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Environmental Management Framework for John Taolo Gaetsewe District Municipality

7 March, 2011

Status Quo Analysis

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Cover page photo: Kuruman Eye

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ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immunodeficiency Syndrome
BP	Before Present (when used in the context of heritage resources)
CASP	Comprehensive Agricultural Support Programme
DEA	Department of Environmental Affairs
DMA	District Management Area
DWAF	Department of Water Affairs and Forestry (refer to DWA)
DWEA	Department of Water and Environmental Affairs (refer to DEA)
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan or Programme
ENPAT	Environmental Potential Atlas
GDP	Gross Domestic Product
GIS	Geographic Information System
HIV	Human Immunodeficiency Virus
I&AP	Interested & Affected Parties
IDP	Integrated Development Plan
IUCN	International Union for the Conservation of Nature & Natural Resource
JTGDM	John Taolo Gaetsewe District Municipality
LED	Local Economic Development
LSU	Large Stock Unit
MEC	Member of the Executive Council
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)
NEM:PAA	National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003)
NEMA	National Environmental Management Act (Act 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NGO	Non-Governmental Organisation
NHRA	National Heritage Resources Act, 1999 (Act No 25 OF 1999)
NSBA	National Spatial Biodiversity Assessment
NSDP	National Spatial Development Perspective
NWA	National Water Act, 1998 (Act No 36 of 1998)
POSA	Plants of Southern Africa
RDP	Reconstruction and Development Programme
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SEMP	Strategic Environmental Management Plan
SoER	State of the Environment Report
WMA	Water Management Area
ZCC	Zion Christian Church

1 INTRODUCTION

1.1 Project Location

Administratively John Taolo Gaetsewe District Municipality (JTGDM) consists out of three local municipalities, Ga-Segonyana-, Gamagara-, and Moshaweng Municipalities and one district management area. Before March 2006 the area was a cross-border municipal area that straddled the border between the Northern Cape Province and the North West Province. However, after re-demarcating the provincial borders the total JTGDM area is situated in the Northern Cape Province. The north-western part of the area is the District Management Area (DMA) is like a fourth local municipality for the area but due to the absence of a local municipality it is managed by the JTGDM, therefore the term 'District Management Area'. However, this area will be transferred to the jurisdiction of the Moshaweng Local Municipality as from the date of the 2011 local government elections.

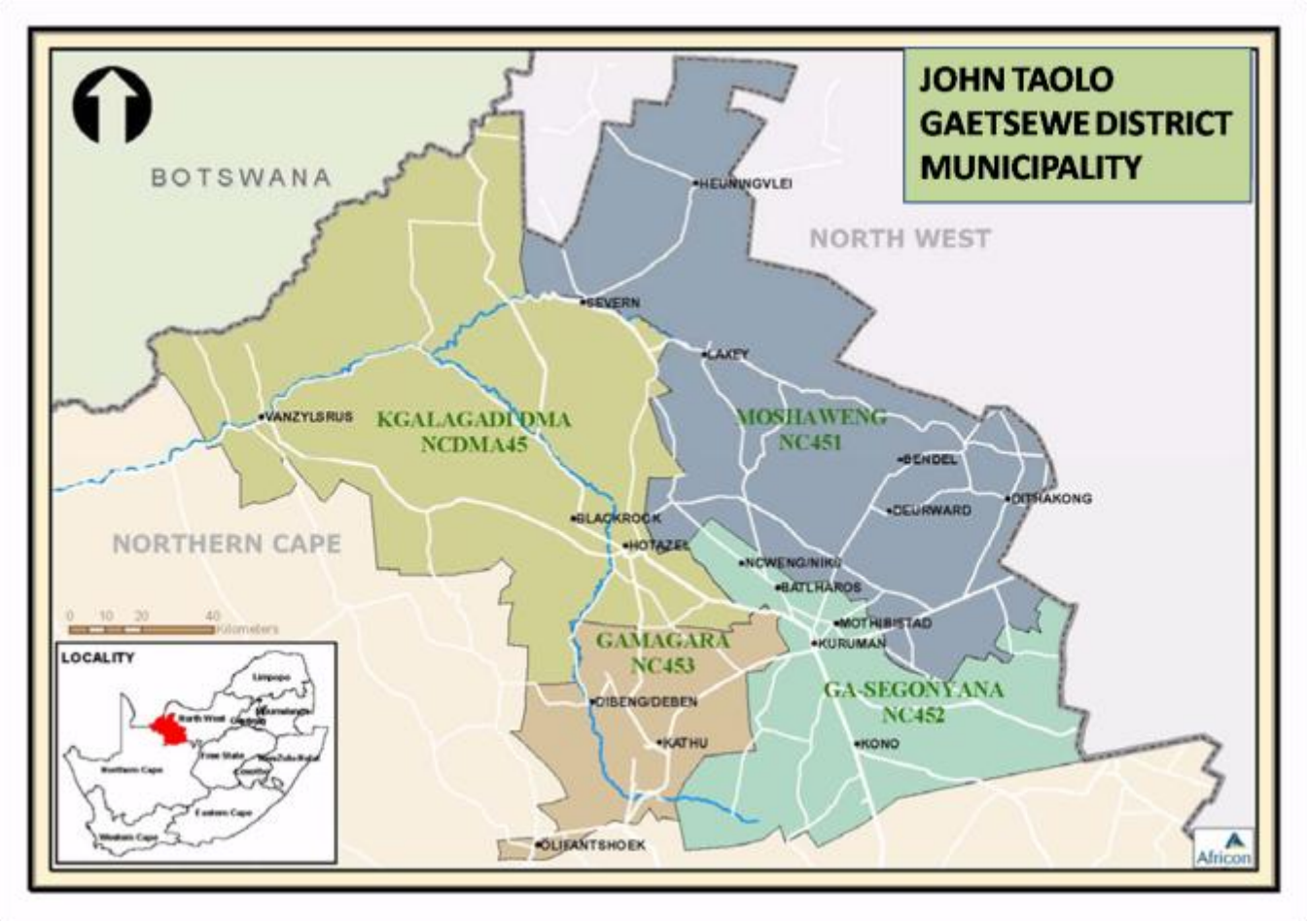


FIGURE 1: LOCATION OF THE JOHN TAOLO GAETSEWE DISTRICT MUNICIPALITY (IDP 2010-2011)

The District is mostly occupied by rural communities who have poor access to services and low level of skills. Within the whole District there is a recorded negative population growth. The biggest contributing factor to the

negative growth is HIV/AIDS and migration of people out of the district. Within the district, migration is mainly from most rural area such as Moshaweng to the urban areas such as Kuruman and Kathu.

The north-eastern region is comprised principally of high-density rural and peri-urban areas while the western and southern areas are sparsely populated and consist mainly of commercial farms and mining activities. The area has a population of approximately 191 538 persons, the majority of which reside in the Moshaweng municipal area (IDP, 2010-11). The district consists of 186 settlements, the majority being in the Moshaweng municipal area. 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.

TABLE 1: SUMMARISED DESCRIPTION OF LOCAL AUTHORITIES IN JOHN TAOLO GAETSEWE DISTRICT MUNICIPALITY

Local Characteristics	JTGDM	Ga-segonyana	Gamagara	Moshaweng	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

The main economic activity in the area is mining, followed by agriculture, tourism and retail. The rural land in the district is used extensively for cattle, sheep, goat and game farming. The area is well known for its good commercial hunting in the winter. In addition, the District holds potential as a tourism destination.

JTGDM was the richest mining region in the Northern Cape until a decline in mining employment and the near extinction of the asbestos mining industry in the 1980s. Today, minerals mined include manganese ore, iron ore and tiger's eye. The Sishen iron-ore mine is one of the largest open-cast mines in the world and the iron-ore railway from Sishen to Saldanha is one of the longest iron-ore carriers in the world.

JTGDM faces a number of challenges to economic growth and development. These characteristics include:

- Commercial and subsistence farming
- Low skills levels
- Mismanagement of assets
- A growing mining sector

- Gravel roads in many areas
- Lack of tourism assets
- A desert-like environment

1.2 Project context

The Department of Environment and Nature Conservation is the delegated regulatory authority for environmental management in the Northern Province. The Department identified the need for a tool to guide development initiatives in the JTGDM from an environmental perspective, i.e. the development of an Environmental Management Framework (EMF). The main driver behind the development of the EMF is the need to provide environmental support for decision makers in the Municipality. Therefore, the purpose of this EMF is to provide a framework which will inform the Integrated Development Planning (IDP) process and Spatial Development Frameworks (SDF) within the District, as well as to provide a framework for environmental decision making by:

- Providing definite criteria for decision making;
- Providing an objective environmental sensitivity overview;
- Defining and categorisation of environmental, social and heritage resources, economic and institutional aspects; and
- Formulating management guidelines.

The focus of the EMF will be to identify areas of natural resource importance, ecological sensitivity, as well as transformation pressures in order to formulate a spatial environmental plan to guide decision making and relevant spatial development plans. The EMF will also be a tool to guide development and focusing on the major backlogs in housing, and infrastructure and service provision without compromising environmental resilience.

1.3 Project phasing

The approach to this project is the use of multi-disciplinary expertise to perform the various specialised analyses of the work scope, with a core group of strategic environmental specialists responsible for integration. As indicated in Figure 2, the process of compiling an EMF follows a clear set of phases, namely:

1. Status Quo Assessment
2. Desired State Analysis
3. Management Zones Identification & accompanying Strategic Environmental Management Plan
4. Final EMF Compilation

Each phase builds on the findings of its predecessor, as well as the inputs from stakeholders and a central project steering committee. The final Environmental Management Framework consists of the most critical findings of the Status Quo Assessment along with a full set of environmental management guidelines for each identified Management Zone, as well as specific guidance on relevant strategic interventions such as the proclamation of protected areas and the interface with other environmental regulatory processes.

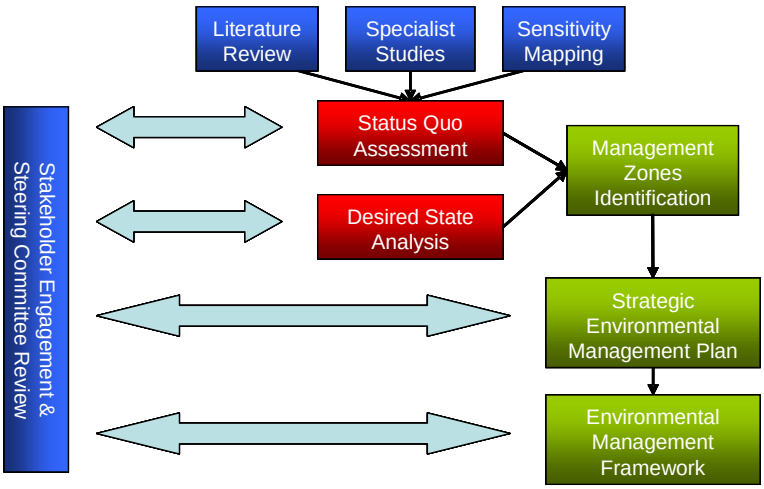


FIGURE 2: SCHEMATIC DIAGRAM OF THE EMF COMPILATION PROCESS

1.3.1 Status Quo Assessment

Various subject-specific specialists are 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, accompanied by a series of more detailed specialist reports. 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

The Desired State phase is preceded by Public Participation, where comments on the Status Quo report are collected and form an important input into the Desired State. Public participation takes the form of specific sessions with different role-players and focus groups (such as landowners; eco-tourism operators; conservancies; etc).

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 provides a description of the desired state of the area given all the available information and inputs.

1.3.3 Management Zones and 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 John Taolo Gaetsewe. 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, and the environmental framework and strategic environmental management plan (SEMP). 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 second and final round of Public Participation ensures that the public and all stakeholders are provided with the opportunity to comment on the Draft Environmental Management Plan and EMF report. This takes the form of a Public Open Day.

The results of the second round of 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 Member of the Executive Council (MEC) for Environment in Northern Cape.

2 LEGAL CONTEXT

2.1 Environmental Management Frameworks

The legal origin of an EMF is embedded in Section 24 (3) of the National Environmental Management Act, 1998 (NEMA) (as amended) which allows the Minister of Water and Environmental Affairs or 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.

Chapter 8, part 1, of the Environmental Impact Assessment (EIA) Regulations (Regulations published in terms of chapter 5 of NEMA) provides 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 reviewed in the light of any representations, objections and comments received, the Minister or MEC may adopt the EMF as an environmental management tool.

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 be used to list activities that may or may not occur in certain areas without environmental authorisations (Section 24 (2)). Activities that are thus exempted from environmental authorisation, may be made subject to norms and standards laid down in terms of Section 10 of NEMA.

TABLE 2: REGULATORY FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT FRAMEWORKS

LEGISLATIVE REFERENCE	LEGISLATIVE TEXT
NEMA S24 (2)&(3)	The minister, or an MEC with the concurrence of the minister, (2) may identify 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, or may be excluded from authorisation by the competent authority may also identify activities contemplated in paragraphs (a) and (b) that may commence without an environmental authorisation, but that must comply with prescribed norms or standards (the listing of activities must comply with the process prescribed in section 24a). (3) 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 (i.e. delegated regulatory authority).
NEMA S24 (4)(B)(VI)	Procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment (commonly known as environmental impact assessments) must include, with respect to every application for an environmental authorization and where applicable, consideration of environmental attributes identified in the compilation of information and maps as contemplated in subsection 24(3).
NEMA S10	The minister, or an MEC with the concurrence of the minister, (10) may develop or adopt

LEGISLATIVE REFERENCE	LEGISLATIVE TEXT
	norms or standards for activities, or for any part of an activity or for a combination of activities, contemplated in terms of subsection (2)(d); may prescribe the use of the developed or adopted norms or standards in order to meet the requirements of this act; may prescribe reporting and monitoring requirements; and may prescribe procedures and criteria to be used by the competent authority for the monitoring of such activities in order to determine compliance with the prescribed norms or standards. Norms or standards contemplated in paragraph (a) must provide for rules, guidelines or characteristics that may commonly and repeatedly be used; and against which the performance of activities or the results of those activities may be measured for the purposes of achieving the objects of this act.
EIA REGULATIONS CHAPTER 8, PART 1	Information and maps compiled in terms of section 24(3) of NEMA can be used as environmental management frameworks in the consideration in terms of section 24 (4)(b)(vi) of NEMA of applications for environmental authorisations in or affecting the geographical areas to which those frameworks apply. They also provide specific regulatory requirements pertaining to the development of an EMF specifying that either the minister or MEC with the concurrence of the minister may initiate an EMF for an area. for this purpose, the minister or MEC must compile a draft environmental management framework and subject it to a public participation process (by making the draft available for public inspection at a convenient place; and inviting potential interested and affected parties by way of advertisements in newspapers circulating in the area and in any other appropriate way to inspect the draft and submit representations, objections and comments in connection with the draft to that person or organ of state). The draft EMF should then be reviewed in the light of any representations, objections and comments received. In terms of the regulations, the minister or MEC may adopt, with or without amendments, an EMF. When an EMF has been adopted, notice must be given in the government gazette or the official gazette of the relevant province of (a) the adoption of the environmental management framework; and (b) the place where the environmental management framework is available for public scrutiny. Finally, 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. An EMF should therefore be regarded as a supportive instrument to assist environmental impact assessment and related decision making processes in the John Taolo Gaetsewe area.

2.2 Biodiversity management

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

2.3 Protected areas management

The declaration of the Kathu Forest as a Protected Woodland under Section 12(1)(c) of the National Forests Act, 1998 (Act No 84 of 1998) has been beneficial with regard to the achievement of the some of the environmental management objectives of the District and Province. It is suggested that the lessons learnt from the Kathu Forest declaration be used in this EMF project to inform the identification and declaration of further areas for possible protected status.

Further options for protection of natural areas are described and provided for in the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003) (NEMPAA).

2.4 Management of heritage resources

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 (NHRA) (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.

2.5 Water management

The National Water Act, 1998 (NWA)(Act 36 of 1998) prescribes tools (e.g. water use licence), measures and principles which will assist the District with the protection of water resources.

2.6 Management of mining activities

The current mining legislation, including the National Mineral and Petroleum Resources Development Act, 2002 (MPRDA)(Act No. 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, MPRDA) 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 NHRA provide various legal instruments which could assist in the regulation of new mining activities in the area. The NEM:PAA provides for the control and limitation of activities in protected areas according to the type of protected area. Therefore, the Project Team could use one of the instruments to enable the control and limitation of mining activities in the area. The NHRA and NEM:BA also provide for similar provisions in terms of heritage resources and biodiversity management, which could also be used by the Management Authority to limit mining developments in the area.

It should be noted that the NEMA EIA regulations have been revised to take into consideration the 2009 proposed amendments to the NEMA EIA regulations to include mining activities. However, this has not yet come into affect.

2.7 Land claims

Some properties in the study area are assumed to be subject to land claims in various stages of resolution. Case history suggests that these claims can still take a long time before a final decision is reached. An immediate response or accommodation of the claims is therefore impossible. The cases need to be resolved in accordance with all due processes, but the opportunity does exist to have the final negotiated settlements take into consideration the socio-economic context and development trajectory envisioned for the District.

3 ENVIRONMENTAL ASPECTS

3.1 Landscape

The landscape of the JTGDM is predominantly flat, with a ridge system bisecting the area along a North-south axis. This, the Kuruman hills, creates variation in the otherwise featureless landscape, and also determines the drainage pattern of the Kuruman river system. The ridge alignment forces all streams in the area to drain northwards before turning sharply west. The topography and drainage is shown in **Map 5: Topography.**

FIGURE 3: LANDSCAPE NORTH OF HOTAZEL

3.2 Climate

The annual rainfall varies from 500 mm in the east to 200 mm in the west, which is below the generally accepted average of 500 mm for dry land cropping. Rainfall occurs mainly during late summer (February) and can be highly erratic.

Mean annual temperatures range between 16°C and 20°C, and the mean annual minimum/maximum temperatures are estimated to range between 8°C and 28°C.

3.3 Biological Productivity

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.

3.4 Grazing Capacity

In the past, the continued healthy existence of the veld was due to the uneven geographic distribution of grazing pressures. With the increased provision of stock-water points, two trends are evident:

- Grazing pressures are greater, relative to the climatic capacity for increased vegetative growth;
- The development of previously undeveloped grazing areas through the increased provision of watering-points has enabled greater numbers of stock to graze over a larger area, reducing the proportion of ungrazed veld and directly reduced the ability of certain areas to re-vegetate after drier periods.

3.5 Land Degradation

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.

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

Map 2: Detailed Locality and Land Use, provided as one of the maps under ANNEXURE 4: STATUS QUO MAPS FOR THE JOHN TAOLO GAETSEWE DISTRICT EMF, shows the extent of land degradation in the context of the JTGDM.

4 SOCIO-ECONOMIC STATE

4.1 Uncertainties

Statistics in this section of the report were primarily taken from Census 1996 and Census 2001 and the more recent Community Survey (CS) 2007. The comparative analyses of these sets of data should be regarded as an indication of broad trends in the area, as data integrity concerns regarding these data sets were raised. The South African Statistics Council was concerned about the following regarding the Community Survey (2007):

- Institutional population is merely an approximation to 2001 numbers and not new data;
- Unemployment in the CS (2007) is higher and less reliable because of questions that were asked differently;
- Grants data should be interpreted with great care;
- Income includes unreasonably high income for children – presumably misinterpretation of the question, listing parents' income for the child;
- Distribution of households by province has very little congruence with the General Household Survey or last census.

The Statistics Council states (Statistician General's Response to the Star and other newspapers, 18 January 2008): *"In the absence of a comprehensive sampling frame, it is difficult to determine whether the differences are due to sampling error, biases or the reality that has changed beyond our expectations. There may be other variables that will require similar warnings after further interrogation."*

A number of systematic errors were observed in the data, which include:

- An underestimate of men relative to women;
- An underestimate of children younger than 10 years;
- An excess of those aged 85+, in particular among men;
- Missing women aged 20–34 from the Coloured population;
- Misdistribution of the population by province;
- Excess of people aged 10–24 in Western Cape and Gauteng; and
- A shortfall of women aged 20–34 in Free State, KwaZulu-Natal and Limpopo.

The Council found that the confidence intervals at some municipal levels were very wide. It then recommended that further analyses and investigation be conducted into the data to ensure that reliable data are released at district and municipal levels.

4.2 Settlements

The history of human settlements in South Africa has been influenced largely by the Apartheid policies of the late 20th Century. Apartheid caused disproportional differences between former 'white' and 'black' areas, with the 'white' areas receiving services, good infrastructure and sufficient formal housing, while the former 'black' or 'coloured' areas were generally poorly serviced, lack sufficient infrastructure and formal housing.

South African human settlements have experienced accelerated changes, particularly in urban areas, and large-scale movement of people from rural areas, suburbanisation and peripheral growth particularly in peri-urban and informal settlements. In the 10 years since 1994, much progress has been made in increasing services and infrastructure to these former 'black' or 'coloured' areas, however much still remains to be done. It is this distribution of services, infrastructure and housing that is measured in this report.

There are no statistics on the predominant types of traditional housing in the Province. However, traditional housing such as reed mat houses and corbelled houses are still in use. Official statistics (Table 3) indicate that informal dwellings are most prevalent in Gamagara and Ga-Segonyana. Nevertheless, an analysis of the formal housing in the District is provided in Table 4 shows that a large percentage of residents have full ownership of their dwellings and property.

TABLE 3: PERCENTAGE HOUSEHOLDS LIVING IN FORMAL AND INFORMAL DWELLINGS

	Formal		Informal	
	Census 2001	CS 2007	Census 2001	CS 2007
John Taolo Gaetsewe District	70.1	70.9	6.8	8.5
Gamagara Local Municipality	84.3	65.4	14.5	13.5
Moshaweng Lcoal Municipality	63.3	65.5	3.3	2.2
Ga-Segonyana Local Municipality	72.5	79.7	8.6	12.2
District Management Area	82.7	58	5.7	5.9
National	70.6	70.6		
Provincial average				10.5
(note: the red shading denotes areas where performance in the local municipalities is below the national or provincial average)				

TABLE 4: PERCENTAGE HOUSEHOLDS BY TENURE

	Census 2001 (%)				CS 2007 (%)			
	Owned and fully paid	owned but not yet fully paid	Rented	occupied rent-free	Owned and fully paid	owned but not yet fully paid	Rented	occupied rent-free
JT Gaetsewe District	67	4.2	10.8	17.9	73.9	2.9	16.5	6
Gamagara Local Municipality	36.4	12.6	35.1	15.9	37	6.3	46.2	6.7
Moshaweng Lcoal Municipality	88.2	1.9	3.8	6	94.9	0.3	2.4	2.5
Ga-Segonyana Local Municipality	56.9	4.7	9.4	29	78.7	4	10.3	7
DMA	16.4	0.9	31.9	50.8	9.2	1.2	67.1	22.5
Northern Cape	48.6	12.1	15.7	23.5	56.9	9.7	16	16.4
South Africa	**41.3**	**15**	**18.7**	**25**	**49.7**	**12**	**18.8**	**18.7**

4.3 Demographics

Demographic breakdown is best illustrated through appropriate graphics and tables. For this purpose therefore, two references are provided:

- Table 5: Number of people and households per local municipality; and
- Figure 4: Population groups (2001 Census)

TABLE 5: NUMBER OF PEOPLE AND HOUSEHOLDS PER LOCAL MUNICIPALITY

	Persons			% of Northern Cape		Households				
	Census 2001	CS 2007	% change	census 2001	CS 2007	census 2001 *	CS 2007	Ave Household size (CS 2007)	Area (km^2)	Population Density (people per km^2)
JT Gaetsewe District	191539	173454	-9.4	19.3	16.4	44218	42151	4.1	23300	0.7
Gamagara Local Municipality	23202	28054	20.9	2.3	2.7	5306	7640	3.7	2470	11.4
Moshaweng Local Municipality	91708	70012	-23.7	9.2	6.6	19995	15479	4.5	6030	11.6
Ga-Segonyana Local Municipality	70392	69791	-0.9	7.1	6.6	17163	17106	4.1	4490	15.5
DMA	6237	5597	-10.3	0.6	0.5	1754	1927	2.9	12430	0.5
**** Excludes collective living quarters***										

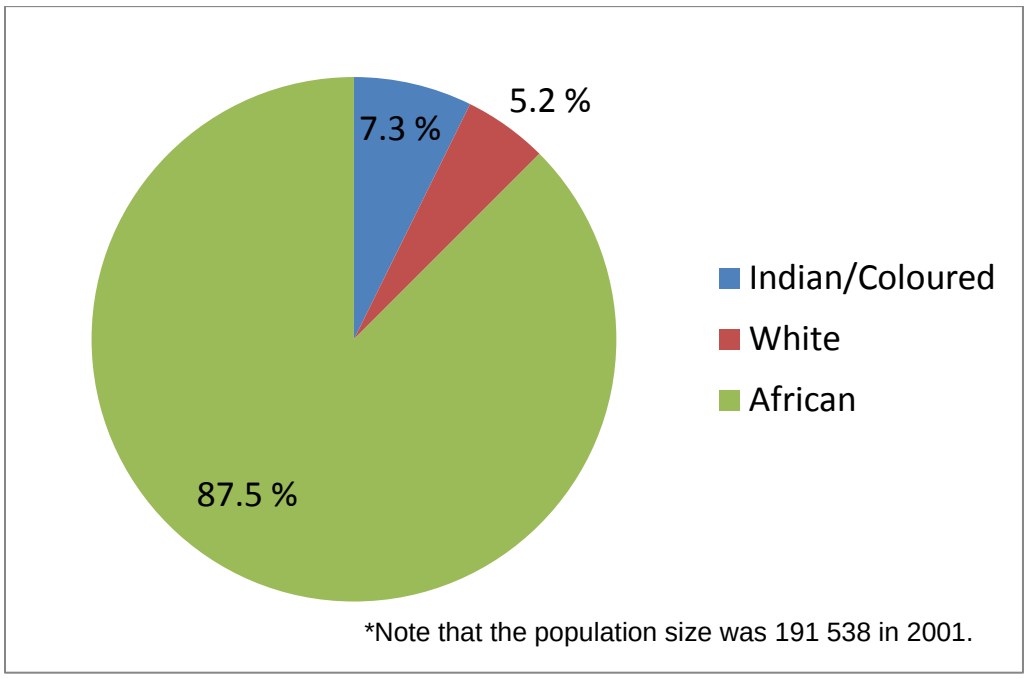


FIGURE 4: POPULATION GROUPS (2001 CENSUS)

Further description is provided in **Map 3: Population, wards, farms and social services** in Annexure 4.

4.4 Health

Human health is considered an important aspect of human settlements. 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, four mobile clinics and three hospitals in the JTGDM (DPGL, 2004). Moshaweng, the most populated local municipality does not have a hospital and there is low 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.

4.5 Heritage

The conservation of heritage resources is of vital importance in any society, if only for the benefit of future generations. In the Northern Cape, the presence of several economic activities threatens the conservation and preservation of several heritage resources that can never be regained once lost.

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.

4.6 Unemployment

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' (Figure 5). This leaves the burden of income generation on 40% of the population within the working age group of 15 to 65. Issues such as job retention and job creation are therefore of vital importance in a Province where the number of working people is so low.

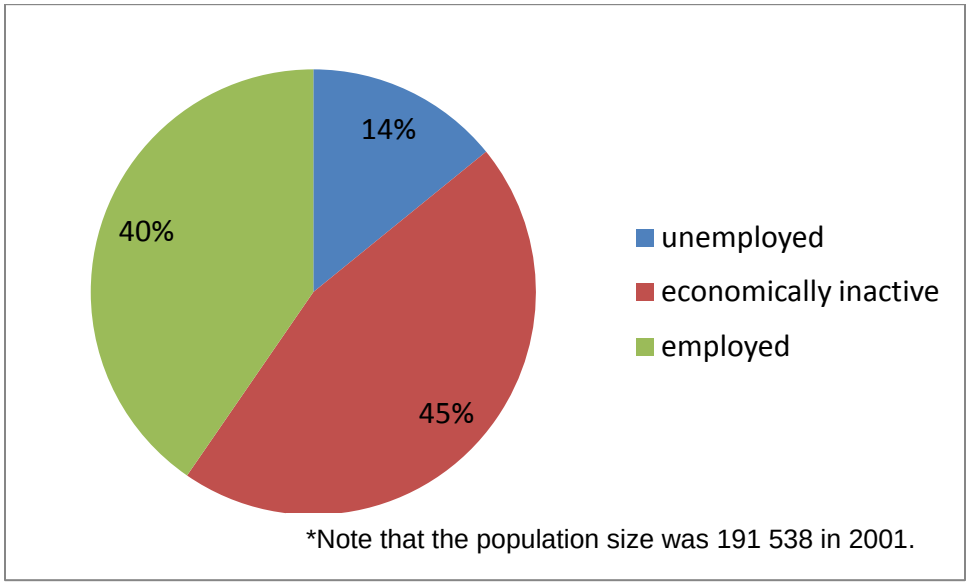


FIGURE 5: NORTHERN CAPE EMPLOYMENT STATISTICS (STATS SA)

In JTGDM the contribution to the provincial statistic is an absolute number of approximately 19 000 people who are unemployed (Table 6).

TABLE 6: COMMUNITY SURVEY 2007: BY MUNICIPALITY AND EMPLOYMENT – OFFICIAL DEFINITION

	Employed	Unemployed	Not economically active	Unspecified	Institutions
Moshaweng Local Municipality	4202	6455	26676	231	17
Ga-Segonyana Local Municipality	14579	8758	18886	535	1029
Gamagara Local Municipality	9506	3358	6088	436	207
District Management Area	2514	538	906	32	47
John Taolo Gaetsewe District	**30801**	**19109**	**52556**	**1234**	**1300**

Poverty is a widespread problem in JTGDM. As can be seen from Table 7, the majority of the population earn less than R1600 per month. The main cause of impoverishment is the loss of employment by the head of the household, resulting in a loss or decline of wages. 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 and thus human settlements in South Africa.

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 of 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.

Women and children are most vulnerable to poverty, with a great number of these demographic groups playing the role of head of the household, especially in rural areas. It is estimated that between 57% and 75% of children are living in varying degrees of poverty, and that women tend to have less access to resources than men. This results in a large amount of financial resources required for the provision of social grants (Table 8).

TABLE 7: INCOME CATAGORIES BY MUNICIPALITY (COMMUNITY SURVEY, 2007)

	Moshaweng Local Municipality	Ga-Segonyana Local Municipality	Gamagara Local Municipality	DMA	JTG DM
No income	28793	24040	7231	1364	61428
R 1 - R 400	1265	2233	405	15	3918
R 401 - R 800	1505	2072	1185	231	4993
R 801 - R 1 600	4057	5521	2465	595	12638
R 1 601 - R 3 200	783	2051	1611	446	4891
R 3201 - R 6 400	385	2527	1652	460	5024
R 6 401 - R 12 800	470	1657	1145	322	3594
R 12 801 - R 25 600	0	405	600	250	1255
R 25 601 - R 51 200	0	43	143	41	227
R 51 201 - R 102 400	0	335	20	20	375
R 102 401 - R 204 800	0	264	28	56	348
R 204 801 or more	0	54	0	16	70
Response not given	305	1555	2908	174	4942
Institutions	17	1029	207	47	1300

TABLE 8: NUMBER OF PEOPLE ON SOCIAL GRANTS BY MUNICIPALITY AND GENDER (COMMUNITY SURVEY 2007)

	Not Applicable	Old age pension	Disability grant	Child support grant	Care dependency grant	Foster care grant	Grant in aid	Social relief	Multiple social grants	Institutions
Male										
Moshaweng Local Municipality	18521	1872	1123	9482	208	37	0	35	0	17
Ga-Segonyana Local Municipality	23412	983	1328	6343	174	0	79	75	78	922
Gamagara Local Municipality	12184	377	587	910	33	0	32	0	72	175
Kgalagadi	2820	40	70	166	0	0	0	0	0	144

	Not Applicable	Old age pension	Disability grant	Child support grant	Care dependency grant	Foster care grant	Grant in aid	Social relief	Multiple social grants	Institutions
Female										
Moshaweng Local Municipality	21930	3992	1408	11134	253	0	0	0	0	0
Ga-Segonyana Local Municipality	27456	2288	631	5496	139	38	0	0	33	317
Gamagara Local Municipality	11289	579	513	1148	0	43	10	28	0	72
Kgalagadi	2044	55	9	120	0	8	0	0	0	119

4.7 Change in population size and distribution

The size and distribution of a population indicates the potential human resources available. Understanding and measuring these indicators can provide pointers to the scale and nature of development needs within the Northern Cape. At the same time, population data can give some indication of the functioning of the economy as a whole.

4.7.1 Change in population size

The total population of South Africa increased from approximately 40.5 million people in 1996 to 44.8 million in 2001. During the same time period, the population for the Northern Cape decreased from approximately 840 000 to approximately 822 000 people. The Northern Cape was the only province to display a negative growth from 1996 to 2001. It constituted 2.1% of the national population in 1996, which decreased to only 1.8% by 2001. No reasons are provided for this decrease in the literature, although it is likely that many people leave the Northern Cape in search of employment in other provinces.

4.7.2 Change in population distribution

The Northern Cape has the highest proportion of land area in South Africa (29.7%) and yet it also has the smallest population. The population density of the Province is therefore significantly lower than the rest of South Africa (2.3 people per km^2), and very few places in the Northern Cape have a population density higher than 430 people per km^2. Despite the low population density, the 1996 Census suggested that 71.7% of the Northern Cape population was urbanised (urban and semi-urban, with associated social facilities). This was the third highest level of urbanisation in the country at the time. Urbanisation is a complex process of change affecting both people and places. Urbanisation has an ongoing impact on the natural environment, through the resources used, and the pollutants and waste generated. Therefore, the density of a population and the distribution of people within a province will have environmental implications.

4.8 Population dynamics

In 2005 legislative amendments were passed to redefine municipal boundaries to ensure that cross-boundary municipalities they now became entirely located in one province. JTGDM was affected by these amendments and a large area to the east was added to the municipality from the North West Province.

According to Community Survey 2007, just over 16% of the population in Northern Cape Province is situated in the JTGDM. Declining populations occurred within the Moshaweng and Ga-Segonyana Local Municipalities and the District Management Area. The Gamagara Local Municipality experienced a substantial increase in population. It should be noted though that there has been strong indications that suggest an undercount in the 2001 and 2007 StatsSA data.

At present though, the population of JTGDM is estimated at approximately 188 838 people. The breakdown in terms of gender balance is provided in Figure 6).

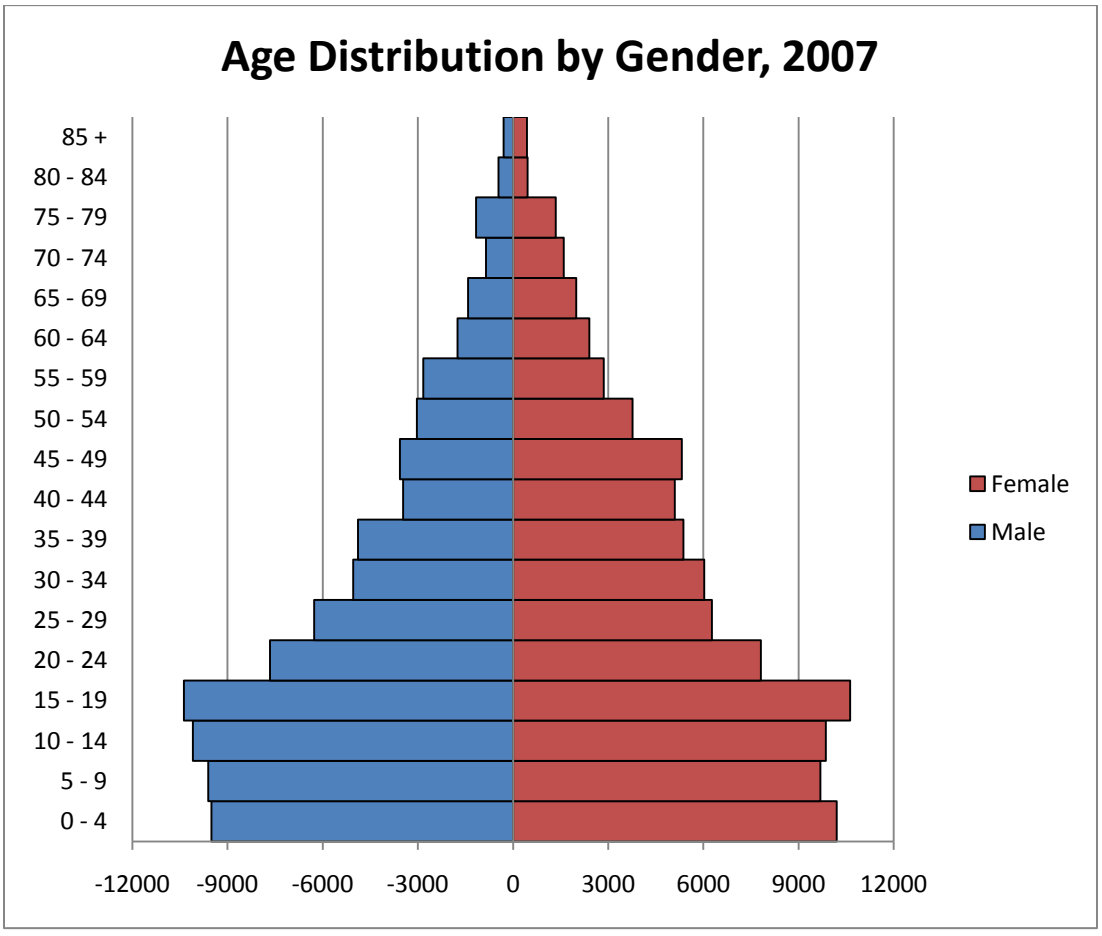


FIGURE 6: POPULATION PYRAMID FOR JTGDM

4.9 Development planning

The results of the 2007 Community Survey suggest that the number of people living in the district area is steadily declining. Gamagara, with its concentration of mines in its local area, is the only local municipality in the area that has shown population gains. This reality has far reaching implications for the district in terms of –

- The scope and extent of the district's spatial development framework;
- The service delivery demands put on the District Municipality, as well as the local municipalities in its area of jurisdiction; and
- The grading of the Municipalities, and thereof the resources (grants and subsidies) made available to them.

There is a need to ensure equity in the activities of the Municipality that reflects its population demographics, both in terms of service delivery, as well as in terms of employment equity. In this regard, gender, racial and disability population demographics are important. Special interest groups, such as the youth, women and persons with disabilities must focus specifically in the strategic priorities of the Municipality.

4.10 Services provision (transportation, electricity, potable water, sewerage)

There is a direct link between the provision of infrastructure, income growth and human development. Infrastructure has multiple links to poverty reduction, and when infrastructure and service delivery are incorporated it can also improve health and education.

Low-income settlements are often characterised by poor quality housing, open drains, no sanitation and uncollected waste. The assumption is that these are 'degraded' living environments. However, it has been found that the consumption patterns of the more affluent sectors of society are responsible for most of the natural resource degradation and not these low income areas. In South Africa, the more affluent sectors of the population are predominantly located in sprawling, low-density suburbs, with large carbon footprints that can be traced internationally.

It is widely acknowledged in South Africa that the greatest backlog in infrastructure and service delivery is in the rural areas. South Africa has to make significant and accelerated progress in service and infrastructure delivery to clear these backlogs and meet national and international targets such as the Millennium Development Goals.

The existence of transport infrastructure allows the daily economic and other activities of the Province to be undertaken in an efficient manner. Although the location of transport infrastructure is important, it is an individual's

access to transport that is considered in this indicator. In a province such as the Northern Cape where unemployment is high, individuals have little or no access to transport infrastructure and are therefore less likely to extricate themselves from their situation by conducting various informal economic activities. This indicator therefore presents the Northern Cape statistics on the mode of travel for work or school. This indicator is an impact indicator as it addresses the impact of transport infrastructure on the population, in conjunction with the economic situation of the population.

The largest percentage of population were categorised as individuals not working and not attending school, individuals who worked at home and as live-in domestic workers and those who did not make use of any form of transport to travel to work or school. In addition, a third of the population either travels to work on foot or resides at their place of work. Outside of these categories, the most common mode of travel is by Car as a driver (4.15%) followed by Car as a passenger (3.98%) and Bus (3.16%). Motorcycle (0.15%) and Train (0.08%) are the least commonly used modes of travel.

Indicators of infrastructure and services explored in this report include:

- Delivery of electricity
- Delivery of water services;
- Delivery of sanitation services; and
- Delivery of waste removal services.

4.11 Access to services and infrastructure

4.11.1 Delivery of electricity

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 (Table 9). In most cases though electricity is used for lighting purposes and many households still rely on other energy sources for heating and cooking.

TABLE 9: PERCENTAGE HOUSEHOLDS USING ELECTRICITY FOR LIGHTING, COOKING AND HEATING

	% households using electricity for lighting		% households using electricity for cooking		% households using electricity for heating	
	Census 2001	CS 2007	Census 2001	CS 2007	Census 2001	CS 2007
JT Gaetsewe District	58.2	90	32.3	63	29	44.1
Gamagara Local Municipality	92.7	97.4	78	94.7	73.5	87.4
Moshaweng Lcoal Municipality	34.1	85.6	7.7	31.9	6.9	15.8
Ga-Segonyana Local Municipality	74.5	90.8	45	74.3	39.2	45.7

	% households using electricity for lighting		% households using electricity for cooking		% households using electricity for heating	
	Census 2001	**CS 2007**	**Census 2001**	**CS 2007**	**Census 2001**	**CS 2007**
District Management Area	68.2	90	49.8	86.1	47.7	85.8
Northern Cape	**72.4**	**86.8**	**54.1**	**77.2**	**49.4**	**64.9**
South Africa	**69.7**	**80**	**51.4**	**66.5**	**49**	**58.8**

4.11.2 Delivery of water services

Supply of reticulated water can reduces the amount of time a household spends collecting water, and prevents the spread of water-borne illnesses such as cholera and dysentery. At present, South Africa exploits almost 50% of its conventional water resources, with some regions experiencing severe water shortages, and in others the demand for water has exceeded the available supply. The underlying cause of water scarcity can sometimes be attributed to government's failure to ensure that available water is supplied efficiently and equitably.

The current extent of water related infrastructure is depicted in **Map 6: Water Resources**.

Based on the data for water service levels in the Northern Cape in 1996 and 2001 the number of households with access to basic water services at the 'Reconstruction and Development Programme' (RDP) level has increased from approximately 192 000 to more than 200 000. However, the number of households with access to basic water services that are not at the RDP level has also increased from 24 000 to 41 000. This increase in households with access to basic water services that are not at the RDP level represents a service delivery backlog. The Community Survey 2007 showed that within the JTGDM 91.9% of all households now have access to piped water (Table 10).

The 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.

TABLE 10: PERCENTAGE OF HOUSEHOLDS THAT HAVE ACCESS TO PIPED WATER BY MUNICIPALITY – CENSUS 2001 AND CS 2007

	Census 2001					CS2007			
	Piped water inside building	piped water inside yard	Piped water on community stand: distance less than 200m from dwelling	Piped water on community stand: distance greater than 200m from dwelling	Total piped water	Piped water inside building	piped water inside yard	Piped water from access point outside the yard	Total piped water
John Taolo Gaetsewe District	14.4	13.7	25.2	29.3	82.6	23	19.1	49.8	91.9
Gamagara Local Municipality	55.8	35.8	4.9	1.8	98.3	60	38.2	0.7	98.9
Moshaweng Local Municipality	1	4.8	32.5	31.8	70.1	2	1.9	76.4	80.3
Ga-Segonyana Local Municipality	13.7	14.8	24.9	37.2	90.6	21	24.6	52.9	98.5
District Management Area	49	36.3	5.5	5.9	96.7	62.3	32.4	2.8	97.5
Northern Cape	**34.3**	**37.7**	**10.9**	**11.1**	**94**	**50**	**30.3**	**14.1**	**94.4**
South Africa	**32.3**	**29**	**10.7**	**12.4**	**84.5**	**47.3**	**22.2**	**19.1**	**88.6**

4.11.3 Delivery of sanitation services

A lack of basic sanitation services can lead to numerous public health problems, outbreaks of disease and death. A demographic and health survey conducted in 1998 found that household child mortality rates were twice as high in households without piped water, and this rate was four times higher in households without flush sanitation. A review of household sanitation services in the Northern Cape indicates that the number of households with access to basic levels of sanitation increased from 1996 to 2001. The sanitation services backlog has been reduced from 100 000 households (46.8%) in 1996 to 80 000 households (33.44%) in 2001.

Statistics from the Community Survey 2007, however, suggest that there is still much room for improvement, with a significant percentage of people still without waterborne sewerage (Table 11).

TABLE 11: PERCENTAGE OF HOUSEHOLDS THAT USE A PIT LATRINE OR BUCKET TOILET OR HAVE NO TOILET FACILITY BY MUNICIPALITY – CENSUS 2001 AND CS 2007

	Pit latrine		Bucket toilet system		No toilet	
	Census 2001	CS 2007	Census 2001	CS 2007	Census 2001	CS 2007
John Taolo Gaetsewe District	55	37.6	0.5	0.4	22.2	11.7

	Pit latrine		Bucket toilet system		No toilet	
	Census 2001	CS 2007	Census 2001	CS 2007	Census 2001	CS 2007
Gamagara Local Municipality	10.4	5.6	0.4	1.4	7.9	2.4
Moshaweng Lcoal Municipality	68.8	57.3	0.2	0.4	29.4	17.2
Ga-Segonyana Local Municipality	54.9	38	0.8	0.1	19	11.3
District Management Area	33	3.2	0.4	0	13.5	6.8
Northern Cape	**18.4**	**14.4**	**10**	**4.4**	**13.1**	**6.9**
South Africa	**28.5**	**27.1**	**4.1**	**2.2**	**13.6**	**8.2**

4.11.4 Delivery of waste removal services

The third basic service discussed is refuse removal. This state indicator displays information on the delivery of basic refuse removal services to households in the Northern Cape. Table 12 shows household access to municipal refuse removal services in the Northern Cape. It indicates that the overall percentage of households with access to refuse removal services is 3.1%. Historical data indicate that the absolute number of households increased from 134 000 in 1996 to 153 000 in 2001. However, it should be noted that this represents an increase of less than 1% in the number of households with access to municipal refuse removal services. The effectiveness of refuse removal service within an area, will impact on the presence or absence of disease vectors such as rodents.

TABLE 12: PERCENTAGE OF HOUSEHOLDS WHERE REFUSE IS REMOVED BY LOCAL AUTHORITY/PRIVATE COMPANY AND WHERE THERE IS NO REFUSE REMOVAL BY MUNICIPALITY – CENSUS 2001 AND CS 2007

	% households where refuse is removed by local authority/private company		% households with no refuse removal	
	Census 2001	CS 2007	Census 2001	CS 2007
John Taolo Gaetsewe District	19.9	31	9.5	3.1
Gamagara Local Municipality	87.8	95.1	2.2	0.2
Moshaweng Local Municipality	0.3	0.5	13	7.9
Ga-Segonyana Local Municipality	20.4	25.5	8.4	0.3
District Management Area	33.3	72.1	2.5	0
Northern Cape	**62.6**	**72.2**	**4.8**	**3**
South Africa	**57**	**61.8**	**8.7**	**7.1**

4.11.5 Communication

Access to modern communication devises improves the ability of people to administrate their social and economic lives, and offers opportunities for self-improvement. Table 13 indicates that % of households with access to landline telephones.

TABLE 13: PERCENTAGE OF HOUSEHOLDS THAT HAVE A LANDLINE TELEPHONE BY MUNICIPALITY- CENSUS 2001 AND CS 2007

	2001	2007
	% households with a telephone	
John Taolo Gaetsewe District	13.4	10.2
Gamagara Local Municipality	35.1	19.7
Moshaweng Local Municipality	3.1	1.2
Ga-Segonyana Local Municipality	17.7	13.3
District Management Area	24.2	17.9
Northern Cape	**27.4**	**22**
South Africa	**24.4**	**18.5**

4.11.6 Summary of service delivery in the Northern Cape

Although a large percentage of households in the Northern Cape have access to basic water services, there has been a decline in the percentage of households with coverage from 1996 to 2001. This is more likely due to an increase in the number of un-serviced households in the Province, rather than a decline in actual service delivery. However, a third of households in the Province still lack these two services.

The growth in access to electricity as a primary source of energy in the district has been spectacular. 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.

If the current realities of the Moshaweng Local Municipality as a rural area faced with vast distances, huge service delivery backlogs and an almost total dependency on grants and subsidies are considered, the progress made is better contextualized.

4.12 Economic Indicators

4.12.1 The Northern Cape Provincial Growth and Development Strategy

The Northern Cape Provincial Growth and Development Strategy is based on a comprehensive analysis of the of economic and social conditions prevailing in the province and has identified the need to focus on sector specific strategies, programmes and project level opportunities and interventions, identify appropriate institutional delivery

and review processes and integrate and seek alignment with Integrated Development Plans, sector development plans and the National Spatial Development Perspective (NSDP). An analysis of the socio-economic situation and indicators of the Northern Cape clearly indicates that the most significant challenge that the government and its partners in growth and development face, is the reduction of poverty.

All other societal challenges that the province is confronted with emanate predominantly from the effects of poverty. While addressing poverty we need to give attention to these societal problems, which includes the following:

Reducing the backlog of basic needs such as water, sanitation and housing;

- Improving and increasing access to health, education and social services;
- Decreasing the prevalence rate of HIV and AIDS;
- Creating opportunities for employment
- Reducing crime; and
- Targeting vulnerable groups.

The only effective means by which we can reduce poverty is through long-term sustainable economic growth and development. The NSDP indicates that, based on analysis of the economic situation and indicators, opportunities for potential growth lie in the following sectors:

- Agriculture and Agro-processing;
- Fishing and Mariculture;
- Mining and Mineral Processing;
- Transport;
- Manufacturing; and
- Tourism.

Of these areas of provincial growth, within JTGDM there is very little, if any potential, for further development of the agriculture and fishing sectors. Mining, tourism and manufacturing would hold the highest growth opportunities.

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; and
- Increasing access to knowledge and information.
- To promote and encourage economic growth and to improve the living conditions of our people, the Northern Cape needs to develop and maintain the provincial infrastructure and communications system.

In response to the social and economic development imperatives yielded by an analysis of the socio-economic profile of the province, the following primary development objectives have been identified:

- Promoting the growth, diversification and transformation of the provincial economy.
- Poverty reduction through social development.

The achievement of these primary development objectives depends on the achievement of a number of related objectives that, at a macro-level, describe necessary conditions for growth and development. These are:

- Developing requisite levels of human and social capital.
- Improving the efficiency and effectiveness of governance and other development institutions.
- Enhancing infrastructure for economic growth and social development.

The economy of the JTGDM depends upon the public sector and the mining industry. According to the Kgalagadi Nodal Economic Development Profile (2004), government and community services accounts for 44% of all jobs in the area. Retail and wholesale is the next significant employer at 13,9% (Figure 7). There is very limited retail and service provision within the node. These economic activities occur predominantly in the town of Kuruman.

Mining nevertheless represents more than 50% of the nodal GDP. Despite accounting for such a large percentage of total employment, government and community services accounts for only 19,2% of GDP.

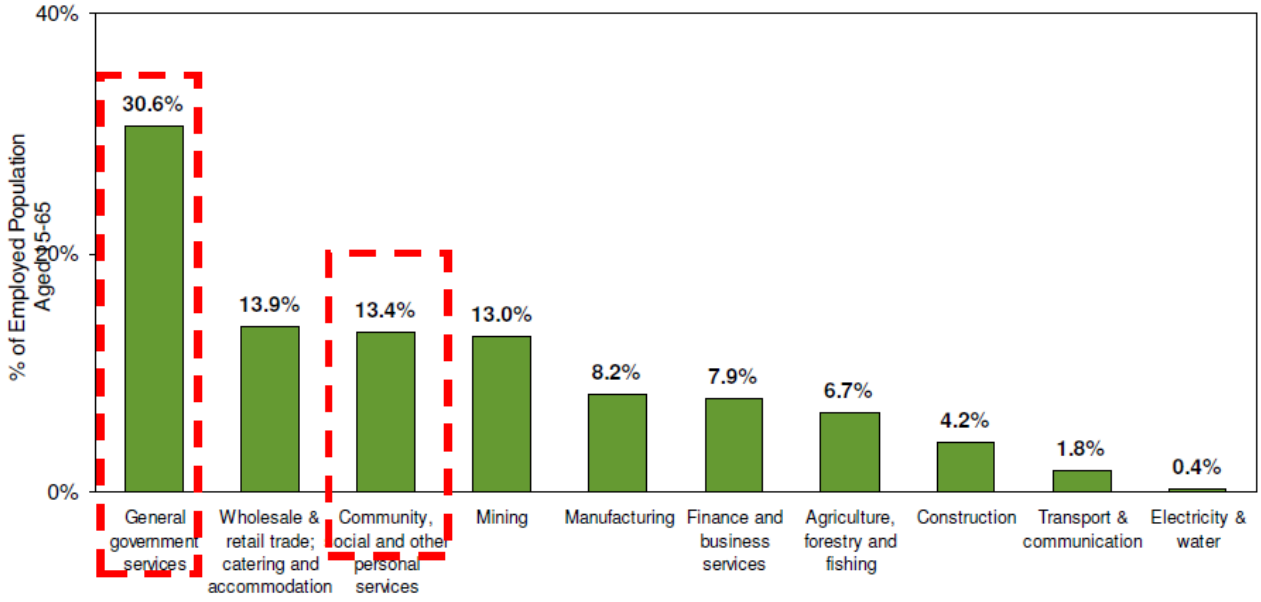


FIGURE 7: SECTORAL EMPLOYMENT IN JTGDM FOR 2004 (DPLG, 2004)

4.12.2 Sector prioritisation

An analysis of the contribution of the various sectors to the local economy and to local employment shows that the five priority sectors are active in the JTGDM.

TABLE 14: PRIORITY SECTORS AND GROWTH POTENTIAL

Priority sector	Growth potential
Mining	Mining is the single largest 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.
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).
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 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, however, underground sources like the Kuruman Eye are available and could provide irrigation in some areas.

4.12.3 Main economic sectors

4.12.3.1 Mining

The mining sector accounts for approximately half of the nodal GDP, yet employment figures for the same sector are not as impressive and have decreased over the past decade. Extensive internal migration occurs from the poorest areas of the node to the mines. Therefore, most of the disposable income of mineworkers is spent outside the node, mainly in mining towns. Hardly any economic activity takes place in the poorest areas of the JTGDM.

There are rich mineral deposits in the area. Manganese and iron ore deposits are abundant in the Northern Cape and especially in JTGDM. There is also an abundance of unskilled labour. However, most machinery and equipment are imported from Europe and the USA.

Currently, manganese is mined around Hotazel by BHP-Billiton, and iron ore is mined around Kathu by Kumba Resources. Extracted minerals are exported to areas outside the node for further processing.

Mining relies on global market trends. 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 Moshaweng 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 ABET programmes) could improve the situation.

4.12.3.2 Tourism

There are several attractions in the area, including the:

- Kalahari "bushveld", with its sandy soils and a number of private game reserves
- Moffat Mission in Kuruman
- Raptor Rehabilitation Centre
- Wonderwerk Caves
- Kuruman Eye

There are several accommodation options such as bed and breakfasts and guesthouses in the area, mainly in Kuruman. However, most of these are designed to accommodate contractors or long-term renters rather than tourists. Current niche markets that exist or trying to developed include adventure tourism, green tourism and the wildlife experience.

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 two major attractions 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.

There is some potential for Ecotourism development where the western parts of the node are scarcely populated and have pristine natural environments. These areas may be suited to ecotourism, hunting and game farming. There are possibilities to develop an 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.

4.12.3.3 Agriculture

The area has limited potential for agriculture, as conditions are not suitable for farming. There is, however, an abundance of labour in the area, as well as good road linkages to Gauteng and the Free State.

Some commercial and subsistence farming does take place in the node, with livestock like cattle, sheep, goats and game currently being farmed. Fully grown cattle are sold at auctions or to the abattoir in Kuruman. Calves

are sent directly to feedlots outside the district. Game is hunted on farms. The hunting market comprises mainly foreign guests, and a small game auction is held once a year in Kuruman.

Subsistence farming occurs mainly in Moshaweng, 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.

Future development of the agricultural sector in JTGDM is severely constrained by a lack of water, high temperatures and poor soil conditions. The sector is not likely to grow substantially in the district.

4.13 Challenges for JTGDM

As per the 2010/2011 Review of the IDP the following issues are the main challenges for JTGDM:

1) To fill the 10% gap that remains in terms of electricity provision as a source of lighting.
2) The clear comparative disadvantages of the Moshaweng Municipality in relation to the other municipalities in the district.
3) The housing need in the district area remains high. The apparent growth in the percentage of informal settlements from 5,1 to 7,6% of the population is especially concerning. However, in formulating strategies to address the housing backlogs in the district, the Municipality is dependent on the guidance and initiatives of both the sector Departments of Housing, as well as of the co-operation of the local municipalities.
4) The educational levels among the population of the district are relatively low. 27,6% of the population has no formal education, while only 67,4% has some school education. Only 1,83% of the population has some tertiary education. These statistics have obvious implications for the employment potential of the population, and therefore also for the district's local economic development and job creation initiatives.
5) A total of 75% of the district's population has no recordable income. This is extremely high and put extreme pressure on the Municipalities operating in the district. The result of such a high level of unemployment is that communities cannot pay for basic services and that severe pressure is put on municipal resources due to demands for services to a poverty-stricken population.
6) The huge discrepancies between income levels in the district are a matter of concern.
7) Unemployment is a serious problem in the district area. If the non-economically active part of the population is excluded from the calculation, the unemployment rate, according to the statistics above, is 44,79%. The situation is especially bad in the area of the Moshaweng LM. The area's job opportunities are provided by three primary economic sectors, which are agriculture, mining and retail. The other job opportunities essentially feed off these three sectors. Following the national trend, it is clear from the abovementioned statistics that job creation must be a key priority consideration for the Municipality in formulating its strategies.

4.14 Long term priorities

There are qualitative and quantitative elements that the Municipality must consider with regards to the formulation of strategies related to water.

- Quantitatively, the current backlog in terms of access to water must be addressed; and
- Qualitatively, the district needs to work towards ensuring piped water inside dwellings to all of its households.

From a developmental perspective, the following remain persistent challenges that must be focus areas for the district's formulation of IDP strategies:

- The complete eradication of all bucket latrines in the area.
- Increasing access to high quality sanitation facilities in the area, with specific reference to ensuring, at least, toilet facilities with adequate vitalization.
- Addressing the 11% backlog where members of the community still do not have access to any acceptable standard of sanitation.

5 HERITAGE RESOURCES

5.1 Introduction

Existing heritage resource datasets for JTGDM are incomplete with respect to both percentage area surveyed and to the lack of descriptive information for features that have been captured. A Heritage Resources Inventory is therefore required for JTGDM. Although this document provides as much information as possible, the current state of knowledge gives no more than a preliminary indication of what resources occur in the district.

5.2 Summary of status quo understanding of the heritage resources of John Taolo Gaetsewe District Municipality

5.2.1 Overview

The archaeology of the Northern Cape is rich and varied, covering long spans of human history. Concerning Stone Age sites here, C.G. Sampson has observed: "*It is a great and spectacular history when compared to any other place in the world*" (Sampson 1985). Some areas are richer than others, and not all sites are equally significant.

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. 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 Gamogara 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). A spatial depiction of the spread of Heritage resources is provided as **Map 11: Sites of Cultural and Heritage Importance**.

5.2.2 Long sequence sites

At a regional level the sites of Wonderwerk Cave (south of Kuruman) and the Kathu complex of sites provide important sequences of significance in themselves. They provide typological series and chronologies for assessing the age and significance of finds made at other sites in the region.

FIGURE 8: ROCKART FROM THE JTGDM

5.2.2.1 Wonderwerk Cave

This 140 m deep cave has been subject to research in the 1940s and from 1978 to the present. Current dating of the base of the sediment sequence indicates a history extending back to nearly 2 million years Before Present (BP) where associated stone artefacts may represent the earliest use of a cave by human ancestors anywhere on earth. A not unbroken sequence from that time to the beginning of the twentieth century makes for one of the longest and best preserved archaeological and palaeoenvironmental sequences in South Africa. The site, 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 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 McGregor Museum in Kimberley co-ordinates management and research (the excavations were primarily the work of P. Beaumont, now retired museum

archaeologist) and collaborates with the research project directed by M. Chazan of Toronto University. Important heritage site infrastructure for public access is being developed.

FIGURE 9: EXCAVATIONS IN WONDERWERK CAVE

5.2.2.2 Kathu

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.

5.2.3 Earlier and Middle Stone Age sites

Large numbers of Earlier and Middle Stone Age sites have been documented to varying degrees (e.g. at Bruce, Kathu, Uitkoms, Sishen, Demaneng, Lylyveld, Mashwening, Wonderwerk, Tswalu);

5.2.4 Later Stone Age Sites

Various phases of the generally post-12 000 year old Later Stone Age is represented by numbers of sites in all Local Districts, in various landscape settings ranging from the Molopo river banks to the dunes, to hills with shelters and caves, to the verges of pans and near water sources. Rock art occurs extensively as both paintings and engravings (see below).

Specularite workings are known on Demaneng and Lylyveld, and were mined in Stone Age times at a site on Doornfontein to the south (Beaumont 1973; Beaumont & Boshier 1974) and at Tsantsabane on the eastern side of Postmasburg (Beaumont 1973; Thackeray *et al*. 1983): numerous other specularite workings are on record (Beaumont 1973).

5.2.5 Iron Age sites

Iron Age sites have been located through the occurrence of characteristic pottery at sites abutting the Langeberg north of Olifantshoek and near Kathu, as well as at stone walled settlements, pre-eminently at Dithakong. The major town visited by the Truter-Somerville expedition at Dithakong in 1801, and by Lichtenstein, Burchell and others in the years that followed, consisted, however, of mud and grass-roofed dwellings. At the time villagers told the European visitors that they did not know who had occupied the older stone walled ruins.

Southern Tswana settlement of the last 500 years (and particularly from the end of the 18th century) was marked by a higher reliance on cattle-based pastoralism than was apparent in contemporary settlement further to the east on the southern High Veld (Maggs 1976).

5.2.6 Rock art sites

Rock engravings are (or have been) known from Sishen and Bruce (the latter site was salvaged and recorded by Fock & Fock 1984), as well as Beeshoek in the Gamogara area (Fock & Fock 1984; Morris 1992; Beaumont 1998). Mining has impacted some of these sites – engravings have been salvaged from Bruce and Beeshoek. Engravings are also recorded on the Tswalu reserve (Rifkin 2009) and at many sites on dolomite 'banke' on the lower slopes of the Kuruman Hills northwards from Kuruman. The Setswana name for them, *lokwalo*, provided Moffat with a word to define writing and printing.

Rock paintings occur in many shelters in the Kuruman Hills and Langeberg range, an outstanding instance being Wonderwerk Cave (Fock & Fock 1984; Morris 2009).

5.2.7 Contact era – 1801 expedition and its ensuing documentation

The 1801 expedition has been alluded to already (see 5.2.5 above): it heralded an era when numerous travelogues by European visitors (Somerville, Barrow, Daniell, Lichtenstein, Burchell, Campbell and many others) would describe or depict journeys through the area with varying degrees of detail on local people, their life, customs, material culture, etc. These documents are today invaluable sources for understanding the complex histories of local groups and their interactions.

5.2.8 Contact era: Mission sites and the "long conversation"

Mission settlements were established, when finally allowed, at Kuruman (1816) and many other sites including Bothithong. Comaroff and Comaroff (2002) have described the dialogues set in motion by these events as a 'long conversation' which left neither the Tswana nor the Colonial worlds free of impacts or influence.

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.

5.2.9 Conquest and settlement

Following the discovery of diamonds in what would become Griqualand West, British interests were extended northwards towards Vryburg and Mafeking (Mahikeng) in 1885. This brought into existence the crown colony of British Bechuanaland, absorbed into the Cape Colony in 1885.

This led to the growth of towns, including Kuruman from about 1886. Parts of the area was divided into white-owned farmland, while 'Locations' were reserved in the more populous parts, much later becoming part of Bophuthatswana or being cleared in 'Homeland consolidation' (see below).

5.2.10 Conflict sites: Dithakong and the Langeberg

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 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.

5.2.11 Anglo-Boer War

Kuruman was besieged for a time during the Anglo Boer War. A fort above the town was built during the war. War graves are known on the banks of the Gamagara south of Kathu.

5.2.12 Cemeteries

Towns as well as farms in the area contain grave yards including designated urban cemeteries and often small burial grounds on farms. In Kuruman itself a low-lying area just east of the town and west of Wrenchville represents a seemingly forgotten burial ground which relates to a township that once existed against the Kuruman-Vryburg road.

Similar abandoned burial grounds could occur in other towns and many graves on farms probably remain to be recorded.

5.2.13 Mining and its impacts – including asbestos

Mining in the district includes principally iron ore/manganese as well as asbestos. The former is the cause of a major economic boom with ore being transported to coastal ports both by rail and road. The latter had been a major mining product now notorious for its deleterious effects for all who have come into contact with it. Most recently schools in the district have been closed on account of asbestos having been used in building construction.

Industrial heritage in JTGDM has not been investigated and this is a gap for future work to address.

5.2.14 Rural architecture

Examples of rural architecture include both colonial settler farmsteads as well as evolving Tswana styles of traditional housing. Older rural skills have been disappearing in recent decades but distinctive features are still to be seen in parts of Moshaweng Local Municipality.

5.2.15 Apartheid era – Group Areas Act impacts, urban development and Homeland development

The urban and rural geography of the JTGDM was impacted to a considerable degree by the social engineering of the Apartheid era when both town and countryside were carved up along segregationist lines together with forced removals/land clearances. 'Black spots' such as Kono in Ga-Segonyana were removed in 'consolidation' processes which resulted ultimately in the fiction that was the Republic of Bophuthatswana (coinciding to a large extent with the poorer parts of the district today, principally Moshaweng). In Kuruman itself Group Areas legislation resulted in urban segregation and removals of people to Mothibistad and Wrenchville. Archaeological traces of earlier settlements are still visible.

5.2.16 Struggle history

Oral history and archive-based research is underway (Sephai Mngqolo, McGregor Museum, pers. comm.) which seeks to flesh out the history of the liberation struggle. In JTGDM this includes the history of the anti-colonial wars of 1878 and 1896-7 and the leadership of Luka Jantjie, Toto and others. More recent histories, such as the role of trade unionist John Taolo Gaetsewe is also included.

5.2.17 Intangible histories, sacred waters

Much intangible history and oral history complements the material heritage traces of the JTGDM. An individual of note presently resident in Mothibistad is the legendary Credo Mutwa who himself has contributed to the array of intangible lore and distinctive tangible expressions.

Intangible histories of a deeper local nature include beliefs about certain locales in the district which are held to be significant or sacred. What are almost certainly vestiges of precolonial religion live on in these, inter alia amongst followers of the Zion Christian Church (ZCC). Places associated with these beliefs include a small cave at

Heuningvlei, the Eye at Kuruman, the two caves on GaMohaan, Wonderwerk Cave and Boesmanspit (outside JTGDM).

5.2.18 Comment

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.

5.3 Data management strategies

5.3.1 Existing data

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, 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 SAHRA.

5.3.2 Content and attributes of the database

The eventual database should be structured to allow the recording of key attributes of the heritage resources. These attributes to be recorded within fields in the database and as an information base that can enable the protection and management of heritage resources.

Ultimately the data should be able to be represented spatially such that they can be viewed in juxtaposition with other key data such as mining and urban and services development to ensure that these development and exploitation activities do not inadvertently degrade or destroy vulnerable sites.

At this stage a map showing the distribution of all heritage resources is not included, partly because the exact location of some resources needs to be protected and because such distribution maps often lead to assumptions of absolute presence or absence of resources. It must be noted: "*absence of evidence is not evidence of*

absence". Data represent chiefly where past research has been undertaken, not the total distribution of sites. The heritage inventory will never stop developing. It will grow together with the discovery of new heritage resources, with the development of knowledge and with changing interpretation over time – since significance is not static.

5.3.3 Access, security and data sharing agreements

Due to the sensitive nature of heritage resources, information regarding the exact locality of most of the resources such as archaeological resources should not be disclosed in order to protect the resources from unscrupulous collectors or for safety reasons. Hence access to the heritage resources database will be controlled.

Procedures and protocols need to be adopted for heritage data including task sequences for maintaining and updating data from individuals and organizations. They should also indicate backup procedures.

5.3.4 Standards and nomenclature

Data standards and naming conventions for heritage resource data, consistent with those used by SAHRA need to be adopted.

6 BIODIVERSITY

FIGURE 10: LANDSCAPE OUTSIDE OLIFANTSHOEK

6.1 Introduction

Biodiversity can be defined (Brownlie *et al*. 2006) as *'the variability among living organisms from all sources and the ecological complexes of which they are part, and includes:*

- ***Patterns and processes*** *of living organisms and ecosystems;*
- ***Genetic diversity*** *within a species (within populations or strains of the same species), the* ***diversity of different species*** *(plant and animal species, microorganisms), and the* ***diversity of ecosystems*** *(e.g. different ecosystems on land, freshwater ecosystems, marine ecosystems);*
- ***Spatial scales****, from localised small sites in an urban environment, to catchments, regional landscapes, to the global level;"*

Biodiversity is important for a variety of reasons. In the first instance, biodiversity promotes ecosystem stability. The more diverse a system, the greater is its ability to withstand shocks and stresses. If biodiversity promotes ecosystem health and function, then biodiversity promotes all the services derived from ecosystems such as

protection of freshwater supplies, production of oxygen, absorption of carbon dioxide, nutrient cycling, provision of habitat, *etc*. Second, plants and animal species have a value because they may be used to produce economic goods. Plant species may provide goods directly such as food crops, or they may be a direct source of natural chemicals and compounds. Third, an organism's genes may be the source of genetic information which may be used in the development of new varieties of plants with different properties than existing varieties. Finally biodiversity may be important because people think it is important. While this statement may seem tautological, many people desire biodiversity, deriving greater utility from more diverse ecosystems than less diverse ecosystems. People may also feel that it is society's ethical responsibility to maintain biodiversity (Kahn 1995).

Humans therefore benefit from the natural environment in many ways: via the provision of ecological services such as climate regulation, soil formation, and nutrient cycling; from the direct harvesting of wild species for food, fuel, fibers, and pharmaceuticals; as well as aesthetically and culturally. In the face of increasing human pressures on the environment, these benefits should act as powerful incentives to conserve natural habitats, yet evaluating them has proved difficult and controversial because they are mostly not captured by conventional, market-based economic activity and analysis (Balmford *et al* 2002).

The main threat to biodiversity in South Africa, is the conversion and fragmentation of natural habitats. Most transformation of habitat arises from the direct conversion of natural habitat for human requirements, including:

- Agricultural activities;
- Urbanization;
- Industrial and mining activities, and
- Infrastructure development (e.g. roads, power lines, dams etc).

Additional impacts related to land transformation includes the introduction of alien invasive plants, inappropriate ecological fire management, and overexploitation of particular organisms or ecosystems.

Sustainable development can be defined as follows:

> *"Development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs and aspirations"* (World Commission on Environment and Development 1987).
>
> *"Improving the quality of human life while living within the carrying capacity of supporting ecosystems" "Caring for the Earth: A Strategy for Sustainable Living"* by the World Conservation Union (IUCN), the United Nations Environment Programme and the World Wide Fund for Nature (1991).

In order to guide sustainable development, a sound understanding of the existing patterns and processes of biodiversity within a receiving environment, is crucial. Information on existing impacts and the potential impacts of future human developments on the biodiversity, should also be assessed – in other words a *status quo*

assessment of the prevailing environment. This information should be used to guide sustainable development by either recommending avoidance or mitigation measures for the potential impacts of future human developments, be they direct, indirect or cumulative – based on a desired state for the biodiversity in the area.

The purpose of this study is therefore to consider the *status quo* of the biodiversity of the John Taolo Gaetsewe District Municipality (JTGDM), and to make recommendations in achieving a future desired state in terms of sustainable development.

6.2 Vegetation

Map 2: Detailed locality and land use under Annexure 4 illustrates that much of the 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*. This is in contrast to Mucina & Rutherford (2006) who report that very little transformation of the vegetation units occurring in the study area has taken place, except for the Mafikeng Bushveld of which 25% (across its distribution and not limited to the study area) has been transformed mainly for cultivation and urban development. This can be clearly seen in the land use around Ditshipeng and Bothithong (Figure 11).

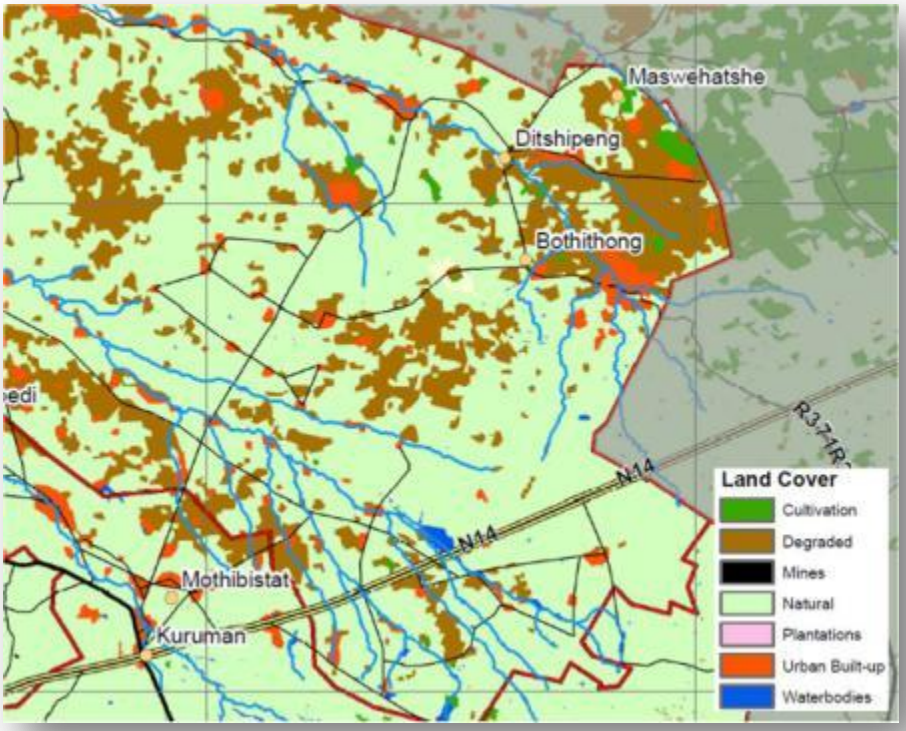


FIGURE 11: LAND USE AROUND DITSHIPENG AND BOTHITHONG

The various mines also have a direct impact on vegetation by the physical destruction of vegetation within the mining footprint. The effects of dust particulate emissions from the plants as well as along the transport routes, will also have a impact on the vegetation.

Fire is an ecological disturbance which is required to maintain community structure and species diversity. Overgrazing eliminates the grassy sward and fires are carried less easily and frequently across the landscape. This encourages bush encroachment which further inhibits grass regrowth. Eventually, however, extreme wildfire conditions, *i.e.* drought and hot temperatures, lead to fires which are too intense for even trees to survive that can burn through encroached areas.

Other disturbances to the natural vegetation cover are utilization in the form of collection of firewood and harvesting for charcoal production. *Acacia erioloba* (Camel Thorn), a protected tree species, is particularly targeted.

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 Twsalu Game reserve, where only 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 (UNEP, 2002). 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 (Van Wilgen and Van Wyk, 1999).

6.3 Fauna

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.

Complete lists of all the fauna expected in the study area are provided in ANNEXURE 2: COMPLETE FAUNA SPECIE LISTS FOR THE JOHN TAOLO GAETSEWE DISTRICT.

6.4 Impacts of urban areas and settlements

There are 186 towns and settlements in the JTGDM, of which 80% are villages in the Moshaweng Municipality (IDP, 2006). Formal urban development across the JTGDM occurs at a relatively low intensity at present **(Map 2: Detailed locality and land use and Map 15: Habitat Fragmentation)**, with the main towns of Kuruman and Kathu located in the southern section of the study area and there are other smaller towns and settlements scattered across the study area (e.g. Hotazel, Olifantshoek, Van Zylsrus). There is, however, a proliferation of informal urbanization associated with high density rural populations in the Moshaweng Local Municipality, particularly to the east of Avontuur, and around Ditshipeng, Bothitong and Ga-Mopedi. The southern, western and northern sections of the study area are sparsely populated and consist mainly of farms and mining activities, with a general absence of urbanization. However, new mining operations could lead to the development of mining townships and associated infrastructure (see below). The areas marked for densification in the IDP (*e.g* around Kuruman, Kathu, Black Rock, Van Zylsrus, *etc*.), will not contribute significantly to the existing impact of urbanization on the environment.

The direct impacts of urban development are habitat destruction/transformation and fragmentation of ecological corridors **(Map 15: Habitat Fragmentation)**. 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 **(Map 2: Detailed locality and land use)**. 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.

6.5 Mining operations

Mining (predominantly iron and manganese) is the main economic activity in the JTGDM, with mining operations scattered across the landscape (refer to **Map 12: Location of mining and minerals areas**). The largest mines are located between Sishen and Hotazel. 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.

FIGURE 12: MINING ACTIVITIES IN THE VICINITY OF BLACK ROCK

6.6 Agricultural activities

Agriculture is the second main economic activity in the JTGDM (from a spatial perspective), comprising mainly of large commercial livestock farms (extensive grazing) and subsistence grazing activities. The former occurs mainly in the south, west and north of the study area, whilst the latter occurs mainly in the east. Cultivation of lands is mainly restricted to the area stretching form Hotazel to Avontuur, Aansluit and along the Molopo River. 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.

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.

6.7 Environmentally sensitive areas

Ecologically sensitive habitats such as nature reserves, primary vegetation types, mountain catchments, rivers, streams, springs, wetlands, rocky ridges, caves *etc.* occur with 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.

6.8 Nature reserves

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 in ANNEXURE 2: COMPLETE FAUNA SPECIE LISTS FOR THE JOHN TAOLO GAETSEWE DISTRICT), 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.

6.9 Catchments, rivers, streams, springs and wetlands

The Korannaberg Mountains are probably the most important catchment area in the JTGDM, with most of the streams arising from this catchment eventually draining 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 (**Map 14: Ecosystem Status**). Overgrazing in the Korannaberg Mountains 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.

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 Korannaberg Mountains. Intensive agriculture is practiced along the extents of the main river courses, e.g. the Kuruman River.

FIGURE 13: KURUMAN RIVER (JANUARY, 2011)

This has resulted in intensive degradation/transformation of these riverine habitats. 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, Secretarybirds, and after good rains, standing water may attract various Red Data species, including Black Stork, as well as large Raptors such as White-backed Vulture, Lappet-faced Vulture, Tawny Eagle and Martial Eagle. Namaqua Sandgrouse are also attracted to standing water.

All wetlands, except Heuningvlei, in the JTGDM are ephemeral, filling up briefly after summer rains. A high number of these wetlands, including Heuningvlei, have been classified as Priority Wetland Areas according to the National Freshwater Priority Areas **(Map 14: Ecosystem Status)**. The Heuningvlei saltpan 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. The 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.

FIGURE 14: EPHEMERAL RIVERBED (FEBRUARY, 2011)

6.10 Mountains/rocky ridges and hills

Ridge faunal assemblages (mostly of invertebrates, birds, reptiles and frogs) are intrinsically limited in space and are therefore naturally vulnerable to habitat degradation and – transformation processes. Varied topography is recognised as one of the most powerful influences contributing to the high biodiversity of southern Africa. Landscapes composed of spatially heterogeneous abiotic conditions provide a greater diversity of potential niches for plants and animals than do homogeneous landscapes. The richness and diversity of flora has been found to be significantly higher in sites with high geomorphological heterogeneity and it can reasonably be assumed that associated faunal communities will also be significantly more diverse in spatially heterogeneous environments.

Ridges and rocky outcrops are characterised by high spatial heterogeneity due to the range of differing aspects (north, south, east, west and variations thereof), slopes and altitudes all resulting in differing soil (e.g. depth, moisture, temperature, drainage, nutrient content), light and hydrological conditions. Temperature and humidity regimes of microsites vary on both a seasonal and daily basis. Moist cool aspects are more conducive to leaching of nutrients than warmer drier slopes. Variation in aspect, soil drainage and elevation/altitude has been found to be especially important predictors of biodiversity.

It follows that ridges will be characterized by a particularly high biodiversity. Many Red Data / threatened species of plants and animals inhabit ridges. Due to their threatened status, Red Data species require priority conservation efforts in order to ensure their future survival. Ridges may have a direct effect on temperature/radiation, surface airflow/wind, humidity and soil types. Ridges also influence fire in the landscape, offering protection for those species that can be described as "fire-avoiders". Because of the influence of topography on rainfall, many streams originate on ridges and control water inputs into wetlands. The protection of the ridges in a natural state will thus ensure the normal functioning of ecosystem processes. In contrast, development of a ridge will alter these major landscape processes. For example, water runoff intensity into streams and wetlands will increase.

The Environmental Potential Atlas (ENPAT) database revealed that the study area does not contain areas where significant slopes are present, but it should however be noted that the ENPAT database slope classes is based on a high contour interval (100m). With the use of more detailed data, the identification of smaller areas of significant slopes will be possible. The study area is generally characterised by Dune Hills (parallel crests) and Lowlands in the northern part and Extremely Irregular Plains in the south, sloping towards the Orange River in a south-eastern direction from a high point of approximately 1,100m in the north to approximately 900m in the south at a general gradient of approximately 1.1%. Part of the Korannaberg foothills is located in the extreme northern section of the study area, comprising a small section of the site, characterized by the presence of boulders, high slopes and mountainous topography **(Map 5: Topography)**.

6.11 Flora and fauna of the John Taolo District Municipality

6.11.1 Primary vegetation units

The JTDM 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) **(see Map 13: Vegetation Types)**. Only one, Mafikeng Bushveld is classified as "Vulnerable", the rest all considered as "Least Threatened", with very little transformed according to Mucina & Rutherford (2006) (Table 15). 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 (Figure 15).

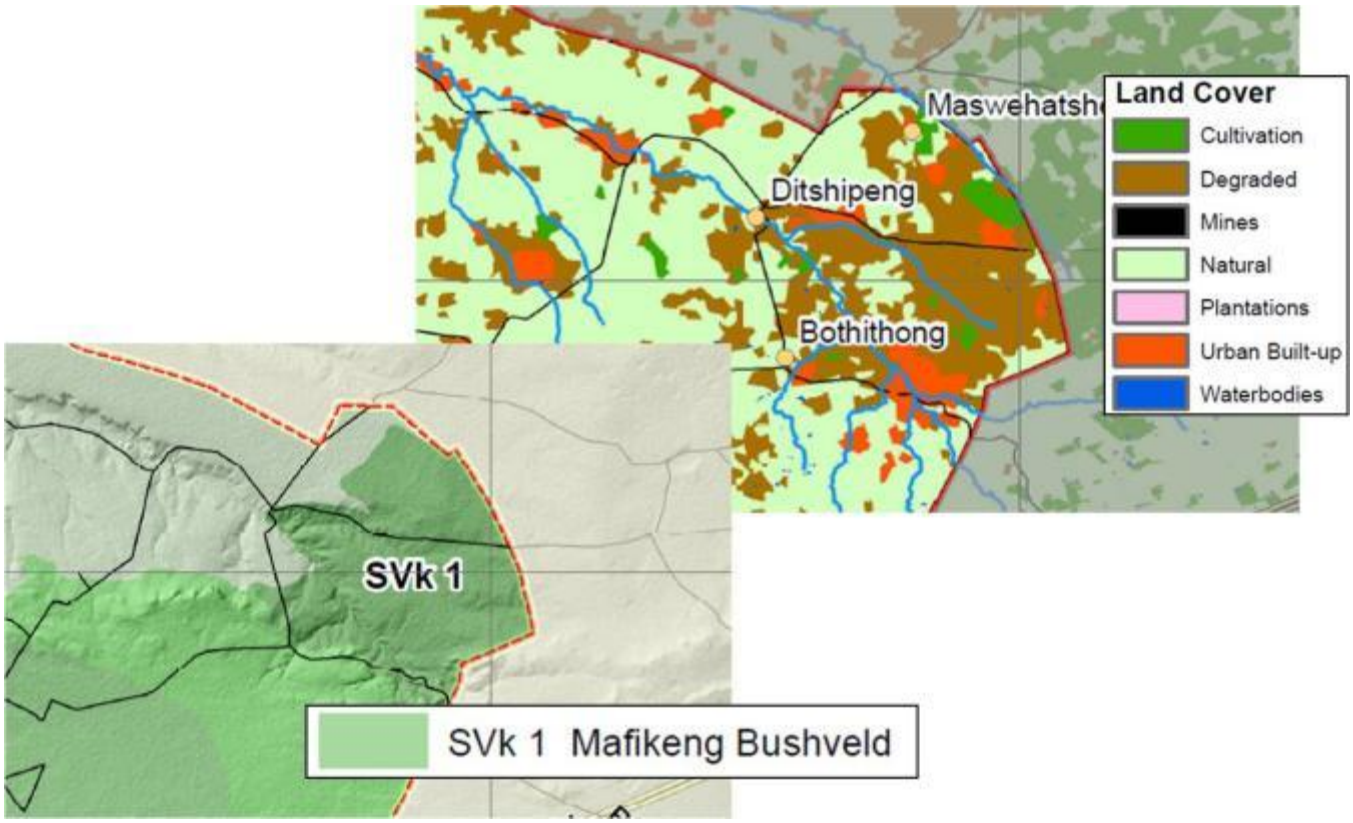


FIGURE 15: ENCROACHMENT ONTO MAFIKENG BUSHVELD

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. Figure 16 illustrates an area where trees have been removed to cultivate a predominantly grass layer.

FIGURE 16: TREES REMOVED TO IMPROVE GRAZING

6.11.2 Plant species

A total of 954 plant species have been recorded for the quarter degree squares of the study area, according to the South African National Biodiversity Institute's (SANBI) Plants of South Africa (POSA) site. These are listed in ANNEXURE 1: LIST OF THREATENED, PROTECTED AND ENDEMIC PLANTS OF THE JOHN TAOLO GAETSEWE DISTRICT MUNICIPALITY.

Despite the relatively low conservation status of the vegetation units occuring 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.

There are two Red List plants species occurring in the study area according to SANBI's POSA site, namely *Acacia erioloba* and *Hoodia gordonii*, which are listed as "Declining". Both are relatively widespread and abundant in the study area, with *Acacia erioloba* being a dominant species in the tree layer.

Three protected tree species occur in the study area, namely *Acacia erioloba, Acacia haematoxylon* and *Boscia albitrunca*. These trees are afforded protection according to Government Notice No. 1012 under Section 12(I) (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.

TABLE 15: THE PRIMARY VEGETATION UNITS OF THE JOHN GAETSEWE DISTRICT MUNICIPALITY ACCORDING TO MUCINA & RUTHERFORD (2006)

Vegetation Type	Vegetation unit	Conservation status	Conservation Target	Where conserved	Transformation	% remaining	% protected
Eastern Kalahari Bushveld	Mafikeng Bushveld	Vulnerable	Target 16%	None conserved in statutory conservation areas, but very small area conserved in the Mmabatho Recreation Area	About 25% transformed	75	0
Eastern Kalahari Bushveld	Ghaap Plateau Vaalbosveld	Least Threatened	Target 16%	None conserved in statutory conservation areas	1% transformed	99	0
Eastern Kalahari Bushveld	Kuruman Vaalbosveld	Least Threatened	Target 16%	None conserved in statutory conservation areas		98	0
Eastern Kalahari Bushveld	Kuruman Thornveld	Least Threatened	Target 16%	None conserved in statutory conservation areas	2% transformed	98	0
Eastern Kalahari Bushveld	Kuruman Mountain Bushveld	Least Threatened	Target 16%	None conserved in statutory conservation areas	Very little transformed	98	0
Eastern Kalahari Bushveld	Molopo Bushveld	Least Threatened	Target 16%	None conserved in statutory conservation areas	1% transformed	99	1
Eastern Kalahari Bushveld	Kathu Bushveld	Least Threatened	Target 16%	None conserved in statutory conservation areas	1% transformed	99	0
Eastern Kalahari Bushveld	Olifantshoek Bushveld	Least Threatened	Target 16%	0.3% statutorily conserved in the Witsand Nature Reserve	1% transformed	99	0
Eastern Kalahari Bushveld	Koranna-Langeberg Mountain Bushveld	Least Threatened	Target 16%	None conserved in statutory conservation areas, but partly conserved in priovate nature reserves, such as the Tsawlu-Kalahari Reserve	Virtually none is transformed	100	0
Eastern Kalahari Bushveld	Gordonia Plains Shrubveld	Least Threatened	Target 16%	Some 9% statutorily conserved in the Kgalalagi Transfrontier Park	Very little transformed	100	9
Kalahari Duneveld	Gordonia Duneveld	Least Threatened	Target 16%	Some 14% statutorily conserved in the Kgalalagi Transfrontier Park	Very little transformed	100	15
Inland Saline Vegetation	Southern Kalahari Mekgacha	Least Threatened	Target 24%	Already 18% statutorily conserved in the Kgalalagi Transfrontier Park and Malopo Nature Reserve	About 2% has been transformed by road building	98	16
Inland Saline Vegetation	Southern Kalahari Salt Pans	Least Threatened	Target 24%	About 8% statutorily conserved in the Kgalalagi Transfrontier Park		99	7

Also refer to **Map 14: Ecosystem Status** in ANNEXURE 4: STATUS QUO MAPS FOR THE JOHN TAOLO GAETSEWE DISTRICT EMF

6.11.3 Mammals

The mammal species recorded in the study area are presented in ANNEXURE 2: COMPLETE FAUNA SPECIE LISTS FOR THE JOHN TAOLO GAETSEWE DISTRICT. This list was compiled from a review of the known data, field trip reports and museum specimen data (Wilson 2011).

Most of the larger mammal species occurring in the study are confined to the various private game reserves, hunting farms and lodges, and therefore cannot be considered as free roaming. This includes re-introduced species and extralimitals, *e.g.* Buffalo, Nyala, Red Hartebeest, Blue Wildebeest, Waterbuck, Gemsbok and Springbok. Only a few large mammal species, *e.g.* Kudu, can be considered free roaming, as most of the naturally occurring species have been hunted out or displaced by stock farming dating back to the arrival of the first settlers.

A total of 27 Red List[1] mammal species (see ANNEXURE 3: THREATENED OR CONSERVATION-WORTHY FAUNA SPECIES IN THE JOHN TAOLO GAETSEWE DISTRICT) have been recorded in the study area (Wilson 2011). 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. Resident Red List species include the Honey Badger, Brown Hyaena and Small Spotted Cat.

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;

[1] The designation 'Red Data' indicates that a species has been classified in terms of the IUCN (International Union for the Conservation of Nature & Natural Resources) Red List of Threatened Species™ and is commonly used for species in the "threatened" category as Critically Endangered (CE), Endangered (EN) or Vulnerable (VU), and therefore at risk of global extinction. Lesser concern, but special attention, is ascribed to species in the Near Threatened (NT) and Least Concern (LC) categories, whilst little effort is wasted on Extinct (EX) or Extinct in the Wild (EW) groups.

6.11.4 Avifauna

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.

Threats to bird species include the following:

a) 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.

b) Collision with power lines

Collision of large birds with overhead power lines has a significant impact on bird populations, particularly those of raptors, bustards, korhaans, storks and large water-associated birds, *e.g.* flamingos.

c) Electrocution of birds on pylons

The extent and the likelihood of this impact is dependant on the pylon structure (van Rooyen 2004). Nevertheless, this is a known impact on bird species in the study area.

d) Poisoning

Indiscriminate poisoning of nuisance animal species can have a knock-on effect on non-target species, such as vultures, owls and eagles.

6.11.5 Reptiles

The reptile species recorded in the study area are presented in ANNEXURE 2: COMPLETE FAUNA SPECIE LISTS FOR THE JOHN TAOLO GAETSEWE DISTRICT. This list was compiled from a review of the known data, field trip reports and museum specimen data (Wilson 2011).

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.

A total of 46 species have been recorded in the study area. Two of these species are considered to be of conservation concern

Rocky habitats of the study area, particularly those associated with ridges and hills provide suitable habitat for reptile species (skinks, snakes and geckoes).

Termite mounds are a common feature in the landscape of the study area, and these are important refuge for numerous frog, lizard and snake species. Large numbers of mammals, birds, reptiles and amphibians feed on the emerging alates (winged termites).

The Acacia woodlands offer favorable habitat for arboreal reptile species, e.g. chameleons, snakes, agamas, geckos and monitors.

6.11.6 Amphibians

The amphibian species recorded in the study area are presented in ANNEXURE 2: COMPLETE FAUNA SPECIE LISTS FOR THE JOHN TAOLO GAETSEWE DISTRICT. This is list was compiled from a review of the known data, field trip reports and museum specimen data (Wilson 2011).

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 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 (Cook, 2009).

7 WETLANDS

7.1 Biotic and Ecological summary of the Study Area

7.1.1 Location of Wetlands

Maps 17(a-d): Wetland Types provide an overview of the location of wetlands in the JTGDM. Apart from the ephemeral river and stream networks, wetlands are found to be concentrated in the far north and far south of the study area.

7.1.2 Ecological Characteristics

The JTGDM landscape comprises of the Kalahari Thornveld, Ghaap Plateau, Rocky Hills and Ridges and the Kuruman Sourveld. Lying between latitudes 26°S and 28°S and with a persisting high pressure cell the JTGDM receives little rain and is classified as semi-arid to arid. Biotic responders are limited to water (due to the major natural surface water scarcity in the region) and this water scarcity can be classed as the major system driver to this region in terms of this status quo report. Other ecological drivers include wind, geomorphology and solar radiation (transpiration, erosion and dehydration agents).

7.1.3 Biotic Characteristics

In terms of the biotic characteristics of the JTGDM, the themes related to alien invasion, mining and farming has the most significant effect on the current and future status of biodiversity. These factors play a key role in land degradation and transformation (Land degradation due to soil erosion is related to a lack of vegetation cover mainly due to overgrazing and deforestation, with wind and sheet erosion being the most common problems). Other themes more specific to fauna include game hunting and direct habitat replacement (mining and competition). Flora and dependant fauna found in this region are characteristic to the Savannah type biomes, with chiefly grasses and water storing plants providing forage and habitat for dexterous herbivores, as well as skilled hunting and scavenging fauna.

TABLE 16: SUMMARISED BIOTIC AND ECOLOGICAL INFORMATION FOR JTGDM (SANBI BGIS 2011)

Municipality	Area	Biome	Water Management	Conservation status
Gamagara	26 194.3ha in size, of which 25 372.6ha is classed as natural (96.9%) and 931.1ha classified as wetlands (301 wetlands)	**Savanna** Gordonia Duneveld, Kathu Bushveld, Koranna-Langeberg Mountain Bushveld, Kuruman Thornveld, Olifantshoek Plains Thornveld and Souther Khalahari Salt Pans	Lower Vaal Water Management Area	No endangered or vulnerable ecosystems

Municipality	Area	Biome	Water Management	Conservation status
Ga-Segonyana	44 9164.5ha in size, of which 43 8771ha is classed as natural (96.9%) and 738.7ha classified as wetlands (686 wetlands)	**Savanna** Ghaap Plateau Vaalbosveld, Kathu Bushveld, Kuruman Mountain Bushveld, Kuruman Thornveld, Kuruman Vaalbosveld, Southern Kalahari Mekgacha and Souther Khalahari Salt Pans	Lower Vaal Water Management Area	No endangered or vulnerable ecosystems
Moshaweng	947 744.6ha in size, of which 900 887.1ha is classed as natural (95.1%) and 6906.1ha classified as wetlands (504 wetlands)	**Savanna** Kathu Bushveld, Kuruman Mountain Bushveld, Kuruman Thornveld, Kuruman Vaalbosveld, Mafikeng Bushveld, Molopo Bushveld, Southern Khalahari Mekgacha and Souther Khalahari Salt Pans	Lower Vaal Water Management Area	Vulnerable Ecosystem: Mafikeng Bushveld
Kgalagadi DMA	No data	**Savanna**	Lower Vaal Water Management Area	No endangered or vulnerable ecosystems

7.2 Desktop classification and delineation of wetlands in the study area

7.2.1 Drainage Context

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 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 groundwater tapped.

"Known as the 'Oasis of the Kalahari', Kuruman is blessed with a permanent and abundant source of water. More densely vegetated than most oases, its water flows from Gasegonyana, commonly called The Eye. A spring delivering 20 million litres of water daily to 71 000 inhabitants, the water flows from solution cavities in the dolomitic Ghaap Plateau and cracks in the mammoth doleritic dykes and sills that thrust their way into prominence from the earth's core some 190 million years ago."

(source: www.northerncape.org.za/getting_around/towns/Kuruman)

Due to the lack of appropriate ecological reserve data (only water quality data is available), water quality and groundwater reserves, are assumed to be highly impacted where urban settlements and heavy industry are found, but natural with high turbidity in undeveloped areas (agriculture and brackish soils).

In the context of wetlands, most wet features are seasonal and ephemeral in nature. Dry lakes are the major types of wetlands found in the study area and can be classed as valley bottom systems that form when the water table intersects the surface and when water seeps into theses depressions.

7.2.2 Classification and Delineation

Wetlands can be divided into various hydrogeomorphic forms, as a result of occurrence within the landscape and its associated hydrological regime. The most commonly accepted and used wetland types within the context of South Africa's wetland management are to describe wetlands as broad hydrogeomorphic units (Kotze *et al* 2004 and Kotze *et al*, 2005).

TABLE 17: ADAPTED DATA ANALYSIS FROM DIGITISED SANBI BGIS RSA WETLANDS TYPES 2010 MAPS (SANBI GIS 2011).

Quantity	Type	Habit	Average area (square meters)
95	Valley Bottom Wetlands	On valley floors	177712
1619	Depression Wetlands	Depressions	87600
412	Flat Wetlands	Benches and plains	955
24	Floodplain Wetlands	Flood plain	1940984
404	Seep Wetlands	On slopes	56157
224	Unchannelled Valley Bottoms	On valley floors	53002
255	Valley Head seeps	On slopes	31354

More than 3000 wetlands were digitised as polygons in the JTGDM by SANBI's National Wetlands Inventory Project. This figure is significantly high for a semi-arid to arid region and is a result of the JTGDM containing numerous ephemeral wetland depressions and seep geomorphology.

THE SOUTH AFRICAN NATIONAL WETLANDS INVENTORY PROJECT

Project Goal

To map the extent, distribution and diversity of South Africa's wetlands, and identify the functions and values of individual wetlands, including ecological, social and cultural values (source: http://bgis.sanbi.org)

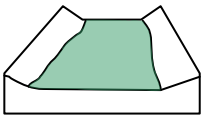
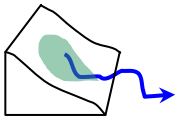
7.2.3 Discussion of adapted analysis

The most common wetland forms in the district municipality are ephemeral in nature and can be classed as dry depressions which receive moisture over intervals of decades (Kalahari and Moshaweng salt pans). These systems are scattered throughout the landscape and may have some agricultural and mining potential (phosphorus).

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. Its also generally supports both specialised and cosmopolitan biota, where the other classed systems support biota with specialised niches.

The more seasonally and permanently inundated floodplain wetlands found in the district are typically dominated by various wetland grass communities and savannah type trees. Good indicators of these types of systems are the predominance of aquatic reeds and resident bird life (flamingo, koot and ducks) as well as nomadic bird species (African Goshawk, Black-chested Prinia). The less common floodplain wetland systems receive their primary hydrological recharge from perennial, seasonal and ephemeral river systems by way of flood water entering the floodplain depressions. Characteristic features in these systems are oxbows and off-stream lakes.

TABLE 18: WETLAND HYDRO-GEOMORPHIC TYPES TYPICALLY SUPPORTING INLAND WETLAND (KOTZE *et al* 2004).

Hydro-geomorphic types	Description	Source of water	
		Surface	Sub-surface
Floodplain 	Valley bottom areas with a well defined stream channel, gently sloped and characterized by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Valley bottom with a channel 	Valley bottom areas with a well defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/ ***
Valley bottom without a channel 	Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/ ***
Hillslope seepage linked to a stream channel 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well defined stream channel connecting the area directly to a stream channel.	*	***
Isolated Hillslope seepage 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***

Hydro-geomorphic types	Description	Source of water	
		Surface	Sub-surface
Depression (includes Pans) 	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	***/ *****	***/ *****

[1] Precipitation is an important water source and evapotranspiration an important output in all of the above settings

Water source:
* Contribution usually small
*** Contribution usually large
*/ *** Contribution may be small or important depending on the local circumstances

7.3 Wetlands status quo and desired state

Due to the lack of available status quo information for the JTGDM, an estimation of wetland health has to be constructed to serve the purpose of this report. The WET Management Series: WET-EcoServices technology as well as the Wetland Index of Habitat Integrity can be utilised to provide wetland health estimations for each of the local municipalities. From these assessments major impacts can be discerned and desired state can be estimated.

7.3.1 Wetland Index of Habitat Integrity

The Present Ecological Status (PES) Method (DWAF 2005) was used to establish the integrity of the wetlands in the study area and was based on the modified Habitat Integrity approach developed by Kleynhans (DWAF, 1999). The table below displays the criteria and results from the assessment of the habitat integrity of the wetlands. These criteria were selected based on the assumption that anthropogenic modification of the criteria and attributes listed under each selected criterion can generally be regarded as the primary causes of the ecological integrity of a wetland.

TABLE 19: WETLAND HABITAT INTEGRITY ASSESSMENT CRITERIA (DWAF 2007).

Criteria & Attributes	Relevance
Hydrologic	
Flow Modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime (timing, duration, frequency), volumes, velocity which affect inundation of wetland habitats resulting in floralistic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.
Permanent	Consequence of impoundment resulting in destruction of natural wetland habitat

Criteria & Attributes	Relevance
Inundation	and cues for wetland biota.
Water Quality	
Water Quality Modification	From point or diffuse sources. Measure directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.
Sediment Load Modification	Consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.
Hydraulic/Geomorphic	
Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities that reduce or change wetland habitat directly in inundation patterns.
Biota	
Terrestrial Encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.
Indigenous Vegetation Removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.
Invasive Plant Encroachment	Affects habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).
Alien Fauna	Presence of alien fauna affecting faunal community structure.
Over utilisation of Biota	Overgrazing, over fishing, etc.

Due to the lack of ecological survey data for the study area, it is assumed that wetlands are highly impacted where development resides and is highly natural where development is absent. Also, it is assumed that agricultural related impacts to wetlands will be focussed around abstraction practise as well as water quality impairment. From a industry perspective water abstraction is normally treated and recycled back into the system and will contribute to direct disturbance practise (habitat replacement and creation, erosion and flow modification practise).

TABLE 20: HABITAT INTEGRITY ASSESSMENT CRITERIA FOR PALUSTRINE WETLANDS (KOTZE ET AL 2004).

Criteria & Attributes	Agriculture	Mining
Hydrologic		
Flow Modification	**4**	**2**
Permanent	**2**	**4**

Criteria & Attributes	Agriculture	Mining
Inundation		
Water Quality		
Water Quality Modification	**2**	**3.5**
Sediment Load Modification	**3.5**	**2**
Hydraulic/Geomorphic		
Canalisation	**3.5**	**1**
Topographic Alteration	**4**	**1**
Biota		
Terrestrial Encroachment	**2**	**2**
Indigenous Vegetation Removal	**3**	**1**
Invasive Plant Encroachment	**1**	**1**
Alien Fauna	**3**	**3.5**
Over utilisation of Biota	**2**	**4**
Total Mean	**2.72**	**2.27**

TABLE 21: WETLAND HABTAT INTEGRITY ASSESSMENT (SCORE OF 0=CRITICALLY MODIFIED TO 5=UN-MODIFIED)

Scoring Guidelines Per Attribute*	Interpretation of Mean* of Scores for all Attributes: Rating of Present Ecological Status Category (PESC)
Natural, unmodified - score=5.	Within general acceptable range
	CATEGORY A
	>4; Unmodified, or approximates natural condition.
Largely natural - score=4.	CATEGORY B
	>3 and ≤4; Largely natural with few modifications, but with some loss of natural habitats.
Moderately modified- score=3.	CATEGORY C
	>2 and ≤3; moderately modified, but with some loss of natural habitats.
Largely modified - score=2.	CATEGORY D
	≤2; largely modified. A large loss of natural habitats and basic ecosystem functions has occurred.

Scoring Guidelines Per Attribute*	Interpretation of Mean* of Scores for all Attributes: Rating of Present Ecological Status Category (PESC)
	OUTSIDE GENERALLY ACCEPTABLE RANGE
Seriously modified – rating=1.	CATEGORY E
	>0 and <2; seriously modified. The losses of natural habitats and basic ecosystem functions are extensive.
Critically modified – rating=0.	CLASS F
	0; critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat.

In relation to the assumptions regarding industrial and agricultural impacts to wetlands, and the assessment scores of the broad classed wetland habitat integrity assessment undertaken; it can only be concluded, from a habitat perspective and thus a structural sustainability view, that wetlands are more impacted by direct industrial disturbances than agricultural related service exploitation. Therefore, in order of relevance to this report, wetlands around industrial zones in the municipality have a higher need to be assessed in terms of its ecological condition than do agricultural zoned areas in the municipality.

7.3.2 Ecosystem Goods and services

The assessment of the ecosystem services supplied by the identified wetlands was conducted according to the guidelines as described by Kotze *et al* (2005). Characteristics are scored according to the general levels of services provided. It is important to manage the wetlands to ensure that they can continue to provide the valued goods and services: This assessment will provide a broad estimation of wetland classes found in the study area.

TABLE 22: WETLAND ECOSYSTEM GOODS AND SERVICES ASSUMED FROM WETLAND SYSTEMS IN THE JTDGM

Goods and services	Valley-bottoms	Floodplain systems	Seeps	Depressions
Flood attenuation	2.5	4	1	1
Stream flow regulation	3.5	4	1	1
Sediment trapping	4	2.5	3	4
Phosphate trapping	2.5	2	2	4
Nitrate removal	3	3	2	1
Toxicant removal	3.5	3.5	2	1
Erosion control	3.5	4	3	1
Carbon storage	4	2	3	2.5

Goods and services	Valley-bottoms	Floodplain systems	Seeps	Depressions
Maintenance of biodiversity	4	4	4	4
Water supply for human use	3	4	2	2
Natural resources	4	4	3	4
Cultivated foods	4	2	3	1
Cultural significance	3	1	1	3
Tourism and recreation	3	3	1	3
Education and research	4	4	4	4

TABLE 23: GOODS AND SERVICES ASSESSMENT RATING TABLE

Service rating	Score
Low	0
Moderately low	1
Intermediate	2
Moderately high	3
High	4

From an ecosystem goods and services perspective, wetland classes floodplain and valley bottoms are more relevant for basic human needs. Biodiversity has a strong significant to seep systems which provides connectivity between wetland systems and from an economical perspective depressions are a good source of mineral resources. These ratings will also need to be assessed on a local scale and can be utilised as a reference, moving forward.

7.4 Wetlands management and monitoring status quo

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).

TABLE 24: SUMMARISED OBJECTIVES FOR WETLANDS MANAGEMENT FOR JTGDM

OBJECTIVE	MOTIVATION
Restricting water quality degradation by improving wetland integrity and functionality	Wetlands have the ability to improve water quality through biological, chemical and physical processes (absorption, adsorption, bacterial transformation, etc)
Restricting direct and indirect wetland erosion damage and desiccation as a result of advancing gullies, furrows and headcuts	Case sensitive wetland designs where ecological considerations is taken into account, so as to prevent irreversible wetland service loss
Conserving wetland related biodiversity	This will improve wetland functionality, resilience and the sustainable exploitation of services
Addressing anthropogenic mismanagement and impacts to wetlands	Rectification of illegal development on wetlands will allow for better future management practise on wetlands
Poverty Alleviation	Management considerations should employ local human capacity as well as provide training in relation to eco-system utilisation practise for sustainable living.
Provision of Wetland Status Quo for priority systems in all local municipalities	Wetlands are classified on a national level. The provision of ecosystem status for wetland systems will provide management with a to the point needs analysis and sensitivity ratings for development, as well as focus for prioritisation of mandates

7.5 Issue considerations for wetland health

7.5.1 Habitat Transformation

Habitat transformation is a strong factor to consider in terms of the sensitivity aspect to most wetland systems (vulnerable to erosion, pollution, development, alien invasion). As a result, eco-system services can be lost which may be impede the overall integrity of greater landscape ecological functionalities in the associated surroundings.

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

- Agricultural practise acts as a vector for habitat transformation to wetlands (alien invasion, flood irrigation, direct farming practise and water quality impairment)
- stock farming (acts as a direct and indirect vector for habitat transformation via alien invasive vegetation, water quality impairment and abstraction practise)
- residential associated activities (acts as a direct and indirect vector for habitat transformation via alien invasive vegetation, water quality impairment and abstraction practise)
- Mining practise (acts as a direct and indirect vector for habitat transformation via alien invasive vegetation, water quality impairment and abstraction practise)
- Recreational practise (acts as a vector for alien invasive vegetation as a result of continual disturbance practise)

7.5.2 Pollution

Pollution of wetlands is often related to agricultural practise (phosphates and nitrates) and industrial practise (toxins) and can include the following:

- Salinisation from agriculture
- Inadequate Waste Water Treatment Works
- Impoundments
- Mining effluent and untreated return flows
- Acid Mine Drainage
- Refuse dumping and inadequate land fill practise
- Urban effluent return flow (storm water)

8 AGRICULTURE

Agriculture is neither a large employer, nor a sector with a substantial contribution to the economy of the JTGDM, yet it is important as a land use due to its spatial prevalence. Its foundation lies in the sheer expanse of available land and relatively low population density, rather than an abundance of agricultural resources. Agricultural practices in the Northern Cape are also considered to be marginal, and hence need special consideration during spatial and environmental planning.

8.1 Resources

8.1.1 Natural

The Northern Cape is best known for its arid and semi-arid character. JTGDM is considered to be extremely dry as it receives very little rainfall (200-500mm per year) and no major water sources like rivers and natural dams are present. Most of the water in the area comes from underground sources, and are accessed through both natural springs (e.g Kuruman eye) and artificial sources (e.g. boreholes). The western part of the district is also more arid than the eastern part (arid to semi-arid). Also refer to **Map 16: Groundwater Resources**.

Soils are predominantly well drained red and yellow soils in an oxidizing environment, leaving the soil particles with an iron oxide coating and leading to the development of non-swelling clays. The A-horizon is usually orthic and overall the soils contain less than 15% clay. Nutrients may be present in the soils, but the low rainfall and extreme summer temperatures inhibit soil productivity. Soil classification in JTGDM is dominated as follows:

- In the **north**: red-yellow apedal, freely drained soils; red and yellow, high base status, usually < 15% clay
- Alongside the **central** Kuruman Hills: red-yellow apedal, freely drained soils; red, high base status > 300 mm deep (no dunes)
- **North-east** of Kuruman: red-yellow apedal, freely drained soils; yellow, high base status, usually < 15% clay.

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 (LSU)) densities. Nevertheless, the province is known for its high-quality meat and meat products.

Respectively, **Maps 8, 9 and 10** provide a graphical representation of **Grazing Capacity, Land Capabilty and Soils** of the JTGDM.

8.1.2 Current activity and development

Agriculture in the District takes both subsistence and commercial forms. Subsistence is prevalent in the Moshwaneng area, whilst more commercial livestock farming takes place further west (Figure 17).

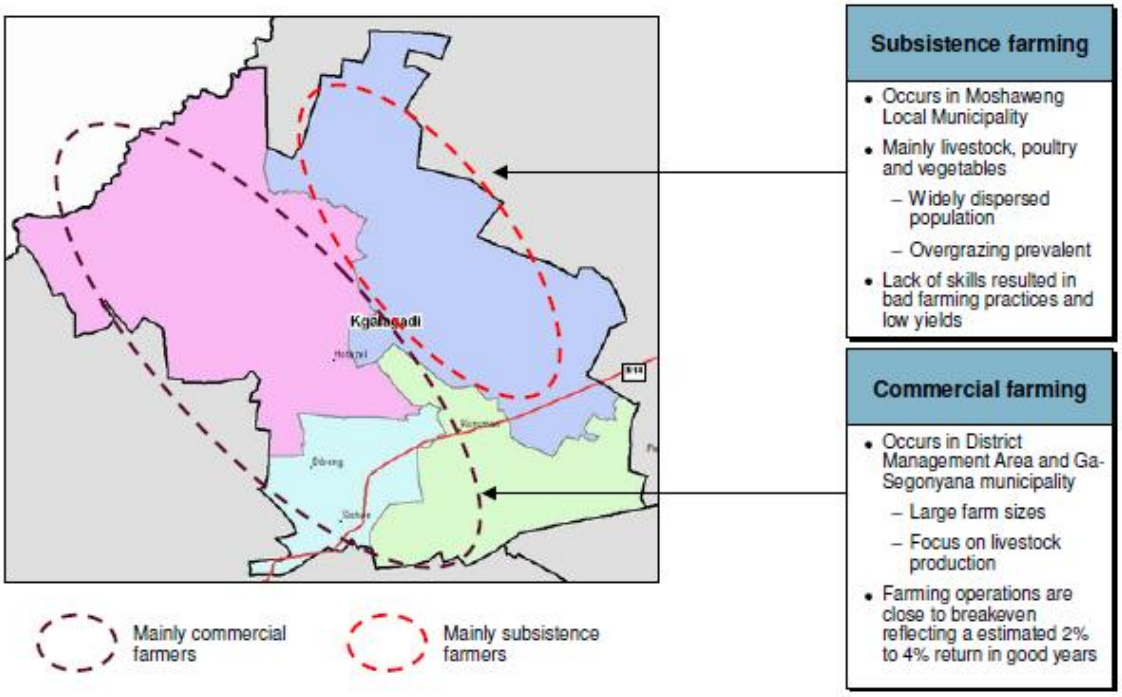


FIGURE 17: PROFILE OF AGRICULTURAL ACTIVITY IN JTGDM (DPLG, 2006: NODAL ECONOMIC PROFILING PROJECT)

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 – 200 metric tonnes and 124 metric tonnes respectively. Very little vegetable production is present other than for subsistence purposes.

The recent good rains (2009-2011) ensure that a good livestock and irrigated crop yield will be reached for the season, save for cultivated areas damaged by the excessive precipitation.

The Northern Cape Department of Agriculture, Land Reform and Rural Development considers 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 John Taolo Gaetsewe District. In the meantime, the department has spent R10-million during the 2009/10 financial year through the Comprehensive Agricultural Support Programme (CASP) 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).

8.2 Limitations and threats

8.2.1 Natural

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.

8.2.2 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.

8.2.3 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 TB 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 Moshwaneng 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.

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

8.2.4 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. On the other hand, in order to develop further, commercial farmers need to form support networks with the emergent farmers, and coordinate the production cycle for the District. Coordinated 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 JTGDM (Table 25).

TABLE 25: ACTIONS REQUIRED FOR AGRICULTURAL DEVELOPMENT IN JTGDM

Barrier / Constraint	Potential solution
Poor basic infrastructure • Many emerging farmers without access to proper drainage, roads, water supplies or electricity, especially in Moshaweng	**Major upgrade of the basic services**
Lack of skills • Many emerging black commercial farmers lack management and financial skills • Subsistence farmers apply bad farming practices, e.g. overgrazing	**Training** • Municipality initiatives to build skills • Mentorship programme • Increase the number of extension officers to assist the agricultural sector
Lack of fertile land • Soil types in the area are infertile for crop farming	**Promote the use of fertilisers** • Provide adequate training to ensure fertilisers are used effectively and efficiently
Lack of water resources • Area is extremely dry with no major river	**Upgrade water supply** • Consider ways of channelling water from the fountains to surrounding farms
Lack of adequate equipment • Some emerging farmers do not possess or have access to implements and equipment, e.g. tractors	**Municipality and Dept of Agriculture to facilitate sharing of assets in the area by partnering emerging farmers with the larger commercial farmers, e.g:** • Provide a service based on the pay per use basis, e.g. tractors • Provide assistance in obtaining second-hand equipment
Low quality of produced products • People tend to think that quantity is better than quality • Application of bad farming practices, e.g. overgrazing	**Mentorship programme** • Utilise the knowledge of the commercial farmers
Little value-add within the node	**Processing within the node**
Understanding of market • Emerging black commercial farmers and subsistence farmers sell to the local shop or	Train people to understand the market • Teach people market dynamics and how to extract a higher price for their products

Barrier / Constraint	Potential solution
direct to people in the node at whatever price they are offered	• Gather people in co-ops to increase their buying/selling power
Infrastructure • High logistical cost of getting cattle to the market/auction	**Co-operatives** • 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

9 MINING

9.1 Introduction

According to the JTGDM, this municipality was the richest mining region in the Northern Cape until a decline in mining employment and the near extinction of the asbestos mining industry in the 1980s. Minerals currently mined in the area include manganese ore, iron ore and tiger's eye. The Sishen iron-ore mine is one of the largest open-cast mines in the world and the iron-ore railway from Sishen to Saldanha is one of the longest iron-ore carriers in the world. 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

9.2 Active mines in the area

Local mining companies in the area are owned by Kumba, Assmang and BHP Billiton. There are several operational mines in the area **(Map 12: Location of mining and minerals areas)**. 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
- Nchwaning
- Gloria mine
- Black Rock mine
- Sishen
- Wessels and
- Mamatwan Mine

9.3 Impacts due to mining activities in the area

9.3.1 Asbestos

According to the Northern Cape mineral sector strategy, South African asbestos production has been in more or less steady decline since the early 80s. The last asbestos mine near Kuruman ceased production in March 1997 in response to falling world demand. Mining of asbestos has left behind a terrible 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 (refer to Bute Mine case study below). A number of asbestos mines and dumps have been rehabilitated ***spending in excess R5 million*** in sites such as Heuningvlei sites though there is still a number awaiting rehabilitation sites (see Figure 18) and refer to case study below).

The Kgalagadi Relief Trust was established to provide financial relief to individuals who contracted an asbestos-related disease while employed between 1952 and 1981 at the Kuruman Cape Blue and Danielskuil Cape Blue asbestos mines. The Kgalagadi Relief Trust is administered by the Asbestos Relief Trust in terms of a Service Level Agreement. The Asbestos Relief Trust was established in 2003 to provide financial relief to the former employees of asbestos mines operated by Gencor Limited and Gefco. This avoids unnecessary duplication of costs and improves operational efficiency as some people claim against both trusts. In the first 8 months of claims processing (July to end February 2007) the Kgalagadi Relief Trust paid or approved payments to a total of R9,2million with further R2,2 million in potential claims likely to be approved. Occupational claims in the administration

pipeline were likely to require payment of a further R2,5 million in benefits and environmental claims awaiting diagnosis and administration were estimated to carry benefits of approximately R5,2 million. The total claims as at 30 November 2010 paid by Asbestos Relief Trust and Kgalagadi Relief Trust are indicated in Table 26 below.

TABLE 26: ASBESTOS TRUSTS' STATISTICS AS AT 30 NOVEMBER 2010

Asbestos Relief Trust		Kgalagadi Relief Trust	
Number	**Claims paid**	**Number**	**Claims paid**
3207	R208,395,569	1064	R67,032,198
239	R11,886,047	114	R5,515,587

Case Study: Bute Mine

The abandoned Bute Mine lies 25km from Heuningvlei. The road leading from Bute Mine to Heuningvlei is badly contaminated with asbestos and asbestos pollution can be found throughout the Heungingvlei settlement, posing a health hazard to the community. Patches of asbestos fibres lie between buildings and hang on trees. Environmental exposure to asbestos fibres places communities at huge risks. Assisting the community to limit their exposure to asbestos will have a huge impact in limiting future illness in that community.

The Department of Minerals and Energy embarked on a rehabilitation programme but simply did not have sufficient funds to complete the necessary rehabilitation. To date the responsible mining companies have not been required to share this rehabilitation responsibility.

The Bute Mine was owned by a subsidiary of Gencor. The LRC's Pretoria office prepared an application to stop the unbundling of Gencor on the basis that Gencor will not have sufficient funds after unbundling to cover rehabilitation costs. Gencor is offering R35 million to be paid immediately into the trust fund of the Department of Minerals and Energy. The assessment of the proposal is that it fails to properly measure the present contamination of the mine. The LRC is now negotiating with the Department of Environmental Affairs and Tourism on the terms of reference for an assessment of the secondary pollution in the Heuningsvlei residential area and the surrounding mine area. Gencor's proposal will be assessed once the level and cost of rehabilitation is determined (Legal Resources Centre, 2004).

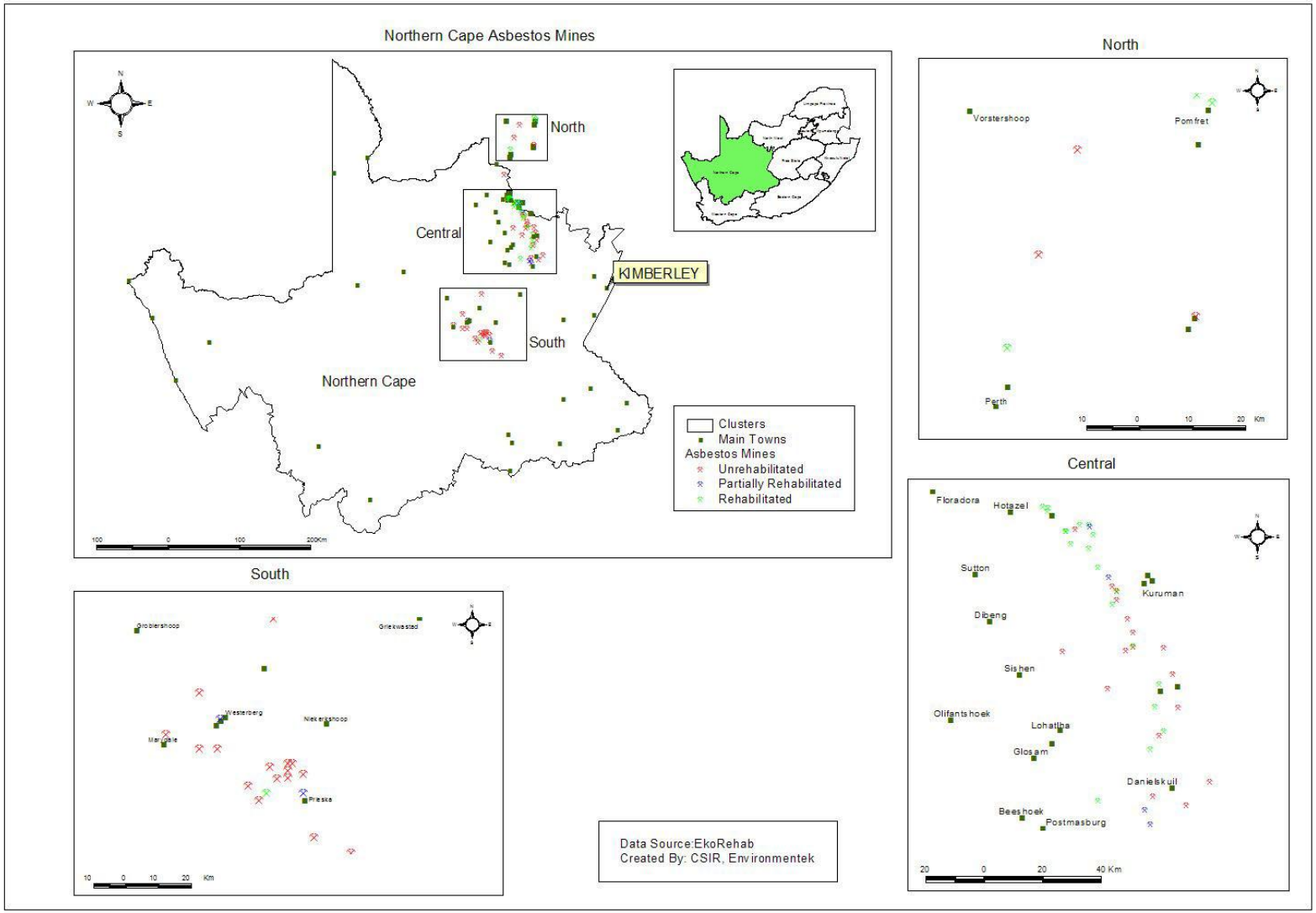


FIGURE 18: LOCATION OF ASBESTOS MINES IN THE NORTHERN CAPE, INCLUDING REHABILITATED, UNREHABILITATED AND PARTIALLY REHABILITATED

9.3.2 Particulate matter concentrations

The opinion of the consultants is that there are minimal amounts of common pollutants like nitrogen dioxide or sulphur dioxide except for a small number of open kiln brickworks. However, the main air pollutant would be particulate matter (PM), released from mining activities in the area, whether it is underground, opencast or the tailings facility. The amount of dust emitted by these activities depends on the physical characteristics of the material and the handling of the material. Dust is classified into three primary categories, respirable dust (typically size fractions less than 2.5 µm), inhalable dust (typically size fractions less than 10 µm), and total suspended dust (typically size fractions less than 75 µm). PM10 and PM2.5 readily penetrate the lungs and are associated with respiratory impacts. But according to the Northern Cape State of the environment there is currently no co-ordinated air pollution monitoring network in the Northern Cape.

9.3.3 Economic Contribution of mining in the area

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 (IDP, 2010/2011). The other job opportunities essentially feed of these three sectors.

The mines' social and community development programmes are embedded in the mines' approved Social and Labour Plans. The three primary focus areas of the Social and Labour Plans are poverty alleviation, community development and the provision of infrastructure. These focus areas are aligned with local municipalities' Integrated Development Plans and below are projects and plans contributed towards John Taolo Gaetsewe Municipality communities from each company.

FIGURE 19: MINE WORKERS' ACCOMMODATION

9.4 Kumba

(The information in this section was obtained from the Kumba Social and Community Development Review.)

In 2009, Kumba had committed R55 million and this amount does not include other investments made that are not part of Social and Labour Plans commitments. Kumba also provides support through donations and voluntary work conducted by Kumba employees.

Since the launch of Sishen Mine's has also established a small business start-up hub where 23 businesses have been created and 250 local community members have benefited through permanent employment.

In addition to Social and Labour Plans commitments, the mines ability to build mutually beneficial long-term relationships is enhanced by additional support in the form of Corporate Social Investment projects that simultaneously provide lasting community benefits and direct business value. The Corporate Social Investment programmes include enterprise development, health, education, sports and recreation, public safety and health, educational and environmental management interventions. Kumba also supports various education and training initiatives/projects in the area.

9.5 BHP Billiton

BHP Billiton mines in this area consists of Hotazel manganese mines; Wessels (underground) and Mamatwan Mine (open-cut) producing manganese ores and integrated ferroalloys. Both mines employ ± 1200 people (of which, ± 600 are contractors).

Hotazel is the main administration centre for both the Wessels and Mamatwan mines. Wessels is situated approximately 20 kilometres north-west of Hotazel and Mamatwan approximately 25 kilometres south. The Hotazel township was developed by BHP Billiton and inaugurated on 19 November 1959. There is housing for approximately 250 married workers and single quarters for 70 workers. BHP Billiton is currently building houses in the town for the community.

9.6 Assmang

(The information in this section was obtained from African Rainbow Minerals Sustainable Development Report 2010)

Assmang's mines in this area consist of the manganese mines Nchwaning and Gloria, and the Iron Ore Division is made up of the new high grade Khumani mine, Black Rock mine and the Beeshoek mine around the towns of Kathu and Postmasburg. Assmang being part of ARM adheres to the seven priority areas in all its operations that have been identified which provide the foundation of ARM's strategy:

- Health care promotion in respect of HIV and AIDS.
- Job creation programmes and projects, with the emphasis on youth and women.
- Infrastructure development.
- Sporting events to unite communities.
- Cultural events, particularly for rural communities.
- Capacity-building programmes aimed at enabling communities to actively participate in socio-economic processes and projects.

In line with the company's Social and Labour Plans, all operations have engaged with local governments and communities in order to establish their needs and developmental requirements and projects are integrated within the integrated development plans of the various district and local municipalities. In 2009, operations within the group had the budget of R65 million for LED in 2009. Amount of money that was spend in 2010 on LED projects was R43.8 million

Some of the primary projects that were undertaken as part of the group's Corporate Social Investment and LED initiatives during the year include the following:

TABLE 27: PRIMARY PROJECTS UNDERTAKEN AS PART OF THE GROUP'S CSI AND LED INITIATIVES

Name of operation	Project	Project description	Amount Spent
Beeshoek mine	Vukuzenzele Car Wash	Beeshoek assisted ex-convicts to start their own car wash business, and has paid all outstanding rentals up to the end of this 2010	R37 537
	Road crossing Postmasburg, Kimberly, Kathu and Beeshoek communities	Creation of a safe road crossing.	R6.64 million
	Realeboga olive trees, fruit and vegetables	The purpose is to train, transfer skills and create jobs.	R783 447
Black Rock Mine	Northern Moshaweng: Bulk Water supply	Infrastructure development for the supply of potable water to seven villages.	R1.37 million
	Kuruman to Hotazel (R31) Road Repair - 60 km stretch of road	Repair works carried out as planned.	R1.38 million
	A game farm	The main focus and intention of the game farm is education of the community and children. Employees pay a minimal fee to visit the game farm and utilise the facilities.	
Khumani	Gamagara cleaning	Enterprise Development –vehicle purchased. Working on maximising intake in cleaning and increasing manufacturing from the existing three products.	R290 487
	Dingleton Clinic	Renovation of the Dingleton Clinic	R290 974
	Diatomite	A new processing plant at Deben, where most of the deposits are located, an administration building and equipping the plant. The local municipality supplied the land, free of charge. The new factory will immediately raise employment from 18 to 71, all of whom will work for Temba.	R2.29 million

9.7 Closure planning and provision of Assmang Mines

Closure and rehabilitation provision assessments are performed annually at all operations and figures are shown on table below. The process is done by means of external estimation of closure and rehabilitation requirements annually and then provision into the various Trust Funds and in some cases bank guarantees are also issued.

TABLE 28: REHABILITATION PROVISIONS AT ASSMANG OPERATIONS IN JOHN TAOLO GAETSEWE MUNICIPALITY

Name of operation	Estimated costs as at 30 June 2010
Beeshoek mine	**87 004 696**
Black Rock Mine	**44 842 457**
Khumani	**106 932 480**
Gloria	**13 274 039**
Nchwaning	**27 588 326**
Total	**279 641 998**

10 ISSUES & CONSTRAINTS

10.1 Socio-economic

From the assessment of the JTDM region, 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 Moshaweng 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.

10.2 Development Planning

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 also 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.

10.3 Agriculture

Agricultural resources in the area are limited, but nevertheless the sector contributes 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 the 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.

10.4 Environmental Sensitivity

The natural environment in JTDM 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.

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.

ANNEXURE 1: LIST OF THREATENED, PROTECTED AND ENDEMIC PLANTS OF THE JOHN TAOLO GAETSEWE DISTRICT MUNICIPALITY

Plant species	Status	Local distribution
Red Data Listed species (SANBI POSA 2010)		
Acacia erioloba (camel thorn)	Declining, NFA	Red sands, ephemeral rivers and drainage lines
Crinum bulbispermum (orange river lily)	Declining	River banks and permanent wetlands
Hoodia officinalis	Near Threatened	Mountains, hills & rocky areas on plains
Protected species		
Acacia haematoxylon (grey camel thorn)	NFA	Deep sands, dunes
Boscia albitrunca (shepherd's tree)	NFA	All habitats
Harpagophytum procumbens ssp. *procumbens* (devil's claw)	NEMBA (protected)	Sandy plains, rocky areas
Hoodia gordonii (ghaap)	NEMBA (protected), CITES App II	Hills, rocky gravely plains, coarse sands
Adenium oleifolium	NECO	Sandy plains
Aloe claviflora	NECO	Rocky areas, hills
Aloe grandidentata	NECO	Variety of habitats
Aloe hereroensis var. *hereroensis*	NECO	Mountains, hills & rocky plains
Aloe striata ssp. *karasbergensis*	NECO	Mountains & hills
Ammocharis coranica	NECO	Sandy plains, pans, drainage lines
Anacampseros cf. *subnuda*	NECO	Mountains, hills, rocky areas on plains
Avonia albissima	NECO	Mountains, hills, rocky areas on plains with pebbles

Babiana species	NECO	Mountains, hills, rocky areas on plains, pans
Boophone disticha	NECO	Sandy plains, hills & mountains
Brachystelma species	NECO	Mountains & hills, sands
Ceropegia species	NECO	Mountains, hills & rocky areas on plains
Chasmatophyllum musculinum	NECO	Mountains, hills, rocky areas on plains
Crinum crassicaule	NECO	Sandy plains
Delosperma species	NECO	Mountains, hills, rocky areas on plains
Duthiastrum species	NECO	Rocky areas on plains
Duvalia species	NECO	Mountains, hills, foothills
Eulophia hereroensis	NECO	Plains
Fockea angustifolia	NECO	Mountains, hills, rocky areas on plains
Freesia species	NECO	Unknown
Haemanthus humilis	NECO	Hills
Haworthia species	NECO	Mountains
Hereroa wilmaniae	NECO	Mountains, hills, rocky areas on plains
Huernia species	NECO	Hills, rocky areas on plains
Huerniopsis decipiens	NECO	Hills, rocky areas on plains
Lapeirousia species	NECO	Hills & plains
Mestoklema arboriforme	NECO	Hills & rocky areas on plains
Microloma species	NECO	-

Moraea species	NECO	Rocky & sandy plains, rivers, drainage lines & pans
Nerine laticoma	NECO	Pans and panveld, wetlands, drainage lines
Orbeopsis knobelii	NECO	Associated with rivers and pans in Kalahari
Orbeopsis lutea	NECO	Hills & rocky areas on plains
Pachypodium succulentum	NECO	Hills & ridges
Pancratium tenuifolium	NECO	Kalahari pans
Piaranthus species	NECO	Hills & rocky areas on plains
Ruschia species	NECO	Variety of habitats
Sarcostemma viminale	NECO	Mountains and hills
Stapelia species	NECO	Mountains, hills & rocky areas on plains
Tavaresia barklyii	NECO	Hills and ridges
Trichodiadema species	NECO	Mountains, hills, rocky areas on plains
Tridentea gemmiflora	NECO	Mountains, hills, rocky areas on plains
Tridentea marientalensis ssp. *marientalensis*	NECO	Mountains, hills & rocky areas on plains
Endemic species		
Adenia repanda	Unprotected	Mountains, hills & rocky areas on plains
Amphiglossa tecta	Unprotected	Sandy plains, dunes
Blepharis marginata	Unprotected	Not known
Brachiaria dura var. *pilosa*	Unprotected	Sandy plains, dunes
Corchorus pinnatipartitus	Unprotected	Not known

Crotolaria griquensis	Unprotected	Not known
Digitaria polyphylla	Unprotected	Not known
Euphorbia bergii	Unprotected	Mountains, hills & rocky areas on plains
Gnaphalium englerianum	Unprotected	Not known
Justicia puberula	Unprotected	Not known
Lebeckia macrantha	Unprotected	Mountains, hills & rocky areas on plains
Lebeckia psiloloba	Unprotected	Not known, probably rock areas
Putterlickia saxatilis	Unprotected	Mountains & hills
Rennera stellata	Unprotected	Not known
Searsia tridactyla (Rhus tridactyla)	Unprotected	Hills & mountains
Sutera griquensis	Unprotected	Not known
Tarchonanthus obovatus	Unprotected	Mountains, hills & rocky areas on plains
Vahlia capensis ssp. *ellipticifolia*	Unprotected	Sandy plains, dunes

Declining = A taxon is Declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline in the population.

Near Threatened = A taxon is Near Threatened when available evidence indicates that it nearly meets any of the five IUCN criteria for Vulnerable, and is therefore likely to qualify for a threatened category in the near future.

NEMBA protected species = Species listed as protected under the National Environmental Management: Biodiversity Act (Act 10 of 2004), in the draft list of 2005.

CITES = The Convention on International Trade in Endangered Species of Wild Fauna and Flora. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

NFA = National Forests Act (Act 84 of 1998) and amendments thereto.

NECO = Species protected under Nature and Environmental Conservation Ordinance (No. 19 of 1974), currently under revision.

Endemic species = The ranges of these species are restricted to the Griqualand West Centre of Endemism. Approximately half of the John Taolo Gaetsewe District Municipality falls within this centre of plant endemism.

ANNEXURE 2: COMPLETE FAUNA SPECIE LISTS FOR THE JOHN TAOLO GAETSEWE DISTRICT

Species marked in **bold** are conservation-worthy species and will be discussed in more detail in Appendix 2.

Mammals		
Common Name	***Scientific Name***	**Recorded**
Round-eared Sengi	*Macroscelides proboscideus*	
Bushveld Sengi	***Elephantulus intufi***	✓
Western Rock Sengi	*Elephantulus rupestris*	✓
Eastern Rock Sengi	*Elephantulus myurus*	✓
Southern African Hedgehog	***Atelerix frontalis***	✓
Reddish-grey Musk Shrew	***Crocidura cyanea***	✓
Lesser Red Musk Shrew	***Crocidura hirta***	✓
Tiny Musk Shrew	***Crocidura fuscomuria***	
Egyptian Slit-faced Bat	*Nycteris thebaica*	✓
Geoffroy's Horseshoe Bat	***Rhinolophus clivosus***	✓
Darling's Horseshoe Bat	***Rhinolophus darlingi***	✓
Dent's Horseshoe Bat	***Rhinolophus denti***	✓
Natal Long-fingered Bat	***Miniopterus natalensis***	✓
Cape Serotine Bat	*Neoromicia capensis*	✓
Long-tailed Serotine Bat	*Eptesicus hottentotus*	✓
Egyptian Free-tailed Bat	*Tadarida aegyptiaca*	✓
Savanna (Chacma) Baboon	*Papio cynocephalus ursinus*	✓
Ground Pangolin	***Manis temminckii***	✓
Cape Hare	*Lepus capensis*	✓
Scrub Hare	*Lepus saxatilis*	✓
Smith's Red Rock Rabbit	*Pronolagus rupestris*	✓
Southern African Ground Squirrel	*Xerus inauris*	✓
Woodland Dormouse	*Graphiurus murinus*	✓
Spectacled Dormouse	*Graphiurus ocularis*	
Springhare	*Pedetes capensis*	✓
Common (African) Molerat	*Cryptomys hottentotus*	✓
Damara Molerat	*Cryptomys damarensis*	✓
Cape Porcupine	*Hystrix africaeaustralis*	✓
Woosnam's Desert Rat	*Zelotomys woosnami*	✓
Pouched Mouse	*Saccostomus campestris*	✓
Kreb's Fat Mouse	*Steatomys krebsii*	✓
Grey Climbing Mouse	*Dendromus melanotis*	✓
Large-eared / Gerbil Mouse	*Malacothrix typica*	✓
Cape Shorted-tailed Gerbil	*Desmodillus auricularis*	✓
Hairy-footed Gerbil	*Gerbillurus paeba*	✓
Bushveld Gerbil	***Tatera leucogaster***	✓
Highveld Gerbil	*Tatera brantsii*	✓
Namaqua Rock Mouse	*Micaelamys namaquensis*	✓
Red Veld Rat	*Aethomys chrysophilus*	✓

Mammals		
Brown House Rat	*Rattus rattus*	✓
Four-striped Grass Mouse	*Rhabdomys pumilio*	✓
Desert Pygmy Mouse	*Mus indutus*	✓
Pygmy Mouse	*Mus minutoides*	✓
Acacia Tree Rat	*Thallomys paedulcus*	
Black-tailed Tree Rat	*Thallomys nigricaudatus*	✓
Southern Multimammate Mouse	*Mastomys coucha*	✓
Brant's Whistling Rat	*Parotomys brantsii*	✓
Vlei Rat	*Otomys irroratus*	✓
Cape Fox	***Vulpes chama***	✓
Bat-eared Fox	*Otocyon megalotis*	✓
Black-backed Jackal	*Canis mesomelas*	✓
Wild Dog	***Lycaon pictus***	✓
Honey Badger (Ratel)	***Mellivora capensis***	✓
African Striped Weasel	***Poecilogale albinucha***	
Striped Polecat	*Ictonyx striatus*	✓
Slender Mongoose	*Galerella sanguinea*	✓
Small Grey Mongoose	*Galerella pulverulenta*	✓
Yellow Mongoose	*Cynictis penicillata*	✓
Suricate	*Suricata suricatta*	✓
Small-spotted Genet	*Genetta genetta*	✓
Spotted Hyaena	***Crocuta crocuta***	✓
Brown Hyaena	***Parahyaena brunnea***	✓
Aardwolf	*Proteles cristatus*	✓
African Wild Cat	***Felis silvestris lybica***	✓
Black-footed Cat	***Felis nigripes***	✓
Caracal	*Caracal caracal*	✓
Cheetah	***Acinonyx jubatus***	✓
Lion	***Panthera leo***	✓
Leopard	***Panthera pardus***	✓
Aardvark	*Orycteropus afer*	✓
Rock Dassie (Hyrax)	*Procavia capensis*	✓
Plains Zebra	*Equus quagga*	✓
Black Rhinoceros (arid ecotype)	***Diceros bicornis bicornis*** ***Diceros bicornis minor***	✓
White Rhinoceros	***Ceratotherium simum***	✓
Common Warthog	*Phacochoerus africanus*	✓
Giraffe	*Giraffa camelopardalis*	✓
African (Cape) Buffalo	*Syncerus caffer*	✓
Common Eland	*Tragelaphus oryx*	✓
Greater Kudu	*Tragelaphus strepsiceros*	✓
Roan Antelope	***Hippotragus equinos***	✓
Sable Antelope	***Hippotragus niger***	✓
Gemsbok	*Oryx gazella*	✓
Black Wildebeest	*Connochaetes gnou*	✓
Blue Wildebeest	*Connochaetes taurinus*	✓
Red Hartebeest	*Alcelaphus buselaphus*	✓
Tsessebe	***Damaliscus lunatus***	✓
Impala	*Aepyceros melanpus*	✓
Springbok	*Antidorcas marsupialis*	✓

Mammals		
Klipspringer	*Oreotragus oreotragus*	✓
Steenbok	*Raphicerus campestris*	✓
Common Duiker	*Sylvicapra grimmia*	✓

De Graaf 1981, Erasmus 1998, Skinner & Chimimba 2005, Smithers 1986, Stuart & Stuart 2007, Monadjem et al 2010

Birds		
Common Name	***Scientific Name***	**Recorded**
Common Ostrich	*Struthio camelus*	✓
Orange River Francolin	*Scleroptila levaillantoides*	✓
Red-billed Spurfowl	*Pternistis adspersus*	✓
Swainson's Spurfowl	*Pternistis swainsonii*	
Helmeted Guineafowl	*Numida meleagris*	✓
Harlequin Quail	*Coturnix delegorguei*	
Common Quail	*Coturnix coturnix*	✓
Kurrichane Buttonquail	*Turnix sylvaticus*	✓
White-faced Duck	*Dendrocygna viduata*	✓
Maccoa Duck	*Oxyura maccoa*	SABAP
Yellow-billed Duck	*Anas undulata*	✓
Mallard Duck	*Anas platyrhynchos*	SABAP
Cape Teal	*Anas capensis*	SABAP
Red-billed Teal	*Anas erythrorhyncha*	✓
Hottentot Teal	*Anas hottentotat*	
Egyptian Goose	*Alopochen aegyptiaca*	✓
South African Shelduck	*Tadorna cana*	✓
Spur-winged Goose	*Plectropterus gambensis*	✓
Comb (Knob-billed) Duck	*Sarkidiornis melanotos*	SABAP
Greylag (Domestic) Goose	*Anser anser*	✓
Southern Pochard	*Netta erythrophthalma*	SABAP
Cape Shoveller	*Anas smithii*	SABAP
Greater Honeyguide	*Indicator indicator*	✓
Golden-tailed Woodpecker	*Campethera abingoni*	✓
Bennett's Woodpecker	*Campethera bennettii*	SABAP
Cardinal Woodpecker	*Dendropicos fuscescens*	SABAP
Bearded Woodpecker	*Dendropicos namaquus*	
Crested Barbet	*Trachyphonus vaillantii*	✓
Black-collared Barbet	*Lybius torquatus*	SABAP
Acacia Pied Barbet	*Tricholaeman leucomelas*	✓
Southern Yellow-billed Hornbill	*Tockus leucomelas*	✓
African Grey Hornbill	*Tockus nasutus*	✓
African Hoopoe	*Upupa africana*	✓
Green Wood-hoopoe	*Phoeniculus purpureus*	SABAP
Common Scimitarbill	*Rhinopomastus cyanomelas*	✓
Lilac-breasted Roller	*Coracias caudatus*	✓
Purple Roller	*Coracias naevius*	✓
European Roller	*Coracias garruls*	✓
Malachite Kingfisher	*Alcedo cristata*	
Striped Kingfisher	*Haycyon chelicuti*	

Birds		
Brown-hooded Kingfisher	*Haycyon albiventris*	
Pied Kingfisher	*Ceryle rudis*	SABAP
Swallow-tailed Bee-eater	*Merops hirundineus*	✓
European Bee-eater	*Merops apiaster*	✓
Little Bee-eater	*Merops pusillus*	
White-backed Mousebird	*Colius colius*	✓
Red-faced Mousebird	*Urocolius indicus*	✓
African Cuckoo	*Cuculus gularis*	✓
Jacobin Cuckoo	*Clamator jacobinus*	✓
Levaillant's Cuckoo	*Clamator levaillantii*	
Great Spotted Cuckoo	*Clamator glandarius*	SABAP
Black Cuckoo	*Cuculus clamosus*	✓
Diderick (Diederik) Cuckoo	*Chrysococcyx caprius*	✓
Burchell's Coucal	*Centropus burchellii*	✓
Alpine Swift	*Tachymarptis melba*	SABAP
Common Swift	*Apus apus*	SABAP
Bradfield's Swift	*Apus bradfieldi*	SABAP
African Black Swift	*Apus barbatus*	✓
Little Swift	*Apus affinis*	✓
White-rumped Swift	*Apus caffer*	✓
African Palm Swift	*Cypsiurus parvus*	✓
Grey Go-away-bird	*Corythaixoides concolor*	
Barn Owl	*Tyto alba*	✓
African Scops Owl	*Otus senegalensis*	
Southern White-faced Scops Owl	*Ptilopsis granti*	SABAP
Pearl-spotted Owlet	*Glaucidium perlatum*	✓
Spotted Eagle-Owl	*Bubo africanus*	✓
Verreaux's Eagle-Owl	*Bubo lacteus*	SABAP
Fiery-necked Nightjar	*Caprimulgus pectoralis*	
European Nightjar	*Caprimulgus europaeus*	SABAP
Rufous-cheeked Nightjar	*Caprimulgus rufigena*	SABAP
Speckled Pigeon	*Columba guinea*	✓
Laughing Dove	*Streptopelia senegalensis*	✓
Cape Turtle Dove	*Streptopelia capicola*	✓
Red-eyed Dove	*Streptopelia semitorquata*	✓
Rock Dove	*Columba livia*	✓
Namaqua Dove	*Oena capensis*	✓
Kori Bustard	***Ardeotis kori***	✓
Ludwig's Bustard	***Neotis ludwigii***	**SABAP**
Northern Black Korhaan	*Afrotis afraoides*	✓
Red-crested Korhaan	*Lophotis ruficrista*	✓
African Rail	*Rallus caerulescens*	
Black Crake	*Amaurornis flavirostra*	✓
African Purple Swamphen	*Porphyrio madagascariensis*	SABAP
Common Moorhen	*Gallinula chloropus*	✓
Red-knobbed Coot	*Fulica cristata*	✓
Namaqua Sandgrouse	*Pterocles namaqua*	✓
Double-banded Sandgrouse	*Pterocles bicinctus*	
Burchell's Sandgrouse	*Pterocles burchelli*	✓
African Snipe	*Gallinago nigrpennis*	
Common Greenshank	*Tringa nebularia*	✓

Birds		
Ruff/Reeve	*Philomachus pugnax*	✓
Marsh Sandpiper	*Tringa stagnatilis*	SABAP
Wood Sandpiper	*Tringa glareola*	✓
Common Sandpiper	*Actitis hypoleucos*	✓
Curlew Sandpiper	*Calidris ferruginea*	SABAP
Little Stint	*Calidris minuta*	✓
Black-winged Stilt	*Himantopushimantopus*	✓
Pied Avocet	*Recurvirostra avosetta*	SABAP
Spotted Thick-knee	*Burhinus capensis*	✓
Caspian Plover	*Charadrius asiaticus*	
Common Ringed Plover	*Charadrius hiaticula*	SABAP
Kittlitz's Plover	*Charadrius pecuarius*	✓
Three-banded Plover	*Charadrius tricollaris*	✓
Chestnut-banded Plover	***Charadrius pallidus***	
Blacksmith Lapwing	*Vanellus armatus*	✓
Crowned Lapwing	*Vanellus coronatus*	✓
Double-banded Courser	*Rhinoptilus africanus*	SABAP
Bronze-winged Courser	*Rhinoptilus chalcopterus*	
Burchell's Courser	*Curosrius rufus*	SABAP
Temminck's Courser	*Cursorius temminckii*	
Black-winged Pratincole	***Glareola nordmanii***	
Grey-headed Gull	*Larus cirrocephalus*	
White-winged Tern	*Chlidonias leucopterus*	SABAP
Black-shouldered Kite	*Elanus caeruleus*	✓
Black Kite	*Milvus migrans*	SABAP
Yellow-billed Kite	*Milvus aegyptius*	SABAP
Egyptian Vulture	***Neophron percnopterus***	
White-backed Vulture	***Gyps africanus***	**SABAP**
Cape Vulture	***Gyps coprotheres***	
Lappet-faced Vulture	***Aegypius tracheliotus***	**SABAP**
Black-chested Snake-Eagle	*Ciraetus pectoralis*	SABAP
Brown Snake Eagle	*Ciraetus cinereus*	SABAP
Black Harrier	***Circus maurus***	**SABAP**
Montagu's Harrier	*Circus pugargus*	
Bateleur	***Terathopius ecaudatus***	**SABAP**
Southern Pale Chanting Goshawk	*Melierax canorus*	✓
Gabar Goshawk	*Melierax gabar*	✓
Shikra	*Accipiter badius*	✓
Jackal Buzzard	*Buteo rufofuscus*	
Steppe Buzzard	*Buteo vulpinus*	✓
African Harrier-Hawk	*Polyboroides typus*	SABAP
Tawny Eagle	***Aquila rapax***	
Verreaux's (Black) Eagle	*Aquila vereauxii*	SABAP
African Hawk-Eagle	*Aquila spilogaster*	
Booted Eagle	*Aquila pennatus*	✓
Wahlberg's Eagle	*Aquila wahlbergi*	
Martial Eagle	***Polemaetus bellicosus***	✓
Secretarybird	***Sagittarius serpentarius***	**SABAP**
Pygmy Falcon	*Polihierax semitorquatus*	✓
Lesser Kestrel	***Falco naumanni***	**SABAP**
Rock Kestrel	*Falco rupicolus*	✓

Birds		
Greater Kestrel	*Falco rupicoloides*	SABAP
Red-necked Falcon	*Falco chicquera*	
Red-footed Falcon	*Falco vespertinus*	
Lanner Falcon	***Falco biarmicus***	**SABAP**
Eurasian Hobby	*Falco subbuteo*	
African Darter	*Anhinga rufa*	SABAP
Reed Cormorant	*Phalacrocorax africanus*	✓
White-breasted Cormorant	*Phalacrocorax lucidus*	✓
Little Grebe	*Tachybaptus ruficollis*	✓
Great-crested Grebe	*Podiceps cristatus*	SABAP
Cattle Egret	*Bubulcus ibis*	✓
Little Egret	*Egretta garzetta*	SABAP
Great Egret	*Egretta alba*	✓
Squacco Heron	*Ardeola ralloides*	
Grey Heron	*Ardea cinerea*	✓
Black-headed Heron	*Ardea melanocephala*	✓
Black-crowned Night-Heron	*Nycticorax nycticorax*	✓
Little Bittern	*Ixobrychus minutes*	SABAP
Hamerkop	*Scopus umbretta*	✓
Glossy Ibis	*Plegadis falcinellus*	SABAP
Hadeda Ibis	*Bostrychia hagedash*	✓
African Sacred Ibis	*Threskiornis aethiopicus*	✓
African Spoonbill	*Platalea alba*	SABAP
Greater Flamingo	***Phoenicopterus ruber***	
Lesser Flamingo	***Phoenicopterus minor***	
Black Stork	***Ciconia nigra***	**SABAP**
Abdim's Stork	*Ciconia abdimii*	SABAP
Yellow-billed Stork	***Mycteria ibis***	
White Stork	*Ciconia ciconia*	
Marabou Stork	***Leptoptilos crumeniferus***	
Eurasian Golden Oriole	*Oriolus oriolus*	SABAP
Fork-tailed Drongo	*Dicrurus adsimilis*	✓
Brubru	*Nilaus afer*	✓
Brown-crowned Tchagra	*Tchagra australlis*	✓
Crimson-breasted Shrike	*Laniarius atrococcineus*	✓
Bokmakierie	*Telophorus zeylonus*	✓
Red-backed Shrike	*Lanius collurio*	✓
Lesser Grey Shrike	*Lanius minor*	✓
Common Fiscal	*Lanius collaris*	✓
Southern White-crowned Shrike	*Eurocephalus anguitimens*	
Pririt Batis	*Batis pririt*	✓
Cape Penduline Tit	*Anthoscopus minutus*	SABAP
Ashy Tit	*Parus cinerascens*	✓
Sand Martin	*Riparia riparia*	
Brown-throated Martin	*Riparia paludicola*	✓
Barn Swallow	*Hirundo rustica*	✓
White-throated Swallow	*Hirundo albigularis*	✓
Pearl-breasted Swallow	*Hirundo dimidiate*	
Greater Striped Swallow	*Hirundo cucullata*	✓
Red-breasted Swallow	*Hirundo semirufa*	SABAP
South African Cliff-swallow	*Hirundo spilodera*	

Birds		
Rock Martin	*Hirundo fuligula*	✓
Cape Crow	*Corvus capensis*	SABAP
Pied Crow	*Corvus albus*	✓
African Red-eyed Bulbul	*Pycnonotus nigricans*	✓
Fairy Flycatcher	*Stenostira scita*	SABAP
Chat Flycatcher	*Bradornis infuscatus*	✓
Marico Flycatcher	*Bradornis mariquensis*	✓
Fiscal Flycatcher	*Sigelus silens*	✓
Spotted Flycatcher	*Muscicapa striata*	✓
Long-billed Crombec	*Sylvietta ruescens*	✓
Yellow-bellied Eremomela	*Eremomela icteropygialis*	✓
Sedge Warbler	*Acrocephalus schoenobaenus*	✓
African Reed-warbler	*Acrocephalus baeticatus*	SABAP
Great Reed-warbler	*Arocephalus arundinaceus*	SABAP
Lesser Swamp-warbler	*Acrocephalus gracilirostris*	✓
Icterine Warbler	*Hippolais icterina*	
Willow Warbler	*Phylloscopus trochilus*	✓
Garden Warbler	*Syvia borin*	SABAP
Rufous-eared Warbler	*Malcorus pectoralis*	✓
Chestnut-vented Titbabbler	*Parisoma sucaeruleum*	✓
Southern Pied Babbler	*Turdoides bicolour*	✓
Orange River White-eye	*Zosterops pallidus*	✓
Cape White-eye	*Zosterops virens*	SABAP
Levaillant's Cisticola	*Cisticola tinniens*	SABAP
Neddicky	*Cisticola fulvicapilla*	✓
Zitting Cisticola	*Cisticola juncidis*	SABAP
Desert Cisticola	*Cisticola aridulus*	✓
Black-chested Prinia	*Prinia flavicans*	✓
Barred Wren-warbler	*Calamonastes fasciolatus*	SABAP
Monotonous Lark	*Mirafra passerina*	
Eastern Clapper Lark	*Mirafra fasciolata*	✓
Sabota Lark	*Calendulauda sabota*	✓
Fawn-coloured Lark	*Calendulauda africanoides*	✓
Spike-heeled Lark	*Chersomanes albofasciata*	✓
Large-billed Lark	*Galerida magnirostris*	✓
Chestnut-backed Sparrowlark	*Eremopterix leucotis*	
Grey-backed Sparrowlark	*Eremopterix verticalis*	SABAP
Red-capped Lark	*Calandrella cinerea*	✓
Pink-billed Lark	*Spizocorys conirostris*	✓
Stark's Lark	*Spizocorys starki*	SABAP
Short-toed Rock Thrush	*Monticola brevipes*	SABAP
Groundscraper Thrush	*Psophocichla litsitsirupa*	✓
Karoo Thrush	*Turdus smithi*	✓
Cape Robin-Chat	*Cossypha caffra*	SABAP
Karoo Scrub-Robin	*Cercotrichas coryphoeus*	✓
Kalahari Scrub-Robin	*Cercotrichas paena*	✓
Familiar Chat	*Cercomela familiaris*	✓
Mountain Wheatear	*Oenanthe monticola*	✓
Capped Wheatear	*Oenanthe pileata*	✓
Ant-eating Chat	*Myrmecocichla formicivora*	✓
African (Common) Stonechat	*Saxicola torquatus*	SABAP

Birds		
Pale-winged Starling	*Onychognathus nabouroup*	✓
Cape Glossy Starling	*Lamprotornis nitens*	✓
Burchell's Starling	*Lamprotornis australis*	
Pied Starling	*Spreo bicolor*	SABAP
Wattled Starling	*Creatophora cinera*	✓
Common Myna	*Acridotheres tristis*	✓
Red-billed Oxpecker	***Buphagus erythrorhynchus***	✓
Dusky Sunbird	*Cinnyris fuscus*	✓
Marico Sunbird	*Cinnyris mariquensis*	SABAP
White-bellied Sunbird	*Cinnyris talatala*	SABAP
Scaly-feathered Finch	*Sporopipes squamifrons*	✓
Red-billed Buffalo-weaver	*Babalornis niger*	✓
White-browed Sparrow-weaver	*Plocepasser mahali*	✓
Sociable Weaver	*Philetarius socius*	✓
Southern Masked-weaver	*Ploceus velatus*	✓
Red-billed Quelea	*Quelea quelea*	✓
Southern Red Bishop	*Euplectes orix*	✓
Yellow-crowned Bishop	*Euplectes afer*	SABAP
African Quailfinch	*Ortygospiza atricollis*	SABAP
Red-headed Finch	*Amadina erythrocephala*	✓
Green-winged Pytilia	*Pytilia melba*	SABAP
Black-faced Waxbill	*Estrilda erythronotos*	✓
Common Waxbill	*Estrilda astrild*	✓
Violet-eared Waxbill	*Granatina granatina*	✓
Red-billed Firefinch	*Lagonosticta senegala*	SABAP
Shaft-tailed Whydah	*Vidua regia*	✓
Pin-tailed Whydah	*Vidua macroura*	✓
Long-tailed Paradise-whydah	*Vidua paradisaea*	SABAP
House Sparrow	*Passer domesticus*	✓
Cape Sparrow	*Passer melanurus*	✓
Southern Grey-headed Sparrow	*Passer diffuses*	✓
Great Sparrow	*Passer motitensis*	SABAP
Cape Wagtail	*Motacilla capensis*	✓
African Pipit	*Anthus cinnamomeus*	SABAP
African Rock Pipit	*Anthus crenatus*	SABAP
Buffy Pipit	*Anthus vaalensis*	SABAP
Kimberley Pipit	*Anthus pseudosimilis*	
Black-throated Canary	*Crithagra atrogularis*	✓
White-throated Canary	*Crithagra albogularis*	✓
Yellow Canary	*Crithagra flaviventris*	✓
Black-headed Canary	*Serinus alario*	SABAP
Lark-like Bunting	*Emberiza impetuani*	✓
Cape Bunting	*Emberiza capensis*	✓
Golden-breasted Bunting	*Emberiza flaviventris*	SABAP
Common Peacock	*Pavo cristatus*	✓

Hockey *et al* 2005, and ToPS Schedule 2007; Harrison et al 1997, Sinclair et al 2002, SABAP 2010.

Reptiles		
Common Name	***Scientific Name***	**Recorded**
Leopard Tortoise	*Stigmochelys pardalis*	✓
Serrated (Kalahari Tent) Tortoise	*Psammobates oculifer*	✓
Marsh Terrapin	*Pelomedusa subrufa*	✓
Puff Adder	*Bitis arietans*	✓
Horned Adder	*Bitis caudalis*	✓
Cape Cobra	*Naja nivea*	✓
Black Mamba	*Dendroaspis polylepis*	✓
Boomslang	*Dispholidus typus*	✓
Common Tiger Snake	*Telescopus semiannulatus*	✓
Southern Stiletto Snake	*Atractaspis bibronii*	✓
Dwarf Beaked Snake	*Dipsina multimaculata*	SARCA
Short-snouted Whip Snake	*Psammophis brevirostris*	✓
Kalahari Sand Snake	*Psammophis trinasalis*	✓
Bicoloured Quill-snouted Snake	*Xenocalamus bicolor*	SARCA
Southern African Python	***Python natalensis***	✓
Mole Snake	*Pseudaspis cana*	✓
Brown House Snake	*Lamprophis capensis*	✓
Two-striped Shovel-snout	*Prosymna bivittata*	
Common Wolf Snake	*Lycophhidion capense*	✓
Common Egg-eater	*Dasypeltis scabra*	SARCA
Peter's Thread (Worm) Snake	*Leptotyphlops scutifrons*	SARCA
Kalahari Round-headed Worm Lizard	*Zygaspis quadrifrons*	SARCA
Dusky Spade-snouted Worm Lizard	*Monopeltis infuscata*	SARCA
Striped Blind Legless Skink	*Typhlosaurus lineatus*	
Cape Skink	*Trachylepis capensis*	SARCA
Kalahari Tree Skink	*Trachylepis spilogaster*	✓
Montane Speckled Skink	*Trachylepis punctiatissima*	SARCA
Western Rock Skink	*Trachylepis sulcata*	✓
Variegated Skink	*Trachylepis variegata*	✓
Bushveld Lizard	*Heliobolus lugubris*	✓
Common Rough-scaled Lizard	*Ichnotropis squamulosa*	SARCA
Spotted Sandveld Lizard	*Nucras intertexta*	✓
Spotted Desert Lizard	*Meroles suborbitalis*	✓
Spotted Sand Lizard	*Pedioplanis lineoocellata*	✓
Namaqua Sand Lizard	*Pedioplanis namaquensis*	✓
Yellow-throated Plated Lizard	*Gerrhosaurus flavigularis*	
Rock / White-throated Monitor	***Varanus albigularis***	✓
Ground Agama	*Agama aculeata aculeata*	✓
Southern Rock Agama	*Agama atra atra*	✓
Flap-neck Chameleon	*Chamaeleo dilepis*	SARCA
Giant Ground Gecko	*Chondrodactylus angulifer*	✓
Kalahari Ground Gecko	*Colopus wahlbergii*	SARCA
Bibron's Thick-toed Gecko	*Chondrodactylus bibronii*	✓
Turner's Thick-toed Gecko	*Chondrodactylus turnerii*	
Cape Gecko	*Pachydactylus capensis*	SARCA
Common Barking Gecko	*Ptenopus garrulus garrulus*	✓

Branch 1998, 2008, Alexander & Marais 2007, Marais 2004, Wilson 1998, SARCA

Amphibians		
Common Name	***Scientific Name***	**Recorded**
Bushveld Rain Frog	*Breviceps a. adspersus*	SAFAP
Guttural Toad	*Amietophrynus gutturalis*	SAFAP
Western Olive Toad	*Amietrophrynus poweri*	SAFAP
Karoo Toad	*Vandijkophrynus g. gariepensis*	✓
Bubbling Kassina	*Kassina senegalensis*	SAFAP
Common Platanna	*Xenopus laevis*	SAFAP
Boettger's Caco	*Cacosternum boettjeri*	✓
Common River Frog	*Amieta angolensis*	✓
Giant Bullfrog	***Pyxicephalus adspersus***	✓
Tremelo Sand Frog	*Tomopterna cryptotis*	SAFAP
Tandy's Sand Frog	*Tomopterna tandyi*	

Minter et al 2004, du Preez & Carruthers 2009; Passmore & Carruthers 1995

Selected Arachnids		
Common Name	***Scientific Name***	**Recorded**
Thick-tailed Scorpions	*Parabuthus granulatus*	
	Parabuthus raudus	
Bark Scorpion	*Uroplectes carinatus*	
Burrowing Scorpions	***Opistophthalmus carinatus***	
	Opistophthalmus wahlbergii	✓
Horned Baboon Spiders	***Ceratogyrus brachycephalus***	✓
	Ceratogyrus darlingi	✓
Starburst Baboon Spider	***Augacephalus junodi***	✓

Dippenaar-Schoeman 2002, Dippenaar-Schoeman et al 1997, 2010, Leeming 2003

ANNEXURE 3: THREATENED OR CONSERVATION-WORTHY FAUNA SPECIES IN THE JOHN TAOLO GAETSEWE DISTRICT

Mammals				
Common Name	***Scientific Name***	**Habitat**	**Status**[1]	**Likelihood of occurrence**
Bushveld Elephant-shrew / Sengi	*Elephantulus intufi*	Prefers sand soils with sparse grass cover	DD	Locally common species but is too data deficient to make conservation assessments
South African Hedgehog	*Atelerix frontatlis*	Variety of dry habitats	NT	Often locally common
Reddish-grey Musk Shrew	*Crocidura cyanea*	Dry areas with dense, matted vegetation	DD	Common and widespread species that may be present in the area but insufficient data available
Lesser Red Musk Shrew	*Crocidura hirta*	Wide range of habitats from moist savanna and wetlands to Kalahari thornveld	DD	May be common to the district but insufficient data available
Tiny Musk Shrew	*Crocidura fuscomuria*	Wide range of moist habitats with dense, matted vegetation	DD	Only has peripheral range in the north eastern parts of the district and not been recorded yet
Geoffroy's Horseshoe Bat	*Rhinolophus clivosus*	Roost in caves or mine shafts	NT	Prefers to roost in large numbers at specific sites in the south western areas of the district
Darling's Horseshoe Bat	*Rhinolophus darlingi*	Roost in caves or mine shafts	NT	They roost only in small numbers at a few sites in the south western areas of the district
Dent's Horseshoe Bat	*Rhinolophus denti*	Roost in caves or mine shafts	NT	Endemic to southern Africa, they roost only in small numbers at a few sites in the south western areas of the district
Natal Long-fingered Bat	*Miniopterus natalensis*	Roost in caves or mine shafts	NT	Prefers to roost in large numbers at specific sites in the south western areas of the district
Ground Pangolin	*Manis temminckii*	Range from low to high rainfall areas, including open grassland,	VU	Fairly rare and generally only occurs on well-managed game ranches and is easily disturbed by

Mammals				
Common Name	***Scientific Name***	**Habitat**	**Status**[1]	**Likelihood of occurrence**
		woodland and rocky hills		human activities
Bushveld Gerbil	*Tatera leucogaster*	Wide range of habitats with sandy soils	DD	Species is widely distributed in the district but is data deficient and thus conservation assessments are difficult to make
Cape Fox	*Vulpes chama*	Open areas as grassland and arid scrub	PS	Fairly common resident
Wild Dog	*Lycaon pictus*	Associated with open country and avoids dense woodland, forest and extensive areas of tall grass	EN	Vagrant groups from Botswana have very occasionally being transient to the northern areas of the district but are quickly persecuted or removed
Honey Badger	*Mellivora capensis*	Wide habitat tolerance from savanna, grassland to desert	NT	Uncommon to rare regionally
African Striped Weasel	*Poecilogale albinucha*	Wide range of habitats but most records are from grasslands	DD	Habitat modelling suggest its presence in the district, but it is highly secretive by nature and has to be recorded
Spotted Hyaena	*Crocuta crocuta*	Open country but also rocky areas and in open woodland provided water is available	NT	Has occasionally been recorded along the Botswana border regions of the district
Brown Hyaena	*Parahyaena brunnea*	Wide habitat tolerance but well-adapted to drier areas	NT	Are present in the district but are routinely persecuted by farmers
African Wild Cat	*Felis silvestris lybica*	Wide habitat tolerance but with some cover	PS	Common but conservation status is due to interbreeding risk with domestic and feral cats
Black-footed Cat	*Felis nigripes*	Open dry panveld and short grass areas	PS	Species has highly isolated and fragmented distribution in the region and is highly sensitive to

Mammals				
Common Name	***Scientific Name***	**Habitat**	**Status**[1]	**Likelihood of occurrence**
				disturbance
Cheetah	*Acinonyx jubatus*	Open savanna and light woodland	VU	Normally only occurs in protected areas and private game ranches but vagrant individuals are fairly common in this region. Are persecuted by farmers
Lion	*Panthera leo*	Wide habitat tolerance from desert fringe to woodland or open savanna	VU	Normally only occurs in protected areas and private game ranches but vagrant individuals may occur in this region but are persecuted by farmers
Leopard	*Panthera pardus*	Wide habitat tolerance	PS	Wide ranging but has all but been eradicated from the more mountainous and rugged areas
Black Rhinoceros (arid ecotype)	*Diceros bicornis bicornis* *Diceros bicornis minor*	From arid plains to rich savanna woodlands where sufficient browse is available	(CE) VU	Only occurs in protected areas and on private game ranches
Roan Antelope	*Hippotragus equinus*	Open savanna woodlands	VU	Only occurs on private game ranches
Sable Antelope	*Hippotragus niger*	Dry, open woodland with medium to tall grass	VU	Only occurs on private game ranches
Tsessebe	Damaliscus lunatus	Open savanna woodland with adjacent grassland and surface water	EN	Only occurs on private game ranches

[1] Status according to Friedman & Daly 2004 and ToPS Schedule 2007; De Graaf 1981, Erasmus 1998, Skinner & Chimimba 2005, Smithers 1986, Stuart & Stuart 2007

Birds				
Common Name	***Scientific Name***	**Habitat**	**Status**[2]	**Likelihood of occurrence**
Kori Bustard	*Ardeotis kori*	Dry open savanna woodland, dwarf shrublands and occasionally grassland	VU	Resident in the region but is likely to select natural, undisturbed areas
Ludwig's Bustard	*Neotis ludwigii*	Favours semi-arid dwarf shrublands, also in arid savanna	VU	Was reported in SABAP but is generally uncommon
Chestnut-banded Plover	*Charadrius pallidus*	Natural and man-made saltpans.	NT	Distribution includes this area but has never been recorded or reported in SABAP to present in the general area
Black-winged Pratincole	*Glareola nordmanni*	Open grassland, edges of pans and cultivated fields. Attracted to damp ground and newly flooded grassland.	NT	Distribution includes this area but has never been recorded or reported in SABAP to present in the general area. Rare migrants may visit the area occasionally
Egyptian Vulture	*Neophron perenopterus*	Favours dry open habitats, including semi-desert	CE RE	Few records in recent past possibly intra-African or Palearctic migrants but was not recorded during SABAP
White-backed Vulture	*Gyps africanus*	Savanna woodland and bushveld	VU EN	Common resident and has breeding areas in the northern areas of the district
Cape Vulture	*Gyps coprotheres*	Cliff-breeding species but ranges widely in surrounding areas	VU EN	Distribution includes this area but has never been recorded or reported in SABAP to present in the general area. Uncommon generally
Lappet-faced Vulture	*Torgos tracholiotos*	Favours semi-arid open woodland	VU EN	Uncommon resident but has been recorded as breeding in the district
Black Harrier	*Circus maurus*	Various habitats including dry grasslands	VU	Uncommon endemic but has been recorded in SABAP
Bateleur	*Terathopius ecaudatus*	Open and closed woodland, also in semi-arid regions	VU	Locally common in nearby protected areas but occasional birds may be encountered in the northern areas of the district

Birds				
Common Name	***Scientific Name***	**Habitat**	**Status**[2]	**Likelihood of occurrence**
Tawny Eagle	*Aquila rapax*	Open savanna woodland	VU	Distribution includes this area but has never been recorded or reported in SABAP to present in the general area. Rare migrants may visit the area occasionally
Martial Eagle	*Polemaetus bellicosus*	Mostly open savanna and woodland on plains, also semi-arid shrublands	VU	Uncommon resident but recorded for the area
Secretary-bird	*Sagittarius serpentarius*	Favours open grassland with scattered trees or shrubs	NT	Uncommon to locally common breeding resident which is highly nomadic. Was recorded in SABAP
Lesser Kestrel	*Falco naumanni*	Open savanna, shrublands, grassland and verges of agricultural lands	VU	Locally common non-breeding Palearctic migrant if sufficient roosting sites are available. Was recorded in SABAP.
Lanner Falcon	*Falco biarmicus*	Open grassland or woodland near cliff or electricity pylon breeding sites	NT	Was recorded in SABAP. Fairly common resident and with migratory populations but generally avoids disturbed areas.
Greater Flamingo	*Phoenicopterus ruber*	Favours saline or brackish shallow water bodies such as saltpans, large dams and coastal mudflats	NT	Distribution includes this area but has never been recorded or reported in SABAP to present in the general area. Highly nomadic and partially migrant which may use ephemeral pans in the district on migratory routes
Lesser Flamingo	*Phoenicopterus minor*	Primary eutrophic shallow wetlands, especially saltpans	NT	Distribution includes this area but has never been recorded or reported in SABAP to present in the general area. Highly nomadic and partially migrant which may use ephemeral pans in the district on migratory routes
Black Stork	*Ciconia nigra*	Associated with mountainous regions, but not restricted to	NT	Uncommon resident but has been recorded in SABAP. Nomadic in non-breeding season and may use

Birds				
Common Name	***Scientific Name***	**Habitat**	**Status**[2]	**Likelihood of occurrence**
		them		ephemeral pans
Yellow-billed Stork	*Mycteria ibis*	Shoreline of most inland freshwater bodies	NT	Distribution includes this area but has never been recorded or reported in SABAP to present in the general area. Uncommon but nomadic in response to water levels and fish availability
Marabou Stork	*Leptoptilos crumenifera*	Favours semi-arid areas	NT	Locally uncommon resident with most populations concentrated in game reserves and ranches but has never been recorded in SABAP
Red-billed Oxpecker	*Buphagus erythrorhynchus*	Open woodland where ungulate hosts are present	NT	Locally common and some groups may be occasionally present due to cattle in the north eastern areas

[2] Status Hockey *et al* 2005, and ToPS Schedule 2007; Harrison et al 1997, Sinclair et al 2002, SABAP 2010.

Reptiles				
Common Name	***Scientific Name***	**Habitat**	**Status**[3]	**Likelihood of occurrence**
African Rock Python	*Python natalensis*	Widespread preferring rocky outcrops in arid and moist savanna as well as in lowland forest	VU	Known to occur in the district but usually restricted to places where they have not been disturbed or persecuted. Victims of electric fences, and the pet and traditional medicine trade
Rock / White-throated Monitor	*Varanus albigularis*	Savanna and moister karroid areas	VU	Common species but exploited for bush meat and traditional medicinal trade outside protected areas

[3] Status according to Branch 1988 and ToPS Schedule 2007; Branch 1998, 2008, Alexander & Marais 2007, Marais 2004, Wilson 1998

Amphibians				
Common Name	***Scientific Name***	**Habitat**	**Status**[4]	**Likelihood of occurrence**
Giant Bullfrog	*Pyxicephalus adspersus*	Seasonal shallow grassy pans, vleis and other rain-filled depressions in open flat areas of grassland or savanna with sandy substrates	NT	Fairly common but seldom seen as they spend much of the year buried up 1m below ground awaiting heavy rainfall periods. Threatened by habit loss. Were recorded in water body on adjacent property

[4] Status according Minter et al 2004, du Preez & Carruthers 2009 and ToPS Schedule 2007; Passmore & Carruthers 1995

Arachnids				
Common Name	***Scientific Name***	**Habitat**	**Status**[5]	**Likelihood of occurrence**
Burrowing Scorpion spp.	*Opistophthalmus carinatus*	Found under large calcrete stones or dead vegetation, also under loose bark of fallen trees	PS	Common and widespread in the Kalahari region
Horned Baboon Spider spp.	*Ceratogyrus brachycephalus*	Ground-dwelling species that prefers sandy soils	PS	Common and widespread in the Kalahari region
	Ceratogyrus darlingi	Ground-dwelling species that prefers sandy soils	PS	Common and widespread in the Kalahari region
Starburst Baboon Spider	*Augacephalus junodi*	Ground-dwelling species that prefers sandy soils	PS	Common and widespread in the Kalahari region

[5] Status according to ToPS Schedule 2007; Dippenaar-Schoeman 2002, Dippenaar-Schoeman et al 1997, 2010, Leeming 2003

ANNEXURE 4: STATUS QUO MAPS FOR THE JOHN TAOLO GAETSEWE DISTRICT EMF