ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE ALBERT FALLS DEVELOPMENT NODE

Strategic Environmental Assessment

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INR Report No: INR473/13

ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE ALBERT FALLS DEVELOPMENT NODE

STRATEGIC ENVIRONMENTAL ASSESSMENT

Submitted to

uMshwathi Municipality

Prepared by

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EXECUTIVE SUMMARY

This summary provides a concise overview of the objectives and approach to this Strategic Environmental Assessment. The focusses of the summary is on the findings of the assessment - ***the key environmental sustainability issues affecting social well-being and economic prosperity in the area*** - as these are the primary concern to the decision makers and managers.

1. INTRODUCTION

This document details the Strategic Environmental Assessment (SEA) which forms the third phase in the process of developing an Environmental Management Framework for the Albert Falls Development Node. The aim of this EMF is to: "***Guide development within the Albert Falls Development Node towards sustainability.*** The node is an approximately 20 000 ha area surrounding the Albert Falls Dam as shown in Figure 1.

SEA is "*a process of integrating the concept of sustainability into strategic decision-making" (DEAT and CSIR, 2000*). SEA enables the proactive consideration of the sustainability at the earliest stages of development by establishing a sustainability framework that guides development planning.

The sustainability framework is the final output of this SEA and was developed through the following steps:

i. Summarise the state of natural systems, their conservation status and their socio-economic value.
ii. Identify and assess the environmental sustainability issues.
iii. Establish a Desired Future State (DFS) through stakeholder consultation.
iv. Detail the DFS in a sustainability framework.

The outcomes of this strategic assessment have informed the final outputs of the EMF.

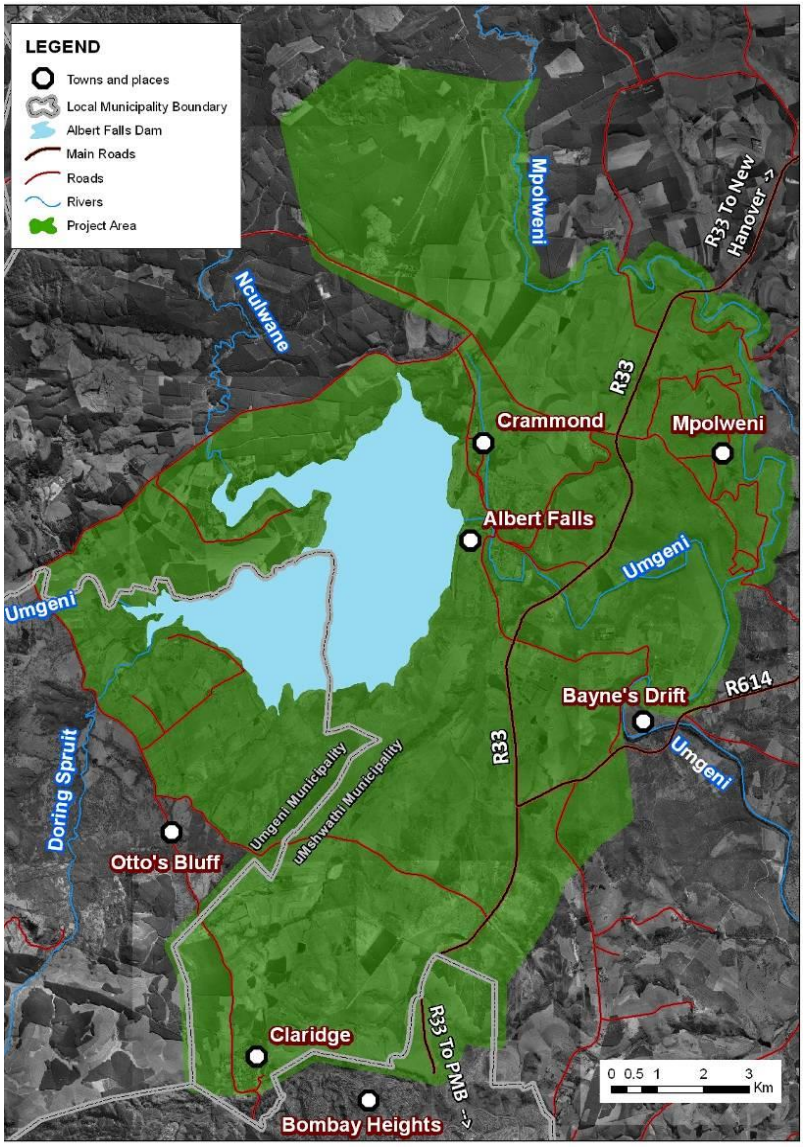

FIGURE 1 STUDY AREA AND SPATIAL CONTEXT

2. UNDERSTANDING SUSTAINABILITY

As the aim of the SEA is to define sustainability for the development node, it is important to define what sustainability is. ''*Sustainable development means* ***the integration of social, economic and environmental factors into planning, implementation and decision-making*** *so as* ***to ensure*** *that development* ***serves present and future generations****;*

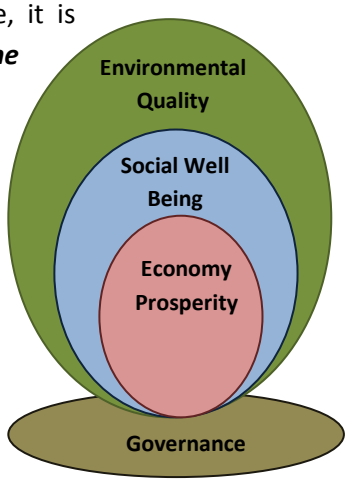

FIGURE 2 SUSTAINABILITY MODEL IN SOUTH AFRICA

This relationship between the environment, people and the economy is presented in the sustainability model (Figure 2) which shows that:

i. A healthy environment (environmental quality) is necessary for ,
ii. Social well-being, which is a prerequisite for
iii. Economic prosperity.
iv. The economic, social and ecological systems are integrated via the governance system, which holds all the other systems together via a regulatory framework.

As an example of a key sustainability issue, levels of bacteria in the Mgeni Water Resource far exceed legal standards for domestic and recreational use with negative consequences for tourism and recreational activities as well as human health of users abstracting directly from the water resources. The municipality needs to ensure that appropriate measures to avoid adding to this issue are built into planning authorisation and design conditions, particularly in the case of sanitation.

3. UNDERSTANDING THE RELATIONSHIP BETWEEN THE NATURAL AND SOCIO-ECONOMIC SYSTEMS

For SEA to assist in the move towards sustainability, it is important that it enables the integration of social, economic and biophysical aspects in the policy and planning process **(**DEAT, 2004). To do this one needs to understand the relationship between these systems i.e. how is the state of natural systems either supporting or negatively impacting people's wellbeing or economic prosperity. This was achieved by applying an Ecosystem Services (ES) approach. As shown in Figure 3, there are four types of ecosystem services.

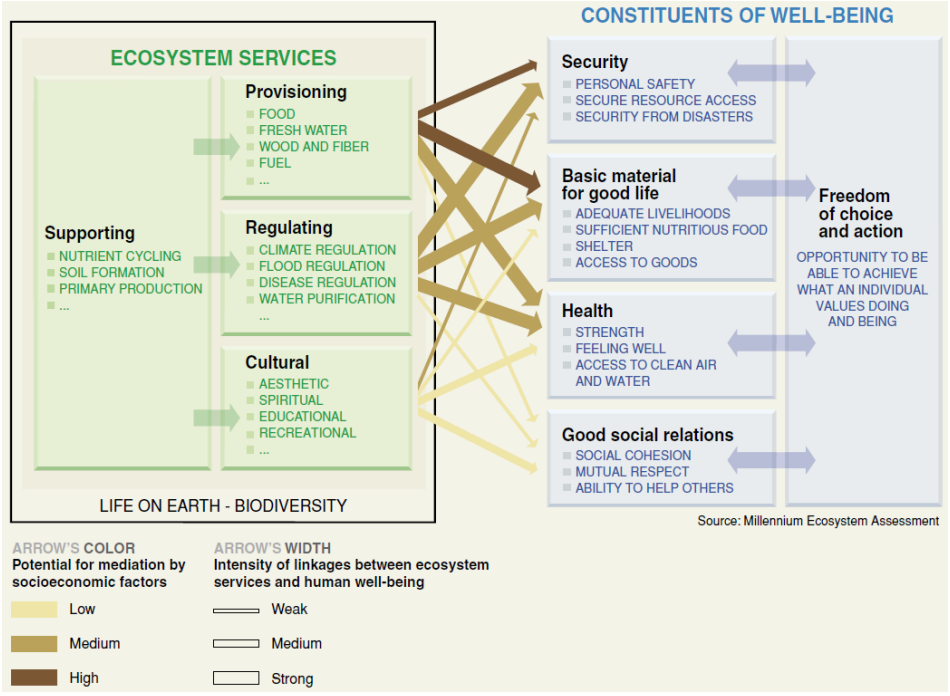

FIGURE 3 TYPES OF ECOSYSTEM SERVCIES AND THEIR BENEFITS TO SOCIO-ECONOMIC SYSTEMS

Supporting services underpin the other three types which are – provisioning, regulating and cultural services. If natural systems are lost or degraded the services they provide need to be met society. As an example, wetlands purify water. If wetlands are lost the cost of this service needs to be met by municipalities through more and larger waste water treatment facilities.

Stakeholders were consulted during the status quo phase to understand which services are important to them, and how the state of the natural systems that provide them is affecting the supply of these services. The analysis showed the systems listed in Table 1 to be the most important because of:

i. The importance and number of services they generate,
ii. The number of user groups that depend on these services, and
iii. The spatial extent of demand for the services – natural systems are considered more important if the services they generate support users both inside and beyond the development node.

TABLE 1 NATURAL SYSTEM GENERATING SERVICES WITH HIGH SOCIO-ECONOMIC VALUE

SYSTEM	SUMMARY STATEMENT
Mgeni River System	*The Mgeni River System **is a significant environmental asset at a local, provincial and national scale** sustaining the population and economic activity in the greater Durban-Pietermaritzburg region which is of significant provincial and national value. There is high demand throughout the study area and the catchment from all users for the following essential ecosystem services: Fresh Water Supply; Water Distribution; Waste Water Treatment; Recreational Use.*
Albert Falls Dam	While not natural, the Dam is a significant asset. It forms an integral part of the water supply system to the PMB-Durban area and has a significant capacity for diluting waste water. It plays a major role in supporting tourism and recreation at a local and regional scale, and also has real estate value which is significant at a local level to the municipality.
Arable Soils	Land with high production potential is the foundation of the primary agricultural economy which in turn supports the secondary activities and an integrated agricultural sector that has significant socio-economic value at a local, regional and provincial scale. These arable soils are therefore a significant natural asset.
Wetlands	While they cover a small area, wetlands provide a range of key environmental services that are in demand from a variety of users throughout the catchment. On an 'area for area' basis, they are probably more important than any other system. Of the services they provide: waste water treatment and habitat for species are probably the most significant given the level of bacterial pollution in the catchment and the demand on the habitat they provide for certain key species – notably the three species of cranes they occur in the area.
Grasslands	Grasslands constitute 15% of the study area and generate a range of important services, most notably fodder which is important to the agricultural sector. Grasslands also assist in treating waste water but not to the same extent as the rivers and the AFD. Probably the most significant value lies in the habitat they provide for endangered species in the area - notably both mammals (oribi), birds (crane species), and various invertebrates.

4. Key Sustainability Issues

The ecosystem services thinking was taken forward in the assessment by defining key sustainability issues in terms of the influence of natural systems on social wellbeing and economic prosperity. Issues are defined as key if they meet one of more of the following three scenarios:

i) Natural Systems are unable to Supply Ecosystem Services at Levels Required to Sustain Economic Sectors and/or Social Well Being (Ecosystem Services: Demand > Supply)

This occurs when the *extent and/or condition of natural system has been negatively impacted to a level where its capacity to supply the ES has been reduced below the demand in terms of sustaining economic activity or levels of human wellbeing.*

ii) There is a Threat to Systems that are Delivering Important Services (Natural Assets)

It is a key sustainability issue where the benefits from a natural resource are being optimized by an economic sector and the resource providing the beneficial services that support that sector are under threat. An example would be the loss of highly productive arable land which is sustaining the agricultural sector.

iii) Failure to Meet Legal Targets

The third scenario is where legal targets/standards, and/or ecological thresholds are not met. An example is the lack of formal protection for the areas of high value biodiversity in the development node.

The assessment framework provided for analysis of significance by considering how many users are affected and the value of the services in economic terms. Based on this framework, the following were identified as the key sustainability issues facing the Municipality. The following should be noted about the issues.

- While certain issues are specific to the development node, several are relevant at a municipal scale.
- Certain issues are also specific e.g. declining water quality, while others such as "Municipal capacity required to ensure environmental governance" are cross cutting.

ISSUE 1: Poor and Rapidly Declining Water Quality

Bacteria and nutrient levels are frequently well above standards for domestic and recreational use throughout the study area. This is probably the most significant issue given the rate at which quality is declining and the significance of the socio-economic implications for the municipality, its constituents and downstream users in the catchment.
The impacts include:

1. Reduced Contribution to the Local Tourism Sector and Associated Real Estate/Recreational value of Albert Falls Dam.
2. Increased costs - for treating water and managing invasive weeds and algae in Albert Falls and Nagle Dams.
3. Decline in Human & Environmental Health – which is potentially high given the relatively high number of people who extract water directly from resources due low levels of access to potable supply.

ISSUE 2: Transformation of High Value Agricultural Resources

Given the value of this sector to the economy and the reality of the threat of transformation, this is a very significant issue with the following impacts:

1. Further decline in an already shrinking regional economy.
2. Increase in unemployment and social vulnerability.

Contravention of Provincial and local planning policy which requires that these resources are conserved and optimized.

ISSUE 3: Municipal Capacity to Ensure Environmental Governance

Environmental governance is a collective responsibility. If the municipality is to assume its responsibility in making a meaningful contribution to addressing the key sustainability issues and implementing the EMF, it is necessary to develop appropriate capacity within the municipality.

ISSUE 4: Lack of Protection and Degraded State of High Conservation Value Biodiversity

All municipalities have a responsibility to contribute to meeting provincial biodiversity targets. There are no formally protected areas in the study area despite high value biodiversity (habitats & species) occurring in several systems. Apart from not contributing to meeting provincial targets, this limits the opportunities for developing and securing tourism and recreational opportunities presented by these systems.

ISSUE 5: Lack of and Poor level of Service Infrastructure

The current lack of and inappropriate services (notably sanitation) is one of the main factors contributing to water quality issues. The lack of other services (notably potable water supply) means that people are exposed to the pollution impacts on human and ecological health. Poor infrastructure (internal roads, power, water) is also a disincentive for attracting economic growth.

ISSUE 6: Lack of Understanding Regarding the State of Resources

There are two environmental components namely, air quality and cultural resources, for which data limitations across the study area limited the confidence in assessing the cumulative issues and recommendations for appropriate development.

ISSUE 7: Uncertainty of Land Tenure

Large sections of the study area are subject to a range of unresolved land claims. Landowners are less inclined to invest in in land management e.g. weed control, and in developing and optimising land if they are unsure of long term ownership. They are also less inclined to optimize the development potential of their land. The failure to finalise claims also limits confidence of investors and limits the ability of potential new owners to use land to access finance and extract themselves from poverty.

ISSUE 8: High Vulnerability Levels of a Large Proportion of the Population

This is issue is very significant but is listed last because it is a consequence of the preceding issues.
High levels of poverty coupled with high dependency rates, low education and skills levels and reliance on poor environmental quality, uncertainty regarding tenure, low levels of service supply - translate in high vulnerability for the poorest proportion of the population i.e. they are the most significantly affected by significant economic or natural crises. An example would be a crash in the sugar industry and associated loss of jobs in the region, where there are limited alternatives. Or alternatively, the loss of family members on whom the household depends for social welfare grants. A flood that destroys traditional/basic housing structures represents an example of a natural event that significantly impacts vulnerable households. Such households are also likely to be affected by Cholera due given their dependence on the polluted resource.

5. Desired Future State

The outcomes of the assessment (sustainability issues) were workshoped with stakeholders in order to define the Desired Future State (DFS). The DFS defines a vision that describes what the state of the natural environment should be in order that:

a) It supports the economic activity which rely on services from particular systems, and
b) Sustains the well-being of people.

This vision is expressed as 'sustainability objectives' that have been defined for each of the natural systems and resources as follows:

NATURAL ENVIRONMENT		
System	***Sustainability Issue***	***Sustainability Objective***
RIVER SYSTEM AND DAMS: ***Water Quality***	***Rapidly declining water quality*** due to high generation of nutrients and bacterial levels throughout the Mgeni River catchment with levels far exceeding legal standards.	***Improve water quality to levels which sustain ecological functioning, and human and economic users/uses.***
RIVER SYSTEM AND DAMS: ***Aquatic Health***	The ***relatively healthy habitat provided by river systems is under threat*** from proposed development in these sub-catchments.	***Maintain good aquatic health and improve sub catchments in fair condition to good.***
WETLANDS	***Extremely high levels of wetland loss and degradation*** *has reduced the capacity of these systems to ameliorate the serious water quality issues in the catchment and sustain high conservation value biodiversity.*	***Increase the health and functional value of all wetlands***
TERRESTRIAL BIODIVERSITY	***Low levels of formal protection and high levels of degradation*** limit the ability to meet conservation targets and benefit from the associated tourism and recreational economic opportunities, and cultural value they provide.	***Secure formal protection and improve the condition of high conservation value systems required to meet Provincial Targets.***
AGRICULTURAL RESOURCES	***Pressure to transform productive agricultural land*** to other land-uses ***threatens economic stability and growth*** in the region.	***Secure productive land and thereby the Existing and Potential value of the Agricultural Sector to the economy and food security.***
AIR QUALITY	***Relatively good air quality is considered an asset*** supporting 'clean' development'. There is a need to define current levels.	***Maintain present state of air quality to sustain current levels of social wellbeing and attract clean development.***

CULTURAL ENVIRONMENT		
System	***Sustainability Issue***	***Sustainability Objective***
Heritage Resources Archaeological, Paleontological, Cultural Landscape, Historical Buildings and Sites, Graves	***Lack of information and understanding regarding the location, state and conservation value of heritage resources*** increases the risk of loss, damage and ability to protect and manage them.	***Develop an understanding of heritage resources and measures to protect and manage them.***

SOCIAL ENVIRONMENT		
System	***Sustainability Issue***	***Sustainability Objective***
Social System	***A large proportion, of the people*** living within and surrounding the development node ***are vulnerable to the environmental impacts*** due to: - Limited access to and poor levels of basic services, which exposes them to environmental issues. - High levels of poverty and a declining economy, - Low levels of literacy and education. - Unresolved tenure issues.	***Reduced vulnerability through improved environmental quality, the prioritization of key services that reduce exposure to the environmental issues and improve people's capacity to benefit from and create economic opportunity.***

ECONOMY		
System	***Sustainability Issue***	***Sustainability Objective***
Economy	Declining economy (GDP) with over reliance on existing strengths (agriculture) , and an inability to - Optimise strengths, - Diversify and take advantage of potential growth opportunities. - Manage negative environmental impacts.	***Economic growth based on the sustainable optimization and protection of natural assets and which supports improved social well-being.***

6. Conclusion

The assessment has clearly illustrated the value of natural systems – particularly the wetlands, grasslands, arable land, the River system and Albert Falls Dam to the economy (agricultural and tourism sector), and societal services such as water supply and water purification. The value of these services from systems in the development node in many cases extends beyond the node to users at a regional, provincial and even a national scale. The influence of the state of these resources on the supply of important services and negative implications for the people and economy has also been highlighted.

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1. INTRODUCTION

1.1 Background

The uMshwathi Municipality has identified an area with development potential. The area is approximately 20 000 ha in extent and draws on its strategic location around the junction of the R33 and R614, its close proximity to Pietermaritzburg and the tourism and recreational opportunities provided by the Albert Falls Dam (AFD). The Municipality held local development summits in 2007 through which they established broad political, economic and investor support for a concept titled 'uMshwathi City' that proposed the establishment of mixed urban, tourism and recreational infrastructure in the area. The attraction of the node has subsequently been expressed through the relatively high number of development applications that have recently either been lodged or approved. In keeping with the Municipality's responsibility to promote '*sustainable development*' the Municipality in consultation with the Department of Agriculture and Environmental Affairs (DAEA) selected an Environmental Management Framework (EMF) as the tool to guide development in the node in a sustainable manner. The Municipality appointed the Institute of Natural Resources (INR) to develop the EMF on their behalf. This report concludes the third phase in the process towards developing the EMF, namely the Strategic Environmental Assessment (SEA).

1.2 Project Purpose and Structure

The aim of this EMF is to: "*Guide development within the Development Node towards sustainability by:*

- *Informing development planning*
- *Informing the EIA process for specific development applications, and*
- *Providing management guidance for responding to key sustainability issues.*

This is in line with the aims of an EMF as defined below in the extract from the EMF regulations.

Information Box 1 - Purpose of an EMF

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. The status of each phase is also presented with the SEA phase highlighted to show where we are in the overall project progress.

INCEPTION

Purpose – To document the desired outcomes, how they will be achieved and the mechanisms for managing the process.

- A common understanding and the purpose, nature and format of desired project outcomes for each phase,
- The relationship between each phase and the associated outcomes,
- The approach and methods for achieving these outcomes,
- Project management mechanisms required to efficiently and effectively achieve the outcomes.

Output – Inception Report
Status – Finalized February 2009.

STATE OF ENVIRONMENT

Purpose - Establish a baseline understanding of the state of the environment within the development node and more specifically:

- Map the location and extent of land-use, natural systems and features in the receiving environment.
- Classify the mapped systems and resources within different components of the receiving environment (social, cultural, biophysical).
- Establish the present state (PS) of resources within the different components of the environment.
- Document the factors responsible for the current state of the environment components.

Output – State of Environment Report
Status – Finalised May 2010

STRATEGIC ENVIRONMENTAL ASSESSMENT

Purpose - Establish a desired future state.

- Summarise the state of natural systems and discuss their socio-economic value.
- Identify, analyse and discuss the implications of key environmental issues – how the current state of natural systems is affecting people's well-being and economic prosperity.
- Establish a Desired Future State – objectives, targets and thresholds that will minimise/reverse negative impacts of the current situation and/or enhance positive aspects.

Output – Strategic Environmental Assessment Report
Status – Draft for Comment

ENVIRONMENTAL MANAGEMENT FRAMEWORK

Purpose – Guide the municipality in planning and implementing sustainable development in the development node, through a range of tools that comprise the EMF including:

- Strategic Environmental Management Plan (SEMP) - provides guidance on how to move from the Present to Desired future state by detailing the actions, methods and responsibilities for addressing key environmental issues and maximizing opportunities.
- Environmental Information Management System (EIMS) – spatial tool for data management and decision support.
- Development Planning Zones & Guidelines – guides location of development types & conditions for planning approval. Also informs the update of other planning instruments like the SDF and LUMS.
- Environmental Sensitivity Zones & EIA Guidelines – defines the sensitivity of areas in relation to natural systems and guides the nature and level of investigation during the EIA process.
- Training and guidelines for use of the EMF.

Output – EMF Products and Report
Status – Draft for comment

1.3 Study Area

The EMF study area is approximately 20 684ha in extent or 11.4% of the total municipal area (Figure 1). The boundaries of the study area are detailed in Figure 2. The area is located within the south-western section of the uMshwathi Municipality and is bordered by the Mgeni Municipality in the West and the Msunduzi Municipality in the south. The Mpolweni River forms the eastern boundary until its confluence with the Umgeni River downstream of AFD. From this point, the boundary runs roughly parallel to the R33 until it intersects the boundary of the Msunduzi Municipality above Copesville.

FIGURE 1 LOCATION OF THE STUDY AREA IN RELATION TO THE MUNICIPALITY

The study area is larger than that of the original area defined for the uMshwathi City Development Node. The node boundary was extended to include the Mpolweni area in the East. It was also extended in the West, from the boundary of the AFD to the Otto's Bluff Road to account for the development pressure being exerted on the area surrounding the dam. It is important to note that 2 826 ha or 13.4% (including a 730ha section of AFD) of the study area south west of AFD is located within the Mgeni Municipality. This area was included because it forms the immediate catchment to AFD and the dam is recognised as a strategic asset to both municipalities in terms of its value for tourism and recreation, and to the province in terms of its role as a water storage facility.

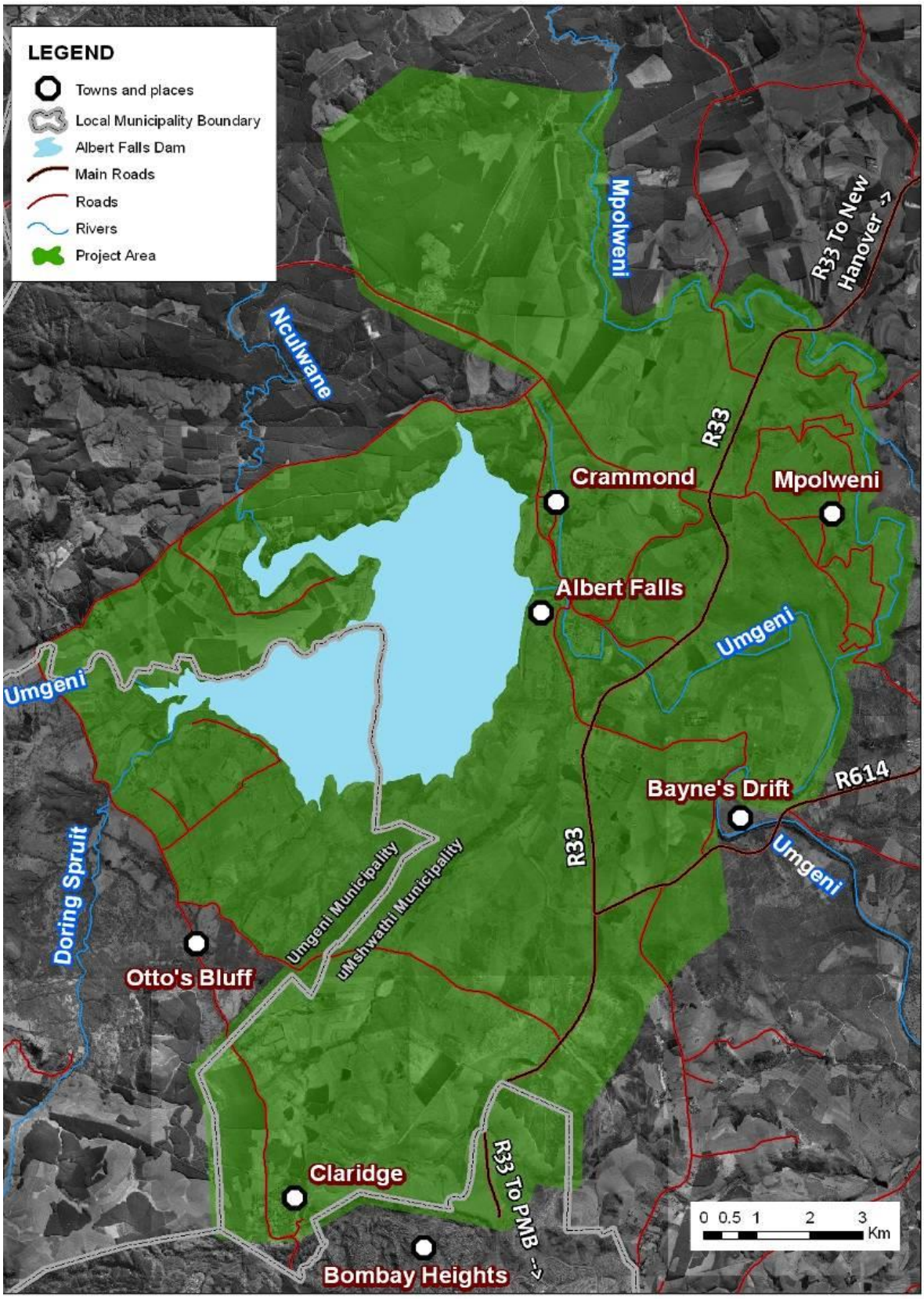


FIGURE 2 STUDY AREA AND SPATIAL CONTEXT

2. DEFINING STRATEGIC ENVIRONMENTAL ASSESSMENT

There are core principles which underpin any SEA (DEAT, 2004). The way in which these principles are accounted for depends on the type of SEA and the approach applied. This chapter explains what SEA is and the role it plays within the process of developing an EMF.

2.1 The Purpose of SEA

SEA has developed as a complimentary tool to Environmental Impact Assessment (EIA). A comparison of the two is consequently a useful way of understanding the purpose of SEA. The major differences between EIA and SEA, as summarised by the DEAT (2004) are summarised in Table 2.

TABLE 2 SUMMARY OF THE DIFFERENCES BETWEEN EIA AND SEA (DEAT, 2004)

ENVIRONMENTAL IMPACT ASSESSMENT		STRATEGIC ENVIRONMENTAL ASSESSMENT	
i.	Is reactive to a development proposal.	i.	Is pro-active and informs development proposals.
ii.	Is used to assess the effect of a proposed development on the environment and socio-economic conditions.	ii.	Is used to assess the effect of the existing environmental and socio-economic conditions on development opportunities and constraints.
iii.	Relates to a specific project	iii.	Relates to areas, regions or sectors of development
iv.	Enables the identification of project-specific impacts.	iv.	Enables the development of a framework against which positive and negative impacts can be measured.
v.	Has a well-defined beginning and end and focuses on informing a specific decision at a particular point in time.	v.	Is a process aimed at the development of a sustainability framework to inform continuous decision-making over a period of time.
vi.	Is focused on the mitigation of negative impacts and the enhancement of positive impacts.	vi.	Is focused on maintaining a chosen level of environmental quality and socio-economic conditions (e.g. through the identification of sustainability objectives and limits of acceptable change).
vii.	Has a narrow perspective and includes a high level of detail.	viii.	Has a wide perspective and includes a low level of detail to provide a vision and overall framework.

The purpose of EIA is to assess the environmental implications of an individual development application at a site specific scale. The intention is for the assessment to inform a decision as to whether the project is acceptable. In terms of NEMA, appropriate development is that which is 'sustainable'. DEAT (2008) concluded that 10 years of practice in South Africa has shown that EIA seldom leads to sustainable outcomes. The study concluded that *"The biggest single issue that negatively affects the effectiveness of EIA in South Africa is that it is often executed without taking sufficient account of the broader context within which the application occurs*." The study highlights the now common understanding that; the site specific scale, high level of detail, narrow perspective and reactive nature of EIA limits it to a tool that is best suited to identifying measures to mitigate negative impacts and enhance potential benefits of individual projects.

It is the purpose of SEA to establish this '*broader context*' in which sustainability can be defined and thereby inform decision regarding the appropriateness (sustainability) of specific projects in the EIA process. SEA achieves this through a proactive approach to setting a chosen level of environmental quality and socio-economic conditions (e.g. through the identification of sustainability objectives and limits of acceptable change). In summary, the ***purpose of SEA*** is 'to ***integrate sustainability objectives into the policy and planning process***, and thereby assist in the ***implementation of the concept of sustainable development'***. The specific role of SEA in the EMF process and the approach adopted in undertaking the SEA is discussed in the remainder of this chapter of the report.

2.2 The role of SEA in the EMF Process

The EMF regulations explain the role of an EMF as follows:

(i) *To inform general environmental management, and*

(ii) *To inform the consideration of applications for environmental authorisation for specific projects, in a defined geographical area*" (information box 1).

SEA has an important role to play in achieving these two objectives as explained below.

i. Informing Environmental Management

In order to manage the environmental issues in an area it is necessary to understand what they are. It is also necessary to understand what the environmental assets in a region are in order that they can be protected and/or managed and thereby minimise damage and optimise benefits derived from them.

The current state of the environment i.e. socio-economic, biophysical and cultural, and sub components (Biophysical – Aquatic systems – Rivers - Water Quality) was established in the State of Environment Report (SoER) of the EMF process. The strategic assessment takes this understanding to the next level by analysing this information to:

- *Understand the nature of specific issues* – positive or negative, scale (national, provincial, local), trends (worsening/improving and at what rates these changes are taking place).
- *Establish linkages between the issues and the state of different systems* e.g. the state of water quality is negatively affecting the value of major water resources for their tourism and recreational value.
- *Understand the cumulative impacts and their significance* - whether various individual impacts combine to represent cumulative impacts.
- *Prioritise issues and systems* – identify which resources or systems have significant value and should be prioritised in terms of conserving and, or harnessing their potential.

The understanding generated through the SEA allows the municipality and other role players to select and plan appropriate responses and management interventions. These will be consolidated in the Strategic Environmental Management Plan, which is one of the outputs of the EMF.

Environmental management is a collective responsibility and the implementation of the EMF will therefore not be the sole responsibility of the Municipality. Other role-players including national and provincial government, civil society and constituents also have a role to play. A further benefit of the SEA for the implementation of the EMF is the contribution of the SEA towards the ***promotion of cooperative governance, which is an essential component of environmental management*** and one of the aims of an EMF. This is achieved by analysing the governance aspect of the key issues and identifying which institutions are responsible for addressing them.

ii. Consideration of Applications for Environmental Authorisation

For environmental management to be effective it needs to be focussed on specific objectives which are defined in terms of sustainability. It is therefore necessary to define sustainability for the geographical area in question which is achieved through the SEA in the following two steps:

- *Establishing the Desired Future State (DFS)*
  The DFS represents a vision towards which the environment should be managed to address the negative issues identified, and to harness the potential benefits derived from natural capital/assets.
- *Establishing a Sustainability Framework*
  The vision is then broken down into a hierarchical framework which includes objectives that give definition to the overall vision, as the first level of the hierarchy. The next level is criteria which are aspects which can represent the objective. The final level are indicators, for which targets are set that relate to the overall objective and need to be met if the sustainability vision is to be achieved. This framework (vision, objectives, and indicators) effectively represent a definition of sustainability. By setting targets for indicators it is also possible to measure success towards the DFS.

Having defined sustainability the EMF can then inform the consideration of applications for environmental authorisation at two levels as described below.

- *Development Planning*
  Sustainability is formalised and spatially represented in the EMF. It is further entrenched in municipal development planning when incorporated in the Integrated Development Plan (IDP) and supporting planning instruments, specifically the sector plans, the Spatial Development Plan (SDF) and the Land Use Management Schemes (LUMS).
- *EIA Process*
  Even where a specific development proposal is considered appropriate when reviewed in terms of the sustainability framework, the nature and scope of the project may still trigger the need for an EIA. The SEA informs this level of decision making by highlighting those issues that require attention during the specific assessment – thereby streamlining the EIA process.

2.3 Approach to the SEA

Having established a broad understanding of SEA and its role in the EMF, this section describes the specific approach to the SEA and methods employed to ensure that the SEA contributes to the EMF as described above.

2.3.1 Types of SEA

DEAT (2004) make the distinction between two types of SEA described below. These are discussed, with reasons provided for the type of SEA selected to support the EMF process.

i. EIA Based SEA

"*SEA is a process to assess the environmental implications of a proposed strategic decision, policy, plan, programme, piece of legislation or major plan (White Paper on Environmental Management Policy for South Africa, 1998: 169), in DEAT, 2004)".* The focus of this approach is on determining the environmental implications of a proposed policy, plan or programme.

ii. Sustainability Led SEA

SEA is "*a process of integrating the concept of sustainability into strategic decision-making" (DEAT and CSIR, 2000*). This approach enables the proactive consideration of the objectives of

sustainability at the earliest stages of decision-making. It facilitates the development of a sustainability framework to guide the development of plans and programmes and/or to assess an existing plan or programme.

In the case of the uMshwathi City Development, there is a broad vision expressed spatially in a very preliminary precinct layout. There is however no defined plan with specific applications intended to give effect to the plan. It is therefore not the intention of the SEA to assess the impact of the Mshwathi City concept plan. Rather, it is to develop a sustainability framework that will inform development planning and against which specific applications for environmental authorisations can be assessed. The SEA adopted in this instance is therefore a *"sustainability led SEA"*.

2.3.2 Process and Methods

The steps and associated methods undertaken to arrive at the sustainability framework, are described in Figure 3. Establishing the relationship between the three spheres of the environment 'social, economic and natural' forms the basis for the assessment. The assessment reflects the implications of the status quo for the people and economy within the study area. The outcomes were discussed with stakeholders in obtaining their view of Desired Future State, or sustainability objectives. The final step involved adding criteria and indicators against which the success towards achieving the DFS can be monitored i.e. completing the sustainability framework.

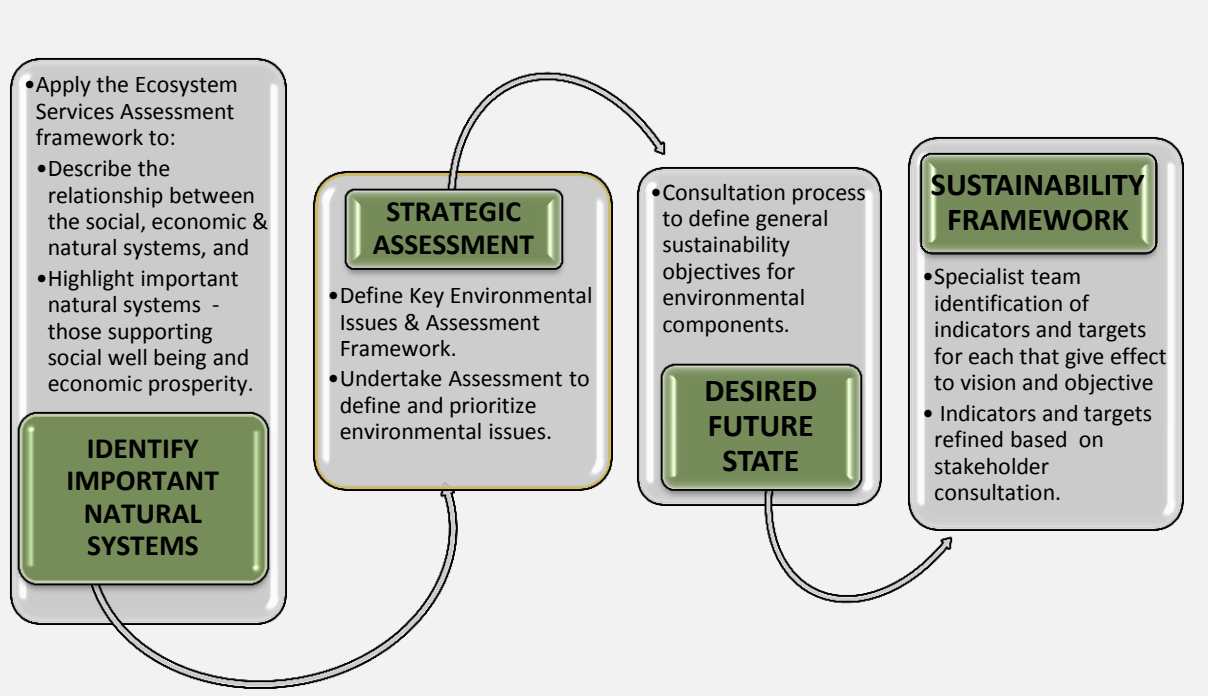


FIGURE 3 METHODOLOGY APPLIED IN THE SEA

Having defined the SEA and the approach adopted for the EMF, Table 3 summarizes how the SEA principles have been accounted for in the process.

TABLE 3 SEA PRINCIPLES AND THEIR APPLICATION IN THE EMF PROCESS

SEA PRINCIPLES (CSIR, 2004)	APPLICATION OF SEA PRINCIPLES IN THE EMF PROCESS
i. SEA is driven by the concept of sustainability.	A 'sustainability led' approach has been adopted with a focus on defining what sustainability means for the Municipality in the development node through the development of the sustainability framework.
ii. SEA identifies the opportunities and constraints which the environment places on the development of plans and programmes.	The SEA defines the opportunities and constraints imposed by the current state of natural systems and environmental quality by analysing these in relation to legal targets and ecological thresholds.
iii. SEA sets the levels of environmental quality or limits of acceptable change.	The Sustainability Framework puts in place targets which management should work towards in order to achieve the Desired Future State.
iv. SEA is a flexible process which is adaptable to the planning and sectoral development cycle.	The analysis in the SEA and outcomes are designed to inform all types of development. Furthermore, recommendations are made for updating the EMF (and therefore the SEA) on a five yearly timeframe in line with the IDP which is the municipal planning framework.
v. SEA is a strategic process.	Effective strategy requires the identification of the most important issues and factors (in this case environmental) that affect the ability to achieve a desired outcome. This process has focussed on identifying the most important (strategic) environmental issues by analysing the implications of the present situation and trends, for both people and society within and users outside the study area.
vi. SEA is part of a tiered approach to environmental assessment and management.	As a strategic level process, the SEA will inform environmental assessment and development planning at a project specific (EIA level) by: · Integrating cumulative impacts into the sensitivity analysis and guidelines which project level assessment need to take account of. · Environmental impact assessment – The sensitivity zones and EIA guidelines will inform the nature and focus of investigation during EIA.
vii. SEA is a participative process.	Stakeholders have contributed throughout the EMF process at the following points: · Establishing the relationship between natural systems and social well-being and economic prosperity (General public meeting, questionnaires and focus group workshops in SOE phase). · Identifying and validation of key environmental issues in stakeholder workshops in SEA process. · Setting sustainability objectives which form the basis for the sustainability framework. · Stakeholders will also be provided with an opportunity to comment on the draft sustainability framework.
viii. SEA is set within the context of alternative scenarios.	This principle is accounted for by integrating environmental constraints into defining the spatial extent of suitable areas for the full suite of development types.
ix. SEA includes the concepts of precaution and continuous improvement.	***Precaution***: The targets and thresholds within the sustainability framework are set in relation to legal limits established on the basis of the threat or risk to human health and well-being. ***Continuous Improvement***: The sustainability framework sets in place targets for improving towards the desired Future State. It also includes indicators against which progress towards this DFS can be monitored.

2.4 Understanding Sustainability

Given the nature, purpose and the type of SEA approach adopted it is important to understand what sustainability means for the Municipality and the development node.

- ***What is Sustainability***

The definition of sustainability in the National Environmental Management Act reads as follows: ''*Sustainable development means the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations;*

This definition is presented in Figure 4 and illustrates the following about the sustainability model as understood in South Africa:

v. A healthy environment (environmental quality) is necessary for ,
vi. Social well-being, which is a prerequisite for
vii. Economic prosperity.
viii. The economic, social and ecological systems are integrated via the governance system, which holds all the other systems together via a legitimate regulatory framework.

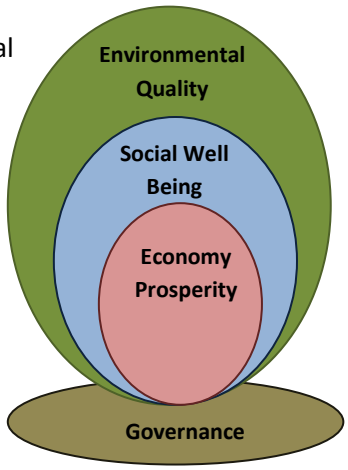


FIGURE 4 SUSTAINABILITY MODEL IN SOUTH AFRICA

In summary, environmental quality underpins a healthy and economically prosperous society. So what does this mean in practical terms for municipality and those living and working in the area? The following section tries to answer this question.

- ***What does Sustainability Mean for Municipalities?***

As with most municipalities across South Africa, uMshwathi is faced with the challenge of reducing unemployment by stimulating economic growth and improving the quality of life for its constituents. Local government's core mandate is understandably people centred. The route to improving quality of life is more often than not perceived to be achieved by addressing the backlog in basic services and stimulating employment opportunities through Local Economic Development (LED) initiatives. The development focus consequently lies within the socio-economic spheres of the model presented above and success is measured in terms of narrow indicators such as:

a) The % reduction in the backlog of supply of basic services such as potable water, sanitation and housing, or
b) The number of jobs created through local economic development (LED) initiatives.

This narrow view fails to account for the role that the natural environment plays in supporting social wellbeing and economic activity. We depend on ecosystems and the services they deliver to produce our food, regulate water supplies and climate, and breakdown waste products. We also value them in less obvious ways: contact with nature gives pleasure, provides recreation and is known to have a positive impact on long-term health and happiness (UK National Ecosystem Assessment 2011).

Despite being critically important to our social wellbeing and economic prosperity natural systems and the goods and services they generate are consistently undervalued in conventional economic analyses and decision making regarding development options i.e. the environmental sphere of the

sustainability model is often disregarded – resulting in unsustainable outcomes. An example is provided in the information box 2 below.

So sustainable development means "***accounting for the impact to the natural environment and the implications (well-being and cost) of this impact for the dependent social and economic systems in the planning and implementation of economic growth***" i.e. taking a holistic view that integrates the implications of a decision, plan or development action for other users (environmental, social and economic). The SEA facilitates a sustainable outcome by proactively defining sustainability for an area and setting in place a framework to guide development decision making in line with this definition.

According to DEAT (2004), "***for SEA to assist in the move towards sustainability, it is important that it enables the integration of social, economic and biophysical aspects in the policy and planning process".*** *This is achieved by identifying and evaluating the opportunities and constraints of the environment and socio-economic conditions on development* (CSIR, 1996).

Ecosystem services (ES) are a useful mechanism for achieving this integration because ES highlight the interdependencies between the social, economic and natural systems i.e. it shows which natural systems are currently (and have the potential) to play an important role in sustaining social well-being and economic prosperity in an area. An ES approach has been used in the SEA process and is explained in the next section.

3. THE RELATIONSHIP BETWEEN NATURAL, SOCIAL AND ECONOMIC SYSTEMS

3.1 An Ecosystem Services Understanding

Environmental Services are defined in Information Box 3. Of the four types, provisioning services (or goods) are the most easily understood of the ESs. Examples are provided in Table 3 of the sub-categories e.g. livestock, and specific examples of each e.g. poultry. A similar breakdown is provided for the other three types of ES in Appendix 1. The role that ES play in supporting wellbeing is illustrated in Figure 5. Supporting Services are the base services that underpin and are necessary for sustaining Provisioning, Regulating and Cultural services.

INFORMATION BOX 3

What Are Ecosystem Services?

Ecosystem services are the benefits people obtain from ecosystems (MEA 2005). There are four main categories:

- ***Regulatory Services***: Services that help regulate our living environment, and in many cases help reduce:
  - The impacts we have on each other e.g. tress provide shade and remove pollutants from the air.
  - Impact of extreme natural events on people e.g. wetlands attenuate floods.
- ***Provisioning Services:*** These are goods such as food and water that we harvest either for home or commercial consumption.
- ***Supporting Services:*** Services that underpin almost all other services and on which we build enterprises such as farming and tourism.
- ***Cultural Services:*** Services from natural areas which we can't eat or use directly, but which provides us with important social benefits.

TABLE 4 CATEGORIES OF PROVISIONING ECOSYSTEM SERVICES AND EXAMPLES OF EACH

Service	Subcategory	Definition	Examples
Provisioning services: The goods or products obtained from ecosystems such as food, timber and fiber.			
Food	Crops	Cultivated plants or agricultural produce that are harvested by people for human or animal consumption as food	· Grains · Vegetables · Fruit
	Livestock	Animals raised for domestic or commercial consumption or use	· Chicken · Pigs · Cattle
	Capture fisheries	Wild fish captured through trawling and other nonfarming methods	· Cod · Crabs · Tuna
	Aquaculture	Fish, shellfish, and/or plants that are bred and reared in ponds, enclosures, and other forms of freshwater or saltwater confinement for purposes of harvesting	· Shrimp · Oysters · Salmon
	Wild foods	Edible plant and animal species gathered or captured in the wild	· Fruit and nuts · Fungi · Bushmeat
Fiber	Timber and other wood fiber	Products made from trees harvested from natural forest ecosystems, plantations, or nonforested lands	· Industrial roundwood · Wood pulp · Paper
	Other fibers (*e.g.*, cotton, hemp, silk)	Nonwood and nonfuel fibers extracted from the natural environment for a variety of uses	· Textiles (clothing, linen, accessories) · Cordage (twine, rope)
Biomass fuel (wood fuel)		Biological material derived from living or recently living organisms—both plant and animal—that serves as a source of energy	· Fuelwood and charcoal · Grain for ethanol production · Dung
Freshwater		Inland bodies of water, groundwater, rainwater, and surface waters for household, industrial, and agricultural uses	· Freshwater for drinking, cleaning, cooling, industrial processes, electricity generation, or mode of transportation
Genetic resources		Genes and genetic information used for animal breeding, plant improvement, and biotechnology	· Genes used to increase crop resistance
Biochemicals, natural medicines, and pharmaceuticals		Medicines, biocides, food additives, and other biological materials derived from ecosystems for commercial or domestic use	· Echinacea, ginseng, garlic · Paclitaxel as basis for cancer drugs · Tree extracts used for pest control

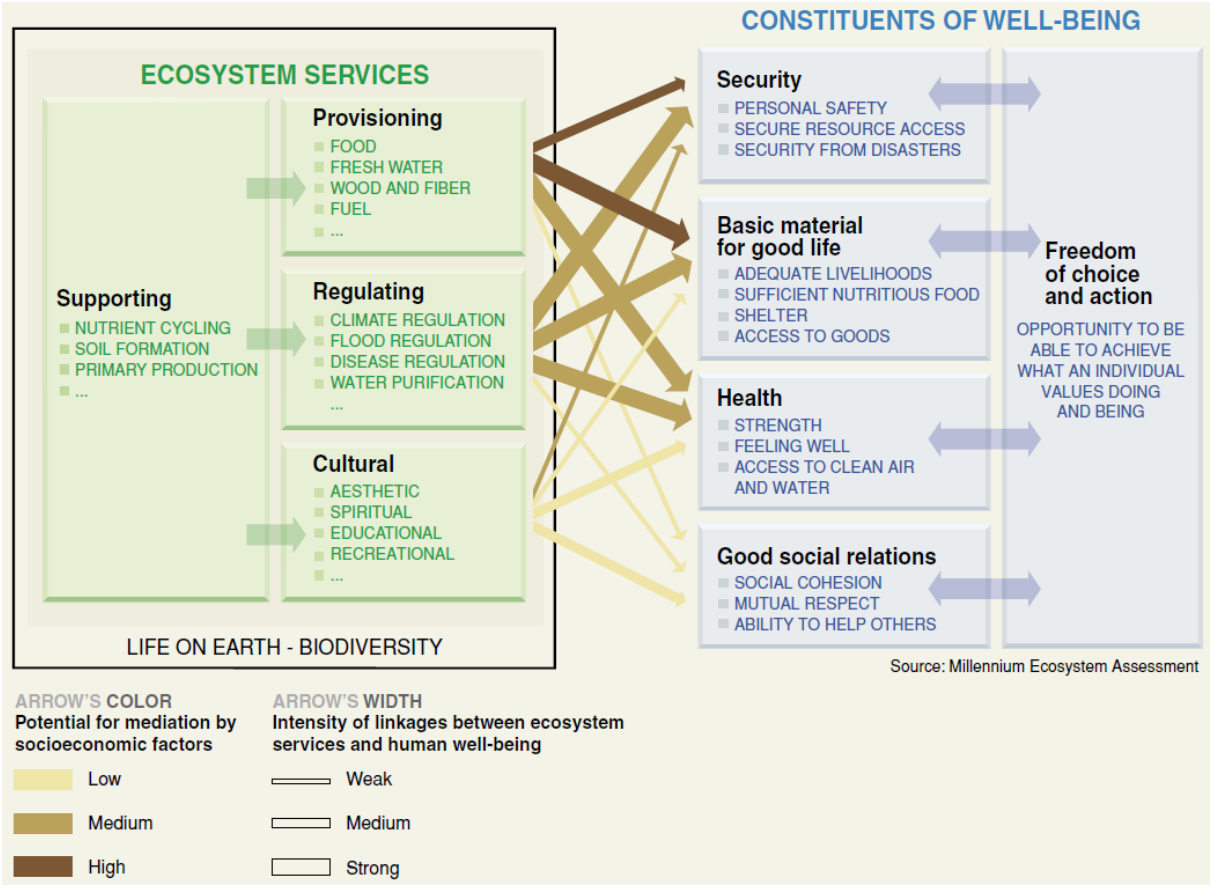


FIGURE 5 LINKAGES BETWEEN ECOSYSTEM SERVICES AND HUMAN WELL-BEING[1]

[1] Source: Millennium Ecosystem Assessment, Living beyond our means: Natural assets and human wellbeing.

Different systems generate certain ESs or deliver them at different levels to other systems. Figure 6 illustrates which systems generate these different goods and services. In the case of uMshwathi, neither the coastal, marine nor mountain and polar systems shown in Figure 6 occur within the area. The purpose of the following section is to establish:

- Which EGSs are generated by the systems occurring in the study area, and
- The level of dependence by different sectors of the society and economy, both within and outside the study area on these.

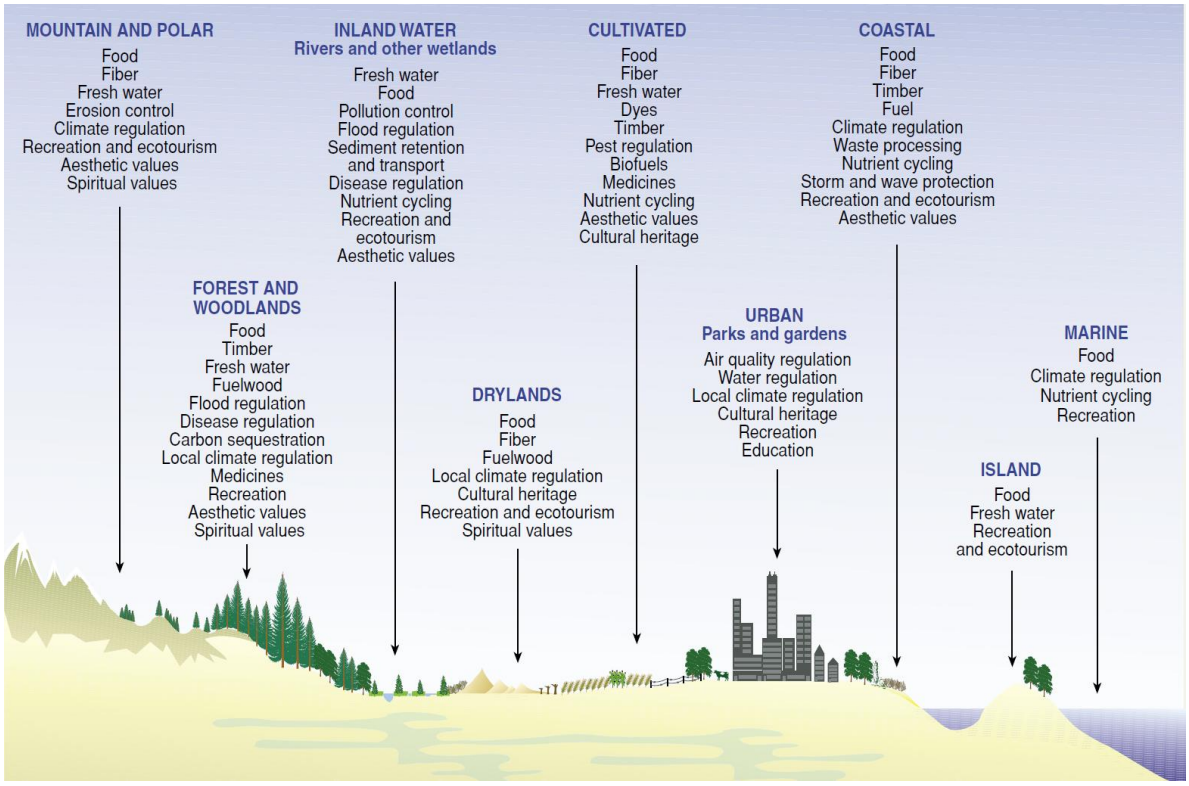


FIGURE 6 ENVIRONMENTAL GOODS AND SERVICES PROVIDED BY DIFFERENT SYSTEMS

3.2 Applying the Ecosystem Services Framework

3.2.1 Establishing Demand for Ecosystem Goods and Services

During the preceding phase of the EMF process, a series of workshops were held with the following five stakeholder groups; (agriculture, ratepayers and tourism, councillors and ward representatives, water authorities, and biodiversity conservation stakeholders. The purpose of these workshops was to identify which environmental goods and services:

i. Are important to their social wellbeing, and/or
ii. Play an important role in supporting their economic activity.

The level of dependence by each group on each service was rated between 1 and 3, with the final rating allocated to each ES being group based on consensus within the group. The outcomes of this process are summarised in Appendix 2. It must be noted that not all stakeholder groups rated every ES. The final dependence rating is calculated by dividing the total score by the number of groups that rated that ES. Comment is provided to elaborate on the numerical scores provided.

The strategic value of the ES is heightened if there is reliance on them from users in the broader municipal area, catchment (in the case of water resources) or even the province as a whole. The

summary in Appendix 2 therefore includes an indication of the spatial relationship between users within and external/downstream to the study area. The following definition of spatial categories used in the analysis is provided in Appendix 2.

TABLE 5 CATEGORIES OF SPATIAL EXTENT APPLIED IN THE ANALYSIS OF THE DEMAND FOR ECOSYSTEM SERVICES

AREA	DEFINITION
Local	Portion of the Development Node
Study Area	Development Node
Municipality	uMshwathi Municipality
Region	Broader catchment, Midlands etc – as defined in each case.
Province	KwaZulu-Natal

In summary the majority of lifestyles, livelihoods and quality of life are directly connected to the natural resources in this area as one would expect from an agricultural or land based economy. There is consequently a high dependence on the natural assets and the services they supply to the resident communities across the entire study area and from users at a regional and provincial scale in the case of certain ecosystem services.

3.2.2 Summary of Important Ecosystems and Features

Having defined what services are important, we need to define which natural systems generate or sustain the provision of these services, so that we can prioritize their management, conservation and restoration, as required. The value of these systems is heightened if the system:

i. Generates services which are in **high demand** from user groups.
ii. The demand extends to **many users within/out** the study area.
iii. The **system generates several services** which are in high demand.

The three factors above have been used to summarise the importance per system in Table 6. The tables providing more detailed information and motivation for the importance allocated to these systems are provided in Appendix 3.

TABLE 6 SUMMARY VALUE OF ECOSYSTEMS IN THE STUDY AREA

SYSTEM	SUMMARY STATEMENT
Mgeni River System	*The Mgeni River System **is a significant environmental asset at a local, provincial and national scale** sustaining the population and economic activity in the greater Durban-Pietermaritzburg region which is of significant provincial and national value. There is high demand throughout the study from all users for the following essential ecosystem services: Fresh Water Supply; Water Distribution; Waste Water Treatment; Recreational Use.*
Albert Falls Dam	While not natural, the Dam is a significant asset. It forms an integral part of the water supply system to the PMB-Durban area and has a significant capacity for diluting waste water. It plays a major role in supporting tourism and recreation at a local and regional scale, and also has real estate value which is significant at a local level to the municipality.
Arable Soils	This resource and the provisioning service they provide are the foundation of the primary agricultural economy which in turn supports the secondary activities and an integrated agricultural sector that has significant socio-economic value at a local, regional and provincial scale.

Wetlands	While they cover a small area, wetlands provide a range of key environmental services that are in demand from a variety of users throughout the catchment. On an area for area probably more important than other systems. Of the services they provide: waste water treatment and habitat for species are probably the most significant given the current state of these two issues in the study area.
Grasslands	Grasslands constitute 15% of the study area and generate a range of important services, most notably fodder which is important to the agricultural sector, but not of as significant value as the arable land in the area. Grasslands also assist in treating waste water but not to the same extent as the rivers and the AFD. Probably the most significant value lies in the habitat they provide for endangered species in the area - notably both mammals (oribi) birds (crane species), and certain invertebrates.

4. STRATEGIC ASSESSMENT

The purpose of the strategic assessment is to*: Identify and describe the key environmental sustainability issues".* The issues are also prioritised to assist in focussing management responses.

4.1 What is a Sustainability Issue?

As context to the assessment it is important to understand what constitutes a "significant sustainability issue". It is defined according to one of the following four scenarios.

iv) Natural Systems are unable to Supply Ecosystem Services at Levels Required to Sustain Economic Sectors and/or Social Well Being (Ecosystem Services: Demand > Supply)

It is a significant issue when the demand (quality and/or quantity) for a service exceeds the level of supply. This occurs when the *extent and/or condition of natural system has been negatively impacted to a level where its capacity to supply the ES at the level required by society has been exceeded*. In such cases, the situation is unsustainable and represents a significant issue. The ES framework is useful because it makes the links between the state of the natural systems and the dependant user groups as illustrated by the example in the figure below.

v) There is a Threat to Systems that are Delivering Important Services (Natural Assets)

It is a significant issue where the benefits from a natural resource are being optimized by an economic sector and the resource providing the beneficial services that support that sector are under threat. An example would be the loss of highly productive arable land which is sustaining the agricultural sector. Such a situation demands measures to protect these resources.

vi) Failure to Meet Legal Targets

The third scenario is where legal targets and/or ecological thresholds are not met. An example is the lack of formal protection for the areas of high value biodiversity in the development node as the need to meet conservation targets is a collective responsibility across all levels of government in terms of the Convention on Biological Diversity.

vii) Combination

It is possible, and likely, that an issue is significant due a combination of the scenarios described above.

4.2 Sustainability Assessment Framework

The assessment framework illustrated in Figure 8 is designed in line with the sustainability model (Figure 4) 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.

1) 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 are described with an indication of the level of demand - who 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.

TABLE 7 CATEGORIES OF PRESENT STATE OF NATURAL SYSTEMS AND IMPLICATIONS FOR SOCIO-ECONOMIC SYSTEMS

PRESENT STATE	SYMBOL	SOCIO-ECONOMIC IMPLICATIONS
System/environmental parameter is in a **natural/good condition** and **within legislated target**/standards and, or **ecological threshold**.		PES represents an environmental asset and is generating high levels/quality of Ecosystem Services that support current use and & may provide opportunity for additional utilisation.
System/environmental parameter is in an **impacted/average condition** but within **the limit of legislated standards** and, or **ecological threshold.**		Present state is impacted and presents some opportunity for additional development – with appropriate management.
System/environmental parameter is **in a highly impacted/poor condition** and exceeds **legislated standards** and or **ecological thresholds**.		Present state is negatively impacting social-well-being and economic activity (declining value from ecosystem service and increased costs to society). Represents an environmental constraint to development.

2) Social Well-Being

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

3) Economic Prosperity

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

4) 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[2] 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).

5) Drivers of Environmental Quality

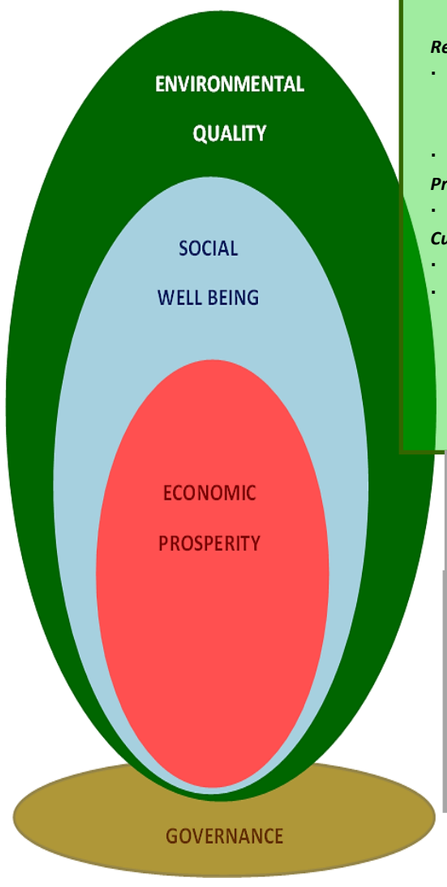
As described in section 4.1 (iii), impacts and threats to ecosystems that play important roles in supporting the social and economic components of the environment also represent environmental issues. The arrows in the diagram document the influence of current and proposed economic activities on environmental quality. These drivers of change to natural systems need to be managed if an issue is to be addressed.

4.3 Assessment

The assessment framework is summarised in a graphic format for the Mgeni River to show how it relates to the sustainability model. The remaining analysis is provided in tables to simplify the presentation of information.

[2] **Environmental Governance** - Environmental governance is the exercising of authority over the use and management of natural resources and the environment (WRI, 2004). It is essentially about making decisions and about who makes the decisions. It includes rules, processes and behavior that affect the manner in which these decisions are made. These decisions ultimately determine whether the environment is harmed or improved. Environmental governance involves a wide range of actors including individuals, Local, Provincial and National Government, community and tribal authorities, civic organisations and interest groups and various international bodies (WRI, 2004). In a democratic society, governance implies that all actors are involved in the decision-making process. Each actor has different interests and different levels of authority but also has a specific role and responsibility; government provides structure and process for interaction and society participates by articulating their needs and exercising their rights. **Reference:** Department of Agriculture, Environmental Affairs and Rural Development. 2010. *KwaZulu-Natal State of the Environment 2004: Governance Specialist Report*. KwaZulu-Natal Provincial Government, Pietermaritzburg.

4.3.1 Mgeni River System



ENVIRONMENTAL QUALITY

Overview of System/Feature

The Mgeni system is the primary resource supplying the greater PMB/Durban urban centres and economic core of the province. It is a highly developed and regulated system designed to ensure supply to meet important and growing demand. It includes several large storage dams including Albert falls (within study area) and Nagle (short distance downstream).

Environmental Services Generated and Demand (Levels of Dependence)

Regulating Services

- ***Flood Attenuation*** *– The system is highly regulated with major dams in close proximity playing a major attenuation function. Important to local users (domestic and agricultural located on floodplain.*
- ***Waste Water Treatment*** *- High demand from domestic local and downstream users.*

Provisioning Services (goods)

- ***Fresh Water*** *- Captured in system. Demand high from local and downstream users .*

Cultural and Tourism

- ***Cultural*** *– The Albert Fall is used for religious/cultural ceremonies.*
- ***Recreational Amenity*** *– The stretch of the Mgeni River downstream of AFD is one of the most paddled sections of river in the province. The picnic site downstream of the dam wall is a popular site for fishing and recreating.*

Present Environmental State (PES)

Summary Statement:

Poor & Rapidly Declining

Water Quality throughout the System

- ***Faecal contamination.*** *All sub-catchments show high levels of faecal contamination. On average all catchments exceed the DWA Target Water Quality Range (TWQR) for Ecoli., with some river having very high levels.*
- ***Nutrient Loading –*** *Nutrient levels in all sub-catchments exceed target thresholds for recreation and domestic use.*

State of Services Supply

Regulating Services

- Flood Attenuation ⇨
- Waste Water Treatment ⇩

Provisioning Services

- Fresh Water ⇩

Cultural and Tourism

- Cultural ⇩
- Recreational Amenity ⇨

DRIVERS OF ENVIRONMENTAL QUALITY

- Nutrients loading driven by agric activities and poor levels of sanitation in and upstream of study area.
- Failure to manage & protect resources through appropriate legal and management instruments.

IMPLICATIONS FOR SOCIAL WELLBEING

a) ***Loss of Recreational Amenity -*** Continued decline in water quality will diminish the ***recreational value*** of the resource due to nuisance issues (infestation by aquatic weeds).

b) ***Decreased Health of People -***The risk of infection with water borne and related diseases such as Diahorea is high for people abstracting directly from the resource for domestic use (which is relatively high due to low level of potable water supply) and recreational users of the system. ⇩

IMPLICATIONS FOR ECONOMIC PROSPERITY

a) ***Increased Water Treatment Costs -*** *For Umgeni Water and consequently users in downstream eThekwini Municipalities.*

b) ***Increase in Water Resource Management Costs –*** *removal of aquatic weeds.*

c) ***Loss of revenue/Decline in Tourism Sector*** *– associated with reduced value of being located adjacent to AFD and the nuisance/health issues*

d) ***Increased Health Treatment Cost –*** *for local municipality health services related to water borne diseases.*

e) ***Loss of productive days -*** *in local economy due to increase incidents of water borne illness.* ⇩

GOVERNANCE & MANAGEMENT

Status

a) ***Implementation of legislation –*** *Key management mechanisms provided for in the National Water Act are not in place including the Catchment Management Strategy, Resource Classification, Environmental Reserve and Resource Quality Objectives.*

b) ***Institutional Structures –*** *The Catchment Management institutional structure and operations are under review and DWA regional office has limited capacity to fulfil CMA role. CMF active but has no legal mandate and the Municipality does not actively participate in the CMF.*

c) ***Poor levels of monitoring and reporting –*** *Limited reporting on the state of water quality in system and gaps in monitoring framework (sites).*

Implications

a) *No legally defensible targets set against to account for sustainability at a catchment level.*

b) *Inability of Municipality to influence actions to address impacts to key resources emanating from upstream sources.*

c) *Reduces ability to evaluate source of issues, severity of impact and respond accordingly.*

4.3.2 Albert Falls Dam

OVERVIEW OF THE SYSTEM – ***A critical resource delivering essential ecosystem services that are of significant value at a provincial scale, and cultural services that play a major role in supporting economic activity at a regional and local scale.***

Albert falls (within the study area) and Nagle (a short distance downstream from where water is abstracted and treated to supply Ethekwini) are essential infrastructure in the supply of water to the greater Durban and Pietermaritzburg area which incorporates a large proportion of the provincial population and economic activity. The dam is providing the following essential services

- *Fresh Water supply* –This is the dam's primary purpose and is of critical importance at a provincial scale.
- *Waste water treatment* –The dilution of waste water is a significant service provided by the dam in such a highly developed catchment for the catchment downstream.
- *Tourism & Recreational Value* – The dam is the icon for the local Tourism Route (Albert Falls Amble) and supports a range of tourism and recreational events and facilities. It plays a significant role in the local economy.
- *Real Estate Value* – The dam is an attraction for housing developments.

PRESENT STATE - Poor & Rapidly Declining Water Quality

Present State – High nutrient loads emanating from the catchment will at current rates of decline result in Albert Falls (currently Mesotrophic) being classified as Eutrophic within 10 years. ***The capacity of the system to dilute nutrient inputs has exceeded ecological and legal standards.***

Mesotrophic (M)	*Usually high levels of species diversity; usually productive systems; nuisance growth of aquatic plants and blooms of blue-green algae; algal blooms seldom toxic.*
Eutrophic (E)	*Usually low levels of species diversity; usually highly productive systems with nuisance growth of aquatic plants and blooms of blue-green algae; algal blooms may include species which are toxic to man, livestock and wildlife.*
Hypertrophic (H)	*Usually very low levels of species diversity; usually very highly productive systems; nuisance growth of aquatic plants and blooms of blue-green algae, often including species which are toxic to man, livestock and wildlife.*

Drivers of present state –The poor state of water quality is due to the following factors:

1. ***Backlogs and basic level of sanitation infrastructure*** - most individual dwellings operate off a septic tank, including tourism and recreational facilities within the immediate periphery of Albert Falls Dam. Furthermore, VIPs have been used in dense formal settlement such as at Thokozana and Mpolweni which are in close proximity to the main Mgeni River. 52 percent of the total households used pit latrines with no ventilation, whilst 13, 8 percent had no toilet facilities at all (2001 Stats in IDP).
2. ***Inadequate Waste Water Treatment*** – The 2011 Green Drop Report (DWA 2011) reported that none of the treatment works within the Umgungundlovu District – which includes uMshwathi and the upstream Mgeni Municipality (Howick) are meeting effluent quality standards i.e. there is pollution from under-performing Waste Water

Treatment Works (WWTW).

3. ***Agricultural activities –*** are a dominant land-use throughout the catchment, including the study area. They generate widespread inputs of nutrients from in the form of fertilisers and pesticides. Animal production, particularly in concentrated production such as poultry, piggeries, dairies and feedlots contributes to bacteria and nutrient levels and bacteria in the system. Secondary agricultural production (saw mills, sugar mills, abattoirs) contributes further to effluent levels in the system.

GOVERNANCE

a) The issues pertaining to the Mgeni system (see 4.3.1) in terms of the failure to implement the National Water Act apply to the Dam because the state of water flowing into the dam is directly related to the state of catchment management – or lack thereof.

b) *Resource Management Plan*

A specific tool designed to manage large dams, is the resource management plan (RMP). This instrument provides for the designation of zones of activity within the boundaries of the dam reserve and on the water to ensure that the resource (water quality and aquatic health) and dam safety are maintained. The lack of an RMP has been a long outstanding issue for Albert Falls given its strategic importance in the province.

IMPACTS – IMPLICATIONS FOR THE SOCIO-ECONOMIC ENVIRONMENT	SIGNIFICANCE
Reduced Recreational Amenity value of the Dam Apart from the economic implications discussed above, the continued decline in water quality (odour, high infestation by aquatic weeds, health risk) will significantly diminish the recreational value of the resources and quality of life for people live adjacent the dam, who use it regular to recreate.	**A very significant issue for the regional population**, as the dam and its surrounds are used by a large number of people within the region for a variety of uses.
Loss in income to the region, due to: ***a) Reduced Real Estate value of land surrounding AFD*** *– Hartebeespoort Dam* ***b) Loss of revenue/Decline in Tourism Sector –*** *The dam is the crown Jewel in supporting tourism in the region and recreational activities. It is an iconic feature after which the local tourist route is named.*	**This is a *very significant issue* for the regional economy given the** high levels of poverty ▪ The municipality cannot afford to shed existing jobs. ▪ The opportunity for growth in the tourism sector and optimizing the real estate value around the dam (which is in high demand based on development applications) will be lost.
Increased Treatment Costs – ***a) For Umgeni Water and consequently users*** **-** treating water for use in ***b) Increase in Water Resource Management Costs*** – removal of aquatic weeds, managing odour issues and treating water quality within the impoundment.	**This is a *very significant issue* for regional and local authorities, and users throughout the catchment.** Although an extreme case, the budget for addressing the water quality issues at Hartebeespoort Dam for the 3 year period 2007-2010 was approximately R500 million.

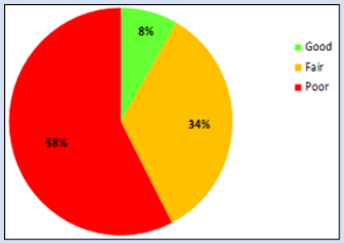
4.3.3 Wetlands

OVERVIEW OF THE SYSTEMS – ***Wetlands account for approximately 1050 ha or 5% of study area. Due to the ability to treat waste water demand on these systems throughout the catchment is high, particularly as the wetlands in the area have the opportunity to intercept and treat waste water.***

- *Waste water treatment –The treatment of waste water is one of the most important services provided by wetlands.*
- *Habitat Value – Wetlands provide habitat for all three species of cranes which have red data status.*
- *Biological Control – Wetlands provide natural habitat for the Eldana worm reducing the negative impact on sugar cane yields and reducing costs of pesticides*

PRESENT STATE - High levels of degradation & reduced functionality resulting in low provision of Ecosystem Services

- 144 wetlands mapped and classified according to terrain unit.
- Majority are in a fair (34%) to poor (58%) condition.



The capacity of wetlands to treat poor water quality and support species of high conservation value is significantly diminished.

Drivers of present state –The poor condition of wetlands within the study area is a factor of the following causes:

1. *Increased infestation by alien species due to disturbance with land transformation.*
2. *Reduction in natural flows from afforestation and irrigation.*
3. *Total conversion of wetland habitat through draining and planting to sugar cane and timber.*
4. *Increased toxic and nutrient inputs (associated with fertiliser and insecticide application) to adjacent wetlands.*
5. *Increased sediment inputs from agriculture.*

GOVERNANCE

The management and conservation of Wetlands is provided for in a variety of Acts. The most notable is the National Water Act as it defines wetlands and provides for their classification, and setting of the environmental reserve, resource quality objectives etcetera, as for rivers. The governance issues affecting rivers apply to wetlands given that the water act has not been implemented in the case of wetlands either i.e. Their management class, quality objectives and reserve requirements have not been set.

IMPACTS – IMPLICATIONS FOR THE SOCIO-ECONOMIC ENVIRONMENT	SIGNIFICANCE
Reduced Capacity to Treat Waste Water and pollutants Given the current condition of wetlands the systems in the area their capacity to treat pollutants in the catchment and thereby to 'protect' Albert Falls and the main River System the issue is a significant issue.	**This is a significant issue at a catchment scale given the water quality concerns in the catchment and numerous sources of pollutants in the study area** i.e. opportunity for the wetlands to supply this water purification service.
Reduced capacity to support high conservation value species – notably crane species.	This is a ***significant issue given that wetlands provide essential*** habitat for all three crane species occurring in the area.

4.3.4 Terrestrial Systems

OVERVIEW OF THE SYSTEMS – ***Grasslands and Savannah type habitat dominate the Terrestrial Environment – covering approximately 32% (16% each) of the total study area – the remainder being primarily transformed. In terms of ecosystem services, their most notable contributions are in the provision of habitat for conservation significant species.***

PRESENT STATE: High levels of transformation and low protection levels with several threatened habitats and species.

i. *High levels of transformation:* Nearly 60% of the study area has already been transformed.
ii. *Grassland condition:* The majority of grassland been transformed or has become encroached by woody species. Remaining grassland in fair to poor condition.
iii. *Level of protection*: Despite several areas currently being managed with biodiversity protection as a primary objective, no areas are formally protected within the study area.
iv. *Species status:* A wide range of species are regarded as rare or threatened within the study area, requiring protection to safeguard remaining habitats and populations.

Drivers of present state – The poor condition of wetlands within the study area is a factor of the following causes:

1. Disruption of natural ecological processes such as fire.
2. Agro-pesticides and herbicides pose a risk to a range of animal species.
3. The transformation and fragmentation of large areas of natural habitat through land-use change and fences – primarily for agricultural purposes.
4. Infestations of alien invasive plant species due to disturbance associated with land transformation.
5. Although it can be compatible overgrazing may result in erosion and a loss of diversity.
6. Over-harvesting of medicinal plants poses a threat to a range of indigenous plant species, including a number of threatened species.
7. Hunting with dogs and poaching of animals through illegal hunting poses a real threat, particularly to mammal and bird species within the study area.

GOVERNANCE

- A large proportion of the biodiversity occurs on private land. It is difficult to oversee the management of this land.
- Capacity/Resources – there is limited funding available to purchase properties and secure them under formal protection – or to then manage them.
- There are limited incentives for landowners to conserve natural systems.

IMPACTS – IMPLICATIONS FOR THE SOCIO-ECONOMIC ENVIRONMENT	SIGNIFICANCE
Loss of inputs to the Agricultural Sector due to threat of conversion to Urban land-use. Both grasslands and savannah *generate fodder* which supports livestock production in the area, either through grazing or baling for use in the feedlots and winter.	***While not as significant as arable land grazing and fodder are important inputs to the very important agricultural sector.***
Loss of Water Supply and Waste Water Treatment Services through Conversion to urban uses. The dense cover provided by grassland and savannah makes it efficient at intercepting and allowing for groundwater recharge. Effluent and animal waste from feedlots and poultry houses is spread across crop and grasslands which serve to dilute this. These systems also allow for the dispersion and treatment of animal waste in grazing lands. Loss of terrestrial systems for urban uses or infrastructure is permanently reducing the capacity of these systems to provide these services.	***Given the state of Water Quality in the region, the loss of these services is a significant issue.***

4.3.5 Productive Agricultural Lands

OVERVIEW OF THE SYSTEM – A large proportion of the area is classified as either good or medium potential arable land, of which most is under intensive production – primarily sugar cane and timber and also orchards (avos, fruit) and nurseries. These resources form the foundation of a highly developed, diverse and integrated agricultural sector that includes primary and secondary production which has significant value to the local, regional and provincial economy.

PRESENT STATE - *Diverse, but integrated and well developed Agricultural System that optimises available natural resources*

- *Large proportion land is high to good production potential.*
- *Regional planning policy requires that this land is delineated, used and retained for agric.*
- *Highly and moderately productive areas well optimized -primarily sugar-cane and timber.*
- *An integrated agricultural system exists: It is a major employer within the local economy (supplies 55% of jobs) with a range of mutually beneficial linkages between the different components within the system. There are linkages to other role players in the sectors located outside the study area:*
  - *Timber and sugar cane in the study area supports broader industry and economy at a regional (Sugar Mills) & provincial level.*
  - *Feedlots and poultry also have regional links.*

Drivers of present state – The state of the agricultural system is dependant on the following factors:

1. *Availability of labour.*
2. *Markets for primary produce – sawmills, feedlots, sugar cane mills, PMB fresh produce market.*

GOVERNANCE

1. *Well organised and agricultural sector with strong economic and institutional linkages (individual agricultural unions and consolidated Umshwathi Union). There are also well organised sector institutions such as Cane Growers that have been established to protect particular producers.*
2. *The voluntary development and implementation of the SUSFarms Environmental Management system on sugar farms is a good example of self-regulation.*
3. *Policy requirement defined in the IDP and agricultural provincial agricultural policy to delineate and protect high value agricultural land.*
4. *The Sub-Division of Agricultural Land Act, 70 of 1970 is being applied strictly to give effect to the policy requirement to protect productive land.*
5. *The disintegration of the Soil Conservation Committees and loss of scientists and extension officers within the provincial department has reduced the effectiveness with which the Conservation of Agricultural Resources Act is being implemented.*

IMPACTS – IMPLICATIONS FOR THE SOCIO-ECONOMIC ENVIRONMENT	SIGNIFICANCE
Reduction in agricultural economy due to the conversion of productive land to alternative/urban land-use. The issue relates not only to direct conversion of land under production – for example sugar cane or timber, but also: - Conversion of natural areas used for agric purposes such as grazing, bailing and distribution of effluent, or - Developing incompatible land-use in close proximity to agricultural industries such as poultry. The recent proposal for a petrol station, mixed commercial and health facilities at the junction of the R33 and R106 is a good example of this. There are also proposals to route the Venus-Sigma and Sector Venus Powerlines (and sub stations) and an alternative link to the N3 through the study area.	***This is highly significant issue given the links of the primary agricultural sector to secondary activities – which are in turn significant for the economy at a provincial scale.***

4.3.6 Air Quality

OVERVIEW OF THE SYSTEM – The area does not have any noxious industry. Sources of air pollution are therefore agricultural activities and the main roads. Air quality is influenced by topography and which is dominated by the Umngeni and Mpolweni River valleys with the elevated areas on the perimeter of the study area that descend towards the valley bottoms. Climate also influences air quality. The northerly and south easterly winds are dominant but are not specific to either summer or winter. The wind speeds are also fairly consistent throughout the year although calm conditions which are not good for dispersion occur more commonly in winter.

PRESENT STATE – Air quality is generally considered to be good and an asset for clean development. Levels are projected to be below legal standards for human health across the entire area. It is better in the higher lying areas of the study area with lower lying areas subjected to nuisance issues of particularly odour from agricultural activities. The entire area is subjected to smut outfall from sugar cane fires – particularly in winter months.

Drivers of present state:

- *Intensive agricultural activities (poultry, feedlot, crocodile farm) generate odour issues that affect the lower lying areas where they are located and where air naturally, particularly in winter months.*
- *Sawmills and timber processing activities also generate noise and odour as does the main provincial access route, the R33.*
- *The burning of sugar cane is the primary source of smoke, of which particles sized below PM10 are particularly harmful. The synergistic effect of the PM10 particles with other gases may be toxic and is harmful to the health of humans through chronic (up to lifetime) exposure. While considered to be below target this needs to be verified.*

IMPACTS – IMPLICATIONS FOR SOCIETY	SIGNIFICANCE
Lack of Detailed Air Quality Data *The lack of data and an associated air quality management plan reduces the ability to Monitor Quality and Manage Development to Maintain the Current Environmental Quality as an Asset.*	**This issue is of moderate significance if impacting industries are not introduced to the area i.e. the status quo is maintained. Should this change it will be important to understand the impact on current levels and what is an asset in the area.**

4.3.7 Social System

OVERVIEW OF THE SYSTEM – The population is largely rural in nature, with low population densities interspersed with small settlements where densities are higher, such as Mpolweni and Thokozane. The majority of people living in are black South Africans with very small percentages of other ethnic groups. Poverty is high, education levels low, there are backlogs in delivery of basic service, which in many cases are at provided at minimum levels.

PRESENT STATE - Highly vulnerable population with low resilience to environmental/economic crises or ability to benefit from opportunities.

- *Demographics – High Dependency Ratio (73 % of population between 0-35).*
- *Education – Low Literacy and Skills levels (A major proportion of the population of uMshwathi Municipality aged above 20 years has absolutely no schooling).*
- *Access to Services - Large % lack access to services and significant backlogs remain.*
- *Of the 7 local municipalities in the District, uMshwathi is 2nd behind Msunduzi with regards need for water, electricity and solid waste disposal. The large majority of population use VIP/French Drains.*
- *Income Levels - High Unemployment 43.7% of economically active proportion of the population are unemployed.*
- *66% of the households earn between R0-R800 and therefore live below the poverty line (IDP 2006)*
- *There was a significant increase in unemployment between 1996 and 2004.*
- *High reliance on government grants.*
- *Land Tenure – Apart from state owned land around Albert Falls Dam and the Albert Falls settlement, the large majority of the land in the study area is under private or commercial ownership. A relatively significant proportion of the land (roughly 20%) is subject to land claims, of which several remain unresolved.*

Drivers of present state:

1. *Capacity within Government to address socio-economic issues such as service delivery and finalise land claims.*
2. *Lack of economic growth and opportunities to provide the resources for poor households to lift themselves out of poverty.*

IMPACTS – IMPLICATIONS FOR SOCIETY	SIGNIFICANCE
High and increasing levels of Vulnerability[3]. The major factors affecting the vulnerability of people in the study area[4] are poverty, levels of and access to basic services and prevalence of HIV/Aids (DAEA, 2010). The affected sections of the population are unable to improve their situation. The decline in the economy and elements of the environmental health such as water quality, coupled with other drivers such as climate change mean that vulnerability levels in the area are likely to worsen.	**This is highly significant issue given the declining economy and state of natural resources i.e. vulnerability to the impacts of economic and/or environmental crises are likely to increase.**

[3] Vulnerability focuses on how an individual or community may be more vulnerable or resilient as a result of their capacities and resources, coping mechanisms, and support structures and complexity (deFur *et al*., 2007; Blaikie *et al*., 1994, Cutter, 1994; Binedell and Oelofse, 2008 – in Department of Agriculture, Environmental Affairs and Rural Development. 2010. KwaZulu-Natal State of the Environment 2004: Vulnerability Specialist Report. KwaZulu-Natal Provincial Government, Pietermaritzburg).

[4]

4.3.8 Economic System

<table>
<tr><td colspan="2">OVERVIEW OF THE SYSTEM – The economy is sustained by a well-developed, integrated agricultural sector, but is limited by failure to take advantage of opportunities to expand the secondary agricultural sector, take advantage of opportunities in the tourism sector and diversify the economy.</td></tr>
<tr><td colspan="2">SUMMARY STATEMENT: Declining economy with over reliance on primary sector and limited capacity to take advantage of potential growth opportunities.
▪ High dependency on agricultural sector – accounts for 50% of employment.
▪ Employment in the services sector has increased in line with national trends and accounts for (11%) of employment in the area.
▪ Limited opportunities for employment mean people rely on agricultural activities to sustain livelihoods.
▪ Opportunities -Proximity to PMB and assets (views, good air quality) raise value for real estate opportunities. Lack of certain bulk Infrastructure reduces development attraction/potential.
▪ Tourism opportunities have been identified but not optimized due to among other factors, lack of integrated planning.
▪ Demographics – High Dependency Ratio (73 % of population between 0-35).
Drivers of present state:
▪ Lack of certainty regarding land tenure.
▪ Depressed national and global economic climate.
▪ Lack of adequate levels of bulk infrastructure.</td></tr>
<tr><td>IMPACTS – IMPLICATIONS FOR THE SOCIETY</td><td>SIGNIFICANCE</td></tr>
<tr><td>Threat of increased decline in economy (existing strengths and opportunities) due to declining environmental quality
The existing strengths (agricultural) and potential opportunities (tourism and recreation) are under threat from - transformation of productive land, decreased environmental quality (notably water quality) and inadequate infrastructure.</td><td>This is <u>highly significant issue</u> given the already depressed and negative trends in the economy.</td></tr>
</table>

4.3.9 Heritage Resources

OVERVIEW OF THE RESOURCES – There are no listed archaeological resources in the study area based on current knowledge, nor is the area considered to be rich in these resources. The most significant heritage resources potentially at risk to development and agricultural expansion are buildings and structures older than 60 years and ancestral graves of labour tenants and farm workers.	
SUMMARY STATEMENT: No listed resources of conservation and low potential apart from the built environment and ancestral grave, but high appreciation and association of residents with the rural/agrarian landscape. **Drivers of present state:** ▪ *Limited use of the area during periods that would have resulted in archaeological resources.* ▪ *High transformation of the landscape through agricultural activity over long periods.* ▪ *Low levels of information for the area.*	
IMPACTS – IMPLICATIONS FOR THE SOCIETY	**SIGNIFICANCE**
Lack of information regarding the location and value of resources – notably the built environment A planned study by Amafa of historical buildings in the area was never completed and so information is limited.	**This is of low-to moderate significance** given that such understanding should be generated through the EIA process prior to any development taking place.
Threat to the rural/agrarian landscape from large scale urban development not in keeping with the existing landscape. A considerable number of residents strongly indicated their opposition to large scale alteration of the landscape to urban uses during the consultation process.	**This is of moderate significance** given the value ascribed to this landscape by a portion of residents and visitors.

4.4 Sustainability Issues

Analysis of the assessment above has resulted in the identification of the following as the most significant environmental sustainability issues.

ISSUE 1: Poor and Rapidly Declining Water Quality

This is probably the **most significant issue** given the rate at which quality is declining and the significance of the socio-economic implications for the municipality, its constituents and downstream users in the catchment.

1. **Reduced Contribution and loss of potential Contribution to the Local Tourism Sector and Associated Real Estate/Recreational**
   Significant decrease in recreational, tourism and real estate value of Albert Falls Dam &, Mgeni River and surrounding land due to ultimate decline of AFD to eutrophic state.

2. **Increased costs - for treating water and managing Albert Falls Dam**
   For Umgeni Water at treatment plants and DWA within storage facilities. Costs passed on to water users throughout the catchment.

3. **Decline in Human & Environmental Health**
   People who have direct contact with water resources both for recreational & subsistence use are at risk of higher infections of water related illnesses. The secondary/associated impacts are:
   - Increase in health costs (local municipal function).
   - Loss of productive days in local economy due to water borne illness.
   - High pollution events also result in biodiversity loss e.g. fish kills.

ISSUE 2: Transformation of High Value Agricultural Resources

Given the value of this sector to the economy and the reality of the threat of permanent transformation, this is a very significant issue.

1. Further Decline in a Shrinking Local GDP

The agricultural sector is the foundation of the regional economy which is decline. Reduction in land under production reduces not only primary production but places stress on secondary activities – saw/sugar mills etc.

- Catchment is closed to further timber so any loss is permanent.
- Mills depend on cane from study area to maintain economic viability**.**

The impact is greatest where transformation is permanent i.e. land is transformed to urban uses. The impact results not only from direct transformation, but establishment of land-uses (residential, commercial) in close proximity to agricultural activities (poultry, feedlots, piggeries) that generate outputs which conflict with socially sensitive land-use.

2. Increase in Unemployment

The Agricultural sector is primary employer in the area – employing 50% of the employable portion of the population. A decline in the area available to the sector will not only increase unemployment, but also reduce the capacity of the sector to improve the situation i.e. expand. This also increases social vulnerability.

3. Contravention of Provincial and Local Planning Policy

The identification and protection/optimization of high value agricultural land is a policy requirement. Having identified this land in the EMF – its loss would be in contravention of this policy.

ISSUE 3: Degraded State of Natural Systems

The degraded state of most natural systems is reducing their capacity to provide key ecosystems services. This is significant because many systems are beyond their ecological or legal thresholds.

Reduced Capacity of natural Systems to generate/ Deliver ecosystem Goods and Services

The degraded state of key ecosystems – reduces their capacity to provide key ecosystem services. The key systems are wetlands, grasslands and rivers/dams.

ISSUE 4: Municipal Capacity to Ensure Environmental Governance

Environmental governance is a collective responsibility. If the municipality is to effectively assume its responsibility meaningful contributing to addressing the key sustainability issues and implementing the EMF, it is necessary to develop appropriate capacity within the municipality.

There are requirements for the Municipality to comply with specific environmental elements. For example developing an Air Quality Management Plan and ensuring they are represented on the Catchment Management Forum. Environmental sustainability issues and governance however cuts across all municipal functions as follows:

- Technical services (ensuring designs reduce negative impacts),
- Planning (analysing development proposals against sustainability criteria and including appropriate conditions in approvals),
- Service delivery waste collection – implement recycling to reduce pollution.
- LED – identifying opportunities and facilitating 'Green Projects and Jobs'

So while all functions need to be accountable for integrating environmental sustainability into their decision making and actions, the lack of a specific position to co-ordinate an integrated approach to sustainability is a major issue and likely to limit the ability of the municipality to implement and utilise the outcomes of the EMF.

ISSUE 5: Lack of Protection for High Conservation Value Biodiversity

All municipalities have a responsibility to contribute to meeting provincial biodiversity targets legislation. There are no formally protected areas in the study area despite high value biodiversity (habitats & species).

1. Reduced Capacity to meet Conservation Targets

Municipal planning is required to take provincial targets into consideration. The lack of protection for high conservation value biodiversity (habitat and species) reduces the contribution of this area to securing these targets.

2. Limited Capacity to Harness Eco-based Tourism and Recreation

The options for ecotourism and recreational activities will be improved by securing land for such purposes.

ISSUE 6: Lack of and Poor level of Service Infrastructure

The current states of services is one of the main factors contributing to the state of natural resources - notably water quality – and the municipality has a key role to play in addressing this situation.

1. Pollution of natural systems

Of particular concern is lack of sanitation services which contribute to the extensive water quality issues via groundwater pollution e.g. Tokhozane on VIP. Lack of solid waste collection and management exacerbate the impact.

2. Impact on Human Health

Lack of adequate secure water supply places rural users at risk (due to poor quality of natural systems). The risk and impact applies to recreational users of the affected systems.

3. Inability to take advantage of opportunities required to diversify and grow economy.

Inability to meet existing demand and limited additional capacity (Power, water, roads) limits the economic growth potential.

ISSUE 7: Lack of Understanding Regarding the State of Resources

There are two environmental components namely, air quality and cultural resources, for which data limitations across the study area limited the confidence in assessing the cumulative issues and recommendations for appropriate development.

1. Loss of cultural resources

There is a lack of data and understanding documenting the location, nature, and conservation value of cultural resources in the region. There is therefore a risk of such resources, notably historic buildings and graves being lost and assets eroded.

2. Negative impact of Air Quality on Human Health

The specialist study identified pollution sources the nature of the associated issues – namely noise and odour issues. It also delineated the area where these issues are highest due to the location of the point sources of pollution and factors affecting air quality i.e. climatic conditions and topography. Based on the nature of pollution sources in the area, the prediction is that the state of air quality in terms of aspects such as particulates which are harmful to human health are within limits, specific data is not available to verify this. The potential is therefore to add activities in the area which may compromise air quality.

ISSUE 8: Uncertainty of land Tenure

Large sections of the study area are subject to a range of different types of unresolved land claims.

1. Reduced Incentive To optimise Value of Land Resources

The number and extent of unresolved land claims is hampering the optimization of economic potential from land under these claims because of the risk of loss to existing landowners, and potential investors in the area. The delay in concluding claims reduces the ability of claimants to benefit from the economic potential associated with owning land.

2. Limited Incentive to manage Natural Resources

Landowners are less willing to invest in managing natural resources (e.g. weed control) on property where tenure is uncertain, resulting in ongoing degradation.

ISSUE 9: High Vulnerability Levels of a Large Proportion of the Population

This is listed last because it is a consequence of the preceding issues. – but it is the most significant issue.

1. Limited capacity to respond to Environmental and Economic Crises

High levels of poverty coupled with high dependency rates, low education and skills levels and reliance on poor environmental quality, uncertainty regarding tenure, low levels of service supply - translate in high vulnerability for the poorest proportion of the population i.e. they are the most significantly affected by significant economic or natural crises. Examples include a crash in the sugar industry and associated loss of jobs in the region, where there are limited alternatives or loss of family members on whom the household depends for social welfare grants. A flood that destroys traditional/basic housing structures represents an example of natural event that significantly impacts vulnerable households. Such households are likely to be affected by Cholera due given their dependence on the polluted resource.

5. DESIRED FUTURE STATE

5.1 Defining the Desired Future State

The first step in dealing with sustainability issues identified is setting a vision and targets that represent a sustainable future. This vision is the 'Desired Future State' (DFS) and informs what actions are required to move from the Present to the DFS. There are two factors which need to be considered in establishing the DFS, namely:

i. The needs and wishes of the people who live and work in the area, and
ii. Legal standards and ecological thresholds defined in planning and policy instruments.

Figure 8 provides an example of how the two are considered in setting the DFS. In a situation where there is good quality air well within legal limits this represents a natural asset in an area because it is not negatively impacting people's health. It also provides scope for new development that decreases the air quality within or up to the legal limit. Or it supports further 'clean development' that requires good air quality. Under scenario 'a' in Figure 7, if people in an area wish to maintain the good air quality this translates to a high development constraint for polluting activities because it either means that:

- No polluting activities are developed, or
- Polluting activities have to be designed and operated with very effective control measures to remove the pollutants generated from their operations which are costly.

Under scenario 'b' people within an area may agree that the additional development may be allowed so that the state of the air quality declines, up to the legal limit which is set as the threshold. Under scenario 'a', the threshold will be set higher.

PRESENT STATE	LEGISLATED IMPLICATIONS FOR DEVELOPMENT	SOCIETAL AIMS FOR FUTURE STATE	DEVELOPMENT CONSTRAINT
Good Air Quality well within legislated limits.	Provides capacity for addition of polluting industry within an area i.e. limited development constraint.	a. Maintain Present State. b. Allow for decrease in PS to enable development (up to legal limit).	a. No polluting industries permitted. b. Allow for development of polluting industries up to legal limit.

FIGURE 7 CONSIDERATION OF LEGAL FRAMEWORK AND SOCIETAL NEEDS IN DETERMINING THE DESIRED FUTURE STATE

5.2 Determining the Desired State for the Study Area

Input from stakeholders into the DFS was established through two workshops at which the broad range of stakeholder focus groups within the area contributed to the development of a 'sustainability vision'. The outcomes of these workshops are included as Appendix 4. The vision was expressed in the form of a statement and represents a sustainability objective for the different aspects of the main environmental categories (social, economic and biophysical). These sustainability objectives have been compiled by pulling out the most common aspects (wishes) expressed by stakeholders and piecing them together to arrive at a consolidated statement or objective.

6. SUSTAINABILITY FRAMEWORK

The DFS is understood as a sustainability objective which captures what people desire as the future state of the resource. There may be an express wish to maintain the status quo, improve the situation or even allow for deterioration in the current state, as long as it does not result in legal limits or ecological thresholds being exceeded i.e. an unsustainable situation. Once the objective has been set it is possible to establish the following elements that together comprise a sustainability framework:

- ***Criteria***: the environmental aspect to be measured, for example air quality or level of biodiversity protection.
- ***Indicators***: are the variables or elements that can be measured to track success in achieving the objective for the criteria such as the concentration of different types of pollutants in the case of air quality. As the objective is to avoid levels that threaten human and environmental health different indicators may be appropriate for different users.
- ***Targets/Thresholds***: are the levels against which the indicators are measured. The targets are set at levels that give effect to the sustainability objective, so they will be higher where the desire is for an improved situation. For example, if an area is dominated by residential and recreational use then targets for air quality will be set higher than the minimum targets to ensure that people's health is not adversely affected. If, on the other hand the dominant land-use is industry, then the target would be the minimum possible level set in terms of the relevant policy or legislation to allow for as much economic activity as possible.

These following factors have been considered in the development of the sustainability framework and the Strategic Environmental Management Plan:

- ***Prioritization*** – The SEA has identified the key environmental assets and issues. The risk exists that by including other, less significant issues, that the effort allocated to priority issues is diluted. As an example, the analysis showed that amongst the wide range of water quality constituents, nutrients and bacteria levels are the constituents are at the core of the problems affecting domestic and recreational users of Albert Falls and the Mgeni system. There is an urgent need to focus on these constituents and the causes of the current levels if a crisis situation is to be avoided.
- ***Measurability*** – It is not useful to propose an indicator that is difficult to measure, or unlikely to be measured due to capacity, technology of other limitations.
- ***Responsibility*** – Development of a framework is meaningless without allocating responsibility to the measuring and or analysis of information, and then indicating who should take appropriate action based on the outcomes of analysis and reporting.
- ***Causal Relationship*** – The response to the issue should address the cause. It is therefore important to define this relationship upfront.
- ***Governance*** – Governance issues invariably contribute to the issue and need to be addressed in the case of any environmental aspect through clear consideration in the SEMP.
- ***Adaptive Management*** – An adaptive approach is required which involves review against targets at an appropriate interval. The frequency of the review will be directed by among other factors, the urgency of the issue and the frequency with which data is collected. The review also needs to take into account whether the indicator is providing the information it is supposed to and changes in the management context, such as new technology or legal standards.

6.3.1 Biophysical Environment

6.3.1.1 Water Resources - Quality

ENVIRONMENTAL COMPONENT	**WATER QUALITY OF SURFACE WATER RESOURCES - Rivers, streams, and Albert Falls Dam**	
STRATEGIC ISSUES	Declining water quality due to high generation of nutrients and bacterial levels throughout the Mgeni River catchment is negatively impacting people's health, increasing costs of treating water and poses a significant risk to the economy in terms of loss in the existing and potential value of the tourism, recreation and real estate value associated with Albert Falls Dam.	
SUSTAINABILITY OBJECTIVE	***Improve water quality to levels which sustain ecological functioning, and human and economic users/uses.*** ***Motivation***: Capacity of the system (rivers and Albert Falls Dam) to dilute and treat nutrients and bacteria levels has been exceeded. ***Implications for Development***: Simply maintaining the status quo is not an option. An improvement has implications for both future and current development/land-use activities. ▪ ***Future development***: Need to treat nutrients and bacteria to levels above standards for nutrients and bacteria to limit the increase in the cumulative impact. ▪ ***Existing economic activity***: Increase targets for nutrients and bacteria generated by existing polluters and implement management measures to achieve improved standards. These measures are necessary to reverse current trends in the face of growing pressure.	
CRITERIA	Water Quality	
INDICATORS		**TARGETS**
1. South African Water Quality Guidelines – Ph and Faecal Coliform for domestic and recreational use.		**1. South African Water Quality Guidelines** ▪ Ph: 6.5 - 8.5 /100ml ▪ Faecal Coliforms (Ecoli): 130 – 400 /100ml.
2. Water use license monitoring data – Collected from waste water treatment plants as required by their license.		**2. Water use license monitoring data** 100% compliance with license targets 100% of the time.
3. Green drop reports –performance of waste water treatment facilities within study area and upstream of Albert Falls Dam.		**3. Green drop reports** 100% compliance with standards 100% of the time.

6.3.1.2 Water Resources - Aquatic Health

ENVIRONMENTAL COMPONENT	**AQUATIC HEALTH OF SURFACE WATER RESOURCES - Rivers, streams, and Albert Falls Dam**
STRATEGIC ISSUES	The relatively healthy state of river systems is under threat from proposed development in these sub-catchments which will alter the rate of run-off and impact bank stability. Increased disturbance will lead to increased infestations of alien invasive plant species in the riparian vegetation.
SUSTAINABILITY OBJECTIVE	***Maintain good aquatic health and improve sub catchments in fair condition to good.*** ***Motivation****: In a highly developed system there are fewer and fewer tributaries or sections of river in good health as one moves down the system. Sections of river in good condition should therefore be maintained to support the maintenance of the overall integrity of the system and species within it.* ***Implications for Development***: ▪ ***Future developments***: Ensure storm-water run-off is managed to reduce impact on rate and frequency of flows. All new developments required to ensure appropriate buffer to water courses (at least 30m) and rehabilitate any degraded stretches of river e.g. remove alien invasive species and manage them in long term. ▪ ***Existing development/land-use*** – rehabilitate any degraded stretches of river e.g. removal and long term management of alien invasive species.
CRITERIA	Aquatic Health
INDICATORS ▪ SASS, Diatom scores as IHI	**TARGETS** ▪ SASS5, Diatom scores and IHI meet or exceed river health classes.

6.3.1.3 Wetlands

ENVIRONMENTAL COMPONENT	**Wetlands**
STRATEGIC ISSUES	High levels of wetland loss and degradation has reduced the capacity of these systems to ameliorate the serious water quality issues in the catchment and sustain high conservation value biodiversity.
SUSTAINABILITY OBJECTIVE	***Increase the health and functional value of all wetlands*** ***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. ***Implications for Development*:** ▪ ***Future developments*:** - 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. ▪ ***Existing development/land-use:*** – Improved functional area through rehabilitation of degraded systems and associated management mechanisms (buffers) and plans.
CRITERIA	Wetland Function and Habitat Value
INDICATORS ▪ % of total wetland area that is in optimal functional condition.	**TARGETS** ▪ 100% of all wetland area functioning at optimal levels (given existing state). ▪ Specific wetland systems supporting high value biodiversity (Crane species) allocated formal protection.

6.3.1.4 Terrestrial Biodiversity

ENVIRONMENTAL COMPONENT	**Terrestrial Biodiversity - Species and Ecological Process**	
STRATEGIC ISSUES	Low levels of formal protection limits the ability to meet conservation targets and benefit from the associated tourism and recreational economic opportunities.	
SUSTAINABILITY OBJECTIVE	***Secure formal protection of high value biodiversity required to meet Provincial Targets.*** ***Motivation****:* The municipality has a responsibility to contribute to meeting provincial targets. ***Implications for Development*****:** ▪ ***Future Developments****:* o Land-use on areas with high conservation value needs to be complimentary to the protection and management objectives of the relevant biodiversity (habitat and species) to ensure targets are met. o The land needs to be secured for conservation purposes via an appropriate mechanism such as those offered under the stewardship programme. ▪ ***Existing Land-use****:* Identify and implement management actions to sustain conservation worthy features and species, and managed accordingly.	
CRITERIA	Protection Status of Biodiversity	
INDICATORS ▪ % of of MINSET areas secured under formal protection.		**TARGETS** ▪ Secure 100% of areas identified as priorities/essential (Minset) for achieving biodiversity targets and process (corridors) under formal protection.

6.3.1.5 Agricultural Resources

ENVIRONMENTAL COMPONENT	**Agricultural Resources**	
STRATEGIC ISSUES	Pressure to convert productive agricultural land to other land-uses threatens economic stability and growth in the region.	
SUSTAINABILITY OBJECTIVE	***Secure the Existing and Potential value of the Agricultural Sector to the economy and food security.*** ***Motivation****:* The Agricultural sector is the cornerstone of the regional economy. ***Implications for Development*****:** ▪ ***Future Developments****:* 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. ▪ ***Existing Land-use:*** Optimise productive land and secondary activities to maximize the economic potential of the sector.	
CRITERIA	Production Levels	
INDICATORS **1. Appropriate Zoning:** a. Of good and moderate agricultural land (both		**TARGETS** **1. Appropriate Zoning:** Appropriate zoning of 100% of land classified

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.	as high and good production potential, and moderate potential land under production, as well as land utilised for intensive agriculture/ agricultural land in the SDF and LUMS.
2. Optimizing agricultural potential. a. Area of productive land currently under production/ secondary agricultural uses. b. Number of jobs generated within the agricultural sector. c. Proportion of GDP growth attributed to agricultural sector.	**3. Optimizing agricultural potential.** a. 100% of the available productive area utilised for agricultural purposes. b. Increase in number of jobs created by the agricultural sector. c. Increase in the proportion of municipal GDP attributed to agriculture.

6.3.1.6 Air Quality

ENVIRONMENTAL COMPONENT	**Air Quality**	
STRATEGIC ISSUES	Lack of data to confirm perceived good air quality and inform management going forward.	
SUSTAINABILITY OBJECTIVE	***Maintain present current air quality to sustain current levels of social wellbeing*** ***Motivation****:* Apart from nuisance issues such as odour from intensive agricultural activities (poultry, feedlots, crocodile farm) it is primarily smoke from sugar cane burning that presents a health risk in terms of respiratory health risk. Air quality is therefore considered an asset and people appreciate living in this environment. There was consequently an express wish to maintain the current situation. ***Implications for Development*:** ▪ ***Current Development: –*** particularly agricultural primary activities need to manage impacts by applying appropriate management measures e.g. correct burning times and measures by sugar producers and managing waste from intensive secondary activities to reduce odour issues. ▪ ***Future Developments:*** Future development should not be of a nature (such as heavy industry) that would comprise the current air quality and/or such outputs have to be managed to a level that they do not alter the status quo.	
CRITERIA	Air Quality	
INDICATORS		**TARGETS**
1. Health Issues - SANS SANS 1929:2005 guideline ambient air quality: Sulphur Dioxide (SO2), Nitrogen Dioxide (NO2), Carbon Monoxide (CO), Particulate Matter (PM10), Ozone (O3), Lead (Pb), Benzene (C6H6).		1. **Health Issues -** Retain Current Levels (to be defined through monitoring programme as current levels not defined).
2. Nuisance Issues Odour levels.		**2. Nuisance Issues** Maintain levels associated with existing activities as defined through monitoring.

6.3.2 Cultural Resources

ENVIRONMENTAL COMPONENT	**Heritage Resources:** Archaeological, Paleontological, Built Environment, Natural features of cultural value	
STRATEGIC ISSUES	Potential loss of heritage resources within the study area due to the lack of information and understanding regarding the location, state and conservation value of cultural resources.	
SUSTAINABILITY OBJECTIVE	***Develop an understanding of heritage resources and measures to protect and manage them.*** ***Motivation****:* There is little or no information regarding the location, state or conservation value of the various types of cultural resources within the study area. The most likely resources of value are buildings (older than 60 years) and the value attached to the rural, agrarian landscape which is sensitive to viewscapes, nocturnal lighting, power lines and uncontrolled urban and peri-urban expansion. Planning in this regard is imperative if the essential fabric of the extant landscape is not to be irreversibly compromised. ***Implications for Development*:** ▪ ***Future Developments****:* Screening of future developments should consider the likelihood of heritage resources occurring and if so a heritage impact assessment will be a requirement. ▪ ***Existing Land*-use**: Screening of changes or expansion that might impact existing resources such as buildings.	
CRITERIA	Understanding of Heritage Resources	
INDICATORS Survey of heritage Resources including a. Mapping indicating location of heritage resources. b. Understanding of Conservation Value and State.		**TARGETS** Comprehensive survey of entire study area with associated recommendations for development planning and decision making.

6.3.3 Social Well-Being

ENVIRONMENTAL COMPONENT	**Social Well-Being**
STRATEGIC ISSUES	▪ A large proportion of the population is vulnerable to poor environmental quality (poor water quality), environmental crises (floods) and/or economic crises (loss of family members providing welfare grants). ▪ The lack of resources (finance) and capacity (education) limits the ability of people to improve their situation. ▪ The high proportion of unsettled land claims relating to a significant portion of land in the study area limits the confidence of both current landowners and potential developers to invest further capital and resources on affected properties. This is inhibiting economic growth.
SUSTAINABILITY OBJECTIVE	***Improved levels of social well-being through prioritization of sustainable economic growth and service delivery*** ***Motivation****:* The following factors are contributing to high levels of vulnerability: High dependency ratio, high poverty levels, lack of access to basic services and/or poor levels of services supplied, low literacy and education levels, and lack of access to/security of tenure. Service delivery

	will not improve the situation if it is not appropriate e.g. VIP sanitation solutions are likely to contribute further to the ***Implications for Development*:** ▪ ***Future Developments: Prioritization of projects:*** o That contribution to addressing the factors currently - e.g. include skills development, employ local people. o Service delivery must: ▪ Not add to existing issues e.g. VIPs are likely to add to the bacterial pollution of water resources and alternative solutions/technology should be used. ▪ Consider sustainable solutions – the waste management plan should ensure the consideration of recycling activities and possible job creation. o Development of economic opportunities that improve ecological quality (recycling business, eradication of alien invasive plants, wetland rehabilitation) or harness environmental assets such as market gardening projects that ensure food security and improve income levels. In summary, explore and develop the green economy within the study area. ▪ ***Existing Land-use***: Investigate opportunities to develop sustainable projects – such as biofuel pellets from agricultural waste products generated in timber and saw milling industry.
CRITERIA	Social Well-Being
INDICATORS **1. Employment levels** As measured by census data.	**TARGETS** **1. Employment levels** Continued reduction in the levels of unemployment.
2. Improved access to all services and the level of service supply. As measured by census data.	**2. Improved access to all services and the level of service supply.** All citizens with access to at least minimum levels of all services.

6.3.4 Economic Environment

ENVIRONMENTAL COMPONENT	**Economic Prosperity**
STRATEGIC ISSUES	▪ Declining economy (GDP) with over reliance on existing strengths (agriculture) and inability to optimise strengths or diversify and take advantage of potential growth opportunities**.** ▪ Opportunities for diversification are limited by limitations in existing bulk service infrastructure and services supply (Water supply, sanitation, waste collection and disposal and power supply).
SUSTAINABILITY OBJECTIVE	***Positive Economic Growth based on the protection of existing value and optimization of opportunities in the agricultural sector, and harnessing opportunities provided by natural assets (rural landscape, good views and clean air) for growing tourism and***

	meeting demand for residential development. ***Motivation****:* The significant value of the agricultural sector as the foundation of the economy cannot be eroded and opportunities for further growth should be harnessed because it is easier to build on existing sectors with institutional and other strengths. There is however a clear need to diversify and grow other sectors and address land tenure issues associated with the land transformation processes. ***Implications for Development*:** ▪ ***Future Developments****: Prioritization of projects:* o They cannot erode existing agricultural activities or establish limitations on growth. o They should aim to benefit from natural assets and/or address environmental issues (solid waste management, alien invasive species). ▪ ***Existing Land-use*:** Improved environmental management is required to reduce the negative impacts to the environment, particularly nutrient and bacterial inputs to water resources from the agricultural sector.
CRITERIA	Sustainable Economic Growth

INDICATORS	**TARGETS**
1. GDP As measured by census data.	**1. GDP** Positive GDP that exceeds provincial average.

7. CONCLUSIONS

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 development node 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.

Based on this understanding, stakeholders have defined sustainability objectives that provide direction for future management interventions. The sustainability framework developed to facilitate measurement of progress towards the desired future has also been put in place.

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.

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APPENDIX 1

COMPLETE LIST OF CATEGORIES OF ECOSYSTEM GOODS AND SERVICES AND EXAMPLES

Service	Subcategory	Definition	Examples
Provisioning services: The goods or products obtained from ecosystems such as food, timber and fiber.			
Food	Crops	Cultivated plants or agricultural produce that are harvested by people for human or animal consumption as food	· Grains · Vegetables · Fruit
	Livestock	Animals raised for domestic or commercial consumption or use	· Chicken · Pigs · Cattle
	Capture fisheries	Wild fish captured through trawling and other nonfarming methods	· Cod · Crabs · Tuna
	Aquaculture	Fish, shellfish, and/or plants that are bred and reared in ponds, enclosures, and other forms of freshwater or saltwater confinement for purposes of harvesting	· Shrimp · Oysters · Salmon
	Wild foods	Edible plant and animal species gathered or captured in the wild	· Fruit and nuts · Fungi · Bushmeat
Fiber	Timber and other wood fiber	Products made from trees harvested from natural forest ecosystems, plantations, or nonforested lands	· Industrial roundwood · Wood pulp · Paper
	Other fibers (*e.g.*, cotton, hemp, silk)	Nonwood and nonfuel fibers extracted from the natural environment for a variety of uses	· Textiles (clothing, linen, accessories) · Cordage (twine, rope)
Biomass fuel (wood fuel)		Biological material derived from living or recently living organisms—both plant and animal—that serves as a source of energy	· Fuelwood and charcoal · Grain for ethanol production · Dung
Freshwater		Inland bodies of water, groundwater, rainwater, and surface waters for household, industrial, and agricultural uses	· Freshwater for drinking, cleaning, cooling, industrial processes, electricity generation, or mode of transportation
Genetic resources		Genes and genetic information used for animal breeding, plant improvement, and biotechnology	· Genes used to increase crop resistance
Biochemicals, natural medicines, and pharmaceuticals		Medicines, biocides, food additives, and other biological materials derived from ecosystems for commercial or domestic use	· Echinacea, ginseng, garlic · Paclitaxel as basis for cancer drugs · Tree extracts used for pest control

Cultural services: The nonmaterial benefits obtained from ecosystems such as recreation, spiritual values, and aesthetic enjoyment.		
Recreation and ecotourism	Recreational pleasure people derive from natural or cultivated ecosystems	- Hiking, camping, and bird watching - Going on safari
Spiritual, religious and ethical values	Spiritual, religious, aesthetic, intrinsic, "existence," or other values people attach to ecosystems, landscapes, or species	- Spiritual fulfillment derived from sacred lands and rivers - Belief that all species are worth protecting regardless of their utility to people—"biodiversity for biodiversity's sake"
Aesthetic values	The beauty and aesthetic values of nature in all its appearances.	- Beauty of nature, from a molecule to a flower to a forest

Regulating services including supporting services: Regulating services are the benefits obtained from an ecosystem's control of natural processes such as climate, disease, erosion, water flows, and pollination, as well as protection from natural hazards. Regulating services normally include also Supporting services, i.e. the natural processes such as nutrient cycling and primary production that maintain the other services.

Service	Subcategory	Definition	Examples
Climate regulation	Global	Influence ecosystems have on global climate by emitting greenhouse gases or aerosols to the atmosphere or by absorbing greenhouse gases or aerosols from the atmosphere	· Forests capture and store carbon dioxide · Cattle and rice paddies emit methane
	Regional and local	Influence ecosystems have on local or regional temperature, precipitation, and other climatic factors	· Forests can impact regional rainfall levels · Lakes regulate humidity levels and influence frequency of frosts, important for agriculture
	Carbon sequestra-tion	The extraction of carbon dioxide from the atmosphere serving as a sink	· Expanding areas of boreal forests, increases the sink · Deforestation in the tropics, decreases the sink · Ocean carbon sequestration
Water regulation		Influence ecosystems have on the timing and magnitude of water runoff, flooding, and aquifer recharge, particularly in terms of the water storage potential of the ecosystem or landscape	- Permeable soil facilitates aquifer recharge - River floodplains and wetlands retain water—which can decrease flooding during runoff peaks—reducing the need for engineered flood control infrastructure
Erosion regulation		Role vegetative cover plays in soil retention	- Vegetation such as grass and trees prevents soil loss due to wind and rain and siltation of waterways - Forests on slopes hold soil in place, thereby preventing landslides
Water purification and waste treatment		Role ecosystems play in the filtration and decomposition of organic wastes and pollutants in water; assimilation and detoxification of compounds through soil and subsoil processes	- Wetlands remove harmful pollutants from water by trapping metals and organic materials - Soil microbes degrade organic waste, rendering it less harmful
Disease regulation		Influence that ecosystems have on the incidence and abundance of human pathogens	- Some intact forests reduce the occurrence of standing water—a breeding area for mosquitoes—which lowers the prevalence of malaria
Pest regulation		Influence ecosystems have on the prevalence of crop and livestock pests and diseases	- Predators from nearby forests—such as bats, toads, and snakes—consume crop pests
Pollination		Role ecosystems play in transferring pollen from male to female flower parts	- Bees from nearby forests pollinate crops
Natural hazard regulation		Capacity for ecosystems to reduce the damage caused by natural disasters such as hurricanes and to maintain natural fire frequency and intensity	- Mangrove forests and coral reefs protect coastlines from storm surges - Biological decomposition processes reduce potential fuel for wildfires
Nutrient cycling		Role ecosystems play in the flow and recycling of nutrients (*e.g.*, nitrogen, sulfur, phosphorus, carbon) through processes such as decomposition and/or absorption	· Decomposition of organic matter contributes to soil fertility
Air quality regulation		Influence ecosystems have on air quality by emitting chemicals to the atmosphere (i.e., serving as a "source") or extracting chemicals from the atmosphere (i.e., serving as a "sink").	· Lakes serve as a sink for industrial emissions of sulfur compounds · Vegetation fires emit particulates, ground-level ozone, and volatile organic compounds

APPENDIX 2

SUMMARY OF IMPORTANT ECOSYSTEM SERVICES AS IDENTIFIED BY STAKEHOLDERS – HIGHLIGHTING THE LINKAGES BETWEEN ENVIRONMENTAL QUALITY, SOCIAL WELL BEING AND ECONOMIC PROSPERITY

SYSTEM SERVICES	DEFINITIONS	ON-SITE SERVICES SUPPLY						COMMENT ON ON-SITE USER DEMAND	OFFSITE/ DEMAND 0 - 3	COMMENT ON USER DEMAND	SUPPLYING SYSTEM
		Dependence of Specific Stakeholder Groups 0 - 3					Overall Dependence 0 - 3				
		Agriculture (A)	Water Resources (WR)	Ratepayers & Tourism (R&T)	Biodiversity (B)	Ward Representatives (WR)	All Stakeholders				
REGULATORY ECOSYSTEM SERVICES - Services that help to regulate our living environment, and in many cases helping to reduce the impacts we have on each other											
Micro climate management	Vegetation or water surfaces helping to keep the local climate comfortable for humans - such as cooling forests, cooling surface water, frost prevention trees.	2	-	2	-	-	**2.00**	Agric stakeholders reported that Albert Falls Dam significantly reduces the incidence and intensity of frost and the impact on crops. This benefit is restricted to Agric and Res & Tourism users living in close proximity to Albert Falls Dam (AF Dam). ***Local benefit of medium importance to all users surrounding AFDam.***	-	Not relevant.	Albert Falls Dam
Soil formation and fertility	Soil ecology or river flooding eroding rocks and maintaining fertile soils	3	3	3	-	-	**3.00**	▪ Essential to sustaining outputs from high and moderate value productive arable land which comprises large proportion of the total project area. ▪ Forms the basis of a well-developed agric sector that provides approximately 50% of employment opportunities in uMshwathi municipality**.** ▪ It is also important for residents relying on subsistence crops. ***Very high local level of dependence by majority of local user groups.***	**2.5**	▪ The sugar cane produced in the area supplies mills in broader growing area, which is important component of regional and provincial sugar sector. ▪ Similarly timber grown here supplies mills in the surrounding region. ▪ These secondary activities are major employers in the regional economy. ***High dependence from the regional and provincial economy***.	Grasslands, Arable systems
Water supply regulation	The capturing of rain water into the soils during the rainy season, and the slow release of the water through-out the year	3	3	3	-	3	**3.00**	▪ Sustained water supply is important for agricultural activities particularly irrigation, ▪ The low levels of potable water supply means that residents are very reliant on abstraction from ground and surface water resources. ***Sustained supply is dependent on water supply regulation which is therefore very important across the study area.***	**1.0**	The study area forms a small portion of the catchment in terms of the capacity it has to regulate overall flow in supplying downstream users. ***Low level of dependence at a catchment (Mid-Lower Mgeni system) scale.***	Grasslands, Savannah, Wetlands
Water distribution	Water being moved by rivers and stream from places of rainfall to places where it can be consumed	3	3	3	-	3	**3.00**	Water is abstracted from the majority of streams and rivers dams for irrigation and livestock watering. The lack of infrastructure to transport water makes ***this service of very high importance across all users in the study area***.	**3**	The Mgeni River is the primary system supplying the major urban areas - transfer of water from Albert Falls to Inanda dams is therefore an ***essential service at a regional (Mgeni Catchment scale***.	Rivers, Wetland, Streams
Waste Water treatment	Water plants absorbing waste nitrates and phosphates, and using them for plant growth, taking them out of the water. Availability of water to dilute pollution or waste discharge into rivers.	3	3	3	-	3	**3.00**	▪ A large proportion of the population relies on water abstracted directly from surface and ground water resources. It is important that this service is being performed at optimum levels to maintain good water quality. ▪ Dilution is critical for maintaining water quality given that local users extract water from the many streams and river running through the study area. ***Very High level of dependence from all users within the study area.***	**2.5**	The study area forms small sections of the Albert Falls and Inanda dams which are the major sources of storage and supply to the greater Durban area. While the study area forms a small component of the Mgeni River Catchment from which supply of water for dilution will be limited, it includes several sources of nutrient inputs and is located only 32kms upstream of Inanda so that ***dilution of pollutants is important at a regional level (Lower Mgeni Catchment).***	Rivers, Wetlands, Albert Falls Dam
Groundwater recharge	Vegetation promoting greater water infiltration into the soil	3	3	3	-	-	**3.00**	A large proportion of the population within the study area access water via boreholes. There is therefore a ***high dependence by all users within the study area on Groundwater recharge,***	-	Not relevant.	Grasslands, Forests, Savannahs

Flood attenuation	Good land cover that reduces water run-off from the land, reducing the degree of flooding	2	3	3	-	-	**2.67**	There is a need to reduce the risk of flooding to infrastructure and agricultural activities located on floodplain areas – particularly the Mgeni System. The demand for this service is therefore ***only a priority in low lying areas and is greatest from residential property owners***.	**1.0**	There is a fairly short area downstream of the study area and Inanda dam which performs an important flood attenuation service. ***Low demand over s short stretch of Mgeni River***	**Wetlands**, Grasslands, **Albert Falls Dam**
Air quality regulation	Ecological processes that reduce the production of odours such as trees which remove pollutants from the air.	1	-	3	-	3	**2.33**	Residents complained of odour and noise generated from the feedlots, poultry, piggeries, crocodile farm and compost sites. The problem is greatest along the R33 and Valleys draining into the main Mgeni River valley where odours are concentrated. There is ***very high dependence by residents and tourism users*** at a local level (valleys areas and in close proximity to odour sources) **to the regulation of air quality – particularly odour.**	**0.5**	Odour will travel outside the area but at far reduced concentrations. ***Low dependence at a municipal scale.***	Grasslands, Woodlands, Riparian Vegetation
Pollination	Bee and other insects that help to pollinate food and fruit crops	2	-	3	3	-	**2.67**	An important service for the agric sector in the study area which includes orchards, nurseries and various crop types. A ***critical service to agricultural users across the study area, and therefore all other users given the reliance on this service***.	**1.0**	Pollination will take place from the study area in immediately adjacent areas of the Municipality. ***Low dependency at Municipal scale***	All terrestrial systems
Biological control	Ecosystems are important for regulating pests and vector borne diseases.	2	2	2	-	2	**2.00**	▪ Wetlands provide natural habitat for the Eldana worm. Where wetlands are in good condition the impact on sugar cane is reduced. ▪ Residents listed monkeys, bush pigs and other species as occurring at pest levels – maintenance of their numbers at lower levels requires the maintenance of predators. ***While not a critical service, biological control does limit damage and costs to residents in the study area.***	-	Not relevant	Wetlands (host Eldana organisma which is major threat to sugar cane)
Fire damage control	Ecological processes and landscapes that prevent dangerous and run-away fires	3	-	3	-	1	**2.33**	Fire management is an important aspect of agricultural practice. It is used in a controlled manner in harvesting e.g. cane and maintaining productivity grazing. While a natural part of ecological processes, frequent uncontrolled fire can create disturbance in certain systems. Uncontrolled fires are therefore have a negative impact in this area. ***Very Important, particularly for agric users in the study area.***	**1.5**	Uncontrolled fire in the study area may spread to surrounding areas within the municipality. ***Moderate importance at a municipal scale***.	**Wetlands**, Rivers (**Umgeni, Mpolweni,**)Dams **Albert Falls Dam)**
PROVISIONING SERVICES/Goods - Goods that we harvest for consumption, either for home consumption for sale											
Fresh water	Water harvesting for consumption, irrigation and manufacturing	3	3	3	-	3	**3.00**	Water is harvested from the streams, rivers, dams and wetlands in the area for domestic, agricultural and other uses. It is an essential 'good' for all residents and economic sectors in the study area. ***Very high dependence from all users in the study area.***	**2.00**	The study area forms part of the Mgeni River catchment which is the primary system feeding the major urban areas of Pietermaritzburg and Durban. While it is a small section of the overall catchment, it includes Albert Falls Dam which is a major storage facility on the system. ***Medium level dependence at a regional (catchment) level.***	Rivers, Streams, Dams, Wetlands
Wood fuel	Wood fuel for household energy supply	2	-	-	-	2	**2.00**	Ward representatives reported a fairly high reliance on wood harvested from natural systems - woodlands and forests. This demand is limited to areas where people are concentrated e.g.Mpolweni, Tokhozani. ***Medium level dependence from residential users in localised areas.***	**-**	Limited demand.	Woodlands, Forest,
Fodder supply	Wild plants for animals grazing and browse	3	-	2	-	3	**2.67**	The fodder in the area is the basis of any extensive beef production in the area, but more importantly is under high demand from the intensive production of beef at the Triple A feedlot. The fodder is also important to subsistence users. ***High demand from commercial and subsistence users across the entire study area.***	**-**		Grasslands.
Food	Ecosystems provide the conditions for growing food – in wild habitats and in managed agro-eosystems.	2	-	2		3	**2.3**	Food grown in the area includes vegetables, fruit etc which is important for commercial growers, it is not as important as other non food crops – timber and sugar cane, which dominate the use of arable areas. Dependence on food is higher from poorer members of the community who rely on growing food to sustain their livelihoods. ***Medium dependence from users in the study area.***	**1.5**	Food grown in the area is exported to surrounding areas but forms a small compone3nt of the total volumes supplied to areas like Pietermaritzburg. ***Low to medium dependence at a regional scale (surrounding municipalities.)***	Croplands, orchards.

Medicinal Uses	Many plants are used as traditional medicines and as input to the pharmaceutical industry.	1	-	3	2	-	**2.00**	Representatives from the isiZulu speaking residents noted having a medium to high demand for indigenous plants sourced from natural systems. ***Medium level dependence from limited section of population in localised sections of the study area.***	-	There is limited demand for natural products from the area.	Grasslands, Woodlands, Wetlands
SUPPORTING SERVICES - These services underpin all other services. Ecosystems provide living spaces for plants and animals; they also maintain a diversity of different breeds of plants and animals.											
Habitat for Species	Habitats provide everything that an individual plant or animal needs to survive. Migratory species require habitats along their migratory route.	-	-	3	3	-	**3.00**	The area includes several ecosystems, habitats and associated species which are rated as threatened, rare and/or endangered. Several species occur within the informal Msinsi Game Reserve and form part of the attraction provided by the reserve. ***This service is therefore of high importance to biodiversity and tourism users in specific sections of the study area.***	**2.0**	Several of the ecosystems, habitats and associated species that occur in the area have i) been allocated high conservation value at a provincial level ii) are beyond minimum conservation targets - making them 'irreplaceable'. Their conservation at a provincial level is dependent on conservation at a local level. ***The service provided by specific sections within the study area is of medium importance at a provincial level.***	Wetlands – All three species of cranes. Grasslands – Oribi and invertebrates.
CULTURAL AND SPIRITUAL SERVICES - Services from natural areas which we can't eat or use directly. These are the non-material benefits people obtain from contact with ecosystems such aesthetic, spiritual and psychological benefits.											
Recreational Amenity	A landscape suitable for outdoor activities such as picnicking, walking, hiking etc. Natural landscapes are important for maintaining mental and physical health.	2	-	2	-	2	2.00	The agrarian landscape intersected by the rivers and Albert Falls Dam, provides for a range of outdoor recreational activities including mountain biking, sailing, fishing and canoeing on Albert Falls Dam. ***All residents rated as moderate benefit to living in the area.***	**1.0**	There are a range of activities - fishing competitions and yachting that take place on Albert Falls dam. The section of the Mgeni River below the dam is one of the most paddled sections of river in the province and noted as an important 'nursery' section of river. People travel into the area from all over the province to attend these events. There are many other locations in the province which reduces the dependence on the area relative to local users. The service provided by the area	Grasslands, forests, agricultural land, Albert Fallls Dam. Mgeni River
Natural heritage	A landscape with indigenous plants and animals, topography and geology that represents the heritage or culture of a people - local, provincial, national or global	3	-	3	3	-	3.00	Rated as high by all residents and the tourism representatives due to the close links people have to the land and natural resources in the study area. Local residents listed the Albert Falls as a spiritual place. All residents highlighted their appreciation of the rural/agrarian landscape and close association with the land as an important draw card for living in the area. ***Very high dependence across all users at a study area scale.***	**0.5**	Apart from Albert Falls, there are no features or sites with known heritage value. Very Low	Albert Falls, Agrarian landscape.
Marketing icons	Wild places or plants and animals that help us to compete for visitors of other destinations, such as the big five, or the best bass fishing dam in South Africa	-	-	3	-	-	3.00	Albert Falls and the dam is the marketing icon for the local tourism route, the "Albert Falls Amble'. The falls and the Dam are therefore an important icon identifying and marketing the area. The icon is understandably rated as high by local residents and tourism initiatives who rely on this for marketing. ***Very High Dependence from tourism and recreational sector.***	**2.0**	While concentrated around the Albert Falls Dam the "Albert Falls Amble" extends outside the study area and is therefore ***important to all tourism activities on the Albert Falls Amble i.e. route at a regional level.***	Albert Falls and AF Dam.
Tourism	The landscape provides suitable space for general tourism - such as visual amenity, attractive climate, and outdoor activities such fishing, skiing, canoeing, boating/yachting.	3	-	3	-	-	3.00	The landscape is suited to and supports a variety of tourism and recreational activities. Albert Falls Dam is a major recreational facility and many tourism enterprises are based around the dam perimeter –drawing on its visual and recreational amenity value. i.e. the AFD is a major draw card and basis for much of the tourism that takes place in the study area. There are also general picnic sites such as the popular site located on the Mgeni River banks below the dam wall.	**1.5**	AFD is the venue for several provincial events including Bass fishing competitions, boating, and mountain biking races. The stretch of the Mgeni river downstream of the Dam is one of the most paddled stretches of river in the province.	Albert Falls Dam, Nature Reserve (grasslands, Woodlands)

APPENDIX 3

DETAILED MOTIVATION OF THE IMPORTANCE ALLOCATED TO NATURAL SYSTEMS

MGENI RIVER SYSTEM

Summary Statement – ***The Mgeni River System is a significant environmental asset at a local, provincial and national scale*** as it sustains the large majority of the population and economic activity in the greater Durban-Pietermaritzburg region which is located within in the Mgeni Catchment and which contributes to the national economy.

Socio-Economic Value

The system supports economic and social activity along its length - including the project area as described below in terms of the services it provides.

- ***Fresh Water supply*** –Water is harvested from the streams, rivers, dams and wetlands in the area for domestic, agricultural and other uses. It is an essential 'good' for all residents and economic sectors in the study area. Very high dependence from all users in the study area.

- ***Water distribution*** – Due to the high number of users in the catchment and variety of uses (Domestic, irrigation, recreation) the movement of water throughout the landscape via the river system is a significant service at a local, and catchment scale given demand from large centres downstream.

- ***Waste water Treatment*** – The high variation and concentration of waste water from the very developed catchment makes the dilution and cleaning of waste water one of the most important services provided by the river system within and downstream of the study area.

- ***Recreational use*** – The section of the Mgeni downstream of Albert Falls Dam is one of the most paddled sections of river in the province. The picnic site just below the dam is very popular and a well-known site for yellow fishing. This is a locally important service.

While only a short section of the Mgeni River runs through the project area, due to the cumulative impact on this important system.

Service Demand Rating

Fresh Water supply
a. Essential Service
b. High Demand all users.
c. Regional/Catchment Scale

Water distribution
a. Essential Service
b. High Demand majority of users.
c. Regional/Catchment Scale

Waste water Treatment
a. Essential Service
b. High Demand all users.
c. Regional/Catchment Scale

Recreational use
a. Non-essential Service
b. Moderate Demand specific group of users.
c. Regional/Catchment Scale

ALBERT FALLS DAM

Summary Statement – Although Albert Falls Dam is not a natural system it is given specific attention because of the ***high value of the services it provides at a local and provincial scale.***

Socio-Economic Value

The system supports economic and social activity along its length - including the project area as described below in terms of the services it provides.

- ***Fresh Water supply*** – The dam is one of the major storage facilities responsible for ensuring sustained supply to the greater Durban and Pietermaritzburg region which houses a large proportion of the provincial population and economic activity. This is the dam's primary purpose and is of critical importance at a provincial scale.

- ***Waste water treatment*** – Large water bodies have significant capacity to dilute pollutants. Due to the high variation and concentration of waste water from the very developed catchment the dilution of waste water is a significant important service provided by the dam, benefitting the entire catchment downstream.

- ***Tourism & Recreational Value*** – The dam is the icon for the local Tourism Route (Albert Falls Amble). There are several private tourism enterprises located along the periphery of the dam which base their attraction on the dam. The water body

Service Demand Rating

Fresh Water supply
a. Essential Service
b. High Demand majority of users.
c. Regional/Catchment Scale

Waste Water Treatment
a. Essential Service
b. High Demand majority of users.
c. Regional/Catchment Scale

Tourism & Recreational Value
a. Non-essential Service
b. High Demand variety of

and adjacent area is the location of a range of recreational activities including recreational use for both recreational and competition skiing, sailing, fishing, and hosts triathlons and mountain bike events. This is a locally and regionally important service.

- ***Real Estate Value –*** Several housing developments have been established overlooking the dam, which adds value to these properties given the view and close proximity to the amenity value it adds. This value is important at a local scale.

users.
c. Regional (municipal) Scale.

Real Estate Value
a. Non-essential Service
b. Moderate Demand variety of users.
c. Regional (municipal) Scale.

WETLANDS

Summary Statement – Due to the high pressure on water in the Mgeni catchment resources in terms of supply of freshwater and impact on quality, the services wetlands supply ***have high value at a local and regional (catchment scale).***

Socio-Economic Value

Wetlands only account for a relatively small proportion of the study area (2%). The range and importance of the ecosystem services they perform however make them very important systems.

Service Demand Rating

- ***Fresh Water supply*** –Farm dams are built in wetlands though which freshwater is captured and used to water cattle and for irrigation purposes. Local communities without access to potable water also noted their use of wetlands to source water for drinking and cattle. This is a key service to a large majority of people in the study area (local scale).

Fresh Water Supply
d. Essential Service
e. High Demand all users.
f. Local Scale

- ***Waste water treatment*** – the ability of wetlands to improve water quality is one of their most important services. As they are located within valleys, much of the organic materials from non-point sources such as cropland can be captured and treated. Given the poor state of water quality in the catchment, this is a critical service provided by wetlands at a local and catchment (regional) scale because they can assimilate waste water from upstream entering the dam, but also waste water from the area flowing towards Nagle dam.

Waste Water Treatment
a. Essential Service
b. High Demand all users.
c. Local Scale.

- ***Biological Control –*** Wetlands provide natural habitat for the Eldana worm. Where wetlands are in good condition the impact on sugar cane is reduced as the organism has less demand for the sugar cane as a habitat. This reduces the cost to pesticides to the sector and reduced production. While not as significant as the services above, this is a specific, but important service given the importance of the sugar cane industry in the region.

Biological Control
a. Non-essential Service
b. Medium demand from specific user (sugar cane growers).
c. Local Scale.

- ***Habitats for Species –*** Wetlands provide essential habitat for all three Species of Cranes which all in the area and of which the Blue and Crowned Crane are classified as Vulnerable, and the Wattled Crane as Critically Endangered. The habitat value of wetlands in the area are of provincial importance for meeting conservation targets and sustaining these keystone species.

Habitat for Species
a. Essential Service
b. High demand from critically endangered species.
c. Provincial Scale.

GRASSLANDS

Summary Statement – Given the range of services delivered by grasslands and which constitute approximately 15% of project area, these systems are of high value in the study area.

Socio-Economic Value

- ***Waste water treatment*** – effluent and animal from feedlots and poultry houses is spread across crop and grasslands which serve to dilute and 'treat' the material to a level before it drains into water courses, thereby reducing the cost of engineered treatment works and saving these industries money. This is an important service at a local scale.

- ***Groundwater-Recharge –*** The dense cover provided by grassland makes it efficient at intercepting and allowing for groundwater recharge. This is an important service given that a large proportion of people across the study area depend on groundwater via boreholes for supply.

- ***Fodder*** – The grasslands support commercial beef production in the area and subsistence level livestock (cattle and goats). More importantly is under high demand from the intensive production of beef at the Triple A feedlot which buys in grass from the surrounding region. Grasslands provide important resource for the regional agricultural sector.

- ***Habitats for Species –*** Grasslands provide essential habitat for the threatened mammal species Oribi and for a number of endemic invertebrates (snails and earthworms). These systems are important for meeting provincial conservation targets for these species.

Service Demand Rating

Waste water treatment

a. Essential Service
b. High demand from critically endangered species.
c. Provincial Scale.

Groundwater-Recharge

a. Essential Service
b. High demand from large proportion of users
c. Local Scale.

Fodder

d. Essential Service
e. High demand from critically endangered species.
f. Provincial Scale.

Habitats for Species

a. Essential Service
b. High demand from critically endangered species.
c. Provincial Scale.

SAVANNAH

Summary Statement – Savannah accounts for approximately 16% of the study area and is located in the private nature reserve and Msinsi holdings land.

Socio-Economic Value

- ***Groundwater-Recharge –*** Due to the good cover provided by Savannah it is efficient at capturing water and releasing it to the environment. This is an important service given that a large proportion of people across the study area depend on groundwater via boreholes for supply.

- ***Habitats for Species –*** A large proportion of the savannah habitat occurs within the Msinsi and private nature reserve and contributes to the habitat supporting some of the important species identified – particularly birds and mammals (browsers) in the reserve.

Service Demand Rating

Groundwater-Recharge

a. Essential Service
b. High demand from large proportion of users
c. Local Scale

Habitat for Species

a. Essential service.
b. Moderate demand from a few important species
c. Provincial Scale.

ARABLE SOILS

Summary Statement – A significant natural asset, playing a major role in supporting the regional primary and secondary agricultural economy, which the largest player in the regional economy.

Socio-Economic Value

- ***Soil Fertility***
  The arable soils (combined with favourable climatic conditions support the well-developed agricultural primary sector (sugar, vegetables, timber in the study area which is part of a larger regional sector which includes secondary activities (sugar and timber mills) and abattoirs. The agricultural sector provides approximately 40% of jobs in the municipality. It is also important for residents relying on subsistence crops as a major part of their daily livelihoods.

Service Demand Rating

Soil Fertility

a. Essential Service
b. Very High demand from local and regional users.
c. Regional Scale.

APPENDIX 4

SUMMARY OF STAKEHOLDER INPUTS AT THE 'DESIRED FUTURE STATE' WORKSHOPS

DFS WORKSHOPS 1 - ATTENDANCE REGISTER

DRAFT ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE MSHWATHI 'CITY' DEVELOPMENT NODE –
Workshop to set the ***Desired Future State*** for the Development Node

Friday, 22nd July 2011
Albert Falls Guest Lodge, Pietermaritzburg

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DFS WORKSHOPS 1 – STAKEHOLDER INPUTS TO DFS SUSTAINABILITY OBJECTIVES

DEVELOPMENT OF A DRAFT
ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE uMSHWATHI CITY DEVELOPMENT NODE

*Workshop to Set the **Desired Future State***

22 July 2011

Stakeholder DFS Template

Name:

Organisation:

EXAMPLE OF DFS FRAMEWORK

SUSTAINABILITY OBJECTIVE	**Maintain air quality at levels which pose no threat to human or environmental health.**	
Criteria	Ambient air quality	
Indicators	SANS SANS 1929:2005 guideline ambient air quality	**TARGETS** ((Set target levels for each in line with DFS)

Substance	10-minute maximum	1-hour maximum	8-hour maximum	24-hour maximum	Annual average
Sulphur Dioxide (SO_2)	500 µg/m^3	350 µg/m^3		125 µg/m^3	50 µg/m^3
Nitrogen Dioxide (NO_2)	940 µg/m^3	376 µg/m^3		188 µg/m^3	94 µg/m^3
Carbon Monoxide (CO)		30 mg/m^3	10 mg/m^3		
Particulate Matter (TSP)				300 µg/m^3	100 µg/m^3
Particulate Matter (PM_{10})				180 µg/m^3	60 µg/m^3
Particulate Matter (Smoke)				250 µg/m^3	100 µg/m^3
Ozone (O_3)	491 µg/m^3	236 µg/m^3	120 µg/m^3		
Lead (Pb)					2.5 µg/m^3
Benzene (C_6H_6)					10 µg/m^3

Governance	**National Environmental Management: Air Quality Act (No. 39 of 2004)** Requires that managed by the AQA is through municipal, provincial and national air quality management plans (AQMPs) (Republic of South Africa, 2004, Section 15), and also through their incorporation into Integrated Development Plans (IDPs) as stipulated by the Municipal Systems Act (No. 32 of 2000).

WATER RESOURCES - Quality

SUSTAINABILITY OBJECTIVE	▪ Maintenance of good state of catchments and rivers ▪ Improvement of quality of catchments and rivers which are in a poor state ▪ Improved quality of albert falls dam ▪ Quality beyond acceptable standards ▪ Water quality is consistently monitored and subsequently managed in order to obtain and maintain acceptable levels for the sustainability of the rivers ecosystem and function. ▪ Maintenance of water resources within the area to a level that is not threat to a human health in terms of disease. ▪ Try to review the entire catchment throughout the area for poor use of water quality. ▪ Water quality must be up to standard as soon as possible (locals rely on water for drinking and cooking and Albert Falls is a major recreational resource - water sport, fishing, camping) o It is important that the sewage pollution from Howick/ area be stopped. Sewage infrastructure in catchment must be upgraded to standard. o Indicators should include Nutrients levels and volume of Raw sewage being received from Howick on daily basis. ▪ Quality is essential for visitors to our area. o What was the original reason that our dams were built? Development of farms for irrigation or to supply water to local resident? o The state of water is not only the responsibility of the local municipality. o All the discussion about the dam: I feel strongly that we also need to save water. Every house that is built by the government should include gutters and a water tank; we could save thousands of gallons of free rain water which is not polluted. ▪ Remain or be modified to keep water quality at an acceptable standard. ▪ Wetlands protected and Buffers for Run off in place in order to preserve the quality until we have found more extreme measures to better quality. ▪ Albert Falls Dam is the number 1 priority in the area: Need EMP with buffer and land-use delineation and links between Midmar and Nagle dams via corridors. Objectives o Flow- to fluctuate according to ecological reserve. o Quality – for potable use, irrigation and tourism/recreation. o Aesthetics and sense of place. Indicators o Blue drop report o Biodiversity including Umgeni results and SASS o Turbidity, nutrients, pathogens, endocrine, disinter, persistent organics. Governance

	○ Water availability – ecological reserve ▪ Quality has declined beyond a suitable level - negatively impacting food production (water has to be cleaned before supply to cattle) ▪ Climate changes irrigation and management retain flexibility to adopt ▪ Improve water quality to enable AFD to supply region with good water quality ▪ Provide raw water relatively cheap treatment to potable levels of quality. ▪ Promote area as tourism assets. ▪ Improve downstream water resources for all users ▪ Improvement of the status quality - Back to acceptable levels that will ensure sustainable availability of this resource. ▪ Reverse the current eutrophication trend and achieve water quality objectives of DWA.

WATER RESOURCES – Ecological Health

SUSTAINABILITY OBJECTIVE	▪ Reduced nitrate/phosphate pollution/concentration in water resources ▪ No raw sewage disposed into water resources ▪ Water quality healthy enough to support fish and other biota dependent on water resources. ▪ Integrated approach focused on and to maintain improving river health from all aspects – social, technical etc. ▪ Regulate all the Municipality/stakeholders of the Environmental Affairs and also about the Ecological expect within the water resources ▪ Also to educate all stakeholders about Ecological expects what's do's/don'ts. ▪ The sewage plants must be upgraded to accommodate the increase in population, upgrade sewage plants in catchment area. ▪ Should be looked at a high concern- Water makes everything possible. ▪ Improve flow and quality to regain excellent status and SASSI category Criteria - Reserve flow quality, SASSI and Biodiversity. ▪ Increase in water production. ▪ Naturally functioning systems. ▪ Setback buffers on all natural water resources and manage buffer areas available water resources ▪ Reserve determination. ▪ Ecosystem functioning at good level ○ Indicator: SASS

WATER RESOURCES – Wetlands

SUSTAINABILITY OBJECTIVE	▪ Protection of all wetlands ▪ No development in wetland areas ▪ Maintain or improve wetland health – Agriculture to retract from wetlands to minimum legal requirements. Sugar cane to maintain SUSfarms standards. ▪ Confirmed commitment to limiting the impact to wetlands and their function through multifaceted approach. ▪ Of utmost importance: all water should pass their viable wetlands. o All wetland no matter how small must be rehabilitated and protected. ▪ Essential to be saved o Bird life a great interest for visitors. o Fishing competition bringing income to uMshwathi area. ▪ Managed and rehabilitated where needed. ▪ Should be protected and untouched. ▪ Determine wetland priorities and develop wetland management plan (Conservation, remediation and landowner agreements). Raise awareness of wetlands goods and services(water flow, Flood alternation etc). Climate damage – flexibility to adapt. Criteria o No wetland, 8% that are untransformed, rehabilitate etc. o Photo dairy annually and Biodiversity index. Indicators o Water flow rates before and after, o Area Buffer zone and o land owner agreements. ▪ Maintenance and management of existing system. ▪ Improving system functionality. ▪ No loss or at least reduction in wetland areas. ▪ Wetland health assessment and rehabilitation. ▪ Rehabilitation of wetland: controlling Alien invasive species, Establishment of naturally occurring species. o Criteria: Farms compliant with SUSFarms standards. o Indicators: Riparian zones populated with natural most plants of Eldana and consequently naturally controlling predators to control Eldana populations. ▪ No net loss of wetland functional area and restoration/rehabs of all wetland areas to good level.

TERRESTRIAL BIODIVERSITY

SUSTAINABILITY OBJECTIVE	▪ All rare and endangered habitats and species protected and restricted development in these areas. ▪ Ecological corridors to be maintained and created to promote species. ▪ Creation of Resources/conservancy's to protect biodiversity. ▪ Formally protecting areas where most diversity occurs, taking into account endangered species. Also increase awareness of the importance of biodiversity. ▪ High level of transformation and also to protect our habitants and species disruption of all natural ecological processes such as fire. ▪ Very difficult to achieve with fences/sugar cane/plantations /population. ▪ Essential for all mammals – two legged as well. ▪ The biodiversity around the dam should be a concern especially if there are already so many endangered species around it. This show the weakened ecosystem caused by habitat loss let's try not to contribute on that. ▪ Establish conservancy/Biodiversity ownership programme to increase area of grassland under conservation. Landowner awareness (grassland goods and services and management).Link areas of biodiversity raise awareness of climate change genetics o Criteria - Biodiversity, Faunal and Floral. o Indicators -Trends of species especially threatened. ▪ Meeting Provincial targets must be a minimum requirement. ▪ Need to be able to formally protect areas with in LM. ▪ Achieve 100% of Biodiversity targets.

AGRICULTURE

SUSTAINABILITY OBJECTIVE	▪ Diverse but integrated and well developed agriculture system. ▪ An agric priority area – supports secondary industry and should be retained/respected for the role it plays (Recreational activities should not be at the expense for the structural base of the community and economy). ▪ Strengthening the already integrated system that exists, to continue to increase the level of operation and production. ▪ Look at all the grassland condition, level of protection and also species status. ▪ Controlling of all human and poaching through illegal threat. ▪ Encourage investment into existing businesses. ▪ Increase agricultural production through more efficient agricultural practices/methods ▪ Protection of existing agricultural resources. ▪ Agricultural outputs for the region. ▪ Maintain level of agricultural activities in study areas: especially sugar cane. o Criteria: Cane supply/area under cane.

	○ Indicators: Cane supply from study area is sustained. ▪ No loss/optimization of high moderate potential agricultural land, ensure compatibility of land uses and account for agricultural production in terms of livelihoods ○ Indicator: Change in transformation ▪ Compatibility of land use. ▪ Agriculture production sustainable livelihoods (food within 50km). ▪ Agriculture is the base of the economy and should be respected as such – recreational and other development should not be at the expense of the structural base of the economy. This requires that primary production is retained to support secondary industry (saw/sugar mills, abattoirs, feedlots)

AIR QUALITY

SUSTAINABILITY OBJECTIVE	▪ Restrict industrial activity that reduces air quality to most suitable areas ▪ Maintain current state of air quality ▪ Maintain current standards – possible negative impacts on agriculture minimized. ▪ Maintain a level air quality, factoring seasoned validation best suited to a good quality of life. ▪ Air quality is good with all impact and represent an Environmental assets. ▪ Must be sustained at the best quality. ▪ It should be a major concern. Air is one of the three main elements you need for agriculture, bad air – bad crops. ▪ Establish winter air quality and develop plan according to results: (biomass burning, dust etc) ○ Criteria - Clinic data on pulmonary disease in winter ○ Indicators - Prevalence of bronchial infections asthma etc. ▪ Maintenance of the status quality. ▪ Reduction in emission through more sustainable agriculture practices where possible. ▪ Maintain current ambient air quality standards. ▪ Social and economic environments have to be seen as reciprocal. Astute planning of both sectors is required.

SOCIAL ENVIRONMENT

SUSTAINABILITY OBJECTIVE	▪ 0% unemployment ▪ Schooling of children up until age of 18. ▪ Social and economic have to be viewed as reciprocal – this requires integrated planning. ▪ Increased commitment from civil society and government to improve the social environment within the study area.

	▪ This part must cover all the communities for educational purpose for their services income. ▪ We all need to work together instead of extra legislation. Money spent on upgrading not only homes but health is essential. ▪ Create sustainable jobs using existing economy. ▪ Develop public and private partnerships for addressing educational issues, agricultural employment issues and forum to address outstanding land claims. ▪ Increasing job opportunities to reduce poverty level and better living standard. ▪ Maintain or improve time provision of jobs by the Agricultural sector: o Criteria: Employment opportunities. ▪ Eradication of abject poverty in line with assurance of an environment that is not harmful to health and wellbeing. ▪ Access to schooling, health care and housing for all. ▪ All hospital and health care in our area is very important – need to reduce reliance of combi/taxis service for those who do not own vehicles. o Pietermaritzburg hospitals are full. o 24 hour service is essential. ▪ The economy comprises primary, secondary and tertiary activities. A healthy economy requires them all to interrelate with each other with the result that the human environment is positively affected by each sector i.e. sustainable employment. This can only be achieved through planning with this target in mind. Healthy economy = healthy population = economic self-sustenance.

ECONOMIC ENVIRONMENT

SUSTAINABILITY OBJECTIVE	▪ Look for agricultural processing opportunities to beneficiate produce locally where possible. Train locals to grow own food at schools, clinics etc. ▪ Reduction in rate of unemployment ▪ Promote tourism and other activities within acceptable limits imposed by the environment. ▪ A healthy economy comprises primary, secondary and tertiary components – that are integrated to uplift each sector. Employment towards a self-sustaining environment is critical. This can only be achieved through integrated planning with overall vision in mind. ▪ Economic growth to be notified and Economic Environment to open Tourism opportunities that are been identified. ▪ Encourage existing business to diversity. ▪ The Economy can do with this opportunity but caution should be taken in reaching the goals required in the right manner and not just jump in as we have seen in all places in this country. ▪ Increase economic activity within the District. ▪ Should be in line and respond on existing economies/activities wherever possible i.e through increase agricultural production/farming practices. ▪ Maintain or improve current economic environment.

	○ Criteria: Both sugar mills in area are able to continue with their operations. ○ Indicators: Sugar cane crops is of a size sufficient to sustain both mills. ▪ Reduction of unemployment and reliance a social grants/state grants. ▪ Positive economic growth.

INFRASTRUCTURE & SERVICES

SUSTAINABILITY OBJECTIVE	**ROAD TRANSPORT** ▪ Control accesses onto our Provincial Road corridor. ○ No structures and services within road reserve boundary generally 15 meters from center of the road and 15 meters building line restriction from road reserve boundary. ○ Remove all services and structures from road reserve and building line e.g. Trading. ○ Remove illegal signage along the provincial road. ○ Adherence to Roads Act No 4 of 2001 **WASTE SERVICES** ▪ Establish waste avoidance and landfill diversion programs. ▪ Develop business plans for recycling initiatives. ▪ Divert organic waste to existing composing facilities. ▪ Contact wildlands conservation trust to develop waste/tree preneurs in thokonjani Criteria ○ Landfill airspace, business opportunities for recycling :waste, plastic, paper wood, fine sorting and baling or beneficiary on site. **Indicators** ○ Overhead litter index photo assessment. ○ Landfilling rates and trends, no new business, work opportunities, no waste and tree prenuers little improvement.

DFS WORKSHOPS 2
STAKEHOLDER INPUTS TO DFS SUSTAINABILITY OBJECTIVES

DFS WORKSHOPS 2 - ATTENDANCE REGISTER

DRAFT ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE MSHWATHI 'CITY' DEVELOPMENT NODE –

Workshop to set the ***Desired Future State*** for the Development Node

Tuesday, 6th September 2011 – Lythwood Lodge, Mooi River

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DFS WORKSHOPS 2 – STAKEHOLDER INPUTS TO DFS SUSTAINABILITY OBJECTIVES

uMshwathi Municipality

Ref No: 4/1/3/1
Date : 12 September 2011

Mr Dave Cox
Institute of Natural Resources

Dear Sir

SUBMISSION FROM THE THIRD COUNCIL OF UMSHWATHI MUNICIPALITY

This is a formal submission of the Third Council of uMshwathi Municipality on the 'Desired Future State' for the uMshwathi City development node.

In the quest to reduce the levels of poverty and unemployment; and to address other related socio-economic challenges facing uMshwathi Municipality, the Council wishes to see economic developments that would diversify and grow the economy of uMshwathi and create the much-needed job and business opportunities for the people of uMshwathi.

Council appreciates the present, less than optimum state of the environment in the study area as reflected in the State of the Environment Report, the legal and environmental imperatives, and Provincial targets and therefore, reaffirms its commitment to supporting 'responsible development'. That is, development that brings about long term growth of the local economy whilst at the same respecting the legal prescripts, Provincial targets and aspirations of the people of uMshwathi Municipality.

Developments in the node must not cause avoidable and undue negative impact on the air quality, water quality, terrestrial biodiversity, the economy and the culture of the people of uMshwathi.

To ensure that the vision of a better life for the majority of the people of uMshwathi, and to overcome the limitations imposed by the legal and environmental considerations, development proposals must always be accompanied by the requisite mitigating actions to minimize the adverse effects on the environment. The acceptable balance between the benefits of the developments and the potential negative impacts must be sort at all times.

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The following table gives the collective 'desired future state' for each of the sustainability objectives in the questionnaire:

Water resources – Quality	▪ Water quality is consistently monitored and subsequently managed in order to obtain and maintain acceptable levels for the sustainability of the rivers' ecosystem and function.
Water resources - Ecological Health	▪ Ecosystem functioning at good level in line with Provincial targets.
Water resources – Wetlands	▪ Maintain or improve wetland health – Agriculture to retract from wetlands to minimum legal requirements. ▪ Minimum pollution from farming and other operations..
Terrestrial Biodiversity	▪ Meeting Provincial targets must be a minimum requirement.
Agriculture	▪ Highest possible levels of production taking into consideration the objective of diversification & general growth & development of the local economy
Air quality	▪ Meeting Provincial targets must be a minimum requirement.
Social Environment	▪ Eradication of abject poverty in line with assurance of an environment that is not harmful to health and wellbeing of the people.
Economic Environment	▪ Promote tourism and other activities within acceptable limits imposed by the environment to bring about long term socio-economic development for the people of uMshwathi.
Infrastructure	▪ Adherence to Roads Act No 4 of 2001. ▪ Establish waste avoidance and landfill diversion programs and develop business plans for recycling initiatives.

Attached is a list of the members of the Third Council of uMshwathi that approved the submission of the above-mentioned 'desired future state' for the study area.

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