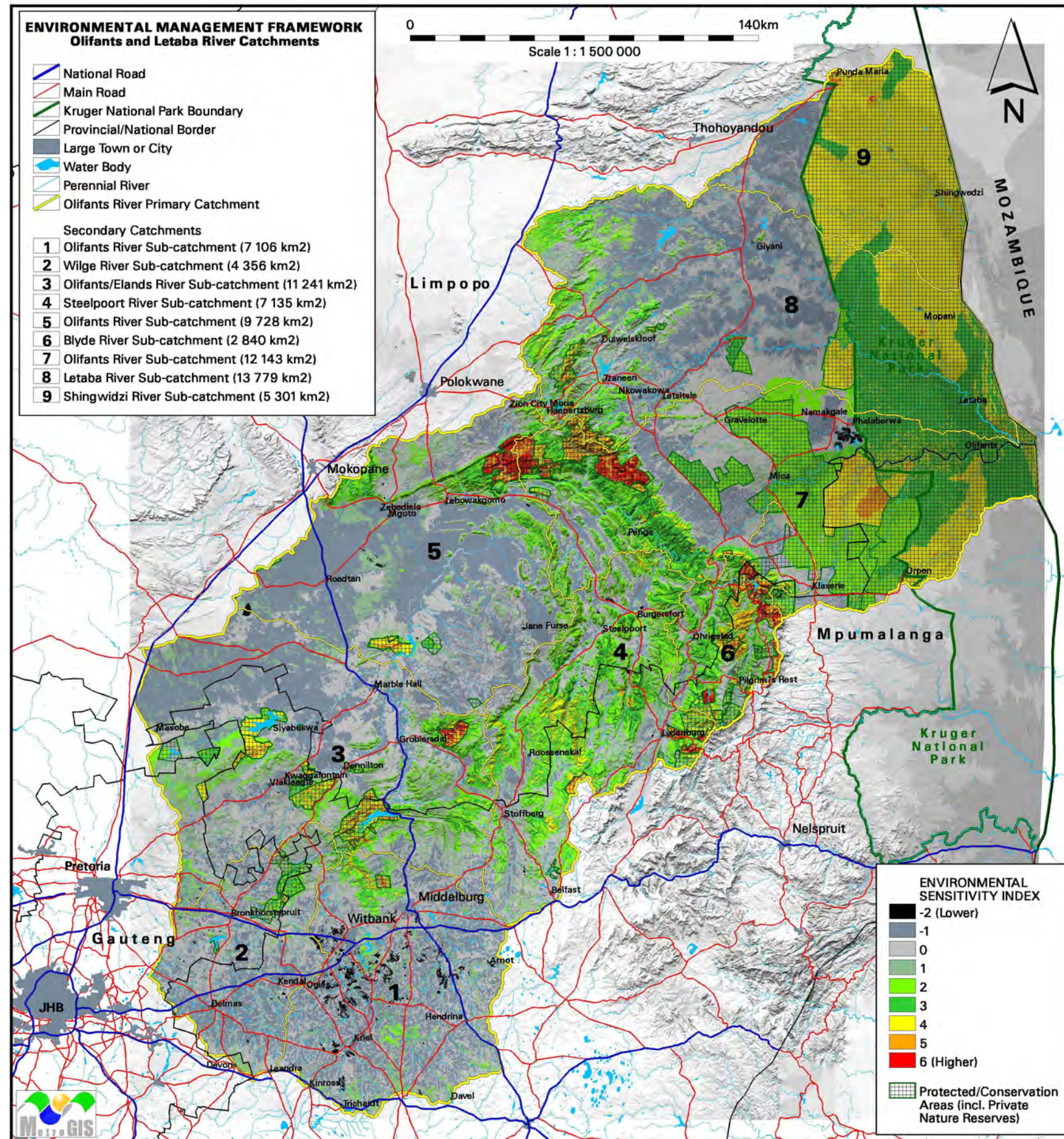
Over allocation of the water resources in this zone is a major constraint. The mining activities, industrial activities and power stations have a large negative impact on the natural environment, especially air and water quality. The poorly functioning municipal sewage treatment plants are of concern as this also contributes to the degradation of water quality and river health. The sensitive headwaters of the Olifants River catchment occur in the zone and water quality impacts that originate in the areas have significant implications for downstream areas. Mining and industry may also impact the scenic value of the environment. The mines have a limited life span, and other economical assets will have to be invested in order to support the area once the mines are abandoned. Erosion caused mainly from mining activities is also a problem in this zone. This zone contains drought prone areas. There is very little natural habitat remaining within this zone. Remaining pans and wetlands are important refuges for natural life and should be protected if possible.

4.6.1.2 Opportunities

A strong mining sector exists within this management zone. The main resource being mined is coal, some of which is directly used by the many coal fired power stations within the area. Other resources also mined in this zone, including chrome, building sand, stone aggregate, copper, magnesium and several other minerals and elements. Industry based activities, such as petroleum, chemical and plastics production also play an important economic role in the southern part of this area.

Management Zone A is rich in arable land suitable for agriculture. Dryland agriculture within this zone produces maize, grain, sorghum, soybeans and sunflower. Irrigated agriculture also occurs across the area. The development of cultural tourism has minor potential in this zone.

Figure 32: Environmental Sensitivity



4.6.1.3 Potential conflicts between opportunities

The damage caused to the natural environment by the mining and industrial sectors means that the opportunity for ecotourism is severely diminished. Competition for water between the mining sector and the agricultural sector is significant and any reallocation of the resource to one will impact negatively on the other.

Power lines and power station in EMZ A



Photo: P. Claassen

Erosion in Sekhukhuneland in EMZ E



Photo: P. Claassen

4.6.2 Management Zone B: Highveld to Bushveld transition area

Thembisile, Highlands, part of Dr JS Moroka and the remaining parts of Emalahleni and Steve Tshwete (of the Nkangala District Municipality area); part of Greater Tvetse and Elias Motsoaledi (of the Greater Sekhukhune District Municipality area); part of Thaba Chweu of the Ehlanzeni District Municipality area; as well as Nokengtsa Taemane, the remaining part of Kungwini (of the Metsweding District Municipality area); as well as a very small portion of Bela-Bela (of the Waterberg District Municipality area) municipal areas fall within Management Zone B.

4.6.2.1 Constraints

Over-allocation of the water resources is a constraint. Drought is a possible risk in this zone. There are some areas containing critically endangered and endangered vegetation, which currently do not fall within in a protected area, statutory or private. Thus there is a risk of further loss of this vegetation from encroaching developments. Excessive medicinal plant harvesting is a risk in this zone, which may damage the ecosystem balance. Pollution of the water resource from human activities in this zone is a definite concern. Poorly functioning municipal sewage treatment plants contribute to the degradation of water quality and river health.

4.6.2.2 Opportunities

Mining of coal, silica and various elements such as chrome, platinum and vanadium take place in this zone. This zone is rich in platinum. Part of the platinum belt occurs here, thus the potential for future mining operations exists.

Part of the Sekhukhuneland Centre of Endemism falls within this zone. This zone has a relatively unspoilt natural environment. There are large areas that have been identified as possible conservation areas by the National Protected Areas Expansion Strategy, some of which cover areas containing endangered vegetation. This creates good opportunities for conservation, recreation and tourism. There are already large established statutory protected areas that create ecotourism opportunities, for example, in the Loskop Dam area. The development of cultural activities also has some potential.

Management Zone B contains some areas with highly arable land. Irrigated agriculture also takes place in this zone.

4.6.2.3 Potential conflicts between opportunities

The Sekhukhuneland Centre of Endemism, areas identified by the National Protected Areas Expansion Strategy and the platinum belt overlap. This implies that an opportunity cost analysis will have to be done, as engaging in one course of action or opportunity, will then affect the viability of the other opportunity. For example, exploring the platinum mining opportunity to its full extent will then impact the

viability of the conservation opportunity, which lies within the same area. The main conflict anticipated is tourism versus other activities.

4.6.3 Management Zone C: Groblersdal/Marble Hall irrigated agriculture area

Part of the Greater Marble Hall and Elias Motsoaledi municipal areas (of the Greater Sekhukhune District Municipality area) make up Management Zone C.

4.6.3.1 Constraints

Over-allocation of water resources is a problem in this zone. Mining occurring in the immediate area may also affect the water quality, which will in turn have a negative impact on the agricultural sector. International export standards require a certain water quality used in crop cultivation. If the water is of a lower quality than the standard, it could mean economic loss through exports not being accepted. Water pollution from human activities is of a definite concern in this zone. The poorly functioning municipal sewage treatment plants are also seen as contributing to the degradation of water quality and river health.

4.6.3.2 Opportunities

The biggest opportunity in this management zone is clearly irrigated agriculture. The land is arable and the Loskop Dam provides the necessary water. Processing of agricultural products may also provide economic opportunities. Some mining occurs near Marble Hall and a number of farms near the southern end of this zone have been identified as areas for possible future mining activities. Cultural tourism may also hold some potential.

4.6.3.3 Potential conflicts between opportunities

The competition for water in this zone between the different sectors, mining and agriculture will have to be addressed. There also exists a potential conflict between current agricultural practices and the possibility of future mining activity on the same properties.

Agricultural fields in EMZ C



Photo: Google Earth 2009

Sekhukhuneland Centre of Endemism in EMZ B & E



Photo: P. Claassen

Roedtan in EMZ D



Photo: Google Earth 2009

4.6.4 Management Zone D: Springbok Flats rural area

Municipality areas that fall within this management zone include parts of Bela-Bela, Dr JS Moroka, Modimolle (of the Waterberg District Municipality area); parts of Elias Motsoaledi and Greater Marble Hall (of the Greater Sekhukhune District Municipality area); and a small part of Mogalakwena (of the Capricorn District Municipality area).

4.6.4.1 Constraints

Over-allocation of water resources is a constraint in this zone. This area is medium risk drought area. Water prevents certain sectors from developing fully, such as agriculture. The area is mostly rural in nature and poverty exists over extensive areas. The infrastructure and service delivery in this zone is inadequate. Very little natural habitat remains undisturbed and desertification is a possible risk. Excessive firewood harvesting as well as medicinal plant harvesting in this zone increases the damage done to the natural ecosystem. The remaining natural vegetation is vulnerable or endangered.

4.6.4.2 Opportunities

Most of this management zone is covered by fairly arable land. The potential for dryland agriculture exists. The potential development of associated agricultural industries may be an opportunity. Limited irrigated agriculture takes place in this area. Limited mining activity takes place within this zone, producing building sand, silica and other elements.

A statutory protected reserve occurs near the Flag Boshielo Dam, with smaller areas around the reserve identified by the National Protected Areas Expansion Strategy. This reserve generates the possibility of ecotourism. The development of cultural tourism also has minor potential.

4.6.4.3 Potential conflicts between opportunities

The only potential conflict of note in this zone is the possible competition for water between the mining sector and the agricultural sector.

4.6.5 Management Zone E: Rural Sekhukhune/platinum mining focus area

Makhuduthamanga, Fetakgomo; parts of Greater Marble Hall and Greater Tubatse (of the Greater Sekhukhune District Municipality); and parts of Lepele-Nkumpi and Polokwane (of the Capricorn District Municipality) municipal areas fall within this management zone.

4.6.5.1 Constraints

Over-allocation of the water resources in this area is a definite constraint. The area is also drought prone. Not much arable land is available within this zone. The land most suitable for agriculture can be found southwest of Jane Furse. High erosion in this zone leads to a siltation problem within the rivers. This zone is largely rural in nature and has been classified as a presidential poverty node. Services and infrastructure are severely inadequate. Education within this zone is fairly low. Employment and income are also low in this area, mostly due to lack of the required skills available within the workforce. There is a high risk of desertification in this area because of the extensive removal of natural vegetation. The excessive harvesting of firewood further increases this risk. A large constraint is the potential future impact on mining and industrial activities on the natural vegetation and scenic environment. Pollution of water and air in this zone is a noticeable risk also.

4.6.5.2 Opportunities

There are a number of mines in this zone along the Dilokong mining corridor, mining platinum, chromite, silica and vanadium ore amongst other minerals. Future mining operations within this area along the platinum belt are already being planned.

Parts of the Sekhukhuneland Centre of Endemism and the Wolkberg Centre of Endemism fall within this management zone. Some private reserves occur within this zone as well as one statutory reserve near the Flag Boshielo Dam. These conservation areas create the opportunity for ecotourism. The National Protected Areas Expansion Strategy has identified some areas within this zone as potential future reserve areas. The largest of these is found southeast of Mokopane coinciding with part of the Wolkberg Centre of Endemism. The rich cultural history of the area also presents possible tourism opportunities.

The development of agriculture and its associated industries also show some minor potential.

4.6.5.3 Potential conflicts between opportunities

A large potential conflict occurs in the areas that have been identified as future potential mining areas overlap with Centres of Endemism, which contain endangered vegetation. Thus a conflict of opportunity occurs between the mining sector and the conservation/ecotourism sector. The other major anticipated conflict is that of the mining sector and agricultural sector competing in respect to water allocation.

4.6.6 Management Zone F: Nature conservation/tourism focus area

Parts of Lepele-Nkumpi, Polokwane and Molemole (of the Capricorn District Municipality area); parts of Greater Tzaneen; Maruleng; Ba-Phalaborwa; Greater Letaba (of the Mopani District Municipality area); part of Makhado (of the Vhembe District Municipality area) municipal areas; MPDMA32 and LIMDMA33 fall within this management zone. The Kruger to Canyons Biosphere Reserve Initiative covers large portions of this management zone.

4.6.6.1 Constraints

Over-allocation of water resources is a major constraint in this zone. Certain areas of the Wolkberg Centre of Endemism contain critically endangered and endangered vegetation, currently falling outside of formally protected areas. A large part of the Natural Heritage and Priority Natural Area's vegetation is currently vulnerable. Excessive medicinal plant harvesting and its negative impacts are of serious concern in this zone. Most of the mines falling within this management zone are abandoned. There is not much arable land available in this management zone. The most arable land is found near Gravelotte and Klasserie. Some areas falling within this management zone carry a medium drought risk. In some areas of the zone rural poverty is a noticeable constraint.

4.6.6.2 Opportunities

The Kruger National Park, as well as many other statutory and privately owned reserves can be found within this zone. This management zone has large conservation potential as the National Protected Areas Expansion Strategy has identified portions within this zone as potential future reserves. Catchment Protection Areas occur within the escarpment, around Pilgrim's Rest, Ohrigstad and Klasserie. A large section of this management zone, adjacent the KNP is a Priority Natural Area and is part of our Natural Heritage. A large portion of the Wolkberg Centre of Endemism occurs in this zone as well as a small portion of the Soutpansberg Centre of Endemism. Some irrigated agriculture occurs along a few of the rivers. Limited mining occurs within this zone, mainly around Pilgrim's Rest and Mica.

4.6.6.3 Potential conflicts between opportunities

The only anticipated potential conflict that may occur within this zone is between tourism and other activities.

4.6.7 Management Zone G: Tzaneen/Phalaborwa activity corridor

Parts of Ba-Phalaborwa; Greater Tzaneen; and Greater Letaba (of the Mopani District Municipality area) municipal areas form part of Management Zone G. The Kruger to Canyons Biosphere Reserve Initiative covers the majority of this management zone.

4.6.7.1 Constraints

Water resources that are over-allocated within this zone are a definite constraint. Some areas within the zone carry a medium drought risk. Other areas of lesser concern include water and air pollution, rural poverty and the potential future impact of mining and industry on the scenic environment. The impact of medicinal plant harvesting is also of concern. There are sections of vegetation in this area that are classified as endangered as well as sections that are vulnerable. The limited lifespan of the mines means that there will be negative economic and social impacts once the mines are closed. Alternative economic assets will have to be invested in, in order to continue to support the population living within the area. The poorly functioning municipal sewage treatment plants are also seen as contributing to the degradation of water quality and river health.

4.6.7.2 Opportunities

Phalaborwa is surrounded by the Phalaborwa Mineral complex, from which are extracted copper, iron ore and phosphates through mining activities. Mining activities also occur elsewhere in the zone, near Gravelotte, Letsitele and Duiwelskloof. Large sections of this zone contain fairly good arable land and irrigated agriculture is occurs extensively. One statutory and one private reserve, adjacent to each other occur in this zone. A southern portion of this zone, as well as the far northern portion has been identified as a Catchment Protection Area. The southern Catchment Protection Area overlaps with an area of Natural Heritage. Thus the potential for conservation and nature-based tourism exists. The development of cultural tourism also has some potential.

4.6.7.3 Potential conflicts between opportunities

It is anticipated that the various sectors within this zone might increasingly compete with one another for water. Another potentially large conflict is anticipated between the tourism sector and other activities that occur within this zone. A conflict between mining and conservation of biodiversity is also a possibility.

4.6.8 Management Zone H: Dry rural Lowveld area

Greater Giyani; parts of Greater Letaba and Greater Tzaneen (of the Mopani District Municipality area); and parts of Makhado and Thulamela (of the Vhembe District Municipality area) municipal areas fall within this management zone. The Kruger to Canyons Biosphere Reserve Initiative covers the southern half of this management zone.

4.6.8.1 Constraints

The area is dry and receives below average rainfall. Available water resources are over-allocated in this zone. Erosion and desertification are of medium concern. There are no reserves or protected areas within this management zone and no areas have been identified as possible future reserves. Very little natural habitat remains untouched. Small areas of vegetation, classified endangered or vulnerable can be found scattered throughout the zone. There is currently no active mining taking place in this zone. There are, however, many abandoned mines around and to the north of Giyani. The majority of the area that comprises this management zone is a presidential poverty node. There are major obstacles surrounding a presidential poverty node, both economically and socially. The lack of adequate services and infrastructure is a large constraint.

4.6.8.2 Opportunities

The development of cultural tourism is the opportunity with the highest potential in this zone. A large portion of this management zone is a Catchment Protection Area. Land in this area has medium arability and some irrigated agriculture can be found along the rivers. The Soutpansberg Centre of Endemism covers a small portion in the far north of this zone. This management zone is situated adjacent to the KNP, which may provide some ecotourism opportunities.

4.6.8.3 Potential conflicts between opportunities

It is anticipated that minor conflicts between tourism and most other activities is a possibility if there is not a conscious effort made to ensure that planning and development in general takes the needs of tourism into account. It is also possible that significant conflict between mining and the conservation of biodiversity might occur in the area. Mining in the area is however in decline and its potential impacts should diminish significantly over the short to medium term.

4.6.9 DEVELOPMENT OPPORTUNITIES, CONSTRAINTS AND PRIORITIES (LOCAL AUTHORITY PERSPECTIVE)

4.6.9.1 Enlanzeni District Municipality area

4.6.9.1.1 Constraints

Thaba Chweu gets very little benefits from primary produce as most of the produce is exported outside the area. Minimal economic activities occur in the Matibidi and the Leroro areas. Employment is limited to unskilled labour due to low levels of education.

4.6.9.1.2 Opportunities

The area has a mining potential. The Sadie area has forestry potential. The area also has some tourism opportunities. The Matibidi water scheme in Thaba Chweu has the potential to cater for economic growth for a considerable period.

4.6.9.1.3 Planning and development priorities in the SDF

Improving a basic service infrastructure in Thaba Chweu, constructing a bus route in Matibidi and improving the agricultural sector is also a priority.

4.6.9.2 Gert Sibande District Municipality

4.6.9.2.1 Constraints

Negative environmental impacts due to the mining and industrial activities are of concern. There is a serious lack of land by the government for low cost development in the urban areas. A lack of road maintenance is a constraint. The decline of Davel as an economic node due to the closure of the coal mine in Ermelo has had negative social and economical impacts. Musukaligwa Municipality faces a lot of security and safety issues.

4.6.9.2.2 Opportunities

The district features a strong agricultural sector. There is also a strong mining sector and industrial base, especially in Secunda. Tourism, featuring mining and industrial attractions has shown some growth. Areas like Secunda and Evander are strategically located and this has added to their advantage. The area features a good transport network.

4.6.9.2.3 Planning and development priorities in the SDF

Management of the natural environment as a resource is a priority in this area. The district's five economic strips should be capitalised on and all settlements linked with the economic nodes. Forestry must be promoted along the tourism corridor as well as intensive farming throughout the district. Concentrate on facilitating subsistence farming activities in the rural areas. To ensure all communities

have at least minimal basic services. To facilitate and accommodate mining in the district in a sustainable manner is also a priority.

4.6.9.3 Greater Sekhukhune District Municipality

4.6.9.3.1 Constraints

The lack of water availability leading to conflicts between the different sectors is a problem. The district has a poor road network and the roads are severely dilapidated. Despite having mines in the area, the district has high levels of unemployment due to lack of skills and low levels of education.

4.6.9.3.2 Opportunities

The area has great agricultural potential. Livestock farming is also practiced. The Greater Tubatse Local Municipality region offers greater opportunities for mining. The location of the Loskop Dam in the area serves as a source irrigation and as a potential for tourism.

4.6.9.3.3 Planning and development priorities in the SDF

To actively protect, manage and enhance the natural environment in order to reduce conflicts between the mining, agriculture and tourism sector in the area. Promote mining activities in the area to ensure job creation and development of the Dilokong Corridor. To promote farming, industry and food production (agri-processing), with the help of the proposed De Hoop Dam. Concentrate on promoting tourism of natural beauty and historic culture. Assist in speeding development by focusing on education and skills development.

4.6.10 Mopani District Municipality

4.6.10.1 Constraints

The settlements in the district are scattered which makes it difficult for developmental planning. A high level of migration of the economically active population impacts the labour force and economic growth of the area negatively. The manufacturing sector in the area is showing signs of decline. The limited life span of the mines means they will eventually have negative impacts socially and economically on the area. Infrastructure backlogs hamper development.

4.6.10.2 Opportunities

Positive growth in the agriculture, transport and communication sectors has been noted within a few of the local municipality's areas. The growth in the agriculture sector has in turn encouraged the growth of the manufacturing sector in the district. There is a large mining sector concentrated in Phalaborwa. The district lies adjacent to the Kruger National Park, and the many game farms that occur create a tourism opportunity.

4.6.10.3 Planning and development priorities in the SDF

The development of district-level economic databases and local business support structures/services is planned. The establishment of depots of national wholesalers and retail trade development is also planned to assist the area. Agriculture diversification and agriculture service as well as the revitalisation of irrigation scheme activities is one of the priorities along with the expansion of small-scale farming and skills development. Development of mining services and processing and product development is planned. Promotion and marketing of potential tourism is also a priority.

Nsami Dam and surrounding development

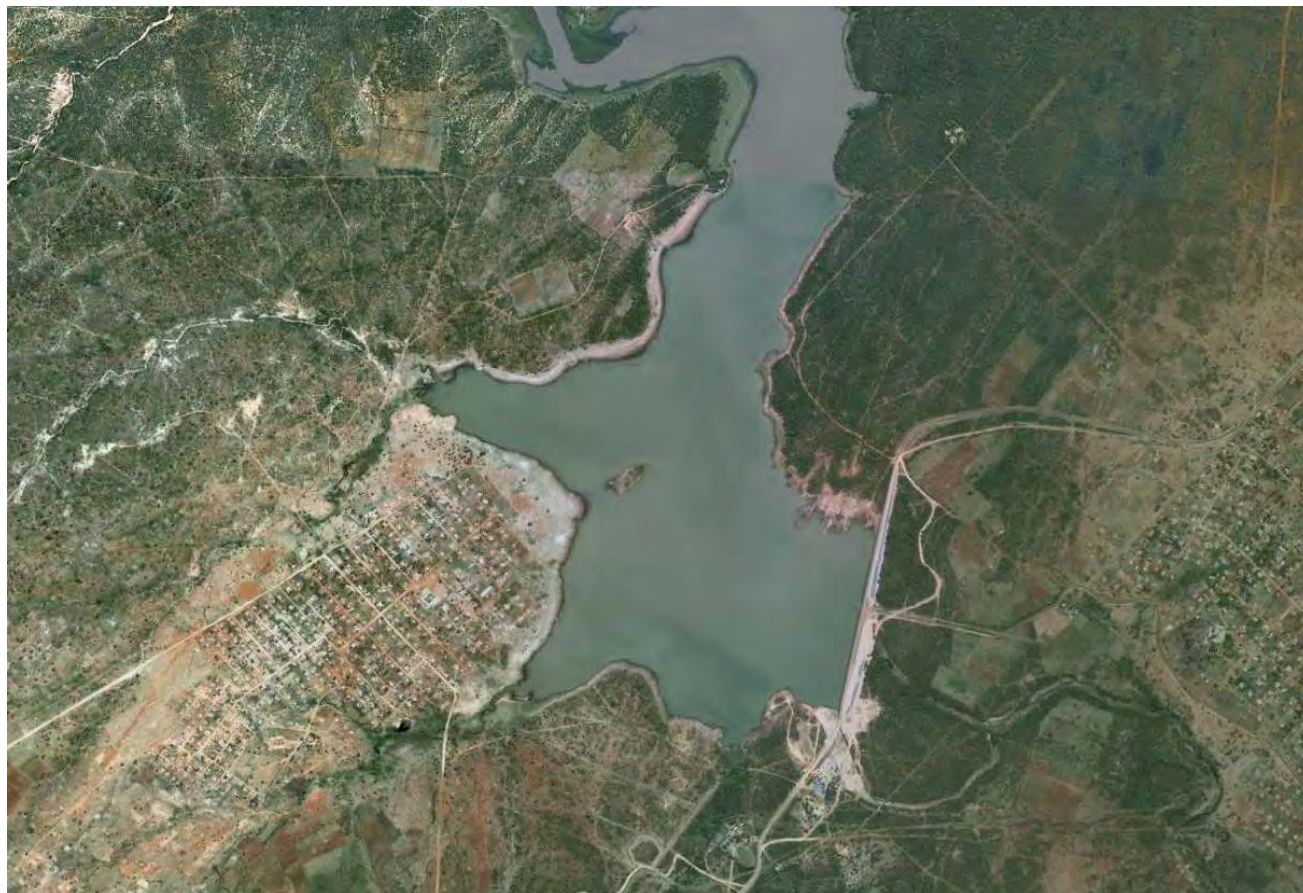


Photo: Google Earth 2009

4.6.11 Nkangala District Municipality

4.6.11.1 Constraints

The negative effects of coal mining land surface degradation, ground water and air pollution is of concern. The lack of land for low-income residential development has contributed to the formation of informal settlements around urban areas. There are high levels of unemployment due to a shortage of appropriate skills. The roads in the area are dilapidated and poorly maintained.

4.6.11.2 Opportunities

A strong industrial, mining and agricultural base exists. Many Eskom power stations are situated in this area. There is an extensive road and rail network. The main towns (Witbank and Middelburg) are strategically located along the Maputo Development Corridor. The proximity of the area is an added advantage. Parts of this area have tourism potential due to their natural beauty.

4.6.11.3 Planning and development priorities in the SDF

Developing and classifying the N12 freeway as a development corridor as it links Nkangala with the Ekurhuleni Metro and promote development activities in areas such as Belfast and Machadodorp. Promote a "Tourism Belt" in the region which will incorporate sensitive wetlands and nature reserves in the area. Enhance mining activities in the southern region to contribute to job creation. Provide services to and upgrade informal communities, and other priority areas.

4.6.12 Vhembe District Municipality

4.6.12.1 Constraints

The lack of proper telecommunication and transport infrastructure is a definite constraint. Basic service delivery is poor with water access being a major problem. Lack of proper agricultural markets hamper local farmers from selling their produce. The tourism sector in this area is poorly marketed. There is lack of serviced land for development in the area.

4.6.12.2 Opportunities

Thulamela and Makhado local municipalities have climatic conditions, which make them favourable for cash crop and fruit farming. Makhado has potential for value-adding to primary products which is not being explored as well as potential for mining. Tourism potential exists in the established nature reserves of the area.

4.6.12.3 Planning and development priorities in the SDF

Implement development proposals for business and residential development, and the construction of a sports stadium in Makhado. Thulamela Local Municipality has plans to develop the agriculture sector through the increase of irrigation scheme for small-scale farmers. Increase business investments and

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

create value-adding sector in the area. Implement the Thulamela gateway project which is meant to improve the access linkage network in the area. Develop the tourism sector.

4.6.13 Waterberg District Municipality

4.6.13.1 Constraints

The main constraints in the area include:

The Bela-Bela local municipality has a weak service sector;

the district municipality has a low agriculture potential; and

the rural component of the district show limited development potential as the levels of substance farming are low.

4.6.13.2 Opportunities

The location of the N1 increases accessibility of the area. Modimolle and Bela-Bela have a strong agricultural sector in the district. The service sector in the district is showing positive growth especially in Modimolle and Mookgopong. The Bela-Bela area has a strong tourism base. Mining has shown and increase in activity.

4.6.13.3 Planning and development priorities in the SDF

Provide support to the mining sector in terms of land and service availability. Promote non-restrictive development in rural areas. Promote investment in tourism. Recognise and promote a agriculture as an important economic activity as well as provide good roads for produce transportation.

4.6.14 Capricorn District Municipality

The Capricorn District Municipality has the smallest area falling within the EMF area. The area in question is rural in nature and is not inhabited. No measurable economic activities take place in this area.

4.7 PROPOSALS FROM ANGLO PLATINUM

4.7.1 The Richmond Dam proposal

Anglo Platinum is proposing a new dam in the Klein Dwars River on their farm Richmond 370KT. The dam will be located in the valley of the Klein Dwars River with the dam embankment on the Farm Richmond 370 KT. The full water supply level will dam an area of 1 517 km² of which 30 Ha is located on the farm St George 2JT.

Rustenburg Platinum Mines (Anglo Platinum) have several current mining operations in the Eastern Limb of the Bushveld Igneous Complex. Due to continuous drilling over the past few years Anglo Platinum refined their geological model and are now in the process of planning future mining operations

as well as applying for the Richmond Early Mining Development, which forms part of their larger Der Brochen Project.

Current water supply in the area, including water to be supplied from the future De Hoop Dam is not sufficient to supply in the immediate as well as the long term water needs of Anglo Platinum. They therefore need the Richmond Dam in order to supply the Der Brochen mine with water for mining operations.

There are a number of positive effects that could come from building the proposed dam. Building the Richmond Dam will allow Anglo Platinum to secure the Der Brochen project. This will allow the unlocking of mineral reserves. The income generated through taxes will be to the benefit of the local economy and province. With the mine operating at full capacity it will be able to contribute indirectly to economic growth, employment creation and social upliftment of the area.

The Richmond Dam will alleviate the pressure on the De Hoop Dam in terms of Anglo's water demand. The proposed dam will to some extent buy DWA more time to address the growing demand for water.

There are, however, also a number of negative impacts that building the proposed Richmond Dam will have on the area, and these should also be carefully considered. The proposed development is situated in the Sekhukhuneland Centre of Endemism, which has a high conservation value in terms of its vegetation. Building the dam as well as the dam itself will have a significant negative impact on the vegetation of the area. Some of the vegetation found within the area is Red listed.

The area is also rich in rare archaeological sites, which dates back to the Early Iron Age and Mid Stone Age periods. There are also several graves belonging to amongst others the GaMawela community. These graves will have to be relocated.

Realignment of infrastructure will have to take place, due to the area that is going to be inundated. Some power lines and telephone lines will have to be moved and the Richmond road will have to be realigned. Such activities will have their own possible negative impacts.

A negative impact on the ecological status of the river downstream of the dam will occur if the flow is reduced. Due to the sensitivity, the natural environment may lead to channel modification, increase in sediments and the deterioration of the Present Ecological Status. This impact will be large unless operating rules for the dam are put into place.

On a larger scale, the Richmond Dam may have an impact on the Olifants River catchment. The system is already failing to meet the ecological reserve requirements. Further removal of water from the system will have a large negative impact on the Kruger National Park.

4.7.2 The coal mining excess water transfer proposal

The platinum mines have proposed to use the excess, low quality water accumulated by coal mining operations on the Highveld Coalfields to run the Limpopo Province platinum mining ventures.

Anglo Platinum is developing new mines in the Mogalakwena area, north of Polokwane. These new mines have a shortage of water, and the future of mining in this area, especially that of new mines is threatened by this shortage.

A study conducted in 2007 and co-funded by Anglo Coal and BHP Billiton, evaluated the available mine water resources as well as the local water requirements of municipalities, mining operations and power stations. The study confirmed that excess mine water may still be available, even after all the local water requirements have been satisfied.

The platinum mines do not require high quality water for their operations. Therefore the low quality water accumulated by the coal mines will be suitable to be used by the platinum mines after minimal treatment.

Excess polluted water accumulated by the coal mines, which cannot be released back into the natural system without extensive treatment, will still be able to be utilised. This low quality water will therefore provide economic benefits through the platinum mine ventures. It will also help to reduce the amount of acid mine drainage that enters into the system. Re-using the water may also reduce the need to build further dams.

The cost involved in transporting the water over such a distance would be great. The overall water available in the Olifants system may be reduced. The piping systems used to transport the water will have a localised negative impact.

4.7.3 The water allocation problem

Water sources in the EMF area is over-allocated. All the sub-catchments are already over exploited. The ecological reserve requirements are not being met over the area as a whole. Any additional allocation of water must come from the reallocation of existing water source allocations.

Irrespective of the quality of water, any schemes or plans to reallocate water should be regarded in the above context. No additional water is available in the area. Existing water sources will have to be made available by different means at different places. In the end it will still require reallocation of existing sources, as opposed to the creation of additional allocations. In the past, the DWA has issued so many licences to the different sectors such as farming, mining, industry and others, in the Olifants River catchment, that in reality more water is allocated out of the river each year than what consistently flows along its length. It is likely that unless water is brought in from a different catchment area or system that the current water usage will have to be reduced in order to balance out supply and demand.

Economically it has been suggested that concentrating on managing water loss would be more viable than inter-basin water transfers.

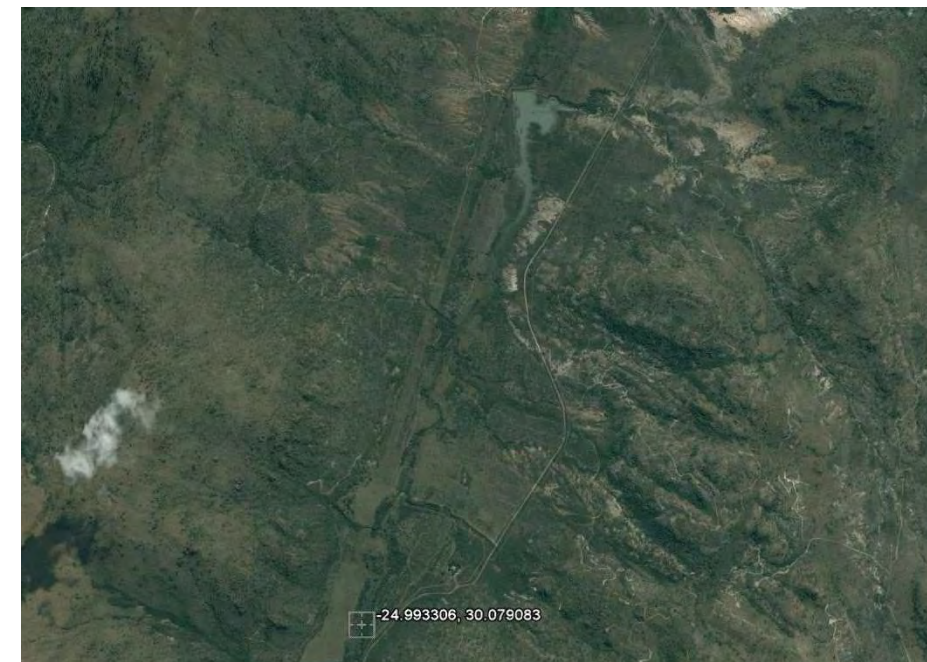
The main criteria that should be used is that the current amount of water entering the Kruger National Park must not decrease. There is already a large shortage for ecological requirements and the natural environment is under extreme stress. Further reduction of quantity or quality of water entering the KNP will have a detrimental negative impact on one of South Africa's most important natural assets. Previous occasions where zero flow reached the KNP has meant that some sections of the river are now impoverished of fish species. Experts fear that the diversity may never recover to its former level, especially if the river suffers further setbacks.

Any scheme or plan that aims to supply water for whatever purpose needs to be carefully considered, especially regarding the effect they would have, not only on a specific sub-catchment, but more importantly on the catchment as a whole. The inter-relationship amongst all the factors and sub-catchments must be taken into account.

Another factor, which should be considered, is climate change. It is thought that climate change is going to affect water resources quite severely, and could aggravate the current problems faced. Phenomenon such as El Nino could also influence the amount of available water. South Africa is especially vulnerable to climate change because of sensitive water hydrology, general aridity and high variability of rainfall in space and time. South Africa is a water scarce country, and the importance of the conservation of freshwater ecosystems is critical in ensuring long-term water security.

If the proposals of Anglo Platinum are viewed in this context neither proposal seems to meet the requirements.

Position of the proposed Richmond Dam and the existing Inyoni Dam downstream



5. DESIRED STATE

5.1 INTRODUCTION

The desired state as reflected in this report has been reworked completely from the draft version in order to focus on the EMZ. It has also been structured to give an overview of the desired state in respect to key issues in the EMZ and also to give effect to the principles of this EMF.

5.2 MANAGEMENT ZONE A: HIGHVELD/ENERGY HUB AREA

5.2.1 Water utilisation

Much of the headwater of the Olifants River originates in this zone. Polluting activities in the zone therefore have negative impacts on the entire downstream part of the river that affects the activities of all downstream water users (see the Status Quo Report and reference documents P, T and Z for more information).

Due to the nature of the pollutants that enter into the system from this zone, it is important that the strictest possible water quality release standards be applied. Releases must be monitored effectively and transgressors should be dealt with in terms of the applicable legislation. Over the short term the introduction of a polluter pays charge system should be considered that allocate the cleanup cost as well as the opportunity cost of the pollution to the polluter.

The water resource in the zone is already over-allocated. There is no additional water available for industrial and mining development. Additional allocations to these sectors have to come from savings and reallocation of existing sources. The excess water from closed and operating mines is required to meet the needs of the municipalities in the area over the short to medium term. Additional water from the zone cannot be allocated to other uses in or outside the area (see Status Quo Report and reference document Q for more information).

5.2.2 Conservation

Very little natural vegetation remains in this zone and the establishment of conservation areas in this zone is not considered to be generally feasible or a high priority. The remaining wetlands in the area are, however, of very high importance to the maintenance and improvement of the river ecosystems within the zone and beyond. Riparian vegetation is also important to the maintenance of the integrity of the rivers in the zone. All remaining wetlands and riparian areas in the zone should therefore be maintained and rehabilitated to the extent that they can fulfil their ecological functions to the extent possible (see reference document AF). The establishment of new man-made wetlands should also be considered wherever possible as part of rehabilitation plans of mines.

2.5.3 Tourism

Nature based tourism is unlikely to ever become a significant economic driver in this area. There is, however, some potential for the development of cultural tourism that is based on the historical development of industry and mining as events that relate to the Second Anglo Boer War and the struggle against apartheid.

5.2.3 Mining

Mining, especially the mining of coal for electricity generation and export is the key activity on which the economy of the zone depends. While mining and the industries that depend on it is likely to decline sharply towards the middle of the century, it will remain the backbone of the economy in the zone over short and medium terms.

It is, however, important to start to think of the economic sustainability of the area over the long term. A decline in the economy and productivity, albeit small, is already noticeable in the local planning documents. In order to survive, the zone will have to reinvent itself over the next fifty years and move to an economy in which mining is no longer a key driver. It is, therefore, important that the long term negative impact of mining be minimised in order to ensure the best possible future after the use of mining land. Wherever possible, the infrastructure created by coal mining should be used for other productive activities that can at least in part offset the expected economic decline over the medium to long term.

Mining and the transportation of mined materials is a major cause of air pollution in the zone that forms part of the Highveld Priority Area national air pollution hotspot. The emission of pollutants into the air is expected to continue for the foreseeable future. The implementation of the Air Quality Management Plan (AQMP) is still in the process of being drafted, but once in place it should ensure that the air pollution that emanates from this source is reduced to the minimum possible over the medium to long term. It is important that the DWA and the local authorities implement the AQMP effectively and efficiently to ensure that the air pollution impacts in the zone is kept to the minimum possible.

5.2.4 Electricity generation

The zone represents the energy hub of Southern Africa and will continue to fulfil that function over the short to medium term. As the coal is mined out in the area over time the potential of the zone to produce electricity will also decline. It is unlikely that coal fired power stations will be used in the area beyond 40 to 60 years from now.

The zone is not suitable for the generation of alternative bulk clean electricity from either wind or sun sources (current technologies) as the winds in the area are too inconsistent and because significantly better sites for sun energy occur in the drier parts of South Africa. It is, therefore, likely that large parts of the electricity distribution network in the zone will also become redundant. Wherever possible, the

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

infrastructure created by the power stations and the distribution networks should be used for other productive activities that can at least in part offset the expected economic decline over the medium to long term.

Electricity generation is a major cause of air pollution in the zone. The implementation of the AQMP as discussed in 5.2.4 above also applies in this instance.

5.2.5 Industry

The industries that occur in the zone are largely determined by the prevalence of coal as an input into industrial processes, the availability of electricity that is generated in the area and the location of the zone along the Maputo Development Corridor (MDC). Over time as coal is being mined out, the focus of the industry will have to move more and more towards activities that support the MDC. This means that a transition has to occur over the short to medium term towards industries that are not dependent on coal and less dependent on electricity that can make use of the important transport link of the MDC between Gauteng and Maputo.

Industry, especially energy intensive metallurgical industries, is a major cause of air pollution in the zone. The implementation of the AQMP as discussed in 5.2.4 above also applies in this instance.

5.2.6 Agriculture

Both rain fed and irrigated agriculture (from boreholes) are important economic activities in the zone with exceptionally high yields due to the soil types, climate and rainfall of the area. Some of the grassland areas are also extensively used for cattle grazing, especially in the Hendrina area. As the mining sector declines in this zone over time it is anticipated that the role of agriculture in the economy will increase. Investment in agriculture over the short to medium term should therefore be regarded as important and necessary. It is, however, important that the negative impacts of agricultural practices on water consumption, water pollution, wetlands and remaining grassland patches be limited to the minimum extent possible and even be improved in many instances. Investment in the agricultural sector should also include investment into practices that make better use of the water resource and that reduce or even eliminate the release of agro-chemicals and pesticides into the hydrological system (see reference document AE for more information).

5.2.7 Transportation

The MDC is an important and major road and rail corridor that links Gauteng with Maputo. It is well developed and is one of the important economic drivers in the zone. Most of the other roads in the zone are under severe pressure due to inadequate maintenance and increasing hauling of coal from mines to power stations and other industries. The upgrade and maintenance of roads are important to all economic sectors in the zone.

5.2.8 Business, services and government

Business and government is located in a number of towns within or on the fringes of this zone. The business sector represent and is closely related to the nature of the economic activities of the area.

From feedback received in the public participation process it is clear that every economic sector blames government (national, provincial district and local levels) in the zone for inadequate delivery, law enforcement and coordination between institutions. This is especially prevalent in:

- The allocation of mining authorisations and water use licences;
- the management and performance of municipal sewage works; and
- the monitoring and enforcement of water and environment related legislation.

There is a very strong desire for a “one stop shop” where the different departments at the different layers of government work together in a cooperative and coordinated way. This is the only aspect on which all the participating sectors agreed (the conservation, tourism, industry, mining, agriculture and ESKOM focus groups). These groups also believe that there is enough legislation and that the focus should shift to implementation.

Power Station



Photo: S. Johnston

5.3 MANAGEMENT ZONE B: HIGHVELD TO BUSHVELD TRANSITION AREA

5.3.1 Water utilisation

To a large extent, due to the topography, geology and soils of the area, the hydrological system flows through the area with relatively little consumption of water within the area itself. This may change over time as more and more platinum group metals mines are developed in the area. The over allocation in the rest of the catchment outside this zone in any case means that additional allocation of water in the zone is also not possible unless it comes from re-allocation of water from another zone. Due to the topography the area is highly suitable for the building of large dams (storage reservoirs). The Loskop Dam is the largest of several dams that occur in the zone.

As with all the other zones the water resources of the area are already over-allocated. It is a priority that the ecological reserve requirements in this zone be met at all times to ensure the health of the river ecosystem. The remainder of the available water resource should then be carefully allocated to ensure optimal use.

The rivers in the zone carry polluted water from Zone A through to downstream areas. Significant pollution is also produced by mining activities in the area (see reference document T). As in the case of Zone A, it is important that the strictest possible water quality release standards be applied. Releases must be monitored effectively and transgressors should be dealt with in terms of the applicable legislation. Over the short term the introduction of a polluter pays charge system should be considered that allocate the cleanup cost as well as the opportunity cost of the pollution to the polluter.

5.3.2 Conservation

The zone has a high potential for conservation with several existing conservation areas, large areas of natural vegetation (including irreplaceable and highly significant ecosystems) and a complex and interesting topography. Significant parts of the area have also been identified as potential expansion areas for reserves in the National and Provincial Conservation Areas Expansion Plan.

Conservation should be the dominant and key land use in the area. The establishment of conservation areas in the zone should be actively encouraged as the preferred land use.

All other activities, but especially mining, that are allowed in the zone should be done in such a way that it does not diminish the conservation potential of the area. Careful planning to avoid significant impacts, appropriately scaled operations and high standards of post mining rehabilitation must be applied to the satisfaction of the relevant conservation authorities for a mining activity to be allowed in the area.

The building of additional dams in the area, for whatever purpose, should be avoided and the ecology of river systems should be rehabilitated to a natural state. Exotic fish species and other organisms in the zone should be eradicated to allow for the reestablishment of indigenous species in the rivers and streams in the zone.

5.3.3 Tourism

The potential for nature-based tourism in the zone is very high. The scenic natural beauty of the zone, the low human population and its relatively undeveloped state makes the zone ideal for tourism and recreation. The close proximity of the zone to Gauteng is also very attractive for local tourism and recreation markets.

The active promotion of tourism in this zone should become a planning priority at national provincial and local levels of government. Private investment in tourism with an emphasis on quality tourism products that match the tourism potential of the area should be encouraged.

5.3.4 Mining

Mining activity in this area is likely to increase significantly over the coming years. There are large deposits of platinum group minerals in the eastern and central parts of the zone. It would be very difficult if not impossible to prevent mining in this sensitive area. Before any further mining is allowed in this zone, a Strategic Mining Plan should be developed between the relevant government departments to ensure that mining occurs in a manner that is appropriate to the overall nature of the zone and where it is allowed, it meets the requirements to ensure that the conservation and tourism potential of the area is not diminished. In this regard it is proposed that mining be limited to an agreed maximum surface area at any given time in the zone and that further mining should be dependent on the successful completion and rehabilitation of mining activities as stipulated in the SMP for the zone.

5.3.5 Industry

Heavy industry in the area is limited. Due to the conservation and tourism potential of the area, industrial activities in general but heavy industry in particular should not be allowed in this zone. Metallurgical industries associated with mines in the zone should be located on derelict land outside the zone, preferably in Zone A.

5.3.6 Agriculture

With the exception of isolated river valleys there is very little agriculture in the zone. Agriculture is not regarded as a growth activity in the zone due to limited suitable land. Significant cattle grazing occur on natural vegetation in the area. This activity should continue where conservation is not established as a land use in a manner that does not lead to overgrazing. The same applies to game farms.

5.3.7 Transportation

While the national road N11 between Middelburg and Groblersdal is in a good condition, a number of major roads in the area (e.g. the R25 between Bronkhorstspuit and Groblersdal) is in an exceptionally poor state of disrepair to the extent that they are very dangerous to drive on. The development potential

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

of the area and especially the potential to develop tourism depends on good quality roads. The repair and maintenance of roads should therefore be a high priority.

5.3.8 Business, services and government

The zone is rural in nature and business activities are limited to small rural towns and local service centres. The view that legislation is ahead of the ability of government to implement it also prevails in this zone.

5.4 MANAGEMENT ZONE C: GROBLERSDAL/MARBLE HALL IRRIGATED AGRICULTURE AREA

5.4.1 Water utilisation

The main water supply to this zone is from the Loskop Dam and its associated irrigation scheme. The bulk of the water supplied to this zone is used for irrigated agriculture. The maintenance and/or potential upgrading of the existing irrigation infrastructure could lead to the efficient use of water. Optimisation of agriculture's water allocation should be investigated, and any additional water gained should then be redistributed amongst other sectors once the ecological requirements are met.

5.4.2 Conservation

The vegetation in this zone has been cleared to create farmland. There is very little remaining natural vegetation, which leaves no real land for potential conservation purposes with possibly the exception of small parts of the river itself.

5.4.3 Tourism

There is no potential for nature-based tourism in this area. The irrigated agricultural fields around the towns of Groblersdal and Marble Hall create a pretty picture that has some potential for tourism.

5.4.4 Mining

Extensive mining of marble and limestone occurs in a limited area to the north east of Marble Hall. The rest of the area consists mainly of alluvial floodplain that has limited mining potential with the exception of construction sand in places.

5.4.5 Industry

Extensive agriculture processing industries associated with irrigated farming occurs in the area. These industries contribute significantly to the local economy and employment.

5.4.6 Agriculture

Agriculture is the dominant sector in this zone. It is likely that this will remain the case for the foreseeable future. The irrigation infrastructure supporting agriculture in this zone is well established.

The use of water for irrigated agriculture, particularly in this zone, is seen by many as an inefficient use of the available water resource. It is estimated that the ability of platinum mining enterprises to pay for water and the economic benefit they derive from it is likely to be at least ten times that of agriculture. Food security is given as the reason while water has to be provided to irrigation farmers at below market rates. It is generally accepted that the use of water for irrigation in this zone is relatively inefficient and that significant efficiency gains are possible. It is therefore very likely that at least some of the water that is currently provided for irrigated agriculture will be reallocated to mining in future. The manner in which such a reallocation of water will occur is still uncertain at this stage but it is likely that it will at least to some extent be based on the establishment of a water market of sorts, probably controlled by DWA.

5.4.7 Business, services and government

Poor road maintenance and dilapidated roads in this zone should be addressed and the situation improved. A functional transport network is of vital support to the economy of the area. People in the area are also very unhappy in respect to landfill management, especially in Groblersdal. As in Zones A and B is also believed that the legislation is ahead of government capacity to implement.

An example of water pollution emanating from a mine with instream dams in Zone B



Photo: Google Earth 2009

5.5 MANAGEMENT ZONE D: SPRINGBOK FLATS RURAL AREA

5.5.1 Water utilisation

This flat area does not have a noteworthy river network. Rainwater is retained in the clayey soils that release it slowly. Besides rainfall the main source of water in the zone is boreholes.

5.5.2 Conservation

Although there is one established reserve within the zone, conservation is a prominent activity and the establishment of further conservation areas of note in the area is unlikely. Most of the natural vegetation has already been removed.

5.5.3 Tourism

The zone has very little tourism potential and it is unlikely to develop to a meaningful extent.

5.5.4 Mining

There are a number of scattered existing mines currently operational within the zone. It is unlikely that mining will increase substantially in the area.

5.5.5 Industry

Industries in the area are limited and linked to the processing of agricultural produce and minerals. Significant growth of industry in the zone is unlikely.

5.5.6 Agriculture and commercial plantations

Dry land agriculture is the main activity in the area. Due to the specific nature of the soils the area is suitable for certain crops such as mealies and sunflowers. Agriculture should be maintained at its current levels. The area is prone to drought and failed crops should be expected from time to time.

5.5.7 Poverty

Remnants of apartheid homelands occur in the south-western part of the area. Many people depend on subsistence living in these areas. Due to the close proximity many people work in Gauteng. The local resources to alleviate poverty is limited and the areas and is unlike that it will ever become economically independent.

5.5.8 Business, services and government

Business is limited in the area and the biggest settlements are Roedtan, a small agricultural support centre with a station that closed down when the railway line stopped working some time ago, and Siyabuswa.

5.6 MANAGEMENT ZONE E: RURAL SEKHUKHUNE/PLATINUM MINING FOCUS AREA

5.6.1 Water utilisation

This zone is the area where a number of smaller tributaries join the Olifants River above the escarpment. It also falls in the zone just below the Flag Boshielo Dam, which is currently the last major dam in the main stream above the escarpment. Water in the system is scarce and the De Hoop Dam that is currently being constructed as a public/private joint venture is meant to supply the growing platinum mining industry as well as the large rural population in the zone. In order for the mining sector to successfully develop in this zone, a guaranteed water supply is necessary. Despite the dam, water will remain the biggest constraint to the development of mining in the area as there is simply not enough to supply in the anticipated demand over time. The only option over the medium to long term would be to reallocate water from other uses, most probably agriculture in Zone C, to supply in the needs of growth in the platinum mining sector. For more information see the Status Quo Report and reference documents Q, Y and Z.

5.6.2 Conservation

Large sections of the natural vegetation of this zone have already been removed, reducing the conservation potential drastically. However, a large part of the Sekhukhuneland Centre of Endemism falls within this zone and should be conserved where possible. The conflict with mining development is severe and it is most likely that the natural vegetation will be damaged significantly over time. It will be desirable to set aside some areas of the Centre of Endemism that will be conserved and not be mined. It is important that the mining sector recognises the importance of the vegetation in this area and that biodiversity offsets should become a part of every mining application that is authorised. This will at least protect the biodiversity of the area even if the overall visual quality of the area is destroyed.

5.6.3 Tourism

There is a rich cultural heritage in this zone, which should be developed for tourism purposes. The Sekhukhuneland Centre of Endemism is also rich in biodiversity and under the right management and cooperation of the mining sector, could provide an ecotourism opportunity. Unfortunately the future platinum mining operations also fall along the Centre of Endemism. Tourism, will however, initially only play a small part in the economic contributors of this zone.

5.6.4 Mining

Platinum mining is the key economic driver of this zone. Burgersfort is exploding as an urban centre with the effect that the rural nature of the zone will change forever over the short to medium term. The mineral resource is adequate to supply an active mining economy to the zone for at least a hundred years (long term). Given the poverty context of the zone it is not possible to curtail mining to the extent that it is developed sub optimally in the zone as it cannot be justified from a socio-economic

development perspective. The development of this sector to its full potential, however, requires a steady water supply. It is important to encourage mines, especially newly developing mines to invest in water efficient technologies that will allow them to make maximum use of the limited water that is available.

5.6.5 Industry

Industry in the area is related to the processing of minerals from the mines. While air pollution is not a significant problem at the moment, it will be necessary to establish an Air Quality Management Plan for the zone to ensure that the air quality remains at acceptable levels over the long term. It will also be necessary to monitor releases of effluent from industries and to apply and enforce strict standards to ensure that the water quality, especially for downstream users, is not adversely affected.

5.6.6 Agriculture

Although some formal agriculture occurs in the zone, especially on the banks of the Olifants River and in a few valleys, the area is dominated by expansive areas of subsistence farming. The degradation of soil and erosion in the area has become critical. Desertification is a reality and it is not possible to rehabilitate the expansive degraded area to its former state. The erosion and subsequent sediment transport in the river system has very significant negative effects of downstream areas and further reduces the water capacity of the system.

The meagre subsistence crops that are produced remain important for the survival of the large rural population. The rural area is not capable of supporting its current population anymore and further agricultural development in the area would in all probability not be feasible.

5.6.7 Poverty

The zone falls within one of the Presidential Poverty Nodes. The subsistence nature of survival for many households in the area is not sustainable over the medium to long term. It is vitally important that many more formal employment opportunities be created to improve the standard of living in the area. The development of the mining and associated industries in the area is important and should be supported provided that it makes use of local people for its labour force. Low education levels and lack of skills is a major concern and will require significant investment in education, skills and training of local people by the mining industry. The negative social and environmental impacts associated with migrant labour brought in from other places, while large proportions of the local communities remain unemployed is not acceptable in this zone.

5.6.8 Business, services and government

The business needs of the community are catered for in a number of towns in the area. It is expected that with the growth in the mining industry general business opportunities will also increase significantly. The zone as a whole should therefore be regarded as a business growth area. Service delivery in rural

areas is generally very poor and difficult to establish. Although the mines will create some employment opportunities, the lack of skills may mean that unemployment levels remain high. It is therefore crucial to increase education levels within this zone.

Rural settlement



Photo: P. Claassen

5.7 MANAGEMENT ZONE F: NATURE CONSERVATION/TOURISM FOCUS AREA

5.7.1 Water utilisation

It is of extreme importance that the ecological reserve requirements along the entire length of the Olifants River are met at all times. Failure to do so has a detrimental effect on this zone, in particular on the Kruger National Park. The fundamental conclusion of this EMF is that the water that remains in the system where it enters the KNP from the Olifants and Letaba Rivers may not decline (taking dry and wet seasons etc. into account). Any water allocation issues upstream from the KNP within this and all other zones has to be addressed in a manner that will not affect the water supply to the KNP. This is the bottom line.

It is also important that the water that enters the zone from other zones meets water quality standards that are suitable for the maintenance and improvement to natural conditions of all rivers and streams in the zone. This is important to maintain the long term integrity of the zone as a whole as a primary conservation area in South Africa.

5.7.2 Conservation

Conservation is the main focus of this zone. A large portion of this zone is made up of the Kruger National Park, which is the largest conservation area in South Africa. There are also several private reserves. The National Parks Expansion Strategy has identified several areas as possible park expansion areas in this zone. Important catchment protection areas as well as centres of endemism also occur within this zone. The focus of the development of this zone should be conservation as a land use and tourism as the main economic activity, with necessary supporting activities.

With the exception of service corridors for roads, pipelines and other service networks, that must cross the western limb of this zone, no activities that will have detrimental impacts on the conservation and tourism focus of the area should be allowed. A service corridor plan should be established through consultation between DEA, DWA, LDEDET, MDEDET, SANRAL, ESKOM, TELKOM, TRANSNET and all other service providers to ensure a coordinated, strategic approach that will limit the environmental impacts of service corridors to the minimum possible over the long term. The information in this EMF can be used in such in the establishment of such a plan. DEA should coordinate the process.

5.7.3 Tourism

Tourism growth within this zone is the most important long term economic objective of the entire EMF area. The Kruger National Park and the escarpment are already major international tourist attractions. There are also several smaller private and statutory reserves in this zone, making nature based tourism or ecotourism the main focus activity. The tourism potential of this area should not be separated from the tourism potential that occurs in the adjoining Zone G. Activities that contribute to nature-based

tourism should be encouraged in this zone and the zone should be protected against activities that may influence nature-based tourism negatively.

5.7.4 Mining

Limited mining activity occurs in this zone with many old worked out mines in the escarpment area. Mining is not regarded as an economic driver in the area and any mining that is allowed should not compromise the natural character of the area or diminish its tourism potential.

5.7.5 Industry

Industries in the area are limited and it is preferable to keep the number of industries occurring in this zone to a minimum and rather locate them in adjoining zones.

5.7.6 Agriculture and commercial plantations

Limited agricultural activity occurs in the zone. The lack of arable land means that it is unlikely that the agricultural sector will grow notably within this zone. Extensive exotic plantations occur in the area. It is important that any extensions to these areas be investigated thoroughly to prevent unnecessary impacts. Extensions of plantations should not be allowed into areas with natural vegetation. The remaining grasslands on the escarpment are specifically at risk and should be avoided altogether.

5.7.7 Other

This zone cannot support the current amount of people residing in the area in a sustainable manner over the medium to long term. It would be desirable to focus service provision in nodes where it can be provided and accessed more efficiently.

Erosion Dongas in Sekhukhuneland



Photo: P. Claassen

Elephant in the Kruger



Photo: P. Claassen

Aerial Photograph of Rural Sekhukhune



Photo: P. Claassen

Letaba River in the Kruger National Park



Photo: P. Claassen

5.8 MANAGEMENT ZONE G: TZANEEN/PHALABORWA ACTIVITY CORRIDOR

5.8.1 Water utilisation

Two irrigation schemes, one in the Tzaneen area and the other in the Blyderivierspoort area occur in the area. There are also several other areas where irrigation occurs out of rivers. Exotic tree plantations on the escarpment are also responsible for absorbing significant amounts of natural flow, which reduces the amount of water that reaches the rivers. Other major water users include the municipalities of Tzaneen and Phalaborwa water while mining in especially the Phalaborwa area also have significant water consumption.

As with all the other zones, the water resources of the area are already over allocated. It is a priority that the ecological reserve requirements in this zone be met at all times, to ensure the health of the river ecosystem. The remainder of the available water resource should then be carefully allocated to ensure optimal use.

5.8.2 Conservation

There is significant potential for conservation in this area. There are especially opportunities to incorporate areas with natural heritage, catchment protection areas and areas with vulnerable vegetation into conservation areas. Links should be made to conservation areas in Zone F.

5.8.3 Tourism

The area is ideally suited and located for tourism and tourism in the area should be developed to also make use of the nature resources in Zone F.

5.8.4 Mining

Mining is currently one of the primary activities occurring within this zone. It is especially an important activity around Phalaborwa. It is, however, expected that the contribution that mining makes to the economy of the area will decline very sharply in approximately 20 years time when the mineral resources are depleted and the mines will close. It is important that other forms of income be developed to offset the expected loss in income and employment over the short to medium term. Such initiatives have already started in Phalaborwa and include all stakeholders including the mines.

5.8.5 Industry

Agri-processing industries support the active agricultural sector within this zone and should be maintained as core economic drivers in the area over the medium to long term.

5.8.6 Agriculture and commercial plantations

Agriculture is one of the primary activities occurring within this zone. A large portion consists of irrigated agriculture as well as commercial plantations. Expansion of this sector will have to proceed with caution as the water resource is already strained and further irrigated agriculture development may worsen the situation. The emphasis for the sector must be on improving efficiency of water use.

5.8.7 Business, services and government

The zone is very important within the EMF area due to its diversity of activities and the relative robustness of its economy. It also has significant potential for conservation and tourism that provides a perfect link with Zone F, while on the other hand it plays a vital supporting function to Zone H. The maintenance and enhancement of economic activities of this area is vitally important for the sustainable development of the wider area. Investment in sustainable development should be focussed in this area.

Forestry



Photo: P. Claassen

5.9 MANAGEMENT ZONE H: DRY RURAL LOWVELD AREA

5.9.1 Water utilisation

This huge rural area with a very high population density is dependent on water for subsistence farming. It is currently a declared disaster area due to drought conditions. The high dependence on surface and groundwater in the area is not sustainable and will have to be reduced in future.

5.9.2 Conservation

Most of the natural vegetation has already been removed from this zone. Part of the Soutpansberg Centre of Endemism falls within the far northern reaches of this zone, and should be a priority in terms of conservation within the area. It also shares a long border with the KNP and local officials are of the opinion that the link and relationship with the KNP should be improved so that the area can derive more direct benefits from the KNP.

5.9.3 Tourism

Cultural based tourism has some potential within this zone, though it will only be a small economic contributor. The proposed initiatives described above under conservation.

The local authority proposes a new road and a gate into the park from Giyani. Another proposal is the establishment of a number of exclusive lodges on the boundary of the KNP, each with a portion of exclusive access to the park for its visitors. The lodges should belong to the local communities in the area. SANParks officials with whom the ideas were discussed will, however, need some convincing.

5.9.4 Mining

Most of the mines in the area are no longer active and mining is likely not to be a major economic contributor.

5.9.5 Industry

With exception of a few industries in the Giyani area, no major industry exists within the zone.

5.9.6 Agriculture and commercial plantations

There are some areas of arable land and limited agriculture takes place within the zone. Irrigated agricultural practice is not likely to be sustainable in this zone over the long term, as water resources are already severely strained. Subsistence farming is a part of the rural way of life in this zone, and the education on good farming practices may increase the general productivity. The introduction of drought resistant higher income practices should also be encouraged. The mass planting of marula trees has for example been mooted as a sustainable development alternative that could have a significant positive impact on the people in the area due to its potentially high value products.

5.9.7 Business, services and government

The biggest employer and contributor to the economy in the zone is government. This is a clearly unsustainable situation, which will have to change over time. Literacy is low and unemployment levels are high. Initiatives to improve education and skills will improve the options for the people living in the zone.

5.9.8 Other

This zone cannot support the current amount of people residing in the area in a sustainable manner over the medium to long term. It would be desirable to focus service provision in nodes where it can be provided and accessed more efficiently. Natural migration out of the area should also be encouraged.

The devastation of overgrazing and erosion in EMZ H



Photo: P. Claassen

6. STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN (SEMP)

6.1 INTRODUCTION

The main purpose of the EMF is to put a decision-making support system in place that provides the following:

- A context that includes, acknowledges and understands the challenges of the area;
- an understanding of the need to utilise resources in the area to its full potential with a long-term sustainability outlook;
- an implementation resolve that is strict but at the same also compassionate and sensitive to the principles that have been adopted for this EMF;
- an approach that is practical, uncomplicated and easy to implement; and
- an indication of the implications of decisions, especially where such decisions have the potential to result in high opportunity costs.

The National Environmental Management Act and its suite of supporting legislation provides the basis for the making of development decisions in the EMF area where development has the potential to impact on the environment. The SEMP is therefore first and foremost targeted to the effective and efficient implementation of this legislative base.

From a land use planning perspective it is important that the EMF does not compete with Spatial Development Frameworks in the EMF area but rather provide a proactive environmental input to the SDFs.

6.2 IMPLEMENTATION OF NEMA SECTION 24

Section 24 of the National Environmental Management Act (NEMA) is the main section in the act that deals with the potential impact of development on the environment. It uses environmental impact assessment as the instrument to assist decision-making about potentially harmful activities.

6.2.1 Alignment with the DEA section 24 initiative

DEA is currently in the process of defining geographical areas that is of national importance in term of section 24(2)(b) of NEMA and at the same time, coordinating the general coordinated implementation of sections 24(2)(b) and (c) across the nine provinces. For this reason it was decided to link the SEMP of this EMF directly to the DEA initiative instead of creating a separate independent instrument.

6.2.2 Identification of geographical areas in terms of NEMA 24(2)(b)

Section 24(2)(b) of NEMA makes provision for a list of additional activities that would require environmental authorisation in specific identified geographical areas. The identification of these geographical areas must be based on environmental attributes. In the identification of attributes in the EMF area the current process that is being undertaken by the national and provincial authorities was used as a basis to ensure exact alignment with this process. As a result the following attributes that occur in the EMF area have been identified:

- Focus areas for contributing to biodiversity thresholds that consists of large, relatively intact (in terms of natural vegetation cover) and unfragmented areas whose contribution is essential to meet long-term biodiversity thresholds and include areas that are likely to become future protected areas or into which current protected areas are likely to expand;
- threatened ecosystems that consist of areas that are highly significant or important and necessary in terms of the Mpumalanga Biodiversity Conservation Plan (MBCP), critically endangered and endangered ecosystems as identified by the South African National Biodiversity Institute in the Limpopo Province as well as irreplaceable and important sites in the Gauteng Conservation Plan (C-Plan);
- important topographical features topographical features that were delineated using the 20m contour interval terrain model of South Africa and based on the inherent scenic value of these features¹;
- National and Provincial Parks and Reserves consists of national and provincial parks and reserves as defined in the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003), as amended;
- National Parks view-shed protection areas means areas that contain sensitive view areas around National Parks as identified by SANParks;
- priority areas in the vicinity of National Parks consists of areas that have been identified for the long term survival of biodiversity around National Parks or upon which the long term survival of the parks depend to a significant extent;
- rivers, wetlands and other water bodies consisting of rivers with a potential zone of influence buffer of 32 metres on each side from the banks of the rivers, wetlands with a potential zone of influence of 10 metres from the edge of the wetlands and dams with a potential zone of influence of 10 metres from their high water lines;
- steep slopes consisting of all areas with a slope of 8 degrees or steeper; and

¹ as identified by Professor W.F. van Riet in van Riet, W.F., Claassen P., Janse van Rensburg J.D., du Plessis L.M. & van Viegen T.R. 1997. Environmental Potential Atlas for South Africa. J.L van Schaik, Pretoria,

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

- private and local protected areas consisting of private nature reserves, conservancies, core areas of biosphere reserves and other protected areas that are part of a stewardship programme or provincial protected area expansion strategy.

The above areas must be demarcated on a geographical areas map. Due to the current initiatives of the national and the provincial governments it is not possible to identify the geographical areas as part of this project. The above environmental attributes must therefore be regarded as the proposed inputs from the EMF to the national and provincial system that is being developed.

Figure 33: Environmental attributes: threatened ecosystems

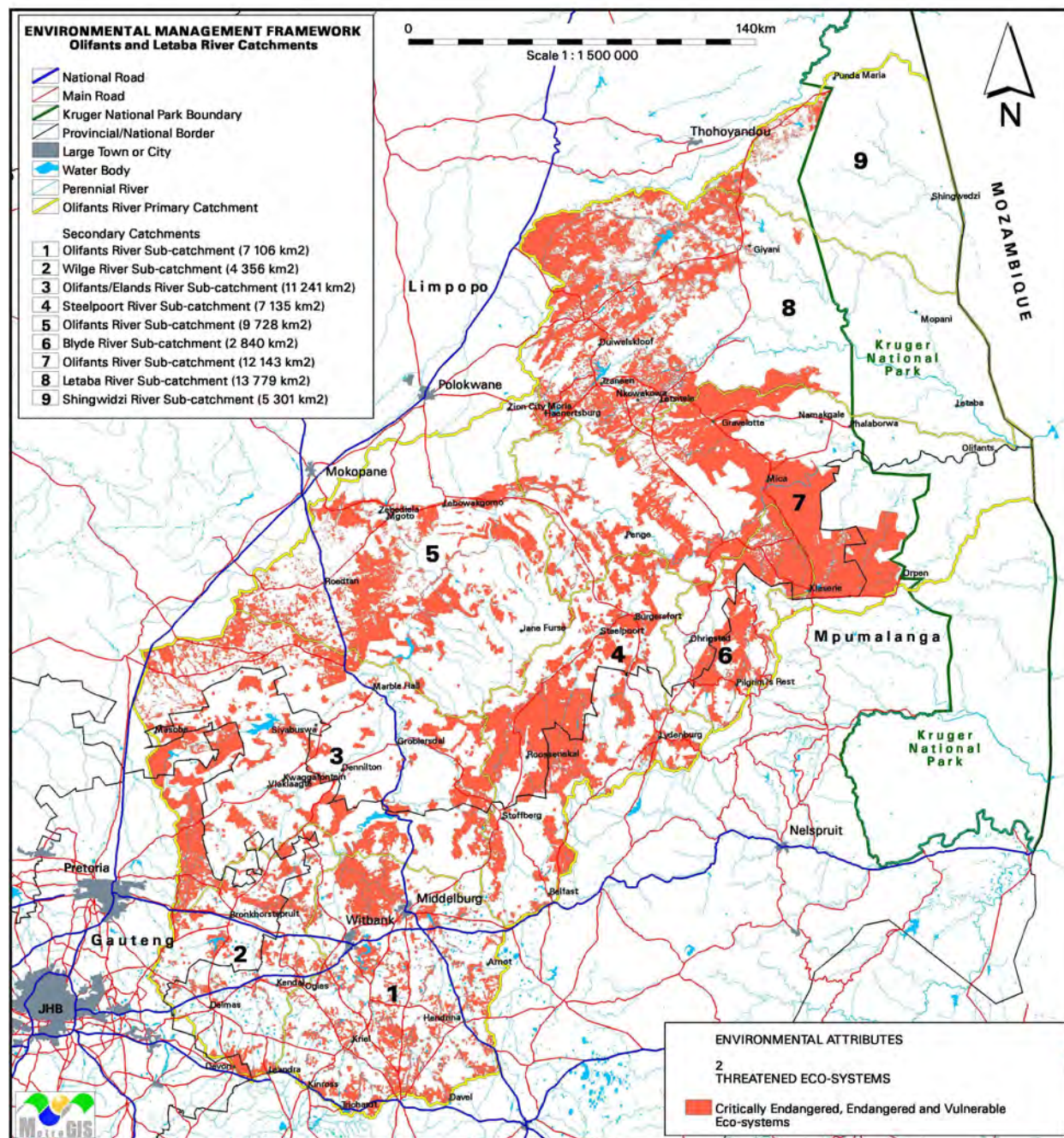


Figure 34: Environmental attributes: focus areas for contributing to biodiversity

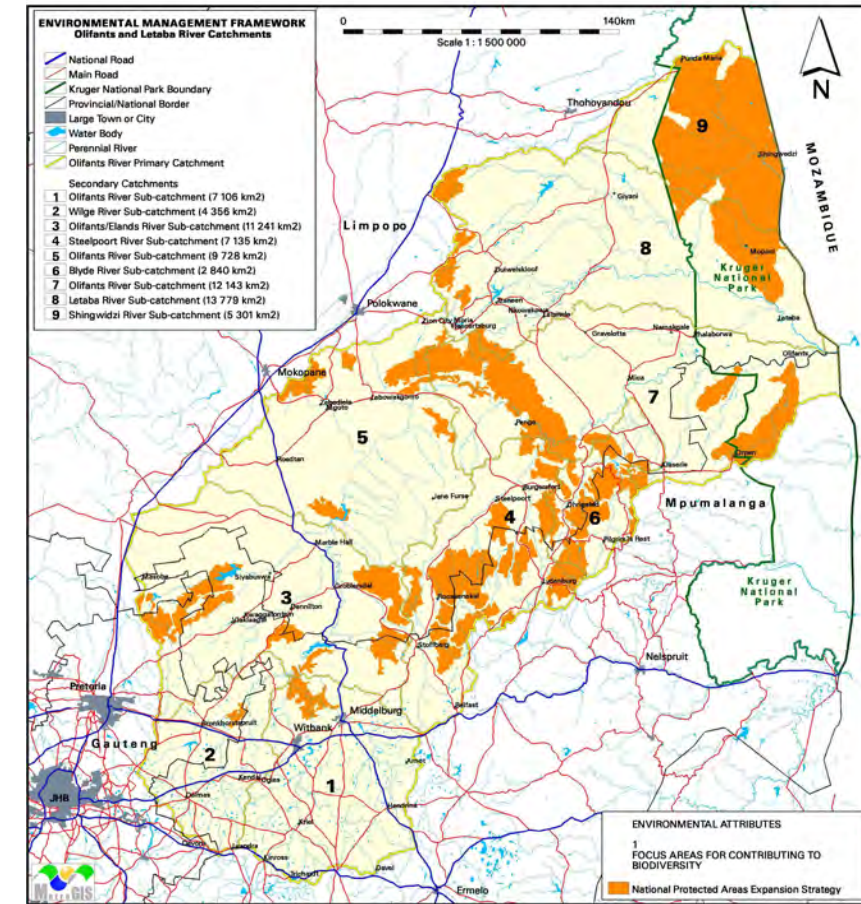


Figure 35: Environmental attributes: important topographical features

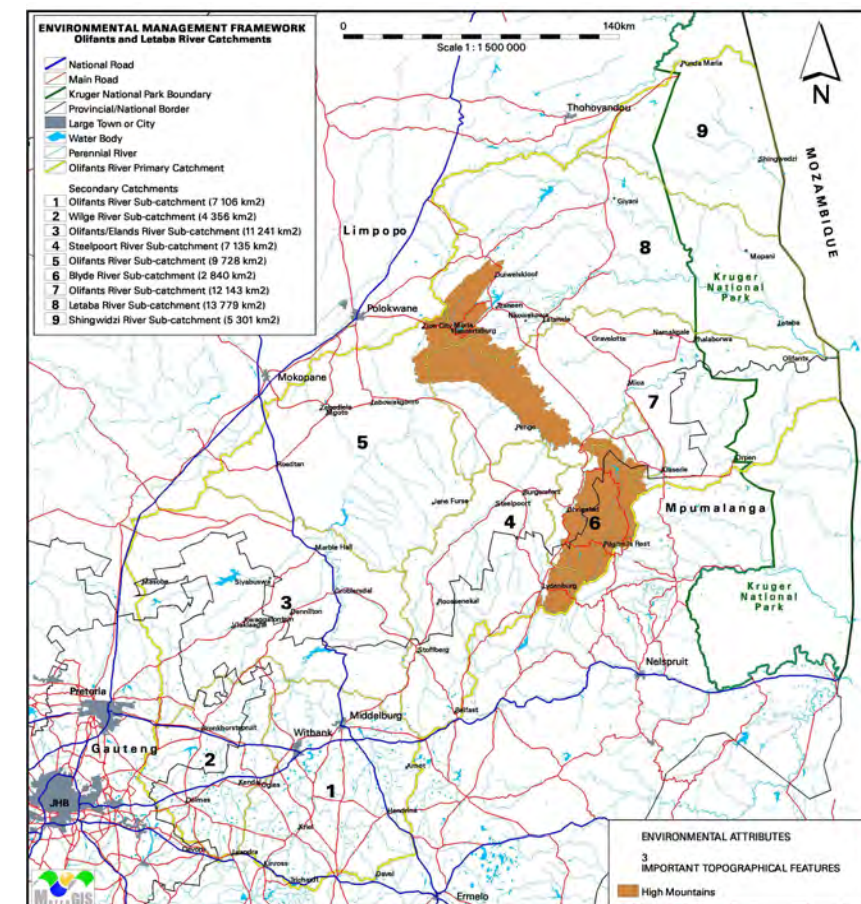


Figure 36: Environmental attributes national and provincial protected areas & private and local conservation areas

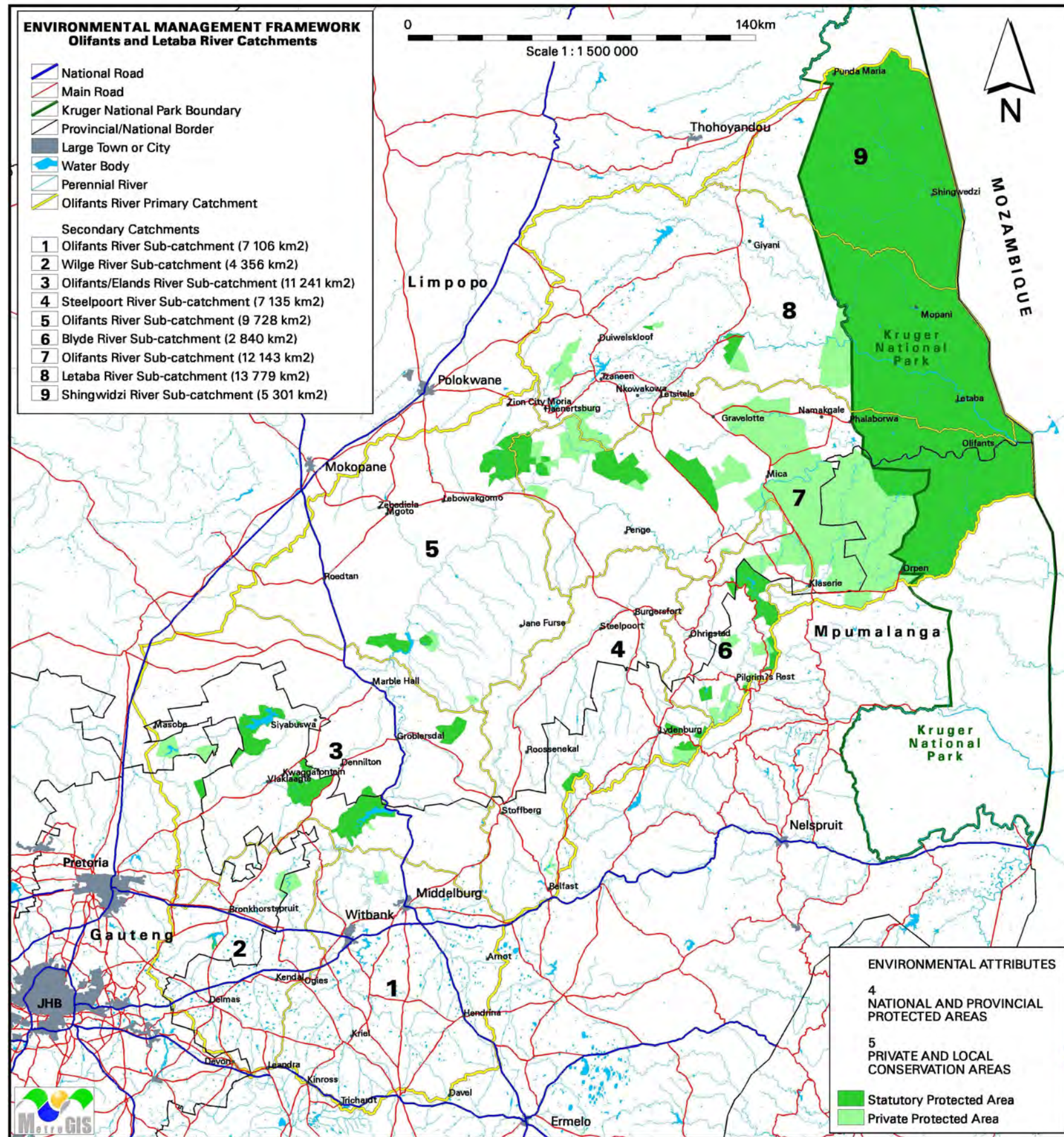


Figure 37: Environmental attributes: national park viewshed protection areas

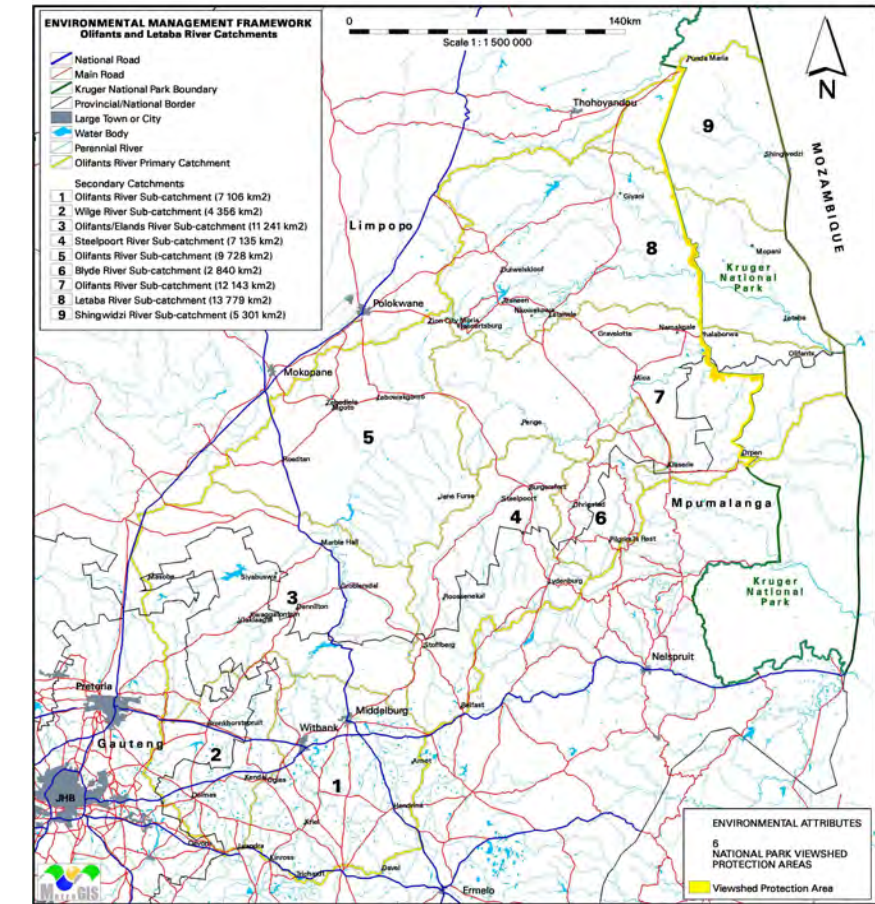


Figure 38: Environmental attributes: priority areas in the vicinity of national parks

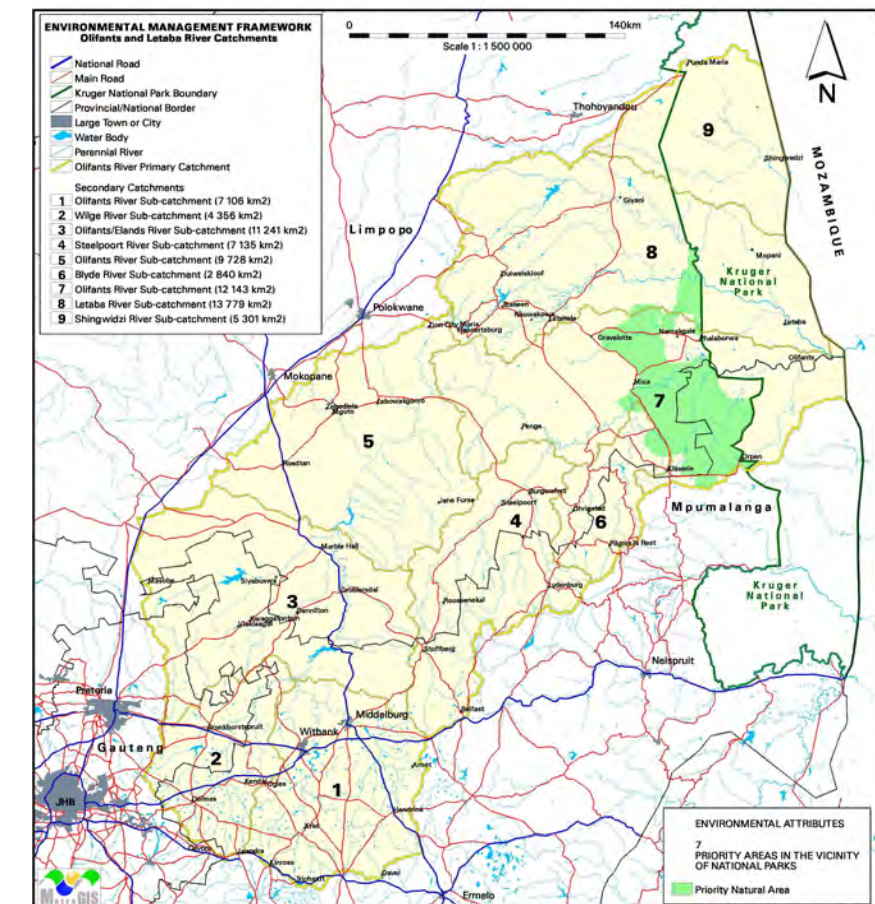


Figure 39: Environmental attributes: rivers, wetlands and other water bodies

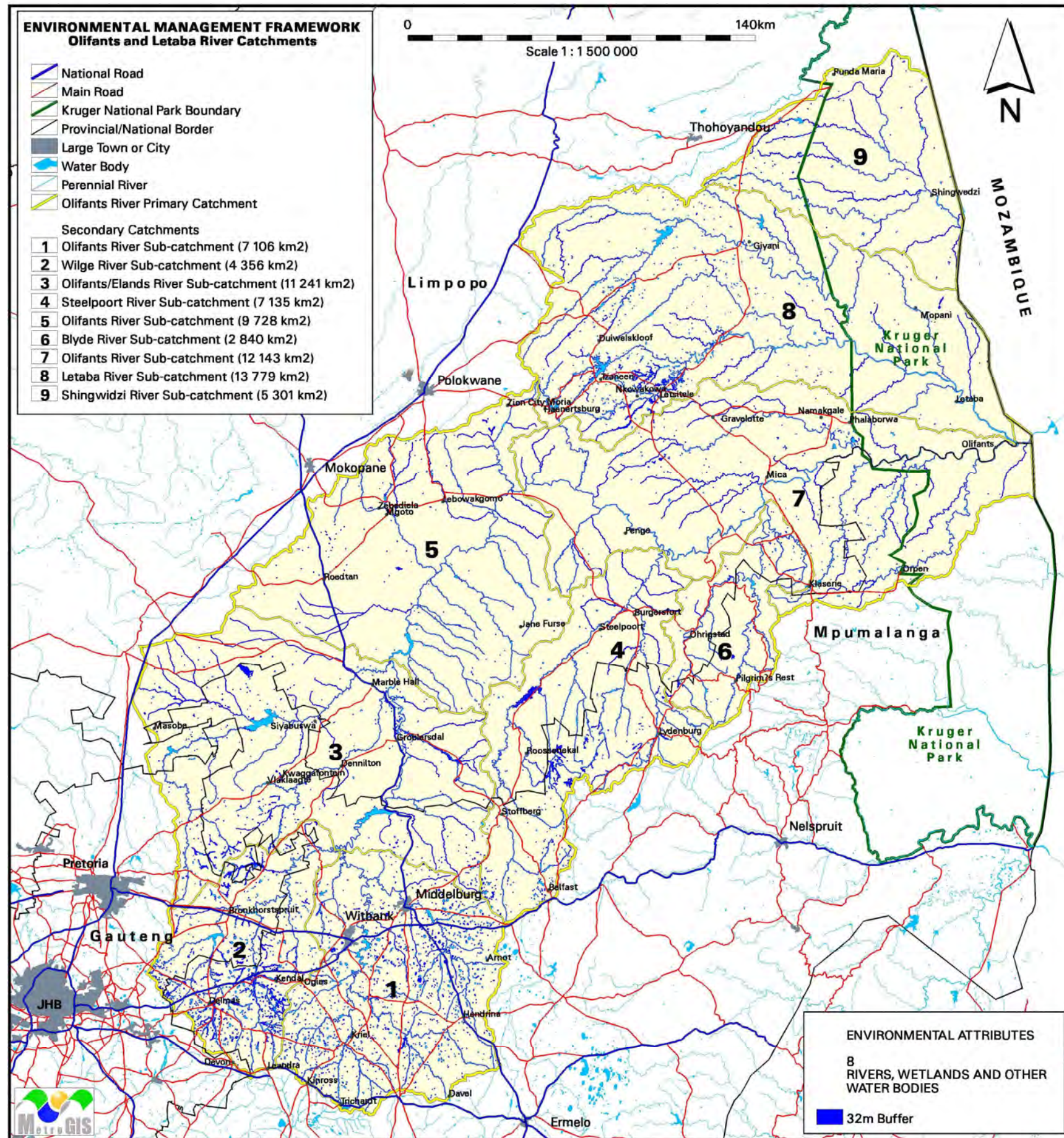
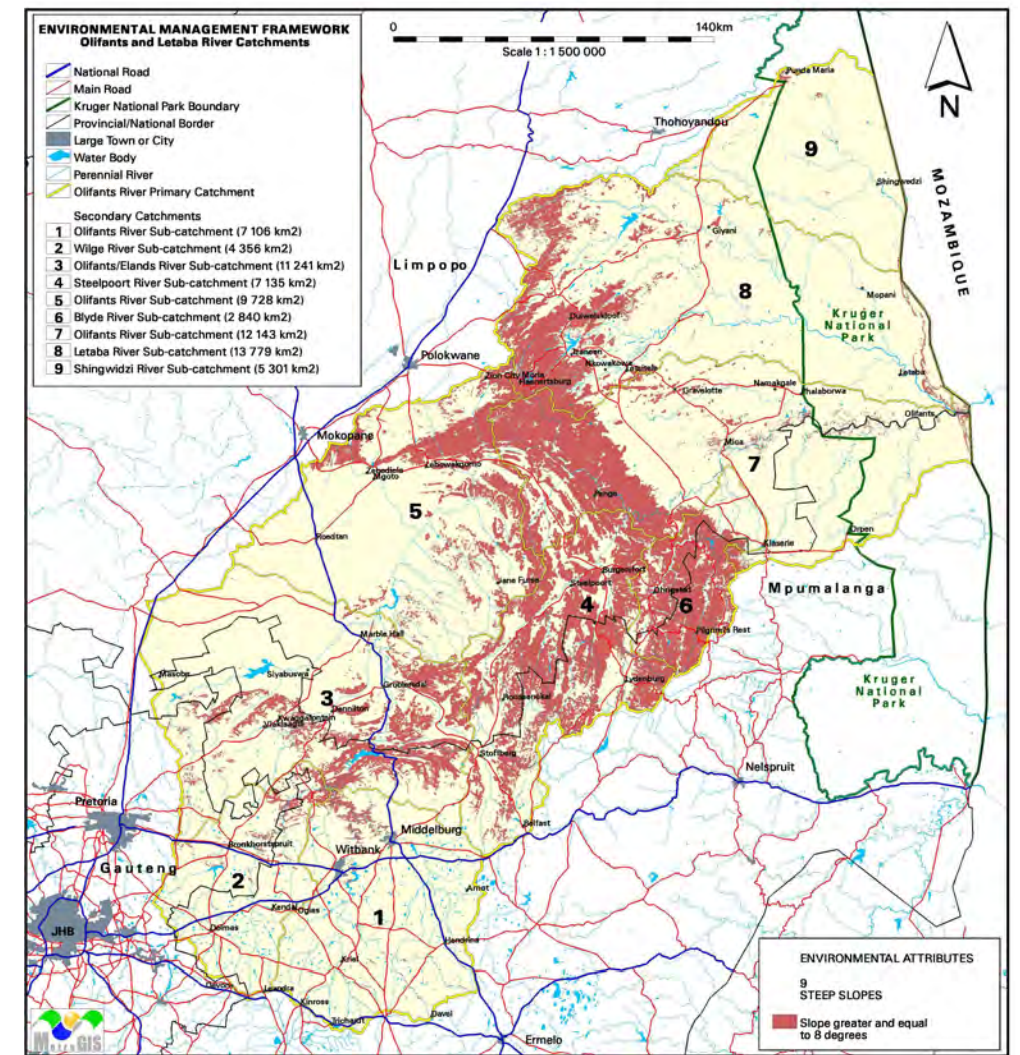


Figure 40: Environmental attributes: steep slopes



Escarpment Scene

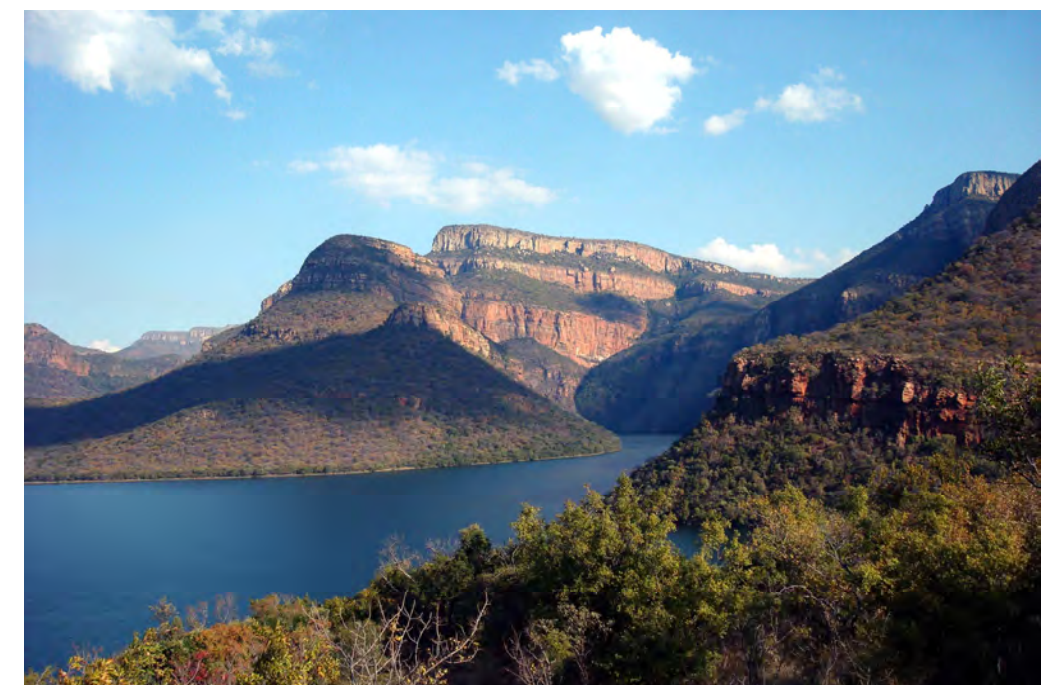


Photo: P. Claassen

6.2.3 Identification of geographical areas in terms of NEMA 24(2)(c)

Section 24(2)(c) of NEMA makes provision for the exclusion of activities for which environmental authorisation is normally required in specific identified geographical areas. The identification of these geographical areas must be based on environmental attributes. In the identification of attributes in the EMF area, the current process that is being undertaken by the national and provincial authorities was used as a basis to ensure exact alignment with that process. As a result the built-up areas have been identified.

6.2.4 Specification of activities in geographical areas

The activities in Table 1 of the specification of activities in geographical areas appendix is proposed for specification as indicated for the activities below as additional activities to the national list of activities that require basic impact assessment:

- Focus areas for contributing to biodiversity in which activities 2, 3, 5, 8, 9,10, 11, 13, 14 and 15 are specified;
- threatened ecosystems in which activities 1, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15 and 19 are specified;
- important topographical features in which activities 1, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14 and 15 are specified;
- national and provincial parks and reserves in which activities 1, 3, 5, 6, 8, 10, 11, 13, 14 and 15 are specified;
- national parks view-shed protection areas in which activities 2, 3, 5, 8, 9,10, 11, 14 and 15 are specified;
- priority areas in the vicinity of National Parks in which activities 2, 3, 5, 6, 8, 9,10, 11, 13, 14 and 15 are specified;
- rivers, wetlands and other water bodies in which activities 1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 17 and 18 are specified;
- steep slopes in which activities 2, 3, 5, 6, 7, 8, 9,10, 11, 12, 13, 14 and 15 are specified; and
- private and local conservation areas in which activities 2, 3, 5, 6, 8, 9,10, 11, 13, 14 and 15 are specified.

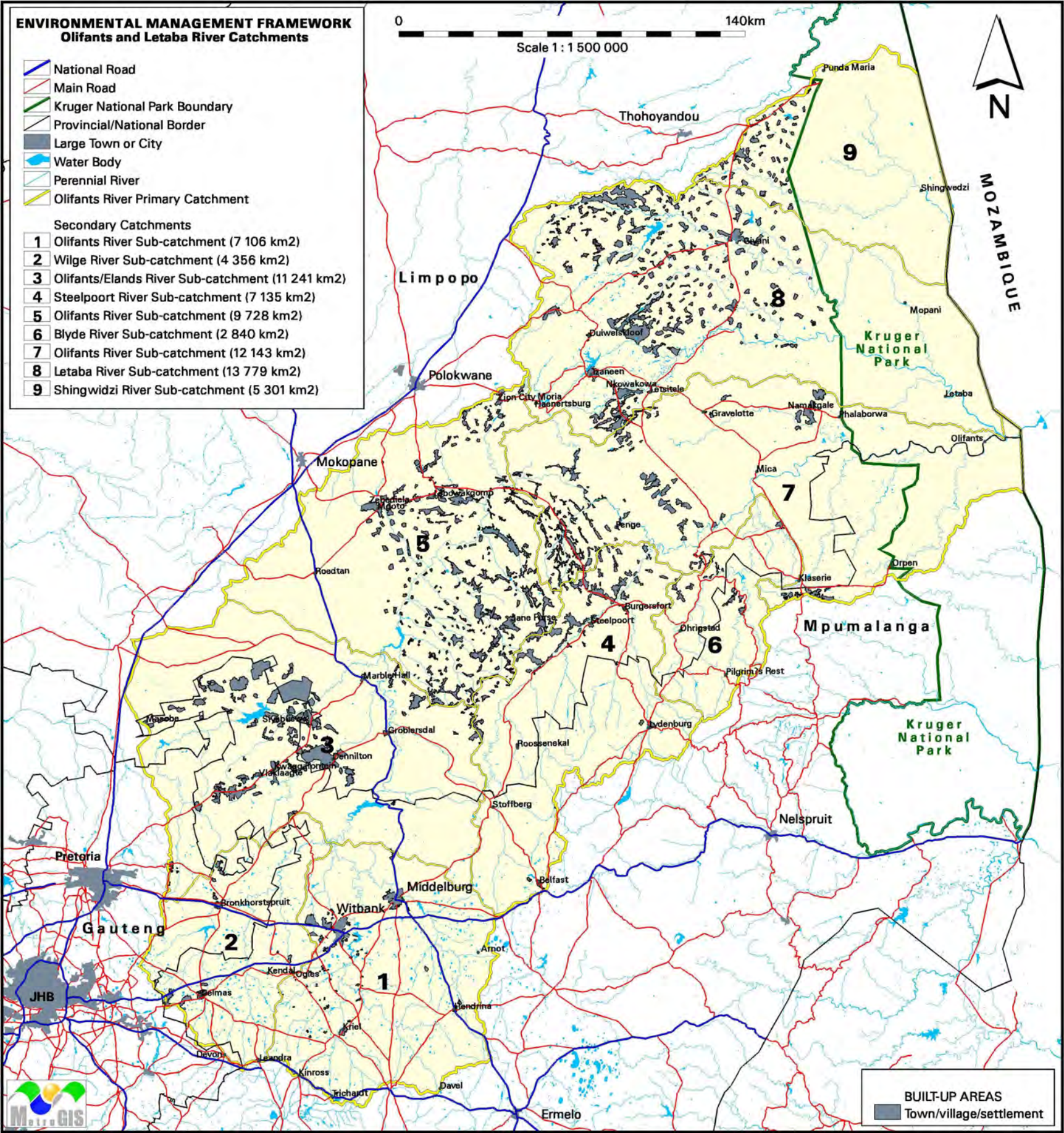
Activities 1(i), 1(k), 4, 5, 9, 10, 11, 12, 14 and 18(h) in Table 2 of the specification of activities in geographical areas appendix are proposed for specification in built up areas as activities on the national list of activities that are to be excluded from authorisation in built up areas that are indicated in the EMF area.

Aerial Photograph of a settlement



Photo: S. Taljaardt

Figure 41: Built-up areas



Infomral Settlements



Photo: P. Claassen

Dennilton



Photo: Google Earth 2009

6.1 MANAGEMENT GUIDELINES

6.3.1 Introduction

The purpose of these guidelines is to assist in attaining the desired state as described in section 5 of the EMF report. It is therefore done for each management zone. Repetition of certain aspect is done on purpose to facilitate a link between the report and the GIS that will give the complete guideline in each instance. The guideline is also done in a point format to make integration with the GIS viewer easier.

6.3.2 Zone A: The Highveld/energy hub area

Guidelines

Water allocation:

- Water allocation in this zone may not have a further negative impact on the ecological reserve of any part of the river system in the EMF area.
- Water allocation to meet the needs of municipalities must in all instances take prevalence over the allocation to other users.
- Additional water allocations for the agricultural, mining and industrial sectors must come from savings from existing allocations that are reallocated. The methods of achieving the savings and facilitating the transfers must be negotiated until DWA develop a policy in this regard.
- Illegal use of water must be investigated, followed up and the perpetrators should be prosecuted.

Water quality:

- Water users must ensure that water that is released back into the system from their activities must comply with the relevant quality standards. It is their responsibility to find out what standards are applicable to them.
- Water release quality standards must be applied strictly and transgressors should be prosecuted.
- Municipalities should be capacitated (personnel and funding) to upgrade and manage sewage works to acceptable standards.
- Municipalities that fail to manage sewage work effectively should be prosecuted.

Responsibility

DWA

DWA

DWA and water users

DWA

Water use licence holders

DWA

DWA

DWA

Conservation:

- All natural wetlands, riparian areas and river systems that occur in the zone as depicted on Spot 5 satellite images dated on or before 30 November 2009 must be maintained in at least the area and condition as at 30 November 2009.
- Whenever possible wetlands should be established as part of the rehabilitation and closure of mines.

Land owners and users

DM

Mining

- A strategic mining plan should be developed for this zone that limits the unrehabilitated surface area of mines to the minimum possible.

DM

Air pollution:

- The Air Quality Management Plan (AQMP) (currently being compiled) that will apply to the zone should be implemented.
- The implementation of the AQMP should be monitored and where it fails corrective action must be taken.

Local authorities

DEA

Cooperative government:

- Government instructions at all levels should coordinate their activities in such a way that authorisations, licences and permits issued does not conflict with one another.
- Government should focus on implementation of legislation and policies especially in respect to compliance monitoring and enforcement.

All government institutions

All government institutions

EMF principles:

- The EMF principles should be used as guiding norms in the evaluation and decision-making processes of activities that requires an authorisation, licence or permit from government.

All government institutions

6.3.3 Zone B: The Highveld to Bushveld transition area

Guidelines

Water allocation:

- Water allocation in this zone may not have a further negative impact on the ecological reserve of any part of the river system in the EMF area.
- Additional water allocations must come from savings from existing allocations that are reallocated. The methods of achieving the savings and facilitating the transfers must be negotiated until DWA develops a policy in this regard.
- Illegal use of water must be investigated, followed up and the perpetrators should be prosecuted.

Water quality:

- Water users must ensure that water that is released back into the system from their activities comply with the relevant quality standards. It is their responsibility to find out what standards are applicable to them.
- Water release quality standards must be applied strictly and transgressors should be prosecuted.
- Municipalities should be capacitated (personnel and funding) to upgrade and manage sewage works to acceptable standards.
- Municipalities that fail to manage sewage work effectively should be prosecuted.

Conservation:

- All natural wetlands, riparian areas and river systems that occur in the zone as depicted on Spot 5 satellite images dated on or before 30 November 2009 must be maintained in at least the area and condition as at 30 November 2009.
- Conservation and associated tourism is the preferred land-use in the area and any other land-use that is allowed should not have significant detrimental long term impact on the conservation land-use focus.

Air pollution:

- The Air Quality Management Plan (AQMP) (currently

Responsibility

DWA

DWA and water users

DWA

Water use licence holders

DWA

DWA

DWA

Land owners and users

DEA, DM, LDEDET and MDEDET

Local authorities

being compiled) that will apply to the zone should be implemented.

- The implementation of the AQMP should be monitored and where it fails corrective action must be taken.

Mining

- A strategic mining plan should be developed for this zone that limits the unrehabilitated surface area of mines to the minimum possible.

Cooperative government:

- Government instructions at all levels should coordinate their activities in such a way that authorisations, licences and permits issued does not conflict with one another.
- Government should focus on implementation of legislation and policies especially in respect to compliance monitoring and enforcement.

EMF principles:

- The EMF principles should be used as guiding norms in the evaluation and decision-making processes of activities that requires an authorisation, licence or permit from government.

DEA

DM

All government institutions

All government institutions

All government institutions

Kudu in Bushveld



Photo: S. Johnston

6.3.4 Zone C: The Groblersdal/Marble Hall agricultural area

Guidelines

Water allocation:

- Water allocation in this zone may not have a further negative impact on the ecological reserve of any part of the river system in the EMF area.
- Water allocation to meet the needs of municipalities must in all instances take prevalence over the allocation to other users.
- Additional water allocations for the agricultural, mining and industrial sectors must come from savings from existing allocations that are reallocated. The methods of achieving the savings and facilitating the transfers must be negotiated until DWA develops a policy in this regard.
- Illegal use of water must be investigated, followed up and the perpetrators should be prosecuted.

Water quality:

- Water users must ensure that water that is released back into the system from their activities comply with the relevant quality standards. It is their responsibility to find out what standards are applicable to them.
- Water release quality standards must be applied strictly and transgressors should be prosecuted.
- Municipalities should be capacitated (personnel and funding) to upgrade and manage sewage works to acceptable standards.
- Municipalities that fail to manage sewage work effectively should be prosecuted.

Conservation:

- All natural wetlands, riparian areas and river systems that occur in the zone as depicted on Spot 5 satellite images dated on or before 30 November 2009 must be maintained in at least the area and condition as at 30 November 2009.

Cooperative government:

- Government instructions at all levels should coordinate

Responsibility

DWA

DWA

DWA and water users

DWA

Water use licence holders

DWA

DWA

DWA

Land owners and users

All government

their activities in such a way that authorisations, licences and permits issued does not conflict with one another.

- Government should focus on implementation of legislation and policies especially in respect to compliance monitoring and enforcement.

EMF principles:

- The EMF principles should be used as guiding norms in the evaluation and decision-making processes of activities that requires an authorisation, licence or permit from government.

institutions

All government institutions

All government institutions

Irrigation canals near Marble Hall



Photo: P. Claassen

6.3.5 Zone D: Springbok Flats rural area

Guidelines

Water allocation:

- Water allocation in this zone may not have a further negative impacts on the ecological reserve of any part of the river system in the EMF area.
- Water allocation to meet the needs of municipalities must in all instances take prevalence over the allocation to other users.
- Additional water allocations for the agricultural, mining and industrial sectors must come from savings from existing allocations that are reallocated. The methods of achieving the savings and facilitating the transfers must be negotiated until DWA develops a policy in this regard.
- Illegal use of water must be investigated, followed up and the perpetrators should be prosecuted.

Water quality:

- Water users must ensure that water that is released back into the system from their activities must comply with the relevant quality standards. It is their responsibility to find out what standards are applicable to them.
- Water release quality standards must be applied strictly and transgressors should be prosecuted.
- Municipalities should be capacitated (personnel and funding) to upgrade and manage sewage works to acceptable standards.
- Municipalities that fail to manage sewage work effectively should be prosecuted.

Conservation:

- All natural wetlands, riparian areas and river systems that occur in the zone as depicted on Spot 5 satellite images dated on or before 30 November 2009 must be maintained in at least the area and condition as at 30 November 2009.

Cooperative government:

- Government instructions at all levels should coordinate

Responsibility

DWA

DWA

DWA and water users

DWA

Water use licence holders

DWA

DWA

DWA

Land owners and users

All government

their activities in such a way that authorisations, licences and permits issued does not conflict with one another.

- Government should focus on implementation of legislation and policies especially in respect to compliance monitoring and enforcement.

EMF principles:

- The EMF principles should be used as guiding norms in the evaluation and decision-making processes of activities that requires an authorisation, licence or permit from government.

institutions

All government institutions

All government institutions

Roedtan



Photo: P. Claassen

Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas

6.3.6 Zone E: Sekhukhune/platinum mining focus area

Guidelines

Water allocation:

- Water allocation in this zone may not have a further negative impact on the ecological reserve of any part of the river system in the EMF area.
- Water allocation to meet the needs of municipalities must in all instances take prevalence over the allocation to other users.
- The provision of water to rural communities should be done in a manner that is cost effective and facilitate the formation of development nodes that can be better serviced by municipalities.
- Additional water allocations for the agricultural, mining and industrial sectors must come from savings from existing allocations that are reallocated. The methods of achieving the savings and facilitating the transfers must be negotiated until DWA develops a policy in this regard.
- Illegal use of water must be investigated, followed up and the perpetrators should be prosecuted.

Water quality:

- Water users must ensure that water that is released back into the system from their activities must comply with the relevant quality standards. It is their responsibility to find out what standards are applicable to them.
- Water release quality standards must be applied strictly and transgressors should be prosecuted.
- Municipalities should be capacitated (personnel and funding) to upgrade and manage sewage works to acceptable standards.
- Municipalities that fail to manage sewage work effectively should be prosecuted.

Conservation:

- All natural wetlands, riparian areas and river systems that occur in the zone as depicted on Spot 5 satellite images dated on or before 30 November 2009 must be

Responsibility

DWA

DWA

DWAF and local authorities

DWA and water users

DWA

Water use licence holders

DWA

DWA

DWA

Land owners and users

maintained in at least the area and condition as at 30 November 2009.

- Whenever possible wetlands should be established as part of the rehabilitation and closure of mines.
- Mining companies and other developers should contribute to the management of the catchments by rehabilitating and maintain badly eroded areas on their properties.

Air pollution:

- The air quality in the area may become a problem if the current industrial growth continues. DEA should investigate this and prepare and Air Quality Management Plan (AQMP) plan in time to prevent high levels of air pollution in the zone.

Mining

- A strategic mining plan should be developed for this zone that limits the unrehabilitated surface area of mines to the minimum possible.

Cooperative government:

- Government instructions at all levels should coordinate their activities in such a way that authorisations, licences and permits issued does not conflict with one another.
- Government should focus on implementation of legislation and policies especially in respect to compliance monitoring and enforcement.

EMF principles:

- The EMF principles should be used as guiding norms in the evaluation and decision-making processes of activities that requires an authorisation, licence or permit from government.

DM

Land owners and mining companies

DEA Local authorities

DM

All government institutions

All government institutions

All government institutions

6.3.7 Zone F: Nature conservation/tourism focus area

Guidelines

Water allocation:

- Water allocation in this zone may not have a further negative impacts on the ecological reserve of any part of the river system in the EMF area.
- Water allocation to meet the needs of municipalities must in all instances take prevalence over the allocation to other users.
- Illegal use of water must be investigated, followed up and the perpetrators should be prosecuted.

Water quality:

- Water users must ensure that water that is released back into the system from their activities must comply with the relevant quality standards. It is their responsibility to find out what standards are applicable to them.
- Water release quality standards must be applied strictly and transgressors should be prosecuted.
- Municipalities should be capacitated (personnel and funding) to upgrade and manage sewage works to acceptable standards.
- Municipalities that fail to manage sewage work effectively should be prosecuted.

Conservation:

- Conservation is the preferred land-use in this zone and must take preference in decision-making and planning processes.
- All natural wetlands, riparian areas and river systems that occur in the zone as depicted on Spot 5 satellite images dated on or before 30 November 2009 must be maintained in at least the area and condition as at 30 November 2009.
- Whenever possible wetlands should be established as part of the rehabilitation and closure of mines.

Cooperative government:

Responsibility

- DWA
- DWA
- DWA
- Water use licence holders
- DWA
- DWA
- DWA
- All government institutions
- Land owners and users
- DM

- Government instructions at all levels should coordinate their activities in such a way that authorisations, licences and permits issued does not conflict with one another.
- Government should focus on implementation of legislation and policies especially in respect to compliance monitoring and enforcement.

EMF principles:

- The EMF principles should be used as guiding norms in the evaluation and decision-making processes of activities that requires an authorisation, licence or permit from government.

All government institutions
All government institutions
All government institutions

Zebra



Photo: P. Claassen

6.3.8 Zone G: Tzaneen/Phalaborwa activity corridor

Guidelines

Water allocation:

- Water allocation in this zone may not have a further negative impacts on the ecological reserve of any part of the river system in the EMF area.
- Water allocation to meet the needs of municipalities must in all instances take prevalence over the allocation to other users.
- Additional water allocations for the agricultural, mining and industrial sectors must come from savings from existing allocations that are reallocated. The methods of achieving the savings and facilitating the transfers must be negotiated until DWA develops a policy in this regard.
- Illegal use of water must be investigated, followed up and the perpetrators should be prosecuted.

Water quality:

- Water users must ensure that water that is released back into the system from their activities must comply with the relevant quality standards. It is their responsibility to find out what standards are applicable to them.
- Water release quality standards must be applied strictly and transgressors should be prosecuted.
- Municipalities should be capacitated (personnel and funding) to upgrade and manage sewage works to acceptable standards
- Municipalities that fail to manage sewage work effectively should be prosecuted

Conservation:

- All natural wetlands, riparian areas and river systems that occur in the zone as depicted on Spot 5 satellite images dated on or before 30 November 2009 must be maintained in at least the area and condition as at 30 November 2009.
- Whenever possible wetlands should be established as part of the rehabilitation and closure of mines.

Responsibility

- DWA
- DWA
- DWA and water users
- DWA
- Water use licence holders
- DWA
- DWA
- DWA
- Land owners and users
- DM

Cooperative government:

- Government instructions at all levels should coordinate their activities in such a way that authorisations, licences and permits issued does not conflict with one another.
- Government should focus on implementation of legislation and policies especially in respect to compliance monitoring and enforcement.

EMF principles:

- The EMF principles should be used as guiding norms in the evaluation and decision-making processes of activities that requires an authorisation, licence or permit from government

All government institutions

All government institutions

All government institutions

Phalaborwa Mine



Photo: S. Johnston

6.3.9 Zone H: Dry rural Lowveld area

Guidelines

Water allocation:

- Water allocation in this zone may not have a further negative impact on the ecological reserve of any part of the river system in the EMF area.
- Water allocation to meet the needs of municipalities must in all instances take prevalence over the allocation to other users.
- Additional water allocations for the agricultural, mining and industrial sectors must come from savings from existing allocations that are reallocated. The methods of achieving the savings and facilitating the transfers must be negotiated until DWA develops a policy in this regard.
- Illegal use of water must be investigated, followed up and the perpetrators should be prosecuted.

Water quality:

- Water users must ensure that water that is released back into the system from their activities must comply with the relevant quality standards. It is their responsibility to find out what standards are applicable to them.
- Water release quality standards must be applied strictly and transgressors should be prosecuted.
- Municipalities should be capacitated (personnel and funding) to upgrade and manage sewage works to acceptable standards
- Municipalities that fail to manage sewage work effectively should be prosecuted

Conservation:

- All natural wetlands, riparian areas and river systems that occur in the zone as depicted on Spot 5 satellite images dated on or before 30 November 2009 must be maintained in at least the area and condition as at 30 November 2009.
- Whenever possible wetlands should be established as part of the rehabilitation and closure of mines.

Responsibility

- DWA
- DWA
- DWA and water users
- DWA
- Water use licence holders
- DWA
- DWA
- DWA
- Land owners and users
- DM

Cooperative government:

- Government instructions at all levels should coordinate their activities in such a way that authorisations, licences and permits issued does not conflict with one another.
- Government should focus on implementation of legislation and policies especially in respect to compliance monitoring and enforcement.

EMF principles:

- The EMF principles should be used as guiding norms in the evaluation and decision-making processes of activities that requires an authorisation, licence or permit from government

- All government institutions
- All government institutions
- All government institutions

Traditional Houses



Photo: P. Claassen

South Africa and Mozambique have not yet agreed on the management, information sharing and procedures for the Olifants and Letaba Rivers as contemplated in the South African Development Community "Revised Protocol on Shared Watercourses" (reference document AJ.) on shared water courses. It is however important that future international obligations that may arise be taken into account in the flows that are let through to Mozambique and the management of water quality.

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