

Environmental Management Framework for iLembe District Municipality



May 2013

Desired State and
Sustainability Framework



agriculture
& environmental affairs

Department:
Agriculture
& Environmental Affairs
PROVINCE OF KWAZULU-NATAL



Cover page photo: Tandi Breetzke

© Royal HaskoningDHV

All rights reserved

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, without the written permission from Royal HaskoningDHV.

Siva Chetty

Tel: +27 (31) 719 5582

Email: siva.chetty@rhdhv.com

6 Payne Street, Pinetown

Janet Loubser

Tel: +27 (12) 367 5881

Email: janet.loubser@rhdhv.com

Fountain Square, 78 Kalkoen St,

Monument Park, Pretoria

DOCUMENT DESCRIPTION

Client:

iLembe District Municipality

Project Name:

Environmental Management Framework for iLembe District Municipality

SSI Environmental Reference Number:

E02.PTA.000338

Client Reference:

PD/03/2011

Compiled by:

Tasneem Collins & Gerard van Weele

Reviewed by:

Janet Loubser

Specialist contributions:

Siva Chetty, Janet Loubser, Gillian Maree, Gerard van Weele, Earl Herdien, Toni Redman, Tandi Breetzke, Luke Moore, Catherine Meyer & Kim Moonsamy (Royal HaskoningDHV), Indiflora Environmental Services cc, AfricaWide Consulting cc, eThembeni Heritage Consultants

Date:

May 2013

Location:

iLembe District Municipality, KwaZulu-Natal

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	PROJECT CONTEXT	1
1.2	LEGAL CONTEXT	1
1.3	PROJECT PHASING	2
1.4	DESIRED STATE METHODOLOGY	2
2	DESIRED STATE FRAMEWORK	5
2.1	SOCIO ECONOMIC	5
2.2	SPATIAL AND DEVELOPMENT PLANNING	15
2.3	HERITAGE RESOURCES	20
2.4	BIODIVERSITY	29
2.5	WATER RESOURCES	38
2.6	AGRICULTURE	43
2.7	COASTAL MANAGEMENT	48
2.8	ESTUARIES	55
2.9	AIR QUALITY	65
2.10	WASTE MANAGEMENT	71
2.11	MINING	77
3	ENVIRONMENTAL INDICATOR ANALYSIS	82
3.1	ENVIRONMENTAL SENSITIVITY BASE LAYER	83
3.2	CONSOLIDATED ENVIRONMENTAL SENSITIVITY	84
3.3	EXISTING DEVELOPMENT OPPORTUNITIES	85
3.4	AREAS NOT SUITABLE FOR HUMAN HABITATION	85
3.5	AREAS WHERE DEVELOPMENT IS RESTRICTED OR CONSTRAINED	86
	APPENDIX A: MAPS	87
MAP 1:	ENVIRONMENTAL SENSITIVITY BASE LAYER	
MAP 2:	CONSOLIDATED ENVIRONMENTAL SENSITIVITIES	
MAP 3:	EXISTING DEVELOPMENT OPPORTUNITIES	
MAP 4:	AREAS NOT SUITABLE FOR HUMAN HABITATION	
MAP 5:	AREAS WHERE DEVELOPMENT IS RESTRICTED OR CONSTRAINED	

LIST OF FIGURES

FIGURE 1: SUSTAINABILITY FRAMEWORK	3
FIGURE 2: THE STRATEGIC ASSESSMENT PROCESS	4
FIGURE 3: VULNERABILITY ASSESSMENT DIAGRAM	11
FIGURE 4: KZN PDGS	12
FIGURE 5: KZN PDGS VISION	13
FIGURE 6: NETWORK OF COMPANIES IN THE KALUNDBORG SYMBIOSIS	66
FIGURE 7: AQMP PROCESS	68
FIGURE 8: CONCEPT OF INDUSTRIAL ECOLOGY	72
FIGURE 9: THE WASTE HIERARCHY	73

LIST OF TABLES

TABLE 1: LEGISLATION GOVERNING THE EVALUATION, PROTECTION AND MANAGEMENT OF HERITAGE RESOURCES IN SOUTH AFRICA	23
TABLE 2: SECTIONS OF THE NBR&BS THAT DIRECTLY REFER TO THE NHRA	24
TABLE 3: SECTIONS OF CHAPTER 7 OF THE KZN HERITAGE ACT RELEVANT TO THE ESTABLISHMENT OF METRO AND DISTRICT HERITAGE FORUMS	26
TABLE 4: APPLICABLE LEGISLATION AND ADMINISTRATIVE AUTHORITY REGARDING THE PROTECTION OF GRAVES AND CEMETERIES	27
TABLE 5: LEGISLATION AND POLICY APPLICABLE TO ESTUARINE MANAGEMENT IN ILEMBE DISTRICT MUNICIPALITY	62
TABLE 6: EXAMPLE OF KEY PERFORMANCE INDICATORS	74
TABLE 7: DESIRED STATE MAPS LAYERS AND DESCRIPTIONS	82

ABBREVIATIONS AND ACRONYMS

AEL	Atmospheric Emissions License
AIDS	Acquired Immunodeficiency Syndrome
Amsl	Altitude in metres above sea level
AQMS	Atmospheric Quality Management System
BAT	Best Available Technique
BP	Before Present (when used in the context of heritage resources)
CARA	Conservation of Agricultural Resources Act
CASP	Comprehensive Agricultural Support Programme
CSA	Climate-Smart Agriculture
DAEA	Department of Agriculture and Environmental Affairs
DEA	Department of Environmental Affairs
DM	District Municipality
DMA	District Management Area
DMR	Department of Mineral Resources
DoE	Department of Education
DWAF	Department of Water Affairs and Forestry (refer to DWA)
DWEA	Department of Water and Environmental Affairs (refer to DEA)
EFZ	Estuarine Functional Zone
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan or Programme
EMS	Environmental Management System
ENPAT	Environmental Potential Atlas
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
GHG	Green House Gas
GIS	Geographic Information System
HIV	Human Immunodeficiency Virus
I&AP	Interested & Affected Parties
ICM	Integrated Coastal Management
IDP	Integrated Development Plan
IPC	Integrated Pollution Control
IUCN	International Union for the Conservation of Nature & Natural Resource
IWMP	Integrated Waste Management Plan
KPI	Key Performance Indicator
KZN	KwaZulu-Natal
KZNHA	KwaZulu-Natal Heritage Act

LED	Local Economic Development
LM	Local Municipality
LSU	Large Stock Unit
LUMS	Land Use Management System
MEC	Member of the Executive Council
MLRA	Marine Living Resources Act
MPA	Marine Protected Areas
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)
NBR&BS	National Building Regulations and Building Standards
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)
NEM:WA	National Environmental Management: Waste Act
NEMA	National Environmental Management Act (Act 107 of 1998)
NFA	National Forests Act (Act 84 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NGO	Non-Governmental Organisation
NHRA	National Heritage Resources Act, 1999 (Act No 25 of 1999)
NPAES	National Protected Areas Expansion Strategy
NSBA	National Spatial Biodiversity Assessment
NSDP	National Spatial Development Perspective
NWA	National Water Act, 1998 (Act No 36 of 1998)
PHRA	Provincial Heritage Resources Act
POSA	Plants of Southern Africa
RDP	Reconstruction and Development Programme
SAHRA	South African Heritage Resources Agency
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SEMP	Strategic Environmental Management Plan
SoER	State of the Environment Report
WMA	Water Management Area
WUAR	Water Use Assessment Report

1 INTRODUCTION

1.1 Project context

The Department of Agriculture and Environmental Affairs (DAEA) is the delegated regulatory authority for environmental management in KwaZulu-Natal (KZN). The Department identified the need for a tool to guide development initiatives in the iLembe District Municipality (hereafter referred to as iLembe) 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;
- Identify sensitive areas spatially; 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.

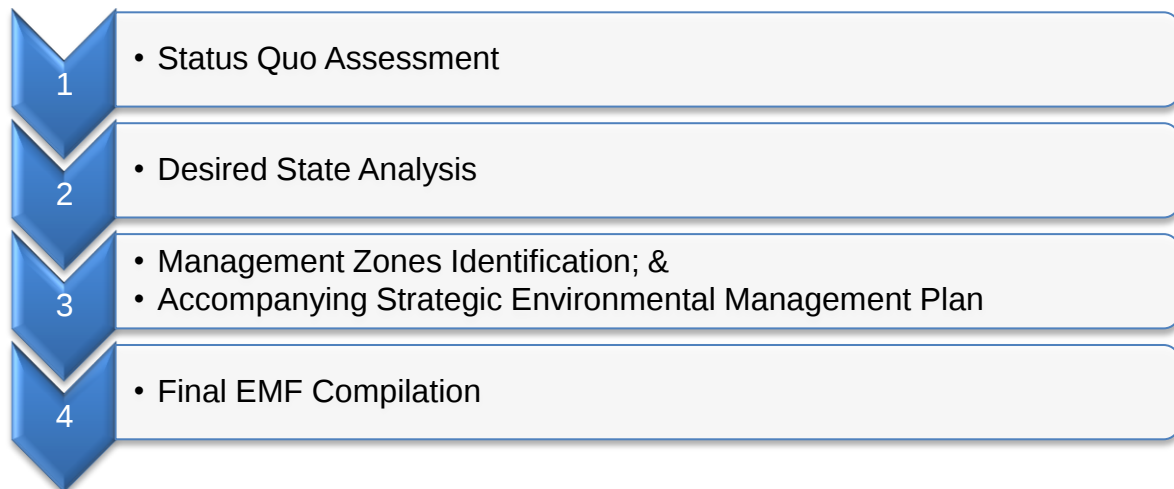
1.2 Legal context

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

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

1.3 Project phasing

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



Each phase builds on the findings of its predecessor, as well as the inputs from stakeholders and the 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.

This report represents the second main phase of the project, namely the Desired State Analysis. It follows on from a profiling of the study area that took place during the Status Quo phase, and involves an analysis of relevant environmental criteria according to feature status, legal and policy requirements, management objectives, and environmental opportunities & constraints.

The Desired State phase involves stakeholder participation in the form of specific sessions with different role-players and public open days (such as landowners; eco-tourism operators; conservancies; etc). In these sessions comments on the Status Quo report and important inputs into the Desired State are collected. Environmental management specialists are responsible for the assessment and integration of all the information into intermediate elements (feature descriptions, feature status, feature objectives, etc.) that feed into the GIS system and ultimately a Desired State analysis. The desired state phase therefore provides a description of the desired state of the area given all the available information and inputs.

The Desired State information needs to feed into the final EMF via the designation of Environmental Management Zones and the compilation of a Strategic Environmental Management Plan.

1.4 Desired State methodology

The formulation of a desired state report for the iLembe EMF project relies on stakeholder engagement and thorough information analysis, in consideration of the overall developmental vision for the area.

1.4.1 Public participation

Key stakeholders are engaged in the form of individual consultation sessions and a public open day. These two processes allowed identified key Interested and Affected Parties (I&APs) to:

- Verify that issues and points of concern have been considered by the environmental specialists and technical investigations;
- Raise comments and issues of concern about the Status Quo Report;
- Identify other relevant interested or affected I&APs; and
- Express their views regarding the future socio-economic development and conservation of the natural resources in the area.

1.4.2 Strategic environmental assessment

The Status Quo findings (opportunities and constraints, issues and concerns) are used to generate a Sustainability Framework that describes each environmental feature category in terms of feature status, sustainability objectives and legal and policy requirements (Figure 1):

- **Feature status** is related to associated natural resources and inherent constraints;
- For each dimension being assessed, a further description is added that details the legal context. This allows the statutory controls to determine relevant **legal and policy parameters** and prevents the setting of legally contradictory objectives.
- **A desired state** is identified, based on existing information and initial stakeholder contributions; and related to strategic outcomes such as climate change, social-ecological resilience etc.; and

The status of each of the features is determined through legislative requirements, accepted norms and quality standards, as well as through technical and specialist input. The feature objectives, which establish principles of how the features or environmental resources should be managed to improve its environmental status, are determined during the I&AP consultation sessions.

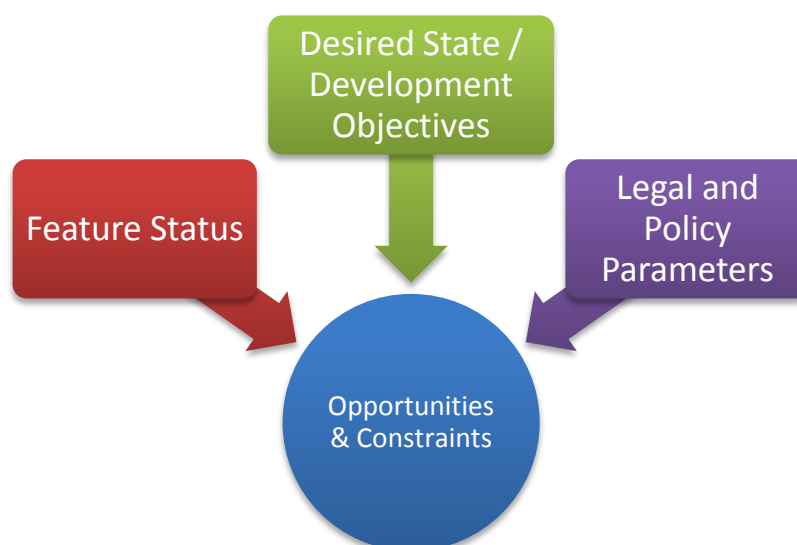


Figure 1: Sustainability Framework

In keeping with the theory behind EMF, the strategic environmental assessment compares the status of the features with their legal requirements and development needs. This allows for the type and extent of the required management intervention to be determined. In particular, environmental conflicts or instances of convergence are identified and described. Feature status can then be improved through the establishment of stringent management requirements.

Against this framework, likely development actions can be measured, and it can be used to inform the designation of Environmental Management Zones.

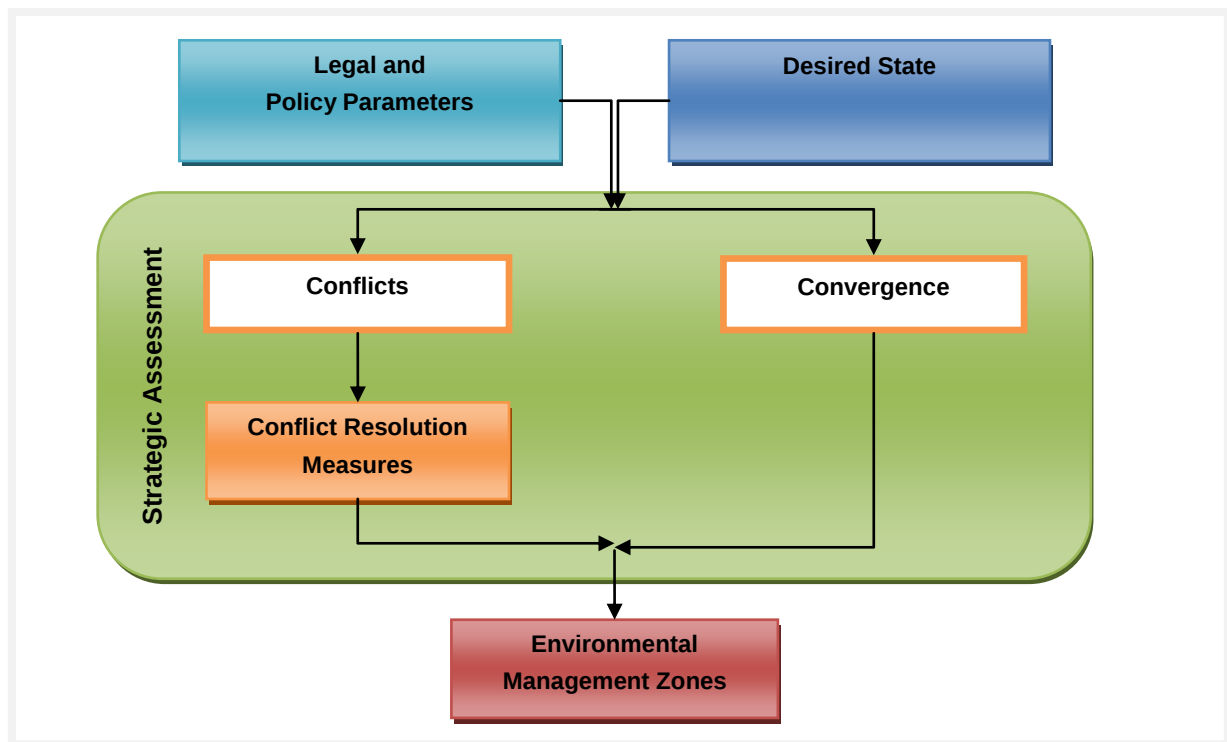


Figure 2: The Strategic Assessment process

2 DESIRED STATE FRAMEWORK

2.1 Socio economic

2.1.1 Feature status

The major economic nodes within iLembe include Stanger, Ballito and Mandeni. KwaDukuza is the most urban of the four local municipalities, as it contains both Stanger, and the rapidly developing town of Ballito. However, the iLembe District contains large areas that are predominately rural in nature.

The total number of households in iLembe is 134,275. This figure has been declining by an average rate of 0.27% over the previous five years (Enterprise iLembe, 2011). In all municipalities, over 50% of the population is under the age of 24 years old, while 62.5% of the iLembe population falls within the working age bracket (15 – 64 years). In iLembe, approximately 74.2% of the employed population fall under the poverty line of R1 600 a month.

Unemployment and poverty is a primary contributor to the socio-economic problems over a large part of iLembe. There are also vast differences in wealth across iLembe with small developed areas along the coast contrasted by large area of extreme underdevelopment in the hinterland. Twenty two percent of all people in iLembe above the age of 25 years also have no schooling.

All of the municipalities have experienced a decline in HIV prevalence growth over the period 2005 – 2010, with an average yearly decline of 1.02% in iLembe.

A lack of electricity access is a serious constraint in the District, with Ndwedwe and Maphumulo municipalities having only 28% and 35% of the population (respectively) with access to electricity. The percentage of people using flush or chemical toilets is still relatively low for all municipalities, with an average of 28% for iLembe. The predominant form of toilet facility for all municipalities are pit latrine toilets, with this accounting 70% in Maphumulo, and 58% for the entire district.

Ndwedwe and Maphumulo are lagging behind with only 5% of their respective populations having access to water within their dwelling. A large portion of the district population (21%) still use a dam, river, stream or spring for water, with the highest number of people using natural resources in local municipalities being 38% in Ndwedwe and 57% Maphumulo. About 9% of the iLembe population live in an informal dwelling or shack, with contribution from 15.1% of the Mandeni population, and 12.4% from the KwaDukuza population.

The KwaDukuza local municipality represents the dominant economy within the district – contributing 51.4% towards the district economy. Sugar cane farming is the dominant agricultural business in the district. Subsistence farming prevails on higher lying ground – mainly within tribal authority areas. Dominant employers in the district include SAPPI, Tongaat Hulett and Illovo. The District also has Africa's two great ports, i.e. Durban and Richards Bay. It is from these two Ports that 60% of all of South Africa's port movements take place.

A relatively well developed SMME sector is found in the coastal strip – Dolphin Coast and the inland corridor of KwaDukuza and Mandeni. Most SMMEs however have very few linkages with larger established businesses. SMMEs found in the rural hinterland of Ndwedwe and Maphumulo are survivalist in nature and not diversified.

iLembe has an unemployment rate of 22.4% which is average for the province and the country. KwaDukuza has the lowest unemployment rate at 16% and Maphumulo has the highest unemployment rate at 30.3%. Just over 40% of the formally employed district population are skilled persons, with this contribution being a little less in KwaDukuza and Ndwedwe due to more semi-skilled and unskilled employees. In iLembe, about 22% of the working age population are formally employed, while approximately 78% are informally employed. Within the district, all the local municipalities display a similar trend, however with only 15% informal employment displayed in Maphumulo.

2.1.2 Development objectives

The following development objectives should be sought. This section has been divided into a 'primary' and 'secondary' category.

2.1.2.1 Primary objectives

Agriculture & industry:

The agricultural sector in iLembe has significant development potential. It is already characterised by a highly developed and competitive commercial farming sector. Sugar cane farming is the main agricultural business in the flatter fertile areas of Mandeni, KwaDukuza and Ndwedwe, and to a certain extent, in the Umvoti valley.

While sugar cane farming does not contribute to food security in the region, it is a huge contributor to job security and the local GDP. The flatter fertile regions of iLembe could therefore support other crop types that contribute to food security. However, the feasibility and trade-offs of the two options would need to be critically assessed to determine the best option for local communities.

Overall, the prospects for further development are good for agri-processing, timber and furniture, and arts and craft, while there is some limited growth potential in the clothing and textiles, and food and beverages industries.

The Municipality would need to focus on undertaking the following:

- Integrating and finding strategic resolution in terms of availability of land;
- Incentivising industrial development/ industries;
- A marketing strategy to attract potential manufacturing/ industry into the area;
- Generate and maintain a directory/ data base of existing products such as an iLembe yellow pages;
- Strategically investigate the feasibility and business value of utilising natural resources for industry such as indigenous wood for furniture;
- Consider the business value chain in the LED strategy; and
- Monitor BEE components at district and local levels.

Education and skills:

A concerted effort to contribute, increase and maintain higher skills and education in all local municipalities is needed.

Household and housing services:

Delivery of services such as water, electricity, sanitation is crucial to improving people's quality of life. Focus should be placed on those local municipalities that are particularly lagging in service delivery to

correct an apparent, very unequal delivery programme favouring KwaDukuza. Some aspects that need to be corrected include:

- Water provisioning needs to be improved, preferably in line with RDP minimum standards which is 25 litres per person per day within 250m from their homes;
- Sanitation needs to be improved as current levels are very low;
- Electricity provisioning needs to be improved and should be prioritised in Mandeni, Ndwedwe and Maphumulo; and
- The municipality should also improve its levels of refuse removal and investigate innovative solutions to solid waste management in rural areas.

Health:

Improvement in the standard of health services facilities in general is required. However, specific interventions required are:

- Improvement in the provision of health service in Mandeni;
- AIDS awareness and educational programmes in all municipal areas; and
- Improved facilities for treating victims of AIDS in all municipalities.

Tourism:

It is necessary to build and capacitate tourism infrastructure/ products in the District, especially in hinterland areas. Similarly, ideas for viable cultural tourism activities and other tourism products (experiences, services or artefacts) must be cultivated. It is also necessary to initiate and maintain business development initiatives, support frameworks (via public private partnerships) and financial (capital) support for emergent business enterprises.

A need has also been identified for maintenance of some key historical/ cultural sites in order to secure their resource value. This should be regarded as an ongoing aspect to ensure the preservation of artefacts and accessibility to them.

Limited access to land in rural areas which is predominantly trust land implies that access agreements/ Memorandums with Trusts (in Trust land areas) with regards to use will be required.

The district is characterized by a clear divide of the rich coastal and the poor hinterland areas, which also accounts for a high incidence of crime in the region. Formal, monitored and reported on crime eradication programmes for the benefit of tourism agencies is therefore required.

2.1.2.2 Secondary objectives

Housing:

Housing delivery is an important issue that needs to be stepped up in the rural areas. The nature of housing delivery must also be reconsidered - houses may need to be designed and built to enable people to use them as income generators. This could require houses to be bigger or a focus on helping people make extensions to their existing houses.

Community services:

There is a need to increase the provision of facilities such as parks, sports facilities and housing support services, as well as general municipal services such as the provision of roads, water and electricity as these are important issues to the population.

Transport:

The District needs to promote the safety and reliability of public transport modes such as taxis and buses, and improve on the provision of amenities such as:

- Tarred roads;
- Signposts;
- Streetlights;
- Pavements; and
- Storm water drains.

Safety and security:

It is necessary to address the crime situation which most people feel has not improved, potentially by promoting better policing as well as the provision of more communal lighting (e.g. streetlights).

Cultural promotion:

The District can promote community cultural and religious organisations, and the infrastructure required for this, since these are critical in promoting community cohesion and integration.

2.1.3 Desired State

2.1.3.1 Spatial

Freedom of movement to work and live within safe, healthy zones is the ultimate overall objective. If relating social objectives to the already identified 'features' then the following can be said:

- Household figures: Balanced distribution of number of people per household within geographically even distribution of households;
- Population: Household figures are guided by potential and available natural resources (if area is rural and resource dependent), or household figures are determined by financial independence (as in an urban area);
- Economic nodes: Balanced distribution of low, middle and high income earners in terms of living arrangements, industry areas to re-strategise planning (geographical positioning) to integrate planning with more sustainable (greening, people oriented) planning;
- HIV AIDS prevalence: Decrease of HIV AIDS prevalence overall;
- Schooling: Schooling facilities available to all and within walking distance. Rural and urban centres to use the same 'acceptable distance' calculations to educational facilities;
- Electricity: Access and use of greener energy with low costs and high returns for mainly poorer populations;
- Sanitation: Access and use of greener waste disposal facilities with low costs and high returns for mainly poorer populations. Access to hygienic sanitation for all, promoting a healthier population. To be associated to every new house built;
- Water: Water facilities available to all and within walking distance. Rural and urban centres to use the same 'acceptable distance' calculations to educational facilities;
- Housing: A firm commitment to deliver appropriate housing to all within strategically designated zones that enhance living and working environments;
- Economic activity: Controlled and advanced development of economic zones that enhance working environments and local and regional economic growth; and

- Unemployment/ formal & informal employment: Best practice approaches to promoting and maintaining increased, legal, fair and equitable employment.

2.1.3.2 Climate change

Communities can potentially be highly sensitive even if most individuals are not. This might occur where the economic base of a community is heavily reliant on the profitability of a few resource dependent businesses, or where important individuals (such as community leaders) are heavily resource dependent. Communities that are highly diverse and contain a range of industry types as well as use resources from a broad base are expected to be less sensitive to climate change.

Strategies to reduce social vulnerabilities include:

- Manage for climate risk and uncertainty;
- Develop skills for planning, learning and re-organising;
- Absorb costs of adaptation;
- Develop and interest in adapting to climate change;
- Decrease resource dependency by enhancing and diversifying livelihoods; and
- Develop, access and use climate technology.

2.1.3.3 Institutional systems

Institutional systems influence, and are influenced by, a number of processes. In this section, labour and employment, industrial development, health care, and duties and responsibilities are specifically looked at to define the desired state in this regard. There are already a number of strategies and plans which play a role in improving institutional capacity and good governance and these documents should be kept in mind. These include the Integrated Waste Management Plan and Growth and Development Strategy.

Labour and Employment:

The needs related to local labour and employment differ depending on the local municipality; however there is an overall need for job creation and skills development. It is therefore important that the following be taken into consideration across the District:

- Skills and training programmes to improve skills levels;
- Wider provision of FET and training colleges as well as improving people's awareness of them;
- Ensure adequate and equitable access to Department of Labour job centres and other resources for helping people find employment; and
- Better provisioning of business support services, for example Local Business Service Centres.

Industry and business development:

The following recommendations should be followed in order to improve on the existing industrial and business activities in the District, and ensure sustainable growth:

- Establish a Business Chamber;
- Determine the viability of declaring Isithebe an Industrial Development Zone;
- Focus on and provide support to local entrepreneurs through capacitated and knowledge sharing institutions;

- Form an alliance with local academic institutions or Business schools, where it is viable; and
- Improve the undertaking of the IDP and LED process so that it is a more inclusive and integrated process with business and the community.

Health care:

The provision of equipped and capacitated health facilities is a great need in all municipalities. The focus here is on increasing the quality of care and treatment in all areas, but particularly in the treatment of HIV/ AIDS.

Duties and responsibilities:

All four local municipalities, but particularly Maphumulo and Ndwedwe local municipalities are very under-resourced. There is a lack of personnel and a need to fill vacant positions in some municipalities. Where there are people in positions, they often lack the requisite skills and capacity and are often required to perform functions unrelated to their position. This dilutes their ability to perform their tasks effectively, especially relating to LED.

2.1.3.4 Environmental quality

The responsibility given to all municipalities and iLembe District should ensure that the quality of natural and historical resources is protected and preserved. This includes adherence to South African standards on water and air quality for its citizens.

2.1.3.5 Vulnerability

Vulnerability may be considered an inverse indicator of resilience, and may be described as a function of three elements: exposure, sensitivity and adaptive capacity. Understanding these elements can help evaluate the nature and magnitude of the vulnerability threat.

In iLembe, vulnerable populations can be estimated as:

- All those of working age that are not economically active;
- All those on the State's welfare system (Single parent homes, child-headed households, etc);
- All those diagnosed as chronically ill (HIV/ AIDS, cancer, tuberculosis patients, etc);
- All those that have not completed secondary schooling and have not advanced to any formal FET college, or other tertiary institution;
- Those that have migrated from rural areas (usually work seekers) and are currently residing in informal settlements closer to the more urban centres; and
- Orphans and the elderly are also identified as 'vulnerable' on the basis of their level of dependence.

All local municipalities must be up-to-date with the influences and impacts that people and the environment are exposed to, if they are sensitive to change, what level of sensitivity they have to it and whether they are able to adjust to changes in their environment. When these elements are assessed, a populations' vulnerability status is also determined.

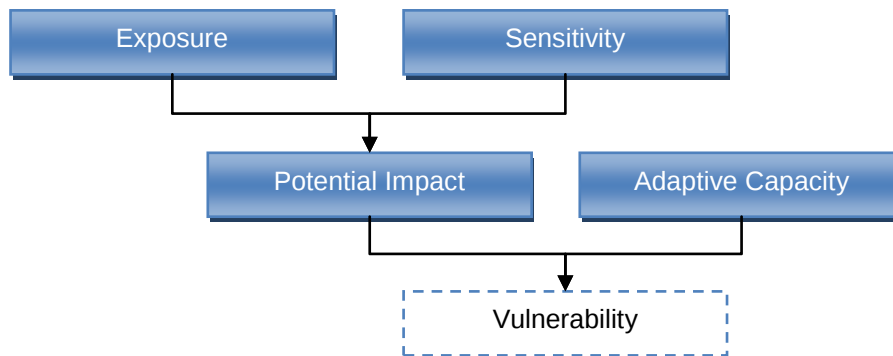


Figure 3: Vulnerability assessment diagram (Source: IUCN: A framework for social adaptation to climate change, 2010)

Generally, it is necessary to develop adaptation and livelihoods strategies that encourage community awareness and dialogues about climate change, and increase the accessibility of climate information, expertise and technology to resource users. Interventions must focus on decreasing vulnerability and increasing the resilience of communities that are at most risk from climate change impacts. The most important impacts to manage include health (increased incidence and wider spread of diseases), food security (protection against crop failures), natural disasters (flooding, drought, landslides, extreme temperatures) and indirect economic effects (e.g. cost of energy).

2.1.3.6 Job creation and poverty alleviation

Establish a dedicated portfolio for monitoring and evaluating major poverty eradication projects situated within iLembe, as well as ensuring that LED projects are implemented to maximise its impact on poverty. A strategy for poverty alleviation will include:

- Connecting growth along the coast with poverty alleviation inland;
- Ensure that the economic development potential in areas of high poverty levels and densities are realised; and
- Effective implementation of National and Provincial Poverty Eradication programmes (ISRDP, DSD, etc), and at the local level, the iLembe's LED.

The following priority areas of the provincial economy with existing comparative advantages have been identified to drive the growth of the province, and address unemployment and poverty (<http://kzntopbusiness.co.za/site/kzn-perspectives>):

- Agriculture – including agri-industry (with opportunities to impact considerably on the economic needs of the poor through land reform);
- Secondary industry and manufacturing;
- Tourism, including domestic and foreign tourism; and
- Services sector including financial, social, transport, retail and government.

2.1.4 Legal and policy parameters

2.1.4.1 Provincial Growth and Development Strategy

The Kwazulu-Natal Provincial Growth and Development Strategy (PDGS) 2011-2030 is in the process of being drafted. The PDGS has a crucial role to play in promoting sustainable development and giving effect to government's concept of a developmental state through:

- Growing the economy
- Reducing unemployment
- Eradicating poverty
- Ensuring greater social inclusion and cohesion

The PGDS is a framework for both public and private sector initiatives. The strategy provides the overarching framework for development in the Province, indicating areas of investment opportunities and development priorities (<http://kzntopbusiness.co.za/site/kzn-perspectives>).

Interestingly, the KZN PGDS presentation delivered in September 2011, shows a solid base of "Governance" supporting both "Infrastructure" and "Spatial Development", all of which represent the three pillars of sustainability at their core, that is "Environmental integrity, Human development and social capital, and Economic development." The figure below illustrates this.

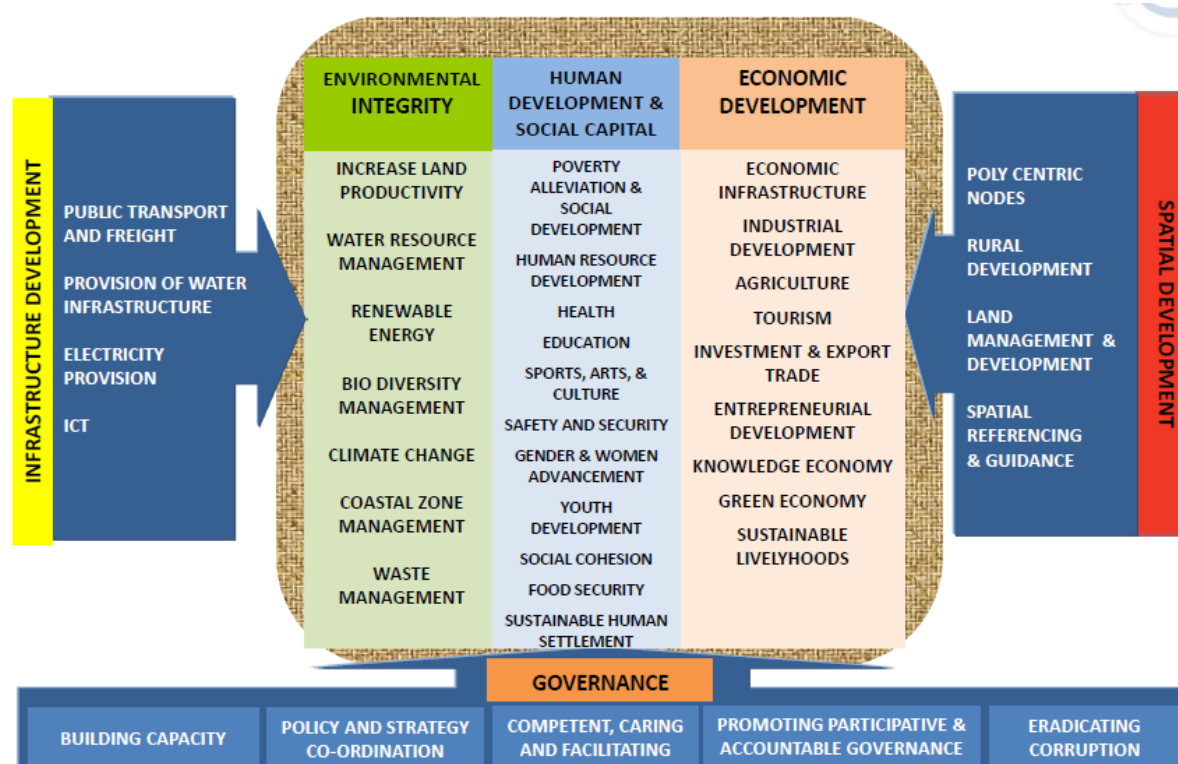


Figure 4: KZN PDGS (Source: KZN Provincial Growth and Development Strategy, Sept 2011)

Seven strategic goals have been outlined in the KZN PGDS (KwaZulu-Natal, 2011) with each goal reflecting a number of strategic objectives. Four out of seven provincial goals are orientated towards social and economic development. These are:

- Job creation;
- Human resource development;

- Human and community development; and
- Strategic Infrastructure



Figure 5: KZN PDGS Vision (Source: KZN Provincial Growth and Development Strategy, Presentation, Sept 2011)

Approaches to economic development remain fragmented and driven locally by short-term political imperatives rather than a medium to longer term developmental approach that seeks to establish sustainable developmental processes. It is precisely this fragmented approach and sub-optimal developmental outcomes that the current PGDS addresses.

2.1.4.2 Local Economic Development Plan and IDP

At a local level, the expected strategic planning and development goals encompassed in the objectives of the Local Economic Development Plan and the Integrated Development Plan for each municipality, should continuously involve key stakeholders in its compilation (citizens and business, public and private sectors). This would encourage collective and collaborative thinking and planning of 'filtered' and practical solutions found at local level.

2.1.5 Summary of constraints and opportunities

Constraints	Opportunities	Other Notes
Access to services is problematic in rural areas	Development in agriculture, agri-processing, timber and furniture, and arts and crafts, transport, tourism,	The commercial farming areas of KwaDukuza, Mandeni and Ndwedwe (i.e.,

Constraints	Opportunities	Other Notes
and backlogs exist; The employable population, previously housed in rural areas, is migrating to urban areas in search of employment and other opportunities; KwaDukuza and Mandeni has much of the formal economic activity in the region; High levels of poverty and unemployment in rural areas; Climate change will impact on health, as the spatial range of diseases increases; Housing backlogs; SMMEs found in the rural hinterland of Ndwedwe and Maphumulo are survivalist in nature and not diversified; Access to land under Trust ownership and development of tourism and other opportunities on such land; Skills shortage; Lack of support for local entrepreneurial activities and business development; and Under-resourced municipal structures.	property and investment feature as the District's predominant opportunities; Tourism has especially good development potential in hinterland areas; There is some limited growth potential in the clothing and textiles and food and beverages industries; Renewable and alternative techniques and technologies bring many benefits and opportunities to local community levels; There is a need for Municipal led economic stimulation and marketing including: • Skills transfer exercises; • Entrepreneurship training; • Setting up of co-operatives and public/private partnerships to capitalize on the opportunities that do exist in the rural areas; and • Effective implementation of National and provincial Poverty Eradication programmes (ISRDP, DSD, etc), and at the local level, the iLembe's LED. There is already a good level of development and level of services provision in KwaDukuza; Isithebe can be considered as an Industrial Development Zone; and It is very important to connect growth along the coast with poverty alleviation efforts inland.	31% of the iLembe District) are mainly under privately owned sugar cane growers; and The District is made up of 45 Traditional Authority areas where settlement is controlled by Traditional Authorities according to a traditional land tenure system.

2.2 Spatial and development planning

2.2.1 Feature status

Based on the information obtained from the Status Quo analysis the following was identified as some of the major spatial or spatial-related issues that impact on the EMF, and therefore need to be considered when determining the Desired State and Sustainability Framework:

- Regional Connectivity
- Settlement Patterns
- Protection of Agricultural Assets
- Land Management Systems

iLembe is currently experiencing development pressure from residential development spilling over from eThekweni, particularly within KwaDukuza. This includes both low-income and high-income residential developments with their commensurate impact on urban functionality and sustainability in particular relating to aspects such as the metropolitan physical and carbon footprint, the optimal use of land, the loss of potential agricultural resources, the distances over which engineering infrastructure must be installed, traffic generation etc.

The nature of urban development being experienced in iLembe, specifically within the Ballito area, is low density with sub-urban sprawl, mostly east of the N2 on the coastal strip. Although, low income development tends to occur west of the R102 - at least 5km inland from employment opportunities in the coastal corridor.

The dispersed nature of rural development within the Municipality impacts on equitable service delivery particularly within Ndwedwe and Maphumulo. A focus on linear development, whilst ideal for addressing accessibility issues, complicates bulk water and sanitation provision which operate on a catchment basis for efficiencies.

Regional connectivity within the iLembe Municipality is a key element that has influenced the spatial pattern of the study area. The main urban and economic settlements of iLembe are located within the relatively flat coastal corridor along the R102 and north-south rail linkage occurring in particular at the main intersections of R102 with the R614 and R74. The main towns of the District include Ballito, Shakaskraal, Groutville, Stanger in the south and Darnall and Mandeni/ Isithebe in the north. This system however, promotes an over reliance on the N2 corridor for local access to iLembe and its constituent local areas.

Agriculture primarily takes the form of large-scale commercial sugar farming. Unfortunately, much of this land is under pressure for conversion to urban development, particularly within the coastal corridor.

2.2.2 Desired State

2.2.2.1 Spatial

In order for iLembe to be developed in an appropriate manner the following development objectives should be met in terms of regional connectivity:

- Provide additional north-south linkages, across the relevant rivers, both east and west of the existing R102 and N2 corridor; and

- Develop a policy on the establishment of 'gated' estates in the region so as not to compromise sub-regional mobility.

Based on the described status of iLembe, it is recommended that in order to guide appropriate development of the area the following development objectives should be met:

- Stronger focus on clustering discreet towns and villages in lieu of linear development and urban sprawl which are inefficient to service;
- Ribbon development along the iLembe coastline should not be permitted;
- Development and infrastructure should be directed into existing development nodes;
- Appropriate forward planning and a realistic land release strategy should be developed for iLembe;
- Optimal densities for development should be identified for areas within the urban development line;
- No leap-frog development should be permitted;
- Development buffers should be set for environmental and agricultural assets;
- A realistic urban development line should be developed for iLembe; and
- Cross boundary planning with Ethekewini (and other adjacent municipalities) is required.

2.2.2.2 Climate change

Climate change has to be considered in terms of spatial settlement, development and agricultural patterns. It is generally known that temperatures will increase, but it could lead to either increased droughts or flooding as there is still uncertainty with regards to future precipitation patterns. There should therefore be pro-active planning to prevent development in risky or hazardous areas, and active relocation of at-risk development or settlements. Other adaptation programmes must be put in place to reduce the vulnerability of the iLembe economic system in terms of economic shocks, natural disasters, and increased demands on social welfare systems.

2.2.2.3 Institutional systems

The nature of Land Management Systems is of particular relevant to development and spatial planning.

Land under the administration of Traditional Authorities provides a level of complexity to development, especially private sector development that is yet to be fully addressed. Development approval processes, permission to occupy and the purchase of such land are fraught with institutional complexity which delays development. This issue has particular bearing on encouraging private sector investment in Ndwedwe and Maphumulo, including some portions of Mandeni. The municipality needs to work closely with the Ingonyama Trust to address this issue and to ensure that development opportunities are not compromised due to land tenure.

In order for iLembe to be developed in an appropriate manner, the following development objectives should be met:

- Obstacles to effective land development must be addressed in an equitable manner;
- Forward planning initiatives need to be implemented;
- Land Use Management Systems in iLembe must be adhered to in the development approval process; and
- The municipality's own systems for managing land also need to be robust and adhered to.

2.2.2.4 Environmental quality

Environmental quality can be ensured through strong insistence on strategically evaluated spatial planning, and development controls that will generate quality public environments, protect or restore functional ecosystems and support the protection of rural spaces.

2.2.2.5 Vulnerability

Spatial development and settlement patterns can impact on the vulnerability of communities or economic systems. It is therefore necessary to ensure that spatial planning receives the necessary strategic level consideration, as well as a commensurate effort at ensuring monitoring and compliance with planning directives. In particular, inefficient municipal service networks must be avoided, and the operational efficiency of settlements improved.

2.2.2.6 Job creation and poverty alleviation

There is an opportunity to diversify the agricultural sector with small cane growers and other forms of agricultural produce linked to food security for the KZN Province, and with export opportunities associated with the Dube Tradeport and land reform objectives.

In order for iLembe to protect good agricultural land the following development objectives should be met:

- High potential agricultural land should be secured for agricultural diversification; and
- No urban development should be permitted outside of identified development nodes and the urban development line.

Other development considerations that could boost job creation and the active involvement of local communities (e.g. project ownership by locals) include:

- Protection of biodiversity and access to natural resources through tourism development; and
- Protection of cultural and historical artefacts and further development of tourism opportunities, including the expansion of the hospitality industry.

2.2.3 Legal and policy parameters

A plethora of legislation, policies and strategies from national and provincial government preside over and influence spatial planning and development. The following directives for development within iLembe are articulated across the key policies and legislation governing development in the area¹:

- Land development must support and facilitate economic growth and development, that will contribute to a reduction in unemployment and halve poverty;
- Government investment must focus on areas with economic growth potential;
- Land development must take place in an integrated manner, both spatially and institutionally;
- The use of existing resources and infrastructure must be optimised;
- Urban sprawl must be discouraged and more compact and efficient cities must be promoted; To this end, development must be channelled into nodes and corridors;
- Historically distorted development patterns must be corrected by means of physical and social integration and the redirecting of investment to areas of highest value and accessibility;

¹ Further details outlined in the Status Quo Specialist Report for Spatial Planning

- The creation of socially and economically viable and sustainable human settlements must be ensured;
- Land development must support public transport infrastructure and services;
- Economically, socially and environmentally sustainable development must be encouraged;
- Integrated land development in rural and urban areas in support of each other must be promoted;
- Environmentally sustainable land development practices and processes must be encouraged; and
- Provide sufficient, affordable, reliable infrastructure and maintain and upgrade existing infrastructure.

Regional Connectivity needs to comply with:

- Principle 5 of the NSDP *“future settlement and economic development opportunities should be channelled into activity corridors and nodes that are adjacent to or that link the main growth centres”*, and
- The KZN PSEDS which seeks to promote the N2 as a primary corridor between Durban and Umhlatuze – a key element to its success is to ensure mobility on the corridor.

Settlement patterns have to aim for compliance with policy principles such as:

- The Constitution of SA – services to communities should be provided in a sustainable manner
- Principle 1 of the NSDP *“as a prerequisite for alleviating poverty, development must ensure sustained and inclusive economic growth”*
- Principle 2 of the NSDP *“local government is obligated (under the constitution) to provide basic services to all citizens where they reside”*
- Principle 3 of the NSDP *“government fixed investment should be focused on localities of economic growth and/or economic potential in order to gear up the private sector, stimulate sustainable economic activities and create long-term employment opportunities”*
- Principle 5 of the NSDP *“future settlement and economic development opportunities should be channelled into activity corridors and nodes that are adjacent to or that link the main growth centres”*
- Chapter 2 of SPLUMB *“the sustainable use and development of land”, “promote land development in locations that are sustainable and limit urban sprawl” and “result in communities that are viable”;*

For the diversification of agricultural assets, sustainability objectives must be pursued that reinforce the policy directives contained within:

- The KZN PSEDS which seeks to promote the P700 as an agricultural and agri-processing corridor; and
- Chapter 2 of SPLUMB *“past spatial and other development imbalances are redressed through improved access to and use of land” and that “special consideration is given to the protection of the prime and unique agricultural land”.*

Land Management Systems have to comply with Chapter 2 of SPLUMB that calls for *“land development procedures will include provisions that accommodate access to secure tenure and the incremental upgrading of informal areas” and “the preparation, adoption and implementation of any Spatial Development Framework, policy or by-law concerning spatial planning and the development or use of land.”.*

2.2.4 Summary of constraints and opportunities

Constraints	Opportunities	Other Notes
Over reliance on N2 for sub-regional connectivity, especially in view of a lack of linkages between the coastal development and rural hinterland; The regional connectivity issues mirror, and contribute, to a lack of integration between rural (low-income) hinterland and coastal corridor (high income); Urban form is low density suburban sprawl in nature, with Gated Estate developments that compromise the urban functionality of the district; Rural settlement is highly fragmented and dispersed in nature; Topographic conditions influence settlement structure; Emerging ribbon development footprint (particularly in coastal corridor and rural accessibility corridors); Disproportionate amount of land deemed urban with new urban edge proposals; Pedestrian infrastructure lacking (particularly in Ballito); Large % of district administered by Traditional Authorities which leads to Traditional land tenure systems complicating private development opportunities; and There is a lack of proper planning in the rural areas.	Dube Tradeport and the international Airport provide an impetus for continued development demand in the region; There is more than enough land for development in the District; High potential agricultural soils; Existing development footprint as boundary for infill and compaction; Proposed coastal and hinterland north-south linkages (access to); and Development planning has to incorporate ideas around renewable microgeneration energy options.	Competition for development from Ethekeini; Cross boundary planning with Ethekeini required; Urban zones need to be redefined; Development planning has to incorporate more conservative development set-backs around natural resources; Creating awareness to influence the traditional value system of settlement which will have to come from the top down through the tribal authority network; and Development no longer needs to be planned around established 'grids' for energy, sanitation and water reticulation.

2.3 Heritage resources

2.3.1 Feature status

Three main aspects threaten heritage resources in iLembe:

- Rapid development and restructuring of the urban environment leading to demolition of significant buildings and erosion of the integrity of townscapes;
- Potential of coastal developments impacting negatively on rich archaeological resources of the coastal littoral zone throughout much of the municipal area; and
- Insufficient knowledge of heritage resource locations (particularly 'intangible' resources such as landscapes), leading to inappropriate placement of developments.

As a consequence, focus needs to be placed on identifying, recording, and protecting resources within a structured heritage management system, along with the necessary monitoring and compliance enforcement controls.

2.3.2 Desired State

2.3.2.1 *Spatial*

Heritage resources are located throughout the District. Proper recording of both physical and cultural heritage resources is a primary ideal, with preservation, conservation and protection applied to the most valuable and representative artefacts.

2.3.2.2 *Climate change*

Climate change will impact on heritage resources in one way or another, but particular threats relate to damage from extreme weather events or landscape changes such as rising sea levels, and the loss of funding streams due to increased burdens on public funds. Sustainability objectives relating to both heritage resources and climate change therefore include:

- Participation in efforts to mitigate and adapt to climate change;
- Pre-emptive recording and rescue of heritage resources that are at risk; and
- Strategic planning to secure the necessary financial and other resources for future heritage resources management.

2.3.2.3 *Institutional systems*

Establishment of a District Heritage Forum

At present a committee including municipal and Amafa staff members and other stakeholders meet irregularly to address heritage issues. These members have undertaken valuable tasks, including the establishment of the King Shaka Heritage Route and the compilation of an initial database. However, in order to adequately address the conservation of the built environment within the iLembe District Municipality it is imperative that Amafa and the municipality create a functioning District Heritage Forum, as required in terms of Section 29 of the KZN Heritage Act (see Sub-section 2.3.3). Such a Forum would:

- Identify and grade heritage resources;
- Co-ordinate heritage development issues;

- Co-ordinate and facilitate the promotion of both physical and living or intangible heritage;
- Promote value and ownership of local heritage resources;
- Ensure collaboration with local stakeholders in all local heritage initiatives; and
- Promote heritage-related local economic and social development.

Since District Heritage Forums are funded by local authorities, their establishment would allow Amafa to direct its limited resources to those activities stipulated in Section 24 of the NHRA, which include the protection and management of Grade II heritage resources; nomination of Grade I heritage resources; database development and maintenance; establishment of provincial policy, objectives and strategy plans; and co-ordination and performance monitoring of local authorities in the implementation of their responsibilities. Local Authority, Metropolitan and District Heritage Forums are responsible for the identification and management of Grade III heritage resources in terms of Section 8 of the NHRA.

Amafa would be responsible for assessing the capacity and performance of the Forum and retain legal responsibility for heritage resources management. However, one of the most important tasks of the Forum would be to monitor local and regional development initiatives and inform Amafa timeously of any threats to heritage resources.

Heritage resource identification

An extensive public participation programme should be undertaken to identify sites of cultural and historical significance, particularly sites of Black, Indian and Asian significance; living heritage; and cultural landscapes. The heritage resource identification programme should be widely advertised, including radio broadcasting, and promoted in all local schools. It is imperative that this programme recognises that heritage resources worthy of conservation must have public significance. Funding for the programme could be sought from local businesses and industry, and matched by municipal funding. All heritage resources should be graded according to the specific heritage criteria.

The NHRA intends that groups and communities be encouraged to play important roles in the heritage management system and it specifically provides for the registration of conservation bodies which must clearly indicate the geographical area of interest and the categories of heritage resources in which they are interested. Ideally, the conservation bodies should identify and indicate the extent of the significance (grade) of the buildings, sites, places and environments that they are interested in that should become the local authority's heritage inventory.

Management plans

Amafa and the District Heritage Forum should compile integrated site management plans for all Provincial and Heritage Landmarks, battlefields and other significant heritage resources identified. These plans should make provision, inter alia, for site documentation and research; visitor management; maintenance; and disaster management.

Further management plans should be compiled as sets of heritage resources are identified and prioritized. These plans should:

- Identify all buildings, structures and places, including monuments and memorials, located in the various local municipalities;
- Grade each heritage resource in terms of the grading criteria established by Heritage Western Cape;

- Provide general management requirements for heritage resource categories and specific management requirements for individual sites, compiled in liaison with site owners;
- Provide for the notification of site owners concerning the legal protection of sites; and
- Establish limits of acceptable change to heritage zones, including the establishment of buffers with preferred and non-preferred land uses.

Database development

A database of all heritage resources should be developed and be continually updated based on any new reports received or additional resources identified. Existing resources, such as oral histories and HIAs, be submitted as part of the EIA process should be included in the database.

Heritage Impact Assessments

HIAs, including Archaeological Impact Assessments (AIAs), should be carried out in all areas identified for development.

Urban conservation

Buildings and structures should be assessed in terms of their various values (not just historical or architectural), including their contribution to streetscapes and for the establishment of heritage resource significance). It is critical to recognise that ALL buildings with heritage significance are protected by heritage legislation, not only those older than sixty years. However, such significance must be demonstrated to be in the public interest. Examples of buildings younger than sixty years that may not be altered without the permission of Amafa could include a modern structure designed by a well-known architect that is an important example of a particular architectural style; or a house that is the birthplace of a prominent person.

2.3.2.4 Environmental quality

Heritage resources form part of social and cultural landscapes, and contribute to social self-worth perceptions. It is therefore necessary to ensure that heritage resources in all forms (living, historic, ancient, natural etc.) are protected and allowed to describe some of the conditions that determined the conditions and systems we have present.

2.3.2.5 Vulnerability

Socio-economic vulnerability can, in a small way, be improved through sustainable management of heritage. Living heritage resources (traditional authority structures, indigenous knowledge) could be used to teach communities how to improve their resilience, whilst historic resources can offer economic opportunities. However, it should be recognised that tourism-based income streams are highly volatile, and that they need to be integrated into a larger economic system.

2.3.2.6 Job creation and poverty alleviation

Heritage management and related economic activities such as tourism offer invaluable opportunities for job creation and economic stimulation to urban and rural areas alike. Tourism in iLembe is focussed strongly on coastal 'beach' tourism, but a rich cultural heritage is also available for commercial development. Specifically, links need to be established between the coastal strip and the hinterland, in order to offer existing tourist bases access to further tourism resources, and in particular, heritage and cultural offerings.

2.3.3 Legal and policy parameters

The identification, evaluation and management of heritage resources in South Africa is required and governed by the following legislation:

Table 1: Legislation governing the evaluation, protection and management of heritage resources in South Africa

Legislation	Applicable section(s)
National Environmental Management Act 107 of 1998 (NEMA)	Basic Environmental Assessment – Section (23)(2)(d) Environmental Scoping Report – Section (29)(1)(d) Environmental Impacts Assessment – Section (32)(2)(d) Environmental Management Plan – Section (34)(b)
KwaZulu-Natal Heritage Act 4 of 2008 (KZNHA)	Protection of heritage resources – Chapters 8 and 9 Heritage Resources Management – Chapter 10
National Heritage Resources Act 25 of 1999 (NHRA)	Definition and management of the national estate – Chapter I Protection and management of heritage resources – Chapter II Heritage Resources Management – Section 38
Minerals and Petroleum Resources Development Act 28 of 2002 (MPRDA)	Section 39(3)
Development Facilitation Act 67 of 1995 (DFA)	The GNR.1 of 7 January 2000: Regulations and rules in terms of Section 31.

2.3.3.1 National Heritage Resources Act 25 of 1999

The National Heritage Resources Act (NHRA) which came into effect in April 2000 is a very far reaching piece of legislation: briefly, it demands the establishment of a heritage resource management system involving a national heritage resource authority, a provincial heritage resource authority (PHRA) in each region or province and the local authorities which, once the system is established, will be responsible for grade I, II and III heritage resources respectively². The KwaZulu-Natal Heritage Act (KZNHA) effectuates this legal requirement through the creation of Metro and District Forms (see section below).

The system requires that these graded heritage resources be formally identified as national and provincial heritage sites which must be placed on heritage registers and local heritage resources which may be placed on a heritage register. The system also provides for the identification of protected areas and heritage areas. All of these formal identifications must follow exhaustive

² The first part of this section, up to subsection 'Definition of heritage resources', is drawn from the unpublished paper titled 'The National Heritage Resources Act and the Implications for the Management, in Particular, of Local Heritage Resources' authored by Dr Stephen Townsend, University of Cape Town and former CEO of Heritage Western Cape, the Western Cape PHRA.

procedures and, once the processes have been carried out, these formally identified sites, areas and resources are described as being formally protected.

The system also requires the assessment of a very wide range of applications relating to structures more than sixty years old (Section 34); archaeological sites (Section 35); or certain development activities (Section 38). These general protections are very far reaching and generate a very large number of applications to the PHRAs, and this part of the system is often arbitrary in its applicability.

The NHRA also intends that groups and communities be encouraged to play important roles in the system and it specifically provides for the registration of conservation bodies which must clearly indicate the geographical area of interest and the categories of heritage resources that they are interested in. Indeed, the conservation bodies should identify and indicate the extent of the significance (grade) of the buildings, sites, places and environments that they are interested in (perhaps just mapped) that would or should become the local authority's inventory.

Section 30(5) of the NHRA requires that when compiling or revising its zoning scheme, the local authority "shall compile an inventory of the heritage resources which fall within its area or jurisdiction". This inventory must be submitted to the PHRA which must assess the list and include those buildings satisfying its criteria on its *Heritage Register*. These provisions create a singular opportunity for heritage management. Section 30(6) enables anybody to submit such an inventory to the PHRA. This is a significant opportunity for conservation bodies.

Section 31(1) requires that when revising a town or regional planning scheme or spatial plan, the local authority must investigate the designation of heritage or conservation areas. The Integrated Development Plan (IDP) of every local authority has a spatial plan component which, strictly speaking, should include reference to the designation of conservation areas. Section 31(2) enables the PHRA to initiate such processes with local authorities.

2.3.3.2 Building plan approvals

The NHRA deals with a wide range of management and decision-making processes regarding the development of the environment. The mechanism for ensuring that this happens is contained within Section 7 of the National Building Regulations and Building Standards Act (NBR&BS Act) which requires that no building plan may be approved unless all other applicable law has been complied with. This section of the NBR&BS Act ensures that building plans are not approved in the following cases where the NHRA is clearly an applicable law.

Table 2: Sections of the NBR&BS that directly refer to the NHRA

Section of NBR&BS	Description
Section 27(18)	No plan for any work to a provincial heritage site (old national monuments) may be approved by a local authority until the PHRA has granted a permit.
Section 34(1)	No plan for any work to or demolition of a building older than sixty years may be approved by a local authority until the PHRA has granted a permit.

It is extremely important to note, however, that if the PHRA refuses an application regarding a building more than sixty years old, it must protect that building formally, that is, it must proclaim the building or

site as a provincial heritage site (Grade I) or place it on the Heritage Register (Grade III) (Section 34(2)). This has several important effects for the management of these applications.

The most important benefit gained by a local authority in submitting an inventory to the PHRA is that gained when the PHRA makes an exemption from the requirements of Section 34(1) within any geographical area on the grounds that all heritage resources in the area are adequately provided for (by having an approved inventory) (Section 34(3)).

2.3.3.3 Heritage Impact Assessments

Section 38(1) of the NHRA requires a heritage impact assessment in case of:

The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

The construction of a bridge or similar structure exceeding 50m in length;

Any development or other activity which will change the character of a site -

(i) exceeding 5 000m² in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

Or in the case where:

The re-zoning of a site exceeding 10 000m² in extent; or

Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

Furthermore, in fulfilment of Section 38(3) of the NHRA, all reports must include the following information:

- The identification and mapping of all heritage resources in the area affected;
- An assessment of the significance of such resources in terms of the heritage assessment criteria set out in regulations;
- An assessment of the impact of the development on such heritage resources;
- An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
- The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
- If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
- Plans for mitigation of any adverse effects during and after completion of the proposed development.

2.3.3.4 KwaZulu-Natal Heritage Act 4 of 2008

The KZNHA is implemented by Amafa aKwaZulu-Natali/ Heritage KwaZulu-Natal, the PHRA charged to provide for the conservation, protection and administration of both the physical and the living or intangible heritage resources of the province; along with a statutory Council to administer heritage conservation in the Province.

Chapter 7 of the Act allows for the establishment of Metro and District Heritage Forums to assist the Council in facilitating and ensuring the involvement of local communities in the administration and conservation of heritage in the Province, as follows:

Table 3: Sections of Chapter 7 of the KZN Heritage Act relevant to the establishment of Metro and District Heritage Forums

Section	Description
29. Establishment of Metro or District Heritage Forums	(1) The responsible Member of the Executive Council may, for the area of a district or metropolitan municipality, by notice in the <i>Gazette</i>, establish a District or Metro Heritage Forum. (2) A Metro or District Heritage Forum contemplated in subsection (1) is - (a) a voluntary structure; and (b) not a juristic person.
30. Powers, duties and functions of Metro or District Heritage Forums	(1) A Metro or District Heritage Forum must within the area for which it has been established - (a) co-ordinate heritage development issues; (b) co-ordinate and facilitate the promotion of both physical and living or intangible heritage; (c) promote value and ownership of local heritage resources; (d) ensure collaboration with local stakeholders in all local heritage initiatives; and (e) promote heritage-related local economic and social development. (2) A Metro or District Heritage Forum - (a) may, within its area of jurisdiction, establish one or more local heritage forums; and (b) must co-ordinate and support the activities of a local heritage forum. (3) A Metro or District Heritage Forum may, generally, do everything which is regarded as necessary or expedient to perform the duties and functions referred to in subsections (1) and (2).

Section	Description
31. Administrative support to Metro or District Heritage Forums	The Department [the Office of the Premier in KwaZulu-Natal] must - (a) provide administrative and secretarial support to a Metro or District Heritage Forum; and (b) build and strengthen the capacity of a Metro or District Heritage Forum in order to enable it to perform the duties and functions contemplated in this Act.
32. Determination of operational and administrative framework by responsible Member of Executive Council	The responsible Member of the Executive Council must prescribe the operational and administrative framework for Metro or District Heritage Forums, which must include - (a) the procedure for appointment of persons to Metro or District Heritage Forums; (b) the term of office for members of Metro or District Heritage Forums; and (c) the frequency of meetings of Metro or District Heritage Forums.

2.3.3.5 Management of graves and burial grounds

Graves and cemeteries are protected under the KwaZulu-Natal Cemeteries and Crematoria Act 12 of 1996, which states that “*no person may damage, alter, exhume, or remove from its original position any grave, without permission from the relevant authority*”. This is further entrenched in a number of other Acts, which have been specified in Table 4:

Table 4: Applicable legislation and administrative authority regarding the protection of graves and cemeteries

Grave type	Relevant legislation	Administrative authority – disinterment	Administrative authority – reburial
Graves located within a formal cemetery administered by a local authority	KwaZulu-Natal Cemeteries and Crematoria Act 12 of 1996 Human Tissues Act 65 of 1983	National and / or Provincial Departments of Health	If relocated to formal cemetery – relevant local authority.

Grave type	Relevant legislation	Administrative authority – disinterment	Administrative authority – reburial
Graves younger than 60 years located outside a formal cemetery administered by a local authority and the graves of victims of conflict	KwaZulu-Natal Heritage Act 4 of 2008 Human Tissues Act 65 of 1983	Amafa aKwaZulu-Natali, the provincial heritage resources authority	If relocated to private or communal property – Amafa. If relocated to formal cemetery – Amafa and relevant local authority.
Graves older than 60 years located outside a formal cemetery administered by a local authority	National Heritage Resources Act 25 of 1999 Human Tissues Act 65 of 1983	SAHRA, the national heritage management organisation	If relocated to private or communal property – SAHRA. If relocated to formal cemetery – SAHRA and relevant local authority.

The procedure for consultation regarding burial grounds and graves (NHRA Section 36) is applicable to all graves located outside a formal cemetery administered by a local authority. The following extract from this legislation is applicable to this policy document:

SAHRA or Amafa may not issue a permit for any alteration to or disinterment or reburial of a grave unless it is satisfied that the applicant has, in accordance with regulations made by the responsible heritage resources authority:

- (a) made a concerted effort to contact and consult communities and individuals who by tradition have an interest in such grave or burial ground; and*
- (b) reached agreements with such communities and individuals regarding the future of such grave or burial ground.*

Any person who in the course of development or any other activity discovers the location of a grave, the existence of which was previously unknown, must immediately cease such activity and report the discovery to the responsible heritage resources authority which must, in co-operation with the South African Police Services and in accordance with regulations of the responsible heritage resources authority:

- (a) carry out an investigation for the purpose of obtaining information on whether or not such grave is protected in terms of this Act or is of significance to any community; and*
- (b) if such grave is protected or is of significance, assist any person who or community which is a direct descendant to make arrangements for the exhumation and re-interment of the contents of such grave or, in the absence of such person or community, make any such arrangements as it deems fit.*

2.3.4 Summary of constraints and opportunities

Constraints	Opportunities	Other Notes
There is a 'sameness' to new developments that are occurring in the district and the historical settlement characters of the old mill towns should be protected; Insufficient knowledge of heritage resource locations (particularly 'intangible' resources such as landscapes), leading to inappropriate placement of developments; No formal District Heritage Forum; Progressive loss of resources through encroachment by development; Absence of management plans; and Commonly held misconceptions (e.g. relating to what is considered 'heritage') or ignorance.	Celebrate local architectural vernaculars; Existing heritage committee forms basis for more formal structures; and Enforcement of heritage impact assessments and protection measures.	None

2.4 Biodiversity

2.4.1 Feature status

The main threats to biodiversity in iLembe relate to spatial planning, natural resource management and pollution. Each of these broad categories has been expanded on in the subsections that follow.

2.4.1.1 Spatial planning

Urban expansion and development is a requirement for the improvement of human living conditions and the growth of the economy. However, it can be achieved in a sustainable manner if it is based on appropriate consideration of biodiversity resources. A key component of such sustainable development planning is ground truthed baseline studies informing developers and officials of where the sensitive areas and no-go areas are. Development should not occur in predetermined areas of high ecological importance and sensitivity. Ecotourism opportunities exist due to the natural beauty of the country side, the habitat or species present. These opportunities may be lost or negatively affected with uncontrolled and unplanned settlement and land use practise. These opportunities therefore need to be identified and secured through co-operative governance.

Good planning of transportation systems can also make a big difference. An understanding of the strategic impacts of transportation systems is necessary, since they stimulate development along corridors and may also open up areas not suitable for settlement because of environmental pressures.

Inappropriate and inadequate town planning around river corridors allow segmentation of core water resources. Ecological connectivity is lost when the riparian area becomes fragmented and with it, ecological functioning. Similarly, unplanned agricultural expansion can permanently transform the natural resource base, impacting negatively on the biodiversity of species as important habitat is lost.

Settlement patterns in rural areas are a concern, especially where people obtain rights to settle from the Tribal Authority. Poorly planned settlements can permanently transform the rural landscape in areas where municipal services cannot be provided which leads to the fragmentation of the natural grassland resource.

2.4.1.2 Natural resource management

In rural areas there is inadequate management of livestock numbers, inadequate management of the grazing resource (inappropriate burning, erosion control and control of alien invasive species) leading to a decline in the quality of the veld and the overall carrying capacity of the veld. Unmanaged, this is a downward spiral getting worse with each successive season.

Development pressure on the highly sensitive coastal belt permanently transforms the character of the coastline. The iLembe coastline is very diverse in its species make-up and needs as much protection against insensitive development possible. Attempting to create equitable access for all to the coastal belt adds pressure to these very sensitive resources since a conflict is created between conservation targets (securing the largest possible intact habitat units to safeguard its survival) and different social usage patterns. For example, tracts of land with sensitive areas of conservation worth often lie on private land. The access to these areas is reserved for the landowners and residents of private estates only, with the broader community deriving no benefit from these resources. At the same time, conservation ideals would see the sensitive areas protected in formal structures.

Mining for any natural resources takes up large tracts of land and permanently transforms the landscape leading to the permanent loss of certain natural resources. The impact of the mining operation is often detrimental on air and water (ground and surface) quality.

The local municipalities have a low level of rural electrification networking. The local communities are still reliant on wood for heating and cooking placing the natural resources under pressure from over-utilisation.

2.4.1.3 Pollution

Waste management in the municipal areas is not up to standard in the developed nodes and is absent in the rural areas. There is also no registered waste treatment facility within the municipal area. This is considered an important concern since apart from detracting from the aesthetical beauty solid waste also pollutes the environment as the waste breaks down to its constituent components. It also provides a breeding substrate for vermin and disease organisms. In addition, hazardous waste that is not disposed of appropriately contaminates the soil, water and air.

The concern is amplified when taking the sensitive nature of the coastal resources of iLembe into consideration. Estuary environments are very sensitive by nature and are breeding grounds for much of the marine fishing stock. These environments are seriously affected by the eutrophication of the river environments, and conditions that are advantageous to alien plant infestation.

Soil erosion also loads rivers with silt and suspended solids affecting water quality and clarity. The detrimental change in water quality and riverine vegetation reduces the ability of estuaries to sustain

high biodiversity contributing to the decline of the marine fish stocks. The condition is then further compromised through over-exploitation of marine fish stocks that reduces the available breeding stock entering estuaries to breed.

Spatially, the following issues are identified in the various municipalities:

Mandeni Municipality

- Planning to connect Harold Johnson Nature Reserve to Amatikulu Nature Reserve;
- Electrification of the Municipal area;
- River corridor protection measures as part of an open space plan;
- Alien plant infestation management strategy to restore the grazing capacity; and
- Establishment of waste collection throughout the municipal area to localised sorting and processing stations throughout the municipal area to reduce the amount of waste disposed of inappropriately or disposed of at the regional landfill.

KwaDukuza Municipality

- The need for a plan to protect the integrity of the coastal dune forest environment from impact of inappropriate development and infrastructure provision;
- River corridor protection measures in the form of an open space plan;
- Alien plant infestation management strategy to restore the grazing capacity;
- Conservation farming is required to enhance the agricultural potential of the agricultural land; and
- Need to establish localised waste sorting and processing stations throughout the municipal area to reduce the amount of waste disposed of inappropriately or disposed of at the regional landfill.

Ndwedwe Municipality

- Management of inappropriate rural settlement impacting on natural resource and ecotourism opportunities as for example mountain plateau grasslands;
- River corridor protection measures in the form of an open space plan;
- Alien plant infestation management strategy to restore the grazing capacity;
- Need to establish localised waste sorting and processing stations throughout the municipal area to reduce the amount of waste disposed of inappropriately or disposed of at the regional landfill; and
- Urgent need to identify and secure ecotourism opportunities and arrange for the safeguarding of the opportunities by the tribal authorities as the land will be rapidly lost through inappropriate and unplanned settlement happening unabated. Resettlement of a few homesteads may be required to regain lost opportunities. Setting land aside for ecotourism need to go hand-in-hand with business models for the development of the ecotourism opportunities, the ongoing management thereof and what community benefits there may be accrued from such developments.

Maphumulo Municipality

- Management of inappropriate rural settlement impacting on natural resource and ecotourism opportunities as for example mountain plateau grasslands and Valley bushveld habitats;
- River corridor protection measures in the form of an open space plan;
- Alien plant infestation management strategy to restore the grazing capacity;

- Need to establish localised waste sorting and processing stations throughout the municipal area to reduce the amount of waste disposed of inappropriately or disposed of at the regional landfill; and
- Urgent need to identify and secure ecotourism opportunities and arrange for the safeguarding of the opportunities by the tribal authorities as the land will be rapidly lost through inappropriate and unplanned settlement happening unabated. Resettlement of a few homesteads may be required to regain lost opportunities. Setting land aside for ecotourism need to go hand-in-hand with business models for the development of the ecotourism opportunities, the ongoing management thereof and what community benefits there may be accrued from such developments.

2.4.2 Desired State

2.4.2.1 Spatial

Biodiversity resources are located throughout the District. Sustainability objectives should therefore be set for particular classes of features, namely:

- *Water resources:* River corridors with its tributaries and appropriate buffers for biodiversity connectivity need to be mapped and the sensitivity communicated to all tribal authorities and municipal departments.
- *Soils and agriculture:* The soils of high to moderate agriculture potential should be mapped to inform future development planning. Agriculture operations in these areas should be promoted and enhancement strategies developed to ensure the land is appropriately utilised to secure food security.
- *Coastal Management:* Limited development of the remaining undeveloped coastal zone. The municipality should buy back land from private ownership with assistance from the land bank to secure the conservation of sensitive land or the municipality should expropriate the very sensitive portions of land.
- *Estuarine Management:* Undeveloped portions of estuaries and buffers thereto should be secured for appropriate management with adequate staff and funding through a buy-back scheme or expropriation.
- *Heritage:* Sites of heritage value should be set aside for conservation.
- *Mining:* Mineral deposits should be identified so that future mining operations can be planned for.
- *Air Quality:* Assessments of air quality should inform planning where residential developments should be located where air quality is at its best. Such assessment should also inform planning where industrial type activities would best be located.
- *Waste Management:* Planning should map human settlements in order to strategically place waste collection and processing centres to ensure efficient waste removal programmes.
- *Socio-economic:* Spatial planning should base economic development nodes where real opportunities exist, where residential areas are located close to the areas of employment to reduce transport dependence but close enough to the transport network to facilitate easy access to other economic opportunities.

2.4.2.2 Climate change

Due to many species and habitats already being under pressure from development encroachment and general degradation, any changes to climatic conditions and increased pressures on natural resource exploitation will affect biodiversity negatively. Objectives for climate change aware biodiversity management should include:

- Identification and protection of portions of the ecological landscape that will be key to species survival;
- Pro-active management of invasive vegetation in order to optimise the application of resources to the issue; and
- Management of biodiversity in a way that will improve social resilience and reduce the vulnerability of individuals and communities.

2.4.2.3 Institutional systems

The following management systems need to be established:

- Integrated Open Space Conservation Management Plan to cover coastal zone, estuary, forest, grassland, wetland and river corridor conservation;
- Integrated Waste Reduction/Recycling Management Plan;
- A plan to encourage and manage the conversion to Conservation Agriculture; and
- Expansion of the Economic Development Management Plan.

2.4.2.4 Environmental quality

The protection of biodiversity is central to the securing of environmental quality. Key management measures to ensure that this link is established and maintained include:

- Protection of natural habitat (forest, grassland and wetland) integrity.
- Maintaining river water quality
- Maintaining ground water quality
- Maintaining clean air quality
- Maintaining cultural heritage resources and assets

2.4.2.5 Vulnerability

Rural communities of Ndwedwe, Maphumulo and Mandeni and to a lesser extent KwaDukuza, remain vulnerable as there are few job opportunities, little entrepreneurial development, high unemployment, low income and high incidence of HIV and AIDS. Such economic environments almost always go hand-in-hand with degradation of natural resources. Typically the economic value and carrying capacity of natural resources, particularly grasslands and dune forest, are misunderstood or ignored due to human survival pressures, and are therefore abused, mismanaged, fragmented and destroyed through unplanned settlement, urban development and poor waste management.

Estuaries and communities that depend on them for various social and economic reasons remain vulnerable through the lack of co-ordinated and concerted management effort and funding.

2.4.2.6 Job creation and poverty alleviation

- With reference to biodiversity and natural resources, the following should be encouraged in order to create meaningful employment;
- Set up buy-back centres to encourage the recycling of waste;
- Set up eco-tourism development centres so that rural communities can begin to identify eco-tourism opportunities and to exploit it. Also provide marketing support to start-up initiatives;
- Start 'Working for Water' programmes, with central government support, to begin to control alien invader infestation as part of the "Save the grazing land" programme;
- Start 'Working for Fire' programmes, with central government support, to manage grassland habitats better;
- Start 'Working for Ecosystem' programmes, with central government support, to manage micro-habitats threatened by inappropriate waste disposal, alien invader plant infestation, stream bank erosion, and other forms of influence on areas of ecological importance; and
- Create incentives, provide ongoing support, training and development for start-up and established rural farmers on pre-identified high to moderate potential soils to grow the emerging farmer industry.

2.4.3 Legal and policy parameters

2.4.3.1 Vegetation types

In terms of the NEMA Biodiversity Act there are national conservation targets for each of the vegetation types present in the study area. Any areas of land with the recorded vegetation types protected in terms of the NEMA Protected Areas Act through various levels of registration will secure such habitat to be included in the scoring of the national target. Land owners should be encouraged, incentivised through rebates to register undeveloped areas of land of high biodiversity and good integrity to register with Ezemvelo KZN Wildlife for formal recognition in terms of the NEMPA.

2.4.3.2 Wetlands

All wetlands should be identified and delineated in terms of the *Practical field procedure for identification and delineation of wetlands and riparian areas, Edition 1, September 2005* to establish the exact extent of the wetlands so that the required buffers (32m in terms of NEMA Regulations GNR 544) can be recorded around the wetlands. These areas are sensitive and should be excluded from any development initiatives.

2.4.3.3 Forests

All areas of forest should be identified and mapped and the 40m buffer around forests indicated in terms of the National Forest Act to inform planning.

2.4.3.4 Coastal development

Development along the coastal zone may only take place inland of the set-back line in terms of the Integrated Coastal Management Act and NEMA Regulations GNR 544.

2.4.3.5 Water use

Utilisation of water from surface and ground water resources must take place in terms of the National Water Act.

2.4.3.6 Environmental Impact Assessments

All EIAs must be compliant with the National Environmental Impact Assessment Management Strategy for South Africa.

2.4.3.7 Climate change

State owned companies operating in the Municipal areas must ensure that they are compliant with the Climate Change Policy Framework for State Owned Companies.

2.4.3.8 Mining

All mines operating within the Municipal area must ensure that they are compliant with the following mining guidelines:

- Water conservation and water demand management guideline for the mining sector in South Africa;
- Draft Mining and Biodiversity Best Practice Guidelines for South Africa;
- Best Practice Guidelines for Water Resources in the South African Mining Industry;
- Mining and Environmental Impact Guide;
- Guideline for the rehabilitation of mined land;
- Strategic review of the status of biodiversity management in the South African mining industry;
- Climate Change: Mining and the Clean Development Mechanism; and
- Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision by a Mine.

2.4.3.9 Department of Water Affairs requirements

The following guidelines, policies and strategies need to be taken into consideration in order to meet the requirements of DWA:

- Waste management:
 - Waste Management Guideline: Application for Disposal Site Permit
 - Waste Management Guidelines: Guidelines for handling, treatment and disposal of Abattoir Waste
 - Waste Management Guidelines: Guidelines for Leachate Control
 - Waste Management Guidelines: Disposal Site Definition
 - Waste Management Guidelines: Waste Incineration Process
 - Waste Management Policy: Asbestos - Handling Asbestos containing waste
 - Waste Management Policy: Farms - The registration of small private non-commercial Farm Waste Disposal Site
 - Waste Management Policy: Groundwater - Groundwater Quality Management in South Africa
 - Waste Management Policy: Medical Waste - Policy on the Disposal of Medical Waste

- Waste Management Policy: Metal Finishing - Metal finishing sludge
- Waste Management Policy: Sanitary Waste - Policy on the Disposal of Sanitary Waste
- Waste Management Policy: Fluorescent Tubes - Disposal of Fluorescent Tubes collected in large quantities
- Waste Management Policy: Cemeteries - Interim arrangement
- Water:
 - Draft Position Paper for Water Allocation Reform in South Africa, January 2005.
 - Introductory Policy Note regarding regulation of Water Service Providers
 - National Sanitation Policy – White Paper, August 1997.
 - National Water Policy for South Africa – White Paper, April 1997.
 - National Water Resource Strategy (NWRS), First Edition, September 2004.
 - Policy on Financial Assistance to Resource Poor Irrigation Farmers, 29 September 2004.
 - Regulations on Financial Assistance to Resource Poor Farmers (GG 30427, Notice R1036
 - Sanitation Services: A Water Services Act Interpretive Guide. A guide to the Water Services Act (Act No.108 of 1997) from a sanitation services perspective.
 - Water Conservation and Demand Management National Strategy – Draft May 1999.
 - Water Resource Protection Policy Implementation Resource Directed Measures for protection of Water Resources.
 - Water supply and Sanitation Policy – White Paper, November 1994.
 - Water use licensing (Final Draft): The Policy and procedure for licensing stream flow reduction activities
 - White Paper on Basic Household Sanitation
- Water – using water for aquaculture purposes:
 - Guideline for Authorising the use of Water for Aquaculture, March 2007
 - Operational Policy: Use of Water for Aquaculture Purposes, April 2006.
- Water – using water for recreational purposes:
 - Recreational Water Use Manual, October 2007 (Second Release)
 - Thukela Water Project Feasibility Study (Part 2)

2.4.3.10 Department of Environmental Affairs requirements

The following policies of the Department of Environment Affairs need to be complied with:

- National Environmental Impact Assessment and Management Strategy (EIMS)
- Environmental Sector Skills Plan (ESKP)
- National Strategy for Sustainable Development and Action Plan (NSSD 1)
- National Waste Management Strategy (NWMS)
- South African Manual for Outdoor Advertising Control (SAMOAC)
- National Protected Areas Expansion Strategy (NPAES)
- National Biodiversity Strategy and Action Plan (NBSAP)
- National Framework for Sustainable Development in South Africa (NFSDSA)
- Management plans
- Biodiversity Management plans

2.4.4 Summary of constraints and opportunities

Constraint	Opportunity	Other Notes
Habitat and vegetation destruction through human settlement, urbanization, agricultural development and alien invader plant infestation, especially lack of planning and control in rural districts, and in particular in Ndwedwe and Maphumulo; Very limited formal conservation of vegetation types within the municipal area; Pollution of watercourses and the atmosphere; Temperature rise related to climate change is likely to alter distribution ranges and lead to local extinctions; and Estuaries require specific attention as neither coastal nor riverine management controls will serve adequately.	Core environmental assets need to be protected in terms of LUMS and a detailed open space policy; Establish “no settlement areas” along river valleys, hill slopes and mountain tops - i.e. to create an open space plan with linkages between areas of high biodiversity, especially biodiversity value in the hinterland and remaining coastal forests; Assist and encourage private landowners to formally register areas of high conservation value through the NEMA Protected Areas Act (NEM:PAA) so that these areas can be formally included in the National Conservation target, and create management structures for the areas; Scenic qualities associated with the dramatic landscapes of the Umvoti and Thukela river systems present opportunities for tourism development; Job creation through invasive alien control; Innovative waste management; Sustainable agricultural practices; Restoration of agricultural resources; Use high level of biodiversity information for management planning; and Functional ecosystems will contribute ecosystem services to the drive for social resilience.	Tourism is heavily dependent on the integrity of the natural environment.

2.5 Water resources

2.5.1 Feature status

2.5.1.1 Location

Water resource supply backlogs is a theme of major contention within South Africa as well as within the iLembe DM. This is a result of past racial and gender inequities leaving a legacy of community distribution outside of current water service institution networks. The goal of providing water and sanitation services to all South African's on a basic services level is yet to be realised.

In addition, the fact that water resources in South Africa are scarce further complicates the issue. A fine-scale status quo for all our significant water resources, as well as its use has not been determined. This promotes a dire situation for management practice for the current and future resource state protection and its sustainable use.

To understand the complexity of this feature status across the District, each local municipality is addressed separately:

Mandeni Municipality:

- Water supply quality is poor;
- Insufficient water tankers and 'Jojo' tank accessibility for communities;
- Great need for water infrastructure development to improve access for communities;
- Need to prioritise management of cluster wetland systems in the area and formalise the freshwater priority areas;
- Need to maintain all those river and wetland resources classified as fair to good; and
- Need to minimise the impact of agricultural use on the water table and groundwater table (pollution).

KwaDukuza Municipality:

- Most RDP type communities are unable to pay for existing water and sanitation services;
- Need to implement river corridor protection measures in the form of open space planning and investment in local conservation programmes;
- Although no significant freshwater priority areas identified, it might point towards a need for rehabilitation;
- Need to improve the condition of all significant river and wetland resources; and
- Need to minimise the impact of agricultural use on the water table and groundwater table (pollution).

Ndwedwe Municipality:

- Need to improve water and sanitation service, as well as significant backlogs (interrupted service with scattered distribution cover to communities);
- River corridor protection measures in the form of an open space plan;
- Need to maintain all those river resources classified as fair to good; and
- Need to prioritise the Mdloti River ecosystem as a FEPA from major and cumulative development impacts.

Maphumulo Municipality:

- Need for improved water tanker or 'Jojo' tank supply where provided and improved sanitation services;
- River corridor protection measures in the form of an open space plan;
- Need to maintain all those river resources classified as fair to good;
- Need to prioritise FEPAs against major and cumulative development impacts (all significant Tugela River tributaries ecosystems);
- Need to minimise the impact of subsistent farming use at water resources; and
- Need to improve alien vegetation management.

2.5.1.2 Threats

From a freshwater resource management perspective, water resources associated with the KwaDukuza Local Municipality are in a very poor state. This may be largely related to the population density use ratio being the highest in the iLembe DM. A significant loss of ecosystem functioning has occurred within the water resources in KwaDukuza. This needs to be reversed to improve the potential ecosystem services received from these resources. For example, restoring water resource integrity will restore its resilience factor as well as its service output whilst lowering the maintenance costs associated with stormwater management and related disaster management. Also, the associated impacts of inter-basin transfer activities within this local municipality need to be mitigated.

Mandeni Local Municipality has similar threats as those experienced in KwaDukuza. However, due to the area being covered by significantly more surface water resources, less people and more agricultural uses, the impact on this municipality's water resources are more related to water quality and not its overall habitat integrity. This implies that the rehabilitation cost associated with water resource systems in this local municipality requires less investment in structural costs, but more in terms of implementing development setback lines by preventing agricultural uses within the buffer areas of wetlands and river resources.

Maphumulo and Ndwedwe are significantly more rural in terms of the types of livelihoods, and therefore the impacts and threats associated with these municipalities are mostly related to anthropogenic threats (e.g. alien species invasion, stock disturbance to water resources, subsistence development within and along floodlines). In addition, due to these municipalities being largely outside of the scope the current bulk water infrastructural service lines, significant threats related to rural water use best practise is a major factor for concern (stock slaughter and ablution facilities need to be monitored, maintained and improved).

2.5.1.3 Key strategic issues

Three clear themes are projected from this situation analysis:

- Water availability for use vs. fitness for use;
- Water availability for use vs. demand; and
- Water availability for use vs. sustainable water resource quality management.

The first factor that can be controlled and/or improved is water resource use (how we use available water resources). In line with the purpose of Water Service Planning, water resource use quality improvement measures will include improvement of maintenance upgrades to water services infrastructure so as to improve the quality of water service, as well as improvement of water resource

quality maintenance management in dams (lowering treatment costs). In conjunction with this is the improvement of basic water and sanitation service provision to all communities within the iLembe DM.

From the status quo, groundwater is regarded as a strategic resource and it is imperative that the DM supports the areas Catchment Management Agency's (CMA no 4: KZN Rivers) establishment and maintenance of a groundwater monitoring network for the DM, which will provide a high confidence estimation of available aquifers for use (groundwater level monitoring) as well as for aquifer quality (groundwater quality monitoring). This is very important considering the constraints already associated with surface water availability, as well as infrastructure costs associated with expanding water services.

It can be noted that the process of Validation and Verification of existing water use by the iLembe DM and the province is also underway. This will provide much needed information in terms of water availability vs. water use and water users.

The second and third strategic issues related to water availability (demand and resource sustainability management) will require relevant input from the local water management area structures (Catchment Management) into the water service institutions plans. This will require the buy-in from local stakeholders or I&AP's and recognition of the importance of water resource protection in the form of rehabilitation and conservation. The primary theme for these issues is related to the implementation of Water Conservation and Demand Management.

2.5.2 Desired State

2.5.2.1 Spatial

It is desirable that the identified freshwater priorities found in the National Freshwater Ecosystem Priority Area Atlas Project be adopted by the iLembe DM. In addition, service infrastructure expansion planning from the water service institution within iLembe DM needs to be undertaken within the limits of the water reserve. Where bulk water supply service infrastructure is already stressed, like the in the case of KwaDukuza, the adoption and alignment to the Water Conservation and Water Demand Management Strategy of DWA need to be undertaken, so as to alleviate the existing strain on its associated water resources.

As a result, the following spatial objectives apply:

- River and wetland condition maps need to be circulated to all planning departments for integration to its planning and development authorisation process;
- No significant development should take place within river and wetland corridors without adopting management plans that will improve the status quo of the affected water resource's health and integrity;
- Areas upstream of significant abstraction uses must be mapped as priorities for rehabilitation where relevant, so as to maintain and improve the residence of the water resource for water use availability (associated upstream tributaries must be well maintained); and
- Areas that are implementing the water reserve and flow releases associated with maintaining the water reserve also needs to be communicated to all downstream planning sectors.

2.5.2.2 *Climate change*

Long term changes in precipitation due to anthropogenic climate change can not yet be accurately predicted, and therefore both increases and decreases in rainfall need to be considered.

An increase in rainfall will result in large scale structural damage related to stormwater floods as well as damage to existing inter-basin transfer schemes. The intensification of rainfall events will cause large-scale flood related erosion and damage to all built infrastructure within the 1:100 year floodlines of rivers and wetlands. Conversely, a decrease or spatial shift in rainfall will produce a large scale water shortage to the existing bulk water service structures. A decrease in rainfall will also result in higher water quality treatment costs as a result of eutrophic events.

The effects of climate change on the current water resource status quo that need to be accommodated are:

- Increase or decrease in stormwater runoff;
- Increase or decrease in stormwater intensity;
- An increase in encroachment by alien vegetation onto riparian areas;
- Decrease in water supply quality and quantity;
- Increase in water service and maintenance costs;
- Decrease in agricultural potential;
- Heavy metal chemical movements in water systems due to stormwater intensity;
- Erosion of water resources and structures within floodlines;
- Change in drought intensity and duration, impacted on water availability and its quality;
- Change in rainfall intensity, duration and distribution impacting on water availability and damming efficiency; and
- Change in water table pressures and water relations at coast (coastal influence), impacting on water quality and potential corrosion of structures.

2.5.2.3 *Institutional systems*

The following needs to be focused on to improve the institutional systems that support water resource management on all levels:

- Alignment and adoption of Water Conservation and Water Demand Management Strategies in the water services sector;
- Improvement of Water Services Plans implementation with the national vision for water resource state and its management;
- Implementation and improvement of effectiveness of Integrated Water and Waste Management Plan at all water treatment works;
- Alignment of municipal plans to implementing the Government Outcomes Programme, specifically, outcome 6 and 10;
- Improvement of Green Drop and Blue Drop certifications and scores;
- Implement the production and adherence to By-laws for stormwater management;
- Implement the development and adherence to wetland and riparian area management and protection plans; and
- Support the implementation of the Working for Water, Adopt a River Project and the National River Health Programme; as well as other local and provincial conservation authority programmes related to water protection, conservation and sustainable use.

2.5.2.4 Environmental quality

Environmental quality and its relation to water resources entails the implementation of measures to protect and enhance water resource ecosystems, and not just one facet such as water quality. The beneficial use of water resources, at an optimal level, can only be realised when a water resource and its supporting ecology is resilient and fit for sustainable use. As a result, environmental quality relates to:

- Maintenance and improvement of water quality and ecological reserve flow;
- Protection of riparian zone integrity (floodlines);
- Support the improvement and/or establishment of a groundwater monitoring network in the form of a Groundwater Resource Information Project (GRIP) aligned with the KZN Groundwater Master Plan by involving all local municipalities and relevant local water forums; and
- Maintenance of indigenous riparian and wetland biota (e.g. eradication of alien fish and vegetation stocks).

2.5.2.5 Vulnerability

Water resources are always vulnerable in general as basic human behaviour relates to settling as close as possible to an available water resource. Conversely, human livelihoods are highly dependent on water resource utilisation. The fact that population growth is exceeding water availability, is a testament to the current vulnerability of water resources.

2.5.2.6 Job creation and poverty alleviation

Much potential lies in realising an economy around the management of alien vegetation tree species, and with attaining temporal employment in programmes such as the Working for Water programme.

The KwaZulu-Natal Water Reconciliation Strategy outlines how poverty can be alleviated through the supply of water and sanitation services. This is strongly linked to the improvement of health and increased access to additional opportunities, such as implementing smarter agricultural measures in the area (e.g. DWA poor farmer financial assistance programme).

2.5.3 Legal and policy parameters

The National Water Act (36 of 1998) (NWA) is the main legislative body in South Africa, that oversees the use, monitoring and evaluations of water resources. There are a number of legal documents that entrench the purpose and intentions of the NWA, such as:

- Constitution of the Republic of South Africa (1996)
- The National Water Policy (1997)
- The Water Services Act (108 of 1997)
- Water Resource Strategy (2003 and its revision *in prep*)
- The National Environmental Management Act (1998); and its listing regulations (2010)

2.5.4 Summary of opportunities and constraints

Constraints	Opportunities	Other notes
Destruction of wetlands and riverine	Creating connected open space	

Constraints	Opportunities	Other notes
environments	areas along watercourses	
Bulk water supply to the Municipality is problematic	Innovative water use and conservation strategies	
Definitive projections on changes to precipitation are not possible at this point. An interesting possibility is that an overall decline in rainfall might go hand-in-hand with more intense rainfall events. This will reduce the availability of water for all water uses.	Implement River Health and Adopt-a-River Programmes	
	Improve ecosystem services;	
	Improve treatment of wastewater and strict management of industrial and domestic effluent;	
Higher temperatures will improve conditions for noxious vegetative blooms in surface waters.	Implement Classification, Reserve and Resource Quality Objectives for all significant water resources;	
Water Use Authorisation Backlog	Implement re-verification and rectification of water uses; and	
Water Use Monitoring and Auditing related to:	Implement the support of a groundwater monitoring network which relates to fitness for use in the DM (water levels and quality).	
• Sand/stone mining; • Artificial breaching; • Agriculture encroachment and poor farming practices; • Water abstraction; • Faecal pollution; • Organic pollution; • Industrial pollution; and • Poorly situated urban development and infrastructure		
Inadequate groundwater monitoring		

2.6 Agriculture

2.6.1 Feature Status

The coastal areas within KwaDukuza and Mandeni are generally of relatively high agricultural potential due to the deeper soils and favourable climate. Large tracts of land within these municipalities are currently used for commercial sugarcane production. The major threat to agricultural production in these areas is the loss of agricultural land to urban development along the coastal belt. Furthermore, the relatively sandy soils are prone to erosion and leaching of fertilisers. Therefore it is essential that farming practices that reduce these risks are employed.

Very few areas in iLembe are suitable for annual cropping as there is a high risk of erosion associated with intensive farming systems. The Maphumulo and Ndwedwe municipalities, further away from the coast, are generally of lower agricultural potential due to steep slopes and shallow soils. These areas are often utilised for subsistence agriculture, forestry and grazing. The soils in these areas are particularly prone to erosion and it is essential that sustainable farming practices are adhered to.

Certain areas are only suitable for grazing and appropriate animal stocking rates, veld management and burning regimes should be adhered to. Grazing capacity is based on the inherent capacity of a given piece of land (based on soil and climate characteristics) to accommodate grazers. It is assumed that veld is managed at approximately 70% of the benchmark (which is the 'optimal' condition in terms of species composition and concentration). So situations such as under- or overgrazing may affect current grazing capacity, but the inherent grazing capacity does not change, and can again be achieved if correct management is applied. It should be noted that each Bio-resource Unit and ecotope within a larger municipal area should be individually assessed and managed as there can be large differences in agricultural potential.

The key strategic issues to address in terms of sustainable development for the agricultural sector are therefore the protection of agricultural resources which include the following:

- Soil health, soil fertility, soil organic status;
- Erosion control;
- Veld management (species composition and concentration); and
- Water quality and quantity available for irrigation.

2.6.2 Desired State

2.6.2.1 Spatial

The presence of agricultural activity and the intensity thereof is very dependant on the inherent agricultural potential/ capability of an area based on its soil characteristics, topography and climate limitations. The use of a land capability/ potential classification system based on the above mentioned characteristics is therefore essential.

Intensive agriculture should be restricted to those areas that have inherently deeper soils with shallower gradients such as those found in large parts of the KwaDukuza and Mandeni areas. High potential agricultural land is vital to produce food for the ever-growing human population and should be conserved as such.

Steep areas with shallow soils that are found in large areas of Maphumulo and Ndwedwe should be retained in as natural state where possible. Grazing is often the only viable form of agriculture that can be practiced in such areas and should be carefully managed to enhance species composition and diversity. Well-preserved grasslands can be grazed without undue pressure on natural plant and animal diversity.

The Bioresource Program as developed by the KZN Department of Agriculture and Environmental Affairs utilise the concepts of land capability, climate capability and land potential and will be a very important tool in the determination of agricultural use and the intensity thereof within iLembe.

2.6.2.2 *Climate change*

The anticipated temperature rise as a result of global warming is likely to result in an increase in the severity and frequency of droughts. The rainfall seasonality is likely to remain the same; however rainfall events during the wet seasons are likely to become more extreme, increasing the frequency and severity of flood events. Agriculture is particularly reliant on climate and climate change could affect productivity and yield of crops and animals. Traditional practices such as conventional tillage and the use of chemical fertilisers and pesticides lead to agricultural system degradation and one of the key components of this system is soil health. Soil health decline results in a reduction in soil fertility, carbon status, moisture levels and the consequences are degraded and depleted lands with ever lower productivity potentials. Soil productivity declines will be exacerbated by the impact of projected climate change.

Adoption of climate-smart agriculture is likely to be an important adaptation strategy and will improve the readiness of people for changes in climate. Climate-Smart Agriculture (CSA) or Conservation Agriculture is defined by the Food and Agricultural Organisation (FAO) as follows: agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes GHGs (mitigation), and enhances achievement of national food security and development goals.

Some examples of practices that can be utilised in CSA are:

- Low/ no till systems. Minimal soil disturbance through reduced-till systems lead to higher soil moisture levels, higher Carbon sequestration, improved microbial life and improved fertility. It should be noted that specialised equipment is needed for reduced tillage on a commercial scale. Therefore, issues such as availability of finance and equipment may influence the adoption of this system.
- Innovative cropping systems such as push-pull agriculture and agroforestry. Push-pull cropping relies on an intercropping system where pests such as stalk-borer are 'pushed' away from crop plants by a 'deterrent crop' and pests are 'pulled' towards a 'trap crop'. Such systems lead to reduced tillage, cooler soils, greater moisture retention and lower or zero applications of inorganic nitrogen. These combined factors lower the loss of carbon from the soil and can lead to significant increases in carbon sequestration over time. Agroforestry similarly encourages the intercropping of trees with crop plants to provide shade, timber, more efficient use of water, potential for Nitrogen fixing and other products. Trees also sequester carbon, which is an added benefit.
- Use of new and improved varieties of crops or animal breeds that are adapted to predicted environmental conditions.
- Altering cropping/ planting times to optimise environmental conditions for the crop. For example it may become too hot to grow maize during the summer period but increased temperatures may allow winter cropping. Water availability may, however, be a limiting factor.
- Improved water management systems, including water-harvesting (both in-field and as separate systems), retention, storage, application and water-use efficiency systems.

2.6.2.3 *Institutional systems*

Agriculture is intrinsically linked to the environment and its natural resources, and can no longer be viewed in isolation. It is therefore a requirement that any institutional systems/ departments/ plans developed by iLembe Municipality work in close conjunction with the environmental planning section.

Implementation of sustainable agricultural practices requires the transfer of this technology to commercial, small-scale and resource-poor farmers. Well qualified agricultural personnel/extension officers are required to provide training and knowledge transfer.

2.6.2.4 Environmental quality

Agricultural activities may have a large impact (both positive and negative) on environmental quality, especially in terms of soil health and water quality. Agriculture can also co-exist with native fauna and flora if managed correctly. The natural ecosystem supplies a number of ecosystem services to the agricultural community/ system, including:

- Mitigation of floods, droughts and water table fluctuations;
- Generation and protection of soils and their fertility;
- Pollination of crops;
- Nutrient recycling;
- Erosion control; and
- Control of agricultural pests.

The following is just some of the systems that must be in place to encourage a positive effect on environmental quality:

- Minimisation of soil erosion. This can be accomplished by a variety of conservation tillage systems. Appropriate contour protection should be implemented and maintained in areas where cropping can take place. No virgin land or land steeper than 12% should be ploughed;
- Increase in soil organic matter status;
- The negative impacts of fire must be minimised, such as air pollution and loss of soil moisture. Controlled burning is however important in the management of grasslands;
- Fertiliser application must be managed to reduce leaching of nitrates and other nutrients;
- Contamination of run-off water by fertilisers and chemicals should be minimised;
- Creation of green corridors on farms to encourage movement of wildlife; and
- Protection of wetlands.

2.6.2.5 Vulnerability

Agriculture is a basic human activity, supplying people with sustenance. South Africa essentially has a dual agricultural economy, with large commercial farms producing food for the majority of the community and subsistence farmers producing food for themselves and their immediate family and community. All farmers are, however, under increasing pressure to inflate their agricultural outputs to meet rising food demands. The United Nations predicts that food production must rise 50% by 2030 and the FAO projects the need to increase 70% by 2050 to meet demands.

Commercial farming will play a significant role in the supply of basic produce. While this continued and future success is dependant on a long-term strategy of sustainability. Successful small-scale farmers can directly improve food security to their families and communities and again need to adhere to principles of sustainability. As mentioned previously the transfer of basic skills are very important to improve the chances of small-scale farmers to succeed.

2.6.2.6 Job creation and poverty alleviation

Commercial farming is a considerable employer of people and commercial farms often house entire families and communities. Such farming systems can perhaps be encouraged and incentivised to provide services such as clinics and crèches. In South Africa there is also a drive towards including the previously disadvantaged black community in commercial farming, which directly contributes to job creation. In terms of the agricultural value chain, it should also be noted that there are a number of input and output suppliers that will benefit from a strong agricultural economy. Many agricultural commodities lend themselves well to value-adding and this could introduce a whole new level of entrepreneurs to the economy.

2.6.3 Legal and policy parameters

The legislation governing agriculture is contained in the Conservation of Agricultural Resources Act 43 of 1983 (CARA). The objective of this Act is to provide for the conservation of natural agricultural resources of the Republic by the: *“...maintenance of the production potential of land; combating and prevention of erosion and the weakening or destruction of water sources; and by the protection of the vegetation and the combating of weeds”*.

The Government’s White Paper on Agriculture (1995), the 1998 Agricultural Policy in South Africa, the 2002 Strategic Plan for South African Agriculture as well as the 2003 version of the Sustainable Utilisation and Protection of Agricultural Resources (SUPAR) Bill are all more recent developments in the government’s agricultural policy. These publications, resulting in the draft SUPAR Bill, have taken a significant step forward and have expanded the horizons of CARA.

The GreenChoice Reference for Well-managed Farms (Scotcher, 2009)³ is perhaps the most important policy document to consider in the Agricultural landscape. It is a joint initiative by the World Wildlife Fund (WWF) and Conservation International South Africa and it states that: *“The goal of sustainable agriculture is to minimise any adverse impacts of farming on the environment, to demonstrate good stewardship of natural resources and to enhance social well-being, while providing a sustained level of production and profit.”*

The GreenChoice Reference deals with all three pillars of sustainability; the economic, social and environmental “pillar”/ principle and gives guidelines for sustainable farming in a South African context. The document is broad enough to be relevant to all farming activities, and can be further refined by specific industries. The objective is that, over time, the GreenChoice Alliance partners would develop sector-specific sustainable farm management systems that meet their needs, using the Reference as a guideline. A number of industries also have their own set of sustainability criteria, such as the Forest Stewardship Council (FSC).

It should also be noted that increasing numbers of farmers are subscribing to certification schemes such as GlobalGAP.

³ Scotcher JSB 2009. The GreenChoice Reference for Well-Managed Farms 2009/2010 version, A. Goldblatt (ed.). Unpublished report to GreenChoice (a World Wide Fund for Nature and Conservation International partnership).

2.6.4 Summary of constraints and opportunities

Constraints	Opportunities	Other Notes
Limited cultivation potential in Maphumulo and Ndwedwe;	Proximity to Dube Tradeport for export of agricultural products;	Production of biofuel crops could impact on other agricultural products and food security.
Erosion/ Soil Loss/ Veld Degradation/ Loss of agricultural land to development;	Good agricultural land provides opportunities for diversification within the agricultural sector;	
High potential agricultural land in the coastal corridor have been earmarked for urban development; and	Conservation Agriculture; Direct influence on food security, vulnerability, poverty and unemployment;	
Evaporation rates will increase and water availability for irrigation purposes will become problematic if there is a reduction in precipitation.	Biofuel production, based on biofuel crops, is a feasible opportunity; and DAEARD Bioresource Programme.	

2.7 Coastal management

2.7.1 Feature status

2.7.1.1 Location

From a spatial perspective, the features described under this section are located within the coastal zone, as defined by the Integrated Coastal Management Act, Act no 24 of 2008 (ICM Act). This includes, *inter alia*, cadastral units situated wholly or partially within 100m from the high-water mark in urban areas and 1000m in rural areas as well as the functional boundaries of estuaries.

In more general spatial terms, iLembe extends along the coast of KwaZulu-Natal for roughly 75km from the Amatikulu River near Gingingndlovu in the northeast to the Tongati River in the southwest. The coastline represents 14% of the municipality's total jurisdictional boundary, and approximately 13% of the provincial coastline. Two local authorities within iLembe are located along the coast, namely the KwaDukuza Local Municipality (46km of coastline) and the Mandeni Local Municipality (29km of coastline).

The two coastal local authority areas within iLembe are of distinctly different characters, with KwaDukuza exhibiting high levels of transformation and degradation as a result of extreme development pressure in the coastal zone and the predominance of commercial sugarcane cultivation. By contrast, Mandeni is characterised by more subsistence agriculture and less transformation of natural areas. Cultural and heritage resources are concentrated in the greater Mandeni area, with culturally significant landmarks such as the Ultimatum Tree being located on the banks of the Thukela River. Within KwaDukuza, urban nodes are interspersed with areas of remaining natural vegetation which are largely fragmented. North of the Thukela River, natural areas dominate

the coastal zone of Mandeni. This is greatly as a result of the presence of the Red Hill and Amatikulu Nature Reserves which stretch for approximately 16km up the coast and are 1614ha in extent. Urban nodes are concentrated in the south, with the most densely populated coastal areas being located between Ballito and Sheffield Beach. North of Sheffield Beach, smaller urban nodes are found at Princes Grant, Umvoti Mouth and Zinkwazi Beach.

2.7.1.2 Threats

Transformation of natural areas which provide valuable free ecosystem goods and services is the primary threat which faces the iLembe coastline and KwaDukuza in particular. Transformation (in various forms) results in a number of other threats either directly or indirectly that cause degradation and/or other negative environmental impacts. Analysing land cover over time is one method of determining rates and levels of transformation. The National Land Cover dataset (SANBI, 2009) was used for this purpose and iLembe's results are extracted below.

- Untransformed land within iLembe accounts for approximately 47% of the total area;
- Cultivation accounts for some 40% of the total area;
- Degraded natural areas are estimated at 3% of the total area; and
- Urban built-up areas account for 8% of the total area of iLembe.

It must be noted that these statistics are for the district as a whole, and do not account for the fact that much of this transformation has occurred in close proximity to or within the coastal zone, particularly cultivation. This situation has severely affected the ability of this important spatial area to reconcile a burgeoning demand with an ever-diminishing capacity to supply ecosystem goods and services. Transformation within KwaDukuza specifically has been driven by increased rates of urbanisation brought about by the growth in the residential housing market during the last twenty years.

Increased movement to urban areas has led to a myriad of issues which contribute to decreased environmental integrity, and these include linear or 'ribbon' coastal development, urban sprawl, transformation of view sheds and the resultant restriction of access to coastal resources and increased pressure on sanitation and transportation infrastructure in coastal areas. Urbanisation also increases recreation needs and requirements often exceeding carrying capacities of swimming beaches and accompanying amenity.

Further threats occur at the catchment level, including but not limited to unsustainable sand-winning practices, development in flood plains, land degradation, invasive alien species (both terrestrial and aquatic) and soil erosion, all of which contribute to a poorer coastal environment. Pollution from land-based sources such as commercial agriculture and industry as well as overburdened and poorly maintained sanitation infrastructure furthermore degrades the coastal environment of iLembe. Degradation of estuaries specifically will be detailed in the next section. Mariculture is deemed an emerging threat in the coastal zone.

Threats to the marine environment are also noteworthy, as high levels of risk and consequently, vulnerability, are detectable as damage from dynamic coastal processes. The coastline of iLembe is not well protected by rocky headlands or breakwaters and as such is prone to coastal erosion and damage from extreme events and potentially sea level rise. KwaDukuza is particularly susceptible to this threat. The marine environment is also at risk and vulnerable to shipping incidents and accidents as well as the increasing interest in off-shore petroleum activities.

2.7.1.3 Key strategic issues

The threats described above require intervention at a strategic level. Key strategic issues for the coastal environment of iLembe, including the KwaDukuza and Mandeni municipal areas, are as follows:

- Coastal access and accessibility:
 - Identification and management of coastal access land; and
 - Investigate alternative / arterial transport routes to relieve burden on N2 and M4.
- Management and conservation of the remaining natural areas particularly coastal forests, dunes, wetlands and grasslands in the face of the continued demand for tourism and housing development:
 - Restoration / rehabilitation of coastal habitat types in line with recognised biodiversity targets;
 - Possible expansion of the Marine Protected Area (MPA) network; and
 - Sustained and continued management action in respect to invasive alien species control.
- Upgrade and maintenance of sanitation and transportation infrastructure.
- Strategies to address water shortages and alternative supply options:
 - Investigate alternative uses for sugar cane; and
 - Consider desalination as a possible alternative.
- Sustainable utilisation of coastal resources:
 - Prioritise wetland rehabilitation and management;
 - Monitor and enforce sand winning activities;
 - Facilitate the recovery of overexploited resources; and
 - Control the use of resources – sustainable harvesting of natural products.
- Hazard and risk mitigation as well as adaptation strategies which address coastal vulnerability and strengthen coastal resilience:
 - Rehabilitate natural habitats that play a critical role in adaptation – dunes, estuaries, mangroves, salt marches etc.;
 - Recreate and maintain damaged dune systems; and
 - Promote soft defence in hazard prone areas where retreat is not possible.
- Recreational opportunities and constraints:
 - Investigate alternate coastal recreation beyond swimming beaches; and
 - Promotion of non-consumptive resource use and recreation activities.
- Human capacity development:
 - Empower key stakeholders for improved cross-sectoral integration, management efficiency and alignment of sustainability objectives;
 - Invest in knowledge base; and
 - Strengthen adaptive management capacity.
- Facilitate appropriate coast dependant activities and developments.

2.7.2 Desired State

2.7.2.1 Spatial

The coastline of KwaZulu-Natal and the iLembe coastline in particular, are inherently high risk because of the predominance of the marine influence and the concomitant risk of flooding, inundation

and erosion. This was evident when the KwaDukuza coastline was one of the worst affected by the extreme erosion event of 2007. Spatial sustainability objectives must therefore focus on mitigating this risk, whilst not neglecting other interconnected and interdependent areas of concern. The following specific spatial objectives have been identified:

- The delineation of an amended, legislated, coastal zone in terms of the ICM Act, not just the default delineation;
- Integration of coastal planning schemes into other municipal tools/frameworks such as the IDP, SDF and LUMS;
- Delineation and adoption of coastal setback lines in terms of the ICM Act;
- Long-term risk aversion through managed retreat in hazardous areas where possible;
- Where retreat cannot be accommodated due to space and other constraints, soft coastal defence principles should apply. So-called hard engineering should only be supported in both isolated and extreme cases;
- Expanded conservation areas as per the National Protected Areas Expansion Strategy (NPAES) (incorporation of conservancies, etc) – with protection of coastal habitat types protected according to recognised biodiversity targets;
- Promotion of coast- dependant development and infrastructure as well as the densification of existing nodes;
- Incorporation and proclamation of remaining Admiralty Reserve land parcels into Coastal Public Property as per the ICM Act; and
- Expanded MPA network as well as special management areas established in terms of the ICM Act.

2.7.2.2 Climate change

The impacts of climate change will be most acutely experienced in transitional spaces such as the coastal zone. Increased incidence and intensity of extreme events coupled with the inherently high levels of urbanisation and resource utilisation in coastal areas will require robust environmental resilience to mitigate the projected impacts that a dynamic and changing climate will have on these spaces. Climate change specific sustainability objectives have therefore been identified as follows:

- Proactive planning to counteract the negative impacts of climate change in the coastal zone e.g. water shortages in coastal areas and saline intrusion into aquifers, disaster management plans in place for coastal hazards such as storm surges and terrestrial flooding;
- Rehabilitation of prioritised natural habitats, such as dune environments, to increase resilience;
- A district-level municipal open space system through the instatement of green corridors and green wedges linking the coast to interior open spaces;
- Developed human capacity through training and awareness of climate change issues and climate change planning; and
- Climate change focused policy and strategy that links the continued provision of ecosystem goods and services in the context of climate change induced impacts to human well-being and economic development.

2.7.2.3 Institutional systems

Synergy and integration between the sustainability objectives discussed above and the institutional frameworks and systems of the district must be prioritised. Coastal management specific frameworks and institutional systems have been identified as follows:

- An adopted Mandeni Coastal Management Programme as well as a more strategic adopted iLembe Coastal Management Programme;
- Estuary management plans for all estuaries;
- A revived and fully functioning iLembe Coastal Committee;
- Established KwaDukuza and Mandeni coastal working groups;
- Measurable investment in coastal awareness raising and training aimed at capacitating authorities, allowing them to apply adaptive management strategies and encourage effective governance; and
- Ongoing and sustainably funded implementation programmes, e.g. alien invasive species programme.

2.7.2.4 Environmental quality

Improvement in environmental quality is a cornerstone of sustainability strategy. Specific targets and objectives are categorised as follows:

- Improvements in coastal water quality, particularly in estuaries, through catchment-level interventions, monitoring and enforcement of legislation and policy;
- Discouragement of habitat fragmentation and encroachment into sensitive areas;
- Rehabilitated key degraded natural areas such as wetlands, coastal grasslands and coastal forests; and
- Coastal cultural and heritage resources both identified and protected.

2.7.2.5 Vulnerability

Linked to objectives for improving environmental quality are objectives pertaining to the reduction of vulnerability of coastal areas. These objectives include:

- Relocated municipal infrastructure from high risk areas, e.g. sewage pump stations and infrastructure currently located on beaches;
- Increased climate change resilience through the rehabilitation of natural habitats such as vegetated dunes and wetlands;
- Controlled and monitored sustainable harvesting of natural resources;
- Removed de-proclamation of protected areas threat;
- Sustainability highlighted as a key factor in planning for the provision of bulk services, thereby reducing risks to the coastal zone; and
- Promotion of permeable urban surfaces to reduce erosion and incorporation of sustainable urban drainage systems.

2.7.2.6 Job creation and poverty alleviation

Sustainability incorporates improvements in human health and wellbeing, therefore job creation and alleviation of poverty are necessary components of objectives to sustainably utilise ecosystem goods and services. Coastal specific objectives have been identified as:

- Identification of strategies to link job creation with sustainable coastal livelihood initiatives;
- Investigation into public-private partnerships in terms of training for managing coastal public property – lifeguards, coastal officers, etc; and
- Sustainable harvesting strategies for natural coastal resources, including monitoring and enforcement.

2.7.3 Legal and policy parameters

A multitude of legislation and policies exist which govern the treatment and management of estuaries in South Africa and in KwaZulu-Natal. These have been detailed previously but are briefly identified and described as:

- National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008): The key legislative parameter relevant to the coastal zone;
- National Environmental Management Act (NEMA) (Act 107 of 1998): Various activities in the coastal zone require environmental authorisation in terms of the NEMA Environmental Impact Assessment (EIA) Regulations (2010) and should be noted regarding future developments and/or plans within the municipality which pertain to the coastal zone;
- Marine Living Resources Act (MLRA) (Act 18 of 1998): The focus of the MLRA is on regulating and managing the consumptive use of South Africa's coastal and marine resources to ensure that over-exploitation does not occur;
- National Water Act (NWA) (Act 36 of 1998): Estuaries are classified as a water resource under the NWA, and thus all the prescriptions relating to water use are applicable to estuarine environments. The Act, and associated policies, provides guidelines and procedures for protecting the ecological freshwater requirements of individual estuaries;
- National Forests Act (NFA) (Act 84 of 1998): The remaining coastal forests within iLembe, as well as identified indigenous trees, are protected via the NFA;
- National Environmental Management: Biodiversity Act (NEM:BA) (Act 10 of 2004): both the Coastal zone and its included estuaries host a diversity of unique habitats and species found only along the coast. As such, the management and protection of coastal biodiversity of the district needs to be in accordance with the NEM:BA;
- National Environmental Management: Protected Areas Act (NEM:PAA) (Act 57 of 2003): The NEM:PAA provides for the protection and conservation of ecologically viable areas representative of the country's biological diversity;
- National Environmental Management: Waste Act (NEM:WA) (Act 59 of 2008): This Act regulates waste management in order to protect human health and the environment via various measures, all of which are applicable to the coastal zone;
- Local Government: Municipal Systems Act (Act 32 of 2000): All municipalities are obliged to prepare and to update IDPs, which in turn must contain SDFs. All Coastal management programmes and estuary management plans should be incorporated into local IDPs, and SDFs, to ensure wise use and biodiversity protection; and
- Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983): Water resources, including estuaries are protected against erosion due to destructive farming practises, whilst natural vegetation is protected against weeds and invasive alien species.

2.7.4 Summary of opportunities and constraints

Constraints	Opportunities	Other notes
Habitat fragmentation; Poor catchment management; Alien invasive species; Pollution threats; Management and conservation of natural resources; Risk of damage from dynamic coastal processes; Climate change impacts; Coastal access issues; Terrestrial and Marine corridor linked with riverine corridors; Institutional capacity; Management and conservation of natural resources; Water resources / quality; Environmental Awareness; Tourism & recreation potential; Inadequate waste management; Environmental management and monitoring; Health; Land use planning; Service delivery; Agriculture; Coastal specific management interventions; Limited formal conservation of the dune thicket environment; Sea level rise will affect the need for coastal defenses and appropriately pro-active	Maintain sense of place and viewsheds; Capitalise on cultural and heritage resources for tourism; Promote nodal development; Conservation expansion opportunities at local conservancies and formal protected areas; Replicate good environmental practice at Zimbali; and The Municipality to formally declare the coastal dune thicket belt as a conservation area in terms of the NEMA PA.	Improve water quality; Control soil erosion; Prevent pollution; Establish movement corridors; Maintain functional conservation areas; Control harvesting of natural products; Promote conservation of biodiversity; Control human disturbance of wildlife; Maintain scenic attractiveness – viewsheds; Control alien plants and animals; Limit impervious surfaces to decrease runoff; Promote access to coastal resources but controlled access; and Consider coastal ecosystem as a whole not as sectors - more collective approach will allow balance between needs.

Constraints	Opportunities	Other notes
development planning; and Coastal regression will reduce the extent of beachfront, and impact on the risks associated with dune collapse.		

2.8 Estuaries

2.8.1 Feature status

2.8.1.1 Location

There are eight estuaries along the iLembe coastline, two within Mandeni and six within KwaDukuza. The Tongati Estuary, the ninth system, lies on the border between the iLembe Municipality and the eThekweni Municipality to the south. Collectively, these systems comprise three different estuarine types; namely six temporarily open/ closed estuaries, two river mouths and one permanently open estuary. Numerous minor drainage lines and water bodies, which are not classified as estuaries *senso stricto*, are also present along the coastal strip. Several systems, particularly the Mvoti, Thukela and Amatikulu/ Nyoni estuaries, are associated with extended wetland environments. Other sensitive estuarine features include:

- Intertidal mudflat and sandbanks;
- Swamp forests, salt marshes and other wetlands;
- Umhlali 'island';
- Narrow dune cordon of the Matigulu/ Nyoni system;
- All estuary mouths; and
- Generally, all areas within the estuarine functional zone; i.e. below the 5m (amsl) contour.

According to the national estuarine desktops health assessment of the National Biodiversity Assessment 2011 (Van Niekerk and Turpie, 2012), which takes into account the condition of various ecological components (estuarine habitat and biological communities), the Tongati is the most degraded estuary across the iLembe study area, followed by the Mvoti, which is largely modified. These systems are impacted by multiple human activities, particularly siltation, nutrient loading and chemical contamination, which have resulted in extremely poor water quality which is often to the detriment of estuarine organisms. In terms of healthy estuaries, the Mdlotane, Nonoti (KwaDukuza LM) and Matigulu/ Nyoni (Mandeni LM) are in a largely natural and unmodified state.

The Thukela and Mvoti estuaries are the largest systems in Mandeni and KwaDukuza LM, respectively. Together with the Tongati Estuary, they are categorised as Critically Endangered (33% of iLembe estuaries) because they have lost much of the original estuarine habitat such that ecosystem processes have deteriorated severely and species associated with these systems have been lost or are likely to be lost (SiVest, 2007; Van Niekerk and Turpie, 2012). A further two systems are categorised as Endangered (Mhlali and Nonoti) (22% of iLembe estuaries), and the remaining estuaries are considered Least Threatened (45% of iLembe estuaries).

Five estuaries, namely, Mhlali, Mvoti, Mdlotane, Zinkwazi and Matigulu/Nyoni, are deemed priority estuaries in terms of the National Estuaries Biodiversity Plan (Turpie *et al.*, 2012), which should receive either full or partial protection to achieve estuarine biodiversity targets. In addition, these same systems were incorporated into the National Freshwater Ecosystem Prioritisation Areas (NFEPA) (Nel *et al.*, 2011).

2.8.1.2 Threats

The major factors threatening estuarine ecosystems in both the KwaDukuza and Mandeni LM, are agricultural and urban development. These pressures are likely to increase in future as these remain the predominant economic and developmental thrusts for the district. These in turn lead to the following direct and indirect impacts on estuaries in iLembe:

- *Agricultural encroachment and siltation*: reduces the overall extent of the natural water body, while the removal of marginal riparian vegetation and drainage of wetlands for crop planting results in habitat transformation and/or loss. This is of particular concern in KwaDukuza LM where commercial farming is intensive and widespread;
- *Urban encroachment*: leads to land reclamation (draining of wetlands), hardening of natural surfaces and the removal of natural vegetation for development, as well as occupation of floodplains which increases flood risk to coastal communities. Currently, urban development along the coast is particularly high in KwaDukuza LM;
- *Artificial breaching* - reduces the scour potential and interferes with natural ecological functioning;
- *Nutrient loading*: leads to eutrophication and proliferation of algal blooms which in turn has adverse effects on biological communities (e.g. fish kills);
- *Faecal contamination*: estuaries become a health hazard to both biological communities as well as users of estuaries and the near shore environment;
- *Water abstraction*: leads to changes in sediment patterns and hydrological regimes, resulting in altered mouth dynamics and estuarine functioning; and
- *Sand mining*: disturbs biological communities, affects habitat loss, alters water quality and reduces the sediment supply to nearby beaches.

The following activities also threaten the status of the estuarine resources:

- Water pollution attributed to wastewater discharge, solid waste, chemical contamination from industries and contaminated stormwater runoff; and
- Encroachment of alien vegetation and animals, thereby reducing natural estuarine biodiversity of the region as well as functioning.

2.8.2 Strategic concerns

As determined in the Status Quo assessment, the major issue that faces the management of estuarine ecosystems in iLembe is the conflict between wide spread agricultural and urban development pressure and the protection of the natural environment.

With as much as 60% of the land of the KwaDukuza LM under intensive sugar cane cultivation, the estuaries of this region will be subject to continued siltation and nutrient inputs. Where additional land is to be acquired for agricultural purposes, or where cultivation is to be intensified, habitat

fragmentation and degradation as well as increased water demand will further impact negatively on estuaries.

Urban development together with the provision of municipal services, result in numerous anthropogenic (human-induced) impacts such as estuarine encroachment and habitat loss, pollution (from municipal and industrial wastewater discharges, and agricultural and contaminated stormwater runoff), water abstraction and impoundments, mining and exploitation of living resources, to name a few. The cumulative and synergistic impacts result in reduced resilience of estuarine ecosystems to disturbance. Poor estuarine condition may also have socio-economic implications through diminishing property values as well as posing a health risk to visitors to the coastal zone.

2.8.3 Desired State

Estuaries are unique and highly dynamic ecosystems. They deliver a number of different goods and services that are essential for the survival of many organisms and others which are critically valuable to society. The following section outlines the future Desired State for estuaries in iLembe DM that will ensure their sustained health and functioning and provision of ecosystem services.

2.8.3.1 Spatial

The iLembe DM is positioned between the estuary-abundant coastline toward the south (eThekweni Metro and Ugu DM have 16 and 41 estuaries, respectively) and the estuary-sparse coastline further north (uThungula and Umkhanyakude DM have 5 and 4 estuaries, respectively). The iLembe DM therefore plays an important role in terms of estuarine connectivity along the eastern seaboard.

In respect to the ecological health of iLembe estuaries, the level of impacts vary with some estuaries faring better than others in addition to differential impacts delivered by upper catchment areas. Authorities may be inclined to prioritise fully functional estuaries with high biodiversity that are currently in good ecological health; however, this would place increasing pressure on the remaining healthy systems to provide the ecosystem services required by society, and also allow increasing neglect of the already degraded systems. According to the National Estuaries Biodiversity Plan (NEBP; Turpie *et al.*, 2012), a minimum of 20% of total estuarine area in South Africa must be conserved. By default, estuaries within iLembe DM should be represented in line with the national target.

Accordingly, the Mhlali, Mvoti, Mdlotane, Zinkwazi and Matigulu/Nyoni systems have been identified as priority estuaries included in the estuary protected area network. The Mdlotane and Mvoti estuaries require full protection and should be deemed as full no-take areas. The remaining three require partial protection, whereby 50% of the biodiversity features are protected using zonation techniques or other appropriate means (Van Niekerk and Turpie, 2012). A further 20% is set for the total area of each estuarine type, as well as 20% set for the total area of each habitat type and specific targets for animal species present in estuarine systems. These targets have important implications for local spatial and development planning in the KwaDukuza and Mandeni LMs, particularly where the estuarine type is rare (river mouths), and for those systems which support protected habitat types (e.g. swamp forest).

The five prioritised estuaries should be regarded as priority features in Municipal IDP, SDF and LUMS, whilst concerted efforts should be made to both minimise the negative impacts and continually improve the ecological state of the remaining estuaries of the iLembe DM.

2.8.3.2 Climate change

Coastal areas and estuaries are at risk of the impacts associated with global climate change, such as altered climatic regimes, sea level rise, increased intensity and frequency of flooding and wind generated storm surges and severe coastal erosion. One of the essential services that estuaries provide to coastal communities is a significant buffer against floods and marine storms. However, inappropriate development is reducing the ability of estuaries to buffer the surrounding landscape.

For the estuaries of iLembe DM, development at estuary mouths, on river floodplains and within the estuarine functional zone (below the 5m contour) increases the risk of rising water levels (marine and riverine) and erosion, as well as natural (non climate change related) back-flooding within estuaries during mouth closure.

The implementation of coastal / development setback lines, as provided for under the Integrated Coastal Management Act (Act 24 of 2008) as well as the amended Environmental Impact Assessment (EIA) Regulations, is a legal and proactive solution toward the protection of, *inter alia*, coastal public property, private property and public safety; and the attributes of the coastal protection zone. The estuarine functional zone, as delineated by the 5m contour, should be adopted as the default setback for development around estuaries preferably with an additional buffer zone, thereby enhancing the buffer against effects of climate change (and reducing risk of damage to coastal property and endangerment of lives), whilst also protecting estuarine function and health, and coastal biodiversity.

2.8.3.3 Institutional systems

Estuarine management is necessary to reduce threats to levels which do not interfere with the natural functioning of an estuary. Essentially, effective estuary management refers to managing negative human activities and interactions with an estuary as opposed to directly manipulating the estuary itself. The key institutional systems that should be employed to facilitate estuarine management in iLembe DM are summarised as follows:

- *Coastal Management Programmes (CMP)*: A CMP is a strategic policy and accompanying plan of action aimed at co-ordinating management of the sensitive coastal zone and its associated resources. It provides, *inter alia*, for the identification of specific areas which require special coastal management and the development of estuary management plans. The Mandeni LM is without such a plan, while the KwaDukuza CMP has already been developed.
- *Estuary Management Plans (EMP)*: An EMP is developed at the local municipal level toward the management of activities and actions toward the enhancement of a specific estuary. An EMP provides for the development of specific management action plans and the development of a local estuary advisory forum to support the implementation of these actions. EMPs are required for all estuaries in the KwaDukuza and Mandeni LMs, and should be integrated into existing Catchment Management Plans.
- *Protected Area Management Plans*: As with an EMP, a protected area management plan is developed for a specific protected area; to ensure the protection, conservation and management of the protected area according to specific objectives for the purpose it was declared. Protected Areas alongside, or which encompass estuaries, will require such a plan, but which also incorporates the estuarine element.
- *Ecological Reserve Determinations (ERD)*: Determining the Ecological Reserve, that is the quantity and quality of water reserved to support ecosystem function, is a critical step towards the securing adequate freshwater supply for estuaries, and management of the country's

water resources (DWA, 2010). Reserve determinations can be carried out at a rapid, intermediate or comprehensive level, with increasing data and cost requirements. An intermediate ERD has been completed for the Thukela Estuary, while comprehensive ERDs are planned for the Nonoti and Zinkwazi estuaries.

- *Integrated Development Plans (IDP), associated Spatial Development Frameworks (SDF) and Land use Management System (LUMS)*: As a strategic planning tool, an IDP, together with a SDF and LUMS, guides and informs all planning, budgeting, management and development decisions at the local and district municipal levels. The IDP and SDFs for both the district and local municipalities highlight the importance of the coast in terms of a unique marine environment and recognises it as a highly sensitive environment (including estuaries). The sensitivity of estuaries and their value as important ecological assets should continue to be upheld at the local municipal level as well.
- *Integrated Waste Management Plans (IWMP)*: A final applicable strategic planning tool is IWMPs which give effect to the Chapter three of the National Waste Management Act by identifying and addressing the negative impact of poor waste management amongst others. Both the coastal zone, as well as estuaries, are vulnerable to the negative impacts of both solid waste as well as water pollution. The status of estuaries, as sensitive, complex and dynamic features, should therefore be incorporated proactively into any Municipal waste management planning.

2.8.3.4 Environmental quality

Estuaries are report cards of their catchments and thus all catchment impacts translate ultimately into impacts on estuaries. However, because estuaries are such complex ecosystems, the consequences of detrimental human impacts, and the current level of degradation of estuaries (as a deviation from their original pristine state), are not always apparent to the broader population.

The scientific determination of the present ecological state of an estuary takes into account the condition of multiple abiotic and biotic components of the estuarine environment (DWA, 2010; Van Niekerk and Turpie, 2012), which results in a health score that reflects the current condition as a percentage of the pristine state. Importantly no estuary in the iLembe DM is considered completely natural or unmodified. While some components may appear to be flourishing and the vista is appreciative, the water quality (or other components) may be particularly poor (e.g. Bird communities of the polluted Mvoti Estuary).

Fortunately, unlike many other ecosystems, estuaries can be restored to a well-functioning state. In brief the Desired State for iLembe estuaries is the restoration and/or enhancement of estuarine health and functioning for all systems, for the sustained provision of goods and services and preservation of biodiversity. The following goals are envisaged:

- *Freshwater requirements* should be determined and secured for all estuaries. This would provide guidance with respect to water use license applications and flow regulation (e.g. dams). For estuaries that are in largely natural state with few modifications, water abstraction throughout the catchment should be carefully considered and restricted, if necessary.
- *Urban development* and human settlement should be excluded from the estuarine functional zone (EFZ), unless absolutely necessary. River crossings in the form of bridges and causeways should similarly be restricted to outside the EFZ. Development in the upper catchment should take cognisance of potential impacts on the downstream estuarine system.

- *Natural habitats* (wetlands, sandbanks) should not be modified, degraded or destroyed to accommodate development or recreational needs, and alternative less sensitive areas must be considered. At a minimum, these habitats should be rehabilitated to offset development.
- *Agriculture*: Croplands and grazing lands should be limited to outside the EFZ and beyond an extended buffer area. For intensive commercial practices, this buffer should be further increased to reduce nutrient input through fertilisers and excessive erosion. Best practise and applicable guidelines should be followed at all times.
- *Artificial breaching* should be prevented with natural processes dictating mouth dynamics.
- *Mining* (all forms) must be excluded from the EFZ. Strict mitigation measures should be imposed for the operation of sand winning activities in rivers.
- *Wastewater infrastructure* must operate at optimum levels, aging infrastructure must be upgraded and regular maintenance must be undertaken to reduce the risk of faecal contamination. Special standards for wastewater discharges into estuaries, in terms of nutrient levels, must be implemented. Illegal sewer connections to stormwater systems should be rectified.
- *Waste management* strategies must be enhanced for areas surrounding estuaries and should include active clean-up programmes in estuaries.
- *Eradication programmes* should be implemented and continually maintained, for the removal of invasive alien plants and animals.
- *Exploitation of living resources* and recreation activities should be controlled and frequently monitored.

2.8.3.5 Vulnerability

As previously stated estuaries provide numerous goods and services that are of benefit to society. As places of rich biodiversity they are an important source of food (e.g. fish and crabs) and natural materials (e.g. wood and Ncema grass) for vulnerable subsistence communities. In addition, estuaries also provide nursery areas for various marine fish and invertebrate species, which in turn benefit other fishing communities along the coastline, as well as the recreational and commercial fishing industries.

Effective management of estuaries in iLembe DM, in terms of sustained good ecosystem health and functioning, water quality and quantity, and the regulated harvesting of natural resources, is imperative to ensure long term provision of these resources to support the livelihoods and needs of subsistence communities.

2.8.3.6 Job creation and poverty alleviation

Estuaries are areas of natural scenic beauty, encompassing a variety of habitats and numerous plant and animal species. They are therefore popular for both coastal development as well as recreational activities. They also serve as important centres for environmental education, for schools and adult interest groups. As part of the estuary management planning process, which is a requirement for all estuaries, measures to increase local job creation and reduce poverty alleviation should be investigated.

If the estuaries of iLembe are maintained in good condition, the opportunity exists to promote their utilisation for ecotourism and education related activities; on condition that activities are carried out responsibly and the carrying capacity is not exceeded. This would in turn provide various benefits and employment opportunities for local disadvantaged communities, such as during construction and

operation of such facilities, and capacity building and employment for the provision of guided birding/ canoeing/ nature trails and education programmes. Additional opportunities exist through the Extended Public Works Programmes, which include the Working for the Coast, Working for Water Programme, and the Invasive Alien Species Programme, toward protecting and enhancing estuarine environments.

2.8.4 Legal and policy parameters

A multitude of legislation and policies exist which govern the treatment and management of estuaries in South Africa and in KwaZulu-Natal. These are set out in Table 1 below and key legal instruments are briefly described (extracted from the NBA 2011; Van Niekerk and Turpie, 2012).

- *National Environmental Management Act (NEMA) (Act 107 of 1998)*: Various activities in and around estuaries and wetlands require environmental authorisation in terms of the NEMA Environmental Impact Assessment (EIA) Regulations (2010) and should be noted regarding future developments and/or plans within the municipality which pertain to estuarine resources.
- *Marine Living Resources Act (MLRA) (Act 18 of 1998)*: The focus of the MLRA is on regulating and managing the consumptive use of South Africa's coastal and marine resources (including estuarine resources) to ensure that over-exploitation does not occur.
- *National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008)*: All estuaries of iLembe require estuary management plans in line with the provisions of the National Estuarine Management Protocol.
- *National Water Act (NWA) (Act 36 of 1998)*: Estuaries are classified as a water resource under the NWA, and thus all the prescriptions relating to water use are applicable to estuarine environments. The Act, and associated policies, provides guidelines and procedures for protecting the ecological freshwater requirements of individual estuaries.
- *National Forests Act (NFA) (Act 84 of 1998)*: Indigenous forests, including mangroves and swamp forests, and protected tree species (for example *Bruguiera gymnorhizza*, Black mangrove) are afforded protection against destruction and exploitation. The Act provides a list of protected tree species, some of which are associated with estuaries.
- *National Environmental Management: Biodiversity Act (NEM:BA) (Act 10 of 2004)*: The estuaries hosts a diversity of unique habitats and species found only along the coast. As such, the management and protection of coastal biodiversity of the district needs to be in accordance with the NEM:BA.
- *National Environmental Management: Protected Areas Act (NEM:PAA) (Act 57 of 2003)*: The NEM:PAA provides for the protection and conservation of ecologically viable areas representative of the country's biological diversity. Significant estuarine areas in iLembe may be declared as one or other type of protected area, and existing terrestrial protected areas may need to be extended to include estuaries, rivers and wetlands (DEAT, 2008).
- *National Environmental Management: Waste Act (NEM:WA) (Act 59 of 2008)*: This Act regulates waste management in order to protect human health and the environment via various measures, all of which are applicable to estuaries.
- *Local Government: Municipal Systems Act (Act 32 of 2000)*: All municipalities are obliged to prepare and to update IDPs, which in turn must contain SDFs. All estuary management plans should be incorporated into local IDPs, and estuary zonation plans into the SDFs, to ensure wise use and biodiversity protection.

- *Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983)*: Water resources, including estuaries are protected against erosion due to destructive farming practises, whilst natural vegetation is protected against weeds and invasive alien species.

Table 5: Legislation and policy applicable to estuarine management in iLembe district municipality

	National	Provincial	Local
Legislation	The Constitution of the Republic of South Africa (Section 24, Act 108 of 1996)	KZN Nature Conservation Management Act (Act 9 of 1997)	
	National Environmental Management Act (Act 107 of 1998)	Natal Nature Conservation Ordinance (Act 15 of 1974)	
	Marine Living Resources Act (Act 18 of 1998)		
	National Water Act (Act 36 of 1998)		
	National Environmental Management: Biodiversity Act (Act 10 of 2004)		
	National Environmental Management: Protected Areas Act (Act 57 Of 2003)		
	National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008)		
	Local Government: Municipal Systems Act (Act 32 of 2000)		
	Conservation of Agricultural Resources Act (Act 43 of 1983)		
	Water Services Act (Act 108 of 1997)		
	National Environmental Management: Waste Management Act (Act 59 of 2008)		
Policy	White Paper on a National Water Policy for South Africa (April 1997)	Draft KZN Coastal Management Policy (2004)	Relevant Municipal Integrated Development Plans (IDPs)
	White Paper on Marine Fisheries Policy for South Africa (May 1997)		Relevant Municipal Spatial Development Frameworks (SDFs)
	White Paper on Environmental Management Policy (May 1998)		KwaDukuza Coastal Management Programme
	White Paper on Spatial Planning and Land-use Management (July 2001)		KwaDukuza Strategic Environmental
	White Paper on the Conservation and		

National	Provincial	Local
Sustainable Use of South Africa's Biological Diversity (August 1998)		Assessment (2007)
Draft National Estuarine Management Protocol (2012)		Siyaya Coastal Framework
National Protected Area Expansion Strategy (2008)		KwaDukuza Coastal Zone Recreational Use Plan (2003)
National Estuary Biodiversity Plan (2012)		

2.8.5 Summary of opportunities and conflicts

Constraints	Opportunities	Other notes
Sand/stone mining; Artificial breaching; Agriculture encroachment and poor farming practices; Water abstraction; Poor water quality from organic and industrial inputs; Poorly situated urban development and infrastructure; The amount of development around the estuarine environments; Sub-regional connectivity is severely constrained and a new coastal linkage route east of the N2 would require river crossings; Sub-regional connectivity is severely constrained and a new western north-south link would require river crossings;	Reverse and improve poor estuarine health; Improve ecosystem services; Increase nursery function and improve local fishing industry; Conserve estuaries and associated environs and high biodiversity through formal protected areas; Conserve pockets of indigenous (coastal dune forest) vegetation; Increase protected area coverage of the Amatikulu Nature Reserve; Facilitate appropriate and environmentally sensitive recreation; Facilitate appropriately situated development; Conduct research to increase knowledge on estuarine systems; Preserve sense-of-place; Maintaining added property value due to good visual aesthetics; Continue existing sugar cane	Estuary-catchment/estuary/marine connectivity; Habitat transformation; Loss of biodiversity; Over exploitation of living resources; Wetland disturbance; Alien invasive species infestations; Coastal ribbon development; Climate change; and Estuarine buffers to limit development. Sub-regional connectivity is paramount in ensuring that the regional network that connects Ethekewini to Richard's Bay is not compromised by local traffic using the system; and Improved connectivity required to address accessibility issues in the rural hinterland.

Constraints	Opportunities	Other notes
Sea level rise will affect estuary management in terms of buffer areas, flood zones, development set-backs etc; and Increased water and air temperatures will change the dynamics of estuary systems.	cultivation as economically viable production units for the medium term, provided high standards of management are maintained (setback from estuarine functional zone); Improve treatment of wastewater and strict management of industrial effluent; Protect human life and property by introducing development setbacks in the estuarine functional zone; Promote education and awareness raising on the value of estuaries; Encourage responsible eco-tourism; Implement potential Local Economic Development through sustainable prawn farming; Implement sustainable livelihood opportunities (e.g. guided walks); Promote co-operative governance via establishment of estuary advisory forums; Implement integrated catchment-estuarine management; and Establish “No-Go” zones around the river estuaries.	

2.9 Air quality

2.9.1 Feature status

2.9.1.1 Location

The main zones for air quality concerns are the town centres of KwaDukuza, Ballito, Stanger and Mandeni. Ambient levels of targeted priority pollutants are within safe margin of national standards as quantified by the air quality monitoring network in Mandeni. However, with growing urban population and industrial and commercial development, air pollution trends are likely to be on the increase. Therefore, it is an opportune moment to develop the appropriate strategy to manage air quality to a sustainable level.

Across the region there is a concern with sugar cane burning, whereby such a practice can cause local exposures to particulate matter, visual impact. Burning of canefields also present threats to persons, property and infrastructure.

Lack of electrification in the rural areas is a cause for concern with regard to indoor air quality leading to compromised respiratory health. Lack of formal waste management services in the underdeveloped and rural areas promotes waste burning which results in toxic emissions.

2.9.1.2 Threats

Air quality management may be perceived to be too costly and that there is a tendency to concentrate on other development priorities. Underlying this is lack of information, insufficient awareness of the true costs involved (e.g. cost of health care due to exposure), limited public input and institutional deficiencies. Experience in the industrialised world shows that the costs of preventing environmental degradation are frequently much lower than those required for clean-up. Having a set of clear and effective environmental controls such as local by-laws and an efficient administration indicates decisiveness and encourages much needed development to take place within a sustainable framework.

2.9.2 Desired State

The science and institutional response to air quality management has been developed to a high degree in terms of policies, guidelines and standards including abatement technology and alternate methods of production. This task at hand is to select what is most appropriate to the IDM and effect implementation. Generally standards for air quality are health based and protective of the environment. Therefore the simple objective of ensuring compliance with these emission and ambient air quality standards provides a sufficient basis of sustainable development and best practice.

2.9.2.1 Comparative advantage

iLembe DM has the comparative advantage with a relatively low level of emissions compared to the eThekweni Municipality. However, the region is poised for development in the future. The strategic air quality management imperative for iLembe is to ensure air quality is managed within the provisions of the national standards for priority pollutants. This is possible by institutional development and establishment of a coherent and integrated local legal framework. All new developments requiring planning approvals should have internal control and approval processes to ensure air quality, climate

change, water pollution and waste management issues are considered at the appropriate level of governance.

2.9.2.2 Air quality and climate change

There are many possibilities of integrating air quality and climate change management. Some of these include:

- The biomass processing industry lends itself to energy production from renewal sources such as sugar cane and wood based biomass usage – this reduces local air pollution like sulphur dioxide and the emitted CO₂ is from a renewable supply;
- The possibility of sustainable green energy such as biodiesel production from algae and oil rich seeds are potential areas of consideration;
- The mass scale roll-out of solar water heaters will have the effect on regional energy security, climate change mitigation, reduced need for indoor water heating and reduced exposure to indoor air pollution; and
- The concept of industrial ecology (discussed under waste management) and the policy on integrated waste management is aimed at reducing overall environmental impact including GHGs. The illustration shows a typical integrated industrial ecology arrangement in Kalundborg:

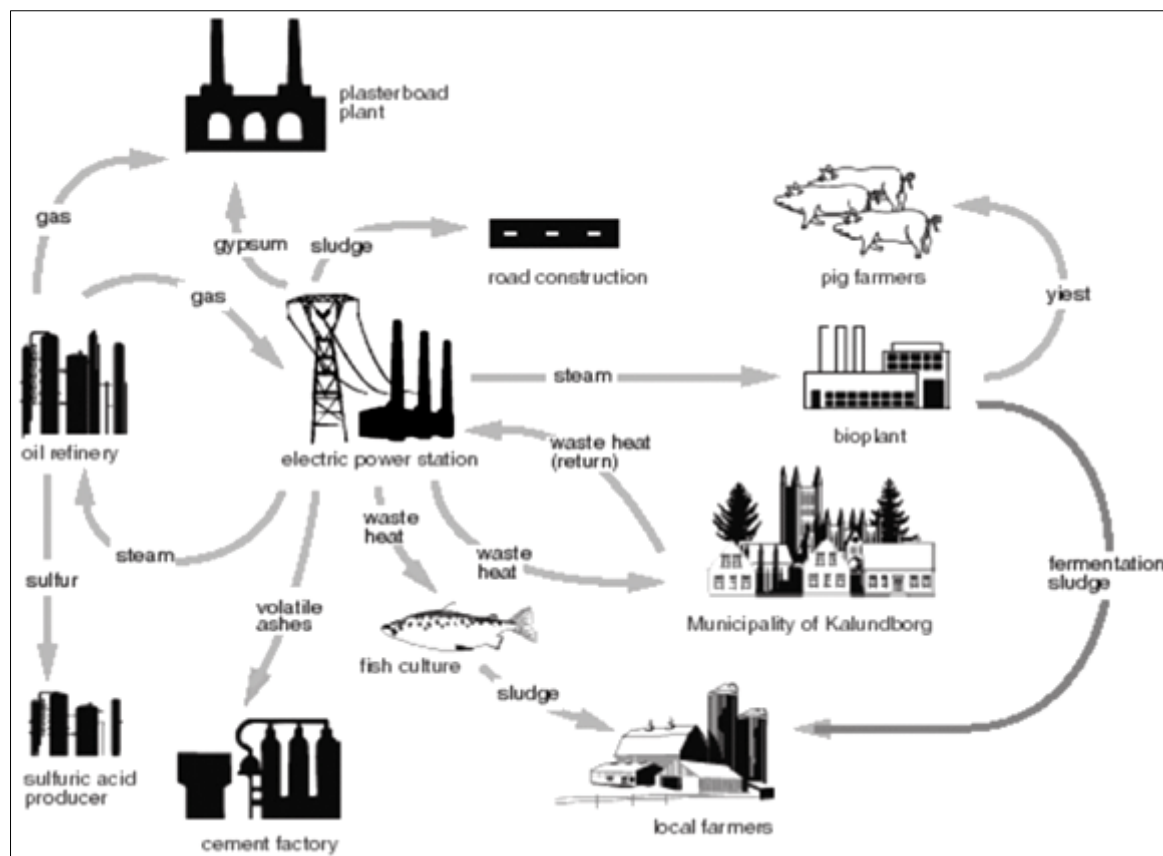


Figure 6: Network of companies in the Kalundborg symbiosis (www.indigodev.com/Kal.html)

There are several areas of financial savings to encourage green development:

- Reducing the amount of raw materials required. This means that less raw materials need to be purchased whilst maintaining constant product output;
- Reducing energy consumption in processing the raw material. The production of waste uses energy. Producing less waste means savings in energy costs and reduced emissions of harmful gases; and
- Reduction of disposal costs. Waste is becoming more expensive to dispose of. As more stringent environmental controls are put in place, more waste has to be specially treated before it can be safely disposed of. Additional savings can also be made in the transportation of waste.

A case in point of the above benefits is the proposal by Sappi Mandeni to use renewable biomass as an energy source with concomitant reduction in GHGs, pollutants, long distance transportation costs involved in coal haulage, and reduced ash loading into the local landfill site.

2.9.3 Legal and policy parameters

Air quality is legislated under the Air quality Act (2004). Despite there being numerous emitting sources in the iLembe, not all are required to comply in terms of the Air Quality Act. Only those activities which constitute a listed activity would require an atmospheric emission licence (AEL). The rest of the controlled emitters such as numerous coal fired boiler plants would require local level by-laws to comply within a regulated framework.

2.9.3.1 Atmospheric emission licensing requirements

In the case of listed activities the main shortcoming is institutional capacity. The AEL is an intensive technical and administrative process. This function is required to be performed at the District level of iLembe with jurisdiction over the 4 local municipalities. This constitutes an economical and rationalised approach for the region. As a minimum the following is required:

- Development of an air quality management plan for the District which must be reviewed every 5 years and integrated with the IDP planning cycle;
- Appointment of an air quality officer to be authorised to sign off all AELs;
- Team of inspectors to review licences, monitor compliance, communicate progress and engage the stakeholders; and
- Operate the air quality monitoring network or appropriate sampling programmes at the critical emission zones such as Stanger and Mandeni.

The AQMP development process comprises of:

- Goal setting;
- Baseline air quality assessment;
- Air quality management system (AQMS) and gap and problem analysis;
- Intervention strategies;
- Action plans implementation; and
- Evaluation and follow up.

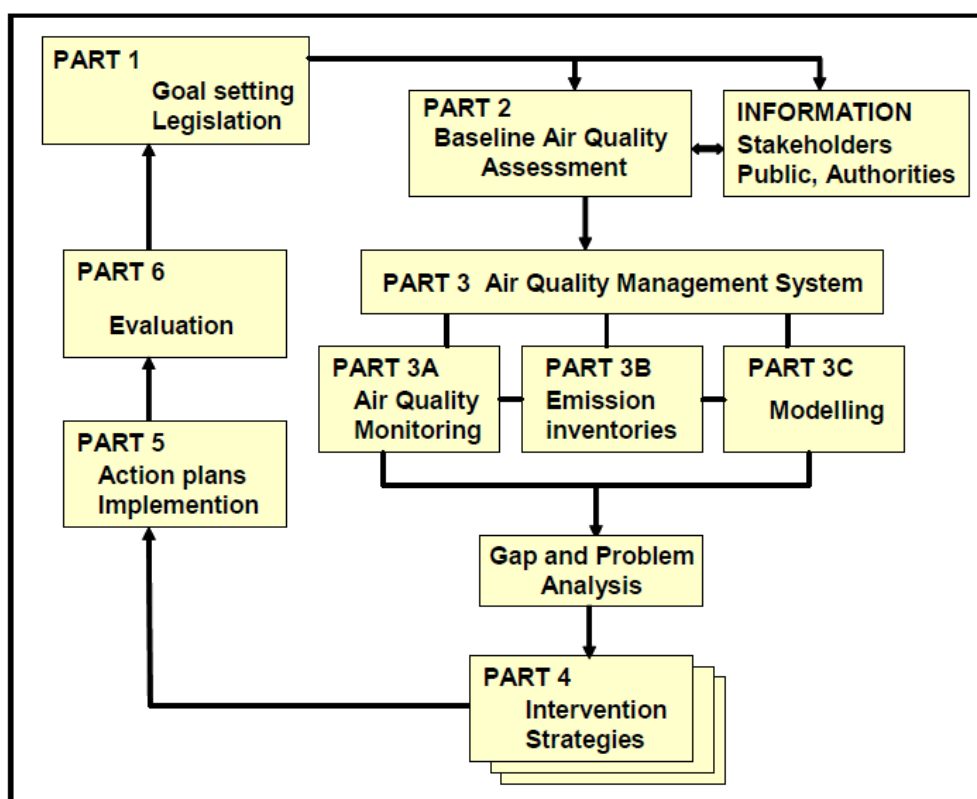


Figure 7: AQMP process (DEAT Manual on AQMP Development)

The stakeholder engagement process covers:

- Consultation with the public to determine the priorities;
- Workshop of the draft AQMP and collation of comments;
- Implement the plan and ensure that stakeholders are informed of the progress through regular media feedback (including governmental departments, industry and the public); and
- Inclusion in periodic review of the AQMP.

2.9.3.2 Local by-law development

There are numerous small to medium industries in the sector of wood processing, metal processing, chemical, sugar refining, paper production and agro-processing. The Isithebe industrial development zone in Mandeni is a case in point. Amongst these, only a few will be required to be registered as a listed activity requiring an AEL. The rest of the industry escapes this requirement. For this cluster it is proposed that the institutional response should be in the form of local by-laws and development control which will focus on:

- Ensuring all emitters have either a permit or licence to operate;
- The AEL mainly covers air quality emissions management, there is a need for integrating water pollution management with the sustainability framework of Integrated Pollution Control (IPC) strategy;
- A general code of practice incorporating the imperatives of NEMA and the Integrated Pollution Control and Waste Management policy framework;
- Adherence to the aims of cleaner production, waste minimisation and continual environmental improvement;

- The by-law should have as a framework the following attributes:
 - Risk management;
 - Chemical sector best practice;
 - Regulation of fuel burning appliances; and
- A framework of rules and regulations can protect the environmental systems and environmental quality by limiting allowable actions on the part of business and individual to tolerable levels of impact.

2.9.3.3 General conditions in the preamble to a permit

The following general conditions can be considered for application to a permit issued in accordance with the proposed environmental by-laws⁴. The remainder of the permit can be specific to the activity targeted such as: Air quality, water pollution, effluent discharge, landfill site, mining related activity, waste management, materials recycling, water, metal processing, timber processing, chemical and allied industry, scrap metals processing etc.

- a. Non-compliance with the requirements of the permit constitutes an offence. The permit may be suspended or withdrawn or legal action may be instituted against the permit holder if the conditions specified are not complied with, or if significant nuisance or impacts to the environment, infrastructure, council employees or public health occurs, or if there is any other contravention of the bylaws.
- b. No building, plant or works used by a permit holder shall be materially extended, altered or added to and no changes in process, procedures or significant production increases that will significantly alter impacts may be undertaken without the prior approval of the permitting authority.
- c. No gases, vapours, dust, smoke, particulates, soot, glare, noise, vibration or waste shall be emitted which in the opinion of the permitting authority could cause significant nuisance or impacts on the environment, infrastructure, council employees or public health.
- d. Where excessive emissions occur, which could cause adverse health or environmental impacts or nuisance, urgent corrective measures must be taken to contain or minimise the emissions through operational interventions. Remediation, if required shall be carried out to the satisfaction of the permitting authority and/or any other governmental agencies. Any incident which has the potential to create significant health, safety or environmental risk or nuisance needs to be reported immediately to the permitting authority.
- e. The permitting authority reserves the right to set and adjust the permit conditions, emission limit values or standards after consultation with the permit holder and taking into consideration information submitted, what is technically achievable, not involving excessive cost to the permit holder, and justifiable on environmental grounds.
- f. The permit holder is required to establish an Environmental Management System (EMS) which gives effect to the principle of continuous improvement. The EMS must as a minimum:
 - i. Identify and quantify potential for environmental impacts
 - ii. Prioritise the identified impacts
 - iii. Identify appropriate preventative and corrective actions
 - iv. Develop responsive management controls, systems and procedures
 - v. Identify improvement projects to be added to the 5-Year

⁴ Adapted from eThekweni Municipality Scheduled Trade by-laws

- vi. Environmental Improvement Programme.
- g. The permit holder must decide on tools and techniques that are appropriate for the nature of its permitted activities. All items shall be clearly documented and kept on site, available for inspection with effect from the above due dates. A presentation of the findings shall be made by the permit holder to the permitting authority in the month following the due date. All items shall be reviewed, improved and updated annually to achieve continuous improvement.
- h. The permit holder's buildings, plant and works are to be constructed, operated, maintained and managed in such a manner that no adverse environmental impacts are associated therewith. Furthermore, such plant works, maintenance and management procedures must be appropriate for the activities and must comply with all relevant statutes and permits.
- i. An annual performance review meeting shall be held with the permit authority and other authorities as necessary. The purpose of the meeting will be to review the permit holder's performance in relation to the permit. Non-compliance or pollution issues identified at inspections and audits will be communicated by notice or at the above annual meeting. This permit may be revoked if significant under performance is noted.
- j. This permit will cease to be of effect on change of ownership or name of the permit holder or cessation of operations and the permit authority shall be duly advised of any such changes.
- k. On cessation of operations the permit authority is to be notified and decommissioning of the plant and substances used shall be managed to prevent environmental impacts.
- l. The permit holder is required to apply best available techniques (BAT) so that its total pollution is minimised. BAT shall mean the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole.

The set of by-laws needs to be supported by:

- Enabling mechanisms to support the regulatory framework such as legal mandates;
- Codes of environmental regulation need to be flexible. Managers may be given discretionary powers to issue permit conditions as long as there is a commitment to medium term compliance. In this instance, an enterprise can be given the goal to be achieved over a set period of say 3-5 years;
- Procedures should apply equally to all in accordance with the equity principle;
- A system of appeal and review is required to ensure transparency in the process;
- Appropriately trained staff to deal with the applications and challenges;
- Procedures to monitor the performance of activities subject to control; and
- Efforts to police compliance and prosecute offenders.

2.9.4 Summary of opportunities and constraints

Constraints	Opportunities	Other notes
There is a concern related to odours and nuisance related to industrial complexes;	Relatively low emissions of priority pollutants presents opportunity to guide imminent and future development along sustainable	Ambient levels of targeted priority pollutants are within safe margin of national standards; Expand the current air quality

Constraints	Opportunities	Other notes
Need to focus on processing of atmospheric emission licenses (AELs); Regulation of waste management to prohibit burning as this practice results in toxic emissions; Regulation of sugar cane burning to minimise risks and local exposure scenarios; Lack of electrification in the rural areas indicates probability of adverse indoor air quality which requires further investigation and interventions; The extent of uncontrolled emissions within the Municipal area; and The effect of higher temperatures on air quality must be investigated.	development path; Adequacy of land offers opportunity to place notorious development such as landfills sites and chemical/industrial complexes with a safe land buffer to minimise effects of residual development; Establish an air quality monitoring unit to assess and audit emissions from industry operating in the Municipal area; Pressure is mounting for the adoption of alternative technologies and international clean production standards; and Higher CO₂ levels increase plant productivity.	monitoring network to include particulate matter; and The main pockets of industrial development would be in Mandeni and KwaDukuza LM. As such, these LMs should have the requisite regulatory capacity to implement the full scope of an air quality management plan.

2.10 Waste management

2.10.1 Feature status

Three integrated waste management plans have been undertaken in the iLembe District over the last decade (iLembe-2003, Mandeni 2009 and KwaDukuza 2010). Within these plans, the key concerns with waste management across the district are:

- Inequitable distribution in waste management services particularly relating underdeveloped rural and urban areas;
- Limited landfill capacity in the Mandeni area;
- Dependence of existing landfill site in KwaDukuza owned by the private sector;
- Lack of integrating the waste management with the green economy; and
- Lack of data with respect to waste management.

2.10.2 Desired State

The sustainability objectives for waste management are discussed under green economy and waste management hierarchy.

2.10.2.1 Climate change

Transition to a green economy:

Much of the problems contributing to climate change are related to our dominant linear industrial economy. This linear system operates via the process of material extraction, processing, concentration, converting, marketing, transporting, and consuming to final disposal. At each point in this process, there are pollutant and GHG emissions to the environment. For example, if aluminium cans were to be recycled the extraction, manufacture and disposal stage would be eliminated thereby saving resources, reducing GHG emissions and extending landfill capacity and of course economic and energy savings.

The shift from the linear extractive economy to a circular eco-focussed economy (Figure 8) founded on the waste management hierarchy principles (Figure 9). This relates to the fundamental basis of the concept of industrial ecology whereby social systems are an integral part of regional and global ecosystem. In an ecosystem there is no concept of waste. This is the vision and goal iLembe and its local municipalities can strive to. Since it is an emerging economy albeit one posited for growth and development into the future, the sustainability planning process can shape this path using good leadership, policy and practice.

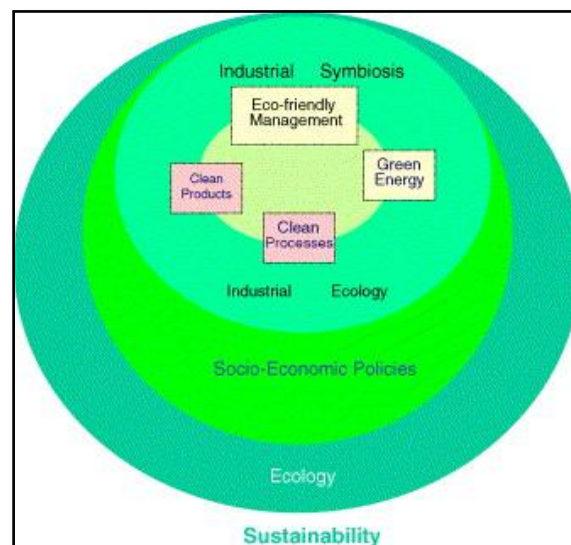


Figure 8: Concept of industrial ecology

At every stage in the above linear process concepts incorporating efficient design and ecological centred thinking can pave the way towards sustainability. Some of these concepts relate to:

- Reduce with ultimate goal of elimination;
- Improve resource efficiency;
- Focus on Renewable resources;
- Recycle materials where possible;
- Reduce the need for transportation by consuming locally produces goods and services;

- Reduce consumption;
- Extend life;
- Reduce packaging; and
- Reduce waste production.

The Waste Management Hierarchy:

The Waste Hierarchy is a list of approaches to managing waste, arranged in order of preference. The process flow representation of the waste management hierarchy is shown in Figure 9, with the least preferred option for managing waste, disposal, located at the bottom and the most preferred option, avoidance and minimisation, located at the top. The Waste Hierarchy will be used to devise initiatives that will be incorporated into the IWMP:

- Strategies which try to avoid products becoming waste are generally preferable to...
- Strategies which seek to find a use for waste, which are in turn generally preferable to...
- Strategies for disposal, which should be used as a last resort.

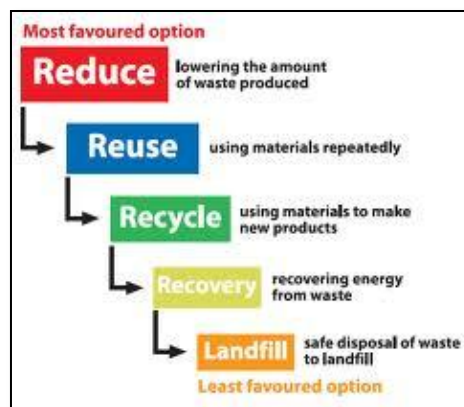


Figure 9: The waste hierarchy

The industrial ecology concept shapes industrial systems towards sustainability which requires that there is no further depletion of natural resources, that the energy requirements to drive industry is derived from renewable resources, and that outputs of waste from one industry are the resource requirements for other industry. Consumer good must be manufactured in a way which makes them capable of remanufacture and reuse.

2.10.2.2 Institutional systems

The planning framework must also facilitate the shift towards green economy based industrial ecology outcome by ensuring:

- Location of industrial activities in a logical manner relating to industrial ecology thinking and practice;
- Creating an enabling environment for this type of practice by promoting:
 - Cleaner production;
 - Incentivising clean business;
 - Penalise waste producing industry and entities; and
 - Assisting in the resolution of problems that may arise.

- Encouraging housing development that reduces waste generation by ensuring
 - Provision of buy-back centres;
 - Provision of waste transfer stations and green waste collection; and
 - Promoting recycling and composting.

The IWMP presents a number of activities that are to be implemented within the plan's timeframe. It is therefore of critical importance that a measurement system is put in place. Key performance indicators (KPIs) are variables which together provide meaningful concise overall picture of the organization's performance. KPIs need to be set as part of the **monitoring and continuous improvement system** for the iLembe waste management operations. It is important to identify key areas for improvement which can be measured for each waste management perspective and in particular the waste streams and by-product streams.

The IWMP will further assist with informing the monitoring protocol and ensure prioritisation takes place. Below is an example of the type of KPI to be developed. Each KPI will be linked to an output measure which immediately communicates status of that key performance area.

Table 6: Example of key performance indicators

Schedule of key performance indicators					
Perspective	Key performance area	No	KPI Unit	Key Performance Indicator	Output measure
Waste minimisation	Reduce quantity of waste	1	%	Reduce volume for handling and disposal	Improved environmental and health performance

It will be important to determine a credible baseline data set in order to measure the outputs. Initially, the waste management operations will have to determine the outputs against the data that they have currently and align these with the KPIs.

Development of alternative programmes, projects and activities is further required to support continual development and improvement within institutional systems in waste management. Some examples of this could include:

- Code of good practice for integrated waste management service provision;
- Buy back centres at optimum points in the iLembe;
- An assessment in terms of the following is required;
- Technical alternatives;
- Waste information systems
- Review of international best practices;
- Waste Minimisation initiatives; and
- Waste education and awareness raising.

2.10.2.3 Environmental quality

The following monitoring and evaluation systems need to be put in place to ensure environmental quality in terms of land, air and water, as well as human health:

- Groundwater monitoring;
- Surface water monitoring upstream and down stream; and
- Leachate analysis including collection, treatment and discharge strategy.

2.10.2.4 Vulnerability and constraints

The iLembe District does not own or operate its own landfill site for domestic waste. However, there are a few privately owned landfill sites and other waste handling facilities. The DAEA has expressed this as a concern that there is no municipal owned landfill site in the district. The main landfill site in the district is the privately owned landfill site (KwaDukuza Landfill site). The Department also indicated that has also recently been granted a licence to accept hazardous waste. The award of this licence is currently under appeal. The Department has pointed out that this development could be both a threat as it lends itself on the one hand to hazardous waste transportation in the District, potential for illegal disposal of hazardous waste, pollution incidents to surface and groundwater; and on the other hand, as a strength, having a hazardous waste facility could attract industry as there is a local point to get rid of hazardous waste. Furthermore, in terms of the National Integrated Waste Management Strategy there would be on going pressure for entities considering hazardous waste disposal to consider alternatives further up the waste management hierarchy. This is where opportunities for **waste minimisation and cleaner production** have a role to play.

2.10.2.5 Job creation and poverty alleviation

Waste management within the context of the Waste Management Act and the emerging green economy presents increase opportunity for job creation and poverty alleviation. The following areas need further development and financial support to support increased social gain from waste management:

- Establishment of buy back centres;
- Promoting materials recycling; and
- Promoting composting as a sustainable strategy for organic waste management.

2.10.3 Legal and policy parameters

Legislation:

- National Environmental Management Act 107 of 1998
- National Environmental Management: Waste Act 59 of 2008
- National Water Act 36 of 1998
- National Health Act 61 of 2003
- Hazardous Substances Act 15 of 1973
- National Environment Management Air Quality Act 39 of 2004
- Municipal Structures Act 117 of 1998
- Municipal Systems Act 32 of 2000
- Occupational Health and Safety Act 85 of 1993

Other policies and regulations:

- White Paper on Integrated Pollution and Waste Management for South Africa May 2000
- Minimum Requirements for waste disposal by landfill, 2nd Edition DWAF 1998
- South African National Standards 0228
- National Waste Management Strategy 2011

It is important to note that the following regulations have been published for comment and cognisance will be taken of these during this process.

- Government Notice no 34415 - Draft National Standard for Assessment of Waste for Landfill Disposal
- Government Notice no 234417 – Draft Waste Classification and Management Regulations
- Government Notice 34418 – Draft National Norms and Standards for the Storage of Waste
- General Notice 573 of 2010 – Draft Industry Waste Management Plan
- General Notice 34167 – Draft Municipal Waste Sector Plan

2.10.4 Summary of opportunities and constraints

Constraints	Opportunities	Other notes
The IDM has prioritized waste management as a priority issue within the IDP review process. Census data reported that only 28.1% of waste is removed by local authority and private company efforts. The most significant backlogs occur in Ndwedwe and Maphumulo. There are reported cases where waste is burnt as a management strategy. This has adverse air quality and social impacts; and Lack of waste management in the rural areas.	Development of an integrated waste management strategy for the region. Opportunity for recycling of waste materials needs to be explored and possibilities of local economic development exists; Integration of waste management to green economy agenda; Composting of waste organic matter, thereby improving soil fertility; The establishment of recycling centres and waste sorting stations where waste can be exchanged for cash; and Investment in renewable technologies means more momentum for re-use and recycling, and the development of waste to energy programmes.	Sludge from VIPs also constitute the waste stream and this would have to be considered in the overall waste management strategy; Recycling appears lucrative but revenue streams can be very low. Careful waste collection and planning logistics are required to make this viable. iLembe should draw on experiences from eThekwin and other areas where there has been advancement in this area; and Higher temperatures will improve conditions for disease vectors and unsanitary conditions. This will place more pressure on waste management systems.

2.11 Mining

2.11.1 Feature status

Sand mining is the predominant mining activity in the area, and is of great importance to the development context as sand and stone is an important element to the built environment. However, the processes of prospecting, extracting, concentrating, refining and transporting mined materials great potential for disrupting the natural environment. The environmental effects caused by the mining of sand from a river have an adverse impact to biota and their habitats.

Sand mining from rivers in the iLembe is practised in all the major rivers (Tugela, Mvoti, Mhlali and Tongati). The most serious effects of sand mining are along river courses within easy reach of the R102 and N2 motorways. These practices threaten the hydraulic and ecological functioning of the estuarine systems and sand balance. Improperly managed sand mining operations can lead to:

- Destruction of riparian habitat;
- Effects on floodplain functionality;
- Re-suspension of material leading to deposition in downstream estuarine environment, thereby changing estuarine benthic habitat;
- Influences on turbidity levels in estuarine waters, thereby affecting system productivity;
- Can directly destroy spawning habitat for fish and macro-invertebrate habitat, and produce increased turbidity and suspended sediment downstream; and
- Influences the dynamics of littoral sand drift along the KZN coastline, thereby making the coastline vulnerable to flooding.

The Umhlali quarry is permitted with the Department of Mineral Resources (DMR), there is air monitoring but not river water quality monitoring. The Lafarge Quarry in Stanger is permitted by the DMR and has an Environmental Management Plan.

2.11.2 Desired State

2.11.2.1 Spatial

As the region enters a phase of intensified development of the built environment in terms of housing, roads and infrastructure, there will be increased demand for mined materials such as sand and stone. Sustainability imperatives call for a balance between ensuring ecosystem functionality on the one hand and socio-economic imperatives on the other. The rate of sand removal must therefore be equivalent to the regeneration rate to ensure sustainability. This requires close monitoring and allocation of quotas relative to the extraction rate.

2.11.2.2 Climate change

The key concern in respect of river based sand mining and climate change is the vulnerability of the coastal zone to flooding and damage due to altered sand balance regimes.

2.11.2.3 Institutional systems

Development of a sustainable sand mining protocol requires an integrated approach with the permitting authorities – i.e. the DMR, the Provincial Department of Environmental Affairs and Rural Development, the iLembe DM and Local Municipalities. Roles and responsibilities have to be clearly

defined and the process for increased surveillance should be mapped out. Integrated with sand mining control is the need for recycling and re-use of building rubble within the waste management plan to ensure sustainability.

The key institutional issue is the lack of resources for monitoring and enforcement. Since legal mandate for the sand mining permit rests with the eThekweni offices of Department of Mineral Resources, there is a concern that the local Authorities are not involved in the process. In terms of the principle of co-operative governance and the requirements of NEMA, there has to be co-ordinated efforts in regulation, monitoring and enforcement. The following strategies are proposed to manage the impact of sand and stone mining operations in the iLembe:

- Development of appropriate by-laws to enable local enforcement of sand mining malpractices, nuisances and associated pollution;
- Provision of funding for increased regulatory surveillance;
- Development of guide for sustainable sand mining best practice;
- Engagement with DoE and local authorities for best practice methodology;
- Engagement of the affected stakeholders within the sand mining supply chain to develop an environmentally appropriate sand mining protocol;
- Engagement with neighbouring coastal districts to have regional level co-ordination and co-operation in this area; and
- Inter-governmental processes should work towards coordination and integration where possible in regulatory approaches.

2.11.2.4 Environmental quality

The following are fundamental considerations that must always be taken into consideration in all sand mining / gravel extraction operations:

- Abandoned stream channels on terraces and inactive floodplains should be used rather than active channels;
- Sand/gravel extraction sites should be situated outside the active floodplain and excavation should not take place from below the water table;
- Streams should not be diverted to form an inactive channel, and isolated pond areas that could cause fish entrapment should be avoided.
- Sand/ gravel extraction activities for a single project should be located on the same side of the floodplain to eliminate the need for crossing active channels with heavy equipment.
- Larger rivers and streams should be used preferentially to small rivers and streams. Larger rivers and streams are preferable because they have more sand/ gravel with a wider floodplain. The proportionally smaller disturbance in large systems will reduce the overall impact of sand/gravel extraction.
- A Water Use Assessment Report (WUAR), management, and monitoring programme.
- Mitigation and restoration. Mitigation must occur concurrently with sand and gravel extraction activities. Restoration is therefore a part of mitigation and the aim of restoration should be to restore the biotic integrity of a riverine ecosystem, not just to repair the damaged areas.

Extraction quantities should be strictly limited so that gravel recruitment and accumulation rates are sufficient to avoid extended impacts on channel integrity and in-stream habitat. This management

regime needs to be undertaken by a team of experts who will also take account of the overall habitat and the riverine, estuarine and coastal ecological and physical systems.

Prior to sand or gravel removal, a thorough review should be undertaken of potentially toxic sediment contaminants in or near the streambed where these types of operations are proposed or where bed sediments may be disturbed (upstream and downstream) by the operation. Extracted aggregates and sediments should not be washed directly in the stream or river or within the riparian zone, and turbidity levels should be monitored.

Riparian habitat must be protected, as it plays a major role in riverine functioning and environmental quality. Management principles that need to be included in management plans include:

- Minimisation or avoidance of damage to stream / river banks and riparian habitats;
- Sand / Gravel extraction operations should be managed to avoid or minimise damage to stream/river banks and riparian habitats;
- Sand/gravel extraction in vegetated riparian areas should be avoided;
- Undercut and incised vegetated banks should not be altered;
- Large woody debris in the riparian zone should be left undisturbed or replaced when moved and not be burnt;
- All support operations (e.g. gravel washing) should be done outside the riparian zone;
- Sand/ gravel stockpiles, overburden and/or vegetative debris should not be stored within the riparian zone;
- It is essential that overburden is evenly redistributed over exposed areas as soon as possible after the operation has been completed for faster re-vegetation;
- Operation and storage of heavy equipment within riparian habitat should be restricted; and
- Access roads should not encroach into the riparian zones.

2.11.2.5 Vulnerability

Extraction of sand has a direct impact on the stream's physical habitat characteristics. Altering these habitat characteristics can have deleterious impacts on both in-stream biota and the associated riparian habitat. The interconnectedness of channels and riparian systems requires the simultaneous evaluation of potential disruptions of the riparian zone and channel activities. For example, aggregate mining, like those required for construction and access roads, involves the channel and boundary but requires land access and material storage that could adversely affect riparian zones.

The vulnerability of all communities and activities that rely on, or exist in watercourses that are affected by sand mining will therefore also be affected. Although a higher level of exposure will not necessarily be present, the long-term effect of water resource degradation will decrease the resilience of communities and related economic activities. It will also contribute to a cumulative effect that will be difficult to resolve since the allocation of responsibility will not be straightforward.

2.11.2.6 Job creation and poverty alleviation

The ability of mining and quarrying to provide employment opportunities must be considered in terms of a wider sphere of influence. Mining activities do create employment, and the mined materials contribute towards development activities that, in turn, also create conditions for employment. However, this should be weighed up against the impact of the deterioration of natural resources should the mining practices not be sustainable. The degradation of natural resources can have

deleterious effects on economic activities directly reliant on a certain level of environmental quality. Ideally, a win-win solution should be found, which protects both the supply of building materials and natural resources.

2.11.3 Legal and policy parameters

Quarrying activities have a local impact on air quality, ground water quality and local surface water quality yet is managed by a permitting system administered by the National Department of Mineral Resources. The permit which is issued must therefore have local municipality level input and report back mechanisms. As a minimum the following parameters need to be reported on at least on a bi-annual basis:

- Monitoring of river water quality upstream and downstream;
- Ground water quality at representative points around the mining activity; and
- Air quality.

The permit should include complaints management systems and mitigation measures related to dust nuisance. The permit should also incorporate the need for re-mediation of the area post mining closure. Should there be destruction of habitat, land or pollution, then the permitted entity shall be required to restore the situation at cost.

The National Water Act (Act 36 of 1998) sets out general principles for regulating water use. The definition of water use is a broad one and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities, altering a water course, removing water found underground for certain purposes, and recreation. Of specific relevance to sand mining / gravel extraction operations, is section 21 (c) and (i): impeding or diverting the flow in a watercourse or altering the bed, banks, course or characteristics of a watercourse. In general a water use must be licensed unless it is listed in Schedule I, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a license. According to section 29(1) of the Water Act (Act 36 of 1998), a responsible authority may attach conditions to every general authorisation or license.

Based on the approach followed in the Water Act (No 36 of 1998), the level of protection of a resource will depend on the ecological management class assigned to the water resource. Criteria for assigning a class to a resource include:

- The sensitivity of a resource to impacts of water use (whether due to ecological sensitivity, or sensitivity of water users);
- The importance of the resource, in ecological, social, cultural or economic terms;
- The value of the resource, again in ecological, social, cultural or economic terms; and
- What can be achieved towards improvement of resource quality, given that some past impacts or modifications may not be practically reversible?

The ecological management class will depend on the river reserve determination, locality specific sensitivity assessments and stakeholder concerns.

Once the management class of the river has been decided on, an activity or impact that would change its status to a lower class may not be permitted, particularly if it is in conflict with the requirements of protection of basic human needs and ecological integrity.

2.11.4 Summary of constraints and opportunities

Constraints	Opportunities	Other Notes
Split/ disjointed responsibility between national (DMR) and Local tiers; Water and energy availability for mining activities cannot be guaranteed; and Energy and water requirements for mining activities, and the associated air pollution, will need to comply with national and international standards, expectations and norms in order to remain globally competitive.	Pockets of quarrying and chalk extraction identified; Collaboration with authorities at National (DMR), Provincial and local level; Develop a best practice guide for sand miners. Engagement of sand mining supply chain: miners, builders, property developers to subscribe to a best practice charter; Investment in alternative industries and technologies must be considered. This includes water recycling and re-use, energy efficiency, pollution reduction, rehabilitation efforts etc; and Development of local authority capacity and enabling by-laws for enforcement.	The general lack of compliance and enforcement capacity in iLembe allows for these activities to have negative impact on the environment and communities with impunity. It is recommended that general regulatory capability be provided at the iLembe District Municipality level of governance.

3 ENVIRONMENTAL INDICATOR ANALYSIS

The purpose of the environmental indicator analysis is to consolidate key elements that have been identified for each feature. This stage is mostly visual, as it relies heavily on GIS and maps that are produced from the various layers of data available. By illustrating all opportunities and constraints visually, convergences and conflicts between each feature are easily highlighted. By indentifying these features and the respective areas of spatial and management overlap, more sustainable planning and decision making can be practised through an informed process.

The first step is an overlay exercise that can indicate where sensitivities align or come into conflict. It therefore requires guidance on which sensitivity maps need to be generated. It is usually possible to combine features that reinforce a broad idea, such as 'biodiversity conservation' – which already provide some guidance on the 'Environmental Convergence' write-up that follows. In the same way, conflicts between natural features, built environment and sensitivities can be mapped.

Five maps have been developed which identify the core concerns within the District and its local municipalities, namely: environmental sensitivities and conservation value; opportunities for development; and risk areas (i.e. areas not suitable for human habitation). The methodology behind the formulation of these maps is outlined in detail in Table 7, below:

Table 7: Desired state maps layers and descriptions

Map	Layers	Descriptions
Map 1: Environmental Sensitivities Base Layer	Status Quo environmental sensitivities layer Protected areas network Priority protected areas for expansion Biodiversity Protected Areas 1 (critical biodiversity) Biodiversity Protected Areas 3 (supporting ecosystems) Water courses Wetlands/ wetland clusters NFEPA's High risk to coastal erosion Estuaries	Natural features that are of importance from a biodiversity and ecosystem functioning perspective. These are also valuable resources for environmental goods and services.
Map 2: Consolidated environmental sensitivity	Status Quo environmental sensitivities layer Priority protected areas for expansion Biodiversity Protected Areas 1 (critical biodiversity) Biodiversity Protected Areas 3 (supporting ecosystems) Water courses	This map builds on from the Environmental Sensitivities Base Map (Map 1), to indicate environmental sensitivities in the iLembe District. This can be used as a spatial guide for development planning as an Environmental Sensitivities Map. It does not, however, include the protected areas network, as indicated on Map 1.

Map	Layers	Descriptions
	Wetlands / wetland clusters NFEPA's High risk to coastal erosion Estuaries	
Map 3: Existing development opportunities	Access to services / basic services Infrastructure including transport network High agricultural potential Development nodes Tourism & Cultural - Heritage sites Dense low urban settlement	Areas where there is opportunity for enhanced economic development by expanding and improving on existing infrastructure, or where development is greatly needed.
Map 4: Areas not suitable for human habitation	Wetlands Rivers Estuaries Mining & quarries Slope >1:3 Landfill and waste sites	Regions of risk are generally those areas that are unsuitable for human habitation for various reasons. This could be because of existing or historic use of the land that is not compatible with human habitation (e.g. mining), are threatened by natural phenomenon (e.g. flooding or landslides) or are contaminated.
Map 5: Areas where development is restricted or constrained	Point sources of pollution Noise zones for the KSIA High-risk coastal erosion	The development constraints are considered as features that require mitigation in order to become compatible to human activities.

These maps can be found attached in Appendix A.

In the next phase, issues and features that have arisen from these five maps, will be further assessed as opportunities and constraints, and defined as environmental zones. The Strategic Environmental Management Plan will correspond with these spatial environmental zones, but also expand on action plans with opportunities and constraints that cannot be shown on a map. Some of these less tangible issues have been outlined in the summary tables under each feature under Section 2: Desired State Framework.

3.1 Environmental Sensitivity Base Layer

3.1.1 Purpose

In many instances across the country, biodiversity is threatened by urban development and land transformation. Therefore, it is important to distinguish where conservation is currently taking place, the focus areas for conservation expansion and where existing sensitive ecosystems exist (within and outside of conservation areas).

There is also much infrastructure that is in place, and the advancement of this can bring great benefit to the District's economy and its people if done correctly. This map therefore consolidates both the

current development and environmental sensitivities to aid future development that balances all elements: social, economic and the natural environment.

3.1.2 Method

Data collected and analysed during the status quo phase was used in the development of this layer. This includes wetlands, estuaries, Biodiversity Priority Areas 1 (showing critical biodiversity) and 3 (supporting ecosystems) (no Biodiversity Priority Areas 2 are found in iLembe), high risk coastal erosion areas, and existing protected areas. Focus areas for conservation expansion and existing settlement were included for indicative purposes only.

3.1.3 Data sources

- Wetlands: SANBI National Freshwater Ecosystem Priority Areas (NFEPA), 2011
- Estuaries: SANBI National Estuaries, 2011
- BPAs: Ezemvelo KZN Wildlife CPLAN, 2010
- High-risk erosion: KZN Dept of Agriculture and Environmental Affairs Coastal Vulnerability Index, 2011
- Protected areas: Ezemvelo KZN Wildlife CPLAN, 2010

3.2 Consolidated Environmental Sensitivity

3.2.1 Purpose

The Consolidated Environmental Sensitivity map (Map 2) serves as a generic sensitivity footprint of the iLembe District. The purpose of this map is to indicate areas within the District that are environmentally sensitive and are important from an ecosystem goods and services perspective. These are areas where development should not be encouraged.

Furthermore, there is some land earmarked for conservation expansion in the west to northwest region of the District. This will be of great value as there is a poor range in biome types in the existing formal conservation.

3.2.2 Method

Many of the same layers from Map 1 were used in this map, however, all development/ settlement was not included. Therefore the data represented on this map includes: wetlands (and wetland clusters), estuaries, Biodiversity Priority Areas 1 (showing critical biodiversity) and 3 (supporting ecosystems) (no Biodiversity Priority Areas 2 are found in iLembe), high risk coastal erosion areas, and existing protected areas.

3.2.3 Data sources

- Wetlands: SANBI National Freshwater Ecosystem Priority Areas (NFEPA), 2011
- Estuaries: SANBI National Estuaries, 2011
- BPAs: Ezemvelo KZN Wildlife CPLAN, 2010
- High-risk erosion: KZN Dept of Agriculture and Environmental Affairs Coastal Vulnerability Index, 2011
- Protected areas: Ezemvelo KZN Wildlife CPLAN, 2010

3.3 Existing Development Opportunities

3.3.1 Purpose

Map 3 indicates areas within the District that present potentially favourable opportunities for development based on various factors. These are areas where development should be encouraged, but with consideration of conflicts with environmentally sensitive areas (Map 1) and areas not suitable for human habitation (Map 4).

Other areas that need to be taken note of include estuaries, high risk erosion areas, wetlands, free flowing river. When compared to the map showing Opportunities for Development, many of these sensitive features fall within existing built environments or where great opportunity lies for development. Management plans will need to guide the types of development appropriate to each area, and mitigation of impacts on the environment.

The Opportunities for Development map further illustrates the expanse of priority agricultural land that spans across the district. Some of this land has already been transformed for both agricultural practices (predominantly sugar cane plantations) and development. However, there is still some land in flat plains that could be maximised on to ensure food security, using appropriate crop types, for locals as well as South Africa. Care should be taken to ensure that this resource is utilised effectively and not lost to inappropriate forms of development.

3.3.2 Method

Data collected and analysed during the status quo phase was used in the development of this layer. These include areas of high agricultural potential, existing development infrastructure (bulk water supply, electricity, roads and railways), 100% transformed land cover, mines and quarries as well as heritage resources. These layers offer development opportunities as they enhance the landscape aesthetically, economically, and socially. Additionally, areas which are already 100% transformed (i.e. have little to no environmental sensitivity) should be considered for development.

3.3.3 Data Sources

- High agricultural potential: AGIS Land Capability Assessment, 2002
- Development Infrastructure: iLembe District Municipality, KZN DoT
- 100% transformed land cover and mines & quarries: KZN Landcover, 2008
- Heritage resources: Status Quo Heritage specialist report, 2012

3.4 Areas not Suitable for Human Habitation

3.4.1 Purpose

Areas of human habitation and/or activity are not always suitable in all landscapes. Therefore this map (Map 4) illustrates regions within the District where development should be actively discouraged. Areas Not Suitable for Human Habitation supports the avoidance of further housing development in areas of high environmental sensitivity and features that are potentially a risk to human settlement. These features include flood lines, estuaries, wetlands, mines and quarries, as well as areas which are at high risk of Geotechnical instability – i.e. slope ratios steeper than 1:3.

3.4.2 Method

Data collected and/or analysed during the status quo phase was used in the development of this layer. These include rivers (buffered), wetlands (buffered), estuaries (buffered), mines and quarries as well as areas not favourable for development from a slope perspective (slopes = or > than 1:3).

3.4.3 Data Sources

- Rivers, wetlands and estuaries: all SANBI NFEPA data
- Mines & quarries: landcover and iLembe DM
- Slope data currently being analysed

3.5 Areas where development is restricted or constrained

3.5.1 Purpose

Certain areas within the District are potentially habitable, but only under certain conditions, or through artificial support. This includes areas where aircraft noise could become problematic and coastal areas where coastal erosion is a real risk. These areas are depicted on Map 5.

3.5.2 Method

Data collected and/or analysed during the status quo phase was used in the development of this layer. The map combines point sources of pollution, noise zones for King Shaka International Airport (up to 2035) and coastal areas identified as being at risk of erosion, and displays them relative to current settlements.

3.5.3 Data Sources

- Point sources of pollution (Status Quo Air Quality Specialist Report, 2012)
- Noise zones: EIA for the KSIA, 2007
- High-risk erosion: KZN Dept of Agriculture and Environmental Affairs Coastal Vulnerability Index, 2011

APPENDIX A: MAPS

