

**ENVIRONMENTAL MANAGEMENT
FRAMEWORK FOR THE AMAJUBA
DISTRICT MUNICIPALITY**

**Environmental Management Framework
EMF Report**



Institute of
Natural Resources

ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE AMAJUBA DISTRICT MUNICIPALITY

Environmental Management Framework Summary Report

Prepared for



edtea

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1. INTRODUCTION

1.1 Background

The Amajuba District Municipality (ADM) has embarked on the development of Environmental Management Framework (EMF). The ADM EMF was initiated through a concurrent agreement between the national and provincial ministers responsible for environmental affairs in terms of Chapter 5 of the National Environmental Management Act (1998). It was prepared as a joint initiative between the National Department of Environmental Affairs (DEA), the KZN Department of Economic Development, Tourism and Environmental Affairs (EDTEA) and the ADM. The need for the EMF was driven by authority concerns in the District regarding the following environmental issues:

- The decline in air quality,
- The extent of water pollution,
- Land degradation and other environmental issues that may negatively affect local people and the growing economy, as well as
- The lack of adequate information to make more informed decisions.

The Institute of Natural Resources NPC (INR) has been appointed to conduct the EMF process on behalf of and in collaboration with the ADM, EDTEA and other key role-players in the District.

1.2 Project Purpose and Structure

The specific aim of the EMF is to:

Integrate environmental sustainability into municipal planning and operations, and to inform decision making regarding specific development applications in terms of the EIA and other regulatory processes. This is in line with the aims of an EMF as defined below in the extract from the EMF regulations.

PURPOSE OF AN ENVIRONMENTAL MANAGEMENT FRAMEWORK

The EMF regulations (Section 2) list the purpose of the regulation as: *Compilation of information and maps specifying the attributes of the environment in a particular geographical area:*

- a) For such information to inform environmental management, and*
- b) For such maps and information to be used as environmental management frameworks in the consideration of applications for environmental authorisations in or affecting the geographical areas to which those frameworks apply.*

Section 2 (3) further explains that EMFs are aimed at:

- a) Promoting sustainability.
- b) Securing environmental protection.
- c) Promoting cooperative environmental governance.

The project is structured into four phases each of which builds on the outcomes of the preceding phase in working towards the overall outcomes. The objectives and deliverables of each phase are summarised below.

This following table summarizes the aims, objectives and deliverables of the project phases. This report contributes to the EMF Phase (Phase 4).

Table 1.1 Project phases, their purposes and outcomes

PHASE
<p>1: INCEPTION PHASE</p> <p><i>What do we want to achieve & how are we going to do it?</i></p> <p>Purpose: Define the aims, objectives and nature of the project deliverables & the proposed approach and methods for achieving these</p> <p>Deliverable - Inception Report</p>
<p>2: STATUS QUO ASSESSMENT</p> <p><i>Where are we now? What is the state of our natural systems & environmental quality, the drivers of the state & consequences for socio-economic systems?</i></p> <p>Purpose: Map, classify and document the Present State of the receiving environment (socio-economic, biophysical, etc.) as well as trends and causes of the present state and environmental issues</p> <p>Deliverable - Status quo & supporting specialist reports</p>
<p>3: STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) & DESIRED FUTURE STATE (DFS)</p> <p><i>Define where we want to get to?</i></p> <p>Purpose: Defines key sustainability issues and the Desired Future State (DFS) in the form of a sustainability framework that defines objectives, criteria, sustainability targets (and permissible limits of change) for the various components of the receiving environment.</p> <p>Deliverable – SEA Report, Sustainability Framework and Environmental Management Zones (EMZ's).</p>
<p>4: ENVIRONMENTAL MANAGEMENT FRAMEWORK</p> <p><i>How do we get there? Develop the tools to move from SQ to DFS</i></p> <p>Purpose: Develop EMF outputs which include Environmental Assessment guidelines, Decision Support Tool, and Strategic Environmental Management Programme.</p> <p>Deliverable – Final EMF Outputs</p>

1.3 Stakeholder consultation

Public participation is a critical element of the EMF process and stakeholders have been consulted at numerous points in the process. A detailed stakeholder consultation report has been prepared which describes each of the consultations undertaken and the methods employed to capture inputs received. This is available as part of the EMF product suite.

1.4 Location and Extent of the Amajuba District Municipality

The ADM comprises three local municipalities (LMs) i.e. Newcastle LM, Dannhauser LM, and Emadlangeni LM. The project area is shown in Figure 1. The Newcastle LM1 is considered the economic hub of the ADM. The key economic activities of the ADM include commercial agriculture, coal mining and industrial manufacturing. As an example, the area constitutes the largest producer of chrome chemicals in Africa. There are transport and nodal links to Johannesburg, Durban and Richards Bay ports. Newcastle is also a retail hub for this and neighbouring districts.

1 An EMF has been developed for the Newcastle EMF. The EMF has not been gazetted and the information will be integrated with the District EMF where still current and relevant.

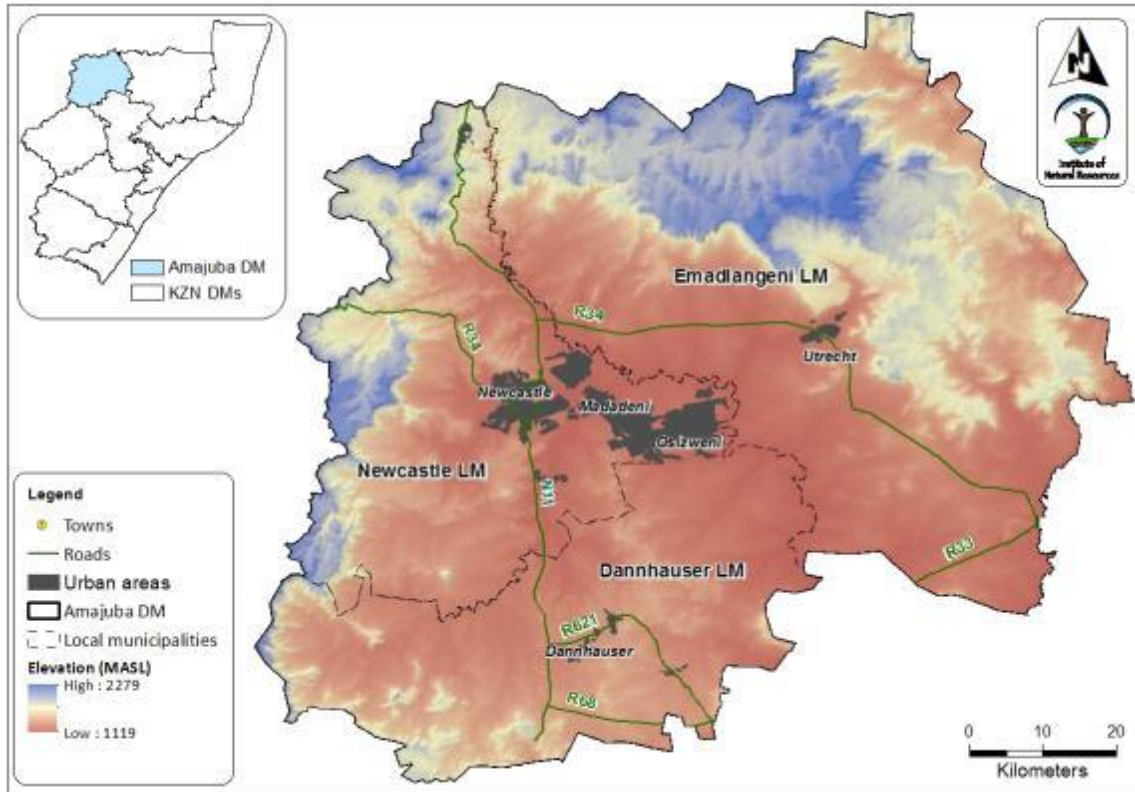


Figure 1: ADM Project Area

2. STRUCTURE OF THE EMF

The broad aim of the Environmental Management Framework (EMF) is to “*Inform sustainable development planning for the Amajuba District Municipality and to streamline the EIA process for specific development applications*”, while the EMF regulations include more specific requirements. The four outputs summarised in the figure below constitute the EMF and all have a role to play in meeting the project aims and the legal requirements.

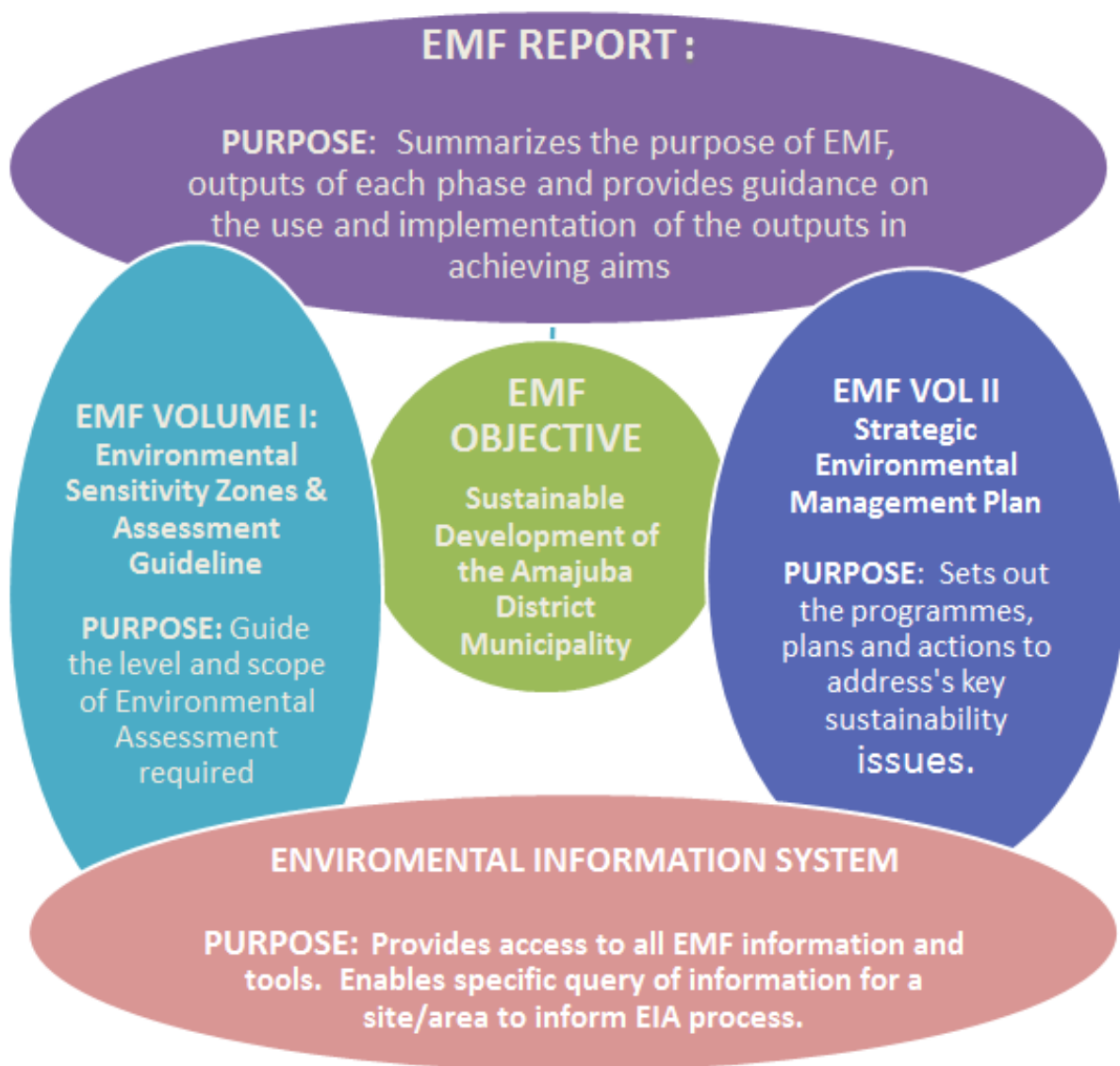


Figure 2: Structure and components of the EMF

2.1 Purpose of this EMF Summary

The EMF regulations define an EMF as the “**Compilation of information and maps** specifying the **attributes of the environment** in a particular geographical **area**: and for such maps and information to be used in the **consideration of applications for environmental authorisations** in or affecting the geographical areas to which those frameworks apply”.

This EMF summary responds directly to this requirement – by providing guidance on the spatial distribution of sensitivity across the ADM together with scope and level of environmental assessment considered appropriate for the different levels of sensitivity within the main environmental zones identified through the EMF process. **This EMF can, and should be applied to all development applications – not only those that require an EIA.**

2.2 Who should Use this EMF Guideline

This guideline is primarily for use by Environmental Assessment Practitioners and the associated specialist team responsible for managing and undertaking the EIA process for specific development applications. The information is also relevant to consultants responsible for managing other relevant regulatory processes that require information relating to the environmental impact of an activity, in support of the applications. Examples of other such processes include water-use licences, heritage development permits, CARA licences, and mining permits. The guideline is also valuable to the decision makers responsible for administering the relevant legislation and for making decisions on applications in terms of the various processes and Acts. It also aids the municipality to assess the sustainability of development activities, which do not trigger the EIA regulations but which will nevertheless have an impact. The guideline provides the basis for the municipality to motivate for appropriate assessments in terms of planning authorisation.

2.3 Reporting Structure

The report is structured as follows.

- **Section 3** Explains how the different information provided in the guideline should be used in different aspects of environmental assessment and management. It also indicates which of the other information and outputs developed during the EMF should be used in combination with this guideline.
- **Section 5** This section provides a graphic overview and descriptive summary of the sensitivity of all the environmental features which have been defined according to the following broad and associated sub-components:

<i>Aquatic</i>	<i>Terrestrial</i>	<i>Social</i>
Aquatic Biodiversity	Terrestrial Biodiversity	Air Quality
Water Quality	Geotechnical Conditions	Heritage Resources
Wetlands	Agricultural Potential	
Water production areas	Flood Zones	

- **Section 5** provides the following detail for each of the ten environmental components listed above.
 - i. A summary of the current status of the environmental system or feature that defines the zone, and its subcomponents.
 - ii. The key sustainability issues and objective [defined in the strategic assessment and sustainability framework – see SEA report].
 - iii. A definition and background to the sensitivity levels used [the thresholds that have been used to define the sensitivity levels].
 - iv. A map showing the spatial extent of the sensitivity levels.
 - v. Recommendations for undertaking Environmental Assessment in these zones in terms of the nature and scope of specialist investigations required.

2.4 Understanding Sensitivity

In considering the sensitivity zones it is important to understand that sensitivity and constraint lie on two ends of a two-way relationship between environmental features and development activities. This is described further below.

- i. *Impact of development on the environment (environmental sensitivity)*

The first is where the development activity impacts the environmental feature or system. For example, urban development on grassland will permanently transform that system resulting in a reduction of habitat and ecosystem services provided by that system. In this case, the level of constraint imposed on development increases with the level of environmental sensitivity of the system.

ii. *Impact of the Environment on Development (environmental constraint)*

The second scenario is where the environmental feature constrains development activities. A prime example is the impact of steep slopes. There is a cost to building or growing anything in steep slope areas, and there is additionally a greater risk of land subsidence and erosion. The steeper the slopes are, the higher the level of constraint.

3. STATUS QUO

3.1 ADM overview

The ADM comprises three local municipalities (LMs) i.e. Newcastle LM, Dannhauser LM, and Emadlangeni LM (Figure 1). The Newcastle LM is considered the economic hub of the ADM. The key economic activities of the ADM include commercial agriculture, coal mining and industrial manufacturing. There are transport and nodal links to Johannesburg, Durban and Richards Bay ports.

Land use in the ADM consists of an assortment of agriculture (commercial and subsistence), afforestation, industrial uses, mining and high density urban settlements and sparse rural settlements. The vast majority (74%) of the District's land cover consists of natural untransformed vegetation. In almost all areas, this is grassland which is utilised as grazing land for livestock. The more densely populated settlements include Newcastle (central economic hub), Dannhauser, Madadeni, Osizweni and Utrecht. This section summarises the chapters from the Status Quo report², providing an overview of the current status of the environment in the ADM.

3.2 National, Provincial and Regional Planning Framework

The Constitution of the Republic of South Africa Act No. 108 of 1996

According to Section 24, everyone has the right to an environment that is not threatening or harmful. Measures are in place to protect the environment such as promoting conservation, environmentally sustainable development and pollution prevention. Moreover, promoting social and economic development and using renewable resources ensures such an environment. Co-operative governance is also included within the constitution; this cooperation needs to be undertaken between national, provincial and local organs of state especially during the development and preparations of an Environmental Management Framework (EMF). This chapter in terms of the EMF is important as it allows for coordination of environmental policies, plans and programmes between a number of spheres of government which play a significant role in terms of its relationship to the environment.

The National Environmental Management Act No. 107 of 1998

The National Environmental Management Act No. 107 of 1998 (NEMA) provides principles and guidelines to be considered in integrated environmental management (IEM). It guides cooperative environmental governance by confirming governments' role in ensuring sustainable development

² Environmental Management Framework for the Amajuba District Municipality Draft Status Quo Report, January 2019.

and the role of society in participating in environmental governance. Chapter 1 of the Act aims to ensure that actions and decision making of all officials relating to the legislation which may affect the environment is binding.

Chapter 5 of NEMA provides a guide for environmental planning and management and promotes the use of appropriate environmental management tools in order to ensure the integrated environmental management of activities. These activities can include policies, plans, projects and processes. NEMA is the parent statute under which a set of environmental laws and regulations have been developed. The environmental management framework is a tool whose overall objective is to promote integrated environmental management (IEM). The objectives of integrated environmental management include: evaluating, predicting and identifying potential threats to the environment, including the socio-economic environment and heritage resources together with determining alternatives and mitigation measures to ensure negative impacts to the environment are adequately minimised, while maximising benefits together with promoting compliance with the general principals of environmental management. To ensure that all processes of IEM are adhered too, public participation around decisions that affect the environment must occur, consideration of environmental attributes and the environmental management style best suited for a particular activity in accordance with the legislation must occur.

National policy

The primary development policies at a national level are the National Development Plan, The New Growth Path, The Comprehensive Rural Development Programme, the Comprehensive Plan For The Development Of Sustainable Human Settlements, the Accelerated and Shared Growth Initiative of South Africa (ASGI-SA) and the National Spatial Development Framework (NSDF).

Accelerated and Shared Growth Initiative of South Africa (ASGI-SA)³

- ASGI-SA is the primary national policy and has a strong focus on poverty reduction,
- ASGI-SA has chosen three priority sectors, specifically: tourism; business process outsourcing and off-shoring (BPO & O); and bio-fuels.

This implies that opportunities within these sectors should be maximized

The National Spatial Development Framework (NSDF)⁴

The NSDF guides government in implementing its programmes in order to achieve the objectives of ASGI-SA of halving poverty and employment by 2014. Of relevance to the EMF is Objective 4: which requires that *“In order to overcome the spatial distortions of apartheid, future settlement and economic development opportunities should be channelled into activity corridors and nodes that are adjacent to or link the main growth centres”*.

Spatial Planning and Land Use Management Act No. 16 of 2013 (commonly known as SPLUMA). The intention of this national legislation is to introduce the norms and standards for spatial planning and to specify the relationship between spatial planning and land use management.

³ ASGI-SA - Aims to ensure that the South African economy achieves higher rates of growth and produces larger volumes of the wealth needed to meet the challenges of growth and development.

⁴ NSDF - Aims to support the development of sustainable local economies through integrated government action

Provincial policy

The key policies at a provincial level are the KwaZulu-Natal Provincial and Growth Development Strategy and the Provincial Spatial Economic Development Strategy (PSEDP).

The KZN Provincial Spatial Economic Development Strategy (PSEDS), guides planning in the province and serves to give effect to ASGI-SA and the NSDF. The PSEDS identified the following sectors as responsible for driving the growth of the province and addressing unemployment and poverty:

- *Agriculture*: including agri-industry;
- *Industry*: including heavy and light industry and manufacturing;
- *Tourism*: including domestic and foreign tourism; and
- *Service sector*: including financial.

The PSEDS also summarises the high level cluster priorities and objectives for the Amajuba District. The following priorities relate directly to Amajuba District Municipality given the existing importance of the agricultural sector, the tourism opportunities, and the strategic importance of the water resources located within the municipality.

- *Agriculture and Land Reform* - The protection of high potential agricultural land for commercial production.
- *Tourism* - Increase arts and crafts resources and improve benefit to previously disadvantaged areas and land reform
- *Industry* - Securing of water resources

An important part of the PSEDS overall strategic thrust is a focus on development corridors and nodes. To give effect to the PSEDS at a district level, a hierarchy of nodes and corridors is required. From the KZN PSEDS perspective, there are a number of priority nodes in Amajuba District Municipality. Newcastle is listed as multi-sectoral node and is located in the centre of the study area.

Local policy

The most important local planning instruments considered in this study are the ADM Spatial Development Framework (SDF) and the District's Integrated Development Plan (IDP). In addition, planning policy with respect to the District's mountainous regions is relevant and important.

3.3 Socio-Economic Context

Population

The Amajuba District Municipality (ADM) has an estimated population of 531 327 people who are accommodated in 110 963 households (Stats SA 2016 Community survey). This is a youth dominated population distributed as follows:

- Age 0-14 = 35.4%.
- Age 15-65 = 60.9%
- Age > 65 = 3.7%

Although all LMs show an overall growth in population, census data show distinctly that more people are moving to the large Newcastle / Madadeni / Osizweni urban centre. The smaller urban centres of Utrecht and Dannhauser show a net reduction in population. Importantly, there is a trend

towards smaller average households meaning many more homes are being built to accommodate this change.

A key aspect of the socio-economic profile of the ADM is the low level of education. The 2011 census (Stats SA) shows that 60% of the people living in this area do not have a matric level qualification and only 5% have any form of tertiary education. Unemployment is consequently high across the district. According to the official definition, employment stands at above 33% of the District's working age population. Using the expanded definition, this figure stands at 71%.

Infrastructure and services

Responsibility for different services infrastructure within ADM varies across different sectors. In addition, responsibility for bulk supply and distribution are separated in several cases.

Water

The uThukela water is the primary bulk water service provider to Amajuba District. Responsibility for distribution then rests with the two water services authorities in the District – The Amajuba District Municipality WSA services Emadlangeni and Dannhauser LMs and Newcastle LM WSA is responsible for servicing its own municipal area.

Based on the 2016 Stats SA Community Survey:

- 111 632 people have piped water supply either to inside the home or on site,
- 17% of households rely on communal stand pipes
- 7.9% of households are reliant on boreholes or springs.

Sanitation

There are currently twelve waste water treatment facilities registered on the DWS Integrated Regulatory Information System (IRIS). These are split equally between the two water service authorities in the study area. About 46% of the households in the Amajuba DM have flushed toilets that are connected to a sewerage system, 30% of households utilise unventilated pit latrines and 4% of the households in the Amajuba DM do not have any form of sanitation (Census, 2011).

According to uThukela Water (2012), all of the facilities in the Newcastle LM fleet struggle with aging sewer infrastructure, storm water ingress and resultant hydraulic overloading during summer storm events. This results in the discharge of large volumes of partially treated or untreated effluent.

Electricity

Eskom is the bulk supplier of electricity to Amajuba DM. Newcastle and Emadlangeni LMs possess licenses to supply electricity in certain areas within their LM boundaries. Typically, the CBD and suburbs are supplied by the LM, while outlying townships and rural areas are supplied directly by Eskom. The capacity of Eskom electrification networks within Amajuba DM is considered the key state indicator with respect to the provision of electricity to the municipality.

The majority of networks within the district municipality are not constrained, with certain areas being exceptions. Urbanised areas in Madadeni, Dannhauser and Emadlangeni LMs show some constrained networks, with areas on the outskirts of urban regions indicating slightly constrained

networks. The only concern is situated in the northern regions of Emadlangeni and the south-western regions of Dannhauser LMs, as electricity networks in these areas are constrained.

Solid Waste

Individual LMs are responsible for waste management in their municipal areas and are solely responsible for the collection and disposal of waste and the management of their waste disposal sites.

Ten registered landfill sites are located within the NLM of which nine are classified as H:H – that is hazardous facilities. These H:H sites are managed by private sector entities. A registered general waste disposal site is located in Newcastle adjacent to the Newcastle airport. This facility is the largest in the District and is managed by Newcastle LM. In 2004, this site was reported as having sufficient airspace for another two years of operation (Sivest 2004). This site is still however being used today. A new site has been identified and the Newcastle LM is in the process of seeking environmental authorisation for this facility. A key environmental concern with the siting of a landfill site is the potential for such a facility to contaminate groundwater, particularly given the shallow groundwater table across much of the Buffalo River basin. Unregistered waste disposal sites are located in Charlestown, Dannhauser and Waterval Prison whilst a general waste landfill site is located in Utrecht.

Roads

Road hierarchy is a significant determinant in road infrastructure governance as national roads are the sole responsibility of National Department of Transport (DOT) and are maintained through the South African Roads Agency Ltd (SANRAL). Provincial roads (both Provincial main roads and Provincial district roads) are the responsibility of the KwaZulu-Natal Provincial DOT.

The majority of road surfaces within ADM are gravel, with the majority of these gravel roads classed as district distributors. Blacktop (tar) roads cover a significant portion of ADM and are classified as primary and regional distributors. The Draft ADM IDP 2018/19 identified the poor state of several regional roads as a weakness. This is corroborated by the 2012 Amajuba spatial economic overview (Isikhungusethu 2012) which identifies the poor condition of roads as a major challenge in economic development in the region. The majority of community access roads are unsurfaced gravel roads and according to the ADM IDP, they are not constructed according to geometric design standards. The high level of usage by public transport vehicles results in high vehicle maintenance costs and unsafe traveling conditions for passengers. During wet periods, these surfaces become slippery or impassable resulting in unreliable transport options for the communities dependent on these roads.

3.4 Water Resources

Surface Hydrology

The Amajuba District Municipality (ADM) falls entirely into two primary catchments namely the Thukela and Pongola catchments. The Ngogo, Ncandu, Horn and Ngagane Rivers are important tributaries of the Buffalo River draining from the western highlands while the Slangspruit, Doringspruit and Dorpspruit form the main tributaries in the north. The headwaters of the Pongola River (including the Bivane River) are found in the high lying north eastern areas of the ADM and drain eastwards out of the District.

The Ntshingwayo Dam is fed by the Ngagane River and is situated at the border of the Newcastle and Dannhauser Municipalities. This dam is the most important water supply point for Newcastle – the most densely populated area and economic hub of the District. The Zaaihoek Dam is situated in the Emadlangeni Municipality and is used to primarily supply water to Majuba Power Station, but also Volksrust town and to supplement the Vaal catchment.

Water Yield

The ADM intersects two nationally important Strategic Water Source Areas (SWSAs). These mirror the distribution of locally important water source areas which are found in the higher lying sections of the District as is illustrated in the map of runoff categories below.

Because of the District's topographic situation, all of the water used in the Amajuba District comes from the catchments contained within the District's boundaries. There are no transfers of water into the District and no catchments feeding into it. This provides a perspective of the importance of the catchment areas for human wellbeing and economic growth in the District. Water yield from these catchments is directly affected by vegetation types and cover and invasive alien woody species are increasingly present in these catchment areas. This represents a significant threat to water security in the District.

Water yield is also affected by land use changes. The conversion of natural veld to cultivated agriculture, industry, mining and urbanisation affects runoff and infiltration which in turn affects the quantity, quality and the timing of flows in rivers. Vegetation changes resulting from grazing also decrease the surface vegetative cover which affects water yield. These have all been identified as impacts affecting the ADM strategic water source areas.

Water Quality

Based on the DWS monitoring data for dissolved salts and nutrient indicator groups, a clear gradient / shift in water quality can be noticed moving from the high lying mountainous areas to the lower lying Buffalo River Basin as a result of various anthropogenic activities, particularly around Newcastle and Dannhauser. Monitoring data is unfortunately spatially biased towards impoundments and large areas of the District are not monitored.

Water quality within the ADM is mainly affected by anthropogenic pollution from the domestic, industrial, agricultural and mining sectors. The Thukela River reserve study undertaken in 2004 showed the water quality component of the Present Ecological State (PES) in the Buffalo River below the Utrecht / Osizweni road bridge to be heavily impacted, particularly with respect to various sulphate salts and nutrients.

In particular, Acid Mine Drainage (AMD) is a very real threat to the water quality of the District. AMD results from the oxidation of sulphides, typically pyrite, and is characterized by low pH and high concentrations of SO_4^{2-} (sulphate), iron, metalloids, and many metals (Larsen and Mann 2005). Abandoned mines and tailings piles can be sources for AMD and represent risk to the equilibrium of different ecosystems (Moncur et al. 2005, Cravotta 2008).

In the ADM context, one of the key overarching drivers of change in terms of both water quality and quantity is the combination of population growth, urbanisation, poverty and unemployment. Population growth in urban and peri-urban areas, particularly together with poverty and unemployment, results in the development of informal/unserved settlements, often close to rivers which inevitably results in a deterioration of water quality through unmanaged sewage and solid waste.

Flood Attenuation Zones

Flood attenuation zones are those areas found adjacent to river systems and which are prone to flooding. These areas play a significant role in dissipating the energy of a flood event and can reduce the impact of flooding on downstream people and infrastructure. It is obviously also important to identify flood zones from a development perspective as flooding poses a risk to human life and any development or activities located within these areas are likely to be damaged or destroyed.

Flood zones in ADM are already highly impacted by agricultural activities and the development of formal and informal settlements and urban areas. These zones are being further impacted by population growth as more people settle in these flood zones which in turn increases human vulnerability.

River Health and Biodiversity

River ecosystems provide essential goods and services for human and environmental well-being. In order to effectively manage the environment to ensure the achievement of a balance between use and protection of river ecosystems it is necessary to characterize each system in terms of its present ecological state (PES) and its ecological value.

The National Freshwater Ecosystem Priority Areas (NFEPA) data set identifies areas that are important for meeting biodiversity conservation goals for freshwater ecosystems. Many of the upper river reaches within the ADM are characterised as river FEPAs. The lower lying areas of the catchment have been characterised as fish support areas. These areas are fish sanctuary areas and are important in the migratory routes of fish species.

DWS's Present Ecological State (PES) information indicates that the Buffalo River is a category B. The Ncandu River is a category D and the Ngagane River is a category C. The results indicate that even though the tributaries are in a poor to fair condition, the main Buffalo River within the ADM is in a good condition which is largely natural with a few modifications.

One of the biggest drivers of change in river health is pollution from activities within the domestic, industrial, mining and agriculture sectors. Another key driver of changes in aquatic ecosystems is invasive alien species. The infestation of riparian areas by alien vegetation can cause significant change in the health of river ecosystems. Alien fish species also have a significant impact on the aquatic ecosystem. Largemouth bass (*Micropterus salmoides*) and Common carp (*Cyprinus carpio*) are both common in the rivers of the District.

Wetlands

The Blood River Vlei, Boschoffsvlei, Groenvlei and the Padavlei are four of the most sensitive and important wetlands in the ADM (among approximately 9200 smaller wetland features).

The District has a high density band of wetlands in the higher lying areas in the North West stretching from the important Blood River Vlei and its upper catchment, through the upper Bivane and Pongola River catchments up to the upper catchment of the Slang River which hosts Zaaihoek dam and Groenvlei wetland. The upper catchments of the Ncandu, Horn and Ngagane Rivers are similarly densely populated with wetlands. The low lying Buffalo River flood plain also hosts a number of wetlands, but the density here is lower. The important Boschoffs Vlei is located in this area.

According to the ADM EMP (2003) the Boschoffsvlei is in a fair condition and the Groenvlei is in a good condition. There is however no record of wetland condition for the thousands of smaller wetland systems in the ADM. There are however many factors which impact on their condition. One of the main drivers of change in wetland extent and condition is the draining wetland areas for agriculture. Developments such as dams and industrial and domestic housing complexes also drive change within wetland ecosystems. In particular, the flat Buffalo River flood plain has been heavily utilised for the development of housing, both formal and informal and other infrastructure.

Wetlands are areas of high biodiversity and provide many ecosystem services such as water purification, flood control, groundwater replenishment and sediment control. In particular, the ADM is geographically located in an important water supply area, and water generated in the catchments of this District is not only critical to the continued economic growth of the District, but it is also vital to users downstream of the District and in other catchments.

Wetlands are also important features in the ADM tourism plan of placing a strong emphasis on birding and avi-tourism. This niche market has potential to improve the district economically as it is known to be a birding region and there are over 400 bird species identified in the region.

Groundwater

In the ADM, large areas of the municipality have very shallow ground water levels. This has important implications for development as shallow groundwater tables impose additional difficulties to construction and added flooding risks during the wet season. Shallow groundwater tables also result in increased health risks. This is particularly relevant in the lower lying peri-urban areas surrounding Osizweni. Here, outside the formalised township areas, the vast majority of households utilize pit latrines, and numerous cases of outbreaks of bacteria related diseases including cholera have been linked to contaminated groundwater (P. Baytopp *pers com*). The Newcastle LM IDP (2018 review) additionally states that the quality of groundwater is moderate to poor and that the most probable causes are:

1. Poor rates of recharge
2. Mining activities – particularly coal mining
3. Industry
4. Farming activities

Information on borehole yields in ADM was obtained from some 800 boreholes scattered throughout the study area and recorded on the National Groundwater Data Base (NGDB).

Statistics which define the yield of boreholes in ADM is presented in the Table 3. These figures reflect that in the main, groundwater is not a significant water resource to alleviate bulk water shortages, but that small scale use for rural domestic and stock watering purposes can be accommodated.

Table 3: Summserised statistics of depth related borehole yield data.⁵

Lithological unit	Mean yield Data (l/s)	Mean yield Range	Maximum Yield Data(l/s)	Maximum Yield Range
Quaternary sediments	0.9	Moderate	4.8	High
Dolerite intrusions	2.7	Moderate	58	High
Karoo sediments	1.2	Moderate	19.8	High
Archaean rocks	0.9	Moderate	2.8	Moderate

Cross Cutting Water Issues

The key challenge in water resources management is balancing the conservation value of water resources with the growing demand to use them. The DWS's Resource Directed Measures (consisting of Water Resource Classification, Resource Quality Objectives and Ecological Reserve) are designed to identify and implement a balance between the use and the protection of water resources. Neither of the ADM's two primary catchments, the Thukela and the Pongola River Catchments, has a completed classification in place.

The importance and limited supply of ADMs water resources is evident in Figure 3 (uThukela Water 2018). Even with short term interventions to meet the water resource demand such as the upgrading of pumping infrastructure there is still likely to be a major water deficit within the ADM in the near future.

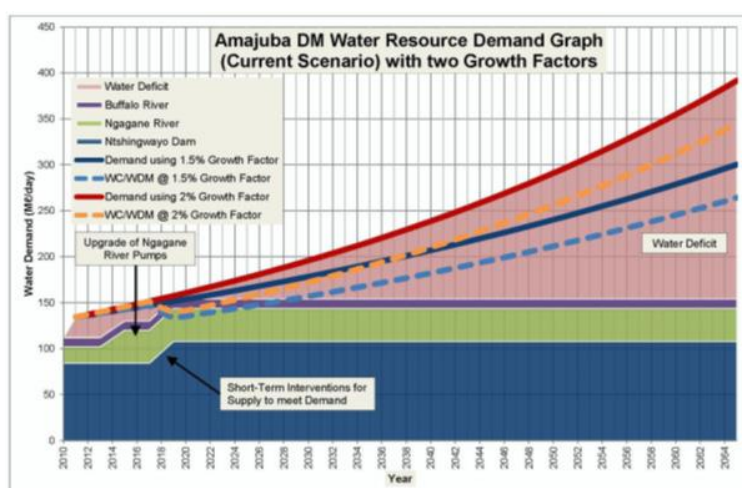


Figure 3: ADM water resource demand graph

⁵ Where Yield Ranges: - High >3l/s; Moderate >0.5 to 3l/s; Low > 0.1 to 0.5l/s; Very Low ≤0.1l/s

3.5 Terrestrial Resources and Land Degradation

Terrestrial biodiversity

There are 4 biomes within the ADM (Forest, Savanna, Grasslands and wetlands) that contain 14 different vegetation types (Scott-Shaw and Escott 2011). The District is dominated by Grasslands and more specifically by Income Sandy Grassland, Wakkerstroom Montane Grassland, Northern KZN Moist Grassland and the KZN Highland Thornveld.

The different grasslands of the ADM are perhaps the most important ecosystems in the District. They play a critical role in providing habitat for a range of biodiversity and perhaps more importantly they provide a range of services that are crucial for the persistence and growth of the local economy. Extensive animal production is directly reliant on grasslands for grazing, while industry, mining and any form of settlement is dependent on the water produced by grassland dominated catchments.

Flora data for the ADM shows that the habitat supports 1 near threatened, 1 rare species and 5 vulnerable species. Faunal data (amphibians, reptiles, birds, mammals, fish and invertebrates) has recorded 3 critically endangered species (all birds), 4 endangered and 5 vulnerable species.

It is widely accepted that globally, habitat loss is the single greatest threat to biodiversity. In the Amajuba District, grasslands such as Income sandy grassland, Paulpietersburg moist grassland, Northern KZN moist grassland and Amersfoort Highveld Clay grassland have been negatively impacted by land use change showing a decline in spatial coverage of between 20-35% from their original extent.

An analysis of land cover change over the period of 1990 to 2014 (using the national land cover data sets) indicates that roughly 94 000 Ha of grassland has been altered to another land cover type. Table 3 shows the area of grassland lost to different land cover categories between 1994 and 2014. This represents 18 percent of the grassland that was present in 1990. The majority of this area is altered to woody vegetation, which in the context of ADM largely represents alien wattle species. Alien species thus pose a major threat to indigenous biodiversity.

Table 2: Grassland land cover loss to other categories

LC Category	Area (Ha)
Woody vegetation	41316.78
Commercial Cultivation	15887.86
Forestry	12172.53
Subs Cultivation	5742.61
Human settlements	4963.65
Other	13612.65
Total	93696.08

Agriculture can pose a significant threat to terrestrial biodiversity, particularly the cultivation of virgin land, which transforms large areas of natural vegetation and habitat. In Amajuba District, heavy grazing is a major concern and one of the biggest pressures (Angus Burns WWF. *Pers. comm*). Intense over-grazing of the grassland decreases biodiversity, allows alien invasive infestation and decreases grassland vigour/health. Grasslands are also put at risk by poor burning management,

where grasslands are burnt too frequently, in-frequently or burnt in the wrong season (C. Botha – KZN DARD *Pers. comm*).

Unplanned, inappropriate and ill managed development i.e. for tourism, formal and informal, urban and rural developments are extremely destructive to biodiversity. Clearing natural landscapes for informal settlements and / or subsistence agriculture is less destructive than hardened urban environments, but none-the-less eliminates or degrades large areas of habitat and this type of activity is very often unregulated and difficult to control. It is evident from aerial photographs that large portions of grassland in the ADM have been converted to small scale or subsistence agriculture, particularly in the southern low lying areas of the Buffalo River basin.

Mining is in most cases incompatible with biodiversity conservation priorities. The areas of Newcastle, Durnacol, Dundee and Glencoe have a long history of coal and metal ore mining, which have played a big role in the development of the local economy. Conflict between the interests of biodiversity conservation and mining are still prevalent in the ADM.

A large number of coal mines have been abandoned within the Newcastle and Emadlangeni municipalities. From a biodiversity perspective, several old mine sites require rehabilitation and despite their closure, still pose a threat to the environment through water and air pollution. Acid mine drainage from defunct mines has reportedly degraded farmers' water resources in the area and is known to have detrimentally impacted the water quality of important water resources.

Agricultural resources

Given the prioritisation of Agriculture at a National and Provincial level, agriculture is accordingly also a key sector for economic growth in the Amajuba District. Amajuba District Municipality is among the most fertile regions within KwaZulu-Natal. Despite this, the agricultural sector only accounts for roughly 2.2% of total GVA in the Amajuba District (though agri-processing is not fully accounted for in this figure), while the contribution of this sector to total formal employment is also low at 2% (LED review 2011). The contribution of the agricultural sector to the District GVA has declined recently, with an average growth rate of -6.7% (*ibid*).

Annual crop production is focused in three key areas:

1. The area in the South west of the District around Normandien and the Ntshingwayo Dam, the catchments of the Horn River, the Ncandu River and the Ngagane River. This is primarily large scale commercial agriculture with a large area under irrigation.
2. Along the Buffalo River and lower Ncandu River, and Ngagane River in the vicinity of Madadeni and Osizweni. The banks of the Buffalo River are heavily utilised for commercial irrigated agriculture while the area around Madadeni and Osizweni is heavily utilised by small scale farmers, very little of which is irrigated.
3. The far southern area of the District, around Hattingspruit where large scale commercial dryland agriculture dominates production.
4. The south eastern corner of the District, along the Blood River and R34 which includes a mixture of irrigated and dryland commercial agriculture.

The vast majority of the high potential land in the ADM is however primarily important from a grazing perspective (KZN DARD). Grazing resources are however particularly sensitive to different

management practices and can easily be degraded by over utilisation and inappropriate burning practices. The ADM area is predominantly highland sourveld with a moderate carrying capacity. Given the importance of grasslands in the agricultural economy of the District, it is important that losses of grazing land be closely analysed.

Further analysis of the areas lost to woody plant encroachment indicates that the vast majority of this area is in fact lost to invasive alien trees, predominantly black (*Acacia mearnsii*) and silver wattle (*Acacia dealbata*).

Land restitution / redistribution / reform is a highly complex and contentious issue with a vast number of stakeholders. In Amajuba District, numerous documents point to this process as being a key reason for the decline in agricultural production and a major stumbling block to agricultural development in the District. In particular, the delays associated with transfer of land, the lack of support for beneficiaries and the uncertainty created amongst existing farmers are all cited as key factors. Approximately 70% of agricultural land is under claim in the Emadlangeni municipality.

Water availability is one of the main threats facing agriculture in the District as large scale commercial farmers have limited water available for irrigation while small scale and subsistence farmers face water shortages due to drought. Climate change is likely to aggravate this situation. The availability of water for on-going agricultural development, in particular irrigated agriculture, is a key constraint to the sector.

3.6 Geotechnical Considerations

Geology, soils and landform

The ADM's Quaternary sediments include fossil subsoils. Limited alluvial deposits generally occur along and in the channels of the larger streams and rivers. In some instances, wetlands have developed locally on the floor of shallow valleys. The extensive dolerite sheets found in the study area represent an important structural element of the geological regime. The greater resistance which these rocks offer to weathering and erosion provides protection for the sedimentary lithologies. This is evident in the steep and often precipitous krantzies which characterize the eastern slopes of the Drakensberg and the upper slopes of the Balelesberg. The Karoo Supergroup is represented almost exclusively by the Ecca and the Beaufort Groups. Of these, the Ecca Group is by far the best represented, in particular by the Vryheid Formation. The sediments of the Beaufort Group, viz, the predominantly sandstone of the **Estcourt Formation** (Adelaide Subgroup) occur at elevations above approximately 1800m amsl and represent the younger lithostratigraphic units of the Karoo Supergroup in the study area.

Generally, the soils in the study area vary from sandy loam over the Vryheid Formation to clayey loam on shale or mudstone. Areas underlain by dolerite are characterised by red to brown or black clayey soils. The typical soil problems that are found in the ADM area are the following:

- Higher rainfall areas, highly leached soils occur which usually have a high acid saturation;
- Areas underlain by sandstone – on a macro scale that will include most of the area covered by the Vryheid Formation – leaching of nutrients is prevalent due to its low clay content;

- The soils that have a plinthic origin and are shallow; tend to be susceptible to erosion especially if on a slope and water logging if found on the lower mid-slope and foot slope positions.

In general, the only geological features to pose a constraint to development are alluvial and unconsolidated sediments, particularly where wetlands occur. There are large areas of the District characterized by mountainous terrain and steep slopes. These areas have significant implications for potential land uses. Mining areas have also been mapped as presenting a constraint to development as undermining potentially leads to structural instability.

3.7 Air Quality

The Provincial Department of Economic Development, Tourism and Environmental Affairs (EDTEA) sampled and reported monthly dust fallout rates between February 2017 and January 2018 at twelve (12) sites across the Amajuba District Municipality. Overall, the finding of comfortable compliance (on average) with the Residential guideline throughout all sites and all months, with the exception of three sites during October 2017 only, suggests that dust nuisance is not a major issue across the Amajuba District Municipality.

Passive samplers were also deployed at selected sites by EDTEA from February 2017 to January 2018 to measure sulphur dioxide (SO₂), nitrogen dioxide (NO₂), and the BTEX parameters (benzene, toluene, ethylbenzene and xylene). In addition, some measurements were conducted for hydrogen sulphide (H₂S) concentrations. NO₂ and SO₂ results are shown in Table 3.

Table 3: Sulphur Dioxide (SO₂) and Nitrogen Dioxide (NO₂) concentrations at selected sites.

Site name	SO ₂	NO ₂
Site 3: Amadada High School	0,8	9,5
Site 6: Madadeni Police Station	3,9	8,8
Site 8: Utrecht Prison	0,3	8,4
Site 9: Emalahleni Secondary School	1,3	4,2
Site 11: Church St and Link St	5,3	11,0
Site 12: Shri Avenue	1,0	12,7

All SO₂ and NO₂ concentrations are well below the National Ambient Air Quality Standards (NAAQS) of 50 µg/m³ and 40 µg/m³ for SO₂ and NO₂ respectively and are thus comfortably compliant. The ratio of SO₂ to NO₂ is typically a good indicator of industrial versus vehicular pollution, since industries produce both SO₂ and NO₂, whilst road traffic produces much more NO₂ than SO₂. Since the SO₂ ambient measurements are low whilst NO₂ concentrations are relatively high compared with SO₂ and when expressed as a percentage of the NAAQS for NO₂, these results suggest that road traffic rather than industry is the main contributor of gaseous air pollution of the Amajuba District Municipality.

Hydrogen sulphide concentrations were measured at four (4) sites. When compared with the WHO standard of 5 ppb over a 30-minute period, there were no apparent exceedances although it is observed that concentrations of this malodorous gas peak in late winter and early spring, and were highest in the Newcastle area.

The BTEX suite of hydrocarbons was also measured at four (4) sites. The NAAQS for annual concentrations of benzene (5 µg/m³) was not exceeded during the duration of this study.

The maximum benzene concentration measured was 2.5 µg/m³. The highest overall BTEX concentrations were measured in Blaauwbosch. VOCs quickly react in the presence of sunlight and moisture, so highest levels are typically measured where samplers are in close proximity to a source. Since neither Amajuba Park nor Blaauwbosch are close to refineries or tank farms, road traffic emissions are again suspected as the major source of volatiles.

Whilst there is a clear perception from stakeholders that air quality in ADM is under pressure and that residents feel that air quality has been severely compromised, particularly in the Newcastle area, insufficient monitoring data is available to adequately quantify this (available monitoring data is only over a short term period, for passive samplers only and at limited sites). A full dispersion model which accounts for topographic influences has also not yet been developed for this area.

Two key overarching drivers of change in air quality in general are the demand for economic growth which results in the growth of industry, mining and other activities which impact air quality and the growth in urban population which brings an increase in the volume of road traffic and associated air quality impacts. Whilst the highly visible industrial emitters are foremost in the minds of ADM stakeholders, growth in this sector over the last decade has been limited. Road traffic volumes have however increased as the urban population has increased and available monitoring data for the District show that traffic related emissions are a significant contribution to overall air quality impacts.

3.8 Cultural Heritage Resources

The Amajuba District has played a significant role in the history of South Africa and is rich in cultural heritage resources. Despite this richness, relatively little systematic heritage survey work has taken place in this region, and even less has been systematically documented on SAHRIS. This hampers efforts at determining the heritage character of the area from existing work.

In summary, no area-wide systematic Stone or Iron Age archaeological surveys have been undertaken for the District Municipality. However, recorded sites attest to a great historical depth of human interaction across the landscape from the Early Stone Age (ESA) (1.5m years ago) to the Late Iron Age (LIA) (150 years ago) and latterly, colonial interaction and into the modern era. The Amajuba District was of enormous strategic importance in several phases of South African history, and this is attested to by the presence of several battlefields, military cemeteries, monuments and memorials in the region. The majority of monuments and memorials in the region are related to the history of military action in the area during the Zulu and Anglo-Boer Wars, in the form of commemorative installations at battlefields and cemeteries.

It is self-evident that numerous buildings and structures with historical, aesthetic, architectural and/or social values occur within Amajuba District. However, no systematic, area-wide survey of such heritage resources has been undertaken, hence their locations, condition and management requirements are unknown.

Given the distribution of rural settlements across the District, it is likely that numerous traditional burial places are located outside formal cemeteries. Such burial places are usually located within homestead precincts and are known to and managed by the next-of-kin.

Given the nature of the historical environment and modern land uses it is highly likely that numerous places associated with oral traditions or living heritage are present within Amajuba District.

Palaeontological sensitivity is determined from the underlying geology of an area. The Amajuba District, by virtue of its varied geological makeup, includes deposits that range from having very low to very high fossil sensitivity

Amajuba District's recognised and proclaimed heritage resources are strongly biased towards settler history, and largely pertain to the settlement of Trekkers in the area, the Anglo Zulu War, and the first Anglo-Boer war. There is evidence, however, that a much broader range of heritage sites are located within the region, although knowledge about these sites and their locations is not widely shared.

It must be recognised that the value in heritage resources does not lie in monetary or economic value but rather in their intrinsic worth in terms of social, historical and cultural significance. That being said, certain heritage resources can provide economic stimulus through tourism and job creation. The prime example of this exploitation of heritage resources is to be seen in the tourist-driven industry of battlefield routes, and, indeed, the battlefields are Amajuba's biggest tourism attraction (Urban-Econ 2012). Here potential exists not only for trained guides to traverse the routes with tourists, but also for unskilled maintenance and caretaking staff.

3.9 Cross Cutting Issues

Urban population growth is seen to be a key driver of environmental change across a number of the specialist studies. This phenomenon is not unique to ADM, but is evident across the world. Its resulting impacts are critically important for the District from a planning and service delivery perspective and they form the basis for a number of the key environmental issues identified in this study.

The Constitution of South Africa provides for a fundamental right for all of an environment that is not harmful to one's health. Two physical elements that are essential for social health and well-being are clean air and clean water. Both of these are presently threatened in the region. Whilst economic activity and growth is important, the impact of various commercial and public service activities on water resources and air quality is clearly evident in the outcomes of this study. Achieving a balance between such activities and a healthy environment requires that infrastructure such as waste water treatment works be maintained at a high level of functionality and that the management of such facilities is of requisite standard.

Water is an essential requirement for socio-economic and environmental wellbeing. In almost all of the specialist studies undertaken for this project, water has been identified as a critical component.

Closely aligned with the water issue is appropriate management of the ADMs key water producing areas. This is a cross cutting issue because of the importance of these areas for agriculture, biodiversity, tourism and water provision, and because of the pressure on these areas from a variety of factors.

Municipal capacity has been identified by a number of the specialist studies as being an important factor in driving deterioration or hindering improvements in the state of the environment in the ADM. This includes both capacity with respect to both financial and human resources. It also includes political will, which sits behind both of these elements and additionally drives the determination to deal with non-compliance with regulatory tools and processes.

4. STRATEGIC ENVIRONMENTAL ASSESSMENT

The purpose of the strategic assessment is to identify and describe the key environmental sustainability issues, and describe the Desired Future State (DFS) for the District. This was achieved through the sustainability framework. This SEA is based on the features that were analysed for the status quo and is broken down into two categories i.e. environmental sensitivity features (where development could potentially damage the environment) and development constraint features (where the environment constrains development).

4.1 Key Sustainability Issues

ENVIRONMENTAL SENSITIVITY

Agricultural Resources

- An emphasis is placed on the importance of agriculture within the district for its growth potential however its contribution to the economy is currently low.
- Agricultural challenges are further exacerbated by:
 - the loss of agricultural land to different land uses and to alien plants,
 - by irrigation water limitations including availability and quality and
 - by governance issues surrounding land restitution.

Air Quality

- There is perception that air quality in certain parts of the District has been compromised, particularly by industry.
- Limited existing data shows that standards have not been exceeded and that a high proportion of emissions are attributable to vehicles.
- There is a lack of robust monitoring data to confirm perceived poor air quality.

Flood Zones

- Large areas have been transformed to urban and peri-urban landscapes. A significant area of flood zone in the District has also been cultivated. Sand mining and brick making also reduce the ecological integrity of these areas
- Increased hardened surfaces and loss of infiltration in these areas increases flood volumes and intensity downstream.

- Climate change is expected to result in increased flooding frequency and intensity
- Development on floodplains mean infrastructure and lives are placed at risk both at the site concerned and downstream

Governance

- Governance is the most important strategic factor under consideration and failings in this arena have far reaching consequences.
- Financial, technical, human and infrastructural capacity to fulfil a number of mandates across various sectors in the District is understood to be poor (e.g. water infrastructure, WWTWs, heritage, air quality monitoring etc.). In some cases this also includes the lack of political will.
- Inter-departmental cooperation is critical in managing the environment. The relationship in particular between the Department of Minerals and Energy and all other departments is failing. This is considered a critical failing due to the importance of the mining sector in the District and the impact active and abandoned mines are having on the environment.
- Dual authority arrangement (Democratic and Traditional) results in problems dealing with development planning, service delivery and the regulation of land use activities.

Heritage Resources

- Heritage sites are poorly documented and not adequately protected or managed across the District. No formal assessment of urban areas has been carried out.
- Heritage resources have been identified as an important contributor to economic growth through the development of tourism opportunities, however governance and responsibility for heritage resources has not been adequately organised to achieve this goal.

Terrestrial Biodiversity

- Low levels of biodiversity protection in the District limits the ability to meet conservation targets, secure other key services such as water production and grazing and to benefit from associated tourism and recreational economic opportunities.
- Critical biodiversity areas (CBAs) found in the highlands of the district are generally irreplaceable CBAs and overlap with high water production areas. These areas are under threat from alien plant expansion, mining and poor rangeland management.
- CBAs in the lowlands are typically optimal CBAs and are highly fragmented by other land uses such as urbanisation and agriculture. These areas are under threat from unplanned and unregulated urban expansion and small scale agriculture.

Water Quality

- Water quality in the District has been compromised through pollution from mining, industrial, domestic and agricultural sources.
- Abandoned mines are sources of acid mine drainage and responsibility for their remediation is not understood or assigned.
- Water availability is a key constraint in the District and poor water quality constrains the resource further, increasing vulnerability of communities and limiting development potential.
- There are concerns around the quality of accessible groundwater resources particularly in mining areas and areas with shallow ground water tables.
- Monitoring data is insufficient to adequately describe water quality issues in many of the District's surface and groundwater resources.

Water Quantity

- Water supply in the area is under extreme pressure and demand currently effectively equals the available supply. This places limitations on economic growth prospects.
- Climate change is likely to increase rainfall uncertainty and increase drought and flood frequency.
- Strategic water source areas (SWSA) are present in the high lying areas of the district and correlate with CBAs and high water production zones. They are almost completely unprotected and under threat from land degradation, alien invasive plants and mining.
- Priority supply catchments are under threat from land degradation including alien plants, poor land management and mining.
- The status of groundwater resources in the District is inconclusive due to a lack of monitoring data.

Aquatic Ecology

- Numerous rivers in the ADM are important for achieving targets for the conservation of aquatic ecosystems.
- These systems are under threat from poor water quality and degradation of catchments.
- Demand for water to satisfy domestic and economic growth necessitates the development of water resource infrastructure such as dams. Dams are key impactors of aquatic ecological integrity.
- Although the ecological reserve for rivers in the uThukela basin has been established, this was undertaken in 2004. The Classification of water resources in the uThukela Basin has not yet been undertaken.

Wetlands

- Wetlands provide critical services including water purification, habitat for important species and flow / flood regulation, but little is known regarding the condition of these resources in the District.
- The vast majority of wetlands occur on private land and very few are located in formally protected areas.
- Wetland loss and degradation through unregulated activities (informal sand and coal mining), mining, agriculture and unplanned housing expansion has reduced the capacity of these systems to supply services

DEVELOPMENT CONSTRAINTS

Geotechnical conditions

- Development on steep slopes carries with it an increased risk of soil erosion which poses a threat to terrestrial and aquatic environments and threatens water quality downstream.
- There is a potential clash between mining related geotechnical constraints i.e. undermining and the expansion of the urban edge in the Madadeni / Osizweni area.
- The constraints imposed by geotechnical consideration relate directly to the cost of constructing in these zones and the risk of damage. For example, it is more costly to construct on steep slopes and unstable geology.

Groundwater conditions

- Shallow groundwater tables occur over large areas of ADM. This is problematic from two perspectives.
 1. Shallow groundwater tables impose significant constraints on construction activities as drainage is poor and excavations and foundations are readily flooded.

2. Activities which involve working with hazardous materials or materials which could potentially contaminate groundwater resources cannot be undertaken in areas with shallow groundwater without significant mitigation measures.

Infrastructure

- Waste water infrastructural operation is not optimal and resulting in non-compliance with discharge standards and compromised water quality which impacts the District socio-economically.
- WWTWs are at capacity and often exceed this through storm water intrusion resulting in water resource contamination.
- Investment in maintenance and development of water infrastructure is rapidly declining as opposed to keeping pace with demand from increasing urbanisation.
- Infrastructure is ageing and functionality is declining, impacting on economic activity.

4.2 Desired Future State

Sustainability Framework

The assessment framework is designed in line with the sustainability model (Figure 4.1) to show the linkages between the various elements (natural, social economic, and governance). The framework has been applied in the identification and assessment of environmental sustainability issues. The various elements of the framework are described below.

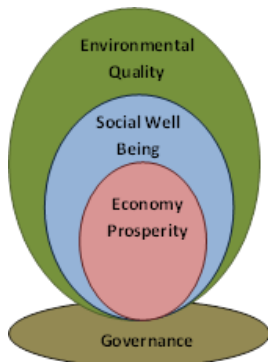


Figure 4: Sustainability model in South Africa

Environmental Quality

The various natural systems and features in the study area are analysed in terms of the following factors to understand the environmental quality associated with the system.

a. Overview of the System

Summary of the location, type and extent of the system within the study area.

b. Ecosystem Services Generated and Demand for the Services

The range of ES generated by the systems is described with an indication of the level of demand - which uses it and how important is the service to sustaining their livelihood, wellbeing or economic activity.

c. Present Ecological State and Level/Quality of Supply of Ecosystem Services

The PES determines the level and quality of supply of the services demanded by users. The PES is described in terms of legal standards and ecological thresholds and the implications for the dependant socio-economic systems.

Social Well-Being

The consequences of the environmental quality are analysed in terms of the social wellbeing.

Economic Prosperity

The implications of the environmental quality for social well-being are analysed.

Governance and Management

Lack of, or ineffective governance is often a contributing factor to sustainability issues and is documented for each of the natural systems defined. Environmental governance is a collective responsibility. It is necessary to understand the stakeholders related to environmental issues including those:

- Responsible for the state/issue,
- Affected/impacted by the state issue,
- Responsible for addressing the situation.

This includes government agencies responsible for administering relevant legislation, and other role-players such as specialist or non-profit organisations with skills and capacity to deal with technical aspects e.g. wetland rehabilitation or environmental education.

Also important is an understanding of the forums and governance structures that exist to deal with issues related to specific aspects of environmental management. Information has also been included regarding management activities under the governance section. Management entails aspects including but not limited to monitoring, co-ordination of role-players, and actions (rehabilitation, education, etc.).

Drivers of Environmental Quality

Impacts and threats to ecosystems that play important roles in supporting the social and economic components of the environment also represent environmental issues. These drivers of change to natural systems need to be managed if an issue is to be addressed.

AGRICULTURAL RESOURCES

Environmental Component	Agricultural Resources	
Strategic Issues	<p>An emphasis is placed on the importance of agriculture within the district for its growth potential however its contribution to the economy is currently low. Agricultural challenges are further exacerbated by:</p> <ul style="list-style-type: none"> • the loss of agricultural land to different land uses and to alien plants, • by water limitations including availability and quality and • by governance issues surrounding land restitution. 	
Sustainability Objective (SO)	<p>Secure the existing and potential value of the Agricultural Sector to the economy and to national food security.</p> <p>Motivation: Agriculture is seen as a key economic growth sector in the District and Nationally is important for food security. Agricultural resources are critical, non-renewable resources.</p> <p>Implications for Development:</p> <ul style="list-style-type: none"> • <i>Future Developments:</i> Future development must not result in the loss or degradation of productive land for primary production. Land-use that is sensitive to impacts from secondary agricultural processing or intensive production activities should be located at a distance from such enterprises in order to limit impact on existing operations and/or expansion. • <i>Existing Land-use:</i> Optimise productive land and secondary activities to maximize the economic potential of the sector. 	
SO Criteria	SO Indicators	SO Targets
High value agricultural land	Zoning of high potential agricultural land (both areas with potential but not yet used, and areas currently under production). This should include buffer areas to avoid conflict between agriculture and competing land-uses.	100% of high potential land that is presently undeveloped should be zoned for agriculture
	Optimizing agricultural potential.	100% of the available productive area utilised for agricultural purposes.

AIR QUALITY

Environmental Component	Air Quality
Strategic Issues	<p>There is perception that air quality in certain parts of the District has been compromised, particularly by industry.</p> <p>Limited existing data shows that standards have not been exceeded and that a high proportion of emissions are attributable to vehicles.</p> <p>There is a lack of robust monitoring data to confirm perceived poor air quality.</p>
Sustainability Objective (SO)	Maintain or improve present air quality and improve the knowledge base

	by implementing an AQ monitoring programme.	
	<p>Motivation: The present state of air quality in the District cannot be accurately characterised without adequate monitoring data. A precautionary approach (maintain or improve) should therefore be adopted with respect to development and at the very least, the present AQ situation be maintained.</p> <p>Implications for Development: Ensure that both current and future development adhere to air quality standards.</p>	
SO Criteria	SO Indicators	SO Targets
Air Quality	Monitoring data collected	Target - A robust ongoing monitoring programme is in place for the District.
	SANS 1929:2005 guideline ambient air quality: Sulphur Dioxide (SO ₂), Nitrogen Dioxide (NO ₂), Carbon Monoxide (CO), Particulate Matter (PM ₁₀), Ozone (O ₃), Lead (Pb), Benzene (C ₆ H ₆).	Target – Once present AQ is defined, national standards to be met (to be defined through monitoring programme as current levels not defined).

HERITAGE RESOURCES

Environmental Component	Heritage Resources
Strategic Issues	<p>Heritage sites are poorly documented and not adequately protected or managed across the District. No formal assessment of urban areas has been carried out.</p> <p>Heritage resources have been identified as an important contributor to economic growth through the development of tourism opportunities, however governance and responsibility for heritage resources has not been adequately organised to achieve this goal.</p>
Sustainability Objective (SO)	<p>To adequately identify, protect and benefit from the District's heritage resources and to ensure their long term management and marketability.</p> <p>Motivation: The heritage resources of ADM are a major element of the character and history of the District. They are also an important economic development opportunity that has been identified in all the District's development plans. There are a number of heritage resources within the district that can be monetised in a manner that boosts the tourism sector. These tourism opportunities need to be identified to determine the most effective method of sustainably preserving these heritage resources.</p> <p>Implications for Development: Future developments will need to adhere to heritage protection legislation and adequately take heritage resources into account when developing a property, ensuring appropriate identification and protection of these resources.</p> <p>Existing developments may need to amend the management of their</p>

	properties to take the protection of identified heritage resources into account.	
SO Criteria	SO Indicators	SO Targets
Heritage resources	Heritage governance	A heritage resources champion is identified and activities relating to the identification and management of these resources are built into their job key performance areas.

FLOOD ZONES

Environmental Component	Flood zones	
Strategic Issues	<p>Large areas have been transformed to urban and peri-urban landscapes. A significant area of flood zone in the District has also been cultivated. Sand mining and brick making also reduce the ecological integrity of these areas</p> <p>Increased hardened surfaces and loss of infiltration in these areas increases flood volumes and intensity downstream.</p> <p>Climate change is expected to result in increased flooding frequency and intensity</p> <p>Development on floodplains mean infrastructure and lives are placed at risk both at the site concerned and downstream</p>	
Sustainability Objective (SO)	<p>To protect people and infrastructure from flood hazards and secure the ecosystem service value of floodplains (flood regulation, water quality and habitat).</p> <p>Motivation: Climate change modelling shows that flooding in Amajuba is likely to become more intense and more frequent. Lives and infrastructure are placed at risk when spatially coincided with flood risk zones. Flood plain areas are ecologically significant as they provide habitat to certain species, reduce erosion along river systems or streams and temporary hold flood waters thereby reducing flood peaks.</p> <p>Implications for Development: Spatial development tools will be essential in ensuring that development does not take place in flood zones. Compliance and governance will be vital in enforcing this.</p> <p>Existing land use: There is an increase in urban and peri-urban developments in flood zones which is transforming the land from being vegetated to solid surfaces, which increases surface run-off. Sand mining is another key issue as it occurs in flood zones.</p>	
SO Criteria	SO Indicators	SO Targets
Development on floodable areas	Change in area of development on floodable areas	0% increase on previous year

TERRESTRIAL BIODIVERSITY

Environmental Component		Terrestrial Biodiversity - Species and Ecological Process	
Strategic Issues		<p>Low levels of biodiversity protection in the District limits the ability to meet conservation targets, secure other key services such as water production and grazing and to benefit from associated tourism and recreational economic opportunities.</p> <p>Critical biodiversity areas (CBAs) found in the highlands of the district are generally irreplaceable CBAs and overlap with high water production areas. These areas are under threat from alien plant expansion, mining and poor rangeland management.</p> <p>CBAs in the lowlands are typically optimal CBAs and are highly fragmented by other land uses such as urbanisation and agriculture. These areas are under threat from unplanned and unregulated urban expansion and small scale agriculture.</p>	
Sustainability Objective (SO)		<p>Secure formal or stewardship agreement level protection of critical biodiversity areas required to meet provincial targets and ensure appropriate management of these and ecological support areas.</p> <p>Motivation: Conservation of biodiversity is a national and provincial priority and the municipality has a responsibility to contribute to meeting provincial targets. Protection of biodiversity also yields critical ecosystem services including water production, grazing and tourism opportunities.</p> <p>Implications for Development: Land-use on areas with high biodiversity value needs to be complimentary to the protection and management objectives of the relevant biodiversity (habitat and species) to ensure targets are met. Such land needs to be secured for biodiversity conservation purposes via an appropriate mechanism such as those offered under the stewardship programme.</p> <p>Existing economic activity: Identify and implement management actions to sustain conservation worthy features and species, and manage accordingly.</p>	
SO Criteria		SO Indicators	SO Targets
Protection	Status	of	
Biodiversity			
		% of CBAs secured for achieving biodiversity targets and processes (corridors) under formal protection or biodiversity stewardship agreements.	Aim to secure 100% of irreplaceable CBAs

WATER RESOURCES-QUANTITY

Environmental Component		Quantity of Water from Water Resources - Rivers, Streams, Dams, Groundwater	
Strategic Issues		<p>Water supply in the area is under extreme pressure and demand currently effectively equals the available supply. This places limitations on economic growth prospects.</p> <p>Climate change is likely to increase rainfall uncertainty and increase drought and flood frequency</p>	

	<p>Priority supply catchments are under threat from land degradation including alien plants, poor land management and mining.</p> <p>The status of groundwater resources in the District is inconclusive due to a lack of monitoring data.</p>	
Sustainability Objective (SO)	<p>Improve water production security through appropriate catchment management measures and protection to ensure best possible hydrological health of catchments and long term sustained output of water.</p> <p>Motivation: Water is a critical resource for meeting basic human needs and without which the District’s economic growth prospects are limited.</p> <p>Implications for Development: Development in key water supply catchments must be strictly controlled to restrict any negative impacts of development on water production potential and hydrological functioning. Activities which impact on water quantity and quality in key catchments should be avoided.</p>	
SO Criteria	SO Indicators	SO Targets
Catchment condition and management	Area of land covered by unmanaged woody alien invasive species	Target – 0%
	Area of strategic water source areas covered by a valid catchment management plan.	Target – 100%
Catchment Protection	Area of critical catchments under formal protection or stewardship agreements.	Target – 30%

WATER RESOURCES-QUALITY

Environmental Component	Water Quality Water Resources - Rivers, Streams, Dams, Groundwater
Strategic Issues	<p>Water quality in the District has been compromised through pollution from mining, industrial, domestic and agricultural sources.</p> <p>Abandoned mines are sources of acid mine drainage and mine affected water and responsibility for their remediation is not completely understood or assigned.</p> <p>Water availability is a key constraint in the District and poor water quality constrains the resource further, increasing vulnerability of communities and limiting development potential.</p> <p>There are concerns around the quality of accessible groundwater resources particularly in mining areas and areas with shallow ground water tables.</p> <p>Monitoring data is insufficient to adequately describe water quality issues in many of the District’s surface and groundwater resources.</p>

Sustainability Objective (SO)	<p>Understand District water quality problems better through improved monitoring and improve water quality to levels which sustain human and economic users/uses and ecological functioning.</p> <p>Motivation: Poor water quality increases the vulnerability of users and limits the economic growth potential of the District.</p> <p>Implications for Development: Existing land use: Need to achieve 100% compliance with established monitoring operational objectives and > 90% compliance with established standards 100% of the time and 100% compliance > 90% of the time. Historical activities: Detailed monitoring programmes must be established to determine the extent and effect of acid mine drainage and mine affected water emanating from active and abandoned mines. Future Developments: Developments which are likely to compromise the quality of water in critical areas must be avoided. Any development proposed to discharge to the environment must comply with water use licencing requirements. Water use licencing must aim to improve water quality in critical zones through acknowledgement of the location of discharges within such zones and appropriately strict conditions designed with zero degradation of the resource as their objective.</p>	
SO Criteria	SO Indicators	SO Targets
Water quality determinands	Raw water monitoring data - South African Water Quality Guidelines for irrigation, aquatic ecosystems and recreational use	Target – SAWQG target water quality range for pH, TDS, soluble reactive phosphate and Faecal Coliforms achieved at all monitoring sites.
Compliance with legal requirements	Water use license compliance	Target – 100% compliance as required by license
	Water use registration and reporting	Target – 100% registration of government water users and reporting compliant with IRIS requirements.

WATER RESOURCES - AQUATIC ECOSYSTEMS

Environmental Component	Aquatic ecosystems
Strategic Issues	<p>Numerous rivers in the ADM are important for achieving targets for the conservation of aquatic ecosystems.</p> <p>These systems are under threat from poor water quality and degradation of catchments.</p> <p>Demand for water to satisfy domestic and economic growth necessitates the development of water resource infrastructure such as dams. Dams are key impactors of aquatic ecological integrity.</p> <p>Although the ecological reserve for rivers in the uThukela basin has been established, this was undertaken in 2004. The Classification of water</p>

	resources in the uThukela Basin has not yet been undertaken.	
Sustainability Objective (SO)	<p>Secure the quality, quantity and timing of ecologically important flows in the rivers of the ADM and implement management measures to protect their ecological integrity.</p> <p>Motivation: Aquatic biodiversity is important for securing the suite of ecosystem services provided by a healthy river. Aquatic biodiversity is included in the suite of biodiversity that South Africa is legally obliged to protect through international treaties.</p> <p>Implications for Development: Existing activities: Existing activities must comply with water use licence requirements and must ensure that impacts on water resources are minimalised (e.g. sedimentation) Future Developments: Future developments will need to comply with RQOs for quality (discharges) and quantity (abstractions). Applications for future development must show how they will contribute to improved state of natural systems.</p>	
SO Criteria	SO Indicators	SO Targets
Ecological Health of Natural Systems	Percentage of time successfully meeting the ecological reserve or hydrological RQO ⁶ (flow).	Target – 100%
	Achievement of RQOs for habitat and biota (to be determined) based on Present Ecological State of River health monitoring sites	Target – 100%

WETLANDS

Environmental Component	Wetlands
Strategic Issues	<p>Wetlands provide critical services including water purification, habitat for important species and flow / flood regulation, but little is known regarding the condition of these resources in the District.</p> <p>The vast majority of wetlands occur on private land and very few are located in formally protected areas.</p> <p>Wetland loss and degradation through unregulated activities (informal sand and coal mining), mining, agriculture and unplanned housing expansion has reduced the capacity of these systems to supply services</p>
Sustainability Objective (SO)	<p>Secure the long term functioning of wetland systems through accurate mapping, condition assessment and application of wetland buffer areas, and implementation of regulatory instruments.</p> <p>Motivation: Given their role in managing water quality issue and providing habitat for key species, the functional status of all wetland in the area has to be optimized and protected.</p>

⁶ Classification and RQO determination for uThukela Catchment still to be undertaken.

	<p>Implications for Development: Net gain of wetland functions through rehabilitation of existing systems as a condition for future development applications and defined management plan to maintain these systems. Improved functional area through rehabilitation of degraded systems and associated management mechanisms (buffers) and plans.</p> <p>Existing land use: Ensure that wetlands are kept function at the most optimal level possible</p>	
SO Criteria	SO Indicators	SO Targets
Wetland protection and Habitat Value	Wetland functional area lost in the last year to development (excluding areas lost with appropriate offsets implemented).	0Ha
	Specific wetland systems supporting high value biodiversity (NFEPA) should be protected through stewardship or other management agreements.	100%

CONSTRAINT FEATURES – GEOTECHNICAL CONDITIONS

Environmental Component	Geotechnical constraints	
Strategic Issues	<p>The geotechnical specialist study delineated seven categories of constraint zone based on geotechnical conditions based on a combined analysis of Geology, Slope and Land Type. The constraints imposed by geotechnical consideration relate directly to the cost of constructing in these zones and the risk of damage. For example, it is more costly to construct on steep slopes and unstable geology.</p> <p>Development on steep slopes carries with it an increased risk of soil erosion which poses a threat to terrestrial and aquatic environments and threatens water quality downstream.</p> <p>This work also identifies the potential clash between mining related geotechnical constraints i.e. undermining and the expansion of the urban edge in the Madadeni / Osizweni area.</p>	
Sustainability Objective (SO)	<p><i>To protect the developed and natural environments by avoiding developments in areas where geotechnical constraints will result in heightened risk to the development and to the natural environment.</i></p>	
SO Criteria	SO Indicators	SO Targets
Development in geotechnical risk areas.	Area developed in very high constraint areas without an adequate geotechnical assessment and appropriate mitigation	0 Ha

CONSTRAINT FEATURES – GROUNDWATER CONDITIONS

Environmental Component	Geotechnical constraints	
Strategic Issues	Shallow groundwater tables occur over large areas of ADM. This is problematic from two perspectives.	

	<ol style="list-style-type: none"> 1. Shallow groundwater tables impose significant constraints on construction activities as drainage is poor and excavations and foundations are readily flooded. Certain activities cannot be undertaken due to the interaction of subsurface structures with groundwater. 2. Activities which involve working with hazardous materials or materials which could potentially contaminate groundwater resources cannot be undertaken in areas with shallow groundwater without significant mitigation measures. 	
Sustainability Objective (SO)	<i>Protect potential development and groundwater resources through directing development to appropriate locations</i>	
SO Criteria	SO Indicators	SO Targets
Development in groundwater risk areas.	Area developed in very high constraint areas without an adequate geohydrological assessment and appropriate mitigation	0%

CONSTRAINT FEATURES – INFRASTRUCTURE

Environmental Component	Infrastructure
Strategic Issues	<p>Infrastructure is unevenly distributed across the District (though this is expected). The declining condition of much of this infrastructure additionally places a constraint on development and puts people and the environment at risk.</p> <p>Waste water infrastructure operation is not optimal and resulting in non-compliance with discharge standards and compromised water quality which impacts the District socio-economically. Many are at capacity and often exceed this through storm water intrusion resulting in water resource contamination.</p> <p>Investment in maintenance and development of water infrastructure is rapidly declining as opposed to keeping pace with demand from increasing urbanisation. There is presently insufficient water available to support economic growth such as the development of additional irrigated agriculture, and further water resources infrastructure development is required.</p> <p>Road and water infrastructure is ageing and condition and functionality is declining, impacting on economic activity. The solid waste facilities in the District are either un-registered or are reaching capacity.</p>
Sustainability Objective (SO)	<p>To develop infrastructural capacity within the municipality such as water treatment works, storm water infrastructure and transport and electrical infrastructure that is in compliance with national standards without comprising the social and natural environment.</p> <p>Motivation: Proper functioning municipal infrastructure facilitates the collection and use of nature's contribution to people. This supports economic growth and</p>

	development and will result in better service delivery, a healthier environment and less vulnerable communities.	
	<p>Implications for Development: Implications for development are largely positive as functioning and capacitated infrastructure facilitates economic growth, job creation and sustainable communities.</p>	
SO Criteria	SO Indicators	SO Targets
Infrastructure management, maintenance and development.	Investment in water, sanitation and road infrastructure.	Amounts budgeted for the development and maintenance of infrastructure should at least reflect an increase year on year.
	Compliance with registration, operational and reporting requirements.	All facilities (e.g. solid waste, WWTWs etc.) must be registered with the relevant authority and must be compliant with operational and reporting requirements.

NON-SPATIAL FEATURES – GOVERNANCE

Environmental Component	Governance	
Strategic Issues	<p>Governance is the most important strategic non-spatial (not map-able) factor under consideration and failings in this arena have far reaching consequences.</p> <p>Financial, technical, human and infrastructural capacity to fulfil a number of mandates across various sectors in the District is understood to be poor (e.g. water infrastructure, WWTWs, heritage, air quality monitoring etc.). In some cases this also includes the lack of political will.</p> <p>Dual authority arrangement (Democratic and Traditional) results in problems dealing with development planning, service delivery and the regulation of land use activities.</p> <p>Inter-departmental cooperation is critical in managing the environment. The relationship in particular between the Department of Minerals and Energy and all other departments is failing. This is considered a critical failing due to the importance of the mining sector in the District and the impact active and abandoned mines are having on the environment.</p>	
Sustainability Objective (SO)	<i>Improve the management of the environment through building capacity within and cooperation between government and private sector institutions</i>	
SO Criteria	SO Indicators	SO Targets
Inter-departmental cooperation	<p>Level of cooperation is difficult to measure. A softer indicator of movement towards sustainability objective is thus chosen:</p> <ol style="list-style-type: none"> 1. State of relationship with DME, KZN DARD, DWS and other key environmentally important departments 	Good

Human capacity to undertake critical mandates	Number of vacant positions in critical sectors (e.g. WWTW, District Planning and Development Services Department – Environment Section etc.)	Zero
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The strategic assessment has met the need of an EMF to inform environmental management by identifying the major environmental issues defined as one or more of the following situations:

- Where natural assets within the District that support social wellbeing and economic sectors are under threat and require appropriate protection and management,
- Where the capacity of natural systems that supply ecosystem services under high demand from society environmental have been exceeded and are therefore negatively impacting social well-being and or economic activity i.e. environmental quality has been compromised.
- Where legal standards and or ecological thresholds are not being met.

The Strategic Environmental Management Plan (SEMP) that will be developed as a key output of the final EMF phase will provide the ‘How To’ part of the sustainability puzzle by describing programmes and projects and actions required to take the Municipality from the present to the desired future state.

5. SENSITIVITY ZONES

The EMF has defined sensitivity or constraint zones for each of the features included in the study. These are represented in the following sections.

5.1 Agricultural Resources

Sensitivity Zones

The thresholds defining the sensitivity zones for agricultural resources are defined according to the following hierarchy and summarised in Table 4. It is important to note that land in lower Land Potential Categories may be so categorised due to low rainfall and may still be very productive if irrigation is available and developed.

- i. **Existing cultivated areas:** The highest sensitivity class is reserved for existing cultivation activities as cultivatable land is a particularly scarce resource and it is considered most critical to protect existing agricultural investment.
- ii. **Uncultivated land with high potential:** Uncultivated land inland Potential Category A or Category B is reflected as being of high sensitivity. Given that the majority of high potential cultivatable land is already under production, the majority of the land in this category is therefore being assessed as high potential from a grazing perspective.
- iii. **Uncultivated land with moderate potential:** Uncultivated land in Land Potential Category C is reflected as being of moderate sensitivity.
- iv. **Uncultivated land with low potential:** Uncultivated land in Land Potential Category D and Category E is reflected as being of low sensitivity.

- v. **Unavailable Areas:** Areas that are unavailable for agriculture including transformed land (urban areas, roads etc.), water bodies and protected areas are considered to contribute almost nothing to the agricultural resource base and are therefore considered very low sensitivity.

Table 4: Sensitivity categories applied to Agricultural Resources

Sensitivity feature	Sensitivity Level	Sensitivity Score
Horticulture	Very High Sensitivity	5
Pivot Irrigation	Very High Sensitivity	5
Rainfed Annual Crop Cultivation / Planted Pastures	Very High Sensitivity	5
Subsistence Farming	Very High Sensitivity	5
Small Holdings	Very High Sensitivity	5
Uncultivated High Potential Land CATEGORY A	High Sensitivity	4
Uncultivated High Potential Land CATEGORY B	High Sensitivity	4
Uncultivated High Potential Land CATEGORY C	Moderate Sensitivity	3
Uncultivated High Potential Land CATEGORY D	Low Sensitivity	2
Uncultivated High Potential Land CATEGORY E	Low Sensitivity	2
Old Fields	Low Sensitivity	2
Transformed land	Very Low Sensitivity	1
Water bodies	Very Low Sensitivity	1
Protected areas	Very Low Sensitivity	1

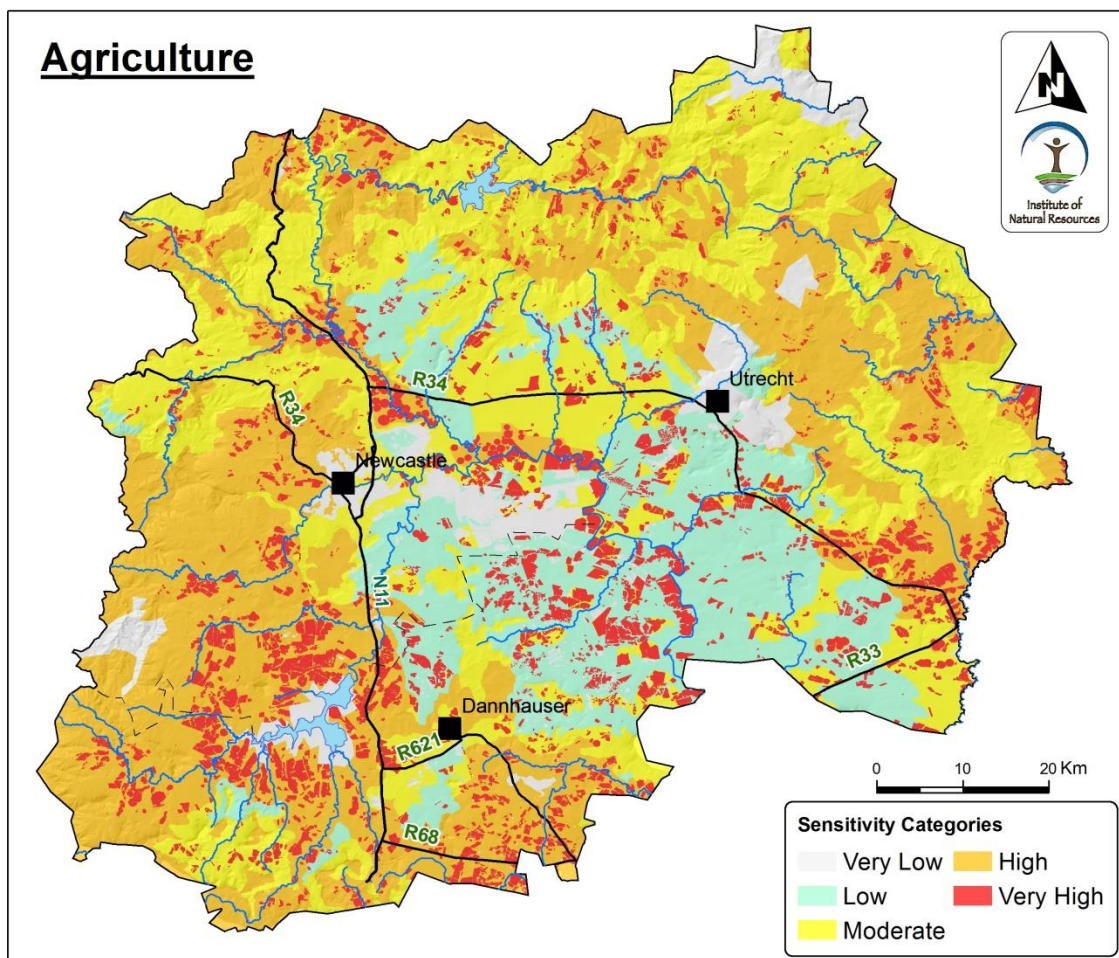


Figure 5: Agricultural resources sensitivity zones

5.2 Air Quality

Sensitivity Zones

Air quality sensitivity zones have been delineated using available emissions data supplied by registered emitters. This has been combined with road density data to accommodate the finding that vehicular emissions are a significant contributor to air quality problems. The road density data are used since there is no vehicular count or emissions data available. The following sensitivity areas have been defined:

- i. **High industrial impact areas and high road density:** These areas are considered to be the most highly impacted areas and thus are the most sensitive from the perspective of evaluating applications for additional development. They are categorised as having very high sensitivity, though they should be more realistically viewed as imposing a very high level of constraint.
- ii. **High industrial impact and low road density:** These areas are considered to be the most highly industrially impacted areas and thus are also considered very high sensitivity
- iii. **Moderate industrial impact and high road density:** The evidence provided by EDTEA monitoring data shows vehicular emissions are highly significant in air quality concerns in the District. For this reason, areas with high road density coupled with moderate industrial impacts are also considered very high sensitivity.

- iv. **Low industrial impact and high road density:** The evidence provided by EDTEA monitoring data shows vehicular emissions are highly significant in air quality concerns in the District. For this reason, areas with high road density coupled with low industrial impacts are still considered moderately sensitive.
- v. **Moderate industrial impact and low road density:** Industrial impacts in such areas are likely to have dispersed to a moderate level of impact.
- vi. **High road density:** Areas beyond the industrial impact zone are likely to only be significantly impacted by vehicular emissions. High road densities are therefore likely to result in a moderate level of sensitivity.
- vii. **Low Impact industrial and low road density:** Air quality impacts in these areas are likely to be of low significance and thus are considered of low sensitivity.
- viii. **Low road density:** Areas outside of the industrial impact area and additionally with low road densities are the least impacted areas in the District and are considered to be of low sensitivity.

Table 5: Air quality sensitivity zones

Sensitivity feature	Sensitivity Level	Sensitivity Score
High impact industrial and high road density	Very High Sensitivity	5
Moderate impact industrial and high road density	Very High Sensitivity	5
High impact industrial and low road density	Very High Sensitivity	5
Low Impact industrial and high road density	Moderate Sensitivity	3
Moderate impact industrial and low road density	Moderate Sensitivity	3
High road density	Moderate Sensitivity	3
Low Impact industrial and low road density	Low Sensitivity	2
Low road density	Very Low Sensitivity	1

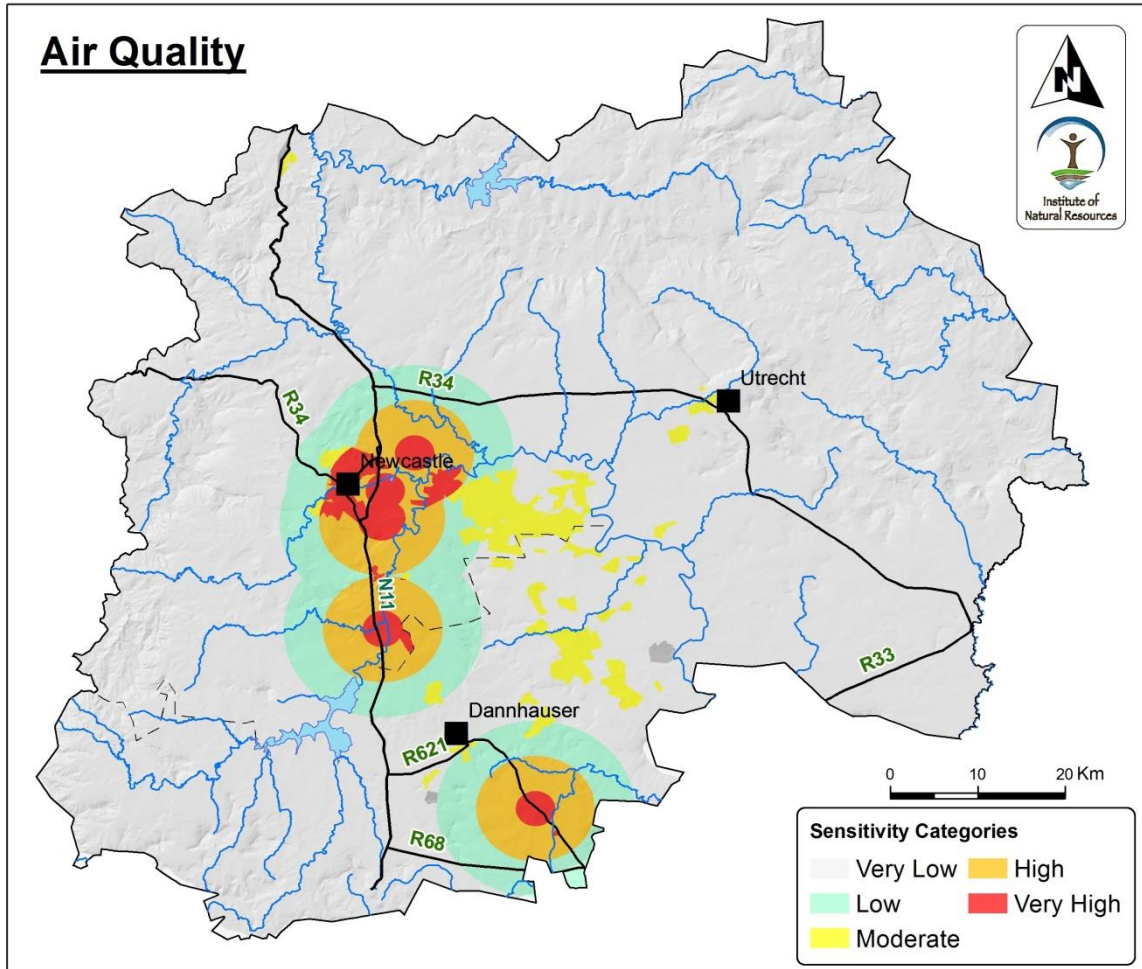


Figure 6: Air Quality sensitivity zones

5.3 Flood Zones

Sensitivity Zones

Flood zones have been demarcated and areas within these zones are categorised as being very highly sensitive. All other areas are considered to be of very low sensitivity.

Table 5.6 Flood Zone sensitivity categories

Sensitivity feature	Sensitivity Level	Sensitivity Score
All areas within demarcated flood zones	Very High Sensitivity	5
All other areas	Very Low Sensitivity	1

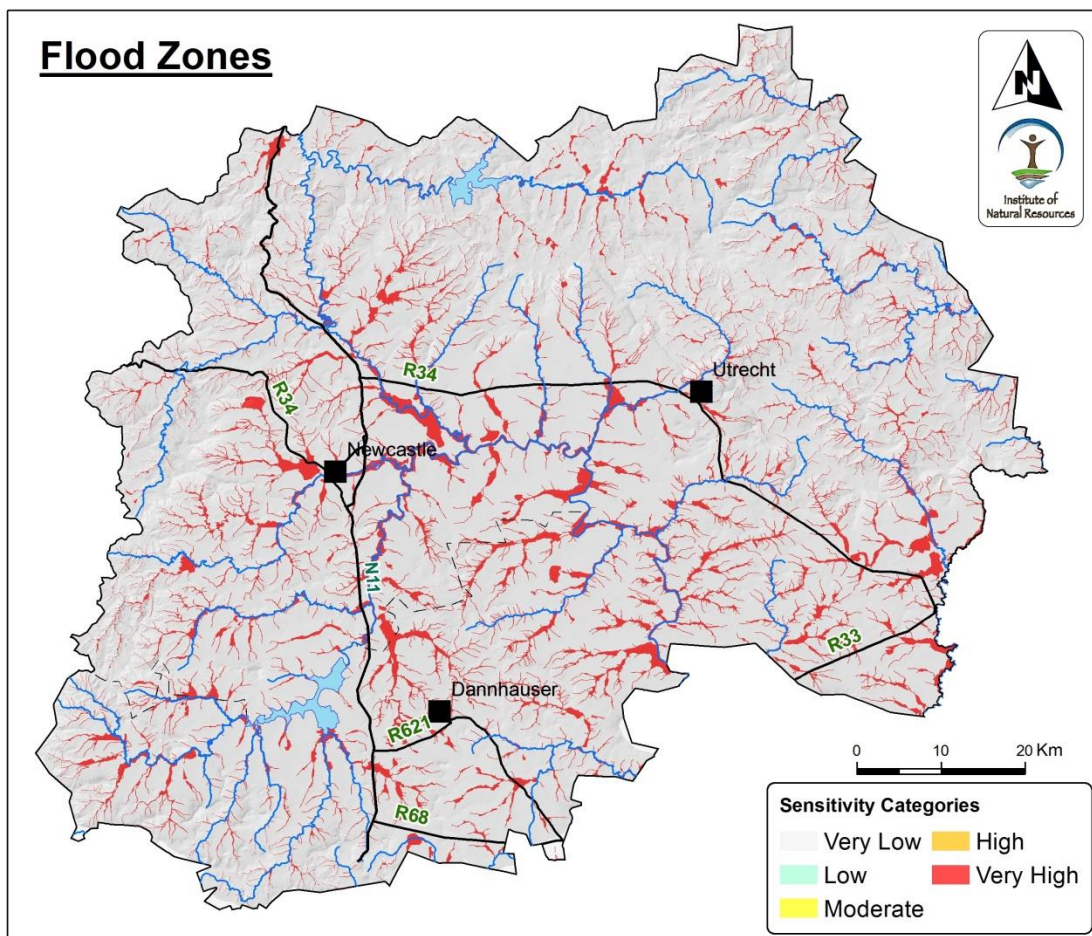


Figure 7: Flood zone sensitivity zones

5.4 Heritage Resources

Sensitivity Zones

Heritage Sensitivity Zones have been defined according to the variety of specific heritage features encountered in the District. The battlefields located in the District are a key element of the District's history and represent a major economic development opportunity. They are therefore regarded as very highly sensitive. Although other SARIS listed National and Provincial Grades I and II Heritage Sites, are not as potentially marketable, they are important on a national level and thus also considered very highly sensitive.

Sites of National Heritage value that are known of but that are not registered on SARIS are considered as one step lower i.e. highly sensitive, only because they do not carry the same level of protections as those sites listed on the national database. These sites are nonetheless of great heritage value.

There are sites that have been proposed by this EMF as being of value, particularly those associated with the anti-colonial / anti-apartheid movements. Recognition of these sites would restore a level of balance in the representation of various events of history as presently, the colonial war related sites dominate the Districts collection. These sites are at this stage have no legislated status and are regarded as moderately sensitive.

Table 5.7 Heritage Resources

Sensitivity feature	Sensitivity Level	Sensitivity Score
Battlefield and 500m buffer	Very High Sensitivity	5
SARIS Site	Very High Sensitivity	5
Non-SARIS Site	High Sensitivity	4
Proposed sites	Moderate Sensitivity	3

* All buffers include a 25m allowance for the feature itself

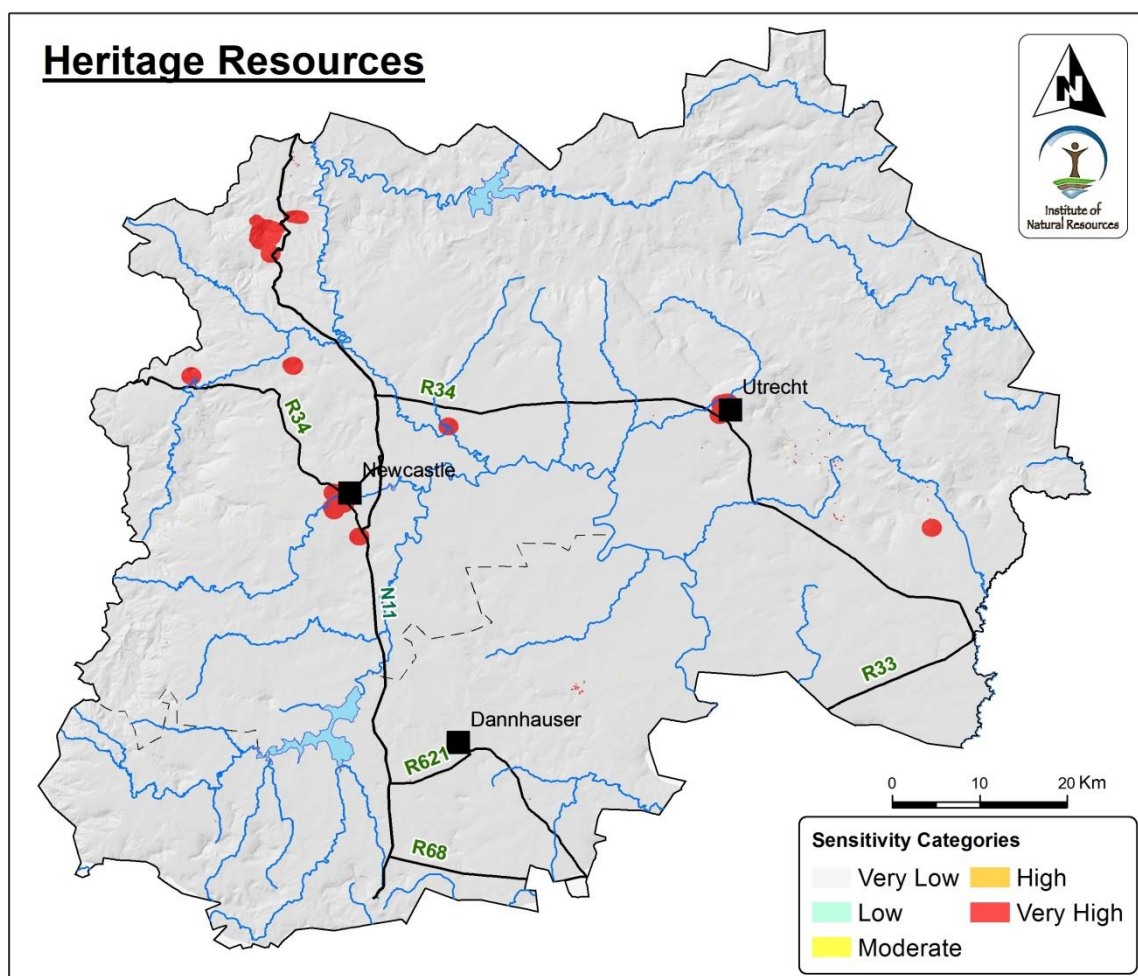


Figure 8: Heritage Resources sensitivity zones

5.5 Terrestrial Biodiversity

Sensitivity Zones

The sensitivity zones for terrestrial biodiversity are derived from varying levels of biodiversity importance/sensitivity according to the following levels of hierarchy:

- i. **Formally protected areas and stewardship sites:** Protected areas include all areas as referred under Section 9 of the National Environmental Management: Protected Areas Act

- (Act 57 of 2003), which are protected by law for the purpose of managing and conserving biodiversity. These include Nature Reserves and Protected Environments with management assigned to the competent authority of the Province, namely the KwaZulu-Natal Nature Conservation Board, trading under the name of Ezemvelo KZN Wildlife (EKZNW). Stewardship sites also include all areas under biodiversity related agreements.
- ii. **Critical Biodiversity Areas (CBAs) and Agro-Biodiversity Zones:** CBAs include all areas that are critical for meeting biodiversity targets and thresholds in the Province, and which are required to ensure the persistence of viable populations of species, as well as the functionality of ecosystems. CBAs are split into two levels, namely Irreplaceable CBAs and Optimal CBAs. CBAs are derived using provincial-scale conservation planning processes (i.e. the irreplaceable and optimal categories from the 2010 Minset). Other datasets included in the conservation planning process included Critically Endangered and Endangered ecosystems, and critical linkages from the landscape corridor dataset. At a similar level of importance, areas that are important for both sustainable agriculture and biodiversity conservation due to presence of land of moderate to high agricultural potential and high biodiversity value are referred to as Agro-Biodiversity Zones.
 - iii. **Threatened Ecosystems as defined by NEMBA:** The Biodiversity Act (Act 10 of 2004) provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value (SANBI Biodiversity Advisor).
 - iv. **Ecological Support Areas (CBAs) and Environmental Management Zones:** ESAs include areas that support and sustain the ecological functioning of CBAs to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs, as well as allowing for the maintenance of Ecological Infrastructure (EI). ESAs include ecological corridors, species-specific areas, and protected area buffers such as the Trail Zone that has been specifically defined for the uKhahlamba Drakensberg Park World Heritage Site. At a similar level of importance to the ESAs, environmental corridors and ecological links that also promote sustainable land management for the ecosystem goods and services that are provided and the biodiversity that is supported are referred to as Environmental Management Zones.
 - v. **Other Natural Areas (ONAs) – Threatened Vegetation Types:** Despite not being identified as critical for meeting biodiversity targets, these areas are still important from a biodiversity conservation perspective and should be avoided if possible in development planning. They are capable of providing a number of services and should be managed carefully with close reference to the other elements of the EMF such as water production areas in terms of maintaining and/or enhancing ecological infrastructure.
 - vi. **Other Natural Areas (ONAs) – Non-Threatened Vegetation Types:** At the lowest level of importance/sensitivity are untransformed natural areas that have not been identified as a priority for biodiversity conservation based on the categories listed above. Nevertheless, these areas retain their natural ability to perform a range of biodiversity and ecological infrastructural functions. They should be managed in accordance with other components of

the UMDM EMF (e.g. water yield and water quality) in terms of maintaining and/or enhancing ecological infrastructure.

The table below summarises the categorisation of sensitivity zones covering terrestrial biodiversity that is based on the aforementioned rationale (Table 8). Figure 9 illustrates the spatial distribution and extent of the terrestrial biodiversity sensitivity zones as they are located within the district.

Table 8: Sensitivity scores for terrestrial biodiversity

Sensitivity feature	Sensitivity Level	Sensitivity Score
Protected Areas	Very High Sensitivity	5
CBA Irreplaceable	Very High Sensitivity	5
CBA Optimal	Very High Sensitivity	5
Agro-biodiversity Zone	Very High Sensitivity	5
Threatened Ecosystem	Very High Sensitivity	5
Proposed Protected Area	High Sensitivity	4
Ecosystem Support Areas	High Sensitivity	4
Environmental Management Zone	High Sensitivity	4
ONA – Threatened Vegetation Type	Moderate Sensitivity	3
ONA – Non-Threatened	Low Sensitivity	2
Transformed Areas	Very Low Sensitivity	1

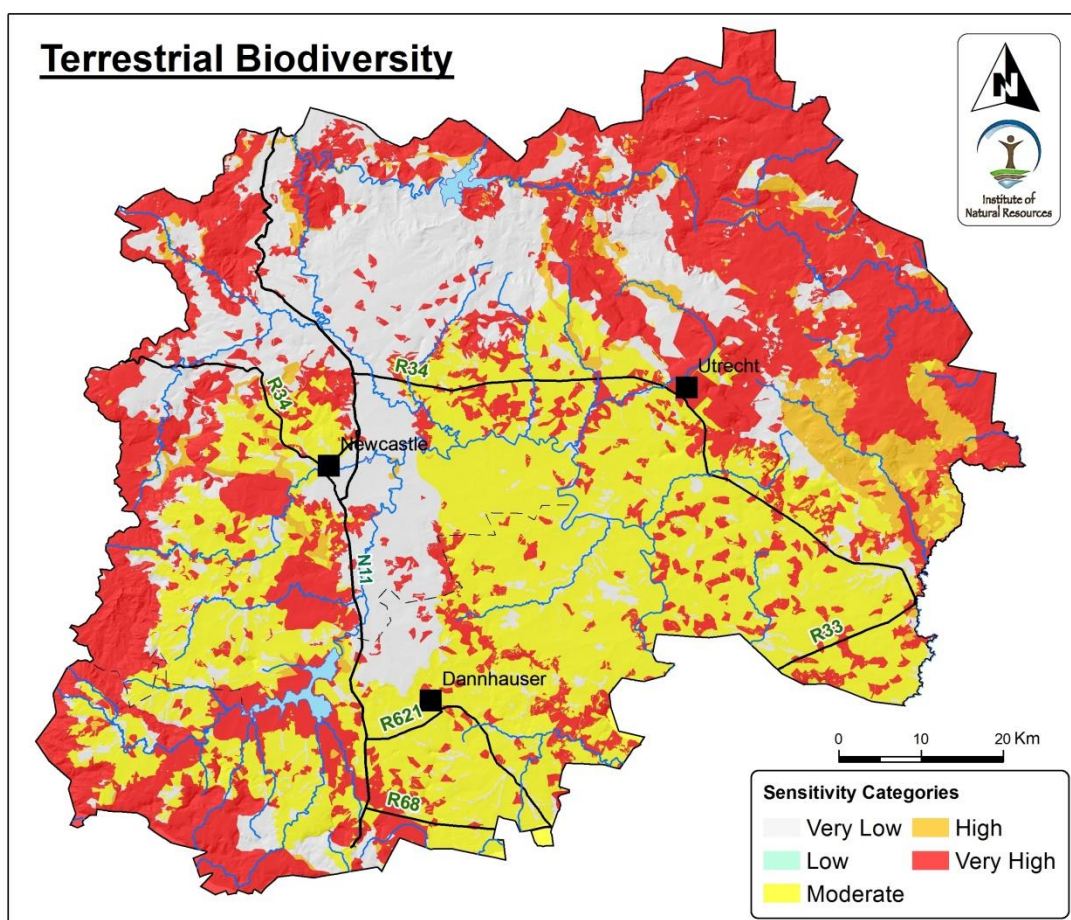


Figure 9: Terrestrial Biodiversity sensitivity zones

5.6 Water - Production

Sensitivity Zones

Water yield has been characterised using mean annual runoff (MAR) estimations for sub-quaternary scale catchments. These have been categorised as follows:

- i. **Highest MAR (catchments in the top 25%):** Catchments reflecting the top 25% in terms of MAR are the most valuable water producing areas in the District and therefore considered critical catchments and allocated a very high sensitivity ranking.
- ii. **Moderate to high MAR (50% - 75%) and located above critical supply points:** Moderate to high yielding catchments located above critical supply points are also considered critical catchments and also allocated a very high sensitivity ranking.
- iii. **Moderate to high MAR (50% - 75%):** Catchments in the 50% – 75% rank are considered to be highly important ecological infrastructure and are categorised as highly sensitivity.
- iv. **Low to moderate MAR (25% - 50%) and located above critical supply points:** These catchments make a modest but important contribution to critical supply points and are considered high sensitivity.
- v. **Low to moderate MAR (25% - 50%):** These catchments make a moderate contribution to downstream users and are therefore considered to be moderately sensitive.
- vi. **Low MAR (1% – 25%):** These catchments make a limited contribution to basin water supply and are considered to be of low sensitivity.

Table 9: Sensitivity categories applied to water production areas

Sensitivity feature	Sensitivity Level	Sensitivity Score
Highest 25% of ADM MAR catchments	Very High Sensitivity	5
Moderate to High MAR (50% - 75%) and above critical infrastructure	Very High Sensitivity	5
Moderate to High MAR (50% - 75%) catchments	High Sensitivity	4
Low to Moderate ADM MAR and above critical infrastructure	High Sensitivity	4
Low to Moderate ADM MAR catchments	Moderate Sensitivity	3
Lowest 25% of ADM MAR catchments	Low Sensitivity	2

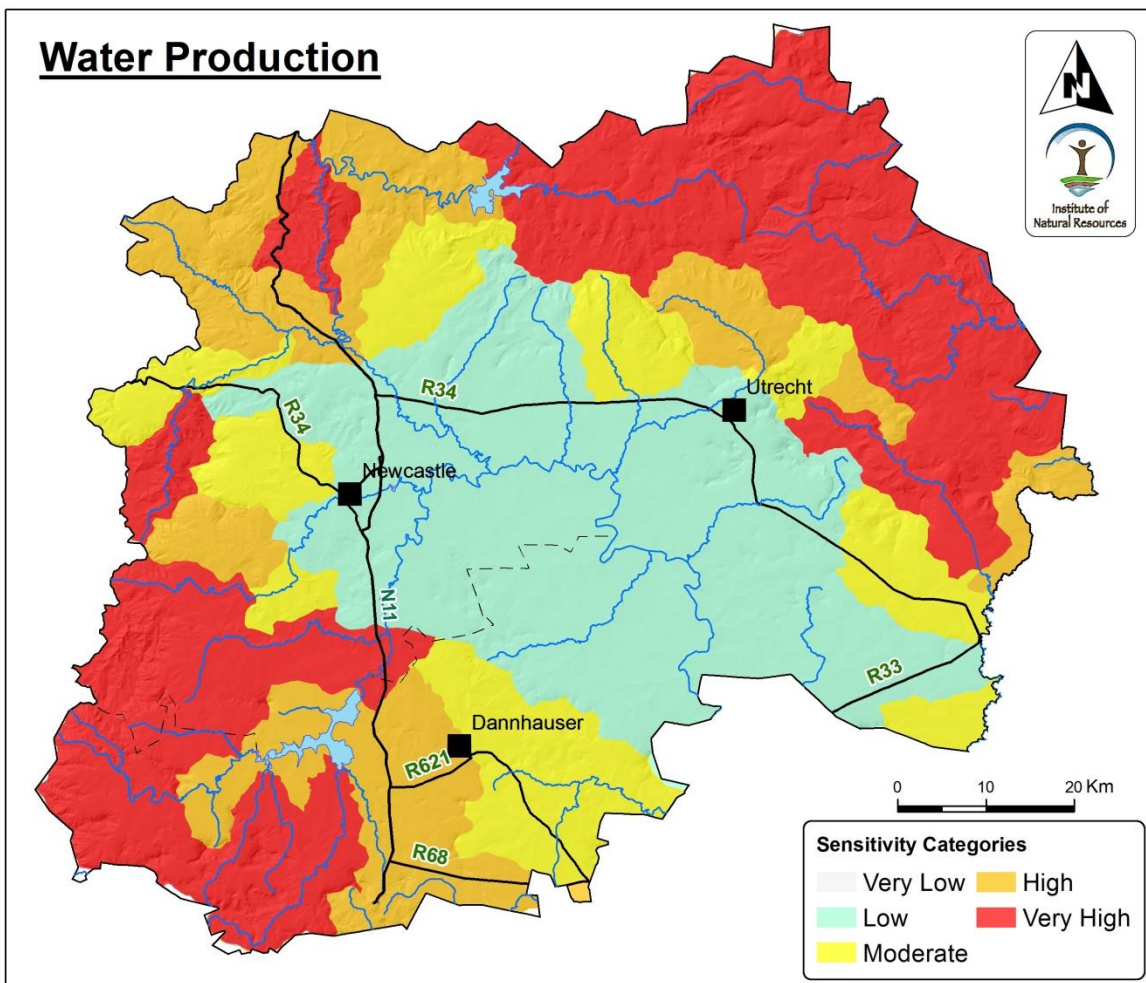


Figure 10: Water Production sensitivity zones

5.7 Water - Quality

Sensitivity Zones

There are many determinants that influence water quality, from salts (such as sulphate, calcium, sodium and magnesium) and metals to bacterial contamination each of which impact different users in different ways. The specialist investigation revealed that the components that are at the core of the quality issue are salts, pH, excessive bacteria and nutrient loading.

A catchment's WQ sensitivity is graded according to:

1. the location of a catchment relative to critical water supply infrastructure – either:
 1. Critical (the catchment in which the supply infrastructure is located),
 2. Proximal (catchments either immediately above or two catchments above critical catchments),
 3. Distal (catchments more than 2 above critical catchments) or
 4. Non influential catchments (not relevant for supply features), and
2. the level to which the catchment's water quality is compromised. This is established using either:
 1. Measured WQ monitoring data, or
 2. through a modelling process based on land use.

The highest sensitivity is located around the key water supply features on the Ngagane and Buffalo Rivers. Not only are these critically important resources, but they are also stressed from a water quality perspective. All catchments are established to be sensitive from an ecological perspective.

Table 5.10 Sensitivity Categories applied to water quality areas

Sensitivity feature	Sensitivity Level	Sensitivity Score
Catchments directly influencing critical water supply features	Very High Sensitivity	5
Proximal catchments - high measured	High Sensitivity	4
Proximal catchments - high modelled	High Sensitivity	4
Proximal catchments - low	Moderate Sensitivity	3
Distal catchments - high measured	Moderate Sensitivity	3
Distal catchments - high modelled	Moderate Sensitivity	3
Distal catchments - low	Low Sensitivity	2
Catchments not influencing - high measured	Low Sensitivity	2
Catchments not influencing - high modelled	Low Sensitivity	2
Catchments not influencing - low	Very Low Sensitivity	1

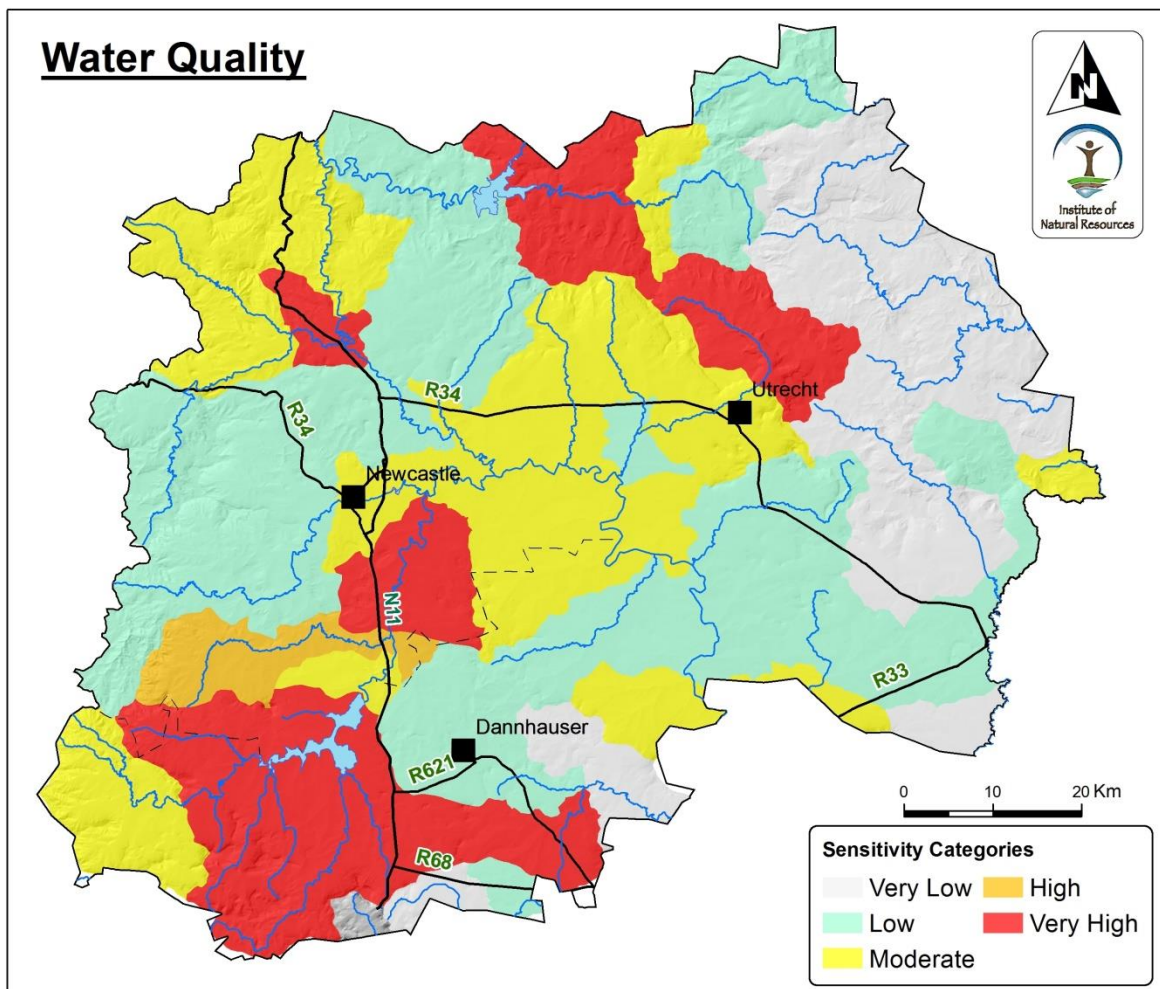


Figure 11: Water Quality sensitivity zones

5.8 Water – Aquatic Ecological Health

Sensitivity Zones

The catchments of the District have been classed into sensitivity categories based on their conservation priority and on their present ecological state.

Table 11: Sensitivity categories applied to aquatic ecological health

Sensitivity feature	Sensitivity Level	Sensitivity Score
River NFEPA Good condition (A/B)	Very High Sensitivity	5
River NFEPA Moderate condition (C/D)	High Sensitivity	4
Fish Support Area Good condition (A/B)	High Sensitivity	4
Fish Support Area Moderate condition (C/D)	Moderate Sensitivity	3
Phase 2 FEPA	Moderate Sensitivity	3
Upstream MA	Low Sensitivity	2
All else	Very Low Sensitivity	1

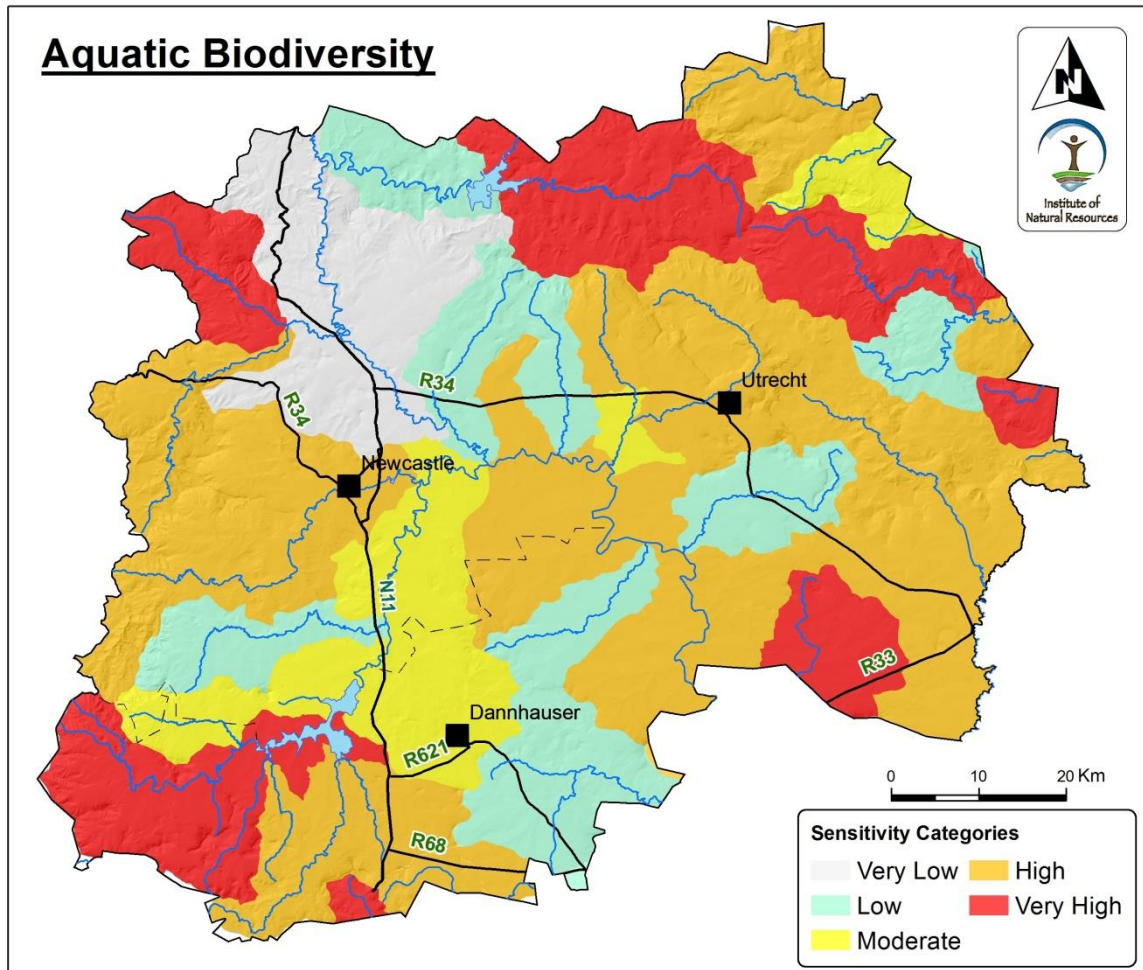


Figure 12: Aquatic Ecology sensitivity zones

5.9 Wetlands

Sensitivity Zones

The sensitivity zones relate to the extent of the wetland and its zone of influence. The actual body of the wetland is the most sensitive, given that direct impacts result in the loss of the habitat and ecological functioning. The 32 metre buffer zone represents a zone of lesser, but still significant

sensitivity as activities in this area are likely to impact the wetland directly. The 500 metre buffer aims to represent the immediate catchment of a wetland and activities in this area can indirectly alter the condition of a system. This threat relates particularly to activities that alter the hydrology (volume, frequency and amplitude of run-off) in the wetland’s catchment as these flows represent the life blood of the system.

Table 12: Wetland sensitivity categories

Sensitivity feature	Sensitivity Level	Sensitivity Score
Wetland body	Very High Sensitivity	5
32m Buffer zone	High Sensitivity	4
500m Buffer zone	Moderate Sensitivity	3

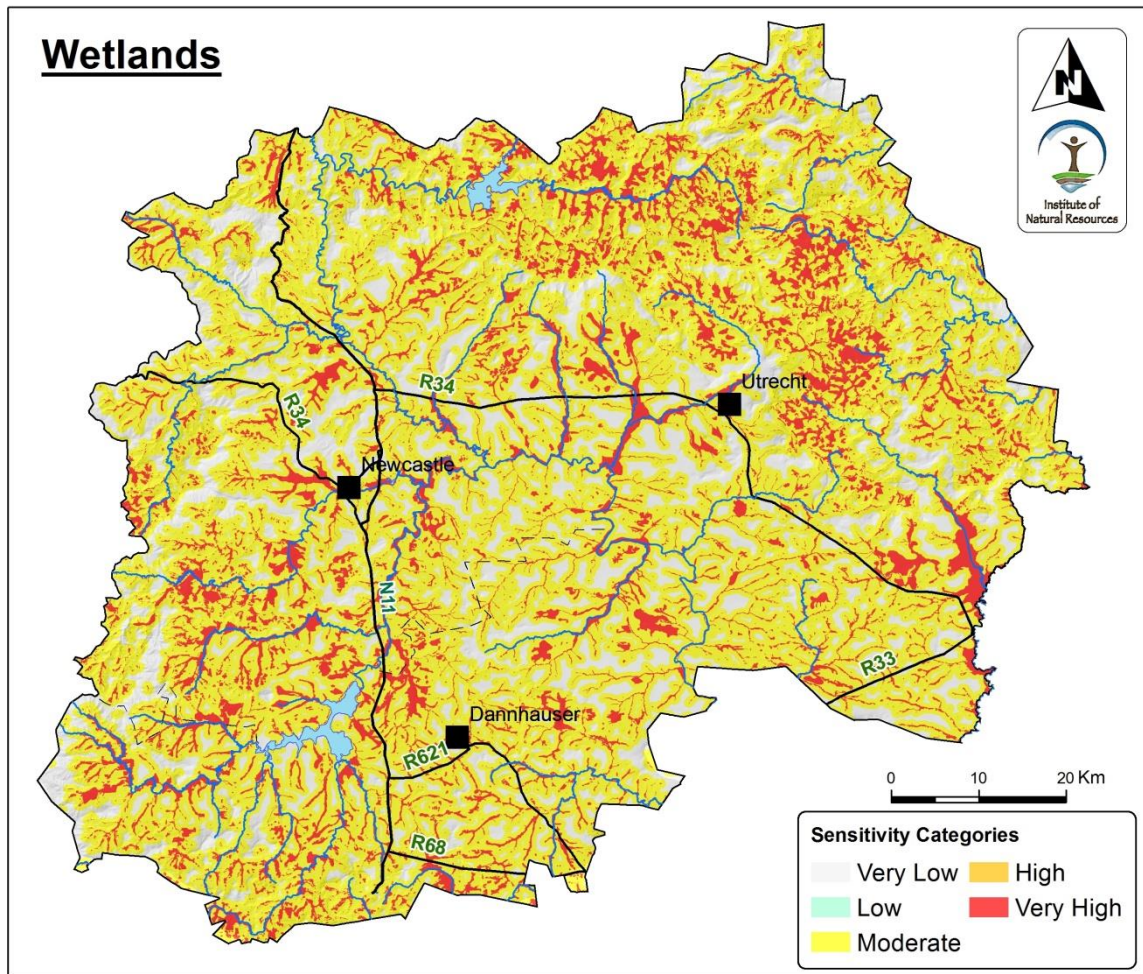


Figure 13: Wetland Sensitivity Zones

5.10 Geotechnical Conditions

The geotechnical specialist study delineated seven categories of constraint zone based on geotechnical conditions based on a combined analysis of Geology, Slope and Land Type. These zones have been categorized into the constraint levels detailed in Table 13. The constraints imposed by geotechnical consideration relate directly to the cost of constructing in these zones and the risk of damage. For example, it is more costly to construct on steep slopes and unstable geology.

Table 13 Development Constraints

Constraint feature	Constraint Level	Constraint Score
Semi/Unconsolidated Sediments	Very High Constraint	5
Steep Slopes	Very High Constraint	5
Mining	Very High Constraint	5
Intrusive Rocks	Low Constraint	2
Mixed Sediments	Low Constraint	2
Tillite	Low Constraint	2
Granitoids	Low Constraint	2

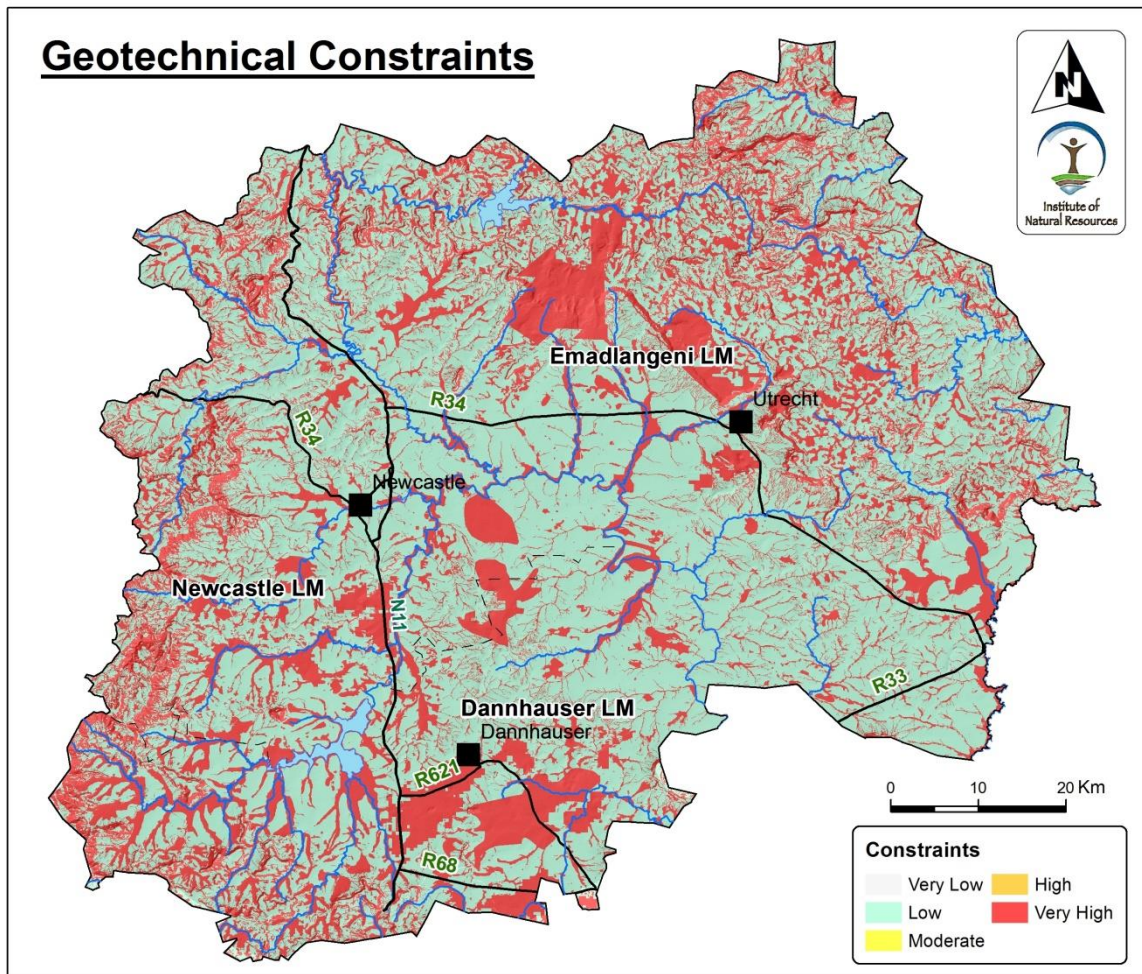


Figure 14: Geotechnical based constraint zones

5.11 Groundwater Conditions

Constraint Zones

The groundwater study delineated zones of depth to the static water table based on borehole data. These values have been used to categorise the level of constraint imposed by groundwater to development. Importantly it also implies constraints regarding sanitation facilities as pit latrines and soak-away pits are likely to impact shallow groundwater resources.

Table 14 Development Constraints

Constraint feature	Sensitivity Level	Sensitivity Score
Depth to Static Water Level < 10m	Very High Constraint	5
Depth to Static Water Level >10 and < 20m	High Constraint	4
Depth to Static Water Level >20 and < 30m	Moderate Constraint	3
Depth to Static Water Level >30 and < 40m	Low Constraint	2
Depth to Static Water Level >40	Very Low Constraint	1

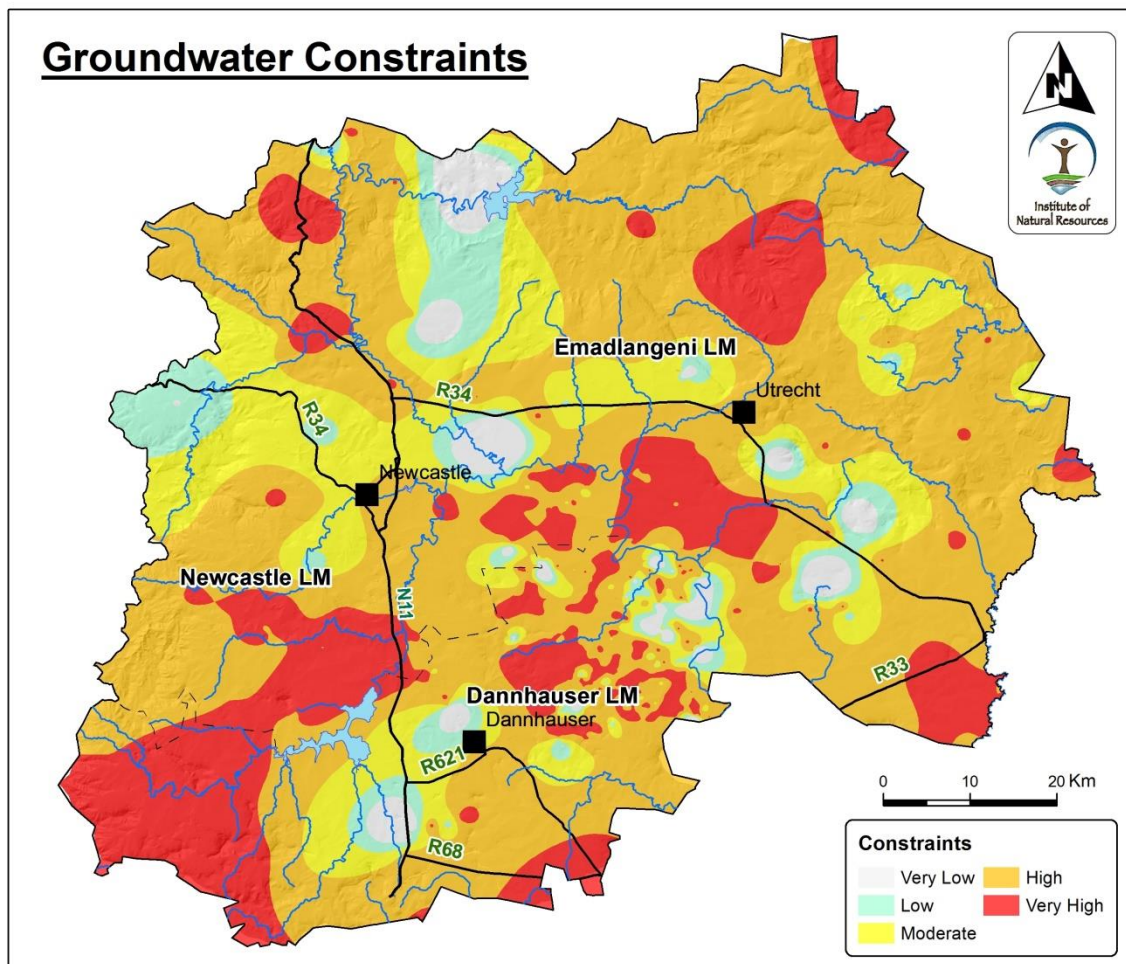


Figure 15: Groundwater based constraint zones

5.12 Infrastructure

Constraint Zones

Infrastructure constraints have been categorised as shown in Table 14 below. These scores have been combined to provide an overall infrastructure index which is used to represent infrastructure constraints across the District.

Table 15: Catergorisation of infastructure constraints

Infrastructure Constraint Feature	Constraint Feature Score
Electricity – Low supply means little infrastructure and constrained in this area means this needs to be built.	
Low supply percentage but Highly constrained	5
High supply percentage and not constrained	1

Infrastructure Constraint Feature	Constraint Feature Score
Moderate to high supply percentage and not constrained	1
High supply and slightly constrained	2
Moderate supply and slightly constrained	3
Moderate to low supply and slightly constrained	4
Moderate to low supply and constrained	5
Low supply and not constrained	4
Moderate to low supply and not constrained	3
Moderate supply and not constrained	2
Moderate to high supply and constrained	3
Moderate supply and constrained	4
Moderate to high supply and constrained	5
Waste – possible waste management issues if no collection	
People with waste collection $\geq 75\%$ - Good	2
People with waste collection $\geq 50\% < 75\%$ - Moderate	3
People with waste collection $\geq 10\% < 50\%$ - Poor	4
People with waste collection $\geq 0\% < 10\%$ - None	5
Water piped	
People with piped water $\geq 75\%$ - Good	2
People with piped water $\geq 50\% < 75\%$ - Moderate	3
People with piped water $\geq 10\% < 50\%$ - Poor	4
People with piped water $\geq 0\% < 10\%$ - None	5
Road density	
Very Low Road Density ≤ 12.5	5
Moderate to Low Road Density $12.5 < \leq 50$	4
Moderate to High Road Density $50 < \leq 100$	3
High Road Density > 100	2
Sanitation infrastructure demand	
Low demand $< 5\%$ without	2
Low to moderate demand $\geq 5\% < 20\%$ without	3
Moderate to high demand $\geq 20\% < 40\%$ without	4
High demand $\geq 40\%$ without	5
Total Infrastructure	
Low infrastructure constraint - Total score 5 - 13	2
Moderate infrastructure constraint - Total score 14 - 17	3
High infrastructure constraint - Total score 18 - 20	4
Very high infrastructure constraint - Total score 21 - 24	5

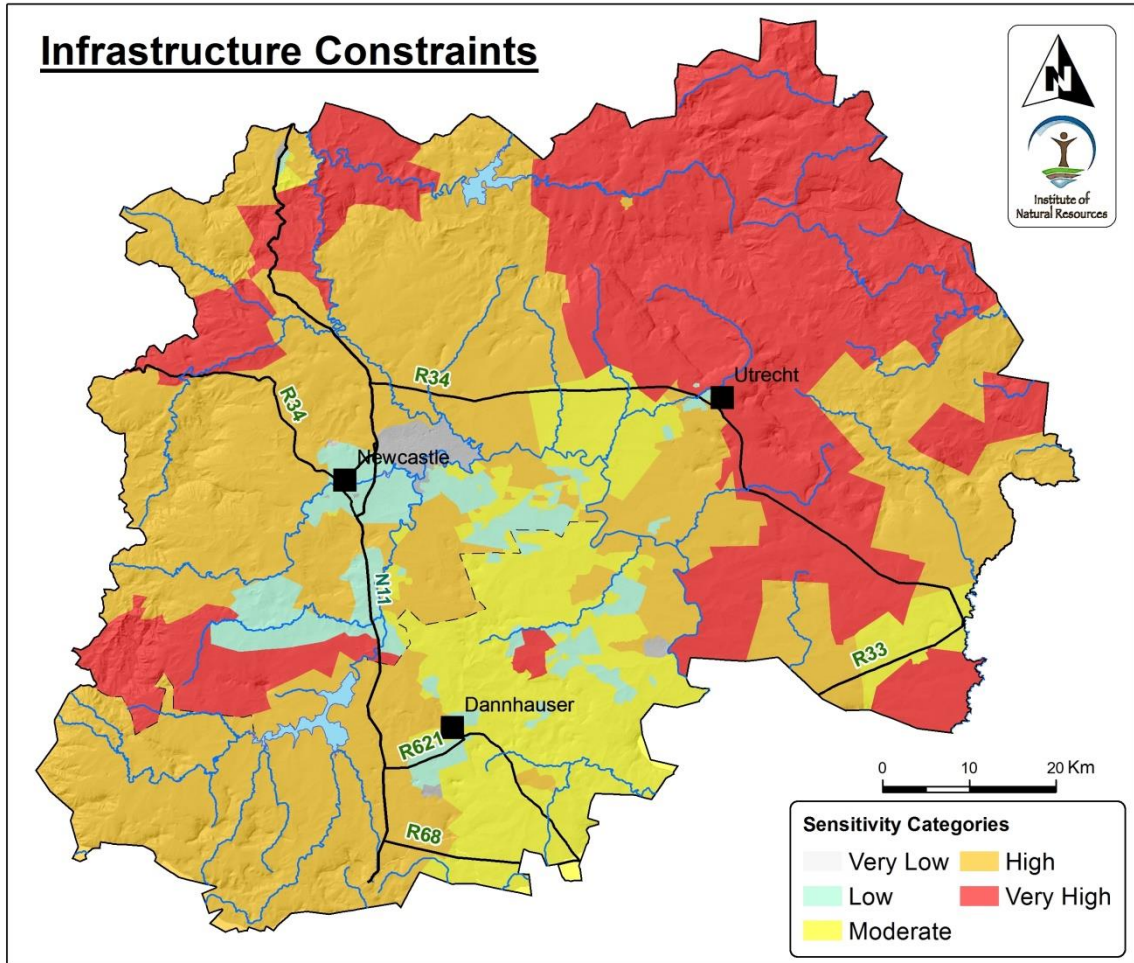


Figure 16: Infrusture based constraint zones

6. STRATEGIC ENVIRONMENT MANAGEMENT PLAN

The following section presents a range of actions for addressing each of the main sustainability objectives identified for the different features in the strategic assessment process.

6.1 AGRICULTURAL RESOURCES								
SUSTAINABILITY OBJECTIVE:								
<i>Secure the Existing and Potential value of the Agricultural Sector to the economy and food security.</i>								
<p>Motivation: Agricultural resources and activities have been identified both nationally and in the District as having potential to grow the economy and improve food security. High potential agricultural land is however a scarce resource and is under threat from expansion of urban settlements, mining and alien invasive plants.</p> <p>Development implications:</p> <ul style="list-style-type: none"> • Future development: Proposed future developments should not in any way compromise the productivity of land with high or moderate agricultural potential. Activities that may generate negative impacts should be strategically positioned so as to not affect existing land-use. • Existing land use: Existing agricultural land uses should be protected and optimised to maximize the economic potential of the sector. Where non-agricultural land uses are currently practised on high potential agricultural land (which have not resulted in the permanent loss of this resource), these should not compromise the potential productivity of this land. 								
				Integrated planning and implementation	Sustaining our ecosystems using resources efficiently	Towards a green economy	Building sustainable communities	Responding effectively to climate change
Action	Activities	Resources and Responsibility	1	2	3	4	5	
Protect high value agricultural land	<p>The high value primary production land delineated in the EMF and its associated secondary agricultural activities must be defined/zoned accordingly in the next version of the SDF and LUMS. Appropriate planning conditions and restrictions need to be built into the zoning.</p> <p>Agrobiodiversity zones included in this EMF must be prioritised for protection through land-owner</p>	<p>District Planning and Development Services Department – Development Planning section: It is the responsibility of the municipal planning section to ensure that productive agricultural land is defined as such in spatial planning outputs.</p> <p>KZN DARD Ezemvelo KZN Wildlife</p>		x	x	x		

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	<p>stewardship arrangements or similar mechanisms that protect existing non-cultivation agricultural uses and promote sustainable grazing practices.</p> <p>Undertake detailed soil surveys along major rivers to characterise land with respect to irrigation potential (as recommended in the 2006 ADM Agricultural Plan).</p> <p>Land with potential for irrigation should be prioritised for protection from development, particularly in areas threatened by urban expansion and mining.</p> <p>KZN DARD in partnership with relevant NGO's to develop and publicise best practice guidelines for grazing management in AMD's grasslands.</p>						
Governance and planning.	<p>The Amajuba District Agricultural Plan was developed in 2005/6. This should be reviewed and updated if necessary.</p> <p>* Rebuild the Amajuba District Municipality's agricultural forum by the next financial year 2018-2019.</p>	KZN DARD.	x				
Land degradation due to invasive alien plants must be halted and remediated	<p>Map and manage invasive alien plants as required by section 76 of NEMBA (all organs of state must draw up an invasive species monitoring, control and eradication plan for land under their control).</p> <p>Prioritise the clearing of alien plants in areas of high agricultural value and draft and implement a clearing plan in partnership with DEA: NRM</p>	KZN DARD, DEA: NRM		x	x		x
Investigation of alternative water sources for irrigation development	<p>* The District together with Newcastle LM to conduct a feasibility study by 2022 on the possibility of recycling storm water in the District Municipal Area for agricultural use.</p>	KZN DARD, Amajuba DM, Newcastle LM			x	x	x

Monitoring Criteria

Protection of high value agricultural land

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Indicators and Data Sources	Targets
Area of productive land under primary agricultural production – analysed using provincial land-use maps against the area mapped during the EMF as being of high potential or and/or current use for agricultural production.	100% of all land defined as suitable for agricultural production
Contribution to Municipal Economy - as established through census data. a. Number of jobs generated within the agricultural sector. b. Proportion of GDP growth attributed to agricultural sector.	Increase in number of jobs created by the agricultural sector. Increase in the proportion of municipal GDP attributed to agriculture.
Agricultural land that is considered to be of good or moderate potential should be zoned appropriately, irrespective of land-use.	100% of all land defined as good or moderate.
<u>Addressing threats to agricultural resources</u>	
Indicators and Data Sources	Targets
Alien invasive plant threat management	AIPs mapped and an eradication plan in place.

6.2 AIR QUALITY

SUSTAINABILITY OBJECTIVE:

Maintain or improve present air quality and improve the knowledge base on air quality by implementing an Air Quality Monitoring Programme

Motivation: A basic right enshrined in the constitution is the right to an environment which is not harmful to one's health. There is a perception that air quality in Newcastle is poor, however verifiable assessments regarding air quality in the District cannot however be made as there is a lack of monitoring data. Efforts should therefore be made at this stage to maintain or improve air quality whilst data is gathered on which to base future decision making.

Development implications:

- **Future development:** Any development or activity that will cause emissions must register as an emitter and upload emissions data as required by SAAQIS. Any development likely to cause emissions must implement best available emissions reductions technologies to ensure minimal impact on AQ and that they are compliant with national air quality standards and the District's Air Quality Management Plan.
- **Existing land use:** All activities classified as emitters must be registered and must submit emissions data to the DEA NAEIS database in accordance with NEM: AQA requirements.

Action	Activities	Resources and Responsibility	1	2	3	4	5
Improve the understanding of air quality in the District	<p>Design and implement an air quality monitoring programme in accordance with the Air Quality Management Plan. It is recommended that low maintenance passive samplers, rather than high-maintenance electronic instruments, be used to assess ambient background measurements in the short to medium term. This will feed into strategic development planning as well as inform environmental impact assessments.</p> <p>Develop a full dispersion model for the District based on emissions inventory developed through the Air Quality Management Plan. Dispersion models are becoming ever more reliable and can be run to predict anticipated single or cumulative impacts from</p>	District Planning and Development Services Department – Environment section: Air Quality Officer; Newcastle Local Municipality; Emadlangeni Local Municipality; Dannhauser Local Municipality; KZN EDTEA Air Quality section; KZN DoT.		X		X	X

	<p>industry and other sources during various dispersion conditions to assist town planners with development decisions</p> <p>Traffic counts are needed to assess the contribution and impact of vehicular emissions in the city, as these are known to be significant in urban areas and the Amajuba District Municipality has experienced a rapid growth in vehicular traffic over the past decade. The traffic count data can be used to model emissions and impact of vehicular pollutants, starting with the busiest routes and intersections. The model findings must then be used to inform future transportation planning</p> <p>The District must initiate discussions with the department of transport and local traffic management authorities to develop a plan for the implementation of vehicular emissions testing and the implementation of local by-laws.</p>						
Regulation of emissions	All emissions should be registered and included in the District's emissions inventory and monitored and regulated as described in the ADM AQMP.	District Planning and Development Services Department – Environment section: Air Quality Officer		x		x	x

Monitoring Criteria

Air quality information

Indicators and Data Sources	Targets
AQ monitoring programme in place	Monitoring programme implemented
Proportion of emitters registered and submitting data	100%
Dispersion model implemented	Model implemented

Air quality emissions management

Indicators and Data Sources	Targets
AQPM Implementation plan	Number of AQPM Implementation plan action items implemented should be increased from previous year.

6.3 AQUATIC ECOSYSTEMS

SUSTAINABILITY OBJECTIVE:			Integrated planning and implementation	Sustaining our ecosystems using resources efficiently	Towards a green economy	Building sustainable communities	Responding effectively to climate change
<p><i>Secure the quality, quantity and timing of ecologically important flows in the rivers of the ADM and implement management measures to protect their ecological integrity.</i></p> <p>Motivation: Aquatic environments play an important role of providing ecosystem services when they are functioning effectively. They play an important role in the supply of fresh water as they filter and ameliorate pollutants. ADM is at a critical stage with respect to water resources and all must be managed to maximise the benefits to the District. Rivers are a threatened ecosystem type and they are a component of South Africa’s biodiversity that must be protected to satisfy national priorities and international treaties.</p> <p>Development implications:</p> <ul style="list-style-type: none"> • Future development: Future developments will need to comply with RQOs for quality (discharges) and quantity (abstractions). Applications for future development should show how they will avoid impacts to the state of natural systems through the establishment of riparian buffers and through water quality impact management. • Existing land use: Existing activities must comply with water use licence requirements and must ensure that impacts on water resources are minimalised (e.g. sedimentation). Riparian buffer areas must be respected. 							
Action	Activities	Resources and Responsibility	1	2	3	4	5
Ensure quality, quantity and timing of flows are sufficient to maintain ecological function	Engage in the National Water Resource Classification process for the uThukela catchment (which has been advertised, but is yet to be undertaken) to ensure the water resources of ADM are correctly classified and that adequate RQOs are set for quality, quantity and timing of flows to sustain ecological systems in ADM (cross reference with Water Quality SAs). Consider and implement the ecological reserve and relevant RQOs when granting water use licenses for new developments	District Planning and Development Services Department – Environment section and the local catchment management forum must register and participate in the process of setting appropriate EMC and RQOs. Provincial Department of Water and Sanitation	x	x			
Leverage existing programmes to help monitor ecosystem status	Engage with District schools to implement mini-SASS monitoring on local rivers. This helps build awareness of aquatic ecosystems and provides important monitoring data for the District.	District Planning and Development Services Department – Environment section in partnership with environmental education NGOs and KZN EDTEA	x	x		x	
Ensure appropriate management of priority catchments and	Develop integrated catchment management plans for the Ngagane and Upper Buffalo River catchments (cross reference with Water Quantity component).	The municipality should approach relevant government programmes and NGOs to develop a co-ordinated approach dealing with	x	x			

<p>rehabilitation of degraded riparian areas</p>	<p>Relevant national and provincial working programmes should be engaged in establishing a co-ordinated approach to prioritizing systems for restoration and rehabilitating them. This includes wetland rehabilitation (as per SA3), alien species eradication and restoration/control of eroded areas.</p>	<p>the restoration of natural resources at a landscape level – covering terrestrial systems, wetlands and rivers. Likely partners include:</p> <ul style="list-style-type: none"> • Working for wetlands. • Working for water • DEA – Alien invasive species programme. • DEA KZN LandCare Programme 					
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Monitoring Criteria

Ecological Health of Natural Systems

Indicators and Data Sources	Targets
<p>Percentage of time successfully meeting the ecological reserve or hydrological RQO (flow).</p>	<p>100%</p>
<p>Achievement of RQOs for habitat and biota (to be determined) based on Present Ecological State of River health monitoring sites</p>	<p>100%</p>

6.4 HERITAGE RESOURCES

SUSTAINABILITY OBJECTIVE:

To adequately identify, protect and benefit from the District's heritage resources and to ensure their long term management and marketability.

Motivation: ADM has an important heritage resource base and although many colonial history sites are recognised, there are many sites of importance from other periods and cultures that are not recognised or protected. The heritage sites in the ADM have also been identified as an important potential contributor to the local economy through tourism opportunities. However, they have not been documented or protected, and marketing and management of such sites is minimal. This has resulted in a grossly underperforming heritage tourism sector in ADM.

Development implications:

- **Future development:** Future developments may be required to undertake heritage impact assessments as part of EIAs in accordance with NEMA and relevant listing notices and according to chapter 2 of the National Heritage Resources Act. In addition, any development taking place in a designated heritage area requires a permit from AMAFA.
- **Existing land use:** A permit is required from AMAFA before any alterations of any sort can be effected on a Provincial Heritage Site. Also, any alterations to any building older than 60 years, requires a permit from AMAFA.

		Integrated planning and Implementation	Sustaining our ecosystems using resources efficiently	Towards a green economy	Building sustainable communities	Responding effectively to climate change
Action	Activities	1	2	3	4	5
Establish capacity and responsibility for heritage resources in the District	<p>Identify a Heritage Resources champion in the Amajuba DM Tourism department to foreground heritage issues and to drive the formation of District Heritage Forum</p> <p>The creation of a functioning District Heritage Forum between Amafa and the municipality, as required in terms of Section 29 of the KZNHA (Act 4 of 2008). Such a Forum would:</p> <ul style="list-style-type: none"> • 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 	District Planning and Development Services Department – Tourism section, together with AMAFA			X	X

	<p>local heritage initiatives; and</p> <ul style="list-style-type: none"> Promote heritage-related local economic and social development. 						
Management of heritage resources	<p>Amafa and the District Heritage Forum should compile integrated site management plans for all Provincial and Heritage Landmarks and other significant heritage resources.</p> <p>All heritage resource information identified by the District, as well as through HIAs, should be uploaded to the SAHRIS database.</p>	AMAFA and District Heritage Forum		X		X	
Undertake heritage surveys for the District	<p>An extensive public participation program should be undertaken to identify sites of cultural and historical significance, particularly places of significance to historically disadvantaged groups; living heritage; and cultural landscapes.</p> <p>Undertake landscape characterisation to identify important landscapes to build tourism potential.</p>	District Heritage Forum			X	X	

Monitoring Criteria

Heritage resources identified and protected

Indicators and Data Sources	Targets
Number of heritage resources identified and graded	Ten percent increase on previous year until no known sites remain.
Number of graded heritage resources captured on SAHRIS	100%

Development of capacity and assignment of responsibility

Indicators and Data Sources	Targets
District heritage champion	Heritage champion identified and heritage related responsibilities included in their KPAs.
District heritage forum	Forum exists and is functional

6.5 FLOOD ZONES

SUSTAINABILITY OBJECTIVE:			Integrated planning and implementation	Sustaining our ecosystems using resources efficiently	Towards a green economy	Building sustainable communities	Responding effectively to climate change
<p><i>To protect people and infrastructure from flood hazards and secure the ecosystem service value of floodplains (flood regulation, water quality regulation and habitat provision).</i></p> <p>Motivation: Climate change modelling shows that flooding in Amajuba is likely to become more intense and more frequent. Lives and infrastructure are placed at risk when spatially coincided with flood risk zones. Flood plain areas are ecologically significant as they provide habitat to certain species, reduce erosion along river systems or streams and temporary hold flood waters thereby reducing flood peaks.</p> <p>Development implications:</p> <ul style="list-style-type: none"> • Future development: Future development should be excluded from flood prone areas. Spatial development tools must be effective in ensuring that development does not take place in these areas. All new developments (including those outside of flood prone areas) should aim to achieve maximum infiltration and minimum storm water runoff in the development footprint and to implement sustainable urban drainage systems wherever possible. • Existing land use: Existing infrastructure located in flood prone areas is vulnerable to flood impacts. Such infrastructure should be identified and flood risk management interventions put in place. This includes encouraging infiltration in existing urban drainage systems through breaking up or removing hardened surfaces where not in use and implementation of sustainable urban drainage systems. 							
Action	Activities	Resources and Responsibility	1	2	3	4	5
Identify vulnerable communities, infrastructure and floodplains	Building on the flood zone mapping undertaken as part of this EMF, identify potentially vulnerable communities and infrastructure and develop accurate 1:50 year flood lines for these areas based on climate change based flood modelling.	ADM Disaster Management department					
	Building on the flood zone mapping undertaken as part of this EMF, identify flood zones which are at risk of being developed for housing or other infrastructure and develop accurate 1:50 year flood lines based on climate change based flood modelling	ADM Disaster Management department	x	x		x	x
Develop protection mechanisms in policy for flood prone areas	Spatial representations of flood risk areas should be included in all planning documents including the SDF and IDP.	Disaster Management Department together with District Planning and Development Services Department – Development Planning section.	x	x		x	x
Build awareness of and	Develop and run flood awareness campaigns with	Disaster management department in				x	x

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resilience to climate change driven flooding intensification	vulnerable communities (as identified by the Climate Change Response Plan) focused on climate change and the impact of this on the frequency and intensity of flooding.	partnership with NGOs active in environmental education such as the Newcastle Environmental Justice Alliance.					
Reduce the impact of new development on flood levels	Storm water management plans for new developments and infrastructure upgrades should demonstrate how storm water runoff has been minimised and how infiltration and groundwater recharge has been maximised (e.g. incorporation of sustainable urban drainage).	District Planning and Development Services Department – Development Planning section; District Technical Services Department KZN EDTEA		X		X	X
Identify opportunities for storing and re-using storm water to support economic activities	* The District together with Newcastle LM to conduct a feasibility study by 2022 on the possibility of recycling storm water in the District Municipal Area for agricultural use.	TBC – Sustainability unit?			X	X	X

Monitoring Criteria

Transformation of flood zone area	
Indicators and Data Sources	Targets
Annual area of flood zone transformed from existing land cover (measured on an annual basis to account for existing transformation)	Zero %

6.6 Governance

SUSTAINABILITY OBJECTIVE:

Improve the management of the environment through building capacity within and cooperation between government and private sector institutions

Motivation: Effective management of the environment is a cross cutting responsibility and relies on effective capacity within institutions and cooperation between institutions

Development implications:

- **Future development:** Effective governance and cooperative institutional arrangements create a positive environment for all development stakeholders. This will positively affect any prospective development.
- **Existing land use:** Effective governance and cooperative institutional arrangements create a positive environment for all development stakeholders. This will positively affect any existing development.

Action	Activities	Resources and Responsibility	1	2	3	4	5
Build capacity and awareness around the EMF products and its implementation	<p>Identify key fora and institutions and conduct presentations at each on the EMF and its available information base. Audiences / Fora should include Government (Councilors, Departmental managers / directors), traditional authority structures and private sector institutions.</p> <p>Feature the EMF and its online GIS application on the ADM website as well as in any ADM media outputs. This should highlight its cross sectoral role and its contribution to achieving sustainable development.</p> <p>The EMF and its products must be included in the Districts key planning instruments such as the IDP and SDF. References should be provided guiding the</p>	District Planning and Development Services Department – Environment Section should champion this, but responsibility also lies with the environmental management units at all levels of government. A key forum in achieving this is the Amajuba District Committee for Environmental Coordination (ADCEC)	x	x			

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<p>Improve inter-departmental cooperation at Provincial, District and Local level.</p>	<p>readers to the EMF online application.</p> <p>Prioritise relationship building with sector departments:</p> <ul style="list-style-type: none"> • The Department of Agriculture and Rural Development • The Department of Water and Sanitation • The Department of Mineral Resources <p>Identify key areas of cooperation between the District and each of these departments based on this EMF and other environmental plans around water, climate change and sustainable development, and add these as standing items onto the ADCEC agenda.</p> <p>Enhance the capacity and efficacy of the ADCEC by improving attendance of key sector departments at ADCEC meetings through ensuring adequate advance warning and follow up of non-responses from key sector departments.</p> <p>* Rebuild the Amajuba District Municipality's agricultural forum by the next financial year 2018-2019.</p> <p>Strengthen intergovernmental relations forums.</p>	<p>Amajuba District Committee for Environmental Coordination (ADCEC) chairperson</p>	<p>x</p>				
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Monitoring Criteria	
Capacity and awareness relating to the ADM EMF	
Indicators and Data Sources	Targets
Awareness workshops and presentations	Key fora and audiences identified and presented to.
EMF publicity and awareness	EMF featured on ADM website news
Improvement of inter-departmental cooperation	
Indicators and Data Sources	Targets
Identification of focus areas for improved cooperation	Key areas of cooperation identified and included on the ADCEC agenda
Attendance at ADCEC of key sector-departments	All invited sector departments attend at least two ADCEC meetings a year.

6.7 TERRESTRIAL BIODIVERSITY

SUSTAINABILITY OBJECTIVE:

Secure formal or stewardship agreement level protection of critical biodiversity areas required to meet provincial targets and ensure appropriate management of these and ecological support areas

Motivation: It is the municipality's responsibility to contribute to meeting the national and provincial biodiversity conservation targets. Benefits of this include securing water production functions, increased tourism opportunities and better grazing management.

Development implications:

- **Future development:** Development options in CBAs will be limited to no impacting development or development in existing transformed footprints. All development will be subject to a full EIA.
- **Existing land use:** Appropriate land management actions should be identified for CBA and ESA areas and implemented so as to work in synergy with conservation objectives. Where implemented, stewardship agreements will aim to secure biodiversity through sound land management agreements with landowners.

Action	Activities	Resources and Responsibility	1	2	3	4	5
Secure the protection of critical biodiversity areas	<p>Prioritise identified Critical Biodiversity Areas for protection based on their combined benefits and ecological infrastructure value and the threat of loss of these resources. This should include, but not be limited to their value as strategic water source areas, carbon sequestration areas, non-cultivation agricultural resources and tourism development opportunities.</p> <p>In partnership with EKZNW and NGOs active in the stewardship sector, establish a plan to secure 10% of unprotected CBAs based on the prioritisation plan using available instruments including:</p> <ol style="list-style-type: none"> 1. Stewardship programme (in partnership with NGOs such as WWF and EWT) 	District Planning and Development Services Department – Environment section, Ezemvelo KZN Wildlife, WWF, EWT, Conservation Outcomes.	X	X			

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	<p>2. Formal protected area expansion (in partnership with EKZNW)</p> <p>3. Planning instruments</p> <p>Prioritisation and protection plan should be re-evaluated every 5 years.</p>						
Improve biodiversity climate change resilience in ADM	Important biodiversity corridors must be protected from land use change through effective representation in land use planning and through their careful consideration in EIA / BA regulatory processes.	District Planning and Development Services Department – Development Planning section, KZN EDTEA, Ezemvelo KZN Wildlife.		x			x
Manage invasive alien plants	<p>Map and manage invasive alien plants as required by section 76 of NEMBA (all organs of state must draw up an invasive species monitoring, control and eradication plan for land under their control).</p> <p>Implement an eradication project in accordance with the drafted management plan.</p> <p>As part of managing alien plants, and in partnership with DEA: NRM Working for Water, identify opportunities for beneficiation and value added industries.</p>	District Planning and Development Services Department – Environment section, DEA: NRM Working for Water Programme		x	x		x

Monitoring Criteria

Protection status of biodiversity

Indicators and Data Sources	Targets
Area of High Conservation Value land under formal Protection.	<p>Analysis of the protection status of areas defined in the EMF as having high biodiversity value undertaken every 5 years.</p> <p>100% of all areas defined as CCA1/irreplaceable protected.</p>

Interventions against threats

Indicators and Data Sources	Targets
Threat management interventions implemented	Alien invasive plant management plan drawn up and approved by council.

6.8 WATER QUALITY

SUSTAINABILITY OBJECTIVE:			Integrated planning and implementation	Sustaining our ecosystems using resources efficiently	Towards a green economy	Building sustainable communities	Responding effectively to climate change
<p><i>Understand District water quality problems better through improved monitoring and improve water quality to levels which sustain human and economic users/uses and ecological functioning .</i></p> <p>Motivation: Water is a critically important resource in the District and is presently a development limiting factor (Demand currently equals supply). Declining water quality aggravates the limited water supply and increases the risk that demands will not be met. The poor quality of water in critical areas carries a significant opportunity cost (e.g. cannot use this water for irrigation) and negatively affects water treatment costs. Vulnerable communities using untreated water sources are placed at risk from a health perspective.</p> <p>Implications for Development:</p> <ul style="list-style-type: none"> ▪ Existing activities: Need to achieve 100% compliance with established monitoring operational objectives and > 90% compliance with established standards 100% of the time and 100% compliance > 90% of the time. ▪ Historical activities: Detailed monitoring programmes must be established to determine the extent and effect of acid mine drainage emanating from abandoned mines. ▪ Future Developments: Developments which are likely to compromise the quality of water in critical areas must be avoided. Any development proposed to discharge to the environment must comply with water use licensing requirements. Water use licensing must aim to improve water quality in critical zones through acknowledgement of the location of discharges within such zones and appropriately strict conditions designed with zero degradation of the resource as their objective. 							
Action	Activities	Resources and Responsibility	1	2	3	4	5
Set Appropriate Water Quality Standards in the Catchment	Engage in the National Water Resource Classification process for the uThukela River catchment (which has been advertised, but is yet to be undertaken).	The municipality along with members of local catchment management fora must register their involvement in and participate in the process of setting appropriate EMC and RQOs.	x	x			

<p>Improve the District scale understanding of water quality in ADM.</p>	<p>As part of development planning, the District should work towards a clear understanding of the risks and limitations water quality imposes on communities, businesses and on economic growth.</p> <ol style="list-style-type: none"> 1. Identify a water quality data champion for the District who can collate available water quality data for the District (ideally this will be someone who is already collecting WQ data such as officials in environmental health or in the water services authority, or perhaps a willing NGO) 2. Work with DWS to ensure all data collected by them is available to the District including data collected as part of WUL compliance monitoring. 3. Use the collated data to characterise and monitor the quality of water resources across the district and to assess risks to potable water supplies, economic development and to vulnerable communities. 4. In partnership with an academic or research institution, develop a proposal to the Water Research Commission or similar funder to undertake an honours or masters level study of water use in the District focusing on informal and unregistered users. This study should aim to develop a comprehensive understanding of the use of water in vulnerable communities in the District and the level of vulnerability of these communities to declining water quality and climate change impacts. The outcomes of this study should be used to inform development planning and interventions aimed at reducing water quality related risks. 	<p>District Planning and Development Services Department in partnership with:</p> <ol style="list-style-type: none"> 1. Provincial DWS, 2. uThukela Water, 3. Municipal Health Services (Community Services Department), 4. District Technical Services Department 5. Amajuba DM Water Services Authority and 6. Newcastle LM Water Services Authority. 7. Catchment Management Forum 8. NGOs e.g. EWT and Wild Trust 	x	x	x	x
<p>Understand and reduce the impact of acid mine</p>	<p>Acid mine drainage poses a significant risk to human health and economic growth in the District. The</p>	<p>District Environment Services (Planning and Development Services Department) in</p>	x	x	x	

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<p>drainage and mine affected water in the District.</p>	<p>District should work towards understanding this threat and understanding the requirements and opportunities for remediation.</p> <ol style="list-style-type: none"> 1. Continually work to improve the District's working relationship with Department of Mineral Resources and the Department of Water and Sanitation. 2. Develop a proposal for and implement a mapping exercise characterising the micro catchments delineated in this EMF with respect to pH and electrical conductivity as a mechanism for identifying catchments affected by Acid Mine Drainage (AMD) and Mine Affected Water (MAW). 3. Undertake an AMD and MAW decant point mapping and characterisation exercise including assessments of quality and quantity of decant. 4. Develop an inventory of existing projects and research work addressing AMD in the District and further afield. Identify which projects are active in the District and which AMD problem sites they are addressing. 5. Investigate AMD treatment options and opportunities to re-use the water in industrial processes. Also investigate the potential for extracting saleable by-products. 	<p>partnership with:</p> <ol style="list-style-type: none"> 1. Provincial/regional offices of DWS, 2. Provincial/regional offices of DMR and 3. Research/academic institutions. 4. District Technical Services Department 5. Amajuba DM Water Services Authority and 6. Newcastle LM Water Services Authority. 7. Catchment Management Forum 8. NGOs e.g. EWT and Wild Trust 					
<p>Secure the quality of key resources which are also used for tourism and recreational use.</p>	<p>Undertake a threat analysis and if necessary develop management plans for Ntshingwayo and Zaaioek Dams and any other dams to be used for recreational purposes. Plans should be aimed at managing impacts related to tourism and recreational use and enhancing the opportunities for tourism and recreational activities.</p>	<p>Dam management authorities - uThukela Water in partnership with landowners (To be confirmed)</p>	x	x	x		
<p>Secure and enhance ecological infrastructure's ability to ameliorate pollution</p>	<p>Ensure riparian and wetland buffers are identified and respected for all new development plans.</p> <p>Through EIA and other regulatory tools and</p>	<p>District Planning and Development Services Department – Development Planning section</p> <p>KZN EDTEA, KZN DARD, DAFF, Ezemvelo KZN</p>	x	x		x	x

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	management plans, ensure agricultural and forestry operations respect and maintain riparian buffers. Identify and protect key wetlands, characterise condition and develop and implement rehabilitation plans where necessary.	wildlife. KZN EDTEA, Ezemvelo KZN wildlife, DEA Working for Wetlands, NGOs e.g. EWT					
Operation of Waste Water Treatment facilities must comply with national standards	The operation of Waste Water Treatment Works has been identified as a key threat to water quality in the District. 1. All WWTWs in the District must be registered with DWS on the Integrated Regulatory Information System (IRIS) and Water service Authorities must ensure that reporting is compliant with IRIS requirements 2. Effluent quality must adhere to National and WUL limits.	Amajuba District Municipality Water Services Authority and Newcastle Local Municipality Water Services Authority		x		x	

Monitoring Criteria

Water Quality - Salt, pH, nutrient and bacterial contamination	
Indicators and Data Sources	Targets
Water quality measurements - pH	Target WQ values for aquatic ecosystems or for recreational contact (whichever is more conservative)
Water quality measurements – Electrical Conductivity (surrogate for TDS)	
Water quality measurements – E.coli count	
Water quality measurements – Soluble reactive phosphate concentration	

6.9 WATER QUANTITY

SUSTAINABILITY OBJECTIVE:

Improve water production security through appropriate protection and water resource management measures to ensure best possible hydrological health of Strategic Water Source Areas and long term sustained output of water.

Motivation: Water is a critical resource for meeting basic human needs and without which the District’s economic growth prospects are limited. All of the water used in the District is generated in the District’s catchments. Currently demand for water roughly equals the supply being generated and effective catchment management is essential to ensure that water supply is maximised throughout the year. This is particularly important given the projected impacts of climate change whereby precipitation patterns are likely to be more erratic with more frequent droughts and more intense storm events.

Development implications:

- **Future development:** Development in key water supply catchments must be strictly controlled to restrict the impact of development on water production potential and hydrological functioning. Activities which impact on water quantity and quality in key catchments should be avoided.
- **Existing land use:** Existing land use in strategic water source areas should be managed to protect hydrological functions. Buffers around water courses and wetlands should be respected. Grazing and grassland management should follow best practice guidelines to ensure soil vegetative cover is protected. Invasive alien plant species must be controlled.

Action	Activities	Resources and Responsibility	1	2	3	4	5
Secure the long term protection and management of SWSAs to secure the hydrological health of these areas above key infrastructure	<p>Identify key areas of overlap between strategic water source areas, critical biodiversity and non-transformative agricultural value and prioritise these areas for protection.</p> <p>In partnership with EKZNW, WWF, Conservation Outcomes and EWT, develop a plan for expanding the protection of the prioritised areas through stewardship agreements or other suitable vehicles.</p> <p>In partnership with DWS and catchment management forums, develop integrated catchment management plans for the catchments of the Ngagane River above Ngagane River abstraction point and the upper</p>	<p>District Planning and Development Services Department – Environment section in partnership with:</p> <ol style="list-style-type: none"> 1. Provincial DWS, 2. Ezemvelo KZN Wildlife 3. DEA: NRM, 4. KZN DARD 5. NGOs e.g. WWF, Wildlands Trust, Conservation Outcomes and EWT 	X	X			X

Integrated planning and implementation

Sustaining our ecosystems using resources efficiently

Towards a green economy

Building sustainable communities

Responding effectively to climate change

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	<p>Buffalo River above Zaaihoek Dam.</p> <p>Map and manage invasive alien plants as required by section 76 of NEMBA (all organs of state must draw up an invasive species monitoring, control and eradication plan for land under their control).</p> <p>In partnership with DEA: NRM develop an alien invasive plants eradication plan for strategic water source areas (which may form part of the catchment management plan in the areas described above and</p> <p>KZN DARD in partnership with relevant NGO's to adopt (if suitable exists already) or develop and publicise best practice guidelines for grazing management in AMD's grasslands.</p> <p>Relevant sector departments should review and where possible adopt the management frameworks provided for various land uses in Le Maitre et al (2018) "Strategic Water Source Areas: Management Framework and Implementation Guidelines for Planners and Managers, WRC Report No. TT 754/2/18"</p>						
<p>Formalise the existence of SWSAs in planning policy.</p>	<p>Include spatial extent of SWSAs or water management zones in planning documents such as IDP, SDF and LUMS etc. and in these documents recognise the value of these areas to the development potential of the District, appropriately restricting land use and managing to protect the quality and quantity of water generated in these areas.</p>	<p>ADM Planning and Development Services Department, Development Planning Section</p>	<p>x</p>	<p>x</p>			<p>x</p>
<p>Maximise use of available water resources and reduce demand on catchment supplied water.</p>	<p>Develop a catalogue of viable water use efficiency technologies for implementation in existing housing and for new developments.</p> <p>All new developments should be able to demonstrate how water use efficiency will be maximised through</p>	<p>TBC – Sustainability unit?</p>		<p>x</p>			<p>x</p>

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	<p>recycling and water wise plumbing fittings.</p> <p>Develop a plan to implement rainwater harvesting for all new developments and to identify opportunities for subsidising procurement of tanks.</p> <p>Develop a plan to implement grey water recycling for new developments, particularly for housing schemes. Reference: Partners In Development.</p> <p>* The District together with Newcastle LM to conduct a feasibility study by 2022 on the possibility of recycling storm water in the District Municipal Area for agricultural use.</p>						
<p>Maximise the potential of existing storage facilities</p>	<p>*Draft a proposal for the removal of silt from major dams that will be sent to the Department of Water and Sanitation by 2021.</p> <p>*Draft a proposal for the removal of silt from agricultural and rural village dams that will be sent to the Department of Agriculture and Rural Development by 2021.</p>	<p>Amajuba District Municipality (as per Climate Change Vulnerability Assessment and Response Plan)</p>		<p style="text-align: center;">x</p>			<p style="text-align: center;">x</p>

Monitoring Criteria

Protection and management of Strategic Water Source Areas	
Indicators and Data Sources	Targets
<p>Proportion of Strategic Water Source Area under protection or management agreement</p>	<p>30%</p>
<p>SDF and IDP to acknowledge SWSAs</p>	<p>SWSAs included in SDF and IDP</p>
<p>Number of new housing developments implementing rainwater harvesting and/or grey water recycling</p>	<p>100%</p>

6.10 WETLANDS

SUSTAINABILITY OBJECTIVE:

Secure the long term functioning of wetland systems through accurate mapping, condition assessment (and rehabilitation where necessary), application of wetland buffer areas and implementation of regulatory instruments.

Motivation: Wetlands provide important ecosystem services including the improvement of water quality, the regulation of water flow in rivers and the provision of habitat for key species. The majority of wetlands are mapped remotely and the accuracy of such data is often a concern which hinders sustainable development planning.

Development implications:

- **Future development:** Future developments should not impact the functioning of wetland areas. Proposed development planning needs to include mapping and condition assessments as part of environmental assessments and implement management mechanisms i.e. wetland buffers. Rehabilitation of existing wetlands should be considered wherever possible as part of offsets so as to improve wetland functioning.
- **Existing land use:** Wetlands and their buffers must be maintained and any land use within buffers should aim to maximise buffering capacity of these areas.

Action	Activities	Resources and Responsibility	1	2	3	4	5
Build an information base regarding wetlands in the District	<p>Develop a mechanism by which EIA wetland specialist data and data stemming from other similar assessments can be captured by the District's GIS to build the wetland information base.</p> <p>Building on the data generated in this EMF, develop a wetlands GIS layer containing attributes of:</p> <ol style="list-style-type: none"> 1. Whether the wetland has been delineated infield, mapped remotely or modelled 2. the condition status of the wetland (if known) and 3. Name of wetland specialist and date captured 	District Planning and Development Services Department – Development Planning section - GIS specialist, KZN EDTEA, Ezemvelo KZN Wildlife, NGOs such as EWT, Wildlands Trust, WWF etc.	x	x			
Build awareness around the need to protect wetlands and their buffers	Run workshops for development planning and environmental departments regarding wetland functions and the importance of buffers.	District Planning and Development Services Department – Environment section in partnership with 1. KZN EDTEA,	x				x

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	Include training on the wetlands buffer tool (MacFarlane and Bredin 2016 - https://sites.google.com/site/bufferzonehub/)	2. Ezemvelo KZN Wildlife 3. NGOs such as EWT.					
Enforce legal protection of wetlands	<p>Wetlands and at least a 32m buffer must be delineated and avoided by all new developments.</p> <p>Any environmental authorisation applications potentially impacting on wetlands should include the application of the wetlands buffer tool (MacFarlane and Bredin 2016) to determine an appropriate buffer to be established.</p> <p>Any development within 500m of a wetland requires a water use license.</p>	KZN EDTEA, Ezemvelo KZN Wildlife, Provincial Office of the Department of Water and Sanitation					
Monitoring Criteria							
<u>Inclusion of wetlands in planning</u>							
Indicators and Data Sources				Targets			
Number of wetlands delineated and assessed and data provided to ADM				Increase relative to previous year			
Proportion of NFEPA wetlands and their catchments under protection				Increase relative to previous year			
<u>Minimise the loss of wetland area</u>							
Indicators and Data Sources				Targets			
Functional area of wetlands lost in the last year				0 Ha			

7. USING THE EMF

The EMF regulations require that the EMF must inform the EIA process. This guideline however has relevance at various stages in the development life cycle. The following points explain what other resources developed during the EMF process should be used in conjunction with this guideline to optimize the value of this resource at different points in the development life cycle.

- i. **Baseline Specialist Reports:*** These reports provide detail that informed the definition of the sensitivity zones including the location, extent and state of the various systems as well as their conservation status. This detail should be analysed to establish relevant features at a site scale. The drivers of the status quo are also discussed in these reports. If an application is for a land use that has already been identified as contributing to the degraded state of the environmental feature in question, it has the potential to add to the cumulative loss of the system. This understanding assists in highlighting the need for an appropriate level of assessment and mitigation of the impacts common to this land-use, during the EIA phase.
- ii. **EMF Decision Support Tool (online GIS):*** This tool contains all the baseline spatial information e.g. the location and extent of environmental features. It can therefore be queried to identify all sensitive features occurring within a development site and the level of sensitivity defined for the system or features at the site in question. The higher the number of environmental features occurring on a site, the higher the cumulative impact. By providing an understanding of the range of features occurring on a site, the DST assists in providing a quick and high level understanding of the potential specific (particular features) and cumulative impact.
- iii. **Sustainability Framework:*** The sustainability framework has value at various points in the development life cycle as described below:
 - a. **Project Planning***

Development proposals must show how they contribute to the achievement of the sustainability objectives relevant to their project through layout, design, choice of technology and on-going management i.e. the sustainability objectives should inform project planning.
 - b. **Environmental Assessment***

The acceptability of the project should be assessed against the sustainability framework and specifically the sustainability objective during the EIA. This is important as it has been informed by an assessment of cumulative impact within the SEA undertaken for the EMF. The assessment accounts for the relationship between natural, economic and social systems because it was founded on an ecosystem services approach. This framework therefore holds much greater value than developing a project specific assessment framework that provides scores for impacts.
 - c. **Environmental Management Programme***

The criteria, indicators and targets in the framework can also be integrated into the Environmental Management Programme (EMP) that must be submitted with the Impact Assessment Report.
- iv. **Stakeholder Database:***

The stakeholder lists generated in the EMF process, provides a starting point for developing an I&AP database as part of the public participation process required in the EIA for specific projects.
- v. **Legal & Institutional Framework:***

The legal and institutional framework described in the state of environment phase is a useful tool for ensuring that all regulatory processes relevant to a particular application are

identified. This needs to be done at an early stage in the process in order that a developer is able to plan accordingly in terms of time and budgets. It also assists the EAP to develop a project plan for the EIA that accounts for the information requirements of the other processes, and provides for alignment in terms of consultation i.e. it facilitates co-operative governance and co-ordinated decision making – one of the other key objectives of the EMF.

Confidence in Sensitivity Layers

It should be noted that the accuracy of the information, notably the spatial definition of location and extent provided for the various systems (such as wetlands) and environmental aspects (water production) varies considerably. This is due to differences in the resolution or scale of the information used in the mapping and the process undertaken (modelling versus direct mapping of systems). While the assumptions and limitations are detailed in the attached specialist reports, the confidence in the spatial outputs that define the boundaries of the various sensitivity zones is summarized below in table for each feature. The confidence rating is a general indication that considers the information presented for each sensitivity layer in relation to the others.

As a guiding context, the scale at which mapping should be undertaken relates to the scale of decision making. In the case of the EMF there are various relevant scales:

- **District Scale** – for informing broad development planning such as the spatial development Framework (SDF).
- **Local and site scale** – for informing localised planning at the scale of a LUMS or local area plan.
- **Site/property scale** – at which a developer makes application for a specific development activity.

The scale at which the majority of the features are mapped is consistent with requirements for the District Scale and certain aspects also for the Local Scale. The focus of this guideline is however the EIA process which takes place at the site/property scale. The assessment of confidence is therefore made with this in mind.

Table 16: Descriptions of confidence ratings associated with data

CONFIDENCE RATING	DESCRIPTION
VERY HIGH	The feature definitely occurs at this location and the position of the feature boundary is considered accurate. An infield assessment may be required to confirm that an EIA is required if the feature represents the trigger.
HIGH	The feature very likely occurs at this location and the position of the feature boundary is considered relatively accurate but requires in field investigation to confirm the extent and nature of further investigations.
MODERATE	The feature likely occurs at this location but the accuracy of the boundary or level of associated constraint is low. Requires in field review and specialist assessment.
LOW	The feature may occur at the location, and the definition of boundary and nature of the system is poor. In field assessment and specialist investigations definitely required.

Table 17: Data sources, limitations and confidence ratings associated with data used in the EMF

ENVIRONMENTAL FEATURE	SOURCE/NATURE OF MAPPING	LIMITATIONS & IMPLICATIONS	CONFIDENCE RATING
Agricultural Resources	The provincial agricultural land potential categories are used together with the provincial field cropping boundaries.	The layer is modelled and developed at a provincial scale. Furthermore, a key input in assessing land capability is soils, for which detailed understanding can only be achieved through detailed investigations. As a consequence agricultural sensitivity is a high level indicator – except where it has been identified as existing agricultural land.	Low to Moderate
Terrestrial Biodiversity	Protected area boundaries surveyed accurately. Provincial scale mapping of the CBAs supplemented by more detailed analysis and mapping for the Agri-Ecological zones which was informed by digitizing off images and consultation.	Provincial level CBA mapping is undertaken using a number of input layers including a provincial scale land cover map. This has inaccuracies, particularly in identifying partially transformed land. It is not uncommon to find a CBA that consists of transformed land.	Moderate to High
Wetlands	A combination of modelled data	The uncertainties of the location of	Moderate to High

	(Heistermann and Rivers Moore) and the existing provincial Wetlands layer (which varies in accuracy depending on the source data)	wetlands in highly disturbed areas, and lack of digitising reduces the confidence. Infield verification is required. The model also predicts the location of certain wetland types better than others.	
Water production	Data drawn from the CSIR's Strategic Water Source Area delineation project was used to map runoff across the District. This was aggregated to micro-catchment level to assess landscapes production potential	Given that this is a modelled output undertaken at a fairly coarse catchment scale, there is a moderate level of confidence relative to the EIA scale.	Moderate to High
Air Quality	In the absence of a full dispersion model, the USEPA's AQ Screen model was used to identify distances associated with the dispersion of emissions. Input data consisted of actual emission data from registered emitters in the District. KZN EDTEA AQ monitoring data was used to validate model outputs	A full dispersion model is not available for the District. The USEPA's Screen model does not take topography or climate variables into account and thus is very much a screening model. Results however compare favourably with the EDTEA's monitoring data.	Low
Floodable areas	The layer is derived from a provincial scale model that utilised a range of	An analysis of modelling outputs show that in flatter areas the output is	Low to Moderate

	Digital Elevation Model data. This was supplemented by a river line buffer approach segmented by altitude and slope.	far more accurate than in steeper areas where the flood risk area is not aligned with the river. This is accommodated through the inclusion of buffered river lines. In areas where engineering has modified the course of a river and altered the topography, the channel is often poorly represented. Detailed screening and assessments are required.	
Aquatic Biodiversity	National Freshwater Ecosystem Priority Area data is used together with the National PES-EIS data to identify the present state and importance of freshwater ecosystems of the District.	Both the NFEPA and the PES-EIS data are desktop level products. No ground truthing has been carried out and no recent river health data is available for the District	Low to Moderate
Water Quality	A synthesis of measured water quality monitoring data was supplemented by a modelled assessment of water quality risk based on land cover.	In catchments where monitoring data is available, confidence regarding water quality is high. In catchments where only modelled data is available, confidence is moderate and an assessment should be undertaken to confirm the modelled	Low to Moderate

		hypothesis.	
Heritage Resources	SAHRIS and KZN Museum database were consulted and data extracted for this work. This has been supplemented by battlefield data available from Amafa aKwaZulu-Natali.	The data used is known to be accurate but incomplete. No area-wide systematic surveys have been undertaken of important buildings or stone or iron age archaeological features for the District.	Moderate to High
Geotechnical features	Input data consists of data from the 30m SRTM digital elevation model, 1:250 000 geological maps, SOTER database District geotechnical and geohydrological studies, Mintek's Assessment of KZN Coal Reserves (2007). Geohydrological data includes the National Groundwater Data Base (NGDB) and the 1:500,000 hydrogeological map series	Some elements of the data have more confidence than others. The DEM is high confidence, while the mining data (extent uncertain) and the geological maps (scale) carry less confidence. The completeness of the NGDB data is also uncertain and parameters are not measured consistently across all boreholes.	Moderate
Infrastructure assessment	The approach integrates census information indicating level of infrastructure available in small place areas and spatial data regarding the location of the infrastructure It also	The confidence varies considerably because the layer integrates such a variety of infrastructure types and combines location and condition/capacity.	Moderate

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	incorporates some information on the condition of infrastructure.		
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