



Environmental Management Framework for John Taolo Gaetsewe District Municipality



September 2011

Draft Environmental Management Framework & Strategic Environmental Management Programme



ENGINEERS AND ENVIRONMENTAL CONSULTANTS

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TABLE OF CONTENTS

TABLE OF CONTENTS	I
ABBREVIATIONS AND ACRONYMS	V
EXECUTIVE SUMMARY	VI
1 INTRODUCTION	2
1.1 PROJECT INTRODUCTION	2
1.2 LEGAL CONTEXT	3
1.3 PROJECT PHASING	4
1.3.1 STATUS QUO ASSESSMENT	4
1.3.2 DESIRED STATE ANALYSIS	4
1.3.3 MANAGEMENT ZONES & STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN	4
1.3.4 FINAL ENVIRONMENTAL MANAGEMENT FRAMEWORK	5
1.4 EMF STRUCTURE	5
2 STRATEGIC ENVIRONMENTAL ASSESSMENT	6
2.1 STRATEGIC ENVIRONMENTAL FRAMEWORK	7
2.1.1 SOCIO-ECONOMIC ISSUES	7
2.1.2 DEVELOPMENT PLANNING	13
2.1.3 WATER RESOURCES	18
2.1.4 AGRICULTURE AND SOILS	25
2.1.5 MINING	32
2.1.6 TOURISM AND HERITAGE RESOURCES	36
2.1.7 BIODIVERSITY CONSERVATION	41
2.2 SUMMARY OF THE STRATEGIC ENVIRONMENTAL FRAMEWORK	51
3 ENVIRONMENTAL MANAGEMENT ZONES	54
3.1 ENVIRONMENTAL FRAMEWORK ANALYSIS	54
3.1.1 ENVIRONMENTAL CONVERGENCE	54
3.1.2 ENVIRONMENTAL CONFLICTS	55
3.2 DIFFERENTIATING MANAGEMENT ZONES	57
3.2.1 ECOLOGICAL FUNCTIONING	57
3.2.2 LIVELIHOODS	57
3.2.3 ENVIRONMENTAL QUALITY	58
3.3 ENVIRONMENTAL MANAGEMENT ZONES	59
4 ENVIRONMENTAL MANAGEMENT FRAMEWORK AND STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN	60
4.1 PURPOSE AND SCOPE OF AN SEMP	60
4.2 LEGAL CONTEXT	61
4.3 THE DIFFERENT TIERS OF ENVIRONMENTAL DECISION-MAKING	62
4.4 ENVIRONMENTAL CONTROL IN THE MANAGEMENT ZONES	62
4.4.1 CONSERVATION NODES	63
4.4.2 MINING BELT	65
4.4.3 AGRICULTURAL SUPPORT	69

4.4.4 ENVIRONMENTAL RISKS	71
4.4.5 RURAL ZONE	73
4.5 SPECIFIC ENVIRONMENTAL MANAGEMENT FOCUS AREAS	74
4.5.1 BUILT-UP AREAS	74
4.5.2 HERITAGE	78
4.5.3 UNIVERSALLY PRESENT BIOPHYSICAL SENSITIVITY	80
4.5.4 WATER RESOURCES	82
4.6 SUMMARY OF THE SEMP	84
4.7 ENVIRONMENTAL IMPACT ASSESSMENTS	88
4.8 ADOPTION, IMPLEMENTATION AND APPLICATION	88
5 REFERENCES	89
6 ANNEXURE 1: MAPS	91

Table of Figures

FIGURE 1: OVERVIEW OF THE JOHN TAOLO GAETSEWE DISTRICT MUNICIPALITY (JTGDM, 2010/2011)	3
FIGURE 2: THE STRATEGIC SUSTAINABILITY ASSESSMENT	6
FIGURE 3: UNEMPLOYMENT IN THE NORTHERN CAPE (STATS SA)	9
FIGURE 4: DEVELOPMENT CENTRES, NODES AND CORRIDORS (K GALAGADI DM, 2007)	14
FIGURE 5: EPHEMERAL RIVER IN THE JTGDM (FEBRUARY 2011)	19
FIGURE 6: PROFILE OF AGRICULTURAL ACTIVITY IN JTGDM (DPLG, 2006: NODAL ECONOMIC PROFILING PROJECT)	26
FIGURE 7: REDUCED TREE COVER IN GRAZING AREAS	27
FIGURE 8: MINING ACTIVITIES IN THE VICINITY OF BLACK ROCK	33
FIGURE 9: ROCK ART FROM THE JTGDM AREA	37
FIGURE 10: INTEGRATED TOURISM PLAN (K GALAGADI DM, 2007)	39
FIGURE 11: LANDSCAPE NORTH OF HOTAZEL	42
FIGURE 14: THE ENVIRONMENTAL FRAMEWORK AND MANAGEMENT PLAN COMPILATION PROCESS	54
FIGURE 13: LANDSCAPE OUTSIDE OLIFANTSHOEK	63
FIGURE 14: EXCAVATIONS IN THE WONDERWERK CAVE	78
FIGURE 15: KIANGKOP	79

List of Tables

TABLE 1: PRIORITY SECTORS AND GROWTH POTENTIAL	11
TABLE 2: CHARACTERISTICS OF THE JTDM (JTGDM, 2010/2011)	13
TABLE 3: LEGAL AND POLICY REQUIREMENTS FOR SPATIAL PLANNING	17
TABLE 4: ACTIONS REQUIRED FOR AGRICULTURAL DEVELOPMENT IN JTGDM	30
TABLE 5: STRATEGIC ENVIRONMENTAL FRAMEWORK SUMMARY	51
TABLE 6: OCCURRENCES OF ENVIRONMENTAL CONVERGENCE	55
TABLE 7: ENVIRONMENTAL CONFLICTS	56
TABLE 8: ROLES AND RESPONSIBILITIES FOR THE CONSERVATION NODES	64
TABLE 9: MANAGEMENT REQUIREMENTS FOR MINING ACTIVITIES	66
TABLE 10: ROLES AND RESPONSIBILITIES RELATIVE TO MINING ACTIVITIES	68
TABLE 11: ROLES AND RESPONSIBILITIES IN THE AGRICULTURAL ZONE	69
TABLE 12: ROLES AND RESPONSIBILITIES IN THE ENVIRONMENTAL RISK ZONE	72
TABLE 13: ROLES AND RESPONSIBILITIES IN THE RURAL ZONE	73
TABLE 14: STAKEHOLDERS AND RESPONSIBILITIES IN SENSITIVE ENVIRONMENTS	80
TABLE 15: DEVELOPMENT CONTROLS FOR RIPARIAN ZONES	83

List of Maps

- MAP 1: AREAS OF ENVIRONMENTAL SENSITIVITY AND CONSERVATION VALUE
- MAP 2: AREAS UNSUITABLE FOR HUMAN HABITATION
- MAP 3: AREAS SUITABLE FOR HUMAN HABITATION
- MAP 4: SPATIAL CONFLICT AREAS
- MAP 5: ENVIRONMENTAL MANAGEMENT ZONES

ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immunodeficiency Syndrome
ASGISA	Accelerated and Shared Growth Initiative for South Africa
CARA	Conservation of Agricultural Resources Act, 43 of 1983
DEA	Department of Environmental Affairs
DENC	Department of Environment and Nature Conservation
DFA	Development Facilitation Act, 67 of 1995
DMR	Department of Mineral Resources
DPLG	Department of Provincial and Local Government
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry (refer to DWA)
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMPR	Environmental Management Programme Report
GDP	Gross Domestic Product
GIS	Geographic Information System
GMO	Genetically Modified Organism
HIV	Human Immunodeficiency Virus
IDP	Integrated Development Plan
JTGDM	John Taolo Gaetsewe District Municipality
LORMS	Low Orange River Management Study
MEC	Member of the Executive Council
MPRDA	Mineral and Petroleum Resources Development Act, 28 of 2002
MSA	Municipal Systems Act, 32 of 2000
NCPGDS	Northern Cape Provincial Growth Development Strategy
NDA	National Department of Agriculture
NEM:BA	National Environmental Management: Biodiversity Act, 10 of 2004
NEM:PAA	National Environmental Management: Protected Areas Act, 57 of 2003
NEMA	National Environmental Management Act, 107 of 1998
NFEPA	National Freshwater Ecosystem Priority Areas
NGDB	National Groundwater Database
NHRA	National Heritage Resources Act, 25 of 1999
NWA	National Water Act, 36 of 1998
PDI	Previously Disadvantaged Person
POSA	Plants of Southern Africa
SADC	South African Development Community
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SEMP	Strategic Environmental Management Plan
SoER	State of the Environment Report
UNESCO	United Nations Education, Scientific, and Cultural Organisation
WARMS	Water Authorisation and Registration Monitoring System
WMA	Water Management Area
WMS	Water Management System
WSA	Water Services Act, 36 of 1998

Executive Summary

What is an Environmental Management Framework?

The Department of Environment and Nature Conservation (DENC) has commissioned SSI Environmental to develop an Environmental Management Framework (EMF) for the John Taolo Gaetsewe District. The EMF will be used to improve the integration of biodiversity conservation into land use planning and decision making.

The project aims to facilitate more desirable land use patterns that are socially and ecologically resilient, by meeting the demands of development and limiting their impact on natural resources. This 'desired state' will be a municipality that optimises those tangible and intangible benefits that are provided as ecosystem goods and services. The EMF also accommodates consideration of natural disasters, climate change, deforestation and water supplies.

Strategic Environmental Assessment

An EMF consists of a Strategic Environmental Assessment (SEA), which is used to inform the demarcation of a spatially defined framework and associated Strategic Environmental Management Plan (SEMP).

For the strategic assessment the current state (status quo) is assessed in a fair amount of detail through sectoral studies and investigation, and then compared to the desired state which is identified through stakeholder engagement. Conflicts, convergence and issues that require specific attention were identified in this manner. These include asbestos related pollution, mining expansion areas, locations of sensitive biophysical features, agricultural concerns etc.

SEMP & Control Zones

While the EMF forms the overarching framework, the SEMP provides the guidance necessary for land use planning and environmental decision-making. Central to both the framework and SEMP are Environmental Control Zones. These zones are coherent spatial demarcations of geographical areas that require environmental management of a particular nature.

The various management zones are used to determine where and how certain development activities should take place.

The suggested control zones for John Taolo Gaetsewe District are:

Conservation nodes: ridges, groundwater catchments, wetland clusters & natural resource core areas. In these areas, activities must be compatible with the need to maintain ecological processes.

Mining belt: active mines, spoil heaps/mine dumps & mineral resources that will be managed in accordance with sustainable resource extraction activities.

Agricultural support: viable grazing areas where strict control is required over stocking rates.

Environmental risks: asbestos contamination where decontamination is required and nature conservation practice may take place.

Rural Zone: undeveloped areas with little economic potential where the preservation of the stressed ecology is key.

In addition, specific ubiquitous environmental management focus areas were identified, and management recommendations proposed. These include *built-up areas, heritage resources, universally present biodiversity sensitivities and water resources.*

Public Participation

Stakeholder involvement was critical to the success of the project. Throughout the process, stakeholders were informed of the project as it unfolded. During the development of the EMF, various stakeholders were consulted and their inputs received.

1 INTRODUCTION

1.1 Project introduction

In response to general concerns regarding the use of limited natural resources in the area, the Northern Cape Department of Environment and Nature Conservation (DENC) initiated the compilation of an Environmental Management Framework (EMF) for the John Taolo Gaetsewe District Municipality (JTGDM) and its three local municipalities, Ga-Segonyana, Gamagara, and Joe Morolong (formerly Moshaweng).

The use of an EMF is appropriate, as the general aim of an Environmental Management Framework is to improve the integration of biodiversity into land use planning and decision making through a combination of activities including:

- engaging in institutional co-ordination mechanisms;
- providing accurate, relevant information and reference materials;
- providing appropriate training and targeted awareness raising; and
- also guiding future land use and development within the municipality.

An EMF is based on the integration of spatially represented information connected to parameters, such as ecology, hydrology, infrastructure and services in order to pro-actively identify areas of potential conflict between development proposals and critical/ sensitive environments. Spatial and development planning in the JTGDM can therefore draw on the guidance from the EMF to steer the utilisation and exploitation of natural resources in a sustainable manner.

The study area for the project, namely the JTGDM, is centred on the town of Kuruman in the North-Eastern corner of the Northern Cape Province against the border of the North-West Province (Figure 1). The north-eastern region of the JTGDM comprises principally of rural and peri-urban areas while the western and southern areas consist mainly of well-defined towns, commercial farms and mining activities. The area has a population of approximately 191 538 persons in 190 settlements, the majority of which reside in the Joe Morolong (Moshaweng) municipal area (JTGDM, 2010/2011). The main towns and villages within the district borders are Kuruman, Kathu, Deben, Dingleton, Olifantshoek, Van Zylsrus, Bothitong, Churchill, Manyeding, Laxey, Batlharos, Mothibistad, Hotazel and Heuningvlei.

Adjacent District Municipalities are Siyanda, Frances Baard and Dr. Ruth Segomotse Mompati. Both Siyanda District and Frances Baard District had EMF projects completed for their areas of jurisdiction in recent years.

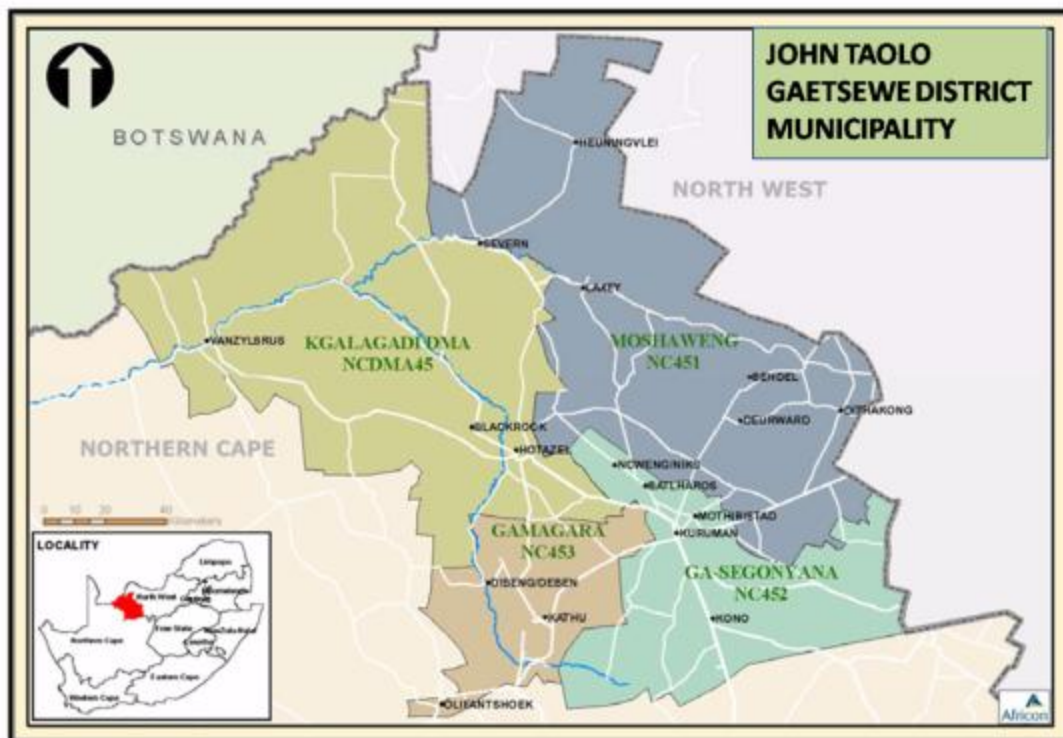


FIGURE 1: OVERVIEW OF THE JOHN TAULO GAETSEWE DISTRICT MUNICIPALITY (JTGDM, 2010/2011)

1.2 Legal context

The legal origin of an EMF is embedded in Sections 24(2) & (3), Section 24(4)(bA)(i), Section 24O(1)(b)(v) and Section 44(2) of the National Environmental Management Act, 1998 (NEMA) (as amended) which allows the Minister of Water and Environmental Affairs or Member of the Executive Council (MEC) to whom a provincial premier has assigned the responsibility for environmental affairs, to compile environmental information and maps of particular geographical areas which must be taken into account in decision making by authorities.

Regulation 547 of 18 June 2010, the Environmental Management Framework Regulations, 2010, provides further specific regulatory requirements pertaining to the development of an EMF. It specifies that either the Minister or an MEC may initiate an EMF for an area, and that a draft EMF must be subjected to a public participation process. Once the draft EMF has been reviewed in the light of any representations, objections and comments received, the Minister or MEC may adopt the EMF as an environmental management tool. Adoption by an MEC, however, must be accompanied by concurrence from the Minister.

The regulations prescribe that an EMF which has been adopted must be taken into account in the consideration of applications for environmental authorisation in or affecting the geographical area to which the framework applies. However, the geographical attributes described in the EMF may also be used to list activities that may or may not occur in certain areas without environmental authorisations (Section 24(2) of NEMA). Activities that are thus

exempted from environmental authorisation may be made subject to norms and standards laid down in terms of Section 24(10) of NEMA.

1.3 Project phasing

The development of an EMF follows a clear set of phases, namely:

1. Status Quo Assessment
2. Desired State Analysis
3. Management Zones Identification
4. EMF and Strategic Environmental Management Plan (SEMP) Compilation

Each phase builds on the findings of its predecessor, as well as the inputs from stakeholders and a central project steering committee.

1.3.1 Status Quo Assessment

Various subject-specific specialists were responsible for the gathering and assessment of information pertaining to the current status of the environment, infrastructure and development activities, as well as legal, policy and economic aspects of the study area. The primary reporting output is the Status Quo Report. At the same time, a Geographic Information Systems (GIS) team is responsible for a GIS interface that holds all the relevant information in a repository that can be constantly updated throughout the project, the collation and manipulation of which provides the required data for the intermediate and final project outputs.

1.3.2 Desired State Analysis

Environmental management specialists are responsible for the assessment and integration of information into intermediate elements (feature descriptions, feature status, feature objectives, etc.) that feed into the GIS system and ultimately a Desired State analysis. The desired state phase therefore provides a description of the desired state of the area given all the available information and inputs and as *de facto* environmental/sustainability objectives, guides the assessment of land use conflicts and management plan compilation.

1.3.3 Management Zones & Strategic Environmental Management Plan

The Desired State information feeds into the final Environmental Management Framework via the designation of environmental management zones and the compilation of a Strategic Environmental Management Plan.

Based on the Status Quo Report and the Desired State information, it is possible to gain a clear understanding of the development trends and environmental requirements in JTGDM. These are depicted as discrete management zones that form the basis for pro-active environmental management in the study area. The various management zones are used as to determine where and how certain development activities should take place.

The environmental management zones are therefore an important input for the development and support of the environmental framework and SEMP. While the EMF forms the over arching framework, the SEMP provides the

guidance necessary for land use planning and environmental decision-making but stops short of prescribing detailed design measures.

1.3.4 Final Environmental Management Framework

A round of Public Participation ensures that the public and all stakeholders are provided with the opportunity to comment on the Draft Environmental Management Framework and Strategic Management Plan. The results of the public participation are used to verify and update the EMF report which can then be submitted to the National Minister of Water & Environmental Affairs for concurrence prior to official adoption by the MEC for Environment in Northern Cape.

1.4 EMF Structure

This, the final project deliverable, contains the Environmental Management Framework and consists of:

- A **Strategic Environmental Assessment** based on the most critical findings of the Status Quo Assessment and converted into a Sustainability Framework;
- An **analysis of the Sustainability Framework** in order to identify strategic objectives as well as spatial and land use conflicts;
- A framework of **Environmental Management Zones**;
- A set of **environmental management guidelines** for each identified Management Zone; and
- Specific guidance on relevant **strategic interventions** such as the proclamation of protected areas and the interface with other environmental regulatory processes.

2 STRATEGIC ENVIRONMENTAL ASSESSMENT

The Strategic Environmental Assessment (SEA) uses a baseline description of the study area¹ (opportunities and constraints, issues and concerns) to generate a Sustainability Framework that describes each environmental feature class in terms of feature status, legal and policy requirements, management objectives, and environmental opportunities & constraints (Figure 2):

- **Opportunities and constraints** are related to their associated natural resources
- **Issues and concerns** are described according to their importance and/or strategic significance
- **Sustainability objectives** are identified, based on existing information and initial stakeholder contributions
- For each dimension being assessed, a further description is added that details the legal context. This allows the statutory controls to determine relevant **legal and policy parameters** and prevents the setting of legally problematic objectives.

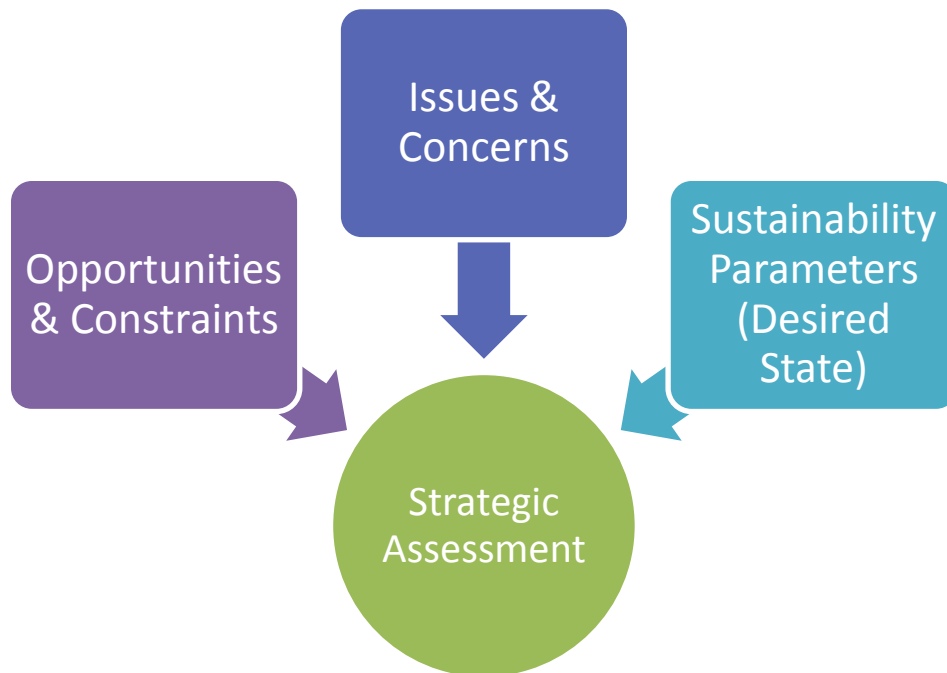


FIGURE 2: THE STRATEGIC SUSTAINABILITY ASSESSMENT

The status of each of the features is determined through legislative requirements, accepted norms and quality standards, as well as through technical and specialist input. The feature objectives, which establish principles of

¹ The baseline study, or Status Quo Report, is available as a separate document from the Northern Cape Department of Environment & Nature Conservation.

how the features or environmental resources should be managed to improve its environmental status, are determined during I&AP consultation sessions.

2.1 Strategic environmental framework

2.1.1 Socio-Economic Issues

2.1.1.1 Feature status

The socio-economic state of the JTGDM is described as a combination of different social indicators. These include access to basic services, human health and wellness, and opportunities for personal economic upliftment.

a) Access to basic services

The 2005 Strategic Environmental Assessment for Kgalagadi District indicates that most of the **domestic water** used in the Kgalagadi District Municipal Area is supplied to the area via the Vaal-Gamagara Government Water Supply Scheme, also known as the Kalahari East Pipeline, from the Vaal-Harts confluence. Excess ground water of acceptable quality originating from dewatering activities at some of the Northern Cape mines along the pipeline route, supplements this supply.

The Community Survey 2007 showed that within the JTGDM 91.9% of all households have access to piped water. This is an improvement from the 82.6% counted by the 2001 census (State of Environment Report (SoER): Socio-economic). 'Piped water', however, still includes approximately 50% of households that access water at a point outside their yard.

The growth in access to **electricity** as a primary source of energy in the district has been very good for the period 2001 to 2007. Access to electricity as a source of energy for perhaps its most vital need, namely lighting, has increased to 90% in the district; a growth of 31,8% over the period 2001-2007. Many households, however, still rely on other energy sources for heating and cooking – i.e. 27% still use other sources of fuel for cooking, and 56% use other fuels for heating.

A review of household **sanitation** services in the Northern Cape indicates that provincially the number of households with access to basic levels of sanitation increased from 1996 to 2001. Statistics from the Community Survey 2007, however, suggest that despite continuous improvement, there is still room for improvement with a significant percentage of people still without waterborne sewerage. In JTGDM access to waterborne sewerage improved from 21,3% to 50,3% between 2001 and 2007.

An overall percentage of 31 households in the District have access to **refuse removal** services. This compares well to the 20% of 2001, but again indicates that there is room for improvement.

There are no statistics on the predominant types of traditional **housing** in the Province. However, traditional housing such as reed mat houses and corbelled ('bee-hive') houses are still in use. Official statistics indicate that

informal dwellings are most prevalent in Gamagara (13,5%) and Ga-Segonyana (12,2%). Nevertheless, the same analysis of housing in the District showed that a large percentage of residents (62%) have full ownership of their dwellings and property, up from 56% in 2001.

b) Health and well-being

Health issues in the Northern Cape relate to specific diseases determined by human settlement characteristics or the environment. Tuberculosis, asbestosis and HIV/AIDS are three of the main concerns for the Province.

Health care and provision of facilities can be challenging in isolated and sparsely populated areas, which are typical of the Northern Cape. Currently, there are 34 clinics and three hospitals in the JTGDM (DPLG, 2004), and mobile clinics serve the rural areas. Joe Morolong, the most populated local municipality does not have a hospital and there is poor access to health care facilities.

Other factors that should be considered in this regard include:

- In 2004 the per capita expenditure for health was R140 per annum.
- The number of patients per nurse per day was on average 52,7.
- HIV prevalence was high, with 29% of all patients tested at antenatal clinics testing positive.

The high proportion of households having access to piped water constitutes a significant measure of development given its role in improving the health status of the population.

c) Economic upliftment

Unemployment is defined as the percentage of the economically active population who want to work and are not unemployed by choice, and are actively taking steps to find or start some form of work. In the Northern Cape over 14% of the population is unemployed by this definition, and 45% of the population is classified as 'economically inactive' (leaving 40% as employed). In JTGDM, of the potentially economically active population, 18% is unemployed, 50% not economically active, and only 30% employed. Unfortunately, employment statistics cannot be compared between the 2001 and 2007 data due to inconsistencies in the data collection processes. The information on employment nevertheless implies that issues such as job retention and job creation are of vital importance in a district where the number of working people is so low.

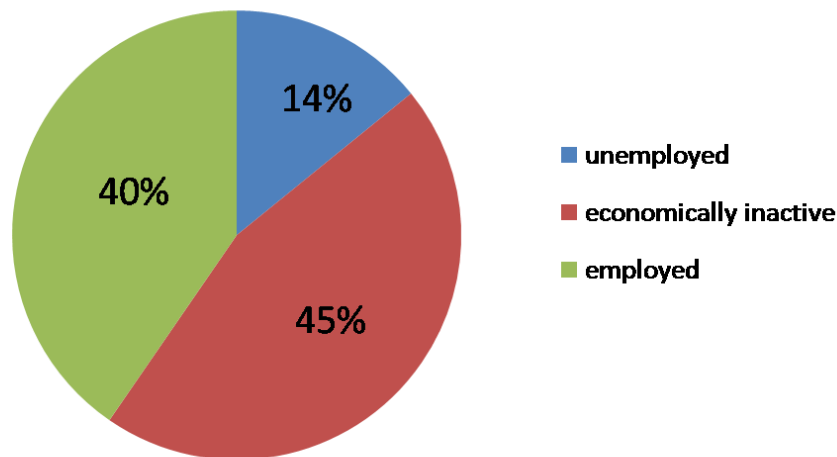


FIGURE 3: UNEMPLOYMENT IN THE NORTHERN CAPE (STATS SA)

The majority of the population has no income, or earns less than R1600 per month. In addition to changing family structure through births or deaths, declining small-scale agriculture, retrenchment and declining wages for labour workers all have impacts on household incomes. Rural poverty in South Africa differs from other developing countries because income generated and food consumed from agriculture is a small component of household resources. Migration is circulatory with households having both a rural and urban base, and rural society is affected by the social and health problems in the urban areas. As a result of discriminatory planning, spatial isolation and underdevelopment of townships and homelands, poor households have limited access to productive resources such as land and capital, which has hindered their exploitation of economic opportunities.

2.1.1.2 Management objectives

According to the Kgalagadi District Municipality (now John Taolo Gaetsewe) Spatial Development Framework (SDF) (Kgalagadi DM, 2007):

“To create the conditions that allow the poor to break the cycle of poverty and to ensure economic growth and development, it is vital to develop our human and social capital. This would require:

- *Creating opportunities for life long learning*
- *Improving the skills of the labour force to increase productivity;*
- *Increasing access to knowledge and information;”*

According to the Integrated Sustainable Rural Development Programme – Programme Design Document (2002), the four strategic objectives for the District are:

- Providing services to struggling communities;
- Developing infrastructure;

- Capacity building within the District Municipality;
- Local Economic Development

Provincial targets for socio-economic development, as set by the Northern Cape Provincial Growth and Development Strategy (NCPGDS) are (Kgalagadi DM, 2007):

- To maintain an average annual economic growth rate of between 4% - 6%;
- To halve the unemployment rate by 2014;
- To reduce the number of households living in absolute poverty by 5% per annum;
- To improve the literacy rate by 50% by 2014;
- To reduce infant mortality by two thirds by 2014;
- To reduce maternal mortality by two thirds by 2014;
- To provide shelter for all by 2014;
- To provide clean water to all in the province by 2009;
- To eliminate sanitation problems by 2009;
- To reduce crime by 10% by 2014;
- To stabilize the prevalence rate of HIV and AIDS and begin the reverse by 2014;
- To redistribute 30% of productive agricultural land to Previously Disadvantaged Individuals (PDI) by 2015;
- To conserve and protect 6,5% of our valuable biodiversity by 2014; and
- To provide adequate infrastructure for economic growth and development by 2014.

2.1.1.3 *Environmental opportunities & constraints*

From the assessment of the JTGDM, it becomes clear that efforts in environmental management will need to be directed towards improving the livelihoods of the poor and unemployed members of the community. Poverty is prevalent, and many people live a subsistence existence, especially in the Joe Morolong area. In these areas, efforts should be directed towards using sustainable environmental management practices to encourage rural and semi-urbanised development that does not reduce the livelihood that can be derived from the natural resource base – i.e. at sustainable levels or focussing on renewable resources.

Improvements in access to basic services will further ensure that the pressures on natural resources, such as the use of wood for fuel, will be reduced. The availability of electricity, communication networks, water and transportation will create new, and optimise existing, opportunities for economic development and entrepreneurship. It will also increase people's access to employment opportunities.

By implication, the two aspects that come to the fore as opportunities are the availability of workforce for the major economic opportunities in mining and manufacturing/processing, as well as investment in infrastructure and services that will reduce the overall cost of the services over time – i.e. renewable energy and ecological infrastructure.

Within JTGDM there is very little potential, if any, for further development of agriculture but mining, tourism and manufacturing could have growth opportunities. Opportunities for development are summarised in Table 1.

TABLE 1: PRIORITY SECTORS AND GROWTH POTENTIAL

PRIORITY SECTOR	GROWTH POTENTIAL
Mining	Mining is the single largest Gross Domestic Product (GDP) contributor in the node and is growing rapidly. Rich mineral deposits together with current major investments give the mining sector strong potential for growth. Mining must not impact on environmental resources to an extent where other land uses or the proper functioning of the ecology become impossible adjacent to mining areas.
Manufacturing	The Northern Cape manufacturing sector has performed poorly in recent years. The contribution of the sector to the provincial economy has declined consistently and remains insignificant in the national context. Although the contribution of the manufacturing sector to the Northern Cape Provincial economy is extremely low, economic diversification and the addition of value to the province's agricultural and mineral output has been afforded a high priority by the Provincial Government.
General government services	The public sector is the largest employer in the district and makes an important contribution to nodal GDP. However, the public sector is funded by taxation, and therefore is itself dependent on growth in the private sector.
Wholesale & retail trade, catering & accommodation	There are various attractions in the area (including the Kuruman Eye, the Kuruman Moffat Mission and the Wonderwerk Caves). Bed and breakfast establishments and guesthouses in the area provide accommodation. Adventurous tourism is an area with strong potential for growth, as are certain niche markets (e.g. a country life experience tailored for European visitors). As tourism has the potential to significantly contribute to economic growth, diversification and transformation, social development and upliftment and the preservation of natural and cultural heritage in the Northern Cape, it is critical that a strategy be developed for the promotion and development of the tourism sector. There is also further potential for eco-tourism in the district with demand for safaris, lodge accommodation and camping associated with wildlife experience and/ or hunting.
Community, social & other personal services	This is also part of the public sector, and includes teachers and health care professionals. Therefore, the same assessment applies as for General Government Services.
Finance & business Services	The sector is a relatively significant contributor to GDP and is seeing good growth. However, it is a consumption sector, and its strength is dependent on other sectors that generate wealth.
Agriculture, forestry & fishing	The climate is too hot, dry and variable for most crops. However, livestock farming is common, especially cattle (80%), sheep (12%), goats (4%) and game (4%). Water sources are scarce in the area, but underground sources like the Kuruman Eye are available and could provide irrigation in some areas. Soil and water conservation therefore needs keen attention, as does the maintenance of sustainable cultivation and stocking levels. Subsistence farming can be improved by capacity building, facilitating access to markets, finance, infrastructure, machinery, agro-processing and skills.

2.1.1.4 Legal and policy requirements

The Municipal Systems Act, Act 32 of 2000 (MSA) describes the core principles, mechanisms, and processes that are necessary to enable municipalities to move progressively towards the social and economic upliftment of

communities and ensure access to services that are affordable to all. Its focus is primarily on the internal systems and administration of the municipality.

Spatial Development Frameworks and Integrated Development Plans (IDP) for the District and Local Municipalities guide the planning and implementation of social and economic development.

The NCPGDS provides for a structured approach to economic and social development in the province, with specific reference to development objectives, targets and economic sectors.

National guidance is present in:

- Breaking New Ground
- Housing Act (Act 107 of 1997)
- National Housing Code
- National Spatial Development Perspective
- Accelerated and Shared Growth Initiative for South Africa (ASGISA)
- National Spatial Development Perspective

Also, the Bill of Rights in the Constitution of the Republic of South Africa, Act 108 of 1996, outlines a number of socio-economic rights. These basic human rights include:

- The right to labour relations
- Environmental rights
- Property rights
- The right to adequate housing
- The right to access to health care, food and water
- The right to social security
- The right to basic and on-going education

The environmental rights ascribe the right to a healthy and functional living environment to all citizens. Specifically, the Bill of Rights states that:

24. Everyone has the right:

- a) *To an environment that is not harmful to their health or well-being; and*
- b) *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:*
 - i) *Prevent pollution and ecological degradation;*
 - ii) *Promote conservation; and*

iii) Secure ecologically sustainable development and use of the natural resources while promoting justifiable economic and social development

2.1.2 Development Planning

2.1.2.1 Feature status

There are about 190 towns and/or settlements in the JTGDM, of which 80% are villages in the Joe Morolong Municipality (Table 2). Formal urban development across the JTGDM occurs at a relatively low intensity at present, with the main towns of Kuruman and Kathu located in the southern section of the study area and other smaller towns and settlements scattered across the study area (e.g. Hotazel, Olifantshoek, Van Zylsrus). The areas marked for densification in the IDP 2010/2011 (e.g. around Kuruman, Kathu, Black Rock, Van Zylsrus, etc.), will not contribute significantly to the existing impact of urbanization on the environment.

TABLE 2: CHARACTERISTICS OF THE JTDM (JTGDM, 2010/2011)

LOCAL CHARACTERISTICS	JTGDM	GA-SEGONYANA	GAMAGARA	JOE MOROLONG	DMA
Location	North-eastern corner of the Northern Cape Province	South-east part of district	South West part of district	North east part of district	Far north west part of district
Land (1000 ha)	23 300	4 490	2 470	6 030	12 430
Number towns and villages	about 190 towns and villages	33 residential areas within 80km radius of Kuruman	3 towns	various tribal authority areas and 154 villages	3 small towns and commercial farms (very low population density)
Number wards and councillors	17 Councillors	9 wards and 18 councillors	4 wards and 7 councillors	11 wards and 21 councillors	1 ward and 1 councillor

Land is used predominantly for agricultural purposes in Joe Morolong and Ga-Segonyana. In Gamagara, mines and quarries dominate the main land use, agriculture.

There is, however, a proliferation of informal urbanization associated with high density rural populations in the Joe Morolong Local Municipality, particularly to the east of Avontuur and around Ditshipeng, Bothitong and Ga-Mopedi. The other more southern, western and northern rural areas of the study area are sparsely populated and consist mainly of farms and mining activities with a general absence of urbanization. However, existing and new mining operations lead to the development of mining townships and associated infrastructure.

The Ghaap Plateau of the Northern Cape is occupied by a succession of strata dominated by dolomite, banded ironstone and mudstone/siltstone. The dolomites of the Griqualand West Sequence are of similar origin to the notorious dolomites of the Transvaal Sequence, and in the JTGDM, occur in the area between the N14 and R31

to the South-East of Kuruman. Damage to buildings and structures due to the karst weathering phenomena is possible, and include sudden and catastrophic failure in the form of sinkholes, and more gradual subsidence of the surface during the formation of dolines.

2.1.2.2 Management objectives

The primary concerns related to urbanisation is the potential for urbanisation to compromise environmental resources, and the inability to provide the requisite level of infrastructure and municipal services to the urban areas. Objectives therefore need to relate directly to these concerns.

The SDF (Kgalagadi DM, 2007) and IDP (JTGDM, 2010/2011) identifies specialisation nodes where specific products or services are available or where it is possible to capitalise on region-specific products. These are reflected in Figure 4. Development is predominantly focussed at the primary residential and commercial centres, as well as along the mining belt between Sishen and Black Rock.

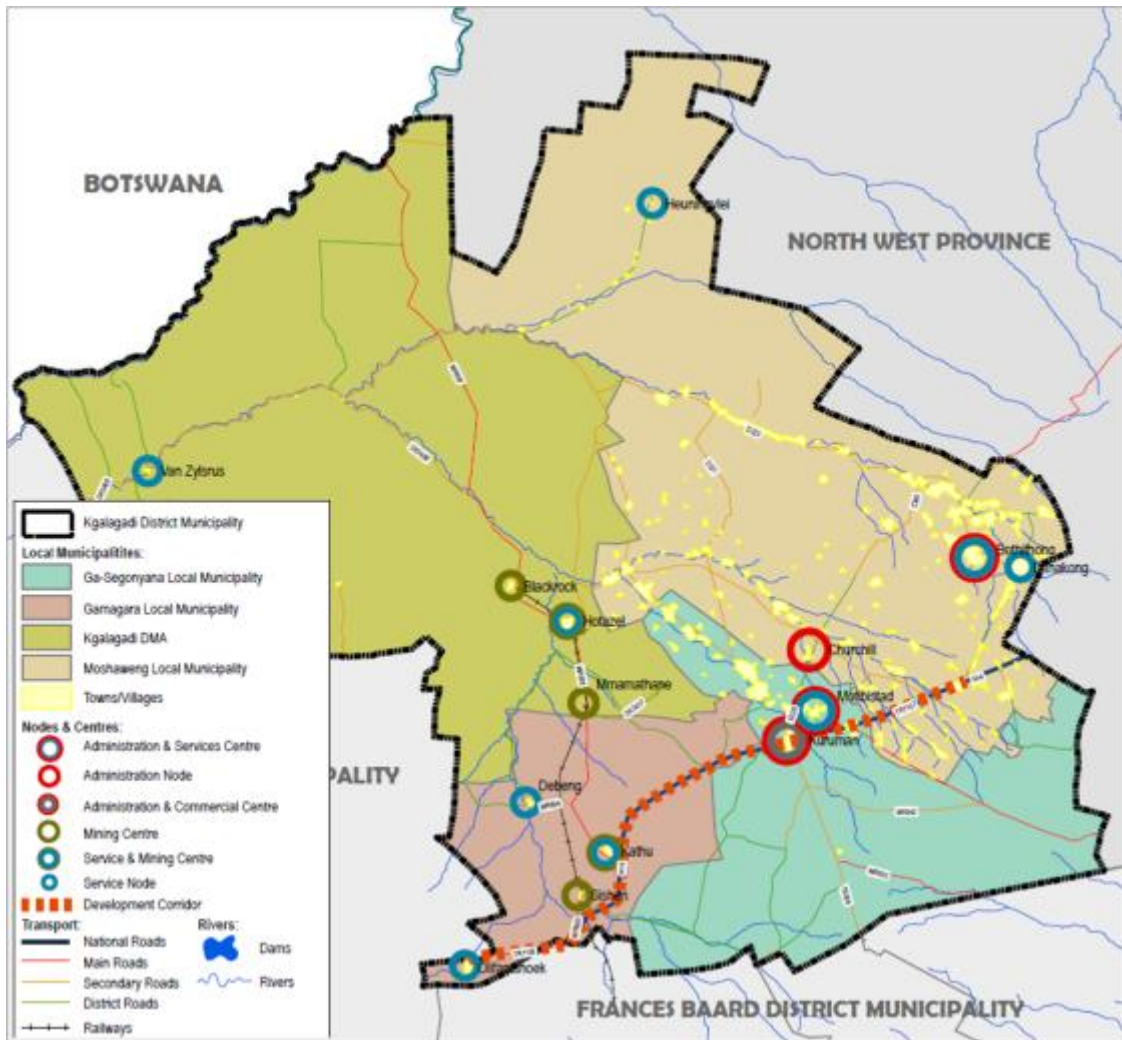


FIGURE 4: DEVELOPMENT CENTRES, NODES AND CORRIDORS (K GALAGADI DM, 2007)

Densification is also identified as a development objective, and the IDP (JTGDM, 2010/2011) suggests its promotion through the following strategies:

- Locating and designing development and services appropriately to optimise natural life support systems;
- Encouraging the efficient and cost-effective provision of services, through nodes and centres;
- Focussing public and private investment that supports the creation of quality urban environmental in previously deprived areas; and
- Demarcating urban edges and managing the open space systems to protect important natural areas and systems.

The provision of infrastructure and services should be planned and co-ordinated through the correct consultative IDP and SDF processes, in order to anticipate budgetary requirements and roll-out schedules. It will also provide potential 'urbanisers' with information on where and when service provision will occur. The objective should focus on a consolidation of urban settlements within the District that can serve a wider community and provide the requisite social and economic services.

The existing towns, such as Kuruman and Kathu, and smaller towns such as Hotazel, Olifantshoek, Van Zylsrus should be developed as integrated, sustainable, equitable and well-functioning urban centres in the District. These existing towns have developed over many years and represent a concentration of investment (both public and private). They are generally well connected by means of road infrastructure, both internally and with areas outside of the District and are centres providing administrative, commercial and services functions. As such, these towns should be prioritised as further development and investment areas, as opposed to creating new development areas where new infrastructure, services and facilities need to be provided. This is particularly important in the District where mining houses develop small settlements adjacent to the mine to house mine workers and associated service providers. Kuruman in particular, should be further developed as the major urban centre. To facilitate this, a detailed Urban Development Framework is required to direct and manage future development in this area towards the achievement of stated objectives (such as provision of public open space, adequate movement and circulation, sustainable human settlements, etc).

The Chapter 1 Principles for Land Development in the Development Facilitation Act, 1995 (DFA) states that land development practices should “*discourage the phenomenon of 'urban sprawl' in urban areas and contribute to the development of more compact towns cities*”. The threat of urban sprawl in the District should be managed despite the reality that there are vast tracts of available land for development. Settlements should be managed in such a way to promote efficiency and liveability in the context of infrastructure provision (including the standard of infrastructure), road networks, traffic generation and environmental implications, and counter ad-hoc low intensity and inefficient sprawling development.

The development of the entire area should in essence be developed according to the principles of sustainable human settlements, as set out in Breaking New Ground: A Comprehensive Plan for the Development of

Sustainable Human Settlements, to counter the sparsely populated and under-developed areas particularly in the Joe Morolong municipality.

The DFA Principles also state that land development practices should “*should discourage the illegal occupation of land, with due recognition of informal land development processes.*”

Informal settlement development in the district should as far as possible be restricted. Land invasions should be monitored and addressed before settlements become permanent. The focus should therefore be on containing informal development around the existing formal towns and mining settlements, and preventing the establishment of *ad hoc*, dispersed informal settlements. In this manner, the informal townships have the best chance of eventual upgrading, service delivery and ultimately formalisation.

In-situ upgrading should only take place where these informal settlements are part of or adjacent to an existing urban environment. Families living in informal settlements located in rural areas should be relocated to housing developments in either urban areas or defined rural settlements. All informal settlements in environmentally sensitive areas or located in hazardous areas (floodlines, dolomitic areas, etc.) should be relocated.

2.1.2.3 *Environmental opportunities & constraints*

Development planning is closely tied to the socio-economic state of the region, and hence should similarly focus on achieving spatial and economic development in the area that does not compromise the ability of the area to sustain itself over time. Development should therefore be planned in a manner that takes cognisance of the inherent limitations of the climate, the landscape character, the conflict over resources (e.g. mining versus surface developments) and the relative economic opportunities and advantages of the region.

Development planning needs to make provision for the adequate protection of sensitive natural features and conservation of the groundwater resources upon which much of the region depends. The areas to avoid, or carefully plan for, include:

- Groundwater recharge zones (Korannaberg, wetlands, dolomitic areas)
- Ecological corridors and core/representative habitats
- Agricultural resources

In particular, the following environmental constraints on development must be taken into account:

- Poor soils and lack of water resources north of the N14
- Low carrying capacity of the natural vegetation
- Importance of the wetlands of the region
- Spatial extent making service provision difficult
- Spatially fixed nature of mineral resources
- Presence of dolomitic areas in the South-East

2.1.2.4 *Legal and policy requirements*

Section 2(4)(f) of the Local Government: Municipal Planning and Performance Management Regulations, 2001, insist on an SEA component for all Spatial Development Frameworks. The strategic assessment component of the EMF provides for the requisite input into the SDF, and updates the SEA conducted for the 2006/2007 SDF. Future growth and development of the district must take the environmental opportunities and constraints into account, and not compromise the ability of the district to sustain itself in the future. An example is the uncontrolled and unsustainable use of water resources, particularly groundwater, that could severely limit development potential and the quality of human settlements.

There exist a multitude of legislation and policies which govern development planning and land use management in South Africa and in the Northern Cape. The most important of these, which have a bearing on the nature of development planning in the JTGD is set out in the table below.

TABLE 3: LEGAL AND POLICY REQUIREMENTS FOR SPATIAL PLANNING

	NATIONAL	PROVINCIAL	LOCAL
LEGISLATION	<ul style="list-style-type: none"> ▪ Constitution of the Republic of South Africa, 1996 ▪ Municipal Systems Act, 2000 (Act 32 of 2000) ▪ Development Facilitation Act, 1995 ▪ National Environmental Management Act, 1998 (Act 107 of 1998) ▪ National Environmental Management Protected Areas Act, 2003 (Act 57 of 2003) ▪ National Housing Act, 1997 (Act no. 107 of 1997) ▪ The National Land Transport Act, 2009 (Act 5 of 2009) 	<ul style="list-style-type: none"> ▪ Northern Cape ▪ Planning and Development Act (1998) 	
POLICY	<ul style="list-style-type: none"> ▪ Millennium Development Goals, 2000 ▪ The United Nation’s Millennium ▪ National 2014 Vision ▪ National Spatial Development Perspective ▪ National Housing Code ▪ Breaking New Ground ▪ White Paper on Spatial Planning and Land Use Management, 2001 ▪ Comprehensive Rural Development Programme 	<ul style="list-style-type: none"> ▪ Northern Cape State of Environment Report (2004) ▪ Provincial SDF ▪ Provincial Growth and Development Strategy 	<ul style="list-style-type: none"> ▪ Kgalagadi District Municipality Spatial Development Framework, 2007 ▪ Ga-Segonyana Spatial Development Framework ▪ Gamagara, Spatial Development Framework ▪ Moshaweng Spatial Development Framework ▪ Relevant Municipal Integrated Development Plans (IDPs) ▪ Scheme Regulations for Ga-Segonyana, 2003 ▪ Scheme Regulations for Gamagara, 2003

Each piece of legislation or policy document contains certain principles which govern development planning. These principles can be jointly summarised as follows:

- Land development must support and facilitate economic growth and development that will contribute to a reduction in unemployment and halve poverty.
- Government investment must therefore focus on areas with economic growth potential.
- Land development must take place in an integrated manner, both spatially (geographical areas) and institutionally (spheres of government).
- The use of existing resources and infrastructure must be optimised.
- Urban sprawl must be discouraged and more compact and efficient cities must be promoted, and therefore development must be channelled into nodes and corridors
- Historically distorted development patterns must be corrected by means of physical and social integration and the redirecting of investment to areas of highest value and accessibility.
- The creation of socially and economically viable and sustainable human settlements must be ensured.
- Land development must support public transport infrastructure and services.
- Economically, socially and environmentally sustainable development must be encouraged.
- Integrated land development in rural and urban areas in support of each other must be promoted.
- Environmentally sustainable land development practices and processes must be encouraged.
- Mixed land uses in specific areas in settlements should be encouraged.
- Enhance economic activity through optimal utilisation of land (such as agriculture).
- Land development and planning should protect natural and cultural resources.

Permitting control is exerted through various pieces of legislation and associated regulatory frameworks:

- Mineral and Petroleum Resources Development Act, Act 28 of 2002
- National Environmental Management Act, Act 107 of 1998
- National Environmental Management: Air Quality Act, Act 39 of 2004
- National Forests Act, Act 84 of 1998

2.1.3 Water resources

2.1.3.1 Feature status

a) Catchments

The JTGDM forms part of the Lower Vaal Water Management Area, with the Kuruman River and the Moshaweng River providing the major surface drainage to the district. From the Department of Water Affairs and Forestry (DWAF) (2004): *“As a result of the low rainfall, flat topography and sandy soils over much of the water management area, little usable surface runoff is generated in the water management area. The runoff which does occur, is highly variable and intermittent.”* For this reason, river water from available dams does not contribute

significantly to the region. Instead water supply for human and industrial needs is primarily obtained as groundwater.

The Kuruman Hills area is probably the most important catchment area for the JTGDM, situated in the centre of the study area. Most of the streams arising from this catchment eventually drain into the Kuruman River system. It has been classified as a priority freshwater Ecosystem Priority according to the National Freshwater Ecosystem Priority Areas (NFEPA) project. Overgrazing in the various hills has resulted in accelerated erosion with concomitant impacts of increased surface run-off and reduced infiltration into the groundwater systems. Unsustainable carrying capacities and lack of rotational grazing camps are the underlying reasons for overgrazing.

b) Watercourses

There are no perennial rivers occurring in the study area, although there are a number of ephemeral systems such as the Molopo River, the Kuruman River and smaller streams arising in the Kuruman Hills and Korannaberg Mountains. Intensive agriculture is practiced along the extents of the main river courses, e.g. the Kuruman River.



FIGURE 5: EPHEMERAL RIVER IN THE JTGDM (FEBRUARY 2011)

Intensive degradation/transformation of the riverine habitats takes place in the form of formal development such as roads and infrastructure, as well as land use practices such as riverbed agricultural cultivation and overgrazing. Invasive alien species have also colonized localized sections of water courses, and have the potential to spread as their seeds are dispersed by water or bird species. Drainage lines are important habitat for Red List bird

species such as Kori Bustard, Secretary birds. After good rains, standing water may attract species such as Black Stork, as well as large Raptors such as White-backed Vulture, Lappet-faced Vulture, Tawny Eagle, Martial Eagle, and even Namaqua Sandgrouse.

c) Wetlands

Wetlands in JTGDM occur both as linear riverine systems and as individual endorheic pans. All wetlands in the JTGDM, except Heuningvlei, are ephemeral – i.e. filling up briefly after summer rains. A high number of these wetlands, including Heuningvlei, have been classified as Priority Wetland Areas according to the NFEPA. Pans are of ecological importance in arid regions for their water holding ability and often unique associated biota.

The Heuningvlei saltpan in the far north is fed by a number of permanent freshwater springs with the northwestern corner a perennial marsh-type wetland with brackish water (Hudson & Bouwman 2006). A relatively high diversity of water-associated birds has been recorded for the Heuningvlei wetland, including migratory waders such as Ruff, Curlew Sandpiper, Greenshank and Common Sandpiper, as well as note-worthy species such as Greater Flamingo, African Spoonbill and the larger herons (Hudson & Bouwman 2006). Although other pans are ephemeral, after rainfall events they are likely to be utilized by water-associated bird species, both Red List species and many non-threatened species, including those covered by international treaties. Other threatened fauna are likely to utilize these seasonal wetlands, e.g. Giant Bullfrog.

Pans are under strong utilization pressure from both wildlife (to graze and for salt licks) and domestic animals (grazing, browsing and penning) (Mucina & Rutherford 2006). Overgrazing, trampling of sensitive wetland vegetation and urbanization have been recognized as threats to the ecological integrity of these pans.

d) Groundwater

Groundwater is one of the key environmental resources in the study area. The water table is found at an average depth of 38m, and boreholes satisfy a lot of the demand for potable and irrigation water. No clear indication is present yet that current levels of abstraction is lowering the water table, but overexploitation is always a risk in such a low rainfall area. Pollution from agricultural and mining activities can further reduce the quality of the resource.

e) Dolomite and fountains

Dolomitic geology is found in the South-East, between the N14 and R31. The inherent qualities of dolomite generally cause karst systems to represent significant and important contributions to groundwater recharge, storage and movement. At the surface, these systems appear as fountains or 'eyes'. The pre-eminent example is the well-known Kuruman eye, but the dolomitic area stretches all the way to Boesmansgat in the South (outside the study area).

In fact, five such fountains have been identified in the JTGDM – two associated with the Kuruman Eye recreational area, the Klein Koning and Groot Koning eyes south of the R372, and one at Manyeding. The Kuruman Eye and Klein/Groot Koning (a.k.a. Kono Reserve) fountains are all associated with cave systems. Whilst extensive recreational modification has taken place at Kuruman, high intensity agricultural activity takes place at the other fountains.

2.1.3.2 Management objectives

From an ecological perspective, channelled and unchannelled valley bottom and hillslope seeps which feed into valley bottom systems are significant in terms of ecosystem goods and service provision where the possibility of annual surface water is more likely than on the many scattered depressions, as well as for their connectivity across the landscape. These systems are common in most drainage areas, where relief is gentle and can often be viewed as an indication of relict rivers, streams or lakes. It also generally supports both specialised and cosmopolitan biota, where the other classed systems support biota with specialised niches.

Conservation, protection and rehabilitation of these wetlands will ensure optimal groundwater recharge and maintenance of ecological processes. Pollution of wetlands is often related to agricultural practices (phosphates and nitrates) and industrial practices (toxins) and can include the following:

- Salinisation, nitrification and chemical pollution from agriculture
- Inadequate waste water treatment
- Mining effluent and untreated return flows
- Dewatering and Acid Mine Drainage
- Leaching or pollution from refuse dumping and inadequate land fill practise
- Urban effluent return flow (storm water)

The 2007 SEA states that:

“The degree of sensitivity of the pans in the Kgalagadi District Municipal area is not particularly great, though any proposed development will certainly destroy what are presently well-preserved habitats for typically undisturbed pan communities. These communities are central to the functioning of panveld ecosystems. They provide food for other invertebrates and small vertebrates, while the pans themselves are foci for the water that they irregularly store. The pans are also all homes to burrowing vertebrates.

A point worth mentioning is the land-management of the panveld in the Kgalagadi District Municipal area. Grazing practices can have a marked effect on this panveld. Whether these practices have any effect on the pans is difficult to say, except that it should be borne in mind that the pan ecosystems are very old and robust. Consequently they can take a lot of disturbance.”

Groundwater resources must be monitored in order to ensure the early detection of over-exploitation or pollution.

In terms of the current state of wetlands management and monitoring, the JTGDM does not have in operation any formal project or programme relating to wetland health, wetland eco-status or wetland goods and service utilisation policies. The JTGDM does however contribute to the working for wetlands and the wetlands forum where a partnership initiative is underway between the Northern Cape and Free State. To date this initiative is at a discussion level, planning the way forward in terms of wetland management and monitoring. As a result, the only bodies acting in a wetlands development and conservation advisory capacity is the Provincial Department of Environment and Nature Conservation (operating under the national Department of Environmental Affairs, as well as in collaboration with the national Department of Water Affairs).

2.1.3.3 *Environmental opportunities & constraints*

The predominantly dry ephemeral watercourses, i.e. rivers and wetlands (pans, eyes/fountains, vleis, etc.), are important natural features in terms of terrestrial vertebrate migration, especially birds, and they are protected by various environmental and associated legislation. They are also intricately linked to the maintenance of groundwater resources.

Preservation of surface wetlands will automatically improve the quality and quantity of water finding its way into the groundwater reserve, from where it can support land uses over a wider area. Groundwater quality and quantity will be determined by the levels of abstraction and the presence of pollutants, especially where direct points of ingress are present. Risks are greater in the dolomitic areas where there is high permeability in the ground and bedrock.

2.1.3.4 *Legal and policy requirements*

The National Water Act, 1998 (NWA)(Act 36 of 1998) repeals and replaces many previous Acts to form, together with the Water Services Act (Act 108 of 1997), a holistic and comprehensive statutory water law. The purpose of this Act is to manage the Nation's water resources in such a way as to ensure the:

“...meeting of basic human needs of present and future generations; promoting equitable access to water; redressing the result of past racial and gender discrimination; promoting the efficient, sustainable and beneficial use of water in the public interest; facilitating social and economic development; providing for growth demands of water use; protecting aquatic and associated ecosystems and their biological diversity; reducing and preventing pollution and degradation of water resources; meeting international obligations; promoting dam safety and managing floods and droughts”.

The Water Act prescribes tools (e.g. water use licence), measures, strategies and principles which will assist the District with the protection of water resources.

The National Water Resource Strategy was published in September 2004 in accordance with Chapter 2 of the NWA. This strategy outlines current water policy, law, water resource management and strategies, the country's water situation, national and international planning and co-operation. Chapter 2 of the NWA further makes provision for water catchment management strategies, for individual catchments. These strategies and objectives set the criteria for all water management decision making.

The Water Services Act, Act 108 of 1997 was enacted to provide for matters ranging from the right of access to basic water supply and basic sanitation, to the provisions of a regulatory framework for water services institutions and water services intermediaries, as well as the gathering and the distribution of information in a national information system. This Act therefore acts hand in hand with the NWA to ensure that infrastructural provisions are provided to ensure access to quality water.

The Draft Operational Policy for using water for recreational purposes such as sports, leisure, recreation and tourism, was written in 2004 by the DWAF. This policy recognises the importance of this use, as well as the various impacts that this use could have on the quantity and quality of water. It is important that this water use be managed and controlled to ensure that it contributes to the attainment of the purpose of the NWA (Section 2).

The Northern Cape Regional Office of DWAF is responsible for water resource management in the Lower Orange and Lower Vaal Water Management Areas (WMA). There are a number of systems and strategies that may be linked to this water resource management initiative, these include (State of Environment Report (SoER): Freshwater, 2004):

- Water Authorisation and Registration Monitoring System is the administrative system for water use authorisations and is used for billing purposes.
- Water Management System (WMS) captures water quality information for both surface and ground water and for both water resource quality and source impacts.
- HYDSTRA is used for flow, but can also be used for quality (e.g. continuous measurements – not allowed for in WMAs).
- National Groundwater Database captures mainly borehole information, such as lithology and yield

DWA specifies certain minimum requirements for water resource delineation and management. Specifically, the delineation of the riparian zone must be done according to *“DWAF, 2005: A practical field procedure for the identification and delineation of Wetland and Riparian areas”*. Generally speaking, a 100m buffer zone from the edge of the riparian zone for rivers/streams outside the urban edge and a 32m buffer zone from the edge of the riparian zone for rivers/streams within the urban edge must be protected from degradation or development. These requirements should, however, be customised to local sensitivities and context.

Impact assessments of proposed developments must include an evaluation of the current hydrological regime and potential changes thereof, including the effect of that change on the downstream habitat and integrity of the system.

The Lower Orange River Management Study (LORMS) is a joint initiative by the republics of Namibia and South Africa aimed at developing joint strategies for the management of the Orange River (SoER: Freshwater, 2004). The establishment of the LORMS became necessary to allow for economic opportunities which require water resources, as well as difficulties in the past in regulating the flow of water along the Orange River. The study will provide an integrated approach towards the assessment, planning, utilisation, conservation, management and development of the water resources in the shared region (SoER: Freshwater, 2004).

Other norms and standards which could be applicable or be used as a base for future management plans and strategies within the water resource sector include the following:

- Convention on Wetlands of International Importance Especially as Waterfowl (RAMSAR Convention)
- United Nations Convention on the Law of Non-Navigational Uses of International Watercourses
- Revised Protocol on Shared Watercourse Systems in the South African Development Community (SADC) Region
- Permanent Water Commission on the Orange (Gariep) River

One of the most important legislative papers relating to water-based ecology is the RAMSAR Convention. The Convention on Wetlands of International Importance is an international treaty signed on 2 February 1971; the mission being the conservation and sustainable use of wetlands by national and international co-operation as a means of achieving sustainable development throughout the world. South Africa is one of 118 contracting parties (RSA became a member on 12 March 1975). The obligations of parties joining the RAMSAR Convention include:

- To designate at least one wetland for inclusion in the List of Wetlands of International Importance (RAMSAR list),
- To promote the wise use of all wetlands,
- To stem the loss of wetlands,
- To promote the training of personnel and
- To promote the implementation of parties obligation under the RAMSAR Convention.

Any activities which take place around, or which have the potential to affect wetlands must comply with the principles of NEMA and the NEMA regulations. Section 4(r) of NEMA states that “*Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure*”. This stipulation is particularly important in terms of the protection of wetlands and the setting of environmental management zones.

Various activities in and around wetlands require environmental authorisation in terms of the NEMA Environmental Impact Assessment (EIA) Regulations and should be noted regarding future developments and/or plans within the municipality which pertain to surface water resources.

The National Environmental Management: Biodiversity Act, Act 10 of 2004 (NEM:BA) provides for different legal instruments for the protection of declaration of a bioregion, listing of ecosystems, norms, standards, biodiversity management framework and biodiversity management plans. NEM:BA also provides for control over restricted activities relating to listed threatened or protected species.

The National Environmental Management: Protected Areas Act, Act 57 of 2003 (NEM:PAA) provides for different legal instruments for the protection of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes.

Regulations have been published in terms of the Conservation of Agricultural Resources Act (CARA)(Act 43 of 1983) that control the spread of weeds and invasive species. In terms of the regulations, identified species must be removed and/or its propagation controlled by land owners.

Generally, karst systems are protected under the provision in NEMA that identifies sensitive, vulnerable, highly dynamic or stressed ecosystems as worthy of protection and conservation. Under the National Heritage Resources Act, caves may be considered protected if they are linked to cultural practices, scientific value or archaeological importance.

2.1.4 Agriculture and soils

2.1.4.1 Feature status

From a spatial perspective, agriculture is an important economic activity in the JTGDM, comprising of large commercial livestock farms (extensive grazing) and subsistence grazing activities. Subsistence is prevalent in the Joe Morolong area, whilst more commercial livestock farming takes place further west (FIGURE 6). Cultivation of lands is restricted to the area stretching from Hotazel to Avontuur, Aansluit and along the Molopo River, as well as most of the ephemeral streams and wetlands.

According to the 2007 SEA,

“...only a very small area in western Moshaweng is highly suited for arable agriculture, while similarly small areas are of intermediate suitability for this purpose in south-western Gamagara and southern Ga-Segonyana. The bigger bulk of the district municipal area is either not suitable or of poor suitability for arable agriculture and thus mainly suitable for grazing. As the area is not rich in fertile soils, cultivation is not very big issue and therefore the overuse or leaching of phosphates and nitrates, resulting from over-cultivation, is seldom a problem”.

The arid nature of the Northern Cape climate results in relatively low carrying capacity for livestock production and little dryland cropping. The only form of agricultural production possible is therefore irrigated cultivation and grazing at low (14-30ha/Large Stock Unit) densities. Nevertheless, the province is known for its high-quality meat and meat products.

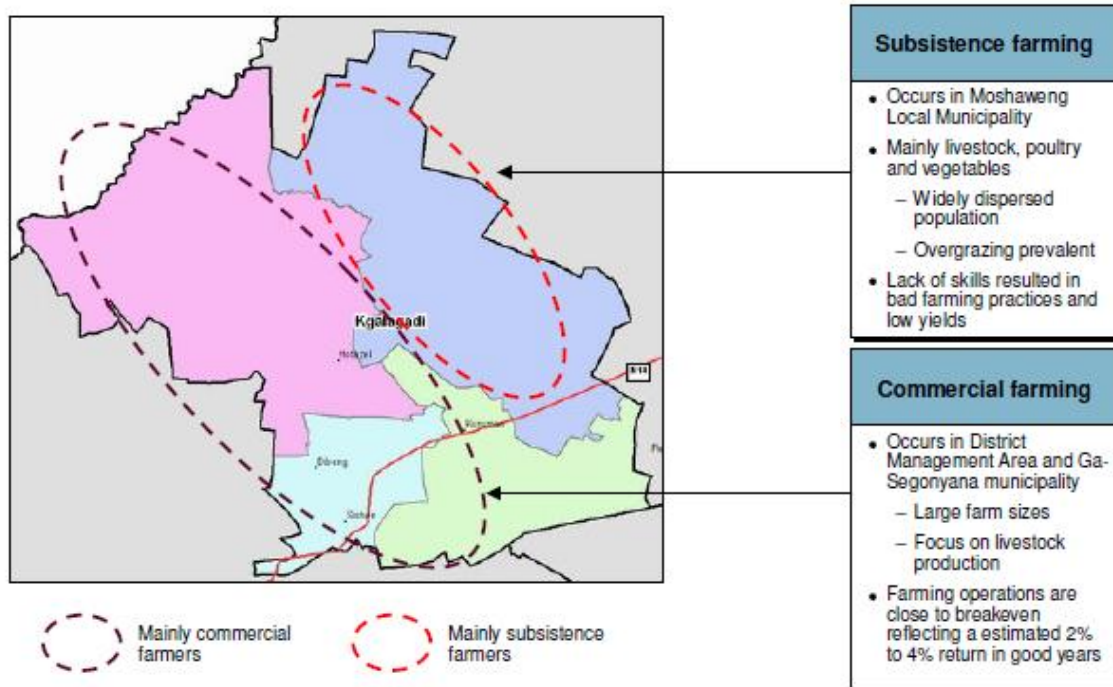


FIGURE 6: PROFILE OF AGRICULTURAL ACTIVITY IN JTGDm (DPLG, 2006: NODAL ECONOMIC PROFILING PROJECT)

With the increased provision of stock-water points and higher stocking rates, the pressures on the natural vegetation become greater and the opportunity for re-growth less. This ultimately degrades the veld and reduces the carrying capacity even further by reducing the resilience and flexibility of the system.

Farming, for subsistence and commercial purposes is therefore heavily reliant on livestock farming with little cultivation wherever it is possible. Livestock farming includes cattle (80%), sheep (12%), goats (4%) and game (4%). Immediate exit points for products include the Kuruman abattoir and feedlots outside the district. Some small scale poultry farming takes place in subsistence farms. Game is kept mainly for hunting purposes, and excess is sold at an annual game auction in Kuruman. Maize and grain is produced at limited quantities with 200 metric tonnes of Maize and 124 metric tonnes of grain are produced, respectively. Very little vegetable production is present other than for subsistence purposes.

The western and southern sections of the study area comprise of extensive areas of natural habitat with relatively limited transformation. Consequently, habitat fragmentation and the associated impacts on ecological processes are likely to be low. Despite this, Agriculture has lead to considerable degradation of the natural vegetation, particularly in the east and the extreme north of the study area. Overgrazing results in the removal of the grassy layer and in some areas, bush encroachment (e.g. by species such as *Acacia mellifera*, *Rhigozum trichotomum*). Transformation of the natural areas will certainly have impacted on ecological patterns and processes, with extreme fragmentation of the natural habitat occurring in the eastern and northern sections of the JTGDm. An indirect impact of bush encroachment is the prolonged exclusion of regular veld fires, which eventually results in

wild fire events of exacerbated intensity and spatial extent, and the associated ecological impacts thereof. Active suppression of lightning ignited veld fires, in an effort to prevent loss of livestock and grazing, has the same effect.



FIGURE 7: REDUCED TREE COVER IN GRAZING AREAS

The overall rate of land degradation in the Northern Cape is decreasing, however the province ranks third highest on the country's land degradation index. Land degradation due to soil erosion is related to a lack of vegetation cover mainly due to overgrazing and deforestation, with the most common contributing factors being wind and sheet erosion.

2.1.4.2 *Management objectives*

a) Climate change

It is important that the impacts of climate change at the local level are understood so that agricultural practices/programmes can be adapted to suit the needs of the district. This adaptation needs to focus on increasing the resilience of the sector, and ultimately the JTGDM as a whole, to long-term climate change and not just focus on short-term impacts of climate change variability. By envisioning the long-term implications of climate change and making the necessary changes to agricultural practices in advance, the sector will become more resilient to the expected changes in climate.

It is vital that adaptation occurs at the rural community level as this group is often the most vulnerable to climate change impacts because of the direct dependence on the natural environment for resources. These people are also often found in the most vulnerable natural environments. With these two factors combined, rural communities are amongst those most impacted, with little or no resources available to recover from the harsh impacts that rob them of their livelihoods.

A proactive stance to climate change in this sector could involve, but is not limited to water management regimes, crop rotations, cultivation of crops better suited to a hot, dry climate (e.g. many indigenous crops are better suited to this climate than commercial crops), grazing management regimes, and education of locals. This requires an integrated approach that addresses multiple sectors, whilst combining indigenous knowledge and experiences of vulnerable groups together with latest specialist insights from the scientific community.

b) Subsistence farming and traditional medicine

The majority of the population within the JTGDM live in rural conditions, and therefore subsistence agricultural practices play an important role in many people's lives. The soil and climatic conditions of the area are not conducive to extensive farming, and most people rely on cattle farming.

One avenue which could be exploited to supplement households is the use and trade of traditional medicine. The use of natural products in medicines, herbal teas, essential oils, and herbs and spices is a fast growing niche market in South Africa. Conveniently, a number of prominent species that have entered the world market grow naturally in the Western and Northern Cape. It is also possible that many more unrecorded plants are being used and traded locally. The checklist of medicinal and magical plants of Southern Africa lists 912 plants of the Northern Cape that are known to have medicinal or magical uses. Of these 912 species, approximately 280 probably occur in JTGDM; however research is necessary to record local knowledge and to determine the species being used.

c) Grazing

Correct grazing management regimes, in terms of sustainable carrying capacities and rotational camp systems, should be encouraged to reduce the impacts of this form of agriculture. Appropriate stocking levels will ensure that bush encroachment remains manageable.

2.1.4.3 *Environmental opportunities & constraints*

a) Climatic

The semi-arid climate with hot summers (29°C–37°C) and cool to cold winters (7°C–9°C) is characterised with a very low seasonal rainfall mean of 373.3 mm. Evaporation is therefore much higher than precipitation, which is a major limiting factor for the agricultural sector.

b) Natural

Future development of the agricultural sector in JTGDM is severely constrained by a lack of water, high temperatures and poor soil conditions. Therefore, the area has limited potential for agriculture growth in the future. There is, however, an abundance of labour in the area, as well as good road linkages to Gauteng and the Free State, both of which support potential agricultural growth and distribution in the region.

Subsistence farming occurs mainly in Joe Morolong, while commercial farming occurs in the rest of the district. The key to success in this sector is to train subsistence farmers and help emerging commercial farmers to become more productive.

The Northern Cape Department of Agriculture, Land Reform and Rural Development consider rural development a key component in unlocking a number of opportunities in respect of sustainable livelihoods and food security. It has therefore undertaken numerous programmes to facilitate positive development in rural areas and growth in the agricultural sector in the province. Amongst others, the department instituted a study to investigate the possibility of water sources in the JTGDM. In the meantime, the department has spent R10-million during the 2009/10 financial year through the Comprehensive Agricultural Support Programme and land care to upgrade and install new stock water systems in areas such as Pender R, Netherway, Herstersgeluk, Maphiniki, Nyra, Adderley, Dithakong and Loopeng (DPLG, 2006).

Surface and underground water supplies are insufficient for large-scale agricultural development of the area. In fact, due to a number of communities utilising more than the recommended sustainable yield of groundwater resources, some areas are threatened by even drinking water resources drying up.

Poor grazing practices have resulted in mild to severe soil erosion and bush encroachment, which further reduces the land capability.

High input costs and non-conducive conditions therefore limit potential for, and profitability of, crop farming.

c) Socio-economic

Widespread poverty, lack of access to shelter and safe water and sanitation, food insecurity, drought and land degradation is prevalent in most of the Northern Cape. This goes along with high poverty levels due to high levels of unemployment caused, amongst other factors, by stock farms shedding large numbers of workers in recent decades, the advent of game farming, as well as mines downscaling. The situation is further worsened by increasing incidences of HIV/AIDS and tuberculosis that increases human vulnerability.

Generally, the living conditions in remote settlements and for farm workers tend to be poor, with low mobility and poor access to health, education and recreation. This is true for most of the Joe Morolong area, and distributed rural settlements.

Resolution of land claims in the area is slow, although in some respects faster than other provinces. The process is, however, also hamstrung nationally by the failure to provide beneficiaries with the necessary skills to turn restituted land into productive units.

Emerging farmers have limited skills as a large number of them have a subsistence background and limited education.

There is a general sense that major infrastructure such as the road network is deteriorating. This limits the developmental prospects of the area.

d) Requirements and development plans

Emergent and commercial farmers have different development needs. Emergent (subsistence) farmers require better access to infrastructure, skill development and mentoring, as well as guided and facilitated nodal development. With commercial farmers the need to form support networks with the emergent farmers and co-ordinate the production cycle for the District is stronger. Co-ordinated agricultural development will improve the utilisation of existing infrastructure and facilitate improved control over the market. The development of agri-processing facilities in the area would also improve local value retention. Communal farmer development will improve employment and food security.

The DPLG (2006) provides a useful analysis of the potential solutions to the limitations currently faced by rural development in the JTGD (Table 4).

TABLE 4: ACTIONS REQUIRED FOR AGRICULTURAL DEVELOPMENT IN JTGD

BARRIER / CONSTRAINT	POTENTIAL SOLUTION
<p>Poor basic infrastructure</p> <ul style="list-style-type: none"> Many emerging farmers without access to proper drainage, roads, water supplies or electricity, especially in Joe Morolong 	<p>Major upgrade of the basic services</p>
<p>Lack of skills</p> <ul style="list-style-type: none"> Many emerging black commercial farmers lack management and financial skills Subsistence farmers apply bad farming practices, e.g. overgrazing 	<p>Training</p> <ul style="list-style-type: none"> Municipality initiatives to build skills Mentorship programme Increase the number of extension officers to assist the agricultural sector
<p>Lack of fertile land</p> <ul style="list-style-type: none"> Soil types in the area are infertile for crop farming 	<p>Promote the use of fertilisers</p> <ul style="list-style-type: none"> Provide adequate training to ensure fertilisers are used effectively and efficiently
<p>Lack of water resources</p> <ul style="list-style-type: none"> Area is extremely dry with no major river 	<p>Upgrade water supply</p> <ul style="list-style-type: none"> Consider ways of channelling water from the fountains to surrounding farms
<p>Lack of adequate equipment</p> <ul style="list-style-type: none"> Some emerging farmers do not possess or have access to implements and equipment, e.g. tractors 	<p>Municipality and Dept of Agriculture to facilitate sharing of assets in the area by partnering emerging farmers with the larger commercial farmers, e.g.:</p> <ul style="list-style-type: none"> Provide a service based on the pay per use basis, e.g. tractors Provide assistance in obtaining second-hand equipment
<p>Low quality of produced products</p> <ul style="list-style-type: none"> People tend to think that quantity is better than quality Application of bad farming practices, e.g. overgrazing 	<p>Mentorship programme</p> <ul style="list-style-type: none"> Utilise the knowledge of the commercial farmers

BARRIER / CONSTRAINT	POTENTIAL SOLUTION
Little value-add within the node	Processing within the node
Understanding of market <ul style="list-style-type: none"> Emerging black commercial farmers and subsistence farmers sell to the local shop or direct to people in the node at whatever price they are offered 	Train people to understand the market <ul style="list-style-type: none"> Teach people market dynamics and how to extract a higher price for their products Gather people in co-ops to increase their buying/selling power
Infrastructure <ul style="list-style-type: none"> High logistical cost of getting cattle to the market/auction 	Co-operatives <ul style="list-style-type: none"> Gather people to share the cost of getting people to the market Develop a collection network / service to get cattle to market and inputs to the farm

Agricultural resources in the area are limited. Nevertheless, the sector contributes significantly to the total number of available employment opportunities. Agricultural resources should therefore be afforded the same opportunity for competition over land, based on the non-consumptive and renewable nature of the activities, as well as the job creation possibilities.

All development planning for the JTGDM, point towards the need for development of agricultural processing facilities in the area. Such facilities would improve the value that is retained from agricultural production in the area.

Land degradation is one of the critical concerns for the agricultural sector, due to the marginal nature of the resources and the harsh climate. Farmer education and land improvement schemes will therefore need to form part of the future planning for the sector.

2.1.4.4 *Legal and policy requirements*

Both the National Environmental Management Act (NEMA) (Act 107 of 1998) and the Conservation of Agricultural Resources Act (Act 43 of 1983) require of landowners to obtain a permit for any agricultural land to be used for another purpose. However, where such conflict occurs close to an existing non-agricultural centre and where there is a significant economic benefit to a development, the pressures on agricultural land can be severe.

The development of agricultural or undeveloped land, either in general (of a certain size) or specific (certain defined developments), usually require environmental impact assessment authorisation under the NEMA Environmental Impact Assessment (EIA) Regulations. The regulatory scheme of the Conservation of Agricultural Resources Act (Act 43 of 1983), on the other hand, involves control measures that relate to the utilisation and protection of land that is cultivated, utilisation and protection of vegetation and the protection of water resources against pollution on account of farming practices. Several control measures have been published.

The Genetically Modified Organisms Act, Act 15 of 1997, is a regulatory framework for the responsible development, production, use and the application of genetically modified organisms (GMO). The Act also ensures

that all activities related to GMO, including importation, production release and distribution, are carried out in such a way as to limit any harmful impacts on the environment, including the prevention of accidents and the effective management of waste. In addition, the Act contains appropriate procedures that must be followed with regard to the notification of specific activities involving the use of GMO.

The Agricultural Laws Rationalisation Act, Act 72 of 1998, provides “...for the rationalisation of certain laws relating to agricultural affairs that remained in force in various areas of the national territory of the Republic prior to the commencement of the Constitution of the Republic of South Africa; and to provide for matters connected therewith”. This Act will therefore be applied in areas where it is necessary, over and above the provisions made in the Conservation of Agricultural Resources Act.

These Acts would naturally be implemented in conjunction with Acts such as NEMA, NEM:BA, NEM:PAA, NWA and any other applicable legislation, norms and standards necessary to maintain ecological integrity of the district.

2.1.5 Mining

2.1.5.1 Feature status

Mining (predominantly iron and manganese) is the main economic activity in the JTGD, with mining operations scattered across the landscape. The largest mines are located between Sishen and Hotazel. The Sishen iron-ore mine is one of the largest open-cast mines in the world and the iron-ore railway from Sishen to Saldana is one of the longest iron-ore carriers in the world. The JTGD has the largest land-based manganese reserves in South Africa. In 1990, it was estimated that South Africa possesses 81,7% of the world's manganese reserves and these reserves are concentrated in the Postmasburg area and Kalahari Fields in the Kgalagadi region.

Local mining companies in the area are owned by Kumba, Assmang and BHP Billiton. There are several operational mines in the area. A list of these operating mines could not be obtained from the Department of Mineral Resources; however, the following mines were identified from a site visit:

- Hotazel manganese mine
- King Mine
- Khumani mine
- Nchwane
- Gloria mine
- Black Rock mine



- Sishen
- Wessels and
- Mamatwan Mine

Mining is considered to be the sector that provides the highest financial inputs to the area, and also one of the highest employment sectors employing 3, 217 people in the area (JTGDM, 2010/2011).

Mining operations, particularly open cast and pit mining, have direct impacts on the vegetation through outright destruction of vegetation, as well as indirectly by way of fragmentation caused by associated roads and railways, and the impacts of dust particulate emissions from the plants as well as along transport (both road and rail) routes. Rehabilitation of waster rock dump sites is inherently difficult because of the hostile substrate and steep slopes, and the end communities seldom resemble the pre-mining communities both in terms of species composition (lower diversity and non-endemics) and structure. Furthermore, invasive alien plant species frequently colonize these disturbed areas.

The main associated air pollutant is particulate matter released from mining activities in the area, whether it is underground, opencast or the tailings facilities.

Of particular concern is the legacy of asbestos mining along the Kuruman Hills and in the far North-East. Abandoned mines, contaminated surroundings and unmined resources are present and a persistent problem remains with regards to the rehabilitation of mining areas and the compensation of affected communities.



FIGURE 8: MINING ACTIVITIES IN THE VICINITY OF BLACK ROCK

2.1.5.2 Management objectives

The 2005 SEA makes certain recommendations in respect of the management of mining in the District (Kgalagadi, 2005):

“Although mining is a major creator of employment, mining activities at their best have major impacts on the environment, especially open-cast mining where high technology earth moving equipment is used. The Kgalagadi District Municipal Area is, by virtue of its semiarid nature, environmentally very sensitive, with this sensitivity progressively increasing from east to west. This means that, even if mining rehabilitation, e.g. backfilling, had been done in accordance with best practice standards, re-vegetation of the mined area and mine residue dump footprints is extremely slow and can take generations to recover. A major problem is that such areas either become sterilised or infested by alien invasive plant species. If, for instance, mining activities cut through the water table during the mining process, chances are good that indigenous trees might never, or only very poorly, re-establish on the rehabilitated mined area.

Mining should therefore be very carefully weighed against other, less destructive, employment creators, even though they might not supply as many employment opportunities and/or generate the same level of income to the area. The Kgalagadi District Municipality and its four municipalities are major direct interested and affected parties in terms of any proposed developments, including mining, in their respective areas of jurisdiction and must therefore be consulted first hand in respect of any such activities as part of the public participation component of the environmental impact assessment process.”

2.1.5.3 Environmental opportunities & constraints

Mining activities contribute to land degradation in areas where land rehabilitation is not undertaken and/or not performed to the best practice standards. Mining also leads to the sterilisation of soil under the footprint of mine residue dumps. This remains a serious concern, with no solution.

Iron ore is processed to produce iron and manganese ore is an important component of steel production, used to improve the quality of steel. Mining companies in JTGDM are encouraged to recruit locally and there is a large supply of unskilled labour, especially from Joe Morolong Local Municipality. However, there is a shortage of skills required for technical and managerial positions. Initiatives like the development of a mining logistics hub and/or the provision of mining-related training (in association with tertiary institutions and Accreditation Board for Engineering and Technology programmes) could improve the situation.

Mining of asbestos has left behind a severely negative legacy, especially in the Northern Cape and these includes some mines and dumps in the John Taolo Gaetsewe Municipality. Un-rehabilitated asbestos mines have

impacted in the past and may still be contributing to serious health problems in the province. Wind blown asbestos dust is known to cause a range of pulmonary diseases, including asbestosis and lung cancer. This is a persistent environmental problem, which local communities have been exposed to for decades. The areas that are particularly affected are in areas such as Heuningvlei, Pomfret, Reivilo, Gamopedi and Nchweng. Many ex-miners and people living in the adjacent communities are significantly affected by these respiratory diseases

Mining opportunities include:

- Extensive manganese deposits and possible new mining areas
- Pig iron smelter (Kathu)
- Manganese smelter (Hotazel)
- Small scale manganese mining where deposits are not suitable for large scale mining operations
- Semi-precious stone mining (Granite, Tiger's Eye)
- Mining in industrial minerals such as clay, sand and salt

The 2005 SEA (Kgalagadi, 2005) indicates that the area *"...is ideally located for beneficiation of its mineral deposits due to an abundance of resources, labour and infrastructure, and many investment opportunities exist for processing raw mining materials even further. For example:*

- *Fluxing agents (dolomite and silica) for steel production are available in the Northern Cape Province and the construction of a smelter to produce steel could be a big generator of economic wealth in the area.*
- *Small-scale mining of zinc deposits or the mineral assemblages in which they occur could also hold some economic benefit, as zinc is used in the production of galvanised steel.*
- *Small-scale mining of lead deposits or the mineral assemblages in which they occur could hold some economic benefit.*
- *Limestone deposits can be mined for cement production.*
- *Gypsum deposits in the Kgalagadi District Municipal Area do not support large-scale mining at present but have the potential to do so. About 90 per cent of gypsum mined is used in the building industry.*
- *Salt deposits in the area could support small-scale mining.*
- *Kieselguhr/Tripolite found in the Kgalagadi District Municipal Area is used extensively for technical purposes in varied branches of industry and is currently not being economically exploited.*
- *Diamonds in numerous small kimberlite pipes and fissures are mostly not being economically exploited. Diamonds occurring in old paleo channels could possibly also be economically exploited.*
- *Tiger's eye and jasper are semi-precious stones, which can be profitably exploited.*
- *The collection of rare mineral specimens for sale to collectors all over the world has not yet been economically exploited fully."*

2.1.5.4 Legal and policy requirements

The current mining legislation, including the National Mineral and Petroleum Resources Development Act, 2002 (MPRDA)(Act 28 of 2002) does not provide adequate legal means to alter mining activities which have been duly authorised by the relevant authority, in the area. Only a few environmental statutes (NEMA, NEM:PAA, NHRA) provide for restricted possibilities to expropriate, however, only the MPRDA and the NEM:PAA allows for the cancellation of minerals rights. Some of the legislation provides legal mechanisms for the management of environmental impacts from mining activities (e.g. rehabilitation and remediation obligation, development of environmental management programmes and plans, financial securities), and for the full life cycle of the activities. However, such mechanisms cannot be directly used by the EMF itself. It is suggested that the Project Team should liaise with the relevant authorities to improve collaboration in terms of the management of mining activities in the area.

NEMA, NEM:PAA, NEM:BA and the National Heritage Resources Act, Act 25 of 1999 (NHRA) provide various legal instruments which could assist in the regulation of new mining activities in the area. The NHRA and NEM:BA also provide for control and limitation of activities in terms of heritage resources and biodiversity management, which could also be used to limit mining developments in the area.

It should be noted that the NEMA EIA regulations have been revised to include mining activities. However, this has not yet come into affect.

2.1.6 Tourism and Heritage Resources

2.1.6.1 Feature status

The various categories for conservation of heritage include national heritage sites, protected areas, heritage objects, structures over 60 years old, burial grounds and graves, fossils, rock art, archaeology, historical shipwrecks and living heritage. Several proposed World Heritage Sites such as the Kimberley Mine and Associated Early Industries, the /Xam Khomani Heartland, the Richtersveld and the Wonderwerk Cave are also found in the Northern Cape. These unique heritage sites in the Northern Cape, if adequately protected and developed have the potential to contribute to the Province's economy through the tourism industry.

The node attracts domestic and international tourists, including those driving from Johannesburg/ Pretoria to Namibia, who stop over in Kuruman for the night. International visitors include Germans, Belgians and British returning for a second visit and looking for niche activities or experiences. There are several accommodation options open to those travelling though, such as bed and breakfasts and guesthouses in the area, with the majority of them found in Kuruman. However, most accommodation is designed to accommodate contractors or long-term renters rather than tourists.

Two major attractions are just a few kilometres from Kuruman, namely, the Kalahari Raptor Rehabilitation Centre and the Kuruman Eye which is the largest natural fountain in the southern hemisphere. Other major attractions include the Wonderwerk Caves and the Kuruman Moffat Museum.

Current niche markets that exist, or are trying to develop include adventure tourism, green tourism and the wildlife experience, with further potential to develop ecotourism, hunting and game farming in the district. The western parts of the node that are scarcely populated and have pristine natural environments are suitable for ecotourism, hunting and game farming. There are possibilities to develop adventure tourism options including mining tours (i.e. Kumba Resources and Kathu mines), 4x4 routes and trails (i.e. potentially in Kiangkop), and hiking trails, of which three are already in use.

There are several sites of archaeological and palaeontological importance in the area. Fieldwork and research are ongoing, and cultural and historical attractions either already exist or are being planned. A possible World Heritage Site at the Wonderwerk Caves can be used to generate many new small businesses in the service and tourism sectors. While much of the area of JTGDM has yet to be examined from an archaeological viewpoint (one estimate suggests that just 1% of the area has been examined from an archaeological perspective), certain areas have been investigated in great detail, particularly in the last quarter century.



FIGURE 9: ROCK ART FROM THE JTGDM AREA

This is especially true of the Kathu area (Beaumont & Morris 1990; Beaumont 2004; Morris & Beaumont 2004) where renewed research by an international team in partnership with the McGregor Museum was commenced in August 2004. This existing work suggests that sites of great significance may yet be brought to light in the region. Broadly speaking, the archaeological record of this region reflects the long span of human history from Earlier Stone Age times (more than one and a half million to about 270 000 years ago), through the Middle Stone Age (about 270 000 – 40 000 years ago), to the Later Stone Age (up to the protocolonial era). The last 2000 years was

a period of increasing social complexity with the appearance of farming (herding and agriculture) alongside foraging, and of ceramic and metallurgical (Iron Age) technologies alongside an older trajectory of stone tool making. Of interest in the Gamagara area is evidence of early mining of specularite, a sparkling mineral that was used in cosmetic and ritual contexts in from early times (Beaumont 1973). Rock art is known in the form of both rock engravings and rock paintings. Information on these sites is on hand at the McGregor Museum in Kimberley (Beaumont 1973; Beaumont & Morris 1990; Beaumont 2004; Morris & Beaumont 2004; Fock & Fock 1984).

Several significant sites on the outskirts of Kathu were excavated by P. Beaumont from the late 1970s which represent important parts of the cultural stratigraphic sequence of the region. Current research is directed by M. Chazan from Toronto in collaboration with the McGregor Museum. It is expected that the Kathu sites would be declared as a combined National Heritage Site, while discussions with the local municipality are looking to the possibilities of museum development there to double up as a Tourism Information office. New sites belonging to this complex were found in recent years.

Dithakong was the site of a battle in 1823 when missionaries and Griquas came to the aid of the Tswana mission settlement to ward off marauding Mantatee refugees. Dithakong then became a site of a much more significant battle in 1878, however, during the Griqualand West Rebellion, when Warren shelled the BaTlhaping as they took up a defensive position amongst the ancient stone walling (Shillington 1985).

The final war of conquest in the JTGDM area was the so-called Langeberg Rebellion of 1896-7. A major siege was enforced by British forces (and Mfengu auxiliaries) at Luka/Gamasep in the eastern Langeberg north of Olifantshoek. Kgosi Luka Jantjie was killed here. The site is of high significance and subject to on-going investigation, with intended declaration as a Provincial Heritage Site. A public access site may be developed in the vicinity.

2.1.6.2 Management objectives

The above overview provides indications of the range of heritage resources that would need to be documented in a Heritage Resources Inventory for JTGDM. It has been estimated in the past that probably no more than 1% of the heritage resources of the district are known.

An Environmental Management Framework for the district needs to take this into account and ensure that mechanisms are set in place to redress this issue. The fact that large parts of this district are rich in minerals means that the heritage, which is a non-replaceable resource, is particularly under threat. Therefore urgency surrounds this matter and it is considered essential that the relevant department/s of government should provide infrastructure and personnel to carry out the necessary inventory and database management tasks.

Information concerning heritage resources has been generated by a range of organizations and individuals and exists in various formats such as maps, documents and images (both analogue and digital). In some cases the information may not be complete and may not conform to any standard in terms of descriptive fields, significance rating, grading, etc.

Much information exists in a wide range of formats, both digital and analogue (documents and images) in diverse locales/archives. The information, however, needs to be better consolidated. A Heritage Resources Inventory for JTGDM, as a sub-set of a Northern Cape Heritage Resources Inventory should be designed in a manner that will enable its compatibility with databases developed as part of the recording process for National Estate of heritage resources currently being undertaken by the South African Heritage Resources Agency (SAHRA).

2.1.6.3 Environmental opportunities & constraints

The 2006/2007 SDF graphically depicts the potential for the development of tourism nodes and corridors in map "E.5" (Reproduced here as FIGURE 10):

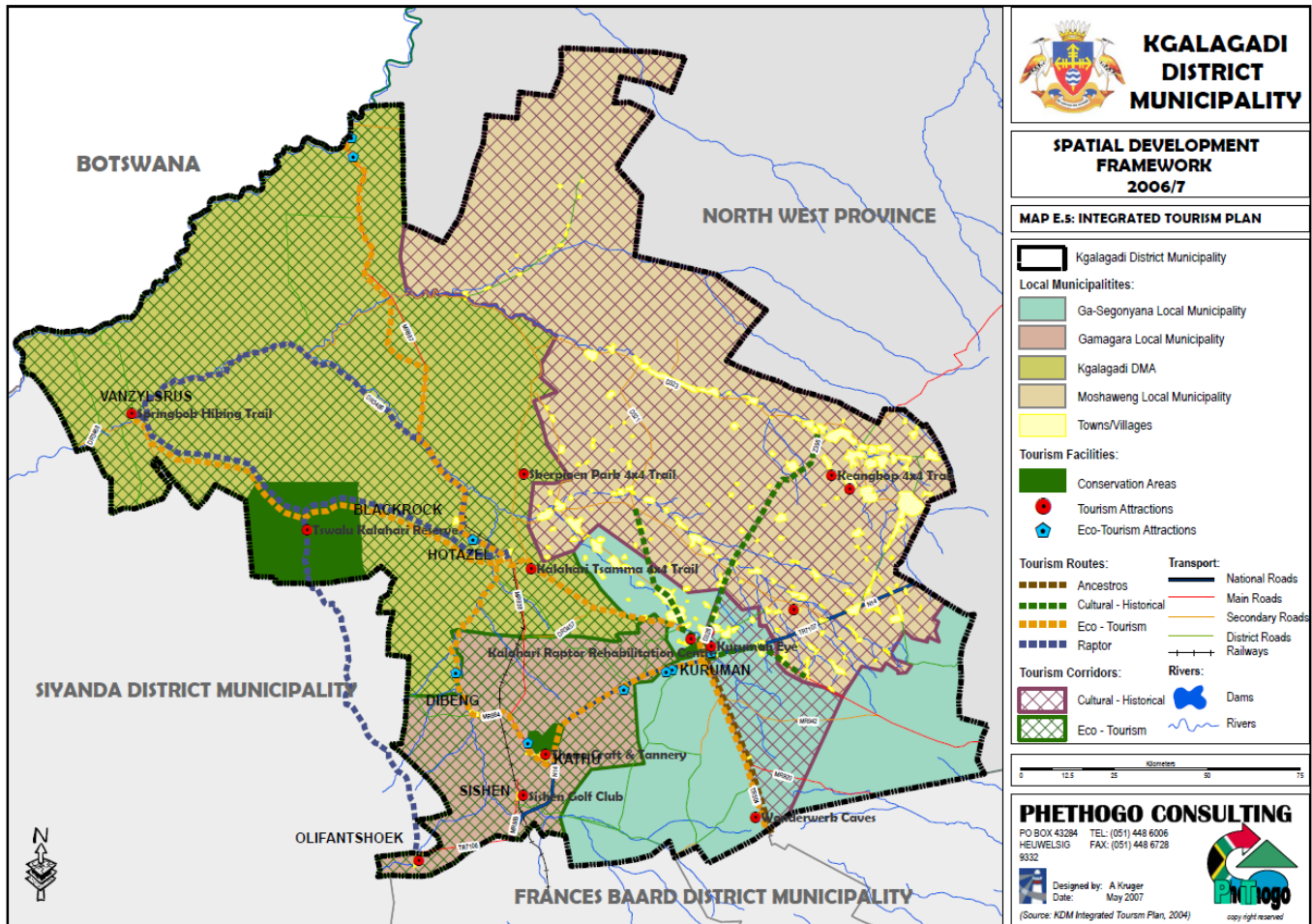


FIGURE 10: INTEGRATED TOURISM PLAN (K GALAGADI DM, 2007)

Opportunities are listed as:

- The majority of the existing tourism facilities are concentrated in the Ga-Segonyana Local Municipality (specifically in and around Kuruman) and within the District Management Area.
- A total of 31 of the identified facilities are located within Ga-Segonyana and 28 in the District Management area.

- The number of facilities within Gamagara Local Municipality (mainly located in and around Kathu) is 14.
- There are two facilities which are located outside but immediately adjacent to the District municipality boundaries.
- The absence of existing tourism facilities within Joe Morolong Local Municipality is very notable.

Wonderwerk cave, Gazetted as a National Heritage Site in 2010, is on South Africa's Tentative List for World Heritage Inscription and it is expected that a nomination document would be submitted to United Nations Education, Scientific, and Cultural Organisation (UNESCO) within the next few years. World Heritage status would entail the setting up of a buffer zone around the site where land use would need to conform to international heritage standards (e.g. no mining).

The oldest of the mission sites is the Moffat Mission at Seodin where the mission church and other structures are preserved and still in use. A substantial and nationally significant collection of heritage objects is also preserved at the Moffat Mission. These should be placed on the national register of heritage objects.

Development of nature-based tourism is also an opportunity.

As far as the spatial distribution of the various types of accommodation facilities are concerned, the following conclusions are made:

- The majority of guest houses within the area (23 of the 26 in the district) are located in Ga-Segonyana and Gamagara Local Municipality areas.
- The majority of the hunting farms/lodges (12 of the 22 within the district) are located in the District Management Area.
- All the facilities classified as guest farms are located in the District Management Area.
- Camping and caravan facilities, self catering facilities and hotels/motels are mainly concentrated within Ga-Segonyana Local Municipality

2.1.6.4 Legal and policy requirements

A nomination of places in the District is necessary for heritage sites to be declared as national or provincial heritage site under the National Heritage Resources Act, 1999 (Act No. 25 of 1999). The NHRA provides for effective general protection of monuments, burial grounds and graves which would assist the realisation of the objectives of the project.

The Draft Operational Policy for using water for recreational purposes such as sports, leisure, recreation and tourism, was written in 2004 by the DWAF. This policy recognises the importance of this use, as well as the various impacts that this use could have on the quantity and quality of water. It is important that this water use be managed and controlled to ensure that it contributes to the attainment of the purpose of the National Water Act (Section 2).

2.1.7 Biodiversity Conservation

2.1.7.1 Feature status

a) State of Conservation

The natural environment in JTGDM is in a fair condition, with poor land management that has resulted in degradation of the resource base. Of particular concern is the deterioration of the natural vegetation through overgrazing, poor fire regimes, wood harvesting, misuse of wetlands, and encroachment by invasive plants and weeds. These factors are common to all veld types in Southern Africa, but the harsh climatic conditions and lack of surface water resources exacerbates the problems in the Northern Cape. They also contribute to a growing concern over the quality and quantity of the groundwater resources upon which much of the area depends.

The larger part of the district does nevertheless qualify for special recognition though – it forms part of the Griqualand West Centre of Endemism. This cluster contains 1800 species of which only 2.2% are endemic, but in terms of succulents that appear in the region, a third of the 40 species are endemic. The area is further deemed significant due to the influences of calcareous soils and heavy metals, especially iron and manganese, on plant distribution and speciation. For example, a few plants are known to be hyperaccumulators for manganese. Survey information is limited though, and therefore larger surface outcrops not yet destroyed by mining activities should be priority for detailed floristic studies to check heavy metal content. The highest species richness is located in the so-called Asbestos Hills range.

Apart from the Kathu Forest and Tswalu private nature reserve, no protected areas are present in the District. Formal protection should be considered as one of the means through which sensitive features and ecosystems can be managed and preserved. Although there are 22 hunting farms/lodges in the JTGDM, the only *bona fide* nature reserve is the Tswalu Kalahari Reserve which covers about 100,000 ha in the Korannaberg Mountains. Various species have been reintroduced into the area (see species list), and include conservation-worthy species such as Black Rhino, White Rhino, Lion, Wild Dog, Cheetah, Mountain Zebra and Brown Hyaena. Transient occurrences of Wild Dog and Cheetah have been recorded outside the fences of hunting farms and game reserves, whilst Brown Hyaena, although occurring at low densities, is certainly a resident species.

Issues related to habitat transformation in the JTGDM are largely related to the mismanagement of the following:

- Agricultural practice as a vector for habitat transformation of wetlands (alien invasion, flood irrigation, direct farming practice and water quality impairment)
- stock farming as a direct and indirect vector for habitat transformation via alien invasive vegetation, water quality impairment and abstraction practice
- residential associated activities resulting in direct and indirect transformation via alien invasive vegetation, water quality impairment and abstraction practice
- Mining practices that lead to habitat transformation via alien invasive vegetation, water quality impairment and abstraction practice

- Recreational practices that encourages the spread of alien invasive vegetation as a result of continual disturbance practice and transportation of propagation material
- b) Ecological regions

The area encompasses four separate ecological regions, which extend beyond the region's boundaries:

- Kalahari Thornveld
- Ghaap Plateau
- Rocky Hills and Ridges
- Kuruman Sourveld

The ecological regions of the area are not as rich in species as many such similar regions located outside of the area. However, at a more detailed level, accepting that the species composition, vegetation form and individual landscape units change over small distances, some 60 vegetation-landscape units which are unique to the District can be identified.



FIGURE 11: LANDSCAPE NORTH OF HOTAZEL

The JTGDM falls entirely within the Savanna Biome. More specifically the broad vegetation types for the area, have been described as Kalahari Thornveld (A16) (Acocks, 1988), Kalahari Plains Bushveld/Shrubby Kalahari Dune Bushveld (Low & Rebelo 1996), and Eastern Kalahari Bushveld (Mucina & Rutherford 2006).

At a finer scale, thirteen vegetation units have been recognized in the study area (Mucina & Rutherford 2006). Only one, Mafikeng Bushveld is classified as “Vulnerable”, the rest all considered as “Least Threatened”, with very little transformed according to Mucina & Rutherford (2006). Nonetheless, it is recognized that none of the conservation targets for the vegetation types occurring in the study area have been achieved, and that few are conserved in statutory conservation areas, either within or outside the study area.

Mafikeng Bushveld is considered vulnerable because about 25% has already been transformed mainly for cultivation and urban development (across its entire distribution). This vegetation unit occurs in the south east of the study area and covers an area of about 37 000 ha. This area is has been severely transformed by overgrazing, harvesting of wood, and urbanization, all indicative of the dense rural population of this area.

Despite the relatively low conservation status of the vegetation units occurring within the study area, there are biogeographically important taxa, such as Kalahari endemics, Griqualand West endemics, species with broadly disjunct distributions and species with their southern most distributions, that occur within the units.

c) Threats

Much transformation/degradation occurs in the eastern and northern parts of the JTGDM, whilst the western and southern sections are less impacted. Agriculture probably represents the greatest threat to the vegetation, in the form of overgrazing, which changes the plant community composition by eliminating certain species (generally palatable species) and encourages bush encroachment particularly by species such as *Acacia mellifera*, *Geigeria ornativa*, *Tribulis terrestris*, *Dichrostachys cinerea* and *Rhigozum trichotomum*.

The direct impacts of urban development are habitat destruction/transformation and fragmentation of ecological corridors. Whilst the low intensity of the current urbanization in the south, west and northern parts of the study area, is unlikely to have severe impacts at the landscape level on biodiversity, the proliferation of urbanization in the east will certainly have impacted on patterns and processes of biodiversity. The concern is that the urbanization in this area is largely informal and a result of high density rural populations, which has implications for biodiversity conservation. Subsistence-type farming, and in particular farming with livestock are associated with these informal settlements, and the impacts of overgrazing on the vegetation are apparent from the land use study. The harvesting of firewood for energy cooking and heating purposes in the high density rural and peri-urban areas, because of gaps in electricity supply, is another impact associated with high density rural and peri-urban areas, with trees species, and in particular *Acacia erioloba*, being targeted. According to the IDP the majority of the district's population use wood for heating, whilst wood is the second main form of fuel for cooking. Apart from the direct impact of hunting (by both humans and domestic animals, *i.e.* dogs and cats), loss of faunal habitat and the disruption of ecological corridors, should also be a concern in these areas.

d) Rare and endangered species

There are two Red List² plant species occurring in the study area according to South African National Biodiversity Institute (SANBI) Plants of Southern Africa (POSA) site, namely *Acacia erioloba* and *Hoodia gordonii*, which are

² The designation 'Red Data' indicates that a species has been listed on the IUCN (International Union for the Conservation of Nature & Natural Resources) Red List of Threatened Species™ as Critically Endangered (CE), Endangered (EN) or Vulnerable (VU), and therefore at risk of global extinction. Lesser concern species are classified as Near Threatened (NT) or Least Concern (LC)

listed as “Declining”. Both are relatively widespread and abundant in the study area, with *Acacia erioloba* being a dominant species in the tree layer. *Acacia erioloba* also counts as one of the three protected tree species present in the study area, along with *Acacia haematoxylon* and *Boscia albitrunca*. These trees are afforded protection according to Government Notice No. 1012 under Section 12(l) (d) of the National Forests Act, 1998 (Act No. 84 of 1998). A distinct threat to *Acacia erioloba* is that it is heavily targeted for utilization as firewood and charcoal making.

A total of 27 Red List mammal species have been recorded in the study area³. A number of Red List species that are not endemic to the study area have also been introduced into various game reserves, hunting farms and lodges, most notably: Black Rhino, White Rhino, Sable Antelope, Roan Antelope and Hartman’s Mountain Zebra. Free-roaming Cheetah and Wild Dog, both endangered species, have been recorded as transient species in the study area. Both these species also occur as re-introduced species in various private reserves, most notably in the Tswalu Kalahari Reserve. Other resident Red List species at the reserve include the Honey Badger, Brown Hyaena and Small Spotted Cat.

Most of the recorded bird species in the study area have widespread distributions across the Savannah Biome. There are only two species that can be considered as Kalahari endemics, namely the Fawn-coloured Lark (*Calendulauda africanoides*) and the Kalahari Scrub-Robin (*Cercotrichas paena*). A total of 32 conservation-worthy bird species have been recorded in the study area. Six are listed as Red Data species, namely Kori Bustard (VU), Ludwig’s Bustard, Secretary Bird (NT), Martial Eagle (VU), Lappet-faced Vulture (VU), Lanner Falcon (NT) and Black Stork (VU). The other species are considered priority species because they a) have conservation status under the Africa-Eurasian Waterbird Agreement, b) are raptors and/or c) have special regional significance, e.g. the Social Weaver, Fawn-coloured Lark and the Kalahari Scrub Robin.

A total of 46 reptile species have been recorded in the study area. Two of these species are considered to be of conservation concern, namely the African Rock Python (*Python natalensis*) and the Rock / White-throated Monitor (*Varanus albigularis*). Both these species have been exploited for local trade in traditional medicine, and are now classified as vulnerable. Rocky habitats of the study area, particularly those associated with ridges and hills provide suitable habitat for reptile species (skinks, snakes and geckoes). The Acacia woodlands also offer favorable habitat for arboreal reptile species, e.g. chameleons, snakes, agamas, geckos and monitors.

Termite mounds are a common feature in the landscape of the study area, and are important refuge for numerous frog, lizard and snake species. It is also an important source of food as a large number of mammals, birds, reptiles and amphibians feed on the emerging alates (winged termites).

The only threatened amphibian species that is known to occur in the study area is the Giant Bullfrog, *Pyxicephalus adspersus* (NT). This species is likely to utilize, as breeding habitat, any of seasonal wetlands that

³ Information obtained from the McGregor Museum, Kimberley, 2011

are scattered across the study area. Destruction or degradation of these essential breeding habitats will therefore negatively impact on Giant Bullfrog and may act synergistically with factors such as fragmentation, deterioration of water quality (due to pesticides and pollutants) and human predation, resulting in local populations declines. Roads that cut across ecological corridors used by this species can result in significant fatalities of migrating adult and juvenile bullfrogs.

2.1.7.2 *Management objectives*

a) Spatial planning

Urbanization should take into account the distribution of sensitive species, the optimal spatial arrangement of habitats, ecosystems and ecological corridors that will ensure continued survival of species, as well as avoiding the disruption of key ecological drivers, such as fire and large mammal herbivory. Urbanization should therefore follow a structured path focusing on the expansion of existing nodes, rather than scattered development across the landscape that leads to transformation and fragmentation of habitats and disruption of ecological processes, such as dispersa, pollination and migration.

b) Mining activities

Mining activities in proximity to ecologically sensitive habitats (e.g. ridges, wetlands, rivers and caves), and localities of sensitive species, should either be adequately controlled or preferably discouraged. All proposed new mining locations must be screened through the formal EIA process. Where approvals are granted, adherence to appropriate environmental management plans must be enforced. Concurrent rehabilitation rather than rehabilitation at mine closure must be encouraged.

c) Agricultural practices

Correct grazing management regimes, in terms of sustainable carrying capacities and rotational camp systems, should be encouraged to reduce the impacts of this form of agriculture. Improved grazing management systems are required to prevent further degradation of catchments, river systems and wetlands, and thus prevent further degradation of water resources, ecological corridors and habitat. Conservation planning should include the identification of the optimal spatial arrangement of corridors, buffers and “stepping stones” that will promote the conservation of these sensitive habitats and the ecological processes associated with them. A systematic invasive alien control programme that prioritizes infestations based on habitat sensitivity, potential to spread and emerging weeds, should be implemented at a landscape scale. Wetlands should be fenced off where practical, to prevent grazing and trampling by livestock and access by humans.

d) Conservation

Ecologically sensitive habitats such as nature reserves, primary vegetation types, mountain catchments, rivers, streams, springs, wetlands, rocky ridges, caves *etc.* occur within the JTGDM, and it is likely that conservation-worthy species are associated with these habitats. Environmental planning must therefore consider the

conservation of the optimal spatial arrangement of sensitive natural habitats and corridors of other natural vegetation that allows for the maintenance of patterns and processes of biodiversity.

The establishment of a network of proclaimed nature reserves should be pursued, using the existing hunting farms/lodges as a platform for expansion of protected areas. The declaration of the Tswalu Kalahari Reserve as a Protected Natural Environment under the NEM:PAA should be supported. Adherence to the Game Translocation Policy of the Northern Cape Department of Environment and Nature Conservation should be encouraged, in terms of extra-limital species, sustainable carrying capacities, ethical hunting practices, adequate enclosures, etc. Fire management regimes should be implemented that mimic, as closely as practical, the natural fire regimes in terms of frequency, season, intensity and size, in order to maintain ecological patterns and processes.

Apart from the Tswalu Kalahari Reserve, there are no other formal conservation areas that have been specifically managed for the conservation of vegetation types. The various hunting farms meet the specific need of hunting *per se*, and although optimal carrying capacities based on maintenance of a healthy vegetation cover, and more particularly grasses, are likely to be an important consideration, conservation of a specific vegetation type, is not. It is suggested that the lessons learnt from the Kathu Forest declaration be used subsequent to this EMF project to inform the identification and declaration of further areas for possible protected status.

Habitats utilized by Red list mammal species should be afforded the necessary protection against activities that will impact negatively on these species. This should include adequate buffer zones to reduce edge effect and direct disturbance, e.g. wetlands, ridges and caves. An example biodiversity management objective that could be used in this regard is the erstwhile Gauteng Department of Agriculture, Conservation and Environment (GDACE) requirements for biodiversity assessments.

Habitats utilized by priority species should be identified and sufficient representation thereof across the study area must be appropriately managed to mitigate existing disturbances, as well as proposed future developments, in order to prevent further population decline and range reductions. Important ecological corridors should be identified and afforded the necessary protection, if they are to sustain patterns and processes.

Collision of birds with overhead power lines should be mitigated by marking problem sections of power lines with appropriate marking devices. Encourage the use of pylon structures that pose the least threat to bird species in terms of electrocution.

The use of residual biocides and insecticides to control nuisance animals must be reduced through education and extension.

The current distribution and conservation status of amphibian species should be thoroughly investigated. Breeding and foraging habitats, as well as the ecological corridors between these habitats should be identified, and afforded the necessary conservation measures.

e) Traditional medicine

The use of natural products in medicines, herbal teas, essential oils, and herbs and spices is a fast growing niche market in South Africa. The most prominent species that have entered the world market include Buchu (*Agathosma betulina*), Rooibos tea (*Asphalatus linearis*), Honeybush tea (*Cyclopia species*), Ghaap (*Hoodia gordonii*), Devil's Claw (*Harpagophytum procumbens*) and Aloe (*Aloe ferox*). The Northern Cape hosts some of these species, and it is expected that many more unrecorded plants are being used and traded. The checklist of medicinal and magical plants of southern Africa (Arnold *et al.* 2002) lists 912 plants of the Northern Cape that are known to have medicinal or magical uses. Of these 912 species, approximately 280 probably occur in JTGDM; however research is necessary to record local knowledge and to determine the species being used.

Very little research has been done on the medicinal trade in the JTGDM to date, with the most recent record of medicinal plant species found in a brief study in the Kuruman area only, as part of the Kgalagadi District Municipality Strategic Environmental Assessment undertaken in 2004. This study recorded 11 plant species of both indigenous and exotic species: Devil's Claw (*Harpagophytum procumbens*), Black thorn (*Acacia mellifera*), Pigweed (*Amaranthus* sp.), Melkbos (*Euphorbia* sp. or *Helichrysum* sp), Wild Senna (*Senna italica*), Blue gum (*Eucalyptus* sp.), Sjambok pod (*Cassia abbreviata*), Camphor bush (*Tarchonanthus camphoratus*), Makgabenyane, Mukakane and Sethlotsane

The following steps towards sustainable use of medicinal plants in the JTGDM area are recommended:

- Recording of local knowledge of medicinal plants,
- Scientific validation of medicinal plants,
- Research into medicinal plant population distribution and sizes to determine where medicinal plants can be commercially harvested,
- Harvesting of each medicinal plant species must be confined to areas where the plant populations are large enough to sustain commercial harvesting,
- Research to define sustainable levels and methods of cultivation and wild harvesting,
- Training of all harvesters to harvest sustainably for each species harvested,
- National and local government structures must facilitate sustainable trade in medicinal plants and continue to monitor and regulate the use of medicinal plant species,
- Resolution of intellectual property rights, and
- Accessible market information, in particular trends and regulations, is needed.

There are also some reptile species which have been recorded to have medicinal properties, and are currently being traded. These include the African Rock Python (*Python natalensis*) which has a wide distribution, preferring rocky outcrops in arid and moist savanna as well as in lowland forest. It is known to occur in the district but is usually restricted to places where they have not been disturbed or persecuted. Population numbers have been greatly diminished as a result of electric fences, and the pet and traditional medicine trade. The Rock / White-throated Monitor (*Varanus albigularis*) found in Savanna and moister karroid areas. It is a common species but

exploited for bush meat and traditional medicinal trade outside of protected areas. Both the Python and Monitor are now vulnerable species and concerted effort needs to be made to ensure their preservation and protection from further exploitation.

It is possible that other animals are being utilised for medicinal and magical purposes, and trade. Further research needs to be done to assess the extent of this.

2.1.7.3 Environmental opportunities & constraints

Invasive alien plants are not well established in the JTGDM. The most dominant species is *Prosopis glandulosa* (Mesquite), which has the potential to invade vast areas, and poses not only a threat in terms of out-competing indigenous species, leading to another pathway of bush encroachment, and its concomitant impacts, but which can greatly impact ground water resources, which again has secondary impacts on vegetation cover. It appears, however, that the species has not yet become a serious threat, in terms of overall spread. At present infestations are still scattered across the study area. That it can become a problem, is evident on the Tswalu game reserve, where concerted efforts have managed to restrict the species from spreading and densifying in this area.

Other species observed during the field survey are:

- Wild tobacco (*Nicotiana glauca*)
- Cactus species (*Opuntia* spp.)
- Queen on the Night (*Cereus jamacaru*)
- Fountain Grass (*Pennisetum setaceum*) - confined mainly to road sides.
- Agricultural weeds

Invading alien organisms pose the second largest threat to biodiversity after direct habitat destruction. Invasive species are a threat to indigenous species through the following mechanisms:

- displacement by direct competition;
- reduction of structural diversity;
- disruption of the prevailing vegetation dynamics;
- impacts on fire regimes due to increases in biomass;
- alteration of local hydrology; and
- Modification of nutrient cycling.

The following are the main factors associated with fauna in the area:

- The continuing fragmentation and disappearance of habitat due to development will increase the pressure on the survival of remaining natural fauna in the area;
- Fragmentation of habitat also destroys natural migration routes; and

- The conservation of adequate habitat across the various vegetation types and landscape situations as well as appropriate management is imperative for maintaining a high level of faunal biodiversity in the area.

The primary threats to mammal species include habitat destruction/transformation and fragmentation by agriculture, urban development and mining activities. Other threats include:

- Illegal hunting of antelope species;
- Predation by domestic dogs and cats;
- Harvesting of wood for energy cooking, heating, firewood and production of charcoal;
- The use of pesticides;
- Use of poisons to control nuisance animals with knock-on effects along the food chain.

The predominant threat to bird species is habitat destruction/transformation. Habitat destruction by agriculture, urbanization and mining activities can have severe impacts on bird species. If large trees, e.g. *Acacia erioloba* are removed, this will impact on the potential nesting sites for birds, including raptors and Sociable Weavers. The species that are most likely to be affected by loss of habitat are the smaller species with smaller home ranges, e.g. Kalahari Scrub-Robin. Bush encroachment can also impact negatively on bird species in terms of the additional protection afforded to rodents and other prey by dense thickets. Other threats include power line collisions, electrocution on pylons, and indirect systematic poisoning.

Reptiles are extremely sensitive to habitat destruction and transformation. Overgrazing urbanization and mining activities will have certainly impacted on populations of species occurring in the study area, although the extent of this is unknown. Out of season fires, will have also impacted negatively on reptile species.

2.1.7.4 *Legal and policy requirements*

National Environmental Management Act, Act 107 of 1998 together with the Environment Conservation Act, Act 73 of 1989 provide for the effective protection and controlled utilisation of the environment. NEMA forms the fundamental legal framework for the environmental rights stipulated in Section 24 of the Constitution of the Republic of South Africa, 108 of 1996, which states that:

1. *Everyone has the right:*
 - a) *To an environment that is not harmful to their health or well-being; and*
 - b) *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:*
 - i) *Prevent pollution and ecological degradation;*
 - ii) *Promote conservation; and*
 - iii) *Secure ecologically sustainable development and use of the natural resources while promoting justifiable economic and social development*

NEMA sets out the fundamental principles that apply to environmental decision making, with the core environmental principle to promote ecological sustainable development. These fundamental principles should be echoed throughout the EMF.

The following mechanisms/instruments found in the National Environmental Management: Biodiversity Act (NEM:BA)(Act 10 of 2004) could efficiently assist the District to achieve the objectives of sustainable development and integrated environmental management:

- Declaration of regions of the John Taolo Gaetsewe District Municipality as Bioregions
- Development of a Biodiversity Plan(s) for the District
- Implementation for Biodiversity Agreement for the area

The National Environmental Management Protected Areas Act, Act 57 of 2003 provides for the protection and conservation of ecologically viable areas representative of the country's biological diversity. This is implemented through the control and limitation of activities in protected areas according to the type of protected area.

Weeds and invasive species are controlled under the auspices of the Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983). Regulations 15 and 16 under this Act, which concern problem plants, were amended during March 2001, and make provision for four groups:

- declared weeds (Category 1 plants);
- plant invaders (Category 2 and Category 3 plants) and
- indicators of bush encroachment.

It is the legal duty of the land user or landowner to control invasive alien plants occurring on the land under their control. The State has the right to clear invasive plants at the landowner's expense if the landowner refuses to remove invasive plants.

Camel Thorn (*Acacia erioloba*) trees, Shepherd's Trees (*Boscia albitrunca*) or Grey Camel Thorn (*Acacia haematoxylon*) trees are protected under the National Forests Act (Act 84 of 1998) and a permit needs to be obtained from the Department of Water Affairs and Forestry in accordance with Sections 12 and 15 in terms of the above-mentioned Act to destroy them.

2.2 Summary of the strategic environmental framework

TABLE 5: STRATEGIC ENVIRONMENTAL FRAMEWORK SUMMARY

	Status	Objectives	Constraints	Opportunities	Policy & Regulation
Socio-Economic	<ul style="list-style-type: none"> Good infrastructure for water and electricity Rural services provision problematic Affordability a concern No hospital in Joe Morolong Unemployment No roads in Joe Morolong Poor waste management 	<ul style="list-style-type: none"> Access to basic services to all Services for self-improvement, including education & job creation 	<ul style="list-style-type: none"> Large service area with low population density Urbanisation of rural areas Migratory agricultural workers returning home Air pollution Water use in potential solar farms 	<ul style="list-style-type: none"> Distributed micro generation Water recycling Renewable energy – esp. plans for wind and solar farms around Kathu 	<ul style="list-style-type: none"> National Energy Strategy NEMA Constitution MPRDA social and labour plans
Development Planning	<ul style="list-style-type: none"> Growth of urban settlements such as Kuruman and Kathu Mining to expand with associated settlements Urbanisation of rural areas 	<ul style="list-style-type: none"> Avoid land use conflicts Optimal use of land Avoid sensitive areas Demarcation of urban edge Management of open spaces Public and private sector investment Improve service provision Efficient, equitable and liveable settlements Mixed use developments Compact settlements Socially and economically viable and sustainable human settlements Land development to support public transport infrastructure and services 	<ul style="list-style-type: none"> Contaminated areas Unstable dolomitic areas Floodlines Impact of powerlines on raptors 	<ul style="list-style-type: none"> Consolidation of urban areas Fomalisation and consolidation of low density sparsely populated settlements Management of open spaces Promotion of economic development Focused & managed nodal settlements (administrative, commercial and services functions) N14 development corridor Wind and solar farms Kalahari Mining Corridor (Dept. of Economic Development & Tourism) 	<ul style="list-style-type: none"> IDP & SDF review cycles NEMA Land Use Management Systems Urban Development Frameworks Local Economic Development Framework
Water Resources	<ul style="list-style-type: none"> Groundwater dependant General degradation and overexploitation of wetland areas Ephemeral river systems Degradation of 	<ul style="list-style-type: none"> Maintain ecosystem health Rehabilitate key wetlands Preserve water quality & quantity Recognition of Karst ecosystems as water quality 	<ul style="list-style-type: none"> Limited resources Degradation through agricultural and mining practices Climate change Localised groundwater 	<ul style="list-style-type: none"> Better control over groundwater extraction Better agricultural practices Water recycling Conservation of Karst systems Working for Water, Wetlands 	<ul style="list-style-type: none"> National Water Act Water Services Act Water use licenses DWA requirements Freshwater Ecosystem Priority Areas

Draft Environmental Management Framework for John Taolo Gaetsewe District Municipality

	Status	Objectives	Constraints	Opportunities	Policy & Regulation
	<ul style="list-style-type: none"> catchment areas Dolomitic geology Overexploitation of groundwater 	<ul style="list-style-type: none"> indicators and controls Optimal use of water 	<ul style="list-style-type: none"> quality problems 		<ul style="list-style-type: none"> WMA & WMS HYDSTRA WARMS NGDB RAMSAR NEMA
Agriculture & Soils	<ul style="list-style-type: none"> Limited resources, e.g. water & soil capacity Low grazing capacity Land degradation Alien species invasion 	<ul style="list-style-type: none"> Improve/Maintain agricultural productivity Improve subsistence practices Improve land capacity Unemployment 	<ul style="list-style-type: none"> Pressure from subsistence agriculture Limited water resources Land & water degradation Climate change Major infrastructure degradation, e.g. roads Vandalising of agricultural resources Safety of animals Chemical pollution Accommodation facilities Storage facilities on communal farms 	<ul style="list-style-type: none"> Agri-processing facilities Information and skills transfer Better agricultural practices Rotational grazing camps Alien species removal/control Water recycling Good access from N14 Land restitution claims Job creation and retention Game farming, also on communal land Programs for land rehabilitation – Land Care, Working for Water, Wetlands 	<ul style="list-style-type: none"> CARA GMO Act ALRA NEMA NEM:BA NEM:PAA Forest Act Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act
Mining	<ul style="list-style-type: none"> Large mining facilities Plans for new and expanded facilities Significant infrastructure Major employer Asbestos contamination & land degradation 	<ul style="list-style-type: none"> Prevent environmental degradation Adequate closure & rehabilitation plans Further exploitation Sustainable mining employment Investment in Manganese mining 	<ul style="list-style-type: none"> Asbestos contamination Remote locations Air pollution Transportation Rehabilitation Small scale sand mining impacts Difficulty of access for small scale mining 	<ul style="list-style-type: none"> Site rehabilitation opportunities Large scale community initiatives Job creation & retention Transfer of skills to locals Availability of resources and deposits Biodiversity offsets 	<ul style="list-style-type: none"> National Water Act MPRDA requirements SEA requirements Asbestos regulations Air and water pollution controls Health regulations
Tourism & Heritage	<ul style="list-style-type: none"> Specific well-known heritage sites Good access from N14 Game farms Archaeological resources Kathu stone age site 	<ul style="list-style-type: none"> Establish good database Fund heritage sites for maintenance and development, including new sites 	<ul style="list-style-type: none"> Poorly studied and documented Funding is scarce Distributed over large area Threat of mining Roads infrastructure Marketing 	<ul style="list-style-type: none"> New sites Improvement of current sites Improve advertising World Heritage Site Buffer Zones (Wonderwerk Cave) Hunting Guest houses and hotels Birding (esp. Raptors) 	<ul style="list-style-type: none"> Heritage Resources Act & Regulations Biodiversity regulation Provincial Conservation Act (in development)
Biodiversity	<ul style="list-style-type: none"> Part of the Griqualand 	<ul style="list-style-type: none"> Veld management for 	<ul style="list-style-type: none"> Impacts from 	<ul style="list-style-type: none"> Game farming and conservation 	<ul style="list-style-type: none"> NEMA

Draft Environmental Management Framework for John Taolo Gaetsewe District Municipality

	Status	Objectives	Constraints	Opportunities	Policy & Regulation
Conservation	West Centre of Endemism <ul style="list-style-type: none"> ▪ Habitat destruction ▪ Overgrazing prevalent ▪ Alien species invasion ▪ Kathu Forest of particular value ▪ No recognition of Karst systems ▪ Only Kathu forest and part of Tswalu are protected ▪ Private nature reserves ▪ Presence of medicinal plants 	maintenance of ecosystem health <ul style="list-style-type: none"> ▪ Control of alien invasive species ▪ Conservation of rare and endangered species ▪ Representative areas given formal protection ▪ Sensitive environments given appropriate level of protection 	agriculture & mining <ul style="list-style-type: none"> ▪ Alien Species Invasion ▪ Habitat destruction ▪ Ecological corridor fragmentation ▪ Low carrying potential ▪ Institutional capacity ▪ Unmined resources ▪ Illegal and unsustainable use of natural resources ▪ Impact of microclimate of wind & solar farms ▪ Wildfires 	<ul style="list-style-type: none"> ▪ Traditional medicine trade ▪ Small-scale farmer education and awareness ▪ Further protection for Kathu Forest, & other sensitive environments/species ▪ Stewardship schemes ▪ Karst systems ▪ Declaration of the whole of Tswalu Kalahari Reserve as a nature reserve ▪ Unique/ important local species assembly 	<ul style="list-style-type: none"> ▪ NEM:BA ▪ NEM:PAA ▪ Forest Act ▪ Nature Conservation Ordinance ▪ Provincial Conservation Act (in development)

3 ENVIRONMENTAL MANAGEMENT ZONES

3.1 Environmental framework analysis

At the core of the Environmental Management Framework lies a comparison of the current environmental state of the study area with a future desired state. The comparison provides the basis for an analysis of any environmental convergence or divergence, and gives structure to the required strategic environmental management actions.

The current environmental state is depicted as environmental sensitivity and development maps that are compiled on the basis of information generated during the Status Quo phase of the project. In comparison, the desired end state of various features is described on the basis of the ‘management objectives’ of the previous section. The sensitivity evaluation is compared with a spatial depiction of the development trends for JTGDM (i.e. ‘Desired State’ mapping), in order to identify potential areas of conflict, a comprehensive spatial planning framework, and an environmental management plan. The process is depicted in Figure 14:

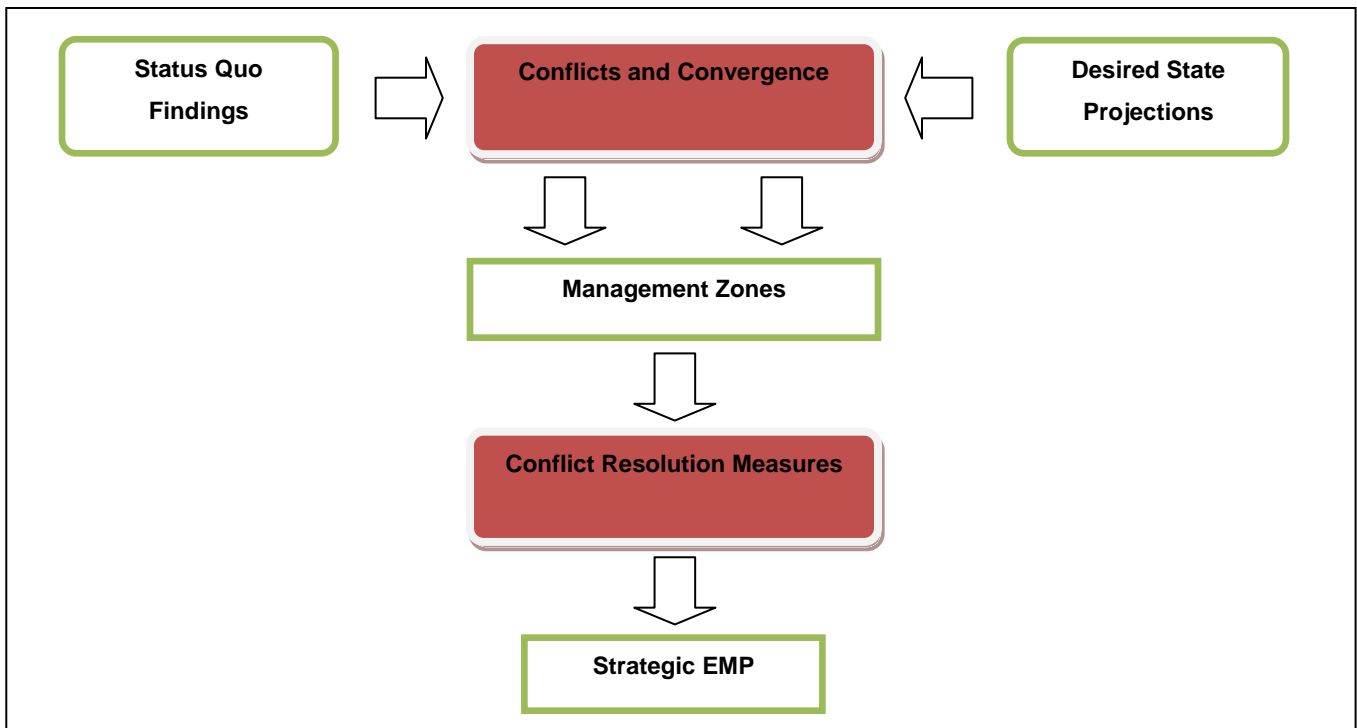


FIGURE 12: THE ENVIRONMENTAL FRAMEWORK AND MANAGEMENT PLAN COMPILATION PROCESS

3.1.1 Environmental Convergence

In order to map distinct environmental management zones, particular environmental resources are identified and prioritised depending on if and where they are supported by other environmental or developmental objectives that came to light during the Sustainability Framework (Desired State) analysis.

In this regard, three maps are produced namely (See ANNEXURE 1: MAPS):

- Map 1: Areas of Environmental Sensitivity and Conservation Value
- Map 2: Areas Unsuitable for Human Habitation
- Map 3: Areas Suitable for Human Habitation

These maps summarise the information gathered as part of the Status Quo and Desired State phases of the project, and indicate where environmental or socio-economic features overlap and form supportive networks.

From the maps, various resource groupings are identified and their context evaluated in order to gain an understanding of where strategic environmental convergence exists in the study area. From the assessment, six resource groups come to the fore. This is shown in Table 6:

TABLE 6: OCCURRENCES OF ENVIRONMENTAL CONVERGENCE

Resource Features	Supportive Strategic Objectives		
Watercourses and wetlands	Groundwater recharge	Maintenance of ecological integrity and natural habitat	Agricultural development
Groundwater	Agricultural activity	Mining Activity	Water supply
Mining resources	Economic foundation	Labour absorption	Infrastructure development
Productive agricultural land	Communal farmland	Agri-processing	Food security
Heritage and tourism	Resource potential	Preservation of existing features	Access off N14
Sensitive terrestrial habitats & biodiversity	Karst systems	Ecosystem service	Climate change resilience
Infrastructure	Access	Services	Investment

When considered in the context provided by the reinforcing elements, it is possible to map some of these features separately as management zones, or combine those with similar environmental functions into larger consolidated zones.

3.1.2 Environmental Conflicts

There are, however, also various conflicts in environmental and spatial dimensions that need to be taken into account in the final determination of control zones. These conflicts are represented on *Map 4: Conflict Areas* and in Table 7. The conflicts themselves are addressed specifically in the SEMP in order to resolve the competition over resources as part of an integrated management guideline.

TABLE 7: ENVIRONMENTAL CONFLICTS

Development Planning	<ul style="list-style-type: none"> Rural sprawl Urban sprawl Mining expansion Inefficient & inequitable urban settlements Under-development & limited provision of services Waste Management 					
Water Resources	<ul style="list-style-type: none"> Encroachment Pollution Subsistence agriculture Demand Reduction in groundwater recharge 	<ul style="list-style-type: none"> Water demand Infrastructure Wetlands destruction Treatment Shortage of drinking water 				
Agriculture & Soils	<ul style="list-style-type: none"> Subsistence agriculture Poor agricultural potential Food security Overgrazing 	<ul style="list-style-type: none"> Encroachment on agricultural resources Local produce limited Limitations on available agricultural land 	<ul style="list-style-type: none"> Cultivation in wetlands Shortage of water for animals 			
Mining	<ul style="list-style-type: none"> Social services provision Pollution 	<ul style="list-style-type: none"> Mining expansion Mining settlements Infrastructure Fragmented and unsustainable settlements 	<ul style="list-style-type: none"> Groundwater pollution Over-exploitation Limited water resources Quality and quantity of resources 	<ul style="list-style-type: none"> Sterilising land Pollution Water resources 		
Tourism & Heritage	<ul style="list-style-type: none"> Budget priorities 	<ul style="list-style-type: none"> Budget priorities Access routes 	<ul style="list-style-type: none"> Kuruman Eye 	<ul style="list-style-type: none"> Undiscovered heritage 	<ul style="list-style-type: none"> Loss of sites Sterilising resources 	
Biodiversity & Conservation	<ul style="list-style-type: none"> Encroachment Alien species 	<ul style="list-style-type: none"> Encroachment Land use conflict Urban sprawl Inappropriate development Informal resource use 	<ul style="list-style-type: none"> Water points 	<ul style="list-style-type: none"> Illegal and legal space competition Land management Alien species Disease and stock control Overgrazing 	<ul style="list-style-type: none"> Direct competition for space Degradation Mining vs. Wetlands (pans) 	<ul style="list-style-type: none"> Access
	Socio-economic Issues	Development Planning	Water Resources	Agriculture & Soils	Mining	Tourism & Heritage

3.2 Differentiating management zones

The identification of Environmental Management Zones is undertaken in consideration of the Environmental Framework Analysis, but specifically with the aim to identify environmental features that are required to (in order of preference):

1. Maintain ecological functioning
2. Maintain livelihoods
3. Maintain environmental quality

3.2.1 Ecological Functioning

The ecological composition and system in the JTGDM has had to evolve and adapt to the harsh climate and lack of water resources. The environmental pressures mean that the systems will have achieved a particular species combination and maximum biomass levels that are sustainable over a long period and resilient in the face of periods of drought. However, this fine balance comes at a cost, as further disturbance can easily disrupt the equilibrium leading to a difficult recovery or spiral into a new state of equilibrium. An altered state would necessarily imply either sub-optimal biomass levels, intensive management requirements or an unsustainable consumption of natural resources. By implication, disturbances to the ecological functioning will also have impacts for the social environment, as changes would occur in the availability and quality of natural resources.

The first Environmental Management Zone group is therefore focused on protecting the natural resources that are critical to the maintenance of the local ecology. These resources include:

- Wetlands and watercourses, in support of fauna species and for groundwater recharge
- Karst systems, in relation to groundwater conservation
- Ridges, as important components of the life cycle of invertebrates and birds

In addition to these features, it is important to maintain the ecological health of important or core biodiversity nodes in the region that serve as feedstock sources for fauna and flora to disperse through the landscape. In JTGDM the most secure nodes are Tswalu Private Nature Reserve and Kathu Forest Reserve, but some of the remaining intact stretches of natural vegetation can also be added as part of an ecological network in the landscape.

3.2.2 Livelihoods

The securing of livelihoods for the residents of JTGDM is closely associated with the limited range of economic opportunities in the region. Most opportunities for employment are associated with the mining industry or the public sector, but many people also rely on various forms of agriculture as livelihood. Current economic activity should therefore be maintained, in as permanent and sustainable a manner as possible, and conditions optimised for the development of new opportunities.

Current mining activities are located along the Sishen – Black Rock spine, and will remain there for the time being. Expansion of the mining areas is possible though, since extensive iron and manganese deposits are still to be exploited. In order to make these opportunities sustainable in terms of livelihoods, attention should be given to issues related to water and energy supply and use, as well as environmental pollution. Social aspects related to quality of employment (e.g. skills development and transfer) should also be addressed.

Employment in the public sector would be associated with government or semi-governmental offices located in all the major towns and villages. These people play a vital role in bringing economic currency into these remote locations. The sustainability of the employment is therefore indirectly related to the creation and maintenance of social facilities and services that will allow local wealth to remain in the area.

Agricultural production in the District will remain limited due to the lack of productive soils and water, but nevertheless serves as means of survival for many people. Optimising the agricultural sector is therefore of critical importance. On a commercial side, viable grazing and game farm areas should be protected from degradation and granted the necessary infrastructural support to develop their sector. The large subsistence farming zones that mainly coincide with the communally owned tribal lands require a different strategy, but are similarly identified as an area with a definable spatial character.

3.2.3 Environmental Quality

In order to ensure that the environment within which the people of the JTGDM live is of acceptable quality, special attention needs to be given to areas where polluting activities are present, human concentrations are located, or where there are features or biophysical processes that contribute or determine the environmental quality.

In this regard, pollution sources are identified as:

- Mine related dust
- Asbestos contamination
- Domestic refuse (litter)
- Industrial waste

These sources are closely associated with either the mines or the urbanised/semi-urbanised areas, and therefore also identify areas of human concentration.

Physical processes that play a role in environmental quality include most sensitive biophysical elements that maintain ecological processes – such as wetlands and karst systems that improve water quality. In terms of important features, specifically socially significant or cultural-heritage features are considered to contribute to environmental value.

A final consideration in this theme is the availability of municipal services. It is fair to expect that where municipal services such as waste removal and electricity provision are available, the environmental quality will be better. For

example, if people have access to electricity they might be less reliant on biomass burning, which leaves more vegetation intact and less smoke in the atmosphere. Proximity to municipal services should therefore also be considered as a determining factor in the delineation of environmental management zones.

3.3 Environmental Management Zones

From the discussion above, a sense is gained of the spatially differentiated zones that will require particular forms of environmental management. The specific zones that are identified are:

1. **Conservation Nodes** - Ridges, groundwater catchments, centre of endemism, natural resource core areas, wetland clusters
2. **Mining Belt** - Active mines, unmined resources, spoil heaps or mine dumps
3. **Agricultural Support** - Viable grazing areas – i.e. potential higher than 21ha/animal unit⁴
4. **Environmental Risks** - Asbestos contamination
5. **Rural** - Generally undeveloped areas with no particular character

These are illustrated on Map 5: Environmental Management Zones.

Other environmental or spatial features are not neglected though, but because of their ubiquitous presence are listed separately with management guidelines that would apply in all the management zones.

⁴ Animal Unit (AU) = 400kg

4 ENVIRONMENTAL MANAGEMENT FRAMEWORK AND STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN

The Strategic Environmental Assessment of section 2 provides an environmental analysis of the JTGDM that highlights the immediate development trends and environmental requirements for the District. Based on this assessment, an environmental framework can be compiled that will guide the development planning and decision making process in future.

The environmental management framework has as its centre environmental management zones or control zones that can be used as geographically based management areas to determine where and how certain development activities should take place. These control zones also inform the compilation of a Strategic Environmental Management Plan or SEMP which details the management actions for each of the zones.

Important to note though, is that the SEMP is intended as a reference that provides the guidance necessary for land use planning and environmental decision making in the study area, but more detailed designs will need to be informed by investigations associated with environmental or town planning authorisation processes.

4.1 Purpose and scope of an SEMP

The actual implementation component of an EMF is the Strategic Environmental Management Plan. This plan is constituted by the guidance that originates from the Status Quo and Desired State analyses, in conjunction with new intervention strategies that are required to achieve a consistent and effective implementation of the management zones.

All environmental management plans aim to provide guidelines that will enhance the positive aspects of a project and prevent undue adverse impacts on the environment. On a strategic level, however, an SEMP needs to guide management planning and decision-making as opposed to specific activities in order to reach certain environmental targets. The objective of the JTGDM SEMP is therefore to provide decision-making criteria and guidance on management activities that will steer the overall development of the JTGDM area towards the identified desired state parameters.

The management plan is therefore focussed on the identified desired state themes, but will identify specific activities that should, or should not, be present in the various management zones:

- Activities that are generally acceptable, and conditions under which they will be deemed acceptable;
- Activities that are incompatible;
- Particular sensitivities that will occur in scattered locations that require acknowledgement, management, development controls and buffer zones; and
- Infrastructural development that is required in order to achieve the Desired State.

4.2 Legal context

According to the EMF Regulations, 2010 (Regulation 4), an Environmental Management Framework must, inter alia,

“(e) state the environmental management priorities of the area;

(f) indicate the kind of developments or land uses that would have a significant impact on those attributes and those that would not;

(g) indicate the kind of developments or land uses that would be undesirable in the area or in specific parts of the area...”

This is given further legitimacy by section 24(2) of NEMA that indicates:

“The Minister, or an MEC with the concurrence of the Minister, may identify...

(b) geographical areas based on environmental attributes, and as specified in spatial development tools adopted in the prescribed manner by the environmental authority, in which specified activities may not commence without environmental authorisation from the competent authority;

(c) geographical areas based on environmental attributes, and specified in spatial development tools adopted in the prescribed manner by the environmental authority, in which specified activities may be excluded from authorisation by the competent authority...

(d) activities contemplated in paragraphs (a) and (b) that may commence without an environmental authorisation, but that must comply with prescribed norms or standards:

Provided that where an activity falls under the jurisdiction of another Minister or MEC, a decision in respect of paragraphs (a) to (d) must be taken after consultation with such other Minister or MEC.”

The geographical areas and spatial development tools referred to in section 24(2) are defined in section 24(3) of NEMA:

“The Minister, or an MEC with the concurrence of the Minister, may compile information and maps that specify the attributes of the environment in particular geographical areas, including the sensitivity, extent, interrelationship and

significance of such attributes which must be taken into account by every competent authority.”

An EMF primarily qualifies as ‘information and maps’ that inform assessments for environmental authorisations, but may be used to inform the Minister or MEC in terms of the identification of ‘geographical areas’ when interpreted or used as ‘spatial development tools’. The requirement for the identification of geographical areas based on environmental attributes is satisfied through the demarcation of various environmental management zones – i.e. areas of particular contiguous sensitivity or land use that become structuring elements in the final management framework and management plan.

4.3 The different tiers of environmental decision-making

Environmental decision-making by authorities involve both day-to-day decisions and determinations of a more strategic nature that need to ‘see the bigger picture’. The SEMP needs to provide guidance for both, and hence is structured in a way that provides principled direction as well as specific guidance.

Principled direction is provided in the form of overall planning for different zones, whilst day-to-day development application decisions (such as EIA or town planning applications) are informed by the “acceptable/not acceptable” development guidance. This dual format is provided for by determining larger spatially determined environmental management zones, but also specific types of land uses or sensitivities that do not necessarily fall within a particular management zone. The Strategic Environmental Management Plan for JTGDM therefore contains two management levels namely universal guidelines and guidelines for the different management zones, yet provides very specific guidance according to the applicable issue or management zone.

The object of guidelines at this level is to have detailed enough information available to put lower level technical staff in a position to decide on straightforward routine applications without the need for in-depth consideration and trade-offs between issues.

4.4 Environmental Control in the Management Zones

The Environmental Management Zones are depicted on Map 5 in ANNEXURE 1: MAPS.



FIGURE 13: LANDSCAPE OUTSIDE OLIFANTSHOEK

4.4.1 Conservation Nodes

4.4.1.1 General management strategy

In terms of conservation planning, a distinction is made between core conservation areas and the network of links between them. For JTGD, the core areas are considered as distinct spatial units that can be managed as environmental management zones, whereas the linkages between them are regarded as elements that will be present in all the management zones and therefore in need of universally applicable guidelines. The assembly of ecologically sensitive core conservation areas therefore consists of non-linear features such as nature reserves, unfragmented areas of primary vegetation, rocky ridges, groundwater recharge areas, wetland clusters and caves.

These core nodes must be protected from degradation and encroachment since they represent the best opportunities for focussed conservation action and (non-consumptive) resource utilisation, and support the most viable populations of species. Dispersal of species and re-colonisation of less resilient areas will be from these cores, and therefore all actions and decisions related to them should be informed by conservation objectives.

The disturbance of soil surfaces must be avoided, as such disturbance will lead to degradation. Thus, the establishment of new roads or tracks, or further negligence of degraded areas must be prevented.

4.4.1.2 *Roles and responsibilities*

TABLE 8: ROLES AND RESPONSIBILITIES FOR THE CONSERVATION NODES

Stakeholder	Responsibility
Conservancies	Conservation plan Land use development control Maintaining biodiversity values
Landowners	Environmental sustainability and responsibility
NC DENC	Technical advice Land use decision-making Implementation of the Bioregional Plan and Conservation Plan areas EIA decision making
Local Authorities	Land use planning and decision-making Implementation of the Bioregional Plan and Conservation Plan areas EIA decision making
Other government departments (e.g. Mining)	Participation in forums

4.4.1.3 *Compatible activities*

- Public and private nature conservation
- Conservancies
- Extensive cattle farming with strict control on environmental impacts and carrying capacities, where the overall there is a net biodiversity gain (stocking rates not to exceed guidelines from agricultural authorities)
- Extensive game farming and eco-tourism operations with strict control on environmental impacts and carrying capacities, where the overall there is a net biodiversity gain (stocking rates equivalent to those set for extensive cattle farming)
- Groundwater extraction at sustainable levels (as per determinations from the Department of Water Affairs)
- Bulk infrastructure authorised through appropriate EIA processes
- Tourism activities, tourism and recreational facilities authorised through appropriate EIA processes

4.4.1.4 *Incompatible activities*

- Cultivation or any other land use that will transform large expanses of natural vegetation or impact on the provision of ecosystem services
- Establishment of settlements or towns (including components thereof) and related infrastructure
- Mining and quarrying that will transform large expanses of natural vegetation or impact on the provision of ecosystem services

- Bulk storage of hazardous substances
- Disposal of waste
- Off-road driving where no tracks exist

4.4.1.5 *Natural resource management*

The establishment of a network of proclaimed nature reserves should be pursued, using the existing hunting farms/lodges as a platform for expansion of protected areas. This must include the declaration of additional protected areas and reserves to ensure all sensitive areas and habitats of ecological importance are preserved. It is also important that reserves and other ecologically sensitive and important habitats are supported within a network of ecological corridors in order to maintain high biodiversity and ecological functioning across the district.

Adherence to the Game Translocation Policy of the Northern Cape Department of Environment and Nature Conservation should be encouraged, in terms of extra-limital species, sustainable carrying capacities, ethical hunting practices, adequate enclosures, etc. Fire management regimes should be implemented that mimic, as closely as practical, the natural fire regimes in terms of frequency, season, intensity and extent, in order to maintain ecological patterns and processes.

Habitats utilized by Red list mammal species should be afforded the necessary protection against activities that will impact negatively on these species. This should include adequate buffer zones to reduce edge effects and direct disturbance, especially on wetlands, ridges and caves.

Habitats utilized by priority species should be identified and sufficient representation thereof across the study area must be appropriately managed to mitigate existing disturbances, as well as proposed future developments, in order to prevent further population decline and range reductions. Similarly, important ecological corridors should be identified and afforded the necessary protection, if they are to sustain patterns and processes.

Collision of birds with overhead power lines should be mitigated by marking problem sections of power lines with appropriate marking devices. The use of pylon structures that pose the least threat to bird species in terms of electrocution must be encouraged and/or enforced.

4.4.2 Mining Belt⁵

4.4.2.1 *General management strategy*

Mining takes place along a spine stretching from Olifantshoek to Avontuur, in accordance with the location of various ore bodies and mineral deposits. It represents the lifeblood of the district, contributing significantly to the GDP and employment of the area, and is of national importance. Mines may consist of subsurface or surface mining activities, but always involve some form of excavation, processing and the discard of waste material. The

⁵ Although the focus of mining activities is the mining belt, the management guidelines apply to any other mining activities in JTGD, irrespective of the management zone in which they are located.

waste can be in the form of tailings (fine processed material), waste rock (unprocessed rock with no ore content) or overburden (soils and vegetative matter removed from the active mining areas).

Mining activities are, however, generally incompatible with most other land-based activities, especially activities that rely on a particular level of quality in the natural or social environment. Mining is also a primary source of strain on ecologically sensitive habitats (e.g. ridges, wetlands, rivers and caves), and sensitive species. This implies that where mining activities are present, or planned, management intervention or control will be required to facilitate the co-existence of the various land uses.

The management requirements for the different activities and waste types therefore differ as well, as detailed in Table 9 for legal mining activities.

TABLE 9: MANAGEMENT REQUIREMENTS FOR MINING ACTIVITIES

		Excavations	Tailings, waste rock, overburden	Water discharge	Weeds & invaders	Sedimentation & erosion
Active		Water use Heavy machinery and vehicles Dust Noise Electricity Ongoing rehabilitation of mined-out areas End-use planning	Runoff Temporary or permanent vegetation Dust Leaching Overburden must be stored for re-use during rehabilitation	Water quality standards Water use licence Groundwater contamination or over-utilisation	Environmental Management Plan & rehabilitation actions	Environmental Management Plan Sediment trapping and erosion control
Not active	Rehabilitated	Monitoring	Permanent vegetation	Groundwater monitoring and pollution containment or treatment programme		Early detection and corrective measures
	Not rehabilitated	Rehabilitation programme & end-use planning	Rehabilitation programme	Groundwater monitoring and pollution containment or treatment programme	Annual follow-up treatment	Sediment traps and erosion control

The legislated tool designed to facilitate the investigation into, and environmental management guidance for, the impacts of mining during and after a mine's operational activities is comprehensive environmental management plans known as Environmental Management Programme Reports (EMPR). It is found that in practice though, EMPRs tend to neglect the full extent of the mining impacts. EMPRs are therefore in need of improvement through community and authority participation in the compilation of the reports, especially with regards to the consideration of spatial frameworks and environmental sensitivities, as well as the compilation of appropriate rehabilitation plans that identify viable end-uses for mines that would be compatible with the surrounding land uses.

Furthermore, an EMPR is only as good as its implementation. Effective monitoring and enforcement of the stipulations of the EMPR (and associated permit conditions) must therefore be present. Stakeholder involvement will be critical since, for example, nearby conservancies or farming communities will be able to monitor and report on mining activities on a more detailed level than any regulatory authority. Proof of compliance with the EMPR, as well as the effectiveness of the EMPR, must be documented and adjusted as required through a detailed monitoring and review process.

The following guidelines should be applied in JTGDM when considering new mining applications:

- New mining or extension of mining activities may not fragment or interrupt designated sensitive (biophysical) areas or corridors that form the basis of a particular ecological resource. The Northern Cape Conservation Planning exercise currently being undertaken must be taken into consideration for any new mining application. Biodiversity offsets can be considered in cases where spatial conflicts exist, but subject to a "like-for-like or better" basis.
- Mining activities may not infringe on the ecological reserve of local water resources
- There should be appropriate ecological buffers between mining activities and sensitive environments such as wetlands and watercourses to ensure that mining does not pose a risk to these ecological resources.
- New mining or extension of mining activities must provide for a rehabilitation and mine closure program to ensure that suitable post-mining activities can take place on the land (e.g. development or indigenous revegetation), with no active erosion, no remnant or ongoing pollution of the surface or groundwater and at least 75% ground cover. That implies that mined areas may not be left as sterile land.
- Mining refers to all of the associated activities with mining, including the transportation of materials and the processing of raw materials, and all such activities must be considered as part and parcel of the overall mining impact and operations. Consequently, these activities must be planned for, designed and located in a manner that does not detrimentally affect other activities in the area that depend on environmental quality or a rural sense of place.

Finally, consideration should be given to the urbanisation that often associates with mining activities. Although it makes development sense to have mine personnel reside close to the mining activities, care should be taken to

ensure the maintenance of a quality environment, free of pollutants, as well as a plan for the post-mining 'operation' of the residential areas.

4.4.2.2 *Roles and responsibilities*

TABLE 10: ROLES AND RESPONSIBILITIES RELATIVE TO MINING ACTIVITIES

Stakeholder	Responsibility
DMR	Mining permits Environmental considerations Permit compliance monitoring and enforcement Rehabilitation at derelict and ownerless mines
Conservancies	Local policing
Mine operators	Compliance with mining best practice, EMPRs, and water use licence conditions
NC DENC	EIA and EMPR evaluations EIA compliance monitoring and enforcement
DWA	Water use policing Ecological Reserve
Local Authorities	Air pollution management and monitoring
DEA	Remediation outside mining areas

4.4.2.3 *Compatible activities*

- Surface and subsurface mining activities
- Residential concentrations and associated services informed by, and in strict compliance with IDP and SDF planning
- Facilities required to reduce the environmental footprint of the mining activities, such as renewable energy generation, water recycling and herbariums

4.4.2.4 *Incompatible activities*

- Residential areas at risk of pollution impacts
- Water abstraction or dewatering that alters the groundwater level
- Deforestation

4.4.2.5 *Natural resource management*

Mining in identified sensitive areas should be discouraged entirely, and all proposed new mining locations must be screened through the formal EIA/EMPR process. Where approvals are granted, adherence to appropriate environmental management plans must be enforced with concurrent rehabilitation rather than rehabilitation at mine closure.

4.4.3 Agricultural Support

4.4.3.1 General management strategy

Despite it not being a lead revenue generator, the agricultural sector in the JTGDM plays a significant role in the maintenance of livelihoods and food security in rural areas. A large portion of the district is used for grazing in the form of communal farming or as game farming, with smaller areas suitable for irrigated cultivation of crops – all despite the harsh climate and limited water supply. The importance of agriculture should therefore not be overlooked, as many people depend on it especially in the tribal areas.

Support can therefore be granted to extensive farming activities through improved access to markets, supplies and offset opportunities, but focus should rather be placed on assistance to subsistence farmers. This can occur in the form of educational programmes, knowledge sharing networks and development of best practice plans that are suited to local needs and climate. It will improve the efficiency of subsistence farming and aid in community upliftment. Improvement of subsistence farming techniques may also lessen the negative impacts on the natural environment, and improve the communities' resilience to climate change impacts. In particular, the efforts of the LandCare programme must continue.

The use of fertiliser and pesticides must comply with relevant standards and guidelines from the DWA, National Department of Agriculture (NDA), Northern Cape Department of Agriculture, Land Reform and Rural Development and NC DENC. Application of agrochemicals has to avoid killing non-target species, bioaccumulation and eutrophication of water resources.

The extension of cultivated lands has to avoid encroachment into priority conservation areas. The untransformed habitats are sensitive environments that need to be conserved, and extension plans or applications must be evaluated accordingly.

4.4.3.2 Roles and responsibilities

TABLE 11: ROLES AND RESPONSIBILITIES IN THE AGRICULTURAL ZONE

Stakeholder	Responsibility
Landowners and farmers	Agricultural production Land care Water conservation Conservation
Municipal town planning departments	Adjudication of town planning applications Adjudication of subdivision proposals
NC Dept. Agriculture, Land Reform & Rural Development	Agricultural support
NC DENC	Environmental management application processes Conservation planning

Stakeholder	Responsibility
DWA	Water oversight
NDA	Agricultural support Subdivision applications
Other government departments (e.g. Mining)	Participation in forums

4.4.3.3 *Compatible activities*

- Grazing at appropriate stocking levels (stocking rates not to exceed guidelines from agricultural authorities)
- Irrigated cultivation (at sustainable abstraction levels as determined by the Department of Water Affairs)
- Agricultural supplies and services, including agri-industrial facilities
- Private residential use associated with farming activities
- Farm worker villages planned in accordance with the IDP and SDF
- Tourism and recreational facilities that are compatible with agricultural activities
- Natural open space/protected areas
- Farm stalls
- Conservancies
- Space intensive activities that will improve livelihoods and food security

4.4.3.4 *Incompatible activities*

- Residential estates
- Urbanisation
- Industrial activity
- Township establishment
- Activities that permanently disturb untransformed natural vegetation
- Activities that degrade the carrying capacity of the land over time

4.4.3.5 *Natural resource management*

Grazing management systems appropriate to the climate and biome are required to prevent further degradation of natural vegetation cover, catchments, river systems and wetlands, and thus prevent further degradation of water resources, ecological corridors and habitat. Rotational camp systems will aid the establishment of sustainable land carrying capacities. Wetlands should also be fenced off where practical or where at particular risk, to prevent grazing and trampling by livestock.

Agricultural practices are also often linked to the introduction, and spread of alien invasive species. Therefore a systematic invasive alien control programme that prioritizes infestations based on habitat sensitivity, potential to spread and emerging weeds, should be implemented at a landscape scale.

The use of residual biocides and insecticides to control nuisance animals must be reduced through education and extension. This will aid with improving water and soil quality.

4.4.4 Environmental Risks

4.4.4.1 General management strategy

Severe risks of terminal disease are present in areas contaminated with discarded asbestos ore or materials. Following the boom of the asbestos industry a realisation of the health risks collapsed the market, and as with all other asbestos areas in the world, the mines in the Northern Cape had to close their doors. This left many miners and mining communities destitute, but even worse, with an environment lethally contaminated by discarded asbestos material.

The problem of contamination is centred on derelict and abandoned mines, processing facilities and waste sites, but extends to improper rehabilitation efforts, asbestos used as structural materials in buildings, general environmental contamination through wind-driven asbestos dust and the pollution that accumulated along transportation routes.

Management of the problem therefore needs to tackle the entire range of issues, and draw in the necessary resources from organs of state, mining companies, restitution funds and other representative entities.

Management and rehabilitation of old asbestos mines can follow the same guidelines prescribed for other mining activities in section 4.4.2, but more attention is warranted in the areas outside the mines where responsibilities and mandates are less clearly defined. In these areas, the Constitution needs to be upheld and a healthy living environment ensured for people. This implies that contamination must be cleared, or alternatively people removed from the risks.

In terms of the former, contaminated areas need to be cleared, and asbestos structures removed. Appropriate demolition and collection methods must be employed, as must the correct transportation standards (SANS 10228 & 10229) and final disposal (as per requirements of the Department of Water Affairs).

All activities related to asbestos handling need to comply with the Asbestos Regulations (Regulations for the Prohibition of the Use, Manufacturing, Import and Export of Asbestos and Asbestos Containing Materials, 2007). The regulations prohibit the acquisition, processing, packaging, repackaging, import or export of asbestos and asbestos containing material other than in certain identified exceptions. The exceptions allow for the phase out of the use of asbestos within a specific timeframe, and address:

- Asbestos importation for research purposes
- Trade in an “Identified Product” – if registered and operating under an approved phase out plan
- Products where alternatives have not been identified e.g. - heat and arc resistant electrical insulation boards, acetylene gas cylinders, gaskets, seals and insulation materials which contain asbestos
- Asbestos in transit through the country without repackaging

- Asbestos waste receive from SADC countries for safe disposal

In cases where contamination is too extensive to clear, relocation of communities might be required. This should, however, be considered a last resort, and be done on the basis of an appropriate social impact assessment and community involvement. In the interim though, support will need to be provided to primary health care facilities.

4.4.4.2 Roles and responsibilities

TABLE 12: ROLES AND RESPONSIBILITIES IN THE ENVIRONMENTAL RISK ZONE

Stakeholder	Responsibility
Mining companies	Rehabilitation and restitution
DMR	Rehabilitation action, monitoring and enforcement
NC DENC	Awareness and coordination of actions
Dept of Education	Decontamination, closure and relocation of contaminated school sites
Dept of Water Affairs	Waste disposal
Dept of Health	Primary health care facilities
Permit holders	Compliance with Asbestos Regulations and Phase-out plan
Asbestos Relief Trust	Compensation of asbestos affected persons

4.4.4.3 Compatible activities

- Rehabilitation and decontamination
- Mine closure
- Conservation

4.4.4.4 Incompatible activities

- Any residential or ancillary land uses
- Activities that contribute to disturbance of contaminated surfaces other than rehabilitation actions
- New asbestos mining

4.4.4.5 Natural resource management

The asbestos deposits, and therefore most of the contamination, are located along the so-called Asbestos Hills – the line of ridges from Kuruman to Heuningvlei. These areas are generally also considered to be hotspots for endemic vegetation species, and therefore of conservation value. This apparent conflict should, however, be seen as an opportunity for complete protection and conservation of the natural habitats in the hills. Apart from rehabilitation of the asbestos polluted areas, the hills should be left undeveloped and generally undisturbed in order not to activate any further asbestos fibres. This will reduce the risks from asbestos contamination and at the same time create opportunities for nature based recreation in the hills, focussed on the presence of unique succulent species associated with the Griqualand West Centre of Endemism.

4.4.5 Rural Zone

4.4.5.1 General management strategy

The rural zone is characterised by low density rural settlements, extensive undeveloped and generally unproductive grazing or natural veld, poor access to basic infrastructure and few opportunities for economic development. It implies that these areas must be used for activities that are space dependent rather than resource intensive, or alternatively dependent on the characteristics of the dry habitat located here.

What should not be disregarded though is the contribution of this zone to the overall ecological functioning of the JTGDM area. The rural zone contains many watercourses, wetlands and endemic vegetation fragments, and therefore contributes to groundwater recharge and the resilience of all adjoining habitats.

Development in the zone may therefore continue as long as development activities do not degrade natural areas.

4.4.5.2 Roles and responsibilities

TABLE 13: ROLES AND RESPONSIBILITIES IN THE RURAL ZONE

Stakeholder	Responsibility
Landowners and farmers	Land care Water conservation Conservation
Municipal town planning departments	Adjudication of town planning applications Adjudication of subdivision proposals
NC Dept. Agriculture, Land Reform & Rural Development	LandCare
NC DENC	Environmental management application processes Conservation planning
DWA	Water oversight
NDA	Agricultural support Subdivision applications
Other government departments (e.g. Mining)	Participation in forums

4.4.5.3 Compatible activities

- Grazing at appropriate stocking levels (stocking rates not to exceed guidelines from agricultural authorities)
- Agricultural supplies and services, including agri-industrial facilities
- Private residential use associated with farming activities
- Tourism and recreational facilities that are compatible with agricultural activities
- Natural open space/protected areas

- Farm stalls
- Conservancies
- Conservation
- Renewable energy generation facilities

4.4.5.4 *Incompatible activities*

- Irrigated cultivation
- Activities that permanently disturb untransformed natural vegetation
- Activities that degrade the carrying capacity of the land over time

4.4.5.5 *Natural resource management*

Natural resources management needs to focus on maintaining the overall integrity of the ecological system, similar to the Agricultural Support Zone and Conservation Nodes. Therefore, grazing must be managed to prevent degradation of natural vegetation cover, catchments, river systems and wetlands. Wetlands in particular must be protected from any form of disturbance.

A systematic invasive alien control programme must be implemented.

4.5 Specific Environmental Management focus areas

4.5.1 Built-up Areas

4.5.1.1 *General management*

Development planning is closely tied to the socio-economic state of the region, and hence should take cognisance of the inherent limitations of the climate, the landscape character, the conflict over resources (e.g. mining versus other surface developments) and the relative economic opportunities and advantages of the region. Other environmental constraints on development that must be taken into account include:

- Poor soils and lack of water resources north of the N14
- Low carrying capacity of the natural vegetation
- Importance of the wetlands of the region
- Spatial extent making service provision difficult
- Spatially fixed nature of mineral resources
- Presence of dolomitic areas in the South-East

It is clear that efforts in environmental management will need to be directed towards improving the livelihoods of the poor and unemployed members of the community. Poverty is prevalent, and many people live a subsistence existence, especially in the Joe Morolong area. In these areas, efforts should be directed towards using sustainable environmental management practices to encourage rural and semi-urbanised development that does not reduce the livelihood that can be derived from the natural resource base – i.e. at sustainable levels or

focussing on renewable resources. In addition, it should facilitate resource sharing through the development of strategic areas, and access to these nodes of infrastructure and services.

Densification of existing towns and mining settlements will play a strong role in the improvement of living conditions within the district by increasing infrastructure, service provision and access to these resources. Consolidation of urban settlements and mining compounds can serve the interests of the wider community by providing more effective and efficient access to social and economic services. Improvements in access to basic services will reduce pressures on natural resources such as the use of wood for fuel. Furthermore, the availability of electricity, education and communication networks, water and transportation will create new, and optimise existing, opportunities for economic development and entrepreneurship.

As stipulated in the 2006/2007 SDF, efforts need to focus on the creation of opportunities for life long learning, improving the skills of the labour force to increase productivity, and increasing access to knowledge and information in order to enable the community to become independent and ensure economic development and growth. Therefore, the provision of education centres and programmes, and increased access to existing facilities plays an important role in upliftment of the community. The densification of existing urban nodes, and urbanisation of surrounding rural areas will facilitate in this regard. The development of the entire area should essentially adopt the principles of sustainable human settlements, as set out in *Breaking New Ground: A Comprehensive Plan for the Development of Sustainable Human Settlements*, to counter the sparsely populated and under-developed areas particularly in the Joe Morolong municipality.

Densification will also address the threat of urban sprawl in the District, and remove pressure on natural resources. Settlements should be managed in such a way to promote efficiency and liveability in the context of infrastructure provision (including the standard of infrastructure), road networks, traffic generation and environmental implications, and counter ad-hoc low intensity and inefficient sprawling development.

Informal settlement development in the district should as far as possible be restricted. Land invasions should be monitored and addressed before settlements become permanent. The focus should therefore be on containing informal development around the existing formal towns and mining settlements, and preventing the establishment of *ad-hoc*, dispersed informal settlements. In this manner, the informal townships have the best chance of eventual upgrading, service delivery and ultimately formalisation.

In-situ upgrading should only take place where these informal settlements are part of or adjacent to an existing urban environment. Families living in informal settlements located in rural areas should be relocated to housing developments in either urban areas or defined rural settlements. All informal settlements in environmentally sensitive areas or located in hazardous areas (floodlines, dolomitic areas etc.) should be relocated.

Within JTGDM there is very little potential, if any, for further development of agriculture but mining, tourism and manufacturing could have growth opportunities. There is a great availability of workforce for the major economic opportunities in mining and manufacturing/processing, as well as investment in infrastructure and services that will

reduce the overall cost of the services over time – i.e. renewable energy and ecological infrastructure. Therefore, responsible development in these areas is encouraged, taking into account all aspects of land-use and resources in the District.

4.5.1.2 Basic services

The development of the area should strive for the following development standards:

- All households to have access to electricity;
- All households to have access to clean potable water;
- Existing infrastructure maintained and current infrastructure upgraded where needed; and
- Storm water drainage systems and flood management is adequate, and is upgraded where necessary – also in rural areas.

Attaining the standards will only be possible though if pre-emptive planning is done rather than reactive *ad hoc* installations and maintenance of services infrastructure. Planning of services would necessarily have to involve load forecasts, supply capacity, servitude planning and maintenance requirement projections. New developments can then be required to contribute to an integrated services network that takes into full account the sensitivities of, and opportunities offered by the natural environment.

Rural areas should not be considered less eligible for services than urban areas, but should be serviced in a way that supports rural living and economic development (land care and food security) rather than progressive urbanisation. For example, subsistence farmers should be supported in their particular economic sector through the provision of farming support as part of a suite of basic services.

Furthermore, in order to maintain the sustainability and social-ecological resilience of urban nodes, serious consideration should be given to the following:

- Alternative, renewable sources of energy must be explored, especially on a microgeneration scale
- Local labour and community involvement must be optimised to upgrade, maintain, and implement infrastructure
- Groundwater quality must be monitored as an early warning system and input into a water resource management plan
- Communities should be educated about responsible water and energy usage

Environmental quality from an environmental health perspective will be directly related to the quality of waste management and pollution control activities of the municipality. The following standards should be applied:

- All households must be incorporated into formal waste removal systems for the different types of waste generated, taking into account the context of communities

- Communities are informed and educated about waste management, recycling and the potential impacts on the environment and tourism
- All illegal litter dumps must be cleared
- Landfill sites need to be managed according to applicable standards and permit requirements
- Air quality should be monitored and managed in high priority areas

All affected regulatory authorities must apply the principles stated above in the execution of their regulatory duties. This includes EIA, water management, land use and mining decision-making. Monitoring bodies must execute their duties in respect of both ecological functioning and socio-economic development. Coupled to this would be information management that facilitates decision-making.

4.5.1.3 *Natural resources*

Urbanization should take into account the distribution of sensitive biodiversity and the location of ecological corridors in order to ensure the continued survival of endemic species, and the persistence of key ecological drivers such as fire regimes and large mammal herbivory. Urbanization should therefore follow a structured path focusing on the expansion of existing nodes rather than scattered development across the landscape that leads to transformation and fragmentation of habitats and disruption of ecological processes, such as dispersal, pollination and migration.

It is important that urban development makes provision for the protection of an urban open space system that will ensure the continued delivery of ecosystem services. This implies that urban functions, facilities and infrastructure need to be designed in consideration of both the impact of infrastructure development on biodiversity, and the potential benefits or services that are derived from a functioning biodiverse ecosystem. In this regard, care should be taken when planning and formulating spatial development frameworks, integrated transportation plans, stormwater management infrastructure and fragmentary linear infrastructure. In every project, consideration should be given to the potential for 'green' infrastructure to replace traditional 'hard engineering' options, like using vegetated swales instead of stormwater culverts.

In order to maintain and optimise services that may be gained from naturally functioning urban ecosystems, urban densification needs to avoid encroachment or impacts on natural features that will result in progressive degradation of the ecological systems. By implication, urban design must provide for adequate buffer areas, the protection of critical open space areas, the control of urban by-products entering the natural system, as well as design and management strategies for open spaces that accommodate urban impacts. Open spaces must be granted a status of urban land use equal to any other 'typical' urban function.

Natural open spaces will be considered separate from park areas with a social function. Although the two may intersect and overlap, the absolute size provision must be calculated separately. I.e. social space must be provided at a ratio of 2 ha per 1000 people or better, in addition to the natural open spaces required for ecological functioning, even if the two overlap.

4.5.2 Heritage

Heritage artefacts are expected to be scattered throughout the region, based on the distribution of known heritage sites and the generally low level of disturbance of the landscape. In fact, the McGregor Museum in Kimberley estimates that only about one percent of the heritage resources of the district is currently known.

Of the best known sites, the Wonderwerk cave archaeological site and Kuruman Mission stand out. Wonderwerk Cave was gazetted as a National Heritage Site in 2010, and is on South Africa's Tentative List for World Heritage Inscription with a nomination document expected to be submitted to UNESCO within the next few years. World Heritage status would entail the setting up of a buffer zone around the site where land use would need to conform to international heritage standards (e.g. no mining).



FIGURE 14: EXCAVATIONS IN THE WONDERWERK CAVE

The Moffat Mission site at Seodin where the mission church and other structures are preserved and still in use, along with the substantial and nationally significant collection of heritage objects preserved at the Moffat Mission needs to be placed on the national register of heritage objects in order to afford it proper recognition and protection.

Other, older heritage sites are also known – such as the stone age artefacts in and around the Kathu Forest, and the spectacular stone kraal assembly at Kiangkop.



FIGURE 15: KIANGKOP

These, and any other heritage sites, should be assessed as National or World Heritage sites. In the mean time, the JTGDGM should impose buffer zones around heritage and cultural sites, to prevent or limit potentially harmful activities in the proximity of the sites.

Information concerning heritage resources has been generated by a range of organizations and individuals and exists in various formats such as maps, documents and images (both analogue and digital). In some cases the information may not be complete and may not conform to any standard in terms of descriptive fields, significance rating, grading, etc. The information, however, needs to be better consolidated, and further information added on lesser known heritage artefacts and sites in the district. A Heritage Resources Inventory for JTGDGM, as a sub-set of a Northern Cape Heritage Resources Inventory should be designed in a manner that will enable its compatibility with databases developed as part of the recording process for National Estate of heritage resources currently being undertaken by SAHRA.

The fact that large parts of this district are rich in minerals means that the heritage, which is a non-replaceable resource, is particularly under threat. Therefore urgency surrounds this matter and it is considered essential that the relevant department/s of government should provide infrastructure and personnel to carry out the necessary inventory and database management tasks.

4.5.3 Universally present biophysical sensitivity

4.5.3.1 General description

Particular sensitivities that require acknowledgement, management, development controls and buffer zones, and that do not necessarily conform to the characterisation of the management zone where they are located, will occur in scattered locations. For example, in all the zones, locations of specific sensitive or endangered fauna & flora or habitats would require appropriate buffer areas.

Sensitive environmental elements, namely pristine grasslands, topographic diversity, watercourses, wetlands, karst systems (caves), migration corridors and biodiversity enclaves will always remain the lifeblood of a region. They represent the main anchors for tourism development in the rural areas, a municipal safety net for the urbanised zones, and generally speaking, an important component of social well-being. It is therefore necessary to identify, preserve and conserve both natural core areas as well as buffer areas required to maintain these core areas as functional units during periods of stress or as a result of development encroachment. The buffers will reduce the total direct impact of development activities on sensitive environments, and represent migration corridors through the landscape that will increase the resilience of islands of biodiversity.

Ongoing urbanisation will require intact ecological systems for their role in providing ecosystem services. These services include stormwater management, water purification, groundwater recharge, pest control, micro-climatic control, pollination, etc.

It is therefore necessary to identify and maintain sensitive environments as a functional ecological system. This implies the conservation and protection of inherently sensitive habitats such as ridges, wetlands and river systems, but also large unfragmented and untransformed grasslands, migration corridors between sensitive areas, and locations where rare or endangered species are known to be present. Where necessary, these areas will need buffers around them that can protect them from the negative influences of adjacent land uses.

Additionally, mitigation measures may be employed that further reduce the impacts of development on sensitive environments. For example, development densities may be reduced through retaining or planting vegetation in-between structures and along linear infrastructure to serve as a ‘softening’ agent and emergency habitat to increase the resilience of the natural fauna & flora. Care must be exercised to prevent weeds and invasive species from replacing critical primary vegetation. ‘Re’-vegetation with indigenous plants that offer food or shelter to sensitive species is recommended. Clustering of development features is always a good practice, as it serves to increase the total size of remaining unfragmented vegetation units.

TABLE 14: STAKEHOLDERS AND RESPONSIBILITIES IN SENSITIVE ENVIRONMENTS

<i>Stakeholder</i>	<i>Responsibility</i>
NC DENC	Technical guidance EIA evaluations

<i>Stakeholder</i>	<i>Responsibility</i>
<i>Local Authorities</i>	Development applications Spatial planning
<i>DWA</i>	Technical guidance Water use licences
<i>DME</i>	EIA evaluations Best practice
<i>Utilities</i>	Route alignments Construction and operational best practice

4.5.3.2 *Systematic biodiversity conservation*

Systematic biodiversity assessments provide guidance on the relative importance of sensitive and critical biodiversity features, and guidelines on how to prioritise conservation initiatives. The development of such a conservation planning exercise commenced at the same time as the development of this EMF, and it is hoped that the information and guidance of the EMF can serve to inform the biodiversity planning exercise that will conclude some time after the conclusion of the EMF. Once the conservation priorities have been identified by the biodiversity planning, they need to be applied as the foundation of the environmental management system, in order to prevent detrimental encroachment and impacts from developments and land uses.

In general, the biodiversity planning needs to consider the following components of a conservation plan:

Core areas:

The core areas consist of the critically sensitive environments such as remaining large areas of pristine vegetation (larger than 5ha, irrespective of property boundaries), rocky ridges and outcrops, watercourses and wetlands.

Buffer zones:

Buffer areas are transitional zones on the outside of the core areas that are required to maintain the ecological functioning of the cores. Different buffer requirements apply to the various environmental states present as a result of the differentiated nature of development pressure and habitat diversity.

Biodiversity corridors:

Maintaining corridors that ensure habitat connectivity and matrix permeability (the ability for species to migrate through the network and/or (re)populate new parts thereof) will translate into a wide diversity of species and ecosystem structures. The diversity grants the overall ecological system the ability to absorb or adjust to disturbances such as climate change or increased cyclicity of water availability due to the increased width of the

ecosystem 'safety net'. Ideally, corridors should be 7km wide and consist of natural vegetation in order to ensure long-term, large scale biological movement (Ferrar & Lötter, 2007).

Obstructions to natural species migrations, especially in-stream barriers, must be removed or improved in a manner that restores migratory routes for sensitive species or species with high ecological value.

4.5.4 Water resources

4.5.4.1 General management

Water bodies in the area can be considered as another sensitive resource upon which much of the region depends. The areas to avoid, or carefully plan for, include: groundwater recharge zones (Korannaberg, wetlands, dolomitic areas), ecological corridors and core/representative habitats, and agricultural land.

The pollution of water bodies and in particular wetlands, is often related to agricultural practices and industrial practices, and can be related to the following:

- Salinisation, nitrification and chemical pollution from agriculture
- Inadequate waste water treatment
- Mining effluent and untreated return flows
- Dewatering and Acid Mine Drainage
- Leaching or pollution from refuse dumping and inadequate land fill practise
- Urban effluent return flow (storm water)

Water management zones should establish conservation, protection and rehabilitation of water bodies such as wetlands, river systems and groundwater. This will need to be initiated by an integrative approach to water use management, as this resource is utilised by and impacted by almost all sectors. Conservation planning should include the identification of the optimal spatial arrangement of corridors, buffers and "stepping stones" that will promote the conservation of water resources, ecological corridors and habitat, and the ecological processes associated with them. The rehabilitation and conservation of these sensitive habitats will ultimately aid, and be strongly linked to ecosystem rehabilitation and maintenance, improvement of land capacity, and optimal groundwater recharge.

4.5.4.2 Management measures for wetlands and watercourses

The management of all watercourses should:

- Control development within the riparian zone;
- Improve solid waste facilities and educate people on the impacts of littering;
- Stabilize bank erosion;
- Identify and control sources of pollution;
- Identify and find means to conserve wetlands needing protection;
- Remove alien vegetation;

- Maintain ecological corridors for aquatic and non-aquatic species; and
- Facilitate public access.

These measures should ideally be applied in a holistic, integrated manner, through means of an integrated catchment management strategy. Such an approach recognises that both rural and urban components and development patterns contributes to the maintenance or degradation of riverine environments. It can therefore find sustainable catchment management solutions with natural and built systems considered as one integrated system.

Additional conditions relating to developments within various floodline zones that should be imposed are listed in Table 15. As a rule of thumb, no structure should be allowed within 150m of any watercourse or dam, except for water management purposes.

Water management structures such as dams, weirs or canals must be designed with the requirement that ecological function and biodiversity corridors along the watercourses be maintained.

TABLE 15: DEVELOPMENT CONTROLS FOR RIPARIAN ZONES

<i>Riparian Zone</i>	<i>Development controls</i>
<i>Within the riparian buffer zone</i>	Only permeable fencing, attenuation ponds
<i>50 yr to 100 yr</i>	No structure causing a loss of flood storage, no fill, berms or dykes, no structure that is not designed to applicable engineering standards, no impermeable roads or parking areas, no facility that poses a risk to water quality, no agricultural activity which results in destabilisation of groundcover or poses risks to water quality
<i>20 yr to 50 yr</i>	No permanent structures except bridge supports, only temporary structures not interfering with the functioning of ecological corridors or floodplains, no parking or roads
<i>10 to 20 yr</i>	Only ground level modifications that do not reduce the permeability of the floodplain soils or interfere the functioning of ecological corridors
<i>Below 10 yr</i>	Only approved water abstraction facilities, approved landscaping, or approved control erosion structures

Wetlands are particularly important in terms of biodiversity conservation and water resource management. All wetlands therefore deserve protection from detrimental impacts through the application of suitable buffer areas.

4.6 Summary of the SEMP

TABLE 16: SEMP SUMMARY TABLE

<i>Management Zones</i>					
	<i>General management</i>	<i>Compatible land uses</i>	<i>Incompatible land uses</i>	<i>Natural resource management</i>	<i>Actions required</i>
<i>Conservation Nodes</i>	<ul style="list-style-type: none"> - Protect core nodes - Avoid degradation 	<ul style="list-style-type: none"> - Public and private nature conservation - Conservancies - Sustainable extensive cattle farming - Sustainable extensive game farming - Sustainable groundwater extraction - Bulk infrastructure authorised through appropriate EIA processes - Tourism activities, tourism and recreational facilities 	<ul style="list-style-type: none"> - Cultivation or any other land use that will transform large expanses of natural vegetation or impact on the provision of ecosystem services - Establishment of settlements or towns - Mining and quarrying - Bulk storage of hazardous substances - Disposal of waste - Off-road driving where no tracks exist 	<ul style="list-style-type: none"> - Protected areas expansion - Maintain ecological corridors - Veld management (fire, carrying capacity, fencing, etc.) - Buffer zones - Safe powerlines 	<ul style="list-style-type: none"> - Declaration of further protected areas - Conservation Planning - Veld management
<i>Mining Belt</i>	<ul style="list-style-type: none"> - Minimise disturbance and pressures on sensitive features - Reduce dependency on limited resources (energy, water, waste) - Rehabilitation - EIA/EMPR - Stakeholder participation - Monitoring & Reporting - Enforcement - Sustainable human settlement 	<ul style="list-style-type: none"> - Surface and subsurface mining activities - Residential concentrations and associated services - Facilities required to reduce the environmental footprint of the mining activities, such as renewable energy generation, water recycling and herbariums 	<ul style="list-style-type: none"> - Residential areas at risk of pollution impacts - Water abstraction or dewatering that alters the groundwater level - Deforestation 	<ul style="list-style-type: none"> - Maintain ecological network - Protect ecological reserve (water) 	<ul style="list-style-type: none"> - Disclosure - Monitoring & Reporting - Enforcement
<i>Agricultural Support</i>	<ul style="list-style-type: none"> - Focus on food security - Stock health - LandCare - Farmer education - Extension plans in accordance with EMF Zones 	<ul style="list-style-type: none"> - Grazing at appropriate stocking levels - Irrigated cultivation (at sustainable abstraction levels) - Agricultural supplies and services, including agri-industrial facilities - Private residential use associated with farming activities 	<ul style="list-style-type: none"> - Residential estates - Urbanisation - Industrial activity - Township establishment - Activities that permanently disturb untransformed natural vegetation - Activities that degrade the 	<ul style="list-style-type: none"> - Veld management in communal areas - Control over agri-chemicals - Fencing and rotational grazing - Cultivation support - Protection for 	<ul style="list-style-type: none"> - LandCare - Development of agri-processing facilities

Draft Environmental Management Framework for John Taolo Gaetsewe District Municipality

Management Zones					
	General management	Compatible land uses	Incompatible land uses	Natural resource management	Actions required
		<ul style="list-style-type: none"> - Farm worker villages - Tourism and recreational facilities that are compatible with agricultural activities - Natural open space/protected areas - Farm stalls - Conservancies 	<ul style="list-style-type: none"> - carrying capacity of the land over time 	<ul style="list-style-type: none"> - wetlands 	
Environmental Risks	<ul style="list-style-type: none"> - Mine closure and rehabilitation programmes - Decontamination - Appropriate safety for workers - Compliance with Asbestos Regulations - Relocation if necessary 	<ul style="list-style-type: none"> - Rehabilitation and decontamination - Mine closure - Conservation 	<ul style="list-style-type: none"> - Any residential or ancillary land uses - Activities that contribute to disturbance of contaminated surfaces other than rehabilitation actions - New asbestos mining 	<ul style="list-style-type: none"> - Prevent surface disturbances - Protect asbestos hills system 	<ul style="list-style-type: none"> - Rehabilitation - Health care - Restitution claims and support
Rural Zone	<ul style="list-style-type: none"> - Wetland management - Protection against degradation 	<ul style="list-style-type: none"> - Grazing at appropriate stocking levels - Agricultural supplies and services, including agri-industrial facilities - Private residential use associated with farming activities - Tourism and recreational facilities that are compatible with agricultural activities - Natural open space/protected areas - Farm stalls - Conservancies - Conservation - Renewable energy generation facilities 	<ul style="list-style-type: none"> - Irrigated cultivation - Activities that permanently disturb untransformed natural vegetation - Activities that degrade the carrying capacity of the land over time 	<ul style="list-style-type: none"> - Veld management (esp. i.t.o. wind erosion and livestock impacts) - Protection of wetlands - Management of alien invasives 	<ul style="list-style-type: none"> - Awareness and monitoring

Universal Features				
	Relevant Features	Resource Constraints	Management Objectives	Management Actions
Built-up	<ul style="list-style-type: none"> - Existing towns - Mining settlements 	<ul style="list-style-type: none"> - Poor soils and lack of water resources north 	<ul style="list-style-type: none"> - Densification - Development of skills & learning 	<ul style="list-style-type: none"> - Renewable energy supply through microgeneration

Draft Environmental Management Framework for John Taolo Gaetsewe District Municipality

Universal Features				
	Relevant Features	Resource Constraints	Management Objectives	Management Actions
Areas	<ul style="list-style-type: none"> - Rural concentrations 	<ul style="list-style-type: none"> - of the N14 - Low carrying capacity of the natural vegetation - Importance of the wetlands of the region - Spatial extent making service provision difficult - Spatially fixed nature of mineral resources - Spatially fixed nature of biodiversity (conservation) resources - Presence of dolomitic areas in the South-East 	<ul style="list-style-type: none"> - opportunities - Rural development based on rural living and economic development (land care and food security) rather than progressive urbanisation - Local labour and community involvement 	<ul style="list-style-type: none"> - Groundwater quality monitoring as part of a water resource management plan - Community education on responsible water and energy usage - Waste management - Protection of an urban open space system - Consider the use of 'green' infrastructure to replace traditional 'hard engineering' options - Urban design to provide for buffer areas, protection of open space areas, control of urban by-products (pollution), and management strategies - Social space must be provided at a ratio of 2 ha per 1000 people or better, in addition to the natural open spaces required for ecological functioning, even if the two overlap
Heritage	<ul style="list-style-type: none"> - Kiangkop - Moffat mission - Wonderwerk - Kathu forest stone age sites - Other features (known and unknown) 	<ul style="list-style-type: none"> - Lack of proper record - Conservation and preservation action and funding - Undiscovered heritage resources 	<ul style="list-style-type: none"> - Proper record of sites - Funding and preservation action on par with rest of the country - Progressive recording of undiscovered resources 	<ul style="list-style-type: none"> - Heritage Resources Inventory - Buffer zones around heritage and cultural sites - Committed effort to establishing World Heritage or alternative status and protection
Biodiversity	<ul style="list-style-type: none"> - Pristine grasslands - Topographic diversity (ridges, valleys) - Watercourses, wetlands - Karst systems (caves) - Migration corridors and biodiversity enclaves 	<ul style="list-style-type: none"> - Threats from invasive alien plants - Low carrying capacity - Fragmentation and transformation 	<ul style="list-style-type: none"> - Conservation and protection of inherently sensitive habitats and large unfragmented and untransformed grasslands, migration corridors between sensitive areas, and locations where rare or endangered species are known to be present - Appropriate buffers around sensitivities 	<ul style="list-style-type: none"> - Systematic biodiversity assessments based on core areas, buffers and corridors. - Obstructions to natural species migrations, like in-stream barriers, must be removed or improved
Water Resources	<ul style="list-style-type: none"> - The areas to avoid, or carefully plan for, include: groundwater recharge zones (Korannaberg, wetlands, dolomitic areas), ecological corridors and 	<ul style="list-style-type: none"> - Salinisation, nitrification and chemical pollution from agriculture 	<ul style="list-style-type: none"> - Ecosystem rehabilitation and maintenance - Improve land capacity - Groundwater recharge 	<ul style="list-style-type: none"> - Control development within the riparian zone; - Improve solid waste facilities and educate people on the impacts of

<i>Universal Features</i>				
	Relevant Features	Resource Constraints	Management Objectives	Management Actions
	core/representative habitats, and agricultural land	<ul style="list-style-type: none"> - Inadequate waste water treatment - Mining effluent and untreated return flows - Dewatering and Acid Mine Drainage - Leaching or pollution from refuse dumping and inadequate land fill practise - Urban effluent return flow (storm water) 		<ul style="list-style-type: none"> littering; - Stabilize bank erosion; - Identify and control sources of pollution; - Identify and find means to conserve wetlands needing protection; - Remove alien vegetation; - Maintain ecological corridors for aquatic and non-aquatic species; and - Facilitate public access

4.7 Environmental Impact Assessments

As indicated, environmental management frameworks can be used as 'geographical areas' or as frameworks by themselves to customise environmental impact assessment regulations applicable to particular areas or zones.

Once adopted, the EMF has to inform day-to-day land development applications, including the review of EIA applications by relevant authorities. However, the management zones of an EMF can also be considered as 'geographical areas' with specific environmental regulation and controls applicable exclusively to these areas. Effect can either be given to the controls through inclusion in the EIA 'listed activities' of Listing Notice 3 of the EIA Regulations, 2010, or through separate declaration of the environmental management zones as geographical areas with special management controls as contemplated in Sections 24(2) and 24A of NEMA.

4.8 Adoption, implementation and application

Following approval of the EMF by the NC DENC, it must be submitted to the MEC tasked with environmental affairs in the Northern Cape, who may then adopt it with concurrence from the National Minister of Water and Environmental Affairs. The adoption of the EMF must be made public through the publication of a notice in the Government Gazette, following which implementation and monitored thereof can follow.

Adoption will impose the obligation to consider the guidance from the EMF during EIA evaluation processes on the decision-making authorities.

Regular revision of EMFs is encouraged by the Regulations. In order to keep the revision of the environmental framework and planning relevant, it is suggested that the EMF be revised according to a schedule that will facilitate environmental inputs into the IDP and SDF planning cycles. Also, with the conservation planning process underway for the province, the final conservation framework can be used to refine the environmental management zones identified in the EMF (and vice versa).

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6 ANNEXURE 1: MAPS