

Climate Change Response Plan for uMzinyathi District Municipality

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UMZINYATHI
UMASIPALA WESIFUNDA
DISTRICT MUNICIPALITY

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Contents

Acronyms.....	8
1. Executive Summary.....	9
1.1 Energy.....	10
1.2 Transport.....	11
1.3 Agriculture.....	11
1.4 Biodiversity.....	12
1.5 Human Health.....	12
1.6 Human Settlements, Infrastructure, and Disaster.....	13
1.7 Water.....	13
2. Introduction.....	15
3. Methodology.....	15
3.1 Climate Change Mitigation.....	15
3.2 Climate Change Adaptation.....	19
4. UMzinyathi DM Climate Change Context.....	23
4.1 Overview of uMzinyathi District Municipality.....	23
4.2 Municipal Climate Change Snapshot.....	24
4.3 General Municipality Indicators.....	26
4.4 Climate Change Mitigation Related Indicators.....	28
4.5 Vulnerability Assessment Tool Indicators.....	28
5. Greenhouse gas inventory results.....	30
5.1 Overview of results.....	30
5.2 Comparison with previous years.....	31
5.3 Energy.....	32
5.4 Transport.....	33
5.5 Waste management.....	37
6. Vulnerability Assessment Results.....	39
6.1 Agriculture.....	39
6.2 Biodiversity.....	50
6.3 Health.....	61
6.4 Human Settlements, Infrastructure, and Disaster.....	70
6.5 Water.....	80
6.6 Vulnerability Assessment Summary.....	87
7. Implementation Plan.....	89
7.1 Cross Cutting Implementation Actions.....	89

7.2	Energy Sector Implementation Actions.....	91
7.3	Transport Sector Implementation Actions.....	94
7.4	Agriculture Sector Implementation Actions.....	98
7.5	Biodiversity Sector Implementation Actions.....	102
7.6	Health Sector Implementation Actions.....	104
7.7	Human Settlements, Infrastructure, and Disaster Sector Implementation Actions 110	
7.8	Water Sector Implementation Actions.....	114
8.	References.....	118
	Appendices.....	120
	Appendix 1: Environmental Management Zones as per the uMzinyathi Environmental Management Framework (Nemai Consulting 2016c).....	120
	Appendix 2: Umzinyathi Disaster Risk Maps (UMzinyathi District Municipality 2015a)	123

Table of Figures

Figure 1: UMzinyathi District Municipality GHG Emissions Per Category for the 2015 Period..	9
Figure 2: Diagram Highlighting the Different Emissions By Scope To Consider When Developing a Community Emissions Inventory Based on a Geographical Boundary (World Resources Institute, C40 Cities Climate Leadership Group, and ICLEI - Local Governments for Sustainability 2014).....	17
Figure 3: Map Showing the Local Municipalities within uMzinyathi District (Urban Earth).....	23
Figure 4: Hydrological Zones of South Africa (Data Source: Department of Environmental Affairs 2013c).....	25
Figure 5: UMzinyathi District Municipality is Situated Within The Pongola-UMzimkhulu Hydrological Zone (Data Source: Department of Environmental Affairs 2013c).....	25
Figure 6 UMzinyathi District Municipality Community GHG emissions by sector for the 2015 Calendar Year.....	30
Figure 7: GHG emissions by emissions category.....	31
Figure 8: Percentage of households with access to electricity for cooking, heating and lighting in uMzinyathi District Municipality (Statistics South Africa 2011).....	33
Figure 9: Percentage households involved in agricultural activities across uMzinyathi Municipal Area (Statistics South Africa 2011).....	39
Figure 10: Average yield of maize per annum with 3 degrees increase in temperatures (Source: KZNDARD).....	41
Figure 11: Current Average yield Maize per annum (Source: KZNDARD).....	41
Figure 12: Current Average yield Soya per annum (Source: KZNDARD).....	42
Figure 13: Average yield of soya per annum with 3 degrees increase in temperatures (Source: KZNDARD).....	42
Figure 14: UMzinyathi District Municipal Area Current Biome Delineation (Data Source: (Data Source: South African National Parks 2011a).....	50
Figure 15: uMzinyathi District Municipality Environmental Analysis (UMzinyathi District Municipality 2015b).....	52
Figure 16: Transformation in uMzinyathi District Municipality (Nemai Consulting 2016b).....	53
Figure 17: UMzinyathi District Municipal Area Medium Risk Biome Delineation (South African National Parks 2011c).....	54
Figure 18: UMzinyathi District Municipal Area High Risk Biome Delineation (South African National Parks 2011b).....	55
Figure 19: Age Structure of the District Municipal Area (Statistics South Africa 2011).....	61
Figure 20: Percentage of young (under 5 years) and elderly (over 65 years) across the District Municipal Area (Statistics South Africa 2011).....	62
Figure 21: Percentage workforce employed in the informal sector across the District Municipal Area (Statistics South Africa 2011).....	63
Figure 22: Percentage of Households Living in Traditional Dwellings Across uMzinyathi District Municipality (Statistics South Africa 2011).....	71
Figure 24: Percentage of population with access to sanitation in the District Municipal Area (Statistics South Africa 2011).....	72
Figure 25: Percentage of the population with access to flush toilets across the District Municipal Area (Statistics South Africa 2011).....	72
Figure 26: Percentage of households with no rubbish disposal across the District Municipal Area (Statistics South Africa 2011).....	73
Figure 27: Employment statistics for District Municipal Area (Statistics South Africa 2011)....	74

Figure 28: Education statistics for the District Municipal Area (Statistics South Africa 2011)..	75
Figure 29: UMzinyathi District Municipality falls within the Pongola-Umzimkhulu Water Management Area (Department of Environmental Affairs 2013a).....	80
Figure 30: Percentage of households who source water from piped water schemes across the uMzinyathi District Municipal Area (Statistics South Africa 2011).....	81
Figure 31: Percentage of households in the uMzinyathi District Municipal Area who do not source water from piped water schemes (Statistics South Africa 2011).....	82
Figure 32: Terrestrial Biodiversity Environmental Management Zone (EMZ) (Nemai Consulting 2016c).....	120
Figure 33: Aquatic Biodiversity EMZ (Nemai Consulting 2016c).....	121
Figure 34: Agriculture EMZ (Nemai Consulting 2016c).....	122
Figure 35: Flood risk map for Umzinyathi District Municipality (UMzinyathi District Municipality 2015a).....	123
Figure 36: Drought risk map for Umzinyathi District Municipality (UMzinyathi District Municipality 2015a).....	124
Figure 37: Combined Disaster Risk Map for Umzinyathi District Municipality (UMzinyathi District Municipality 2015a).....	125

Table of Tables

Table 1: Key Vulnerability indicators for uMzinyathi District Municipality.....	10
Table 2: Community Emissions Sources Identified.....	17
Table 3: Local Government Emissions Sources Identified.....	18
Table 4: General Municipality Indicators for uMzinyathi District Municipality (Data Source: Statistics South Africa 2011).....	26
Table 5: Modes of transport used in uMzinyathi District Municipality (UMzinyathi District Municipality 2015b).....	28
Table 6: Electricity access in the uMzinyathi District Municipality and its Local Municipalities (Nemai Consulting 2016c).....	28
Table 7: Key Vulnerability Indicators for uMzinyathi District Municipality (Source Statistics South Africa 2011).....	28
Table 8: Key health indicators for KwaZulu-Natal District Municipalities (Data Source: Massyn et al. 2016).....	29
Table 9: Community Emissions By Scope.....	30
Table 10: Community GHG emissions by scope.....	31
Table 11: Electricity access in the uMzinyathi District Municipality and its Local Municipalities (UMzinyathi District Municipality 2015b).....	32
Table 12: Percentage of people not travelling (UMzinyathi District Municipality 2015b).....	34
Table 13: Modes of transport used in uMzinyathi District Municipality (UMzinyathi District Municipality 2015b).....	35
Table 14: development programmes to improve basic service delivery (UMzinyathi District Municipality 2016).....	35
Table 15: Transport related intervention areas by the year 2030 for uMzinyathi District Municipality.....	36
Table 16: Waste Removal Census Statistics (Statistics South Africa, 2011).....	37
Table 17: Agriculture Vulnerability Table uMzinyathi District Municipality (Populated by Urban Earth together with Umzinyathi District Municipality Officials at Two Workshops in 2017).....	43

Table 18: Threatened ecosystems in the District Municipality per Local Municipality (Nemai Consulting 2016b).....	56
Table 19: Biodiversity Vulnerability Indicator Table uMzinyathi District Municipality (Populated by Urban Earth together with Umzinyathi District Municipality Officials at Two Workshops in 2017).....	57
Table 20: Health Care Facilities in Umzinyathi District Municipality (District Health Expenditure Review (DHER 2017)).....	63
Table 21: Health Vulnerability Indicator Table uMzinyathi District Municipality (Populated by Urban Earth together with Umzinyathi District Municipality Officials at Two Workshops in 2017).....	65
Table 22: Population per settlement type 2012 (UMzinyathi District Municipality 2015b).....	70
Table 23: Human Settlements Vulnerability Table uMzinyathi District Municipality (Populated by Urban Earth together with Umzinyathi District Municipality Officials at Two Workshops in 2017).....	76
Table 24: Blue and Green Drop ratings for uMzinyathi District Municipality 2015/16 (Source: Bonginkosi Hlatshwayo IDP Department Umzinyathi District Municipality, Sourced From Department of Water and Sanitation).....	81
Table 25: Water Vulnerability Table uMzinyathi District Municipality (Populated by Urban Earth together with Umzinyathi District Municipality Officials at Two Workshops in 2017).....	83
Table 26: High Priority Indicators uMzinyathi District Municipality.....	87
Table 27: Medium priority Indicators uMzinyathi District Municipality.....	88

Acronyms

DARD - KZN Department of Agriculture and Rural Development

DEA – National Department of Environmental Affairs

DEFRA- United Kingdom Department for Environment, Food & Rural Affairs

DoE – National Department of Energy

EDTEA - KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs

EEDSM - Department of Energy's Energy Efficiency Demand Side Management Program

EMF - Environmental Management Framework

EMZ- Environmental Management Zone

GHG- Greenhouse gas

IBA -Important Bird & Biodiversity Areas

IPCC- Intergovernmental Panel on Climate Change

IPPU- Industrial Processes and Product Use

LGCCS - National Department of Environmental Affairs Local Government Climate Change Support Programme

SANBI - South African National Biodiversity Institute

1. Executive Summary

UMzinyathi District Municipality acknowledges that climate change poses a threat to the environment, its residents, and future development. Actions are required to reduce carbon emissions (mitigation), and prepare for the changes that are projected to take place (adaptation) in the District. UMzinyathi District Municipality has therefore prioritised the development of a Climate Change Adaptation, Mitigation, and Response Plan. Urban Earth has been contracted by uMzinyathi District Municipality to undertake this work. Funding for the development of the plan was provided by the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (EDTEA).

On the mitigation side, this Climate Change Response Plan highlights the highest sources of greenhouse gas (GHG) emissions in the District. These are potential areas where uMzinyathi District Municipality should focus their attention on developing responses that reduce greenhouse gases. A total of 368,777 kgCO₂e was emitted in the 2015 calendar year within the uMzinyathi District Municipality borders. Figure 1 below shows the different categories of emissions in the District and their contribution to the total figure. The graph shows the emissions from transport (mobile fuel combustion) and electricity as significant.

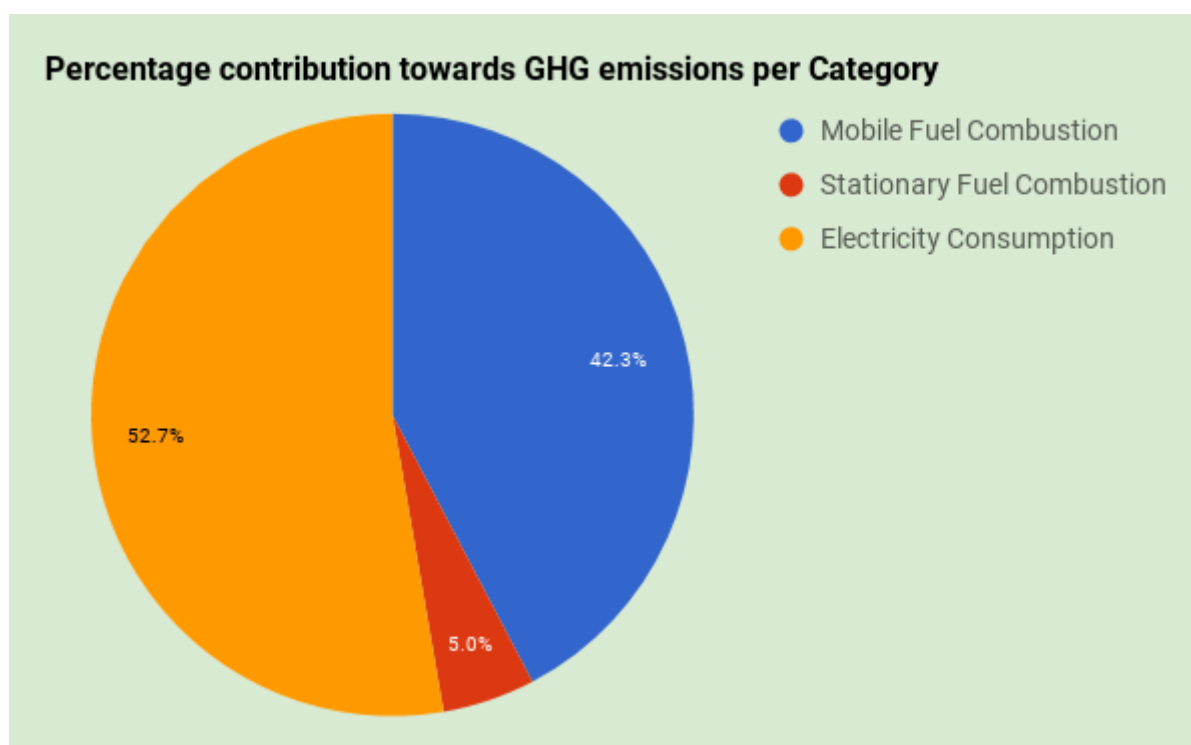


Figure 1: UMzinyathi District Municipality GHG Emissions Per Category for the 2015 Period.

On the adaptation side, this Climate Change Response Plan highlights the key climate change vulnerability indicators that have been identified by Urban Earth in consultation with municipal officials from uMzinyathi District Municipality and its local municipalities. These are indicators where uMzinyathi District Municipality may be at risk to the impacts of climate change. A summary of the key vulnerability indicators is provided in Table 1 below.

Table 1: Key Vulnerability indicators for uMzinyathi District Municipality

No	Sector	Indicator Title	Exposure Answer	Sensitivity Answer	Adaptive Capacity Answer
1	Agriculture	Change in grain (maize, wheat & barley) production	Yes	High	Low
3	Agriculture	Change in Soya Bean Production	Yes	High	Low
10	Agriculture	Increased risks to livestock	Yes	High	Low
12	Biodiversity	Loss of High Priority Biomes	Yes	High	Low
23	Human Health	Increased vector borne diseases from spread of mosquitoes, ticks, sandflies, and blackflies	Yes	High	Low
24	Human Health	Increased water borne and communicable diseases (e.g. typhoid fever, cholera, and hepatitis)	Yes	High	Low
25	Human Health	Increased malnutrition and hunger as a result of food insecurity	Yes	High	Low
26	Human Health	Increased air pollution	Yes	High	Low
27	Human Health	Increased Occupational health problems	Yes	High	Low
29	Human Settlements	Increased impacts on strategic infrastructure	Yes	High	Low
30	Human Settlements	Increased impacts on traditional and informal dwellings	Yes	High	Low
31	Human Settlements	Increased isolation of rural communities	Yes	High	Low
36	Water	Less water available for irrigation and drinking	Yes	High	Low
37	Water	Increased impacts of flooding from litter blocking sewer system	Yes	High	Low

Based on the highest emission sources and the key vulnerability indicators identified, a range of interventions were identified to respond. These responses were identified by Urban Earth in collaboration with uMzinyathi District Municipality officials during two stakeholder workshops held on 1 June 2017 and 27 July 2017. These responses are listed in Section 7 of the plan. The following responses were highlighted as the most important of these interventions in each of the sectors.

1.1 Energy

The energy sector is a significant contributor of GHG emissions in the uMzinyathi District Municipality due to the reliance on coal generated electricity. In addition to this, there are a number of different ways that climate change will impact the energy sector in uMzinyathi District Municipality. Projected changes in climate are likely to increase the number and severity of extreme weather events consequently affecting energy production and delivery. However, the use of alternative energy sources such as solar could decrease dependence on fossil fuel derived electricity. The use of alternative energy sources will assist the district to reduce GHG emissions associated with electricity use and simultaneously adapt to electricity provision challenges.

The proposed priority mitigation projects and responses in the Energy Sector are:

1.1.1 Promote and implement energy efficiency initiatives

1. Participate in Department of Energy's Energy Efficiency Demand Side Management (EEDSM) Program to reduce electricity use in municipality owned infrastructure.

1.1.2 Invest in alternative energy sources

1. Pilot Renewable Energy use in the District Municipality (e.g. Solar PV Rooftop installations).
2. Conduct a feasibility study on converting cow dung to biogas in the District.
3. Develop a business plan for the installation of solar streetlights in rural areas within the District.

1.2 Transport

The transport sector is a contributor of GHG emissions in the uMzinyathi District Municipality. This is due to the reliance on fossil fuel derived fuel for vehicles. Extreme storm events as a result of climate change will also negatively impact on the District's transport infrastructure. Promoting low carbon modes of transport in the district will assist in reducing carbon emissions associated with transport. Investing in transport related infrastructure will assist with preparing the District to cope with the impacts of severe weather events.

The proposed priority mitigation projects and responses in the Transport Sector are:

1.2.1 Invest in and promote low carbon modes of public transport

1. Promote the use of public transport e.g. taxis.
2. Encourage the use of biofuels for agricultural fleet i.e. tractors.
3. Develop a public transport master plan that incorporates the centralisation of public service areas.

1.3 Agriculture

Climate change is predicted to negatively impact on the agricultural sector in uMzinyathi District Municipality. Increased temperatures, variability in rainfall patterns and the associated drought seasons are projected to have a major impact on the agriculture sector as water availability will be compromised. Maize and Soybean are the most common crops currently grown, whilst cattle, sheep and goats are the main livestock kept. A high percentage of households are involved in agricultural activities at a subsistence level that currently do not have the capacity to respond to the changes in climate that are projected.

The proposed priority adaptation projects and responses in the Agriculture Sector are:

1.3.1 Manage the change in grain production areas

1. Implement a land capability mapping and awareness program to identify high production areas for annual cropping on a ward basis. To be completed by 2020 for all Land Reform and Traditional Cropping Areas.
2. Implement minimum and zero till practices in the limed and fertilised areas through coordination with various departments.

1.3.2 Manage increasing risks to livestock

1. Conduct an awareness and capacity building campaign to educate farmers on the carrying capacity of the various grazing areas so that they engage in livestock farming practices that consider the available resources.

1.4 Biodiversity

Changes in climate are predicted to result in the shifting of biomes across the District Municipality and many parts of the country. UMzinyathi District Municipal Area is dominated by the grassland and savanna biomes, it is forecast that the grassland biome will be replaced by the savanna biome under different climate scenarios. This change will place pressure on the natural ecosystems and impact both fauna and flora species' distribution.

The proposed priority adaptation projects and responses in the Biodiversity Sector are:

1.4.1 Manage Loss of High Priority Biomes

1. Develop environmental units that deal with environmental management issues within the District and local municipalities.
2. Prioritise projects identified in the district's Environmental Management Framework (EMF) that can be used to respond to the loss of priority biomes.
3. Manage alien plants in water production areas to conserve water resources.
4. Implement donga rehabilitation programmes.

1.5 Human Health

The human health sector in the District will be impacted by the changing climate in a number of different ways. Projected increases in temperatures due to climate change will result in increased heat stress and impact particularly the young and elderly, and those working outdoors. Furthermore, favourable conditions for the incubation and transmission of vector borne and waterborne diseases may be created by increasing air and water temperatures. A reduction in the availability of food may also result in increased hunger and malnutrition.

The proposed priority adaptation projects and responses in the Human Health Sector are:

1.5.1 Manage the increasing vector borne diseases from spread of mosquitoes, ticks, sandflies, and blackflies

1. Increase the capacity of local health facilities to deal with diseases resulting from climate change.

1.5.2 Manage the increasing water borne and communicable diseases (typhoid fever, cholera, bilharzia, and hepatitis)

1. Plan and prioritise upgrades for water and storm water related infrastructure.

1.5.3 Manage increased malnutrition and hunger as a result of food insecurity

1. Promote urban agriculture in order to improve food security in urban areas particularly in informal settlements.
2. Implement a social relief programme that provides food to households without food.

1.6 Human Settlements, Infrastructure, and Disaster

There are a number of different ways that climate change may impact on human settlements and infrastructure in uMzinyathi District Municipality which are related to disaster. Increases in

the severity of storm events and increase in flooding will damage strategic infrastructure which may result in service delivery disruptions. The impacts of storm events will particularly affect communities located in informal and traditional dwellings, on flood plains and where there is poor drainage infrastructure. In addition, communities in rural areas that depend on subsistence farming may be unable to grow crops that they have grown in the past due to the changing climate. It is predicted that there will therefore be an increase in rates of rural-urban migration. Rural communities may also become more physically isolated from accessing services due to extreme events impacting on key infrastructure.

The proposed priority adaptation projects and responses in the Human Settlements, Infrastructure, and Disaster Sector are:

1.6.1 Manage potential increased impacts on informal and traditional dwellings

1. Develop a housing/human settlements sector plan that incorporates climate change for each local municipality within the district. To be initiated by the Planning Department.
2. Create an awareness on proper land use management and the impacts of locating informal/traditional housing on floodplains.
3. Upgrade existing storm water systems in order to minimise flooding impacts on traditional and informal dwellings.

1.7 Water

UMzinyathi District Municipality is currently experiencing issues of water scarcity and quality. Climate change is expected to exacerbate this problem. Drought, reduced runoff, increased evaporation, and an increase in flood events will impact on both water quality and quantity. In addition to this, the groundwater capacity within the District may decrease and possibly impact on households that are dependent on this source of water.

The proposed priority adaptation projects and responses in the Water Sector are:

1.7.1 Manage the quantity of water available for irrigation and drinking

1. Research groundwater potential in the area and conduct a feasibility study on drilling additional boreholes.
2. Conduct an assessment on leakages and spillages using programmes such as the Department of Water and Sanitation's "War on Leaks" programme.
3. Conduct research on the feasibility of including rainwater harvesting initiatives/measures in newly built homes within the District.

4. Conduct a hydro-census on existing boreholes to determine the quality and quantity of groundwater within the District.

2. Introduction

Urban Earth was contracted by uMzinyathi District Municipality to develop a climate change response strategy for the District that incorporates mitigation and adaptation responses. Funding for the development of the plan was provided by the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (EDTEA).

Climate change is the term given to the large-scale changes that are taking place in long-term weather patterns around the world. These changes are due to an increase in the amount of greenhouse gases that are emitted through human activities such as the burning of fossil fuels. Responding to climate change is broken down into two different types of action: Climate Change Mitigation, and Climate Change Adaptation. Climate change mitigation refers to the actions that are taken to reduce the amount of greenhouse gases that occur in the atmosphere; whilst climate change adaptation refers to the actions that are taken to respond to the changes in climate that take place, such as an increase in extreme rainfall events.

3. Methodology

This Climate Change Response Plan has been developed in consultation with officials from uMzinyathi District Municipality, its local municipalities, and KwaZulu-Natal Provincial stakeholders. On the mitigation side, a greenhouse gas inventory was conducted in order to identify the sources and sectors of highest greenhouse gas emissions. On the adaptation side, a vulnerability assessment was conducted to identify the areas that were most vulnerable to the impacts of climate change. This section explains these methodologies in more detail.

3.1 Climate Change Mitigation

3.1.1 *What is a Greenhouse Gas Inventory?*

A significant part of mitigating climate change involves compiling a greenhouse gas (GHG) emissions inventory. A GHG inventory assists with identifying GHG emissions sources and quantifying the associated GHG emissions (Department of Environmental Affairs 2014). Once completed, GHG inventories are used to identify the sources and sectors of highest emissions so that appropriate strategies and policies to reduce emissions can be developed. However, a huge challenge when compiling GHG emissions inventories in South Africa is the availability of accurate data (Department of Environmental Affairs 2014).

3.1.2 *Inventory Tool*

EThekweni Municipality's GHG emissions inventory tool was used as a starting point to develop a Municipal GHG Emissions Inventory Tool that could be used for uMzinyathi District Municipality to measure its GHG emissions. This user-friendly tool is based on the Global Protocol for Community-Scale GHG Emission Inventories and the International Local Government GHG Emissions Analysis Protocol (EThekweni Municipality 2014). The Global Protocol for Community-Scale GHG Emission Inventories sets out requirements and provides guidance when calculating and reporting city-wide GHG emissions and it is consistent with the 2006 Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas

Inventories (World Resources Institute, C40 Cities Climate Leadership Group, and ICLEI - Local Governments for Sustainability 2014).

3.1.3 Steps involved in a greenhouse gas inventory

There are six key steps to conducting a greenhouse gas inventory and developing mitigation responses, these are:

- Step 1: Set the temporal and operational boundary
- Step 2: Identify the emission sources by Scope
- Step 3: Collect data
- Step 4: Convert and capture data
- Step 5: Identify highest sources of emissions
- Step 6: Develop mitigation responses

3.1.3.1 Step 1: Set the temporal and operational boundary

The first step in developing a GHG emissions inventory is to set out the temporal and operational boundaries as this defines the time period, as well as the emission sources and data that will be included in the emissions inventory. The temporal boundary for the uMzinyathi District Municipality was set for the 2015 year as this was the most recent data that could be obtained. On the operational side, measuring a municipality's emissions involves measuring the emissions from the community as a whole, as well as the emissions that can be attributed to the local government as an institution.

For the purpose of this emissions inventory, the operational boundary for community emissions was set as the uMzinyathi District Municipality geographical boundary. This includes emissions from the different sectors and activities operating within the geographical boundary of the District. For local government emissions, the GHG emissions resulting from any activities under the control of the District Municipality as an organisation was set as the operational boundary. The local government emissions are a sub-set of the greater community emissions.

3.1.3.2 Step 2: Identify the emission sources by Scope

The next step is to identify the GHG emission sources within the operational boundaries identified in Step 1. Emissions are divided up into different sectors including Energy, Transport, Waste, Industrial Processes and Product Use (IPPU), Agriculture, Forestry and other Land-Uses sectors. Within each sector emissions are categorised according to Scope, which identifies whether an emission source is direct or indirect.

- Scope 1 emissions are direct GHG emissions produced by the organisation/area (e.g. Fuel combustion).
- Scope 2 emissions are indirect GHG emissions produced by electricity that is purchased by the organisation or area.
- Scope 3 emissions are any other indirect GHG emissions that occur from the organisation or area's activities but the sources of the emissions are owned or controlled by another entity (e.g. out of boundary transport)

Separating these emissions according to sector and scope prevents the possibility of double counting and assists with data collection. The figure below highlights the different types of

emissions by scope in a community inventory defined by a geographical boundary (Figure 2).

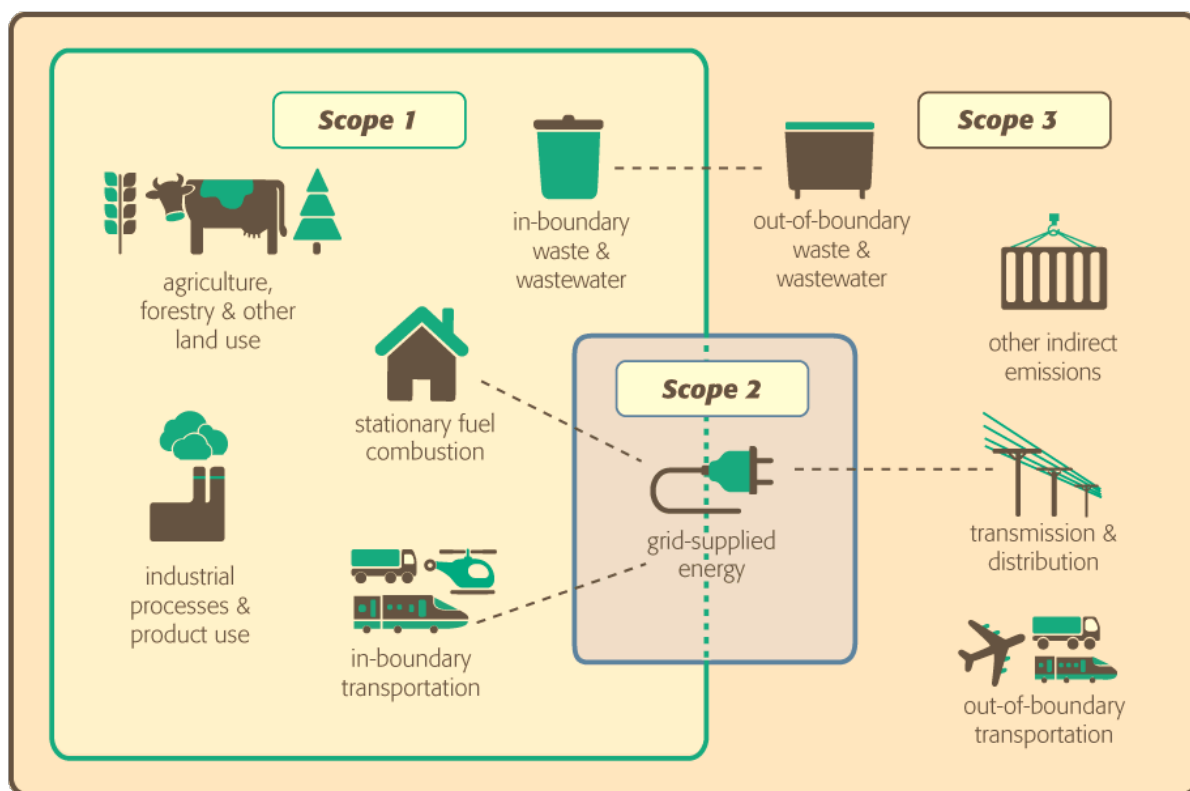


Figure 2: Diagram Highlighting the Different Emissions By Scope To Consider When Developing a Community Emissions Inventory Based on a Geographical Boundary (World Resources Institute, C40 Cities Climate Leadership Group, and ICLEI - Local Governments for Sustainability 2014)

The Municipal GHG Inventory Tool was used to identify the different emission sources by Scope for the Community Emissions and Local Government Emissions Inventories. The following sources were identified for inclusion in the uMzinyathi District's GHG Inventory in Table 2 and Table 3 below:

Table 2: Community Emissions Sources Identified

Scope 1	Scope 2	Scope 3
Stationary fuel combustion e.g. liquid petroleum gas.	Electricity consumption (Residential, commercial and industrial buildings)	Air transport systems.
Mobile fuel combustion e.g. diesel, petrol.		
Fugitive emissions from landfill sites.		
Fugitive emissions from wastewater treatment.		
Stationary fuel combustion e.g. paraffin		
Enteric emissions from livestock		

Table 3: Local Government Emissions Sources Identified

Scope 1	Scope 2	Scope 3
Stationary fuel combustion e.g. liquid petroleum gas.	Electricity consumption from Municipality owned infrastructure: buildings, street lights, traffic signals, landfill sites, wastewater treatment plants.	Electricity consumption from infrastructure used, but not owned, by the Municipality: buildings, traffic lights, streetlights.
Fugitive emissions from municipality owned landfill sites.		Mobile fuel combustion from vehicles used, but not owned, by the Municipality
Fuel combustion by municipal owned vehicle fleet e.g. petrol and diesel		Municipality staff flight travel.
Fugitive emissions from municipality owned wastewater facilities		

3.1.3.3 Step 3: Collect data

Step 3, the collection of data, is often the hardest step as the availability of accurate data in South Africa is a challenge (Department of Environmental Affairs 2014). All the data collected should be for the same calendar year and the units clearly included (For example, it should be noted whether the electricity data collected is in kWh or MWh). It is important to keep a record of the individuals that have provided you with the data as this will be useful in years to come.

For the uMzinyathi District Inventory, Community emissions data were requested from Eskom, Department of Energy and the KZN Department of Agriculture and Rural Development. Local government emissions data were requested from the various departments in the District Municipality and Local Municipalities. Unfortunately, only electricity consumption and fuel use data for community emissions were available. No data was obtained for the local government inventory.

3.1.3.4 Step 4: Convert and capture data

The next step involves the conversion of the collected data into greenhouse gas emissions data. Emission factors help to ensure that the emissions from different activities can be compared by converting activity data into kilogrammes of Carbon Dioxide equivalent (kg CO₂ e). As a full set of emission factors has not been developed for South Africa yet, a combination of Eskom, IPCC and DEFRA emissions have been used in the Municipal Emissions Inventory Tool.

The Municipal Emissions Inventory Tool is user friendly as it includes the most recent emission factors, converts the data into kg CO₂e and only requires the collected data to be captured which will be useful going forward.

3.1.3.5 Step 5 Identify the highest sources of emissions.

Once your data been captured, GHG emissions are calculated and classified according to the set boundaries, sources and sectors. During this step GHG emissions can be compared by sector and source and the highest sources of emissions identified.

3.1.3.6 Step 6: Develop mitigation responses

The final step involves the development of mitigation responses that directly link with the highest sources of emissions. The responses developed should be implementable and

specific and result in the reduction of greenhouse gases.

Once the GHG emissions were calculated for uMzinyathi District Municipality and the highest sources of emissions identified, stakeholders identified climate change mitigation responses that linked to the identified highest emission sources at a workshop held on 27 July 2017. The responses were defined in terms of implementable “projects” that talk directly to the responsibility of the municipality. Once a list of responses was identified for each mitigation sector, stakeholders short-listed the top three responses in each sector in the workshop held on the 27th July 2017. These three responses were then agreed to as the priority short term climate change mitigation responses for uMzinyathi District Municipality.

3.2 Climate Change Adaptation

3.2.1 What is a Vulnerability Assessment?

In order to identify where a municipality’s climate change vulnerabilities lie it is vitally important that a Vulnerability Assessment is conducted. A vulnerability assessment helps to identify the most important climate change impacts for a specific area. Once these impacts are identified, adaptation projects can be developed in response to these priorities.

A Climate Change Vulnerability Assessment is therefore a way of identifying and prioritising impacts from climate change. The IPCC¹ defines vulnerability as:

“Vulnerability to climate change is the degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with, adverse impacts of climate change” (Parry et al. 2007)

3.2.2 The Local Government Climate Change Support VA Toolkit

A desktop Climate Change Vulnerability Assessment was first conducted for uMzinyathi District Municipality by Urban Earth. This was done using a toolkit² that was developed through the Local Government Climate Change Support Programme (LGCCS), an initiative of the National Department of Environmental Affairs (DEA). The toolkit assists municipalities in identifying and prioritising climate change impacts or indicators which are of importance to their areas. This toolkit was also introduced to municipal officials at the workshop on 1 June 2017 where the officials were able to review and improve the results from the desktop assessment.

3.2.3 Steps involved in a Vulnerability Assessment

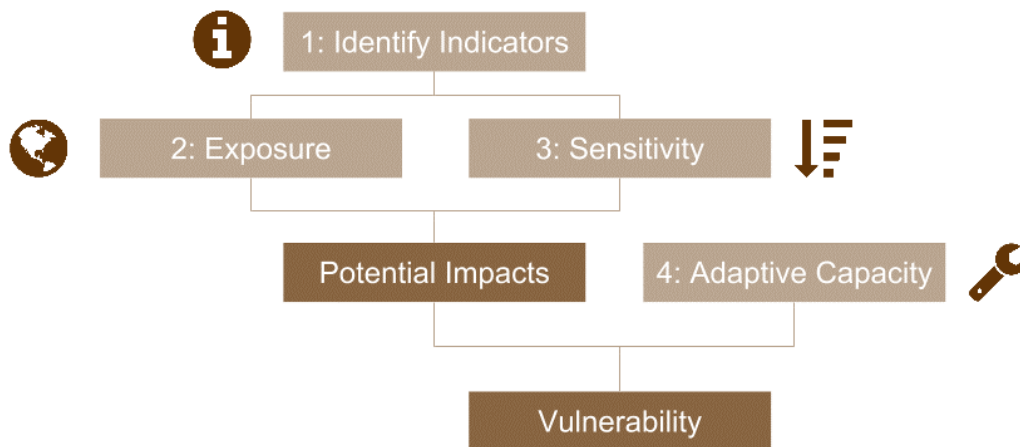
There are four steps to conducting a vulnerability assessment, these are:

- Step 1: Identifying potential impacts of indicators.
- Step 2: Assessing whether the impact will take place (exposure).
- Step 3: Assessing how important the risk is (sensitivity).
- Step 4: Assessing if you can respond to the risk (adaptive capacity).

¹ https://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch19s19-1-2.html

² More detail on the toolkit can be found on the website <http://www.letsrespondtoolkit.org/>.

Vulnerability Assessment Methodology



3.2.3.1 Step 1: Develop Climate Change Indicators

The first step in a Climate Change Vulnerability Assessment is to develop a set of indicators. Indicators are a list of potential impacts that may take place in your area as a result of climate change. The DEA's LGCCS Vulnerability Assessment Toolkit has already developed a draft range of indicators using the Long Term Adaptation Scenario (LTAS) Reports³. The indicators were grouped into the following sectors:

- Agriculture,
- Biodiversity and Environment,
- Coastal and Marine,
- Human Health,
- Human Settlements, and
- Water.

3.2.3.2 Step 2: Assessing Exposure

The second step of a Climate Change Vulnerability Assessment is to determine whether a particular indicator is relevant. This is termed "Exposure". Exposure is whether or not a particular impact will take place in a municipality. Each of the indicators were assessed in terms of exposure and those that noted as "yes" were recorded as potential exposure areas for uMzinyathi District Municipality.

3.2.3.3 Step 3: Assessing Sensitivity

The third step of the Climate Change Vulnerability Assessment asks the question, "if you are exposed, how important is the potential impact?" This is termed "sensitivity" and is generally assessed by a scale (e.g. 1 to 5 or High, Medium, Low). The LGCCS Vulnerability Assessment Toolkit grades the Sensitivity Questions as High, Medium and Low, using

³ <http://www.letsrespondtoolkit.org/climate-change-resources/long-term-adaptation-scenarios>

national averages.

The indicators that score “yes” for the exposure questions were then assessed in terms of sensitivity. Those that were noted as “high” and “medium” were recorded as potentially sensitive areas for uMzinyathi District Municipality.

3.2.3.4 Step 4: Assessing Adaptive Capacity

The fourth step in the Climate Change Vulnerability Assessment asks the question: "If there are going to be significant impacts due to climate change, do you have the systems (policy, resources, social capital) to respond to the change?" The IPCC defines Adaptive Capacity as:

"The ability of a system to adjust to climate change to moderate potential damages, to take advantage of opportunities, or to cope with the consequences"(Parry et al. 2007).

The indicators that scored “yes” for the exposure questions and “high” or “medium” for the sensitivity questions, were then assessed in terms of adaptive capacity. The Vulnerability Assessment Toolkit asks: "Do you have high, medium or low adaptive capacity (policy, institutional, social and finance) to respond to the change?" The Adaptive Capacity answers were scored as High, Medium and Low.

Those that are noted as “low” and “medium” were recorded as indicators with potential adaptive capacity constraints for uMzinyathi District Municipality.

3.2.3.5 Step 5: Develop Response Plans for Priority Indicators

Once the exposure, sensitivity and adaptive capacity assessments were completed, the indicators that had the following answers were short-listed:

- Exposure - Yes
- Sensitivity - High
- Adaptive Capacity - Low

The short-listed indicators are the indicators that uMzinyathi District Municipality is most vulnerable to and the responses will be developed to deal with these vulnerabilities.

3.2.3.6 Step 6: Developing Responses

Once the priority climate change indicators were identified, stakeholders identified responses to address these indicators. The responses were defined in terms of implementable “projects” that talk directly to the responsibility of the municipality. Once a list of responses was identified for each priority indicator, stakeholders short-listed the top three responses in each sector in a workshop held on 27 July 2017. These three responses were then agreed to as the priority short term climate change adaptation responses per sector for uMzinyathi District Municipality.

4. UMzinyathi DM Climate Change Context

4.1 Overview of uMzinyathi District Municipality

UMzinyathi District Municipality is located in the province of KwaZulu-Natal and is made up of the following four local municipalities: Endumeni, Nquthu, Msinga, and Umvoti (Figure 3). The District Municipality covers an area of 8,589 km² and has a total population of 510,837 which is approximately 5% of the total population of the province (Statistics South Africa 2011; UMzinyathi District Municipality 2016).

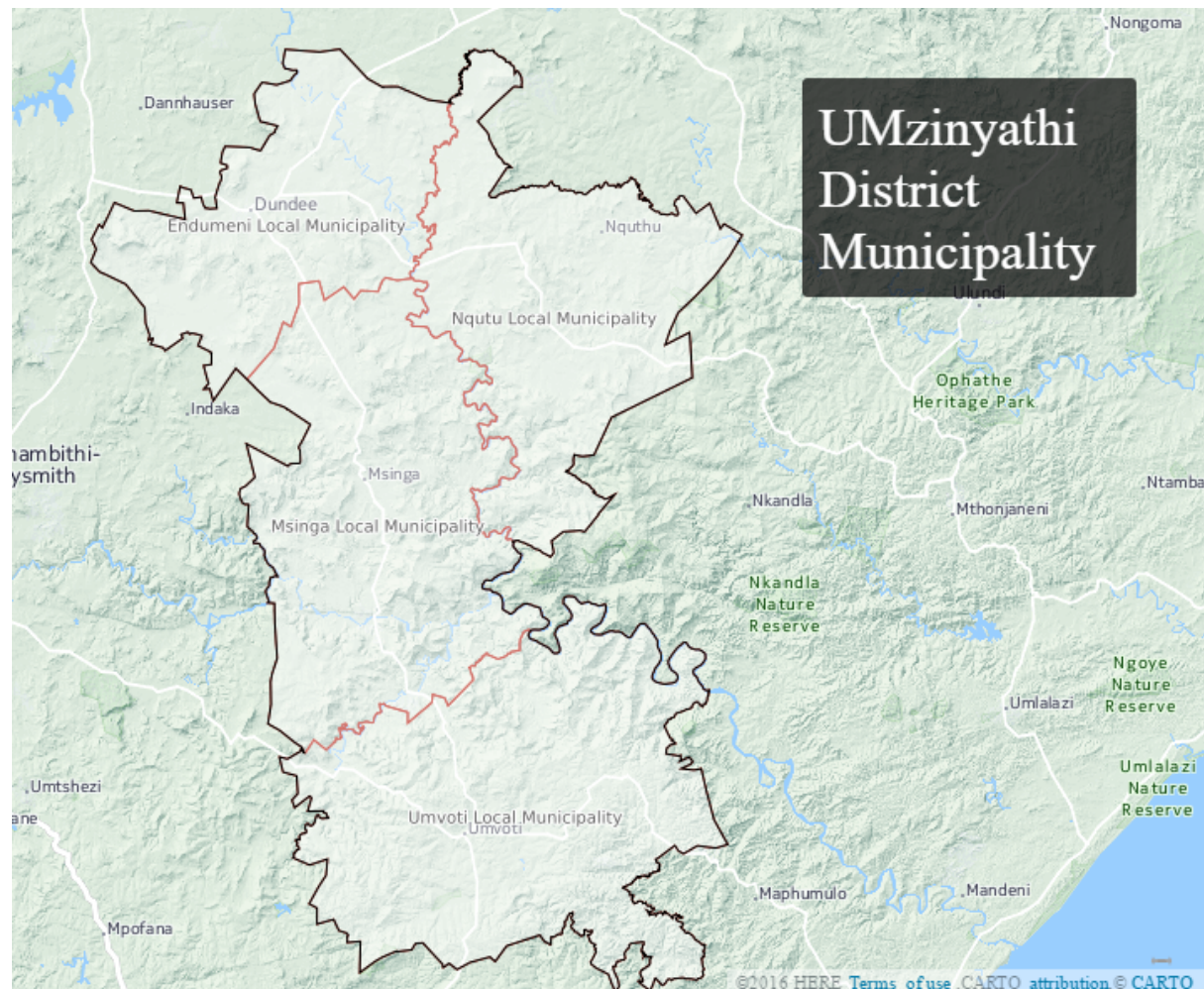


Figure 3: Map Showing the Local Municipalities within uMzinyathi District (Urban Earth)

The major economic centres, Dundee and Greytown, are situated in Endumeni and Umvoti local municipalities respectively. Endumeni Local Municipality is predominantly urban with a large portion of land allocated to commercial farming. Umvoti Local Municipality is the agriculture centre of the District contributing substantially to the economy of the District, whilst Nquthu and Msinga local municipalities are primarily rural subsistence based economies (UMzinyathi District Municipality 2016).

The highest contributing economic sectors in the District include: government services (17%), manufacturing (17%), business services (15%), trade (14%) and agriculture (11%) (UMzinyathi District Municipality 2015b). The highest sectors of employment are trade

(20.8%), community services (19.5%), and government services (17.8%). The agriculture sector is a large employment contributor at 12.3% (UMzinyathi District Municipality 2015b).

UMzinyathi District Municipality has a temperate climate, experiencing warm to hot summers and mild to cool winters. Summers are mostly hot with temperatures exceeding 30 °C. Winters are characterized by frost at the beginning of winter for most of the areas in the district with the exception of Greytown where it occurs earlier (Nemai Consulting 2016a). The southern and north-eastern areas tend to have warmer temperatures than the northern areas. Rainfall increases towards the southern parts of the municipality (Nemai Consulting 2016b). Irregular droughts occur in the area (Nemai Consulting 2016b).

4.2 Municipal Climate Change Snapshot

UMzinyathi District Municipality is situated within the Pongola-Umzimkhulu Hydrological Zone, one of six hydrological zones in South Africa (Department of Environmental Affairs 2013a). These hydrological zones not only reflect water management areas but have been grouped according to common climatic and hydrological characteristics (Department of Environmental Affairs 2013a). Based on a range of data and projections, four possible climate scenarios have been identified for South Africa:

- warmer/wetter (with greater frequency in extreme rainfall events),
- warmer/drier (with an increase in frequency of drought and somewhat increased frequency of extreme rainfall events),
- hotter/wetter (with substantially greater frequency of extreme rainfall events), and,
- hotter/drier (with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events).

Projections on rainfall have also been developed for each of the hydrological zones (Department of Environmental Affairs 2013a). The following four climate change scenarios have been described for the Pongola-Umzimkhulu Hydrological Zone (Where uMzinyathi District Municipality occurs) in the Department of Environmental Affairs' Long Term Adaptation Scenarios Reports (Figure 4 and Figure 5):

- **Warmer Wetter Scenario:** Increased rainfall in spring.
- **Hotter Wetter Scenario:** Strong increase in rainfall in spring.
- **Warmer Drier Scenario:** Decreased rainfall in spring, a strong decrease in rainfall during summer and autumn.
- **Hotter Drier Scenario:** Decreased rainfall in spring, a strong decrease in rainfall in summer and autumn.

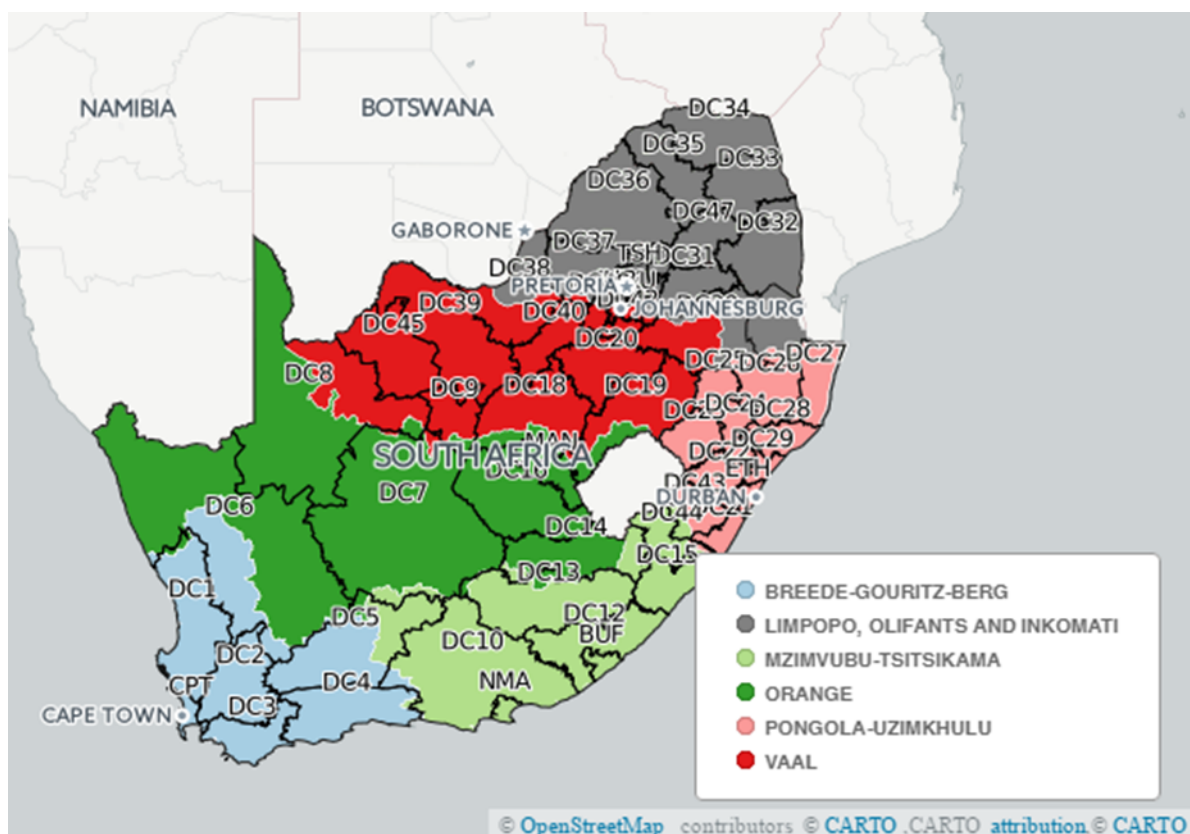


Figure 4: Hydrological Zones of South Africa (Data Source: Department of Environmental Affairs 2013c)

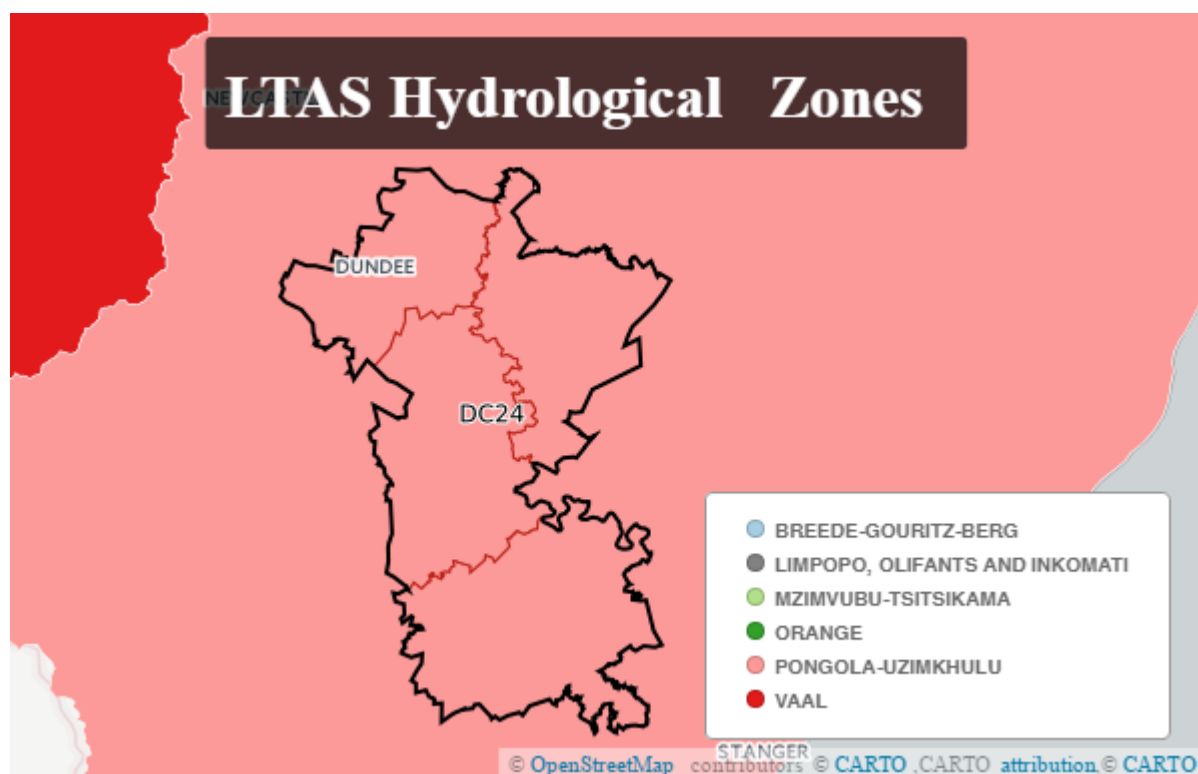


Figure 5: UMzinyathi District Municipality is Situated Within The Pongola-UMzimkhulu Hydrological Zone (Data Source: Department of Environmental Affairs 2013c)

4.3 General Municipality Indicators

A summary of key indicators for the uMzinyathi District Municipality is shown in Table 4, below (Statistics South Africa 2011).

Table 4: General Municipality Indicators for uMzinyathi District Municipality (Data Source: Statistics South Africa 2011)

General Information	uMzinyathi District Municipality	South Africa
Code	DC24	
Province	KwaZulu-Natal	
Seat	Dundee	
Area (km ²)	8589	1219740
Census Statistics	uMzinyathi District Municipality	South Africa
Population	510837	51770553
Age Structure		
Population under 15	40.15%	29.17%
Population 15 to 39	38.37%	44.30%
Population 40 to 64	16.26%	21.19%
Population over 65	5.22%	5.34%
Dependency Ratio		
People in age group 0-14 & 65+, supported by age group 15-64	83.1%	52.7%
Employment (between 15 and 64)		
Employed	18.11%	38.87%
Not economically active	58.07%	39.21%
Unemployed	10.46%	16.50%
Discouraged work-seeker	13.36%	5.41%
Education (aged 20 +)		
Post School Qualification	4.22%	9.94%
Grade 12/Matric	21.25%	27.83%
High School	24.87%	32.16%
Less than High School	21.84%	16.43%
Other	27.82%	13.64%

Vulnerability Indicators	uMzinyathi District Municipality	South Africa
Household Dynamics		
Households	113457	14450151
Average household size	4.50	3.58
Percentage households involved in agricultural activities	45.50%	20.56%
Dwelling Type		
Percentage Households that are Informal Dwelling	2.36%	13.58%
Percentage Households that are Traditional Dwelling	42.80%	7.89%
Combined Percentage Households that are Traditional and Informal Dwelling	45.16%	21.47%
Sources of Water		
Percentage of Population that sources water from Boreholes	3.28%	1.76%
Percentage of Population that do not source water from piped water schemes	62.60%	21.82%
Percentage of Population that source water from Service Providers (e.g. Municipalities)	37.40%	78.18%
Percentage of Population that sources water from Water Tanks	5.36%	2.67%
Electricity Usage		
Percentage of households that use alternatives to electricity for cooking	63.30%	26.12%
Percentage of households that use alternatives to electricity for cooking, heating or lighting	50.29%	17.77%
Sanitation		
Percentage Population with flush toilets	16.57%	56.51%
Percentage Population using pit latrines	58.13%	30.73%
Percentage of Population with no toilet facilities	13.52%	5.34%
Percentage of Population with other toilet facilities	11.77%	7.42%
Refuse		
Percentage of Households with no rubbish disposal	14.05%	5.97%
Percentage of households with refuse removed by local authority/private company	16.68%	59.40%
Health		
Percentage of young (<5yrs) and elderly (>64yrs)	19.47%	16.32%
Percentage workforce employed in the informal Sector	18.40%	12.20%

4.4 Climate Change Mitigation Related Indicators

The tables below provide climate change mitigation related indicators useful for understanding the GHG emissions as a result of electricity and transport use.

Table 5: Modes of transport used in uMzinyathi District Municipality (UMzinyathi District Municipality 2015b)

Mode	Endumeni	Nquthu	Msinga	Umvoti	Total
On foot	61.6%	91.9%	94.1%	79.6%	86.0%
By bicycle	1.3%	0.4%	0.4%	0.6%	0.6%
By motorcycle	0.6%	0.3%	0.4%	1.1%	0.5%
By car as a driver	9.2%	0.7%	0.8%	4.0%	2.5%
By car as a passenger	11.8%	2.8%	2.1%	8.8%	5.1%
By minibus/taxi	7.0%	1.7%	1.0%	3.1%	2.5%
By bus	7.6%	1.7%	0.8%	1.2%	2.0%
By train	0.2%	0.3%	0.3%	0.2%	0.3%
Other	0.8%	0.1%	0.1%	1.5%	0.5%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6: Electricity access in the uMzinyathi District Municipality and its Local Municipalities (Nemai Consulting 2016c)

Municipality		Basic and more (Electricity or solar connection)		Less than basic (No connection)		Total	%
Endumeni Municipality	Local	11 203	79.8%	2 827	20.2%	14 030	100.0%
Nquthu Municipality	Local	12 887	37.7%	21 278	62.3%	34 165	100.0%
Msinga Municipality	Local	7 462	21.6%	27 040	78.4%	34 503	100.0%
Umvoti Municipality	Local	13 298	48.9%	13 882	51.1%	27 180	100.0%
uMzinyathi Municipality	Local	44 851	40.8%	65 028	59.2%	109 879	100.0%

4.5 Vulnerability Assessment Tool Indicators

The tables below provide the key indicators for uMzinyathi District Municipality that are used in the Climate Change Vulnerability Assessment Tool to determine sensitivity for certain indicators.

Table 7: Key Vulnerability Indicators for uMzinyathi District Municipality (Source Statistics South Africa 2011)

Vulnerability Tool Indicators	uMzinyathi District Municipality	South Africa
Percentage households involved in agricultural activities	45.50%	20.56%
Percentage Population with flush toilets	16.57%	56.51%
Percentage of young (<5yrs) and elderly (>64yrs)	19.47%	16.32%
Combined Percentage Households that are Traditional and Informal Dwelling	45.16%	21.47%
Percentage of Households with no rubbish disposal	14.05%	5.97%

Table 8: Key health indicators for KwaZulu-Natal District Municipalities (Data Source: Massyn et al. 2016)

Province	District	Child under 5 years diarrhoea case fatality rate ⁴	Child under 5 years severe acute malnutrition case fatality rate ⁵	Incidence (diagnosed cases) of TB (ETR.net) ⁶
KwaZulu-Natal	Amajuba District Municipality	3.9	11.1	696.7
KwaZulu-Natal	eThekweni Metropolitan Municipality	3.9	6.5	1 066.6
KwaZulu-Natal	Harry Gwala District Municipality	6.5	15.5	997
KwaZulu-Natal	iLembe District Municipality	5.9	8.2	849.90
KwaZulu-Natal	Ugu District Municipality	5	15.6	830.4
KwaZulu-Natal	uMgungundlovu District Municipality	21.9	6.7	972.4
KwaZulu-Natal	uMkhanyakude District Municipality	6.4	16.3	935.8
KwaZulu-Natal	uMzinyathi District Municipality	5.3	21.3	902.7
KwaZulu-Natal	uThukela District Municipality	3.6	15.4	501.4
KwaZulu-Natal	King Cetshwayo District Municipality	8.9	12.5	1 050.4
KwaZulu-Natal	Zululand District Municipality	7.6	18.4	1 025.3

⁴ Proportion of all diarrhoea-related admissions of children under 5 years who died

⁵ Proportion of all severe acute malnutrition admissions of children under 5 years who died

⁶ Cases per 100,000 people

5. Greenhouse gas inventory results

5.1 Overview of results

A greenhouse gas inventory was conducted for uMzinyathi District Municipality for the 2015 year. A total of 368,777 kgCO₂e was emitted in the 2015 calendar year within the uMzinyathi District Municipality borders. Figure 6 below shows the different emissions by category in the District and their contribution to the total figure. The graph shows the emissions from transport (mobile fuel combustion) (172,939.86 kgCO₂e), electricity (electricity consumption) (215,491.10), and stationary fuel consumption (20,330.51 kgCO₂e). Electricity consumption is responsible for the highest emissions followed by mobile fuel combustion sources.

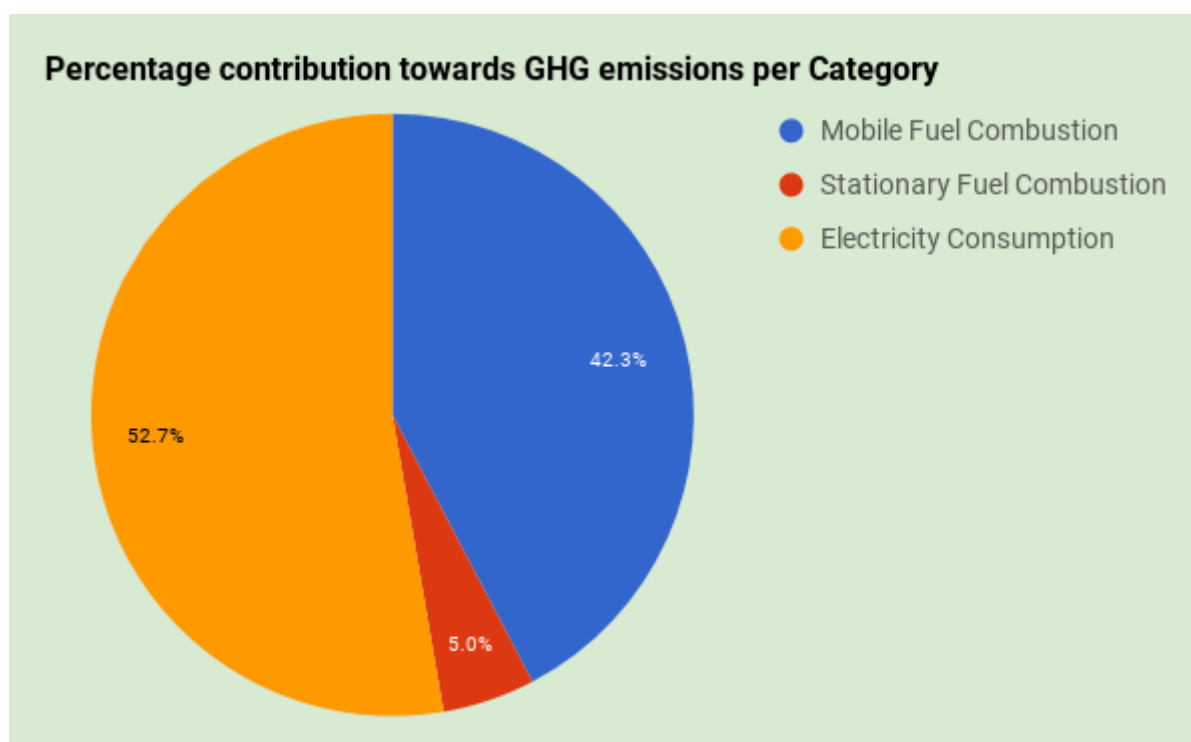


Figure 6 UMzinyathi District Municipality Community GHG emissions by sector for the 2015 Calendar Year.

The greenhouse gas sources that have been included in this inventory, by Scope, are included in Table 9 below.

Table 9: Community Emissions By Scope

Emissions Scope	GHG Sources	Community Emissions (kg CO ₂ e)
Scope 1	Stationary and mobile fuel use (Diesel, petrol, paraffin)	193,270.3764
Scope 2	Electricity consumption (Residential, commercial and industrial buildings)	215,491.10

Fuel use data were accessed from the Department of Energy South African fuel sales volume sold annually. Electricity data were accessed from Eskom for Endumeni, uMvoti and Nquthu Local Municipalities. Eskom was able to provide the amount of electricity used annually because of the bulk purchases. However, electricity use data for Msinga Local Municipality was unavailable. No waste, agriculture or air transport community data was available and

therefore this is a limitation on the inventory results. In addition, no data could be obtained for the Local Government Emissions Inventory.

5.2 Comparison with previous years

This was the first attempt at developing a greenhouse gas inventory for uMzinyathi District Municipality and 2015 will serve as a baseline for future inventories that are compiled. As only Stationary fuel, Mobile fuel, and Electricity data was gathered for 2015, Urban Earth was able to also gather this data for 2013 and 2015 to try and see if there have been any trends in emissions over this period. Table 10 below shows the community emissions for Scope 1 and 2 over the three years.

Table 10: Community GHG emissions by scope

Emissions Scope	GHG Sources	Community Emissions (kg CO ₂ e)		
		2013	2014	2015
Scope 1	Stationary and mobile fuel use (Diesel, petrol, paraffin)	97,415.90	111,826.94	193,270.3764
Scope 2	Electricity consumption (Residential, commercial and industrial buildings)	166,933.36	167,290.23	215,491.10

The bar graph below (Figure 7) shows the GHG emissions in the District Municipality for each emissions category for the period 2013-2015. There has been an increase in mobile and stationary fuel consumption as well as electricity consumption emissions from 2013 to 2015.

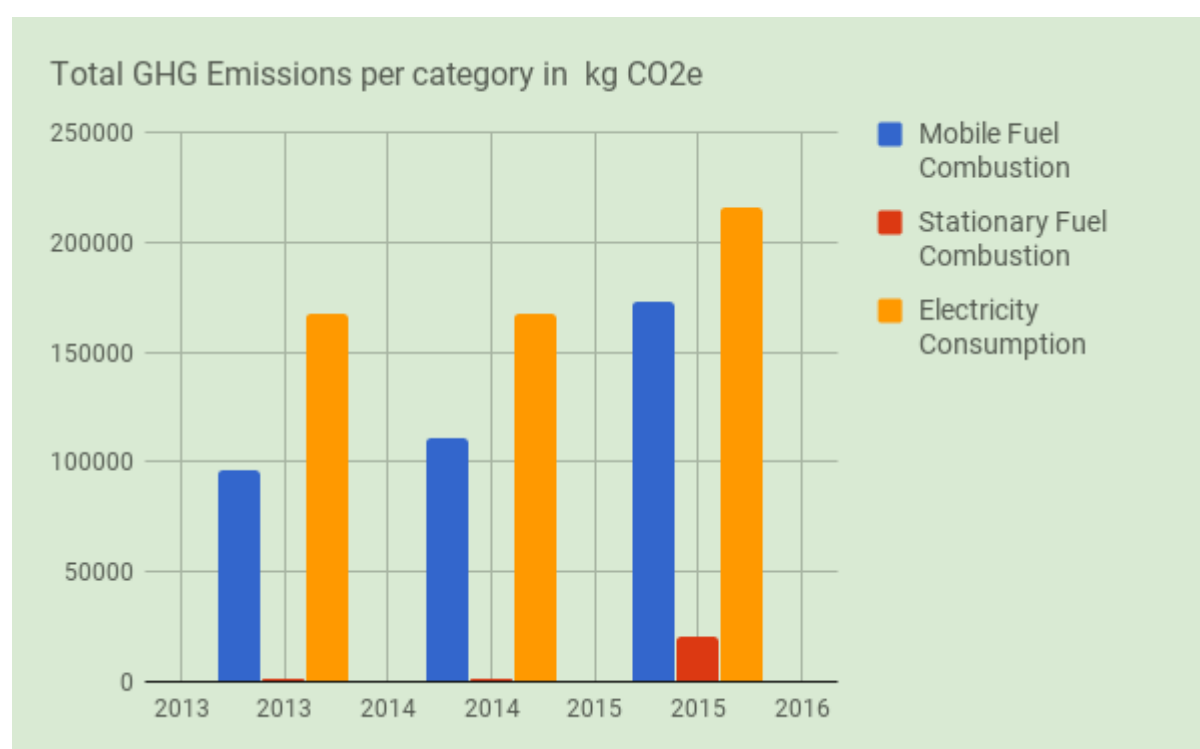


Figure 7: GHG emissions by emissions category

5.2.1 Limitations in conducting the GHG Inventory

The major limitation for the GHG inventory was the lack of appropriate data which limited the calculation of GHG emissions. For example, local government GHG emissions could not be calculated and for community emissions, only fuel use and electricity use data were available.

Another limitation was the time frame for the project, this is because although data were requested from Municipal Officials, they did note that they required more time to compile and gather the data.

5.3 Energy

5.3.1 Overview of the Energy Sector of the District Municipal Area

UMzinyathi District Municipality is reliant on electricity as a major source of energy and has identified the need to improve energy production and supply as part of the District's growth and development plan and IDP 2016/2017 (UMzinyathi District Municipality 2016). In addition to this, in order to contribute towards environmental sustainability, the District has identified the need to support alternative energy generation and reduce the reliance on fossil fuel generated energy (UMzinyathi District Municipality 2016).

Electricity within the District is provided by the local municipalities together with Eskom (UMzinyathi District Municipality 2016). The local municipalities provide electricity services where they have supply licenses and Eskom provides electricity in the remaining areas (UMzinyathi District Municipality 2015b). Electricity provision in the District has increased over the years, however, a high percentage of households are still without access to electricity.

5.3.2 Access

The number of households with access to electricity in the District is shown in the Table below, where only 40.8% of the District Municipality has access to electricity (UMzinyathi District Municipality 2015b). In order to improve electricity access, the District Municipality plans to prepare an Electrification Master Plan that will provide a comprehensive approach when managing electricity within the District (UMzinyathi District Municipality 2016).

Table 11: Electricity access in the uMzinyathi District Municipality and its Local Municipalities (UMzinyathi District Municipality 2015b)

Municipality		Basic and more (Electricity or solar connection)		Less than basic (No connection)		Total	%
Endumeni Municipality	Local	11 203	79.8%	2 827	20.2%	14 030	100.0%
Nquthu Municipality	Local	12 887	37.7%	21 278	62.3%	34 165	100.0%
Msinga Municipality	Local	7 462	21.6%	27 040	78.4%	34 503	100.0%
Umvoti Municipality	Local	13 298	48.9%	13 882	51.1%	27 180	100.0%
uMzinyathi Municipality	Local	44 851	40.8%	65 028	59.2%	109 879	100.0%

Households in the District use energy mostly for cooking, heating and lighting. The graph shown below, shows that the number of households with access to electricity for cooking, heating and lighting in the District is below 40% and it is also less than the provincial and

national electricity access figures.

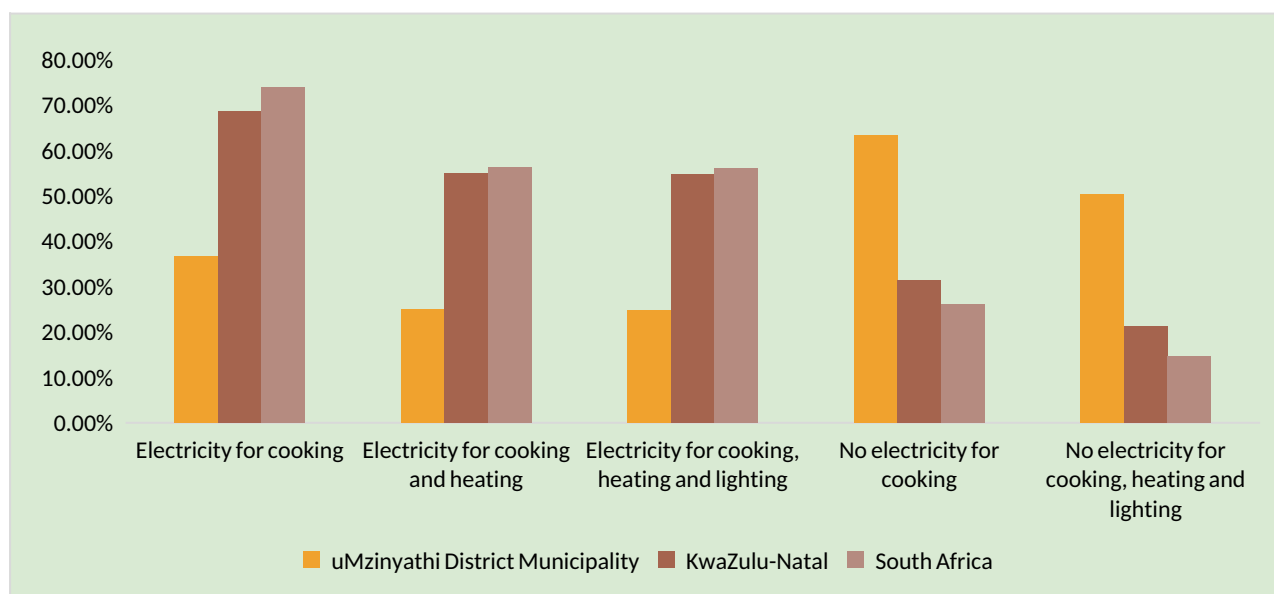


Figure 8: Percentage of households with access to electricity for cooking, heating and lighting in uMzinyathi District Municipality (Statistics South Africa 2011).

5.3.3 Use

Electricity in the District Municipality is mostly used for cooking, heating and lighting. The main types of energy used for cooking, heating and lighting within the District are: electricity, candles, wood, paraffin, gas and to a lesser extent coal and solar energy (Statistics South Africa 2011).

5.3.4 Likely Impacts of Climate Change

Most of the energy used in the District is electricity produced from coal, which is a non-renewable resource with dire consequences for the environment. The District Municipality seeks to develop a strategy to combat climate change and encourage sustainable energy solutions such as energy efficient heating and lighting (Nemai Consulting 2016b). The District also seeks to maximize the potential in terms of solar and wind energy as it further investigates the potential for other alternative energy sources such as biomass and general waste (UMzinyathi District Municipality 2016). However, the increasing use of alternative energy sources could have an impact on the energy grid for the Local Municipalities as suppliers of energy. There could be additional energy sources to be considered within the municipal grid and the municipal revenue from electricity provision could also be affected.

5.4 Transport

5.4.1 Overview of the Transport Sector of the District Municipal Area

Transport infrastructure in uMzinyathi District Municipality includes: roads, railway lines, air strips as well as bus and taxi rank infrastructure. Road infrastructure constitutes the main infrastructure type in the District, which is mostly of poor quality requiring maintenance and upgrades, more so in rural areas. According to the District's Spatial Development Framework (UMzinyathi District Municipality 2015b) uMzinyathi District Municipality has an estimated total of 2,701km of road networks of which only 663km (25%) are tarred. The remainder of the roads are generally gravel roads outside the urban areas.

The R33 is the backbone of the road transport system of the district which is in a poor condition and dangerous in some parts. The R33 is in need of maintenance and upgrading to support mobility and service provision in the district (UMzinyathi District Municipality 2015b).

Railway infrastructure in the District is historically linked to mining activities in the District and includes the following lines: Durban-Ladysmith-Volksrust, Glencoe-Dundee-Vryheid Main Line, Pietermaritzburg-Greytown-Kranskop Branch Line and the Mount Alida Branch Line. These lines are currently underused, but with investment could provide transport for people and freight (UMzinyathi District Municipality 2015b).

Additionally, the District has licensed airports at Dundee and Greytown, both registered with the South African Civil Aviation Authority (UMzinyathi District Municipality 2015b).

5.4.2 Access

The extent, and quality of road infrastructure is important and influences accessibility for communities within the District area. The transportation network is also crucial for the transportation of goods to sustain economic trade. Key issues around transport infrastructure in the District include the lack of accessibility and poor or no road infrastructure, particularly in rural areas (UMzinyathi District Municipality 2015b).

UMzinyathi District Municipality's Spatial Development Framework (UMzinyathi District Municipality 2015b) highlights that a high percentage (50% and higher) of people in the district do not travel, particularly in the Nquthu and Msinga municipalities (Table 12)

Whilst the reasons for this might be a combination of no need to travel and an inability to afford the cost of travelling, it also highlights the immobility of the local population which influences their access to services essential for sustainable livelihoods (UMzinyathi District Municipality 2015b). Mobility and access needs to be overcome to promote the development objectives of the municipality. In response to this, the municipality is carrying out an investigation into the establishment of a municipal rural public transportation system that will enable people to travel to access services (UMzinyathi District Municipality 2015b).

Table 12: Percentage of people not travelling (UMzinyathi District Municipality 2015b)

	Endumeni	Nquthu	Msinga	Umvoti	Total
People not traveling	50%	55%	61%	50%	56%

Table 13 below shows the modes of transportation used in the District per Local Municipality. The vast majority of people in the District travel on foot (86%). Traveling by car (as a driver or passenger), minibus taxi, and bus are the next most common forms of transportation in the Local Municipalities.

Table 13: Modes of transport used in uMzinyathi District Municipality (UMzinyathi District Municipality 2015b)

Mode	Endumeni	Nquthu	Msinga	Umvoti	Total
On foot	61.6%	91.9%	94.1%	79.6%	86.0%
By bicycle	1.3%	0.4%	0.4%	0.6%	0.6%
By motorcycle	0.6%	0.3%	0.4%	1.1%	0.5%

By car as a driver	9.2%	0.7%	0.8%	4.0%	2.5%
By car as a passenger	11.8%	2.8%	2.1%	8.8%	5.1%
By minibus/taxi	7.0%	1.7%	1.0%	3.1%	2.5%
By bus	7.6%	1.7%	0.8%	1.2%	2.0%
By train	0.2%	0.3%	0.3%	0.2%	0.3%
Other	0.8%	0.1%	0.1%	1.5%	0.5%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

5.4.3 Likely Impacts of Climate Change

Climate change and associated extreme events may impact on transport infrastructure in the Municipality which includes the impacts on roads and bridges in the District Municipality. Climate change impacts, such as flooding, may damage key bridges such as those over the Tugela and Mooi Rivers. This will impact on people's access to services, especially in the rural areas.

Erosion associated with increased flooding incidences may also result in further deterioration of already compromised road infrastructure, especially gravel roads which are the main connection lines between rural communities to towns and access to services, thus resulting in further isolation of rural communities.

5.4.4 Existing Transport Sector Adaptation Capacity

The District's Integrated Development Plan identifies the need to manage and invest in public infrastructure in the District (UMzinyathi District Municipality 2016). One of the municipality's development priorities for the 2016/17 period focuses on community development programmes to improve basic service delivery, which includes a transport component. These programmes cover the development and improvement of roads and road access as shown in Table 14 below:

Table 14: development programmes to improve basic service delivery (UMzinyathi District Municipality 2016)

Municipal developmental priorities for 2016/17	Municipal Objectives	Municipal Strategies
Community Development Programmes (Electricity, Access Roads, Human Settlement)	To provide sustainable community development programmes: Development and improvement of the access roads	Development and improvement of the access roads

UMzinyathi District Municipality plans to invest in a number of transport plans, programmes and projects that will assist with adapting to climate change. These include:

- A review and update of the existing Integrated Transport Plan for the District in 2017/18 period (UMzinyathi District Municipality 2016).
- Improving the state of transport corridors, access roads to farms, and improving roads for the transportation of raw materials such as coal, as part of the District's LED Programme (UMzinyathi District Municipality 2016).

- A Rural Road Asset Management System programme is also being developed in the district, through grant funding from the Department of Transport. The programme aims to identify the road network under uMzinyathi District's jurisdiction, create a roads database, and identify remedial measures, priorities and costs, training of technicians. (UMzinyathi District Municipality 2016)
- The SDF recommends a number of key climate change responses. One of which is to promote public transport systems as opposed to use of private vehicles in the aim to reduce carbon emission in the District (UMzinyathi District Municipality 2015).

In the longer term, the District Growth and Development Plan (DGDP) Implementation Plan highlights a number of transport related intervention areas by the year 2030. These are noted in Table 15 below and focus on the development of airports, the development and upgrading of road and rail infrastructure, the improvement of public transport, the promotion of development along transport corridors, and the improvement of the efficiency of transport (UMzinyathi District Municipality 2016)

Table 15: Transport related intervention areas by the year 2030 for uMzinyathi District Municipality

DGDP Objectives	Strategic	DGDP 2030 intervention areas
Develop airports		<ol style="list-style-type: none"> 1 Optimise potential role of Dundee and Greytown airports in district growth and development 2 Participate in KZN Aviation Coordinating Body 3 Investigate potential linkages of district with Pietermaritzburg and Richards Bay regional airports
Develop Road and Rail Network		<ol style="list-style-type: none"> 1 Maintain the functionality of the railway lines through the district and increase volumes where possible 2 Revitalize branch rail lines and investigate feasibility for alternative uses such as tourism 3 Maintain the functionality of the important rail link to Richards Bay 4 Upgrade the road surface quality and capacity of the R33 to improve transport logistics for commercial activity 5 Maintain and upgrade the secondary road network of the district 6 Maintain and upgrade the rural access road network of the district 7 Develop Integrated Public Transport Services
Promote Concentration	Spatial	<ol style="list-style-type: none"> 1 Establish a hierarchy of nodes with clearly defined functions and interventions per node 2 The promotion of concentration and coordinated development along provincial corridors.
Enhance Development Trade & Investment	Sectoral through	Improve the efficiency of the transport sector in the district
ECD, primary and secondary education		Improve public transport facilities and services to all education facilities

5.5 Waste management

5.5.1 Overview of the Waste Sector of the District Municipal Area

The majority of residents in the district are not provided with adequate waste removal services with more than 65% making use of their own refuse dumps (Table 16) (Statistics South Africa 2011).

Table 16: Waste Removal Census Statistics (Statistics South Africa, 2011)

Waste Removal Service	Residents	Percentage
Communal refuse dump	6110	1.20%
No rubbish disposal	71754	14.05%
Other	11006	2.15%
Own refuse dump	336739	65.92%
Removed by local authority/private company at least once a week	80946	15.85%
Removed by local authority/private company less often	4280	0.84%
Total	510835	100.00%

Waste collection services mostly take place in the urban areas of the district. There are currently five solid waste disposal sites in the Umzinyathi area (UMzinyathi District Municipality 2015b). They are:

1. Glencoe
2. Greytown
3. Nquthu - Nodweni Area
4. The Peacevale area north of Dundee
5. Sibongile site south of Dundee

UMzinyathi District municipality is currently rehabilitating the existing waste sites and is in the process of developing two regional waste sites for waste management. These sites will be shared by the four local municipalities.

Poorly managed waste in the District is creating health risks for communities. Highly infectious waste like used disposable nappies, used condoms, and needles used by diabetic patients in households, is not properly managed.

5.5.2 Likely Impacts of Climate Change

There are two key linkages between waste and climate change. The first is the potential opportunities associated with better waste management activities such as recycling or waste to energy projects. Given the low levels of waste collection that is taking place in the municipality, the potential recycling and greening opportunities in the sector are limited at this stage.

The second linkage between climate change and waste is the potential indirect impacts of poor waste management practices that will be made worse by climate change. Waste that is not adequately managed often ends up in the environment. This can lead to pollution, biodiversity impacts and land degradation. Waste that is not adequately disposed of can often find its way into water and sanitation systems. With increased storm events linked to climate change litter can result in increased blockages to storm water and waste water treatment works, which in turn could impact drinking water quality as sewage systems overflow into rivers. It is therefore critical that waste is adequately managed as a response to climate change.

5.5.3 Existing Waste Sector Adaptation Capacity

As highlighted above the key response to climate change impacts linked to waste is the ability of the municipality to maintain key waste infrastructure and waste collection services.

6. Vulnerability Assessment Results

The following section provides a summary of the Vulnerability Assessment conducted for uMzinyathi District Municipality.

6.1 Agriculture

6.1.1 Overview of Agriculture in the District Municipality

The Agricultural sector contributes only 11% towards the local economy but is the second highest employer in the uMzinyathi District Municipality (30.3%) after the Community Services sector (UMzinyathi District Municipality 2016). Whilst its contribution to the local economy is low, agriculture has the potential to be the backbone of job creation and also contributes significantly towards livelihoods and subsistence activities in the District (UMzinyathi District Municipality 2016).

The 2011 South African Census statistics reveal that 45.50% of households are involved in agricultural activities (Statistics South Africa 2011). Figure 9 below shows the percentage of households that are involved in agricultural activities across the District by local municipality. Msinga and Nquthu local municipalities accommodate higher percentages of households that are involved in agriculture (displayed in the darker shade of red).

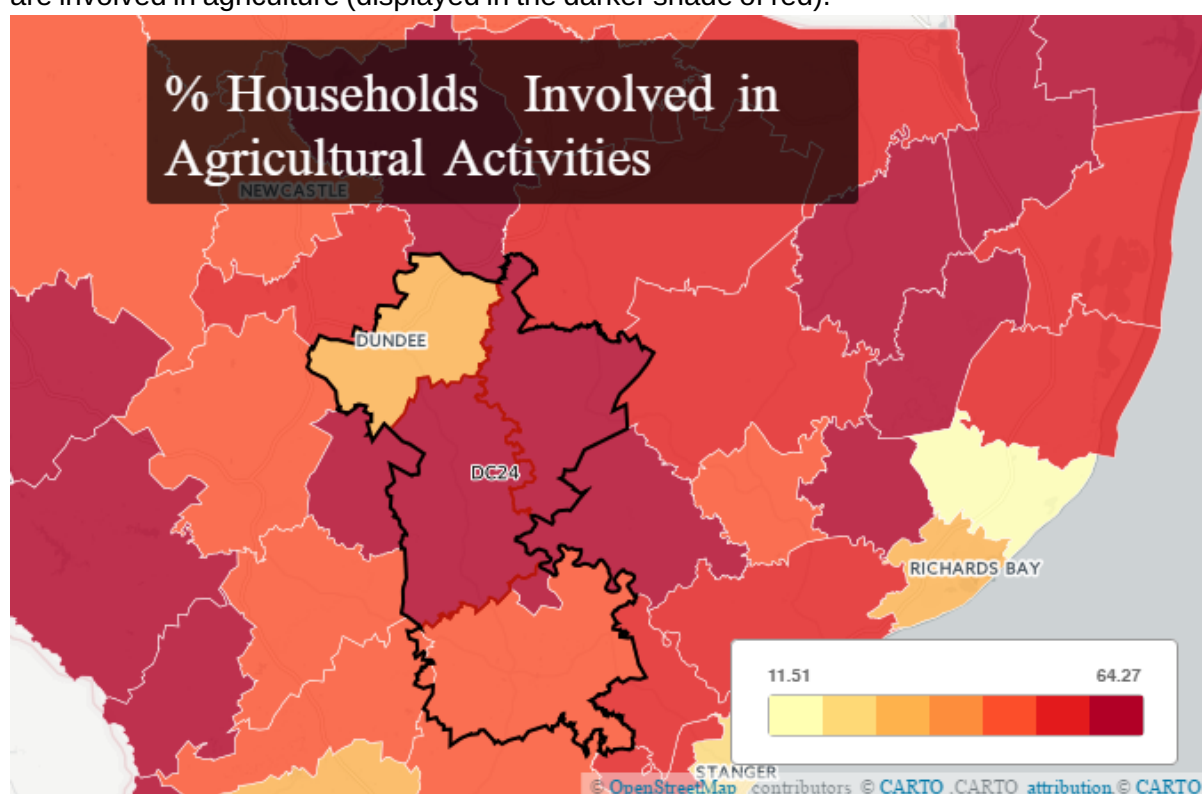


Figure 9: Percentage households involved in agricultural activities across uMzinyathi Municipal Area (Statistics South Africa 2011)

Subsistence farming is more common in the more rural local municipalities of Msinga and Nquthu, whilst commercial farming occurs mostly in Endumeni and Umvoti local municipalities (Nemai Consulting 2016b). Agriculture is considered as an important economic contributor and employer in Endumeni and Umvoti Local Municipalities, mainly through agricultural companies (Nemai Consulting 2016b).

Agricultural activities in uMzinyathi District Municipality can be grouped into four areas, namely, arable agriculture, forestry, livestock, and subsistence agriculture (UMzinyathi District Municipality 2015b). Common crops across the District include maize, soya, sugar beans, vegetables and ground nuts (Nemai Consulting 2016b). The grasslands in the north of the District, support commercial cattle farming as well as small scale sheep and maize farming. Small scale sugar and fruit farming, including tomatoes, occurs in the south of the District (UMzinyathi District Municipality 2015b). Goat farming is particularly prevalent in Msinga Local Municipality. There is a large abattoir in Glencoe and a number of small scale tanneries. Sugar cane is the main crop cultivated under irrigation in the south of the District. Areas that have potential along the Tugela River are not commercially utilised, and there is limited cultivation under irrigation in the northern parts of uMzinyathi District Municipality (UMzinyathi District Municipality 2015b). Agriculture on a commercial and subsistence scale, has also led to the transformation of large tracts of land in the District which has impacted on biodiversity and ecosystem services in the District (UMzinyathi District Municipality 2015b).

A major barrier to future agricultural development in the District is the poor soil quality. Large areas in the District are unsuitable for cultivation and grazing due to this factor. Arable land in the District is mostly limited to riverbanks and areas in the vicinity of Dundee, Helpmekaar and Greytown. In some areas, forestry plantations are the only viable option (UMzinyathi District Municipality 2015b).

6.1.2 Likely Climate Change Impacts for the District Municipality within Agricultural Sector

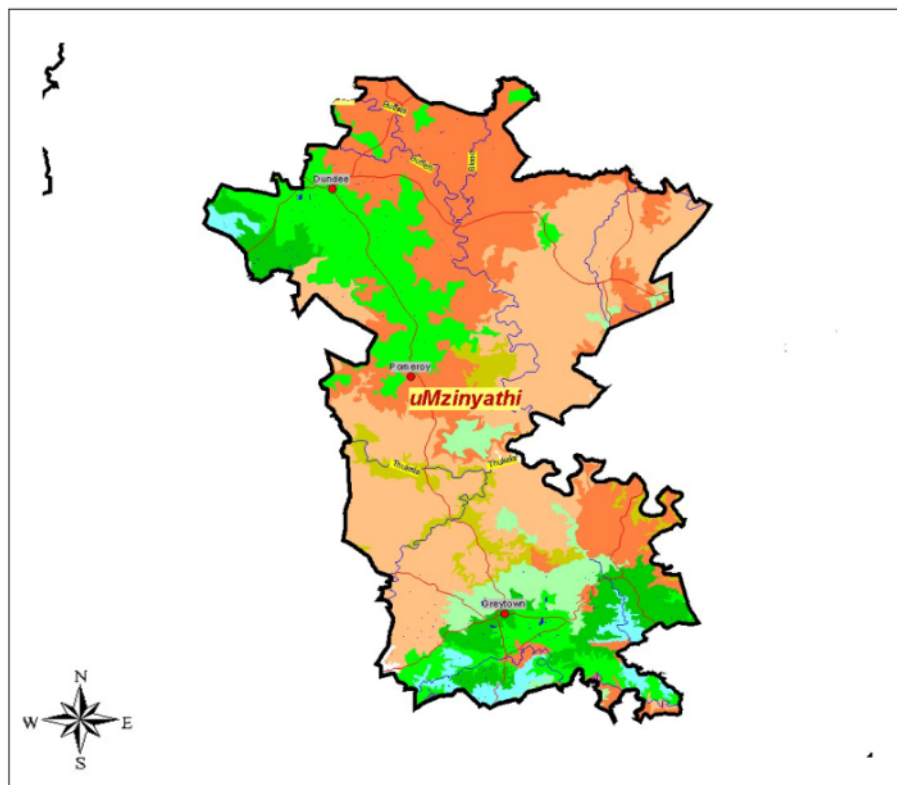
The agricultural sector is already facing challenges linked to drought and frost. Changes in climate, such as increases in temperatures and variability in rainfall will have an impact on the types of crops that can be grown. Poor crop yields will impact on the commercial sector and will have an impact on food security and subsistence livelihoods (UMzinyathi District Municipality 2015b). Whilst the commercial sector is already implementing measures to respond to the changing climate, subsistence farmers are not capacitated to cope with the changes that are projected and require assistance.

6.1.3 Existing Agriculture Adaptation Capacity in the District

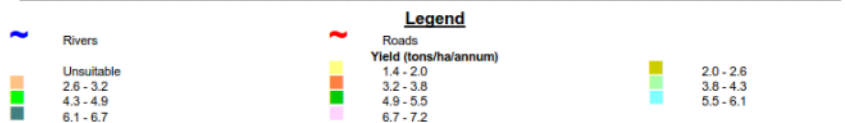
An Environmental Management Zone (EMZ) has been identified for Agriculture in the uMzinyathi Environmental Management Framework (EMF) that identifies areas of high agricultural potential (Nemai Consulting 2016c). Furthermore, a set of production potential maps have been developed at a provincial level that take climate change into account. The following maps are for the most common crops grown in the District: Maize and Soybean, and show the change in the production of each crop with a 3 degree increase in temperature (BRU Report Writer Programme, KZN Department of Agriculture and Rural Development 2017b, 2017a). Two other crops that could potentially benefit from climate change in uMzinyathi District Municipality are Grain Sorghum and Sunflower (Chapman 2017).

Average yield of Maize : Dryland (Oct) in KwaZulu-Natal (District council : uMzinyathi)

(This yield map assumes a management level of 70%)



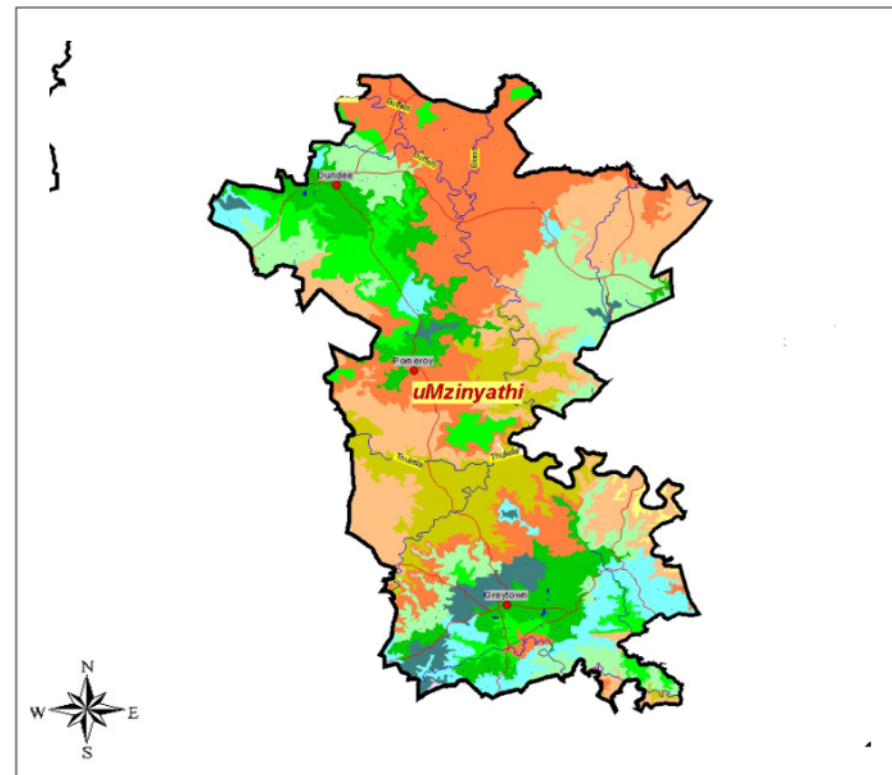
Approximate scalebar (km)



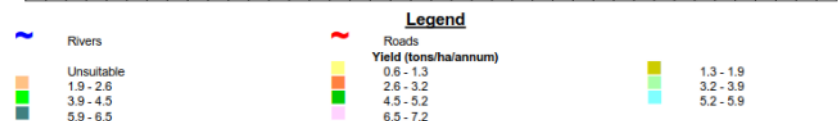
DISCLAIMER: All information relating to the Bioresource Classification Programme of KwaZulu-Natal must be regarded as a first approximation. While every reasonable effort has been made by the authors to obtain objective and realistic results, neither they nor the Department of Agriculture of KwaZulu-Natal make any warranty, or assume any legal liability or responsibility for the accuracy, completeness or usefulness of any information, product or process disclosed in reports relating to the Bioresource Programme.

Average yield of Maize : Dryland (Oct) in KwaZulu-Natal (District council : uMzinyathi)

(This yield map assumes a management level of 70% and 3 degrees global warming)



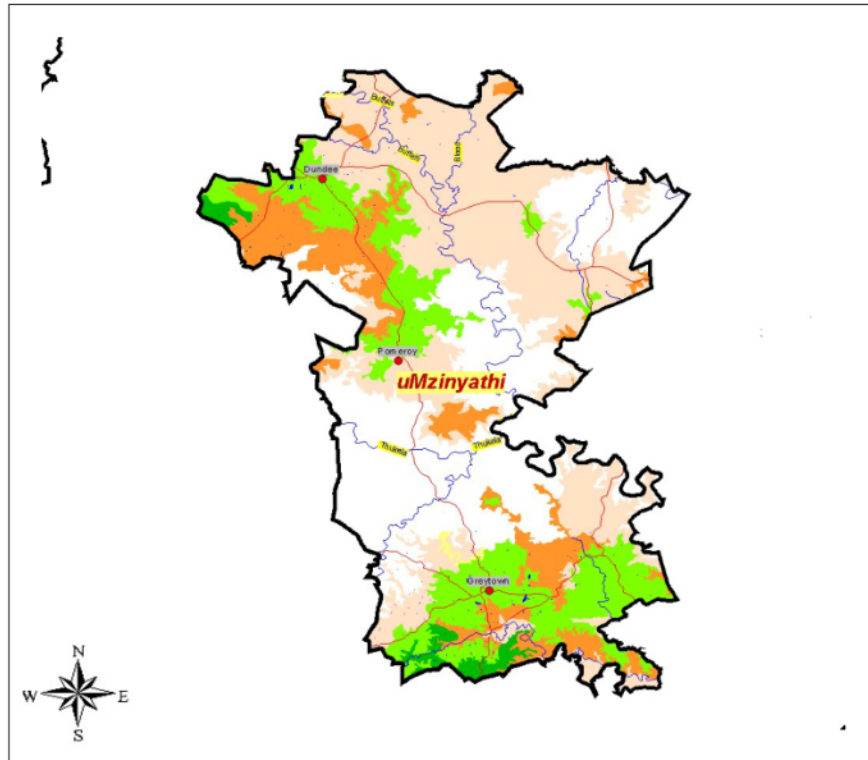
Approximate scalebar (km)



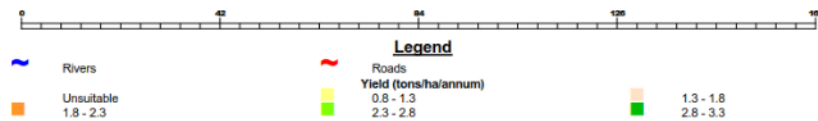
DISCLAIMER: All information relating to the Bioresource Classification Programme of KwaZulu-Natal must be regarded as a first approximation. While every reasonable effort has been made by the authors to obtain objective and realistic results, neither they nor the Department of Agriculture of KwaZulu-Natal make any warranty, or assume any legal liability or responsibility for the accuracy, completeness or usefulness of any information, product or process disclosed in reports relating to the Bioresource Programme.

Average yield of Soyabean : Dryland in KwaZulu-Natal (District council : uMzinyathi)

(This yield map assumes a management level of 70%)



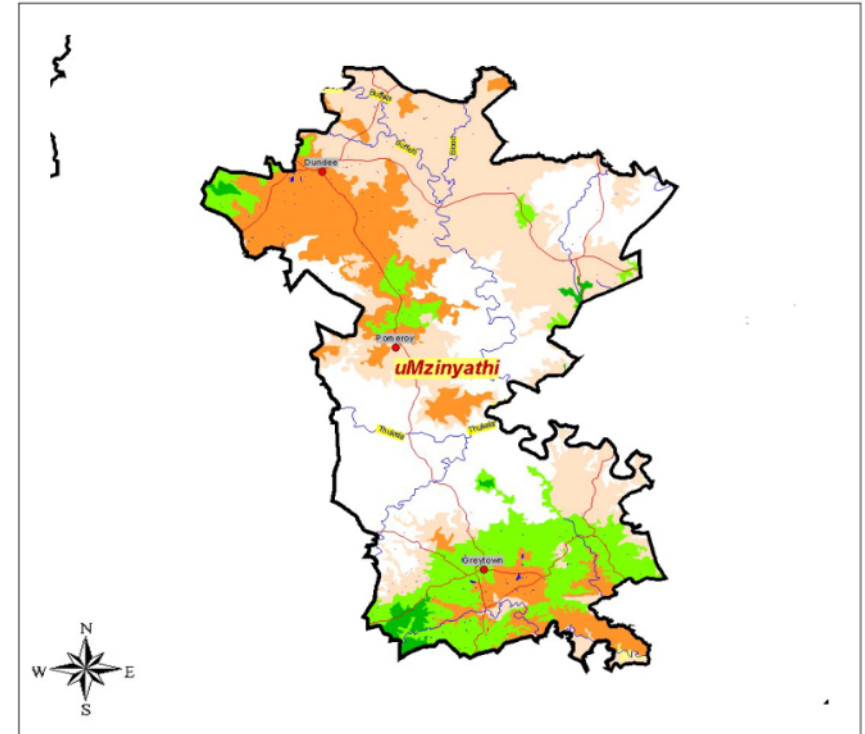
Approximate scalebar (km)



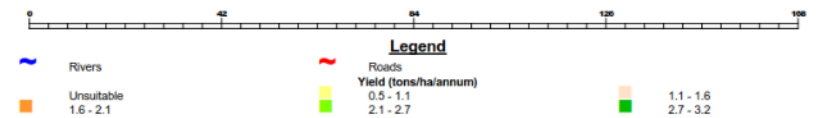
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Average yield of Soyabean : Dryland in KwaZulu-Natal (District council : uMzinyathi)

(This yield map assumes a management level of 70% and 3 degrees global warming)



Approximate scalebar (km)



DISCLAIMER: All information relating to the Bioresource Classification Programme of KwaZulu-Natal must be regarded as a first approximation. While every reasonable effort has been made by the authors to obtain objective and realistic results, neither they nor the Department of Agriculture of KwaZulu-Natal make any warranty, or assume any legal liability or responsibility for the accuracy, completeness or usefulness of any information, product or process disclosed in reports relating to the Bioresource Programme.

6.1.4 Agriculture Vulnerability Indicator Table

Table 17: Agriculture Vulnerability Table uMzinyathi District Municipality (Populated by Urban Earth together with Umzinyathi District Municipality Officials at Two Workshops in 2017)

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
1	Change in grain (maize, wheat & barley) production	Areas towards the west of RSA are likely to become less suitable for grain production.	Do you grow or have potential to grow grains in your area?	Yes, especially Maize	Some of the most productive maize yielding areas in the province. Maize is commonly grown, in all local municipalities.	How important is grain to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low	High	Maize is a significant commercial crop in the District and contributes to the economy, employment, and livelihoods	Low	<ul style="list-style-type: none"> An EMZ has been identified for Agriculture in the uMzinyathi EMF that identifies areas of high agricultural potential. The DAEA has invested in maize irrigation projects in the District including the Umvoti-Maize Cultivar Breeding Project. Financial support is however required especially for subsistence farmers.
2	Change in Sorghum production	Sorghum yields are projected to increase in parts of western KZN, inland areas of	Do you grow or have potential to grow Sorghum in	Yes	Production restricted due to damage from birds.	How important is sorghum to the local economy and	Low	Sorghum is more heat and drought tolerant than maize. Very little		

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
		the Eastern Cape and the eastern Free State, with some areas in the north registering losses compared with present climatic conditions.	your area?			livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low		research is being done on Sorghum. Bird proof cultivars are not as popular for human consumption. This could become a "fall back" crop.		
3	Change in Soya Bean Production	Areas in the east of RSA lost to potential production, with an expansion of suitable areas inland towards the central/west or RSA.	Do you grow or have potential to grow Soya Bean in your area?	Yes	Commonly grown in Endumeni and Umvoti Local Municipalities	How important is soya bean to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low	High	Soya is grown commercially in the District. Soya Beans are planted in rotation with maize. Soya is also more heat tolerant.	Low	<ul style="list-style-type: none"> An EMZ has been identified for Agriculture in the EMF that identifies areas of high agricultural potential. KZN Dept of Agriculture is assisting small scale farmers through the Agricultural mechanization programme.
4	Change in Sugarcane Production	Increase in <10% in many parts of the present cane growing areas, but by up to 30% in new growth	Do you grow or have potential to grow Sugarcane in your area?	Yes	Sugar cane is a crop cultivated under irrigation in the south of the District (Umvoti Local Municipality).	How important is sugarcane to the local economy and livelihoods? High Priority	Low	Sugar cane is grown commercially in the District. Sugar cane production is restricted due to		

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
		areas further inland.				Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low		frost sensitivity.		
5	Change in viticulture (grapes) production	Areas suitable for viticulture could be substantially reduced or shift to higher altitudes and currently cooler, more southerly locations.	Do you grow or have potential to grow grapes in your area?	Yes	Restricted viticulture in Umvoti area.	How important is viticulture (grapes) to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low /No Priority Crop = Low	Low	Limited potential. Hail occurrence restricts production		
6	Change in fruit production	Projected reduction of the area suitable for fruit production (e.g. 28% reduction in apple and pears) by as early as 2020.	Do you grow or have potential to grow fruit in your area?	Yes	Small scale farming of fruit such as avocado and kiwi fruit occur. Some of the best tomato and peach growing conditions.	How important is fruit to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No	Medium	Small scale farming currently but there is potential for peach and tomato farming. Peach, kiwi and avocado will rate low for sensitivity whilst tomato will have a high sensitivity	Low	Requires market and production research. Restricted to irrigation areas.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
						Priority Crop = Low		due to production in Msinga and Muden.		
7	Change in other crop production areas (e.g. vegetables, nuts, etc.)	Crop production may vary depending on a warmer wetter or warmer drier climate.	Do you grow or have potential to grow other crops in your area?	Yes	Vegetables are cultivated in Muden. Vegetables commonly grown in Msinga. Ground nuts grown in Nquthu and Endumeni. Pecan nuts in Umvoti and Muden area.	How important are other crops to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low	Medium	Vegetables are grown commercially and at a subsistence level. Generally, marketing requires coordination.	Medium	<ul style="list-style-type: none"> An EMZ has been identified for Agriculture in the EMF that identifies areas of high agricultural potential. DAEA has invested in vegetable irrigation projects in the District.
8	Increased areas for commercial plantations	The total area suitable for commercial forestry plantations would increase along the eastern seaboard and adjacent areas.	Do you have or have potential for commercial forestry plantations in your area?	Yes	Timber is commonly grown in Umvoti Local Municipality. The Forestry and Logging industry in the district has experienced stable growth in the past ten years.	Is there capacity for commercial plantation expansion (water use licence, land availability, demand for plantation products)? High Potential for Expansion = High; Medium	Medium	Forestry has grown in the last ten years and is the only viable commercial farming activity in some areas where terrain restricts annual cropping.	High	<ul style="list-style-type: none"> An EMZ has been identified for Agriculture in the EMF that identifies areas of high agricultural potential. Forestry has been a growing industry and with climate change conditions will become more favourable.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
						Potential for Expansion = Medium; Low/No Potential for Expansion = Low				
9	Increased exposure to pests such as eldana, chilo and codling moth	Exposure to eldana would increase in areas suitable for sugarcane by ~10% to > 30%. The area subject to damage by chilo would increase substantially (sugarcane). The area subject to damage by codling moth would increase substantially (apples, pears, walnuts and quince).	Are you or will you be exposed to agricultural pests in your area?	Yes	Potentially exposed to Chilo and Eldana which does impact on sugarcane production. Fall Army Worm affects maize and other pests for vegetables.	How important are crops that are vulnerable to pests to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low	High	Chilo and Eldana affect sugar cane. Sugar is the main crop cultivated under irrigation but is a low priority crop. Fall Army Worm for maize is a common pest.	Medium	<ul style="list-style-type: none"> Varied capacity to deal with pests. Small scale production often more vulnerable due to not having spraying equipment and the high cost of insecticide.
10	Increased risks to livestock	Projected decreases in rainfall and hence herbage yields would result in negative health	Do you or will you have livestock in your area?	Yes	Commercial cattle farming in the north of the District. Small scale sheep farming. Beef is commonly farmed	How important is livestock farming to the local economy and livelihoods?	High	The District has extensive beef farms and abundant livestock kept by rural households.	Low	<ul style="list-style-type: none"> An EMZ has been identified for Agriculture in the EMF that identifies areas of high agricultural

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
		impacts for livestock.			in all Local Municipalities. Pigs are commonly farmed in Umvoti LM, goats in Msinga LM and dairy cows in Endumeni LM.	High Priority = High; Medium Priority = Medium; Low/No Priority = Low		Nguni cows and goats are very adaptive to difficult conditions. Traditional areas are facing greatest challenges.		<ul style="list-style-type: none"> potential. KZN Dept of Agriculture is assisting small scale farmers through the Nquthu wool sheep farming project. DAEA is implementing livestock Intervention Programmes.
11	Reduced food security	Reduced food security, particularly of subsistence farmers, and resultant increase in malnutrition.	Do you or will you have food insecurity in your area?	Yes	A large percentage of people in the District are dependent on agriculture. If climate change impacts on food production, food security will be affected.	Percentage households involved in agricultural activities More than 20% = High; Between 20% & 10% = Medium; Less than 10% = Low	High	45.5% of households are involved in agricultural activities in the District which is higher than the national average of 20.56%.	Medium	<ul style="list-style-type: none"> KZN Rural Development Programme aims to improve the livelihoods of the rural communities through expansion of rural development programmes to ensure sustainability. KZN Dept of Agriculture is assisting small scale farmers through the Agricultural mechanization

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
										<p>programme.</p> <ul style="list-style-type: none"> There are specific food security programmes from DARD.

6.2 Biodiversity

6.2.1 Overview of Biodiversity in the District Municipality

UMzinyathi District Municipality has high levels of biodiversity and is home to a wide variety of ecosystems. This variety is due to the elevation differences and significant variances in climatic conditions. Some areas in the municipality are considered to have high conservation value due to the presence of species endemic to the area (Nemai Consulting 2016b). The municipal area has extensive grasslands mostly in the north which support a variety of species as well as the primary agricultural sector (UMzinyathi District Municipality 2016). The two biomes that dominate the District, grassland and savanna, are shown in the Figure 14 below:

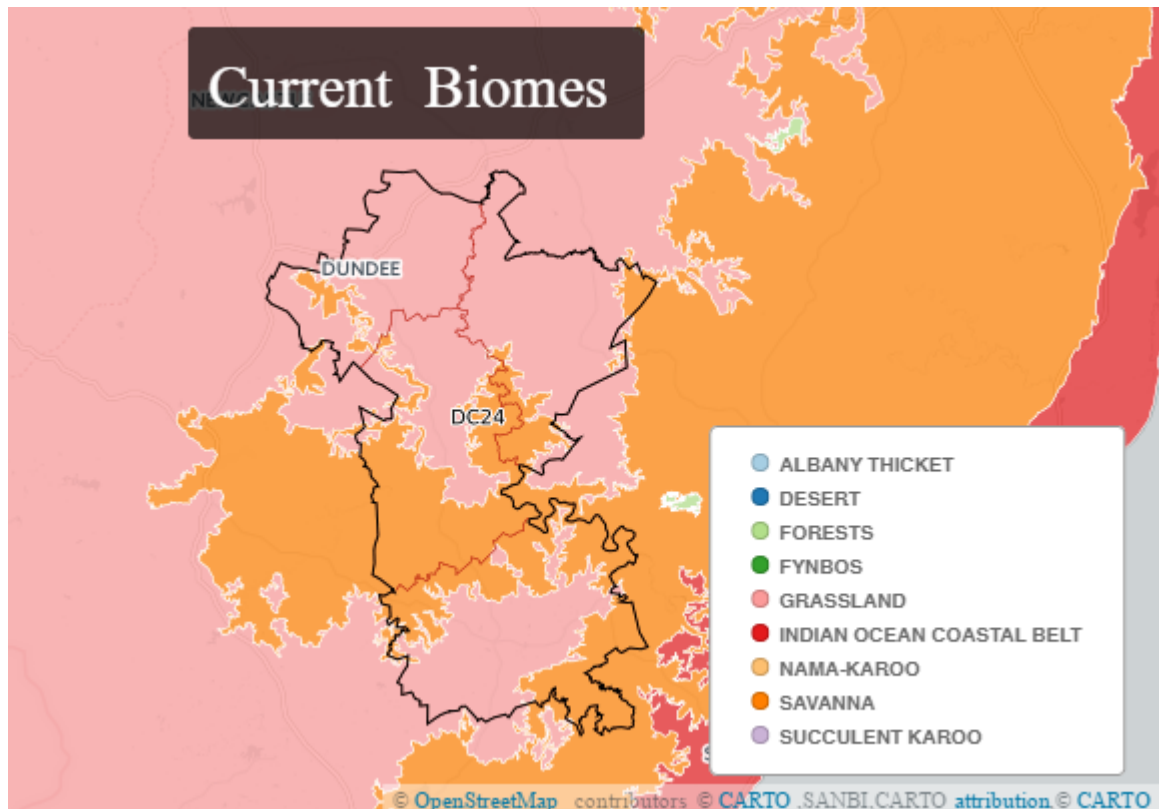


Figure 14: UMzinyathi District Municipal Area Current Biome Delineation (Data Source: (Data Source: South African National Parks 2011a))

There are a number of conservation and protected areas in uMzinyathi District Municipality including:

- Two reserves in Nquthu Local Municipality, namely Isandlwana and Ntinini Training Centre;
- One reserve in Msinga Local Municipality, namely Isandlwana Provincial Nature Reserve; and
- Two reserves in Umvoti Local Municipality, namely Blinkwater Nature Reserve and Umvoti Vlei Nature Reserve (Nemai Consulting 2016b).

Conservancies in the District include: Doornberg, Gregories Neck, Balgray Farm, Sunset Rest, Biggarsberg, Dundee Agricultural RS, Ilanga, Aalwynkop, Vants Drift, Boschfontein, Ndumeni, Kameelkop, Helpmekaar, Valhalla, Buffelshoek/Umzinyathi Re, Isibindi Eco-Reserve, Fugitives Drift, Thukela Biosphere, Mooi River Valley, Umvoti Vlei, Masonite,

Greytown, and Umvozaan (Nemai Consulting 2016b).

Additionally, the District has two Important Bird & Biodiversity Areas (IBA) in Umvoti Vlei and Karkloof. IBAs are of high international significance, and are important for the conservation of birds, related biodiversity, as well as the sustainable use of the natural environment (Nemai Consulting 2016b). The District also has several rivers, wetlands and other water resources of high importance.

The District's Spatial Development Framework notes the presence of various environmentally sensitive areas, including biodiversity corridors that are important for the maintenance of ecological processes, movement and continuation of species populations. Figure 15 shows the results of an environmental analysis undertaken as part of the Spatial Development Framework for Umzinyathi Municipality displaying conservation corridors and where conservation plans exist (Nemai Consulting 2016a).

A number of current land uses threaten sensitive environmental habitats in the area including unplanned and incompatible development (tourism and formal/informal urban/rural), clearing of vegetation for informal settlements and associated subsistence agriculture, expansion of forestry, sugarcane and other commercial cultivation, over utilization of natural resources/ecoservices and medicinal species, poor land management activities and pollution (Ezemvelo KZN Wildlife, 2014 unpublished, Nemai Consulting 2016b, 2016a).

According to the uMzinyathi District Municipality Biodiversity Sector Plan (EKZNW, 2014 unpublished), the municipal area has experienced high levels of transformation due to these and other threats, particularly in the northern and southern areas of the District. Figure 16 displays transformation in uMzinyathi District Municipality.

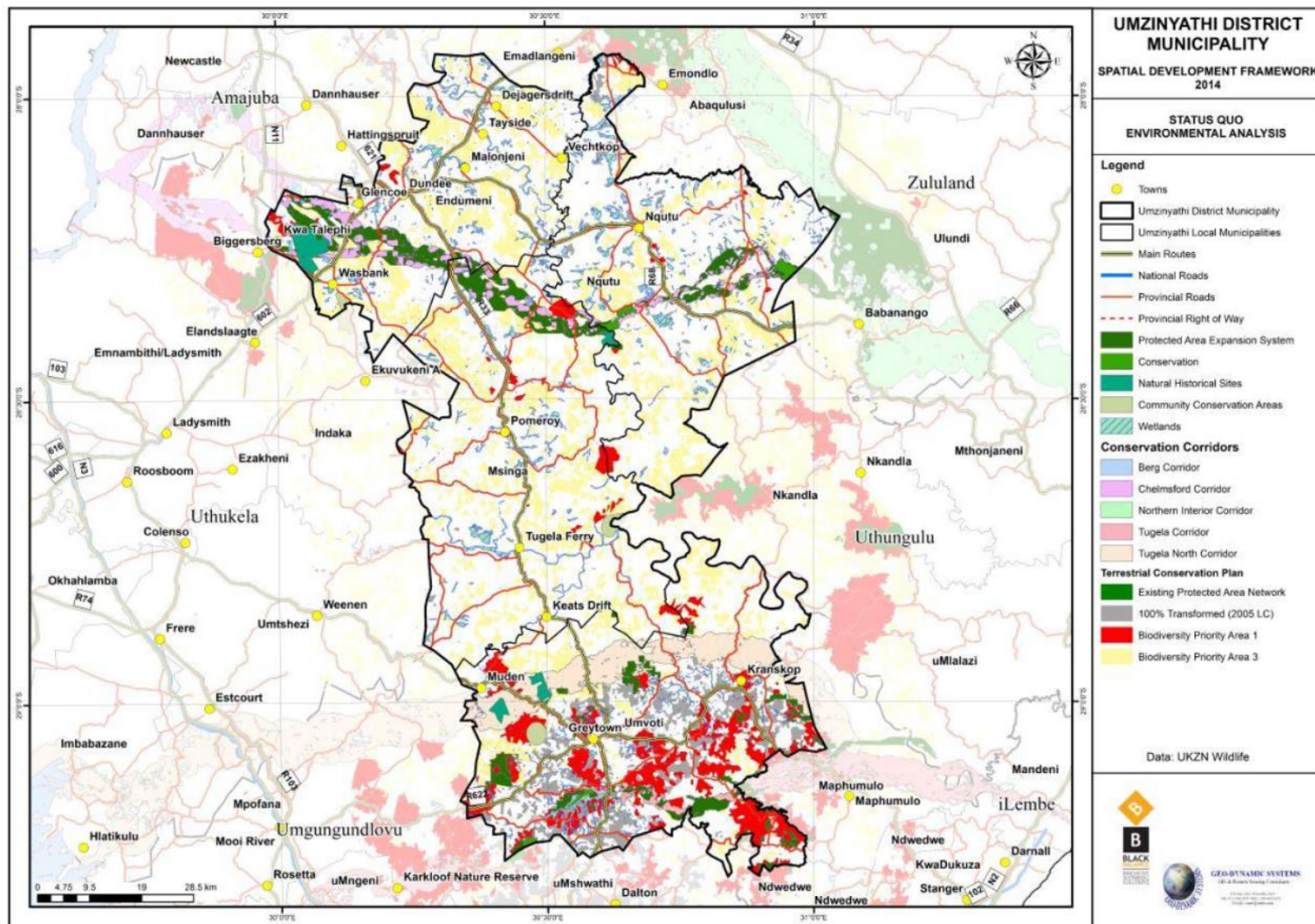


Figure 15: uMzinyathi District Municipality Environmental Analysis (UMzinyathi District Municipality 2015b)

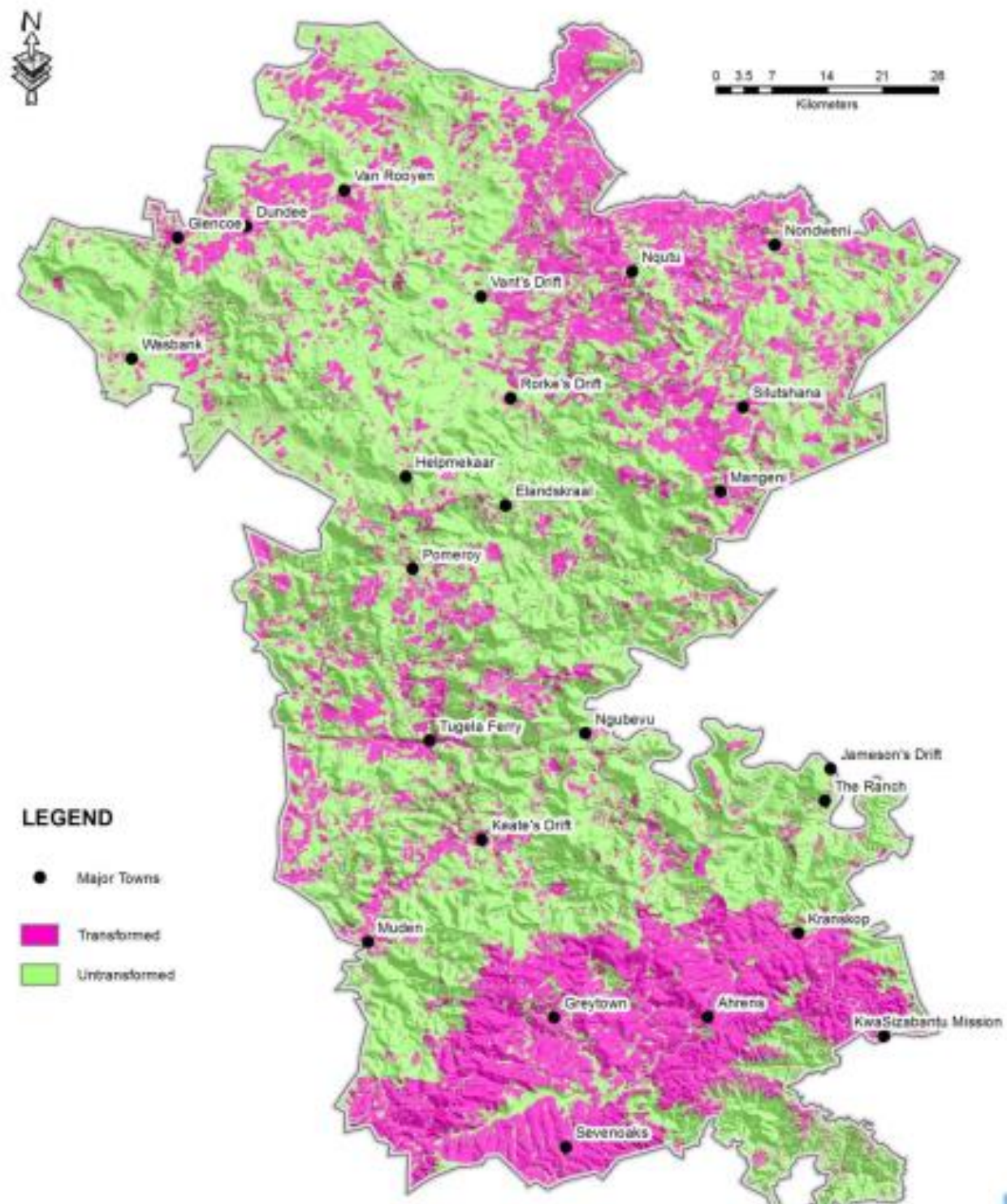


Figure 16: Transformation in uMzinyathi District Municipality (Nemai Consulting 2016b)

6.2.2 Impacts of climate change: Loss of High Priority Biomes

South Africa has nine biomes and each biome has specific climate characteristics. This includes a particular range of rainfall and temperatures for each biome. With climate change these biomes will shift with the consequent shift in ecosystems and vegetation.

The Long Term Adaptation Scenarios Report on biodiversity highlights the following biomes as the most vulnerable and “in need of strong protection, restoration and/or research” (Department of Environmental Affairs 2013b):

- Highest priority for action: Grassland and Indian Ocean Coastal Belt.
- High priority for action: Fynbos and Forest.
- Medium priority for action: Nama Karoo and Succulent Karoo.

The maps below show the shift in biomes in uMzinyathi District Municipal Area given different climate scenarios modelled by South African National Parks in 2011. uMzinyathi Municipal Area is dominated by the grassland and savanna biomes and these maps show that the grassland biome will be replaced by the savanna biome under different climate scenarios.

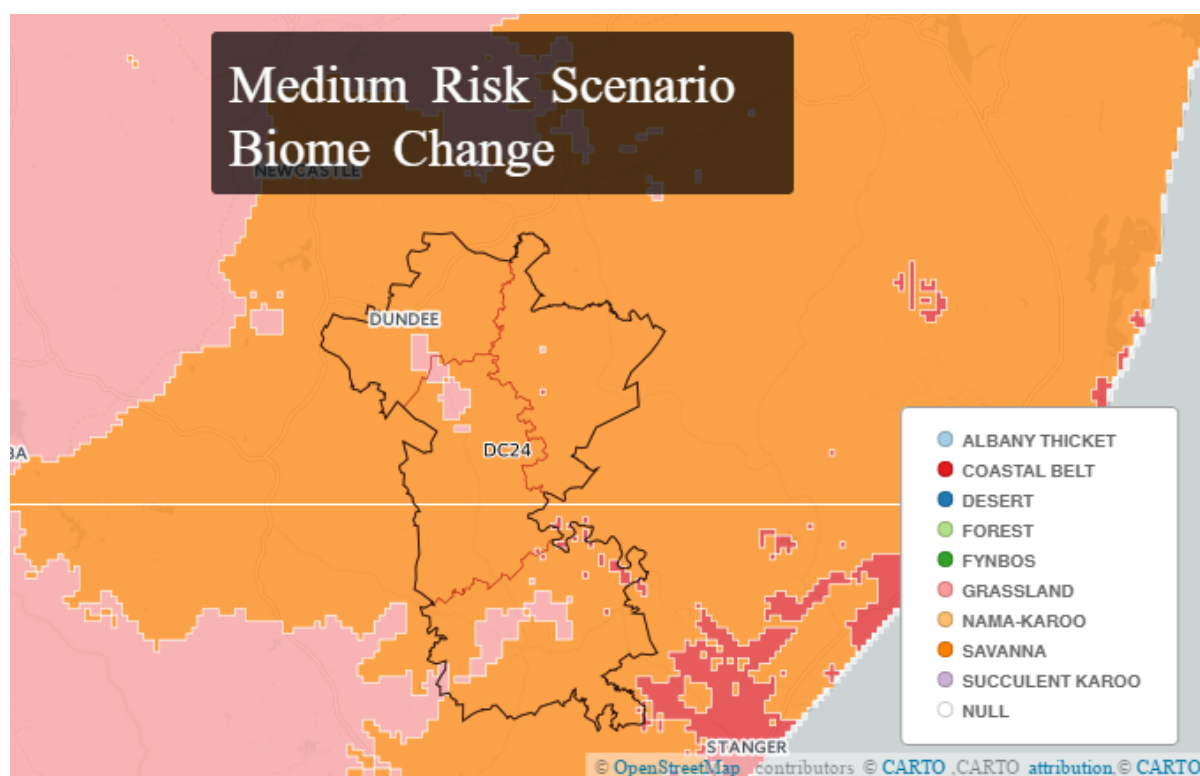


Figure 17: uMzinyathi District Municipal Area Medium Risk Biome Delineation (South African National Parks 2011c)

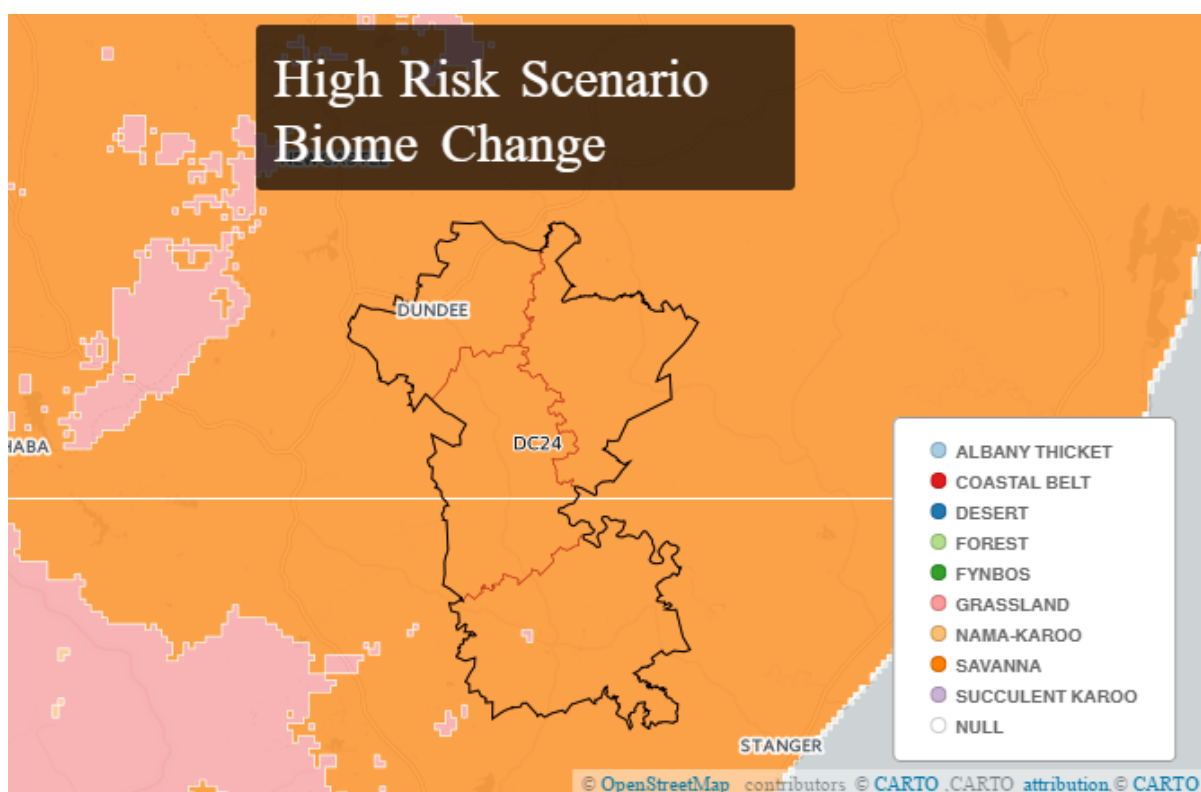


Figure 18: UMzinyathi District Municipal Area High Risk Biome Delineation (South African National Parks 2011b)

6.2.3 Impacts of climate change: Increased impacts on threatened ecosystems

At an ecosystem level, the table below (Table 18) shows the ecosystems that are currently threatened in the District, by local municipality, according to the South African National Biodiversity Institute (SANBI). These are ecosystems that are classified as critically endangered, endangered, or vulnerable, which are expected to be negatively impacted on due to changes in climate (Nemai Consulting 2016b).

Table 18: Threatened ecosystems in the District Municipality per Local Municipality (Nemai Consulting 2016b)

Local Municipality	Threatened ecosystems
Endumeni	<ul style="list-style-type: none"> Two vulnerable ecosystems: Eastern Temperate Freshwater Wetlands and Low Escarpment Mistbelt forests.
Nquthu	<ul style="list-style-type: none"> One endangered ecosystem: Qudeni Mountain Mistbelt Forest and Grassland; Four vulnerable ecosystems: Eastern Temperate Freshwater Wetlands, eMondlo Sandy Moist Grassland, Midlands Mistbelt Grassland and Northern Qudeni Mistbelt Grasslands.
Msinga	<ul style="list-style-type: none"> Two vulnerable ecosystems, namely Eastern Temperate Freshwater Wetlands and Midlands Mistbelt Grassland.

Umvoti	<ul style="list-style-type: none"> – Four endangered ecosystems, namely Greytown North Grasslands, Karkloof Forest Collective, KwaZulu-Natal Sandstone Sourveld and Ntunjambili Valley Complex. – Six vulnerable ecosystems, namely Eastern Scarp Forest, Kromberg Plateau, Midlands Mistbelt Grassland, Ngongoni Veld, Umvoti Vlei and Surrounds and Vaalkop Headlands.
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6.2.4 Existing Biodiversity Adaptation Capacity in the District

UMzinyathi District Municipality in partnership with the KwaZulu-Natal (KZN) Department of Economic Development, Tourism and Environmental Affairs (EDTEA) have developed an Environmental Management Framework (EMF) for the District to establish an environmental vision for the District. This document includes Environmental Management Zones (EMZ's) which represent specific demarcated areas that require active control to ensure that their potential is realised and sensitive features are adequately safeguarded. The District has six delineated EMZs (See Appendix 1) with the following encompassing environmental and biodiversity issues:

- Formally Protected Areas;
- Terrestrial Biodiversity;
- Aquatic Biodiversity;

Responding to climate change has been identified as a key environmental issue in the District and the Strategic Environmental Management Plan of the EMP recommends that a Climate Change Strategy is developed for the District that includes an implementation plan (Nemai Consulting 2016c).

The key barrier to responding to climate change in the biodiversity sector in the District is capacity. There are no environmental units or environmental officers in the District or Local Municipalities and although a position has been created for an environmental officer at the District level, the position has not yet been filled.

6.2.5 Biodiversity Vulnerability Indicator Table

Table 19: Biodiversity Vulnerability Indicator Table uMzinyathi District Municipality (Populated by Urban Earth together with Umzinyathi District Municipality Officials at Two Workshops in 2017)

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
12	Loss of High Priority Biomes	High Priority Biomes (including Grasslands, Nama-Karoo, Indian Ocean Coastal Belt, Fynbos, Forest) to be replaced by other biomes such as savanna and desert.	Do you currently have high priority biomes in your area?	Yes	The majority of the District is covered by the Grassland Biome which is under threat due to climate change. It is predicted that the grassland will be replaced by savanna.	How much of this High Priority Biome will be lost due to climate change? A significant amount= High; A moderate amount= Medium; None/a low amount = Low	High	A significant amount of the grassland biome will be lost in the medium risk scenario with all the grassland biome lost to savanna in the high risk scenario.	Low	<ul style="list-style-type: none"> An EMZ has been identified for terrestrial biodiversity in the EMF and a Biodiversity Sector Plan has been developed for Umzinyathi District. Finance has been provided by KZN EDTEA to develop an EMF for the District, and an EMF monitoring tool development is under way. No environmental units across the whole district and family of municipalities. Environmental functions shared between planning, community services, technical disaster services and finance units. Overgrazing and land degradation as well

										<ul style="list-style-type: none"> as drought are great threats. Need for robust education and awareness of the local community.
13	Increased impacts on threatened ecosystems	Loss of threatened ecosystems due to changes in climate.	Do you currently have threatened ecosystems in your area? (Classified as critically endangered, endangered or vulnerable)	Yes	There are many endangered ecosystems such as Qudeni Mountain Mistbelt Forest and Ntunjambili Valley Complex	<p>How much of your Municipality is covered by threatened ecosystems?</p> <p>A significant amount= High; A moderate amount= Medium; None/a low amount = Low</p>	Medium	A moderate amount of the District Municipal Area is covered by threatened ecosystems.	Medium	<ul style="list-style-type: none"> An EMZ has been identified for terrestrial biodiversity in the EMF and a Biodiversity Sector Plan has been developed for Umzinyathi District. There is however no environmental department at District level. Finance has been provided by Province to develop an EMF for the District. The EMF tool will assist with adaptive capacity as soon as the district has environmental officials to implement it.
14	Increased impacts on environment due to land-use change	Loss of biodiversity and degradation of natural habitat due to significant land use	Are you currently experiencing land use change?	Yes	The District has experienced high levels of transformation particularly in the northern and southern areas of the District.	<p>Have you experienced significant loss of habitat since 1990?</p> <p>Above 10% = High;</p>	High	Vast areas of land (estimated above 10% based on Desired State Report) have been	Medium	<ul style="list-style-type: none"> An EMZ has been identified for terrestrial biodiversity in the EMF and a Biodiversity Sector Plan has been developed for Umzinyathi District.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
		change which impacts on ability to respond to climate change				Between 5-10% = Medium; Under 5% = Low		transformed in the District.		<ul style="list-style-type: none"> There is however no environmental department at District level. Finance has been provided by Province to develop an EMF for the District. There will be adaptive capacity as soon as there are environmental officials for implementation.
15	Loss of Priority Wetlands and River ecosystems	Changes in rainfall patterns and temperature are likely to impact on wetlands and the ecosystem services they provide.	Do you have priority wetlands and river ecosystems in your area?	Yes	The District has several rivers, wetlands and other water resources of high importance.	How important are wetlands and river ecosystems in providing ecosystem services in your Municipality? A significant amount= High; A moderate amount= Medium; None/a low amount = Low	High	The District has a high rural population and wetlands and rivers provide important ecosystem services to rural households.	Medium	<ul style="list-style-type: none"> An EMZ has been identified for aquatic biodiversity in the EMF and a Biodiversity Sector Plan has been developed for Umzinyathi District. Finance has been provided by Province to develop an EMF for the District. There are no environmental units across the whole District family of municipalities. Hence no finance for environmental management.

6.3 Health

6.3.1 State of Health in the District Municipality

UMzinyathi District Municipal Area has a population of 510,837 (Statistics South Africa 2011). The population is extremely youthful, with children under the age of 15 making up 40.15% of the population and those aged between 15 and 39 accounting for a further 38.37% (Figure 19). The 40 to 64 age group makes up 16.26% of the population and the 65 and older age group makes up the remaining 5.22% of the population (Statistics South Africa 2011).

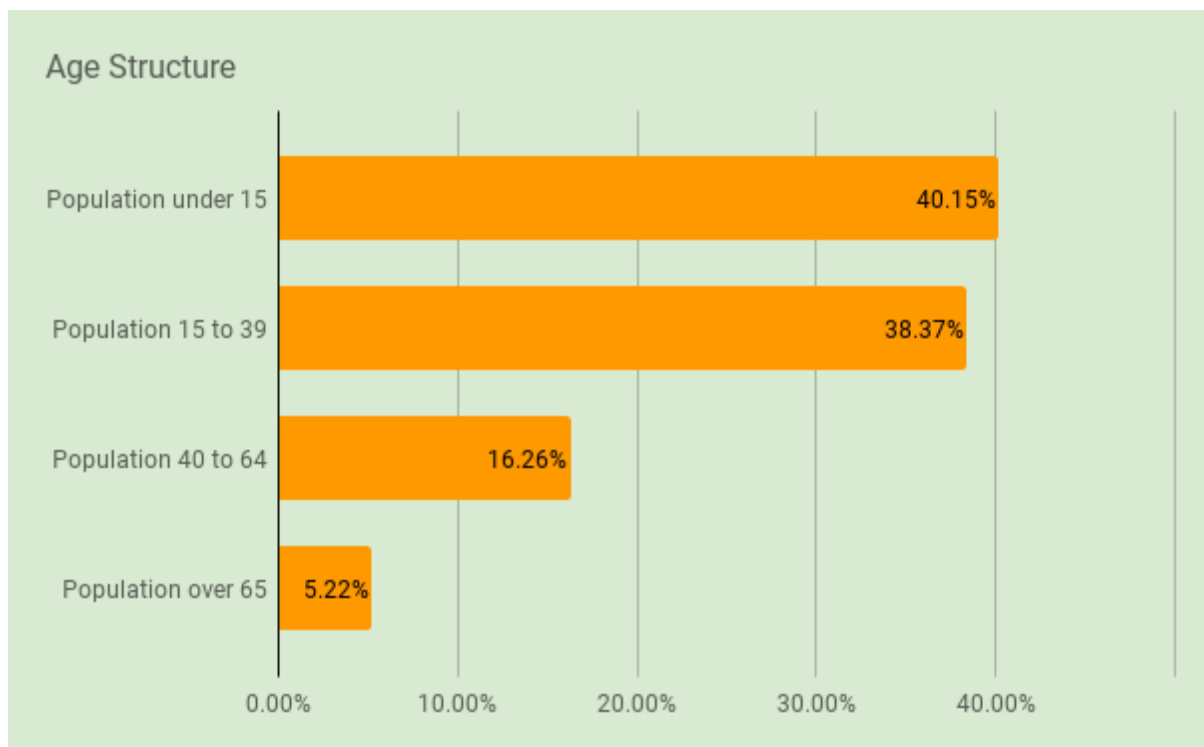


Figure 19: Age Structure of the District Municipal Area(Statistics South Africa 2011).

The percentage of young (under 5 years old) and elderly (over 65 years old) across the District Municipal Area is shown in Figure 20. The darker maroon shaded areas on the map indicate higher percentages of young and elderly people (Nquthu and Msinga). The young and elderly are especially vulnerable to health impacts relating to changes in climate.

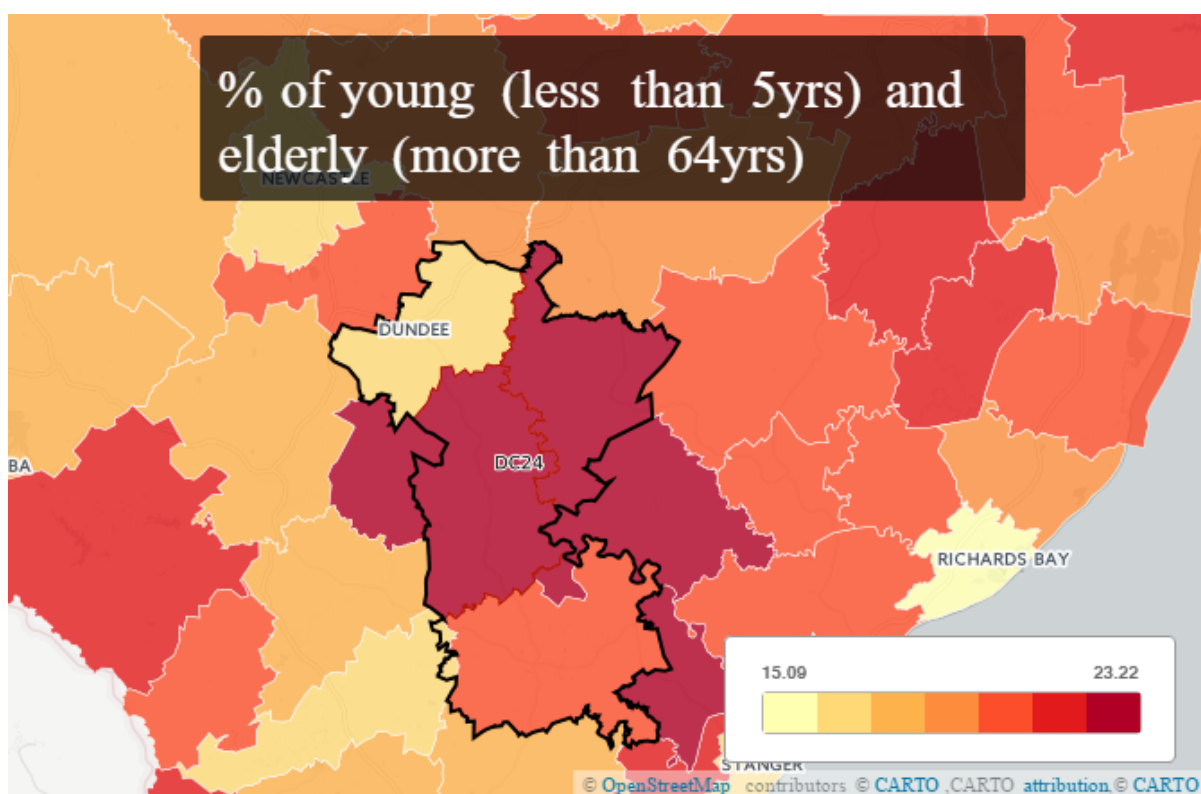


Figure 20: Percentage of young (under 5 years) and elderly (over 65 years) across the District Municipal Area (Statistics South Africa 2011)

There were 4,253 natural deaths in the District Municipal Area in 2015 (Statistics South Africa 2017). The five leading causes of death in 2015 in the District Municipal Area were Tuberculosis (7.7%), Cerebrovascular diseases (7.4%), other viral diseases (7.2%), other forms of heart disease (excluding hypertensive disease) (5.5%), and Diabetes Mellitus (5%) (Statistics South Africa 2017).

6.3.2 Vulnerability

UMzinyathi District does not fall within a malaria risk area in KwaZulu-Natal. However, there were 608 cases of Malaria recorded in the KwaZulu-Natal Province in 2015, which resulted in six deaths. At least 58 of these cases were contracted inside the Province (Department of Health 2016).

The child under 5 years severe acute malnutrition (SAM) case fatality rate (CFR) for the District Municipal Area was 8.7% during 2015/16 (Massyn et al. 2016). The 2020 District Growth and Development Plan 2020 Trajectory for severe malnutrition of children under 5 years (per 1000 children) is three.

People who work outdoors are especially vulnerable to the impacts of extreme heat conditions. In the District Municipal Area 45.50% of households are involved in their own agricultural activities (Statistics South Africa 2011). Furthermore, 18.4% of the population are employed in the informal sector (Statistics South Africa 2011), many of which are likely to work outdoors in poor conditions, with limited infrastructure such as access to amenities and shade. The percentage of the workforce employed in the informal sector, in the District Municipal Area, is shown below (Figure 21). The darker maroon shaded areas on the map indicate higher rates of employment in the informal sector (Mvoti Local Municipality has the highest

percentage workforce employed in the informal sector).

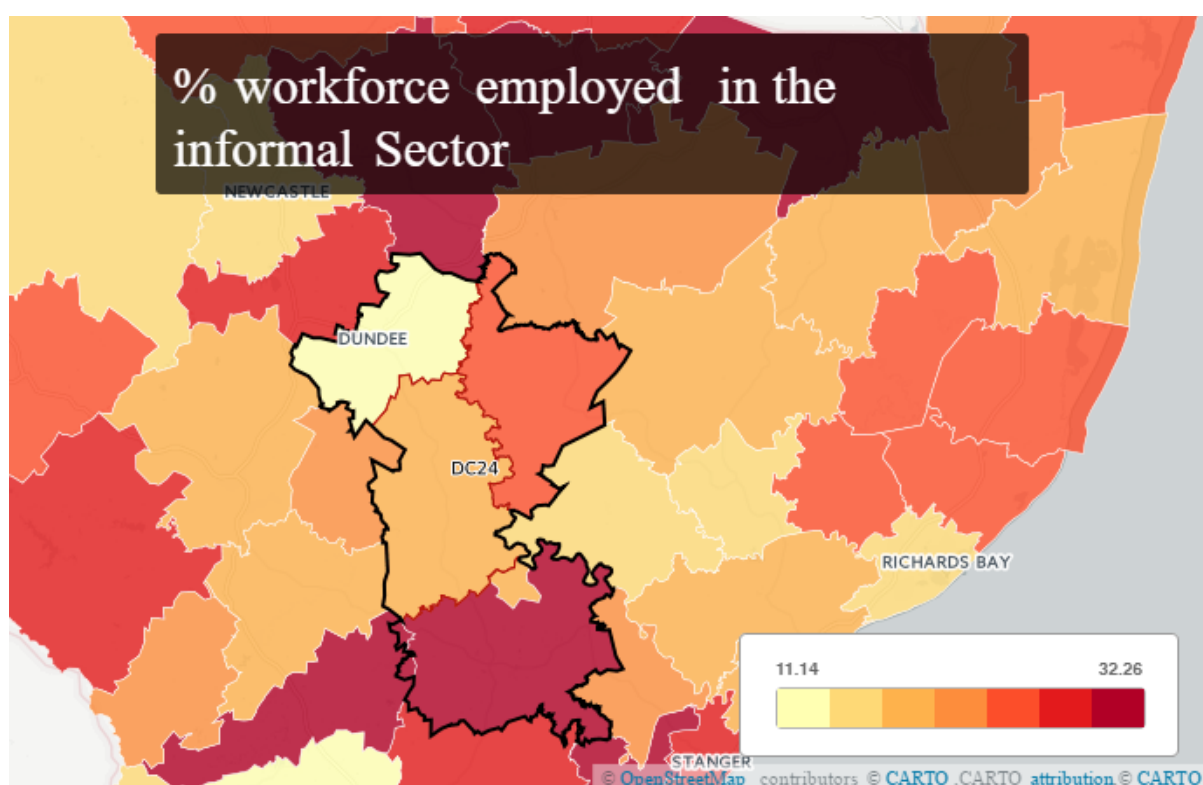


Figure 21: Percentage workforce employed in the informal sector across the District Municipal Area (Statistics South Africa 2011).

6.3.3 Overview of Health services

Within the District Municipal Area there are several health care facilities. According to the District Health Expenditure Review (DHER) 2016/17, the District Municipal Area has four district hospitals, 53 fixed clinics, 13 mobile clinics, and one community health centre (District Health Expenditure Review (DHER 2017) (Table 20 below).

Table 20: Health Care Facilities in Umzinyathi District Municipality (District Health Expenditure Review (DHER 2017)

Facilities	Endumeni	Msinga	Nquthu	Umvoti	District
District Office	1				1
District Hospital	1	1	1	1	4
TB Hospital				1	1
Community Health Centre		1			1
Fixed Clinics	6	20	15	12	53
Mobile clinics	2	4	4	3	13
EMS	2 ⁷	1	1	1	5
Forensic Mortuary	1			1	2
Nursing Colleges		1	1		2

⁷ Endumeni has 2 EMS facilities 1 x EMS District Office and 1 x Dundee EMS Base

Regional Laundry	1				1
Total	12	27	22	19	83

6.3.4 Health Vulnerability Indicator Table

Table 21: Health Vulnerability Indicator Table uMzinyathi District Municipality (Populated by Urban Earth together with Umzinyathi District Municipality Officials at Two Workshops in 2017)

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
21	Health impacts from increased storm events	Increased storms will result in increased risk of drowning, injuries and population displacement impacts.	Are you or will you experience increased storm events in your area?	Yes	Umzinyathi District already experiences severe storms and flood events which are expected to increase due to climate change.	How populated are areas vulnerable to storms events (e.g. flood zones)? Densely populated = High; Partially populated = Medium; Sparsely or not populated = Low	High	The Disaster Management Sector Plan rates floods as a high area of risk.	Medium	<ul style="list-style-type: none"> A map of areas prone to flood risk has been mapped for the District and the SDF highlights that development should not be permitted in areas prone to flooding. Umzinyathi District has a Disaster Management Risk Centre, a Head Disaster Management and four Disaster Management Officers. More capacity is however required. The existing storm water systems need to be upgraded.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
22	Increased heat stress	Increases in average temperatures and extreme events (such as heat waves) are projected to induce heat stress, increase morbidity, and result in respiratory and cardiovascular diseases.	Are you or will you experience increased heat waves in your area?	Yes	The District experiences warm to hot summers with temperatures of above 30 degrees.	Is there a high percentage of young and elderly in the area? More than 20% = high; Between 15% & 20% = Medium; Less than 15% = low	Medium	19.47% of the population is <5yrs and >64yrs according to Statistics SA stats. Umzinyathi District Population statistics indicate 12.14% under 5 and 7.5% over 65.	Medium	<ul style="list-style-type: none"> Umzinyathi DM has 51 clinics and 13 mobile clinics. Awareness campaigns to be conducted through Community Caregivers (CCG's) and Operation Sakuma Sakhe (OSS) War Rooms (Ward committees).
23	Increased vector borne diseases from spread of mosquitoes, ticks, sandflies, and blackflies	Vector borne diseases such as malaria is projected to spread within regions bordering current malaria areas, which are presently too cold for transmission.	Are vector borne diseases present or likely in your area?	Yes	UMzinyathi District is a rural dominated municipality. Ticks and sandflies are more prone in the rural dominated municipalities.	Are you in or neighbouring an area with vector borne diseases (e.g. malaria)? Already in a vector borne disease area = High; Neighbouring a vector borne disease area = Medium; Not near a vector borne disease area = Low	High	Not near a malaria area but already experiencing tick and sandfly related diseases.	Low	Consult Department of Agriculture and Environmental Health to provide more information on current capacity.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
24	Increased water borne and communicable diseases (e.g. typhoid fever, cholera, bilharzia, and hepatitis)	Favourable conditions for the incubation and transmission of waterborne diseases may be created by increasing air and water temperatures.	Are waterborne and communicable diseases present or likely in your area?	Yes	These diseases have been reported and as they are linked to increases in air and water temperature, may become more common in the District.	Have you had an incidence of water borne and communicable diseases (e.g. typhoid fever, cholera, bilharzia, and hepatitis) in the past 3 years Yes = High; No = Low	High	These diseases have been reported.	Low	<ul style="list-style-type: none"> The District needs more health practitioners. Localise the environmental practitioners to the local municipalities. Environmental Health to develop an action plan with areas affected with waterborne and communicable diseases.
25	Increased malnutrition and hunger as a result of food insecurity	Climate Change will affect food systems, compromising food availability, access and utilisation, leading to food insecurity (particularly of subsistence farmers).	Do you or will you have food insecurity in your area?	Yes	Food security may be affected due to climate change if crops grown are no longer suitable in the altered climate.	Child under 5 years severe acute malnutrition case fatality rate More than 7 incidence 1000 children = High; Between 7 & 2 incidence 1000 children = Medium; Less than 2 incidence 1000	High	8.7 incidences per 1000 children (District Health Barometer 2015/16 Health Systems Trust).	Low	KZN Department of Agriculture provides some support to small scale farmers and DAEA has implemented some Intervention Programmes

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
						children = Low;				
26	Increased air pollution	Health impacts in resulting from exposure to air pollutants include eye irritation, acute respiratory infection, chronic respiratory diseases and TB, and sometimes death.	Do you or will you have air pollution in your area?	Yes	The air quality across most of the District is relatively good. Indoor air pollution is however a problem due to a large number of households without access to electricity and reliance on coal, wood and paraffin.	Would you consider your area a high priority in terms of air pollution (e.g. SAAQIS Priority Areas)? Yes = High; Somewhat = Medium; No = Low	High	Increased mining activities in the district. Harmful emissions in the rural areas because of the lack of electricity.	Low	<ul style="list-style-type: none"> Eskom and private companies should develop alternative energy sources. Indigenous trees to be planted to absorb carbon dioxide. Future developments should be away from mining activities.
27	Increased Occupational health problems	Temperature is a common climatic factor that affects occupational health (for example, agricultural labourer's productivity) by causing heat stress and dehydration.	Do people work outside or are in conditions that cannot be cooled in your area?	Yes	A large percentage (45.5%) of households are involved in agricultural activities, at a commercial or subsistence level and will be susceptible to increases in temperatures when working outdoors. These people	Do a significant percentage of people work outside or are in conditions that cannot be cooled? Significant = High; Some = Medium; Low/No = Low	High	Large number of people work in agricultural sector, commercially or at a subsistence level. Agriculture is the second highest employer in the District. The District also employs a large	Low	<p>Unsure of capacity to deal with occupational health problems.</p> <p>Environmental Health has a minimum role to play regarding agricultural activities which involve well established farmers but is involved with farming practices at a small community</p>

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
					are also exposed to harmful agricultural chemicals.			number of people in the coal mines.		level

6.4 Human Settlements, Infrastructure, and Disaster

6.4.1 Overview of households and household services

The District Municipality has a total population of 510,837 which is approximately 5% of the total population of the province (Statistics South Africa 2011; UMzinyathi District Municipality 2016). Table 22 below illustrates the population per settlement type per Local Municipality in the District. The table highlights that Nquthu and Msinga local municipalities have large rural populations that reside in rural traditional areas at 90% and 98% respectively, whilst Endumeni Local Municipality has the highest urban population at 83% (UMzinyathi District Municipality 2015b).

Table 22: Population per settlement type 2012 (UMzinyathi District Municipality 2015b)

Municipality	Urban	Rural farm	Rural Traditional	Total	% Rural Traditional	%Urban
Endumeni	47766	9403	209	57378	0.36%	83.25%
Nquthu	10891	5141	146812	162845	90.15%	6.69%
Msinga	1505	2075	185087	188667	98.10%	0.80%
Umvoti	18684	23504	61445	103633	59.29%	18.03%
Total per area	78846	40123	393553	512522	76.79%	15.38%

According to the 2011 Census Data, 42.80% of the 113,457 households in uMzinyathi District Municipal Area, live in traditional dwellings which is higher than the national average of 7.89% (Statistics South Africa 2011). Figure 22 shows the distribution of households living in traditional dwellings across the district. Only 2.36% of households live in informal dwellings which is lower than the national average of 13.58%. These informal dwellings are mostly found in the two local municipalities that have major economic centres, Endumeni Local Municipality, and Umvoti Local Municipality.

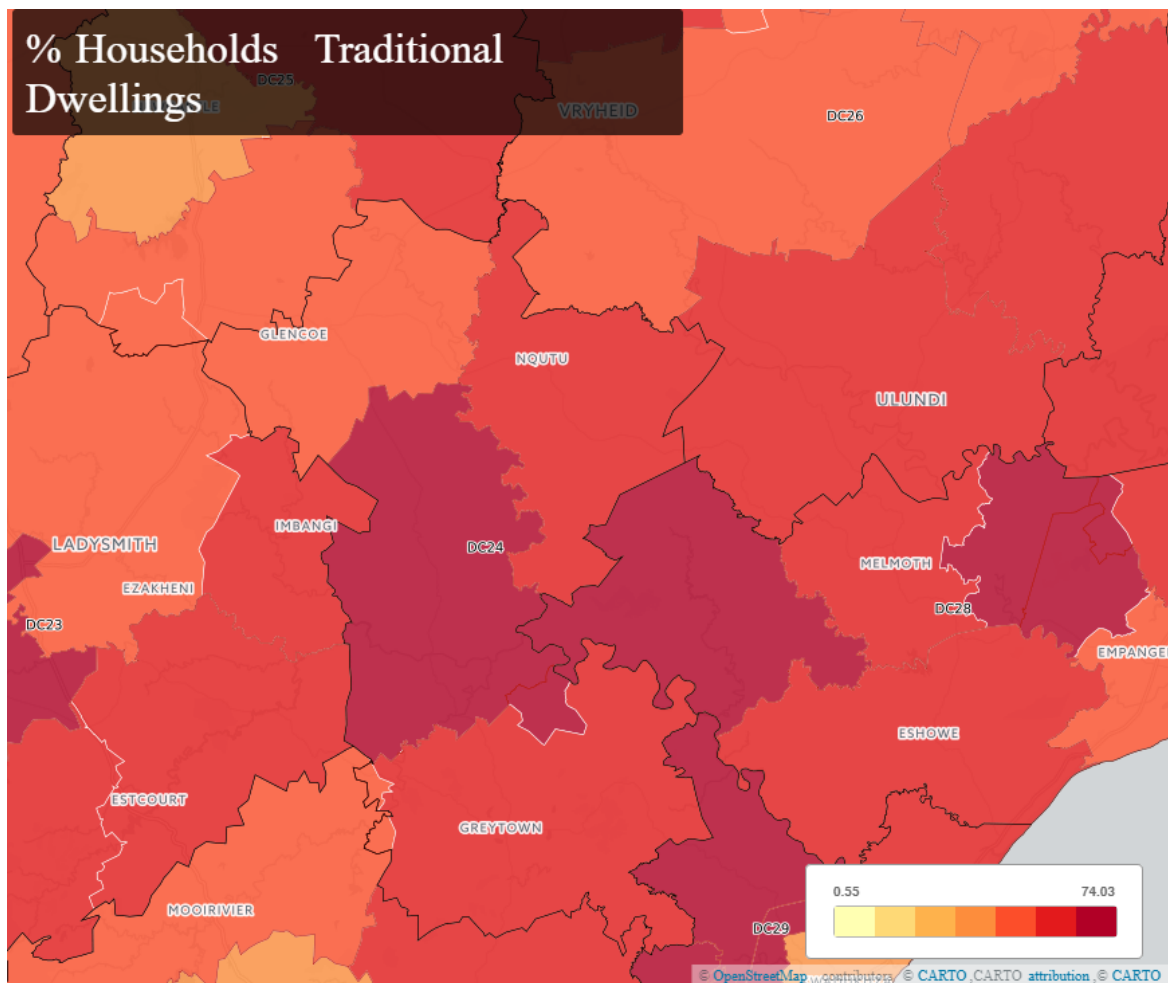


Figure 22: Percentage of Households Living in Traditional Dwellings Across uMzinyathi District Municipality (Statistics South Africa 2011)

Housing types built are strongly linked to security of tenure as areas where residents have secure tenure tend to build more permanent and conventional housing types while those with insecurity around land tenure opt for traditional houses in the rural areas and informal dwellings in the urban areas (UMzinyathi District Municipality 2015b). These less permanent structures are more vulnerable to extreme storm events.

With regards to basic household services, 62.60% of the population do not have access to piped water. Only 37.40% of the District Municipal Area's population has access to water from a service provider, which is lower than the national average of 78.18%.

The sanitation statistics follow a similar pattern with a low percentage of the population having access to flush toilets (16.57%) in comparison to national statistics (56.51%), and a high reliance on pit latrines (58.13%). Figure 23 below shows the access to sanitation percentages for the District Municipal Area (Statistics South Africa 2011).

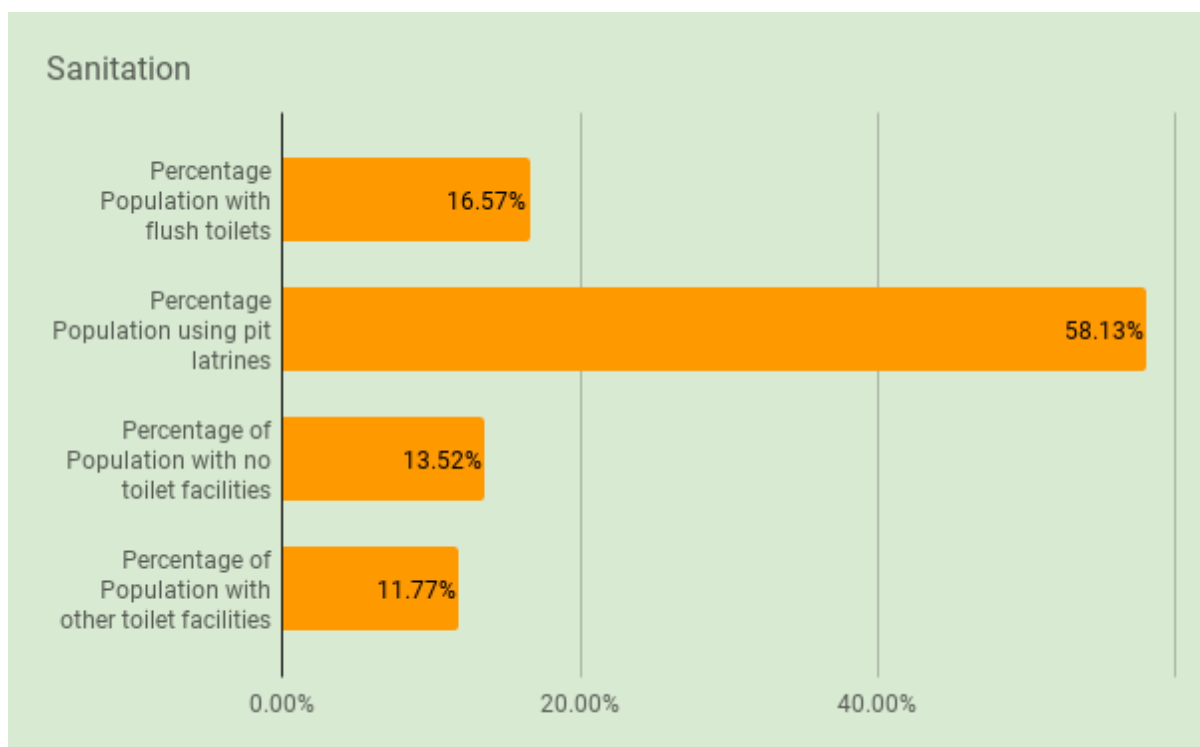


Figure 23: Percentage of population with access to sanitation in the District Municipal Area (Statistics South Africa 2011)

Figure 24 below, shows the percentage of the population with access to flush toilets by local municipality. The darker shaded areas are those where a higher percentage of the population have access to flush toilets, in this case Endumeni and Umvoti Local Municipalities, the more urban municipalities.

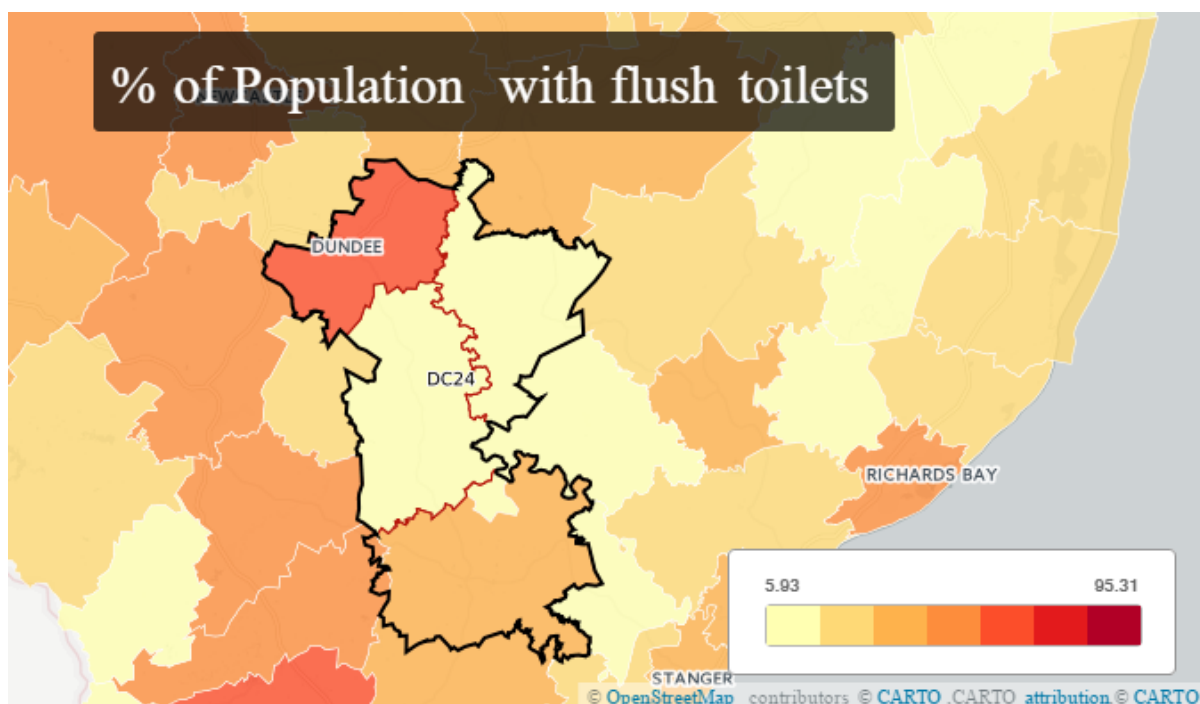


Figure 24: Percentage of the population with access to flush toilets across the District Municipal Area (Statistics South Africa 2011)

Most households in the District Municipal Area do not have access to electricity with 59.2% of households not having any electricity connection, and 50.29% of households using alternatives to electricity for cooking, heating or lighting (Statistics South Africa 2011).

Whilst only 14.05% of households in the District Municipal Area do not have access to any form of refuse disposal, only 16.68% of households have their refuse removed by a local authority or private company (Statistics South Africa 2011). Figure 25 below, shows the percentage of households with no rubbish disposal across the District Municipal Area, by local municipality. The darker maroon shaded areas are those where a higher percentage of the population do not have access to rubbish disposal (Msinga and Umvoti Local municipalities are the most affected).

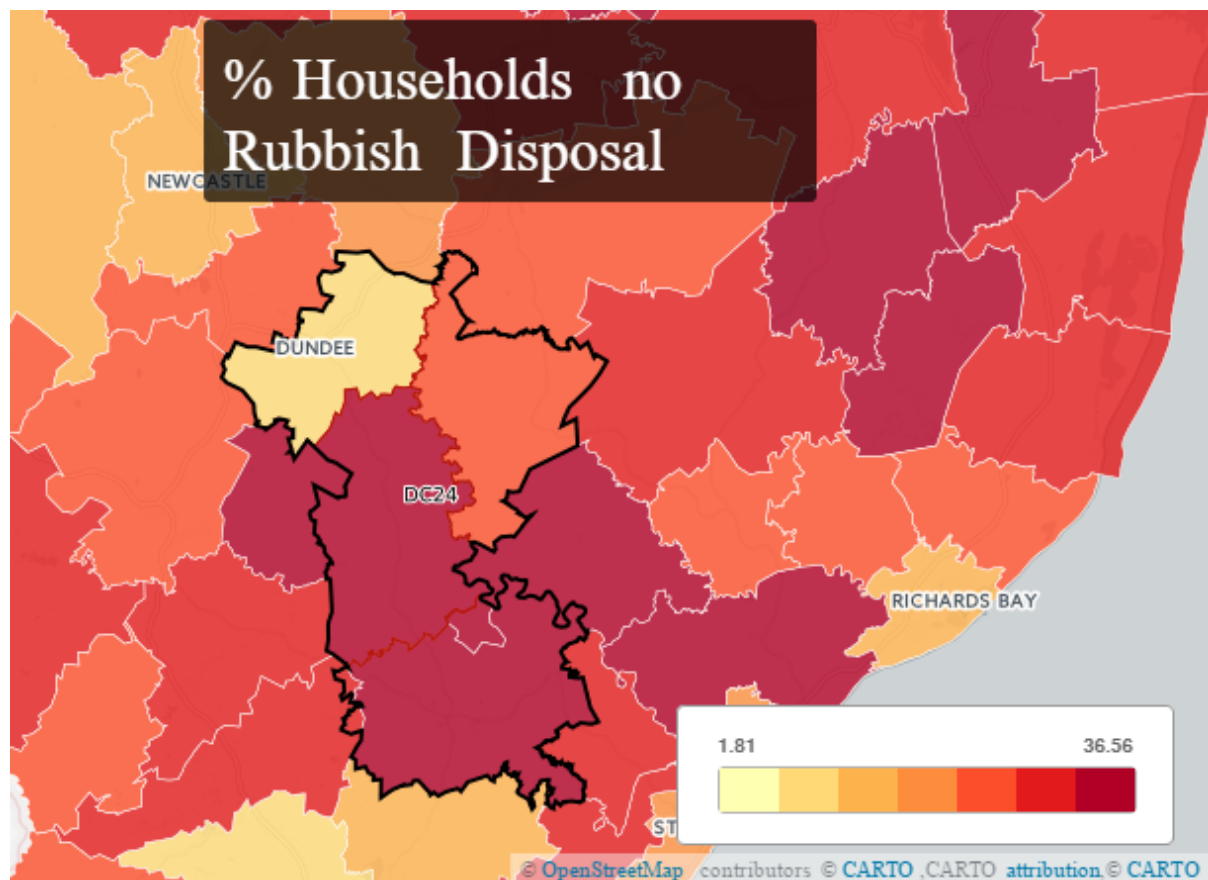


Figure 25: Percentage of households with no rubbish disposal across the District Municipal Area (Statistics South Africa 2011)

The employment statistics of the District Municipal Area show that only 18.11% of the population is employed, which is much lower than the national average of 38.87% (Statistics South Africa 2011). Of those not employed, 10.46% are classified as unemployed, 58.07% are not economically active, and 13.36% are discouraged work-seekers (See Figure 26, below).

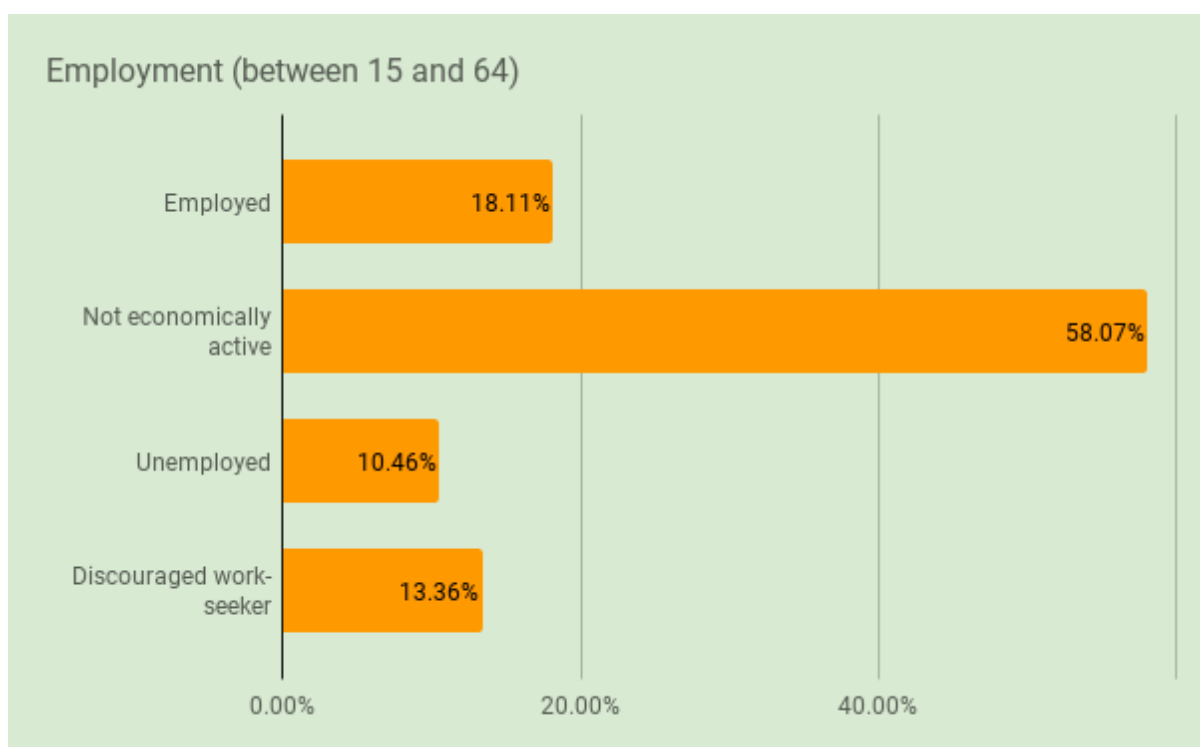


Figure 26: Employment statistics for District Municipal Area (Statistics South Africa 2011)

In uMzinyathi District Municipal Area 4.22% of the population have a post school qualification, compared to the national average of 9.94% (Statistics South Africa 2011). The other educational figures are also lower than national averages with only 21.25% having a Grade 12/Matric education, and 24.87% with some high school education (See Figure 27 below).

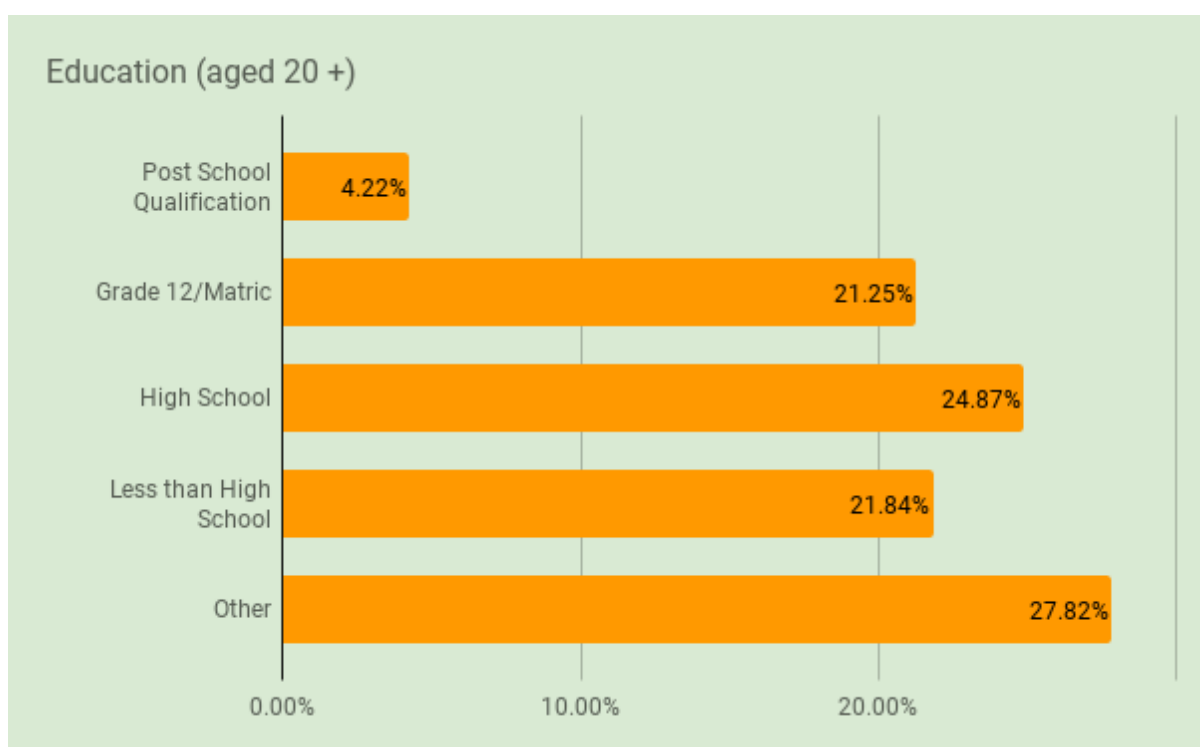


Figure 27: Education statistics for the District Municipal Area (Statistics South Africa 2011)

6.4.2 Likely Impacts of Climate Change

There are a number of different ways that climate change may impact human settlements and infrastructure in uMzinyathi District Municipality. Increases in the severity of storm events and increase in flooding is likely to damage strategic infrastructure which may result in service delivery disruptions. The impacts of storm events will particularly affect communities living in informal and traditional dwellings and those living on flood plains and where there is poor stormwater drainage infrastructure. In addition, communities in rural areas that depend on subsistence farming may be unable to grow crops that they have grown in the past due to the changing climate. It is predicted that there will therefore be an increase in rates of rural-urban migration. Rural communities may also become more physically isolated in terms of accessing services due to extreme events that may impact on key transport infrastructure such as bridges. In addition, income in the tourism industry may decrease as biodiversity and tourism related infrastructure may be negatively impacted on by climate change.

6.4.3 Existing Human Settlement Adaptation Capacity

UMzinyathi District Municipality has completed a disaster risk assessment for the district and has developed a number of disaster risk maps which have taken into account some of the climate related risks such as floods and drought (See Appendix 2). These disaster risk maps highlight the areas at highest risk from veld fires, flooding, drought, and lightning, and have been included in the Spatial Development Plan which provides guidance on development going forward.

6.4.4 Human Settlements Vulnerability Indicator Table

Table 23: Human Settlements Vulnerability Table uMzinyathi District Municipality (Populated by Urban Earth together with Umzinyathi District Municipality Officials at Two Workshops in 2017)

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
28	Loss of industrial and labour productivity	Direct impacts of weather on construction, electricity generation and other industries, resulting in loss of productivity.	Do you have industrial activities in your area?	Yes	Manufacturing is a significant contributor to the economy. Mining is a small contributor to the economy, but has been identified as a potential area of growth in the District. Concentrated in Endumeni. Mining is illegal in Msinga.	How significant is the Mining/Industrial/Manufacturing sector for the local economy? Significant = High; Somewhat = Medium; Low/No = Low	Medium	Manufacturing is the joint highest economic contributing sector at 17%, along with Government (17%). Mining is a small contributor to the local economy.	Low	Unsure of capacity. Need to consult the DM and LMs LED strategies.
29	Increased impacts on strategic infrastructure	Increased disruptions to key transport infrastructure (roads, rails, bridges, airports, tunnels) as a result of extreme weather events.	Do you have strategic infrastructure in your area?	Yes	The R33 is the backbone of the road transport system of the district which is in a poor condition and dangerous in some parts. Key bridges occur over the Tugela and Mooi Rivers.	How important is this strategic infrastructure to the functioning of your municipality? Significant amount = High; Moderate amount = Medium; Minimal or no = Low	High	The transportation network is crucial for the transportation of goods and people. Flooding may damage key bridges such as those over the Tugela and Mooi Rivers. The R33 is the backbone of the road	Low	A Rural Road Asset Management System programme is being developed in the district, through grant funding from the Department of Transport.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
								transport system of the district which is in a poor condition and dangerous in some parts. The railway line in Endumeni is aged and the passenger rail only passes the rail stations that were once active.		
30	Increased impacts on traditional and informal dwellings	Increased risk of extreme weather events to already vulnerable traditional and informal dwellings, that are often unplanned, and without extensive service or infrastructure.	Do you have traditional and informal dwellings in your area?	Yes	Informal dwellings mostly found in the two local municipalities that have major economic centres, Endumeni Local Municipality, and Umvoti Local Municipality. Large numbers of Traditional dwellings found in Nquthu and Msinga local municipalities.	What percentage of households are in traditional and informal dwellings in your area? More than 15% = high; Between 15% & 10% = Medium; Less than 10% = low	High	According to 2011 Census Data only 2.36% of households live in informal dwellings. However, 42.80% of households live in traditional dwellings. The combined Percentage of Households that are Traditional and Informal	Low	Disaster risk assessment for the district municipal area has been completed and disaster risk maps developed which have taken into account some of the climate related risks such as floods and

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
								Dwelling is 45.16%.		drought.
31	Increased isolation of rural communities from services	Physical isolation of rural communities from services as a result of poor rural roads and increased flooding and erosion.	Do you have isolated rural communities in your area?	Yes	The District has large rural populations that reside in rural traditional areas, especially in Nquthu and Msinga local municipalities. The rural areas experience poor or no road infrastructure, limiting access for the population to services. Endumeni's CPA (Land reform farms) the LM cannot render services to such farms (land tenure-private properties).	Is your area predominantly Rural? Mostly Rural = High Equally Urban and Rural = Medium Mostly Urban = Low	High	The District is predominantly rural with poor quality road and transport infrastructure	Low	Poor road infrastructure currently isolates rural dwellers from accessing services and will worsen with climate change.
32	Increased migration to urban and peri-urban areas	Increased migration from rural settlements to urban and peri-urban settlements.	Do you have rural urban migration in your area?	Yes	Large numbers of people are moving from the rural areas to the urban areas within the District and to other urban centres within the province.	Is there a strong rural economy? Low opportunities in rural areas = High; Some opportunities in rural areas = Medium; Strong rural economy = Low	Medium	The District experiences high rates of migration from the rural dominated Nquthu and Msinga local municipalities to Endumeni and Umvoti Local	Medium	The urban centres may not be able to accommodate the influx of people.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
								Municipalities, especially in the case of economically active males.		
33	Decreased income from tourism	Reduced income from tourism as a result of reduced recreational opportunities and increased impact on tourism-supporting infrastructure, such as conservation area access roads.	Do you have tourism assets that can be impacted by climate change in your area?	Yes	The infrastructure (particularly roads) is already under strain in the municipality. The network of tourism assets relies heavily on roads and transport networks.	How significant is tourism to the local economy? Significant contributor = High; Some contribution = Medium; Low/No contribution = Low	Medium	Tourism is a key economic activity of uMzinyathi District Municipality. Battlefields of the Zulu Kingdom.	Low	Tourism has been identified as a key development sector in the District. Currently poor infrastructure in terms of roads and basic services.

6.5 Water

6.5.1 Overview of Water in the District Municipality

UMzinyathi District Municipality falls within the Pongola-Umzimkhulu Water Management Area, one of nine water management areas in the country (Figure 28).

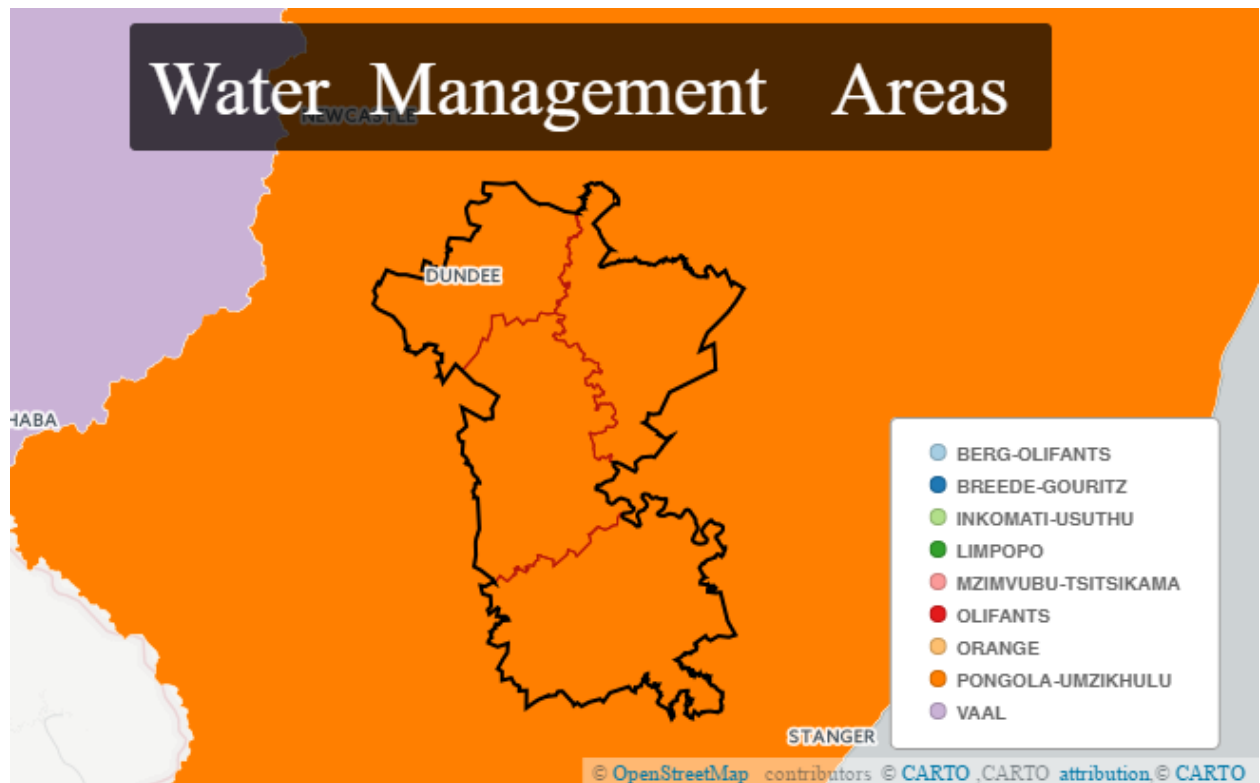


Figure 28: UMzinyathi District Municipality falls within the Pongola-Umzimkhulu Water Management Area (Department of Environmental Affairs 2013a)

The main rivers within the District are the Buffalo, Mooi and the Mvoti rivers (UMzinyathi District Municipality 2016). The Buffalo river flows through the centre of the District and feeds into the Thukela River east of Ngubevu while the Mooi River flows into the Thukela River at Keate's Drift and the Mvoti River drains the southern section of the district (UMzinyathi District Municipality 2016). There is a heavy demand on surface water resources in the District because of the agricultural, mining, industrial and domestic sectors (UMzinyathi District Municipality 2016). The uMzinyathi District Municipality area falls mostly in the Thukela catchment and only a small portion of the District falls within the Mvoti and uMsutu catchments (UMzinyathi District Municipality 2016).

Drinking water quality in the uMzinyathi District Municipality and wastewater treatment provision received average blue and green drop scores. There are no blue and green drop scores for the local Municipalities within the District, however, Table 24 below shows the blue and green drop scores received by the uMzinyathi District Municipality for the 2015/16 period. The Blue Drop score rates the quality of water supplied by municipalities (90-100%-Excellent situation; 75-<89%-Good status; 50-<74% - Average performance; 33-<49%- Very poor performance; 0 -32%- Critical status) (Department of Water Affairs 2011). The Green Drop scores municipalities according to wastewater management (90 - 100%- Excellent situation; 80 - <90%- Good status; 50 - <80%- Average performance; 30 - <50%- Very poor performance; <

30%- Critical state).

Table 24: Blue and Green Drop ratings for uMzinyathi District Municipality 2015/16 (Source: Bonginkosi Hlatshwayo IDP Department Umzinyathi District Municipality, Sourced From Department of Water and Sanitation).

Municipality	Blue Drop Score		Green Drop	
	Rates quality of drinking Water		Rates wastewater treatment	
uMzinyathi District	73.2 %	Average Performance	61.46%	Average Performance

6.5.2 Water Access

With regards to access to water, a small percentage of the District's population (37.40%) has access to water from a service provider with the majority of the population (62.60%) without access to piped water (Statistics South Africa 2011). Figure 29 below shows the percentage of households who get water from service providers or municipalities across the District. The darker shaded local municipality (Endumeni Local Municipality in orange) has the highest percentage of access.

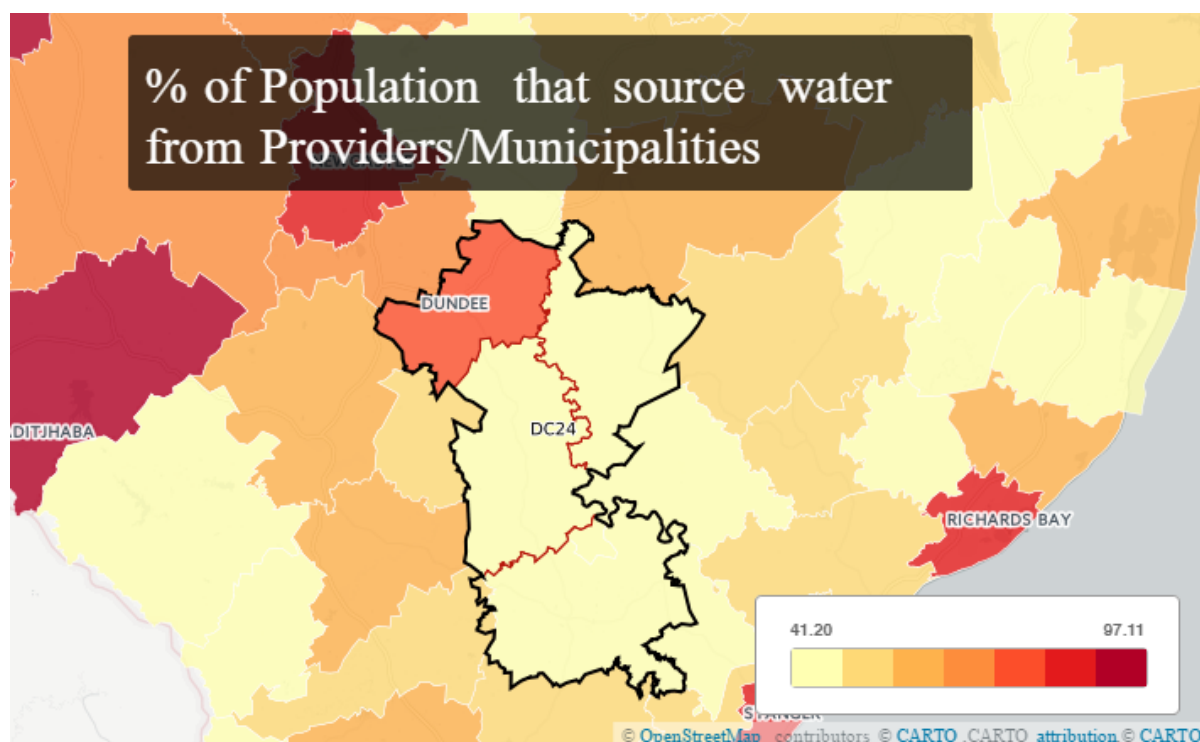


Figure 29: Percentage of households who source water from piped water schemes across the uMzinyathi District Municipal Area (Statistics South Africa 2011).

Figure 30 shows the percentage of the population in the District, who do not source water from piped water schemes but from other sources including boreholes, dams, pools, rain water tanks, rivers, streams, and springs. The darker shaded municipalities (in maroon) are those with the higher percentages that do not have access to piped water (Msinga, Mvoti, and Nquthu).

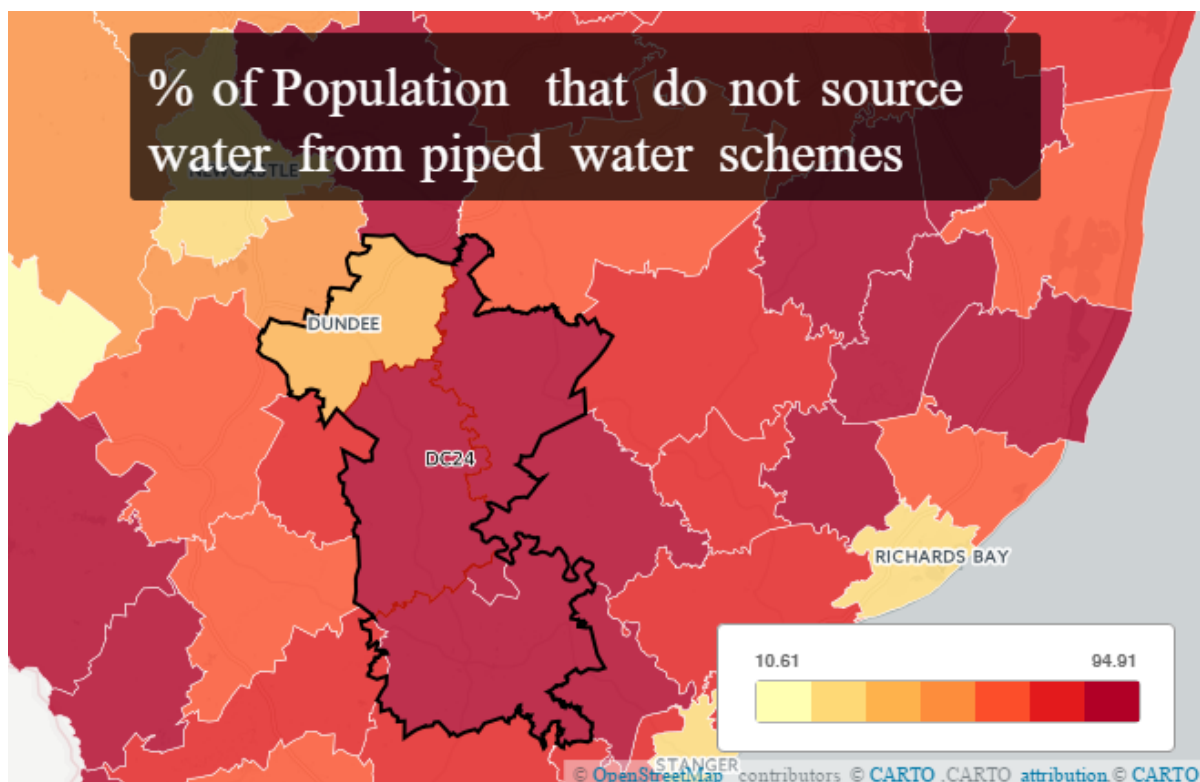


Figure 30: Percentage of households in the uMzinyathi District Municipal Area who do not source water from piped water schemes (Statistics South Africa 2011).

6.5.3 Climate Change Impacts

In 2014/15 there were many cases of extreme water scarcity that were reported by areas in all four local municipalities. Information from the South African Weather Services indicated that many of these areas have received reduced annual rainfall in the last five years. This has led to a reduction in crops and livestock production and has impacted on the availability of drinking water (UMzinyathi District Municipality 2015a). Climate change is expected to exacerbate this problem. Drought, reduced runoff, increased evaporation, and an increase in flood events will impact on both water quality and quantity. In addition to this, the groundwater capacity within the District may decrease and possibly impact on households that are dependent on this source of water.

6.5.4 Existing Water Adaptation Capacity

A drought relief programme has been implemented by the District that focuses on different drought interventions. These include the provision of water tankers to provide water to communities on a monthly basis, a spring protection programme, as well as the refurbishment and drilling of new boreholes (UMzinyathi District Municipality 2016). An amount of R15,000,000 was allocated by the District for drought relief in the 2016/17 financial year (UMzinyathi District Municipality 2016). Budget has been set aside to review the Water Services Development Plan for the District.

6.5.5 Water Vulnerability Indicator Table

Table 25: Water Vulnerability Table uMzinyathi District Municipality (Populated by Urban Earth together with Umzinyathi District Municipality Officials at Two Workshops in 2017)

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
34	Decreased quality of drinking water	Deterioration in water quality due to increased salt concentrations in dams, wetlands and soil/plant systems from enhanced evaporation rates.	Is this or will this take place in your area?	Yes	Water quality within the Water Management area is declining. It will decrease due to industrial and mining effluents.	What is the Blue Drop Score for the area (2012 Report)? Less than 50% = high; Between 50% & 90% = Medium; More than 90% = low	High	The Blue Drop Score for the District in 2015 was 73.21%	Medium	<ul style="list-style-type: none"> Water Services Authority (WSA) section function taken over from UTW since July 2012. Funding through grants-MIG. Research and policy- Budget has been set aside to review the Water Services Development Plan (WSDP) (currently old document-needs to be updated). Bulk Water and Sanitation Strategy- policy. The implementation of water provision in the district needs to be enhanced.
35	Decreased water quality in ecosystem due to increased	Increased drought mean less water is available to dilute	Is this or will this take place in your area?	Yes	Land degradation, Industrial effluent, poor sewerage, solid waste and	What is the Green Drop Score for the area?	High	The Green Drop Score for the District was 61.46%	Medium	<ul style="list-style-type: none"> Measures to monitor and improve water quality are

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
	concentrations of effluent and salt concentrations	wastewater discharges and irrigation return flows to rivers. This results in reduced water quality and associated downstream health risks to aquatic ecosystems.	area?		storm-water management are currently impacting on water and aquatic ecosystem quality in the District. Storm damage to water and sewerage related infrastructure. Pit latrines in rural areas overflow during floods.	Less than 50% = high; Between 50% & 90% = Medium; More than 90% = low		in 2015		<ul style="list-style-type: none"> identified in the EMF. Budget has been allocated to respond to the sanitation backlog in the District.
36	Less available water for irrigation and drinking	Increased periods of drought mean less water is available.	Is this or will this take place in your area?	Yes	In 2014/15 there were many cases of extreme water scarcity that were reported by areas in all four local municipalities. Worst affected by drought in 2015.	Years of drought over the past 20 years More than 7 incidence = High; Between 7 & 2 incidence = Medium; Less than 2 incidence = Low;	High	Drought experienced in 2014/15	Low	<ul style="list-style-type: none"> The District has mapped areas most at risk to drought. An amount of R48,520,224.00 has been made available to the municipality by the Department of Water and Sanitation for drought relief programme. Drilling of boreholes to address drought. Transfer schemes from the catchment areas.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
										<ul style="list-style-type: none"> Water quality could be a concern due to boreholes. Limited funding to address the issue of drought. Water being provided by water tankers for the community.
37	Increased impacts of flooding from litter blocking sewer system	Human health and ecosystem impacts, associated with increased rainfall intensities, flash floods and regional flooding resulting in litter and washed-off debris blocking water and sanitation systems.	Is this or will this take place in your area?	Yes	An increase in flash floods could result in the blocking of sanitation systems in the urban areas and pollution of rivers in the rural areas as the majority of residents in the district are not provided with adequate waste removal services.	Percentage of Households using no rubbish disposal More than 10% = High; Between 10% & 5% = Medium; Less than 5% = Low	High	14.05% of households do not have access to any form of refuse disposal, and more than 65% make use of their own refuse dumps.	Low	<ul style="list-style-type: none"> District is in the process of developing two regional waste sites. Limited capacity and funds to upgrade storm water infrastructure. The majority of residents in the district are not provided with adequate waste removal services. Endumeni landfill site is operational. Umvoti landfill site to be operational in the new financial year. Awareness campaigns to

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
										avoid littering. • Development of the IWMP in the Local and District Municipalities.
38	Increased fish mortality	Increased freshwater fish mortality due to reduced oxygen concentrations in aquatic environments and mortality of temperature-sensitive fish species.	Do you have fresh water fish in your area?	Yes	The dams and rivers host freshwater fish.	How significant is fresh water fish to livelihoods? Significant to livelihoods = High; Some dependence = Medium; Low/No dependence = Low	Low	Low dependence		

6.6 Vulnerability Assessment Summary

The tables below list the high and medium priority climate change indicators for uMzinyathi District Municipality.

6.6.1 High Priority Climate Change Indicators

Based on the above vulnerability assessment the following indicators were identified as high priority climate change vulnerabilities for the municipality. These were shortlisted by answering “yes” to exposure, “high” to sensitivity and “low” to adaptive capacity.

Table 26: High Priority Indicators uMzinyathi District Municipality

No	Sector	Indicator Title	Exposure Answer	Sensitivity Answer	Adaptive Capacity Answer
1	Agriculture	Change in grain (maize, wheat & barley) production	Yes	High	Low
3	Agriculture	Change in Soya Bean Production	Yes	High	Low
10	Agriculture	Increased risks to livestock	Yes	High	Low
12	Biodiversity and Environment	Loss of High Priority Biomes	Yes	High	Low
23	Human Health	Increased vector borne diseases from spread of mosquitoes, ticks, sandflies, and blackflies	Yes	High	Low
24	Human Health	Increased water borne and communicable diseases (e.g typhoid fever, cholera, bilharzia and hepatitis)	Yes	High	Low
25	Human Health	Increased malnutrition and hunger as a result of food insecurity	Yes	High	Low
26	Human Health	Increased air pollution	Yes	High	Low
27	Human Health	Increased Occupational health problems	Yes	High	Low
29	Human Settlements	Increased impacts on strategic infrastructure	Yes	High	Low
30	Human Settlements	Increased impacts on traditional and informal dwellings	Yes	High	Low
31	Human Settlements	Increased isolation of rural communities from services	Yes	High	Low
36	Water	Less water available for irrigation and drinking	Yes	High	Low
37	Water	Increased impacts of flooding from litter blocking sewer system	Yes	High	Low

6.6.2 Medium Priority Climate Change Indicators

Based on the above vulnerability assessment the following indicators were identified as medium priority climate change vulnerabilities for the municipality. These were shortlisted by answering “yes” to exposure, “medium” or “high” to sensitivity and “low” or “medium” to adaptive capacity

Table 27: Medium priority Indicators uMzinyathi District Municipality

No	Sector	Indicator Title	Exposure Answer	Sensitivity Answer	Adaptive Capacity Answer
6	Agriculture	Change in fruit production	Yes	Medium	Low
7	Agriculture	Change in other crop production areas (e.g. vegetables, nuts, etc.)	Yes	Medium	Medium
9	Agriculture	Increased exposure to pests such as eldana, chilo and codling moth	Yes	High	Medium
11	Agriculture	Reduced food security	Yes	High	Medium
13	Biodiversity and Environment	Increased impacts on threatened ecosystems	Yes	Medium	Medium
14	Biodiversity and Environment	Increased impacts on environment due to land-use change	Yes	High	Medium
15	Biodiversity and Environment	Loss of Priority Wetlands and River ecosystems	Yes	High	Medium
21	Human Health	Health impacts from increased storm events	Yes	High	Medium
22	Human Health	Increased heat stress	Yes	Medium	Medium
28	Human Settlements	Loss of industrial and labour productivity	Yes	Medium	Low
32	Human Settlements	Increased migration to urban and peri-urban areas	Yes	Medium	Medium
33	Human Settlements	Decreased income from tourism	Yes	Medium	Low
34	Water	Decreased quality of drinking water	Yes	High	Medium
35	Water	Decreased water quality in ecosystem due to increased concentrations of effluent and salt concentrations	Yes	High	Medium

7. Implementation Plan

Based on the highest emission sources and the key climate change vulnerability indicators that have been identified through the Climate Change Strategy, a range of interventions have been identified to respond to the impacts of climate change. These include a set of high level cross-cutting responses that are then followed by sector specific implementation plans. These sector specific implementation plans can be used in the corresponding section of the IDP and SDBIP for uMzinyathi District Municipality.

7.1 Cross Cutting Implementation Actions

It is recommended that this climate change response plan is incorporated into the uMzinyathi District Municipality's Integrated Development Plan and SDBIP so that the priority projects are implemented. It is also recommended that a climate change committee is set up to monitor the progress of the projects within the plan.

The following high-level cross-cutting sub-projects should be implemented:

7.1.1 Sub-Project 1: Review IDP for Climate Change “Credibility” and Revise based on Climate Change Response Plan

This will involve assessing the IDP using the DEA's IDP Climate Change Checklist for credibility to identify any gaps (The checklist can be found here <https://climatechangetraining.org/wp-content/uploads/sites/27/2017/04/Integrated-Development-Plan-Climate-Change-Checklist.docx>), and adding in narrative text on climate change in the IDP. A generic introduction statement about climate change and why it is important for Umzinyathi District should be included. This can be copied from the executive summary of the Climate Change Response Plan. Sector specific text for climate change integration should also be included and can be taken from the different sector summaries in the plan.

7.1.2 Sub-Project 2: Include climate response projects in the SDBIPs and MTEF budget allocations

This will involve setting up meetings with the sector managers to discuss the inclusion of projects in their sector plans and SDBIPs. The Sector Implementation Plans below can be used when meeting with the sector managers. This is a crucial step as it is when the budget for projects are formally agreed to. Targets and responsibilities should also be discussed with the sector managers.

7.1.3 Sub-Project 3: Communicating the municipal response to the community

This involves communicating with the public during the IDP consultation processes to ensure that the climate change components of the IDP are communicated.

7.1.4 Sub-Project 4: Project and programme implementation and monitoring

This involves the monitoring and implementation of the climate change response plan and includes the following tasks:

7.1.4.1 Set up a monitoring and evaluation system

A monitoring and evaluation system should be set up that clearly allocates roles and responsibilities, and sets timeframes and clear targets. Measurements of success should also be identified. A monitoring and evaluation template developed by the Department of Land Reform and Rural Development (DLDR) can be used as a guide here (<https://climatechangetraining.org/lesson/theme5-do-it-yourself/>).

7.1.4.2 Set up a climate change committee

A climate change committee will be set up as part of the existing District Disaster Management Forum that meets regularly. This forum is currently chaired by Mzwandile Hadebe. The following officials have volunteered as champions for climate change in the following sectors:

- **Biodiversity:** Nomsa Khanyile (KZN EDTEA)
- **Human Health:** Ajeeth Gurudial (Department of Health)
- **Environmental Health:** Sono Malinga (Environmental Health) (Proposed)
- **Human Settlements:** Ayanda Dlungwana (Planning Endumeni Local Municipality)
- **Water:** Bonginkosi Hlatshwayo (UMzinyathi District Municipality IDP) and Caiphus Ngubo (KZN EDTEA)
- **Agriculture:** Siegfried Haschke (KZN DARD) (Proposed)
- **Energy:** Ntokozo Ngubo (KZN EDTEA)
- **Transport:** Mohau Mokhantso (UMzinyathi District Municipality IDP)

7.1.5 Sub-Project 5: Review of climate change response plan

The Umzinyathi District Climate Response Plan along with the vulnerability assessment, greenhouse gas inventory, and priority responses should be reviewed annually by the climate change committee.

7.2 Energy Sector Implementation Actions

7.2.1 Introduction

Item	Description
Project Name	Energy Mitigation in response to Climate Change in uMzinyathi District Municipality
Project Custodian/Driver	Bonginkosi Hlatshwayo (UMzinyathi District Municipality IDP) Ntokozo Ngubo (KZN EDTEA) (Proposed)
Overview of Key Issues	The energy sector is a significant contributor of GHG emissions in the uMzinyathi District Municipality due to the reliance on coal generated electricity. Coal is a non-renewable resource with dire consequences for the environment. The energy sector does not only contribute towards climate change but is also at risk of experiencing climate change impacts. There are a number of different ways that climate change will impact the energy sector in uMzinyathi District Municipality. Projected changes in climate are likely to increase the number and severity of extreme weather events consequently affecting energy production and delivery. However, the use of alternative energy sources such as solar could decrease dependence on fossil fuel derived electricity. The use of alternative energy sources will assist the district to reduce GHG emissions associated with electricity use and simultaneously adapt to electricity provision challenges.
Objectives	Reduce the greenhouse gas emissions associated with energy by: <ol style="list-style-type: none"> 1. Promoting and implementing energy efficiency in the District 2. Investing in alternative energy in the District
Key Stakeholders	Municipality technical services, electricity Department, Eskom
Other Interested Parties	University of KwaZulu-Natal
Area / locality	UMzinyathi District Municipality
Regulatory and Legislative Framework	National Climate Change Response White Paper, Long Term Mitigation Scenarios (LTAS)
Existing Policies, Programme(s)/ Project(s)	

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Reduce the greenhouse gas emissions associated with energy use through the implementation of efficient energy initiatives.	DM and LMs technical services, electrical department, Eskom	TBD	TBD				

7.2.2 Sub-Project: Promote and implement energy efficiency initiatives ⁸

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Participate in Department of Energy Efficiency Demand Side Management (EEDSM) Program to reduce electricity use in municipality owned infrastructure.	DM and LMs technical services, electrical department	TBD	TBD				
2	Conduct awareness drives aimed at promoting energy efficiency in the municipality.	DM and LMs technical services, electrical department	TBD	TBD				
3	Develop an appropriate framework that will promote energy efficiency.	DM and LMs technical services, electrical department	TBD	TBD				
4	Replace traditional lighting technology with energy saving LED light bulbs in the District. The DM to do the replacement per LM, one at a time.	LMs and DM	12 months	R2 million				
5	Install geyser timers in all households in the District.	DM and LMs technical services, electrical department	12 months	R2 million				
6	Install prepaid electricity meters in households within the DM.	Eskom, LMs	12 months	R2 million				

⁸ The responses that are greyed out are the priority responses identified by stakeholders at the workshop on 27 July 2017.

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Reduce the greenhouse gas emissions associated with energy use through the implementation of alternative energy technologies.	Technical Services, electrical department	TBD	TBD				

7.2.3 Sub-Project: Investing in alternative energy sources⁹

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Pilot Renewable Energy use in the DM (e.g Solar PV Rooftop installations).	Technical Services, electrical department	TBD	TBD				
2	Develop a business plan for the installation of solar streetlights in rural areas within the District.	Technical Services, electrical department	2-3 years	R15 million				
3	Conduct a feasibility study on converting cowdung to biogas in the District	EDTEA	TBD	TBD				
4	Identify an area for implementing solar farms in Msinga	Msinga LM	TBD	TBD				

⁹ The responses that are greyed out are the priority responses identified by stakeholders at the workshop on 27 July 2017.

7.3 Transport Sector Implementation Actions

7.3.1 Introduction

Item	Description
Project Name	Transport Mitigation in response to Climate Change in uMzinyathi District Municipality
Project Custodian/Driver	Bonginkosi Hlatshwayo (UMzinyathi District Municipality IDP) Mohau Mokhantso (UMzinyathi District Municipality IDP) (Proposed)
Overview of Key Issues	The transport sector is a contributor of GHG emissions in the uMzinyathi District Municipality. This is due to the reliance on fossil fuel derived fuel for vehicles. Transport infrastructure in uMzinyathi District Municipality includes: roads, railway lines, air strips as well as bus and taxi rank infrastructure. Extreme storm events as a result of climate change will also negatively impact on the District's transport infrastructure. Climate change impacts, such as flooding, may damage key bridges such as those over the Tugela and Mooi Rivers. This will impact on the access of people to services. Promoting low carbon modes of transport in the district will assist in reducing carbon emissions associated with transport. Investing in transport related infrastructure will assist with preparing the District to cope with the impacts of severe weather events.
Objectives	Reduce the greenhouse gas emissions associated with transport by: <ol style="list-style-type: none"> 1. Investing in and promoting low carbon modes of public and private transport. 2. Investing in and promoting low carbon modes of freight transport. 3. Investing in and promoting waste minimization to reduce transport related emissions
Key Stakeholders	Technical Services, Public Works, Department of Transport, Planning
Other Interested Parties	University of KwaZulu-Natal
Area / locality	UMzinyathi District Municipality
Regulatory and Legislative Framework	National Climate Change Response White Paper, Long Term Mitigation Scenarios (LTAS)
Existing Policies, Programme(s)	A Rural Road Asset Management System programme is being developed

7.3.2 Sub-Project: Invest in and promote low carbon modes of public and private transport.¹⁰

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Reduce the greenhouse gas emissions associated with transport use through the use of low carbon modes of public and private transport.	LMs and DM with technical services, Planning, Public Works, Dept of Transport						

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Promote use of public transport e.g. taxis.	LMs and DM with technical services, Planning	10 year program	R10-20m million				
2	Encourage the use of biofuels for agricultural fleet i.e. tractors.	Agricultural Business Sector	5 year programme	>R50 million				
3	Develop a public transport master plan that incorporates centralisation of public service areas	LMs, DM, Planning, Public Works, Dept of Transport	2017-2035	R2 million				
4	Encourage car-pooling, walking and cycling with appropriate non-motorised infrastructure such as cycle parking bays	LMs and DM with technical services	TBD	TBD				

¹⁰ The responses that are greyed out are the priority responses identified by stakeholders at the workshop on 27 July 2017.

7.3.3 Sub-Project: Invest in and promote low carbon modes of freight transport

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Reduce the greenhouse gas emissions associated with freight transport	Department of Transport, LED	TBD	TBD				

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Promote collaboration with freight transport service providers	Department of Transport, LED	TBD	TBD				

7.3.4 Sub-project: Invest in and promote waste minimisation to reduce transport related emissions

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Reduce greenhouse gas emissions associated with the transport of waste	DEA, EDTEA, Waste Management, LMs, DMs	TBD	TBD				

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Encourage reduction, reuse and recycling of waste to minimise transport related fuel use from the waste sector.	DEA, EDTEA, Waste Management	1 year	TBD				
2	Conduct a feasibility study on the location of a waste plant in the District Municipality and identify ways of managing associated emissions.	DEA, EDTEA, Waste Management	1 year	>R500k				
3	Procurement of waste compressing trucks and implement a centralised waste recycling plant in the District Municipality.	LMs, DM, DEA, EDTEA	1 year	R2 million				

7.4 Agriculture Sector Implementation Actions

7.4.1 Introduction

Item	Description
Project Name	Agriculture Adaptation to Climate Change in uMzinyathi District Municipality
Project Custodian/Driver	Bonginkosi Hlatshwayo (UMzinyathi District Municipality IDP) Siegfried Haschke (KZN DARD) (Proposed)
Overview of Key Issues	Climate change is predicted to negatively impact on the agricultural sector in uMzinyathi District Municipality. Increased temperatures, variability in rainfall patterns and the associated drought seasons are projected to have a major impact on the agriculture sector as water availability will be compromised. Maize and Soybean are the most common crops currently grown, whilst cattle, sheep and goats are the main livestock kept. A high percentage of households (45.50%) are involved in agricultural activities in the District, with a large number of subsistence farmers that currently do not have the capacity to respond to the changes in climate that are projected.
Objectives	Improve climate change resilience of the agriculture sector to deal with the following vulnerabilities: <ol style="list-style-type: none"> 1. Manage the change in grain production areas 2. Manage the change in soya bean production 3. Manage increasing risks to livestock
Key Stakeholders	Commercial and subsistence farmers, DARD and DRDLR
Other Interested Parties	University of KwaZulu-Natal
Area / locality	UMzinyathi District Municipality
Regulatory and Legislative Framework	National Climate Change Response White Paper, Long Term Adaptation Scenarios (LTAS)
Existing Policies, Programme(s)	<p>Policy: The uMzinyathi Environmental Management Framework (EMF) identifies an Environmental Management Zone for Agriculture that identifies areas of high agricultural potential.</p> <p>Research: A set of crop production potential maps have been developed by DARD that take climate change into account.</p> <p>Projects: The DAEA has invested in maize irrigation projects in the District including the Umvoti- Maize Cultivar Breeding Project. KZN Dept of Agriculture is assisting small scale farmers through the Agricultural mechanization programme. DAEA has invested in vegetable irrigation projects in the District. KZN Dept of Agriculture is assisting small scale farmers through the Nquthu wool sheep farming project. DAEA is implementing livestock Intervention Programmes.</p>

7.4.2 Sub-Project: Manage the change in grain production areas¹¹

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Adapt to the shift of grain (maize) production areas towards the east of RSA.	DARD and DRDLR						

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Implement a land capability mapping and awareness program to identify high production areas for annual cropping on a ward basis. To be completed by 2020 for all Land Reform and Traditional Cropping Areas.	DARD and DRDLR	Going to be reviewed in the 2016/2017 financial year, take place over 3 years	R3M				
2	Implement minimum and zero till practices in the limed and fertilised areas through coordination with various departments.	DARD	Project to be completed in phases with an ongoing target of 1000ha annually	TBD				
3	Implement a capacity building programme that supports soil sampling and its interpretation to rectify identified liming and fertility deficiencies in the mapped production areas of the LRAD and traditional cropping area. This will result in only the best soils being used for planting. The focus here should be on small scale production areas.	DARD	Project to be completed in phases with an ongoing target of 1000ha annually	R10M				

¹¹ The responses that are greyed out are the priority responses identified by stakeholders at the workshop on 27 July 2017.

7.4.3 Sub-Project: Manage the change in soya bean production areas

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Adapt to the loss of soya bean production in the east of RSA while suitable areas expand inland towards the central/west of	DARD						

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Implement a land capability mapping and awareness program to identify high production areas for annual cropping on a ward basis. To be completed by 2020 for all Land Reform and Traditional Cropping Areas.	DARD and DRDLR	Going to be reviewed in the 2016/2017 financial year, take place over 3 years	R3M				
2	Implement a capacity building programme that supports soil sampling and its interpretation to rectify identified liming and fertility deficiencies in the mapped production areas of the LRAD and traditional cropping area. This will result in only the best soils being used for planting. The focus here should be on small scale production areas.	DARD	Project to be completed in phases with an ongoing target of 1000ha annually	TBD				
3	Implement minimum and zero till practices in the limed and fertilised areas through coordination with various departments.	DARD and local municipalities	Project to be completed in phases with an ongoing target of 1000ha annually	TBD				

7.4.4 Sub-Project: Manage increasing risks to livestock¹²

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Minimise negative health impacts on livestock due to decreases in rainfall and reduction in herbage yields	DARD, Local Government- LED, EDTEA, Umzinyathi District Municipality						

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Conduct an awareness and capacity building campaign to educate farmers on the carrying capacity of the various grazing areas so that they engage in livestock farming practices that consider the available resources.	DARD, Local Government- LED, EDTEA	To be completed by 2020 in four local municipalities	R1M per annum				
2	Provide water reticulation systems for the existing dip tank communities.	DARD, Umzinyathi District Municipality	Ongoing- Target 3 per annum	R6M per annum				
3	Implement a farming program for dip tank programs that have completed their water provision designs.	DARD	Ongoing- Target 3 per annum	R6M per annum				

¹² The responses that are greyed out are the priority responses identified by stakeholders at the workshop on 27 July 2017.

7.5 Biodiversity Sector Implementation Actions

7.5.1 Introduction

Item	Description
Project Name	Biodiversity Adaptation to Climate Change in uMzinyathi District Municipality
Project Custodian/Driver	Bonginkosi Hlatshwayo (UMzinyathi District Municipality IDP) Nomsa Khanyile (KZN EDTEA) (Proposed)
Overview of Key Issues	<p>Biodiversity is crucial to ecosystem health, and healthy ecosystems are central to human well-being. Healthy ecosystems interlinked with working landscapes and other open spaces form the ecological infrastructure of the country and are the foundation for clean air and water, fertile soil and food. All South Africans depend on healthy ecosystems for economic and livelihood activities, including agriculture, tourism and a number of income generating and subsistence level activities. In uMzinyathi District, these natural ecosystems are under pressure from land use change and related processes causing degradation, as well as invasive alien species. Accelerated climate change (resulting in increasing temperature, rising atmospheric CO₂ and changing rainfall patterns) is exacerbating these existing pressures.</p> <p>UMzinyathi District Municipality has high levels of biodiversity and is home to a wide variety of ecosystems. The changes in climate are predicted to result in the shifting of biomes across the District Municipality. UMzinyathi District Municipal Area is dominated by the grassland and savanna biomes, and it is forecast that the grassland biome will be replaced by the savanna biome under different climate scenarios. This change will place pressure on the natural ecosystems and impact both fauna and flora species' distribution.</p> <p>Well-functioning ecosystems provide natural solutions that build resilience and help society adapt to the adverse impacts of climate change. This includes, for example, buffering communities from extreme weather events such as floods and droughts, reducing erosion and trapping sediment, increasing natural resources for diversifying local livelihoods, providing food and fibre, and providing habitats for animals and plants which provide safety nets for communities during times of hardship.</p>
Objectives	<p>Improve climate change resilience of the biodiversity sector to deal with the following vulnerabilities:</p> <ol style="list-style-type: none"> 1. Manage the loss of grasslands due to the biome being replaced by the Savannah biome.
Key Stakeholders	EDTEA, DEA, EKZN Wildlife
Other Interested Parties	University of KwaZulu-Natal
Area / locality	UMzinyathi District Municipality
Regulatory and Legislative Framework	National Climate Change Response White Paper, Long Term Adaptation Scenarios (LTAS)
Existing Policies, Programme(s)/ Project(s)	Policy: Environmental Management Framework (EMF) and Biodiversity Sector Plan for the District has been drafted

7.5.2 Sub-Project: Manage the loss of grasslands due to the biome being replaced by the Savanna biome¹³

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Manage the loss of Grassland (Most threatened biome) with large portions of the biome being replaced with savanna.	Umzinyathi LMs and DMS, EDTEA, EKZN Wildlife, DARD, DEA, Department of Education						

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Develop environmental units that deal with environmental management issues within the District and local municipalities	Umzinyathi LMs and DMS	TBD	TBD				
2	Prioritise projects identified in the district's Environmental Management Framework (EMF) that can be used to respond to the loss of priority biomes	Umzinyathi DM	TBD	<R200K				
3	Manage alien plants in water production areas to conserve water resources	EPWP, EDTEA, Umzinyathi DM	Ongoing, annually	R500K				
4	Implement donga rehabilitation programmes	DARD, DEA	14 months	R17 million				
5	Identify priority areas that need to be conserved within local and district Municipalities	EKZN Wildlife	TBD	<R200K				
6	Create education and awareness programmes on priority biomes	EDTEA, LMs and DMS, Department of Education	Annually	R1 million				

¹³ The responses that are greyed out are the priority responses identified by stakeholders at the workshop on 27 July 2017.

7.6 Health Sector Implementation Actions

7.6.1 Introduction

Item	Description
Project Name	Human Health Adaptation to Climate Change
Project Custodian/Driver	Bonginkosi Hlatshwayo (UMzinyathi District Municipality IDP) Ajeeth Gurudial (Department of Health) Sono Malinga (Environmental Health) (Proposed)
Overview of Key Issues	The human health sector in the District may be impacted by the changing climate in a number of different ways. Projected increases in temperatures due to climate change will result in increased heat stress and impact particularly the young and elderly, and those working outdoors in agriculture and in the mines. Favourable conditions for the incubation and transmission of vector borne and waterborne diseases may be created by increasing air and water temperatures. Malnutrition and disease interact strongly, and there is a key relationship between environmental quality, food security, and the disease burden of communities. Furthermore, severe storm events may result in increased risk of drowning and injuries.
Objectives	Increase the resilience of human health towards climate change impacts to deal with the following vulnerabilities: <ol style="list-style-type: none"> 1. Manage the increasing vector borne diseases from spread of mosquitoes, ticks, sandflies, and blackflies. 2. Manage the increasing water borne and communicable diseases (typhoid fever, cholera, bilharzia & hepatitis). 3. Manage increased malnutrition and hunger as a result of food insecurity. 4. Manage health impacts of increased air pollution. 5. Manage the increasing occupational health problems.
Key Stakeholders	Environmental Health LM's, Department of Health, Department of Social Development, Local Communities, COGTA
Other Interested Parties	Local Communities
Area / locality	UMzinyathi District Municipality
Regulatory and Legislative Framework	National Climate Change Response White Paper, Long Term Adaptation Scenarios (LTAS)
Existing Policies, Programme(s)/ Project(s)	Policies: Umzinyathi District has a Disaster Management Sector Plan

7.6.2 Sub-Project: Manage the increasing vector borne diseases from spread of mosquitoes, ticks, sandflies, and blackflies¹⁴

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Contain the spread of vector borne diseases from mosquitoes, ticks, sandflies and blackflies into regions bordering existing malaria areas that are currently too cold for transmission.	LM Environmental Health, Department of Health	TBD	TBD				

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Increase the capacity of local health facilities to deal with diseases resulting from climate change.	LM Environmental Health, Department of Health	1 year	1 million				
2	Conduct research, in collaboration with the Department of Health and research institutes, to identify communities that are vulnerable to the spread of vector-borne diseases.	LM Environmental Health, Department of Health	1 year	R200,000.00				
3	Create awareness programmes on vector-borne diseases.	LM Environmental Health	1 year	1.million				

¹⁴ The responses that are greyed out are the priority responses identified by stakeholders at the workshop on 27 July 2017.

7.6.3 Sub-Project: Manage the increasing water borne and communicable diseases (typhoid fever, cholera, bilharzia & hepatitis)¹⁵

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Manage the growth of water borne and communicable diseases whose incubation and transmission is favoured by the increasing air and water temperatures.	LM Environmental Health, Department of Health	1 Year	2.5 million				

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Plan and prioritise upgrades for water and stormwater related infrastructure.	LM Environmental Health, Department of Water and Sanitation	TBD	TBD				
2	Motivate to the Department of Health to provide more mobile clinics to rural communities in the District.	Department of Health	2017/2018 Financial year	>R1Mil				
3	Increase awareness campaigns around health issues and climate change through Community Care Givers (CCG's), War rooms and Operation Sakuma Sakhe (OSS) on a quarterly basis	LM Environmental Health, Department of Health	Every Quarter	<R200 k				
4	Commission research to investigate alternative water purification methods for households without adequate access to purified water.	LM Environmental Health	TBD	TBD				
5	Ensure continuous monitoring of drinking water quality and natural water resources.	LM Environmental Health	TBD	TBD				
6	Environmental Health Practitioners employed by Umzinyathi District Municipality to implement Health and Hygiene awareness programs to communities on how to prevent water borne and communicable diseases.	LM Environmental Health Department of Health	TBD	TBD				

7.6.4 Sub-Project: Manage increased malnutrition and hunger as a result of food insecurity¹⁶

¹⁵ The responses that are greyed out are the priority responses identified by stakeholders at the workshop on 27 July 2017.

¹⁶ The responses that are greyed out are the priority responses identified by stakeholders at the workshop on 27 July 2017.

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Reduce malnutrition and hunger due to food insecurity.	COGTA, Local Government: LED, EDTEA, Planning, Environmental Health, DARD, Department of Social Development	TBD	TBD				

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Promote urban agriculture in order to improve food security in urban areas particularly in informal settlements	COGTA, Local Government: LED, EDTEA, Planning, Environmental Health, DARD	2.5 years	R1.5 million				
2	Implement a social relief programme that provides food to households without food	DM:LED, Department of Social Development	Annually	R3.4 million				
3	Collaborate with universities and the Department of Agriculture to capacitate communities in food gardening and crop suitability.	DARD	TBD	TBD				
4	Educate communities on livelihood diversification strategies (waste recycling/buy-back centres).	Local Government: LED	TBD	TBD				
5	Establish community food gardens in collaboration with the Department of Agriculture, Local Economic Development and the South African Institute of Environmental Health.	DARD, LED	TBD	TBD				
6	Integration of food safety practices for prevention of food borne diseases.	Environmental Health	TBD	TBD				

7.6.5 Sub-Project: Manage health impacts of increased air pollution

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Manage the effects of exposure to increased air pollutants such as eye irritation, acute respiratory infection, chronic	EDTEA, Environmental	TBD	TBD				

respiratory diseases and TB.	Health						
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No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Encourage the planting of indigenous trees during Arbor Week to absorb carbon dioxide	EDTEA	TBD	>R1Mil				
2	Identify alternative energy sources such as solar, wind and hydro energy that can be used in the Municipality	EDTEA	TBD	>R1Mil				
3	Conduct awareness campaigns on efficient energy use	EDTEA, Environmental Health	TBD	<R200K				
4	Develop a comprehensive emissions inventory to identify the sources of pollution in the area.	EDTEA	TBD	TBD				
5	Initiate community awareness campaigns to improve indoor air quality (e.g. pot plants to reduce indoor air pollution)	Environmental Health	Every quarter	2 million				

7.6.6 Sub-Project: Manage the increasing occupational health problems

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Managed increased occupational health problems caused by heat stress and dehydration.	LMS- Environmental Health, Department of Health, Department of Labour, Disaster Management	TBD	TBD				

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Identify and profile the groups that are most vulnerable to heat stress and dehydration.	LMS-Environmental Health, Department of Health	TBD	TBD				
2	Conduct awareness campaigns on the health risks of high temperatures in the workplace, and inform on appropriate responses such as improved ventilation and promotion of behaviors that increase resilience.	Department of Labour, Environmental Health, Department of Health	TBD	TBD				
3	Commission a reliable early warning system that will alert industries and businesses about extreme weather events, in order to manage the exposure of their employees.	Disaster Management	TBD	TBD				
4	Development of a health hazard response plan by next financial year by the Department of Health (Need to establish whether the Department of Health has this in place already).	Department of Health, Disaster Management, Environmental Health	TBD	R200k-R1million				

7.7 Human Settlements, Infrastructure, and Disaster Sector Implementation Actions

7.7.1 Introduction

Item	Description
Project Name	Human Settlements Infrastructure, and Disaster Sector Adaptation to Climate Change in uMzinyathi District Municipality
Project Custodian/Driver	Bonginkosi Hlatshwayo (UMzinyathi District Municipality IDP) Ayanda Dlungwana (Planning Endumeni Local Municipality) Mzwandile Hadebe (Disaster Management) (To be confirmed) (Proposed)
Overview of Key Issues	There are a number of different ways that climate change may impact on human settlements and infrastructure in uMzinyathi District Municipality. Increases in the severity of storm events and increase in flooding will damage strategic infrastructure which may result in service delivery disruptions. The impacts of storm events will particularly affect communities located in informal and traditional dwellings, on flood plains and where there is poor drainage infrastructure. In addition, uMzinyathi District Municipality is a mostly rural district, and the communities in rural areas that depend on subsistence farming may be unable to grow crops that they have grown in the past due to the changing climate. It is predicted that there will therefore be an increase in rates of rural-urban migration. and Rural communities may also become more physically isolated from accessing services due to extreme weather events impacting on key infrastructure.
Objectives	Increase the adaptive capacity of human settlements towards climate change impacts to deal with the following vulnerabilities: <ol style="list-style-type: none"> 1. Manage potential increased impacts on strategic infrastructure. 2. Manage potential increased impacts on informal and traditional settlements. 3. Manage potential increased isolation of rural communities from services.
Key Stakeholders	Planning Department, Dept of Human Settlements, LMs, COGTA, DM, local communities, Dept of Transport, Disaster Management, Housing, Technical Services
Other Interested Parties	University of KwaZulu-Natal
Area / locality	Umzinyathi District Municipality
Regulatory and Legislative Framework	National Climate Change Response White Paper, Long Term Adaptation Scenarios (LTAS)
Existing Policies, Programme(s)/ Project(s)	Policies: Umzinyathi District has a Disaster Management Sector Plan, and a series of disaster risk maps Projects: A Rural Road Asset Management System programme is being developed

7.7.2 Sub-Project: Manage potential increased impacts on strategic infrastructure

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Minimise disruptions to key transport infrastructure (roads, rails, bridges, airports, tunnels) as a result of extreme weather events.	Dept of Transport, LMs, Planning Department	TBD	TBD				

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Develop an integrated district transport plan within a year. (To be implemented by the Planning Department)	Dept of Transport, LMs, Planning Department	2017/18 Financial year	TBD				
2	Implement the integrated district transport plan in five years, incorporating it into the Operational Maintenance Plans (OMPs) etc.	Dept of Transport, LMs, Planning Department	5 years	TBD				
3	Conduct continuous monitoring and evaluation of the integrated district transport plan	Dept of Transport, LMs, Planning Department	Continuous	TBD				
5	Incorporate climate change adaptation when planning, designing and implementing transport infrastructure to ensure that new building designs are climate change resilient	Umzinyathi DM and LMs, Planning, Department of Transport	TBD	TBD				

7.7.3 Sub-Project: Manage potential increased impacts on informal and traditional dwellings¹⁷

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Minimise the impacts of extreme weather events to already vulnerable informal and traditional dwellings, that are often unplanned, and without extensive service or infrastructure.	Planning Department, Dept of Human Settlements, LMs,	TBD	TBD				

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Develop a housing/human settlements sector plan that incorporates climate change for each local municipality within the district. To be initiated by the Planning Department.	Dept of Human Settlements, LMs, Planning	1 year	TBD				
2	Create an awareness on proper land use management and the impacts of locating informal/traditional housing on floodplains	Municipality Technical services	Continuous	TBD				
3	Upgrade existing storm water systems in order to minimise impacts on traditional and informal dwellings	Municipality Technical services	Continuous	R21 million				
4	Implement the housing/ human settlements sector plans for each local municipality within the district.	Dept of Human Settlements, LMs, Planning	TBD	TBD				
5	Conduct continuous monitoring and evaluation of the housing/human settlements sector plans within the district.	Dept of Human Settlements, LMs, Planning	TBD	TBD				

¹⁷ The responses that are greyed out are the priority responses identified by stakeholders at the workshop on 27 July 2017.

7.7.4 Sub-Project: Manage potential increased isolation of rural communities from access to services

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Minimise the physical isolation of rural communities as a result of poor rural roads and increased flooding and erosion.	Planning, LED, LMs, Dept of Transport, COGTA, EDTEA	TBD	TBD				

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Conduct research to identify the rural isolated communities. This should be done by Planning and LED team within a year.	Planning, LED, LMs	1 year	TBD				
2	Implement a response plan through LED strategies that focuses on the impacts of climate change on rural communities.	LED, LMs	TBD	TBD				
3	Commission research to identify roads at risk of flooding and erosion, and prioritise those for upgrading and maintenance.	Dept of Transport, COGTA (Disaster)	TBD	TBD				
4	Develop economic nodes and improve service provision in rural areas to improve connectivity.	LED, EDTEA, COGTA	TBD	TBD				

7.8 Water Sector Implementation Actions

7.8.1 Introduction

Item	Description
Project Name	Water Sector Adaptation to Climate Change in uMzinyathi District Municipality
Project Custodian/Driver	Bonginkosi Hlatshwayo (UMzinyathi District Municipality IDP) and Caiphus Ngubo (KZN EDTEA) (Proposed)
Overview of Key Issues	UMzinyathi District Municipality is currently experiencing issues of water scarcity and quality. The potential demand for water is expected to increase with economic growth, increased urbanisation, higher standards of living, and population growth. Drought, reduced runoff, increased evaporation, and an increase in flood events, as a result of climate change will impact on both water quality and quantity. In addition to this, the groundwater capacity within the District may decrease and possibly impact on households that are dependent on this source of water.
Objectives	Equip the water sector with climate change adaptation responses that will increase resilience when dealing with the following vulnerabilities: <ol style="list-style-type: none"> 1. Manage the quantity of water available for irrigation and drinking. 2. Manage the increased impacts of floods due to litter blocking the sewer system.
Key Stakeholders	Umzinyathi DM, LMs, Technical Services, Stormwater, MISA, COGTA, Dept Water and Sanitation
Other Interested Parties	University of KwaZulu-Natal
Area / locality	UMzinyathi District Municipality
Regulatory and Legislative Framework	National Climate Change Response White Paper, Long Term Adaptation Scenarios (LTAS)
Existing Policies, Programme(s)/ Project(s)	Policies: Review of the Water Services Development Plan (WSDP) Projects: Drought relief programme includes the provision of water tankers to provide water to communities on a monthly basis, a spring protection programme, as well as the refurbishment and drilling of new boreholes.

7.8.2 Sub-Project: Manage the quantity of water available for irrigation and drinking.¹⁸

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Manage the quantity of water available for irrigation and drinking which could be affected by increasing water temperatures linked to higher ambient temperatures.	Umzinyathi DM, LMs, Technical Services, Stormwater, MISA, COGTA	TBD	TBD				

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Research groundwater potential in the area and conduct a feasibility study on drilling additional boreholes	Umzinyathi DM, LMs, Technical Services, Water and Sanitation	TBD					
2	Conduct an assessment on leakages and spillages using programmes such as the Department of Water and Sanitation's "War on Leaks" programme.	Umzinyathi DM	TBD					
3	Conduct research on the feasibility of including rainwater harvesting initiatives/measures in newly built homes within the District.	Human Settlements and Water Services in LMs	6 months	R200k				
4	Conduct a hydrocensus on existing boreholes to determine the quality and quantity of groundwater within the District.	Water Services	8 months	R1.5 million				
5	Review and implement the District Water Services Management Plan	Umzinyathi DM	TBD	>R1Mil				
6	Fix and maintain existing water management schemes to minimise leaks and save water. (Water Demand and management, currently happening in Endumeni).	LMs, Technical Services, Stormwater	TBD	>R1Mil				
7	Review and implement Operation and Maintenance plan	MISA, UDM, COGTA	Ongoing	>R1Mil				
8	Review and implement the Water Demand and Conservation Management project	UDM, LMs	TBD	>R1Mil				
9	Review and implement the Bulk and Water Sanitation strategy	UDM Technical Services	TBD	>R1Mil				

¹⁸ The responses that are greyed out are the priority responses identified by stakeholders at the workshop on 27 July 2017.

10	Create awareness campaigns that educate communities on conducting MINISASS assessments in order to determine the purity of water through species identification.	Department of Education, District Water and Sanitation	8 months	R300k				
11	Implement an alien eradication program in water production areas to reduce the quantity of water used by alien vegetation.	EPWP	Annually	<R500k				
12	Develop and implement water quality plan to monitor community water sources.	Environmental Health	TBD					

7.8.3 Sub-Project: Manage the increased impacts of floods due to litter blocking the sewer system

Sub-Project Aim	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
Reduce impacts on human health and ecosystems, as increased rainfall intensities, flash floods and regional floods cause litter and washed-off debris thus blocking water and sanitation systems.	EDTEA, LMs, Dept of Enviro Affairs, Waste Management, Dept of Education, Environmental Health	TBD	TBD				

No	Sub-Project Activities	Responsible Department	Timeframe	Budget	Q1 Target	Q2 Target	Q3 Target	Q4 Target
1	Raise community awareness on waste management and the impact of pollution and waste on drinking water, stormwater and sanitation systems.	Dept of Education, EDTEA, Waste Management, Environmental Health, LM	1 year	1 Million				
2	Develop a community stormwater systems' clearing and monitoring programme, in collaboration with the existing Expanded Public Works Programme.	LM's Technical Services	TBD	TBD				
3	Facilitate the development of refuse removal plans and strategies for rural communities.	LMs, Waste Management, Dept of Enviro Affairs	TBD	TBD				
4	Conduct clean up campaigns around freshwater systems such as rivers and springs.	EDTEA, LMs, Dept of Enviro Affairs	TBD	R600k				
5	Renovation of Nodweni landfill site in Nguthu Local Municipality to improve management of waste in that area.	LMs, DM, DEA, EDTEA	1year	2.5 million				

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Appendices

Appendix 1: Environmental Management Zones as per the uMzinyathi Environmental Management Framework (Nemai Consulting 2016c)



Figure 31: Terrestrial Biodiversity Environmental Management Zone (EMZ) (Nemai Consulting 2016c)

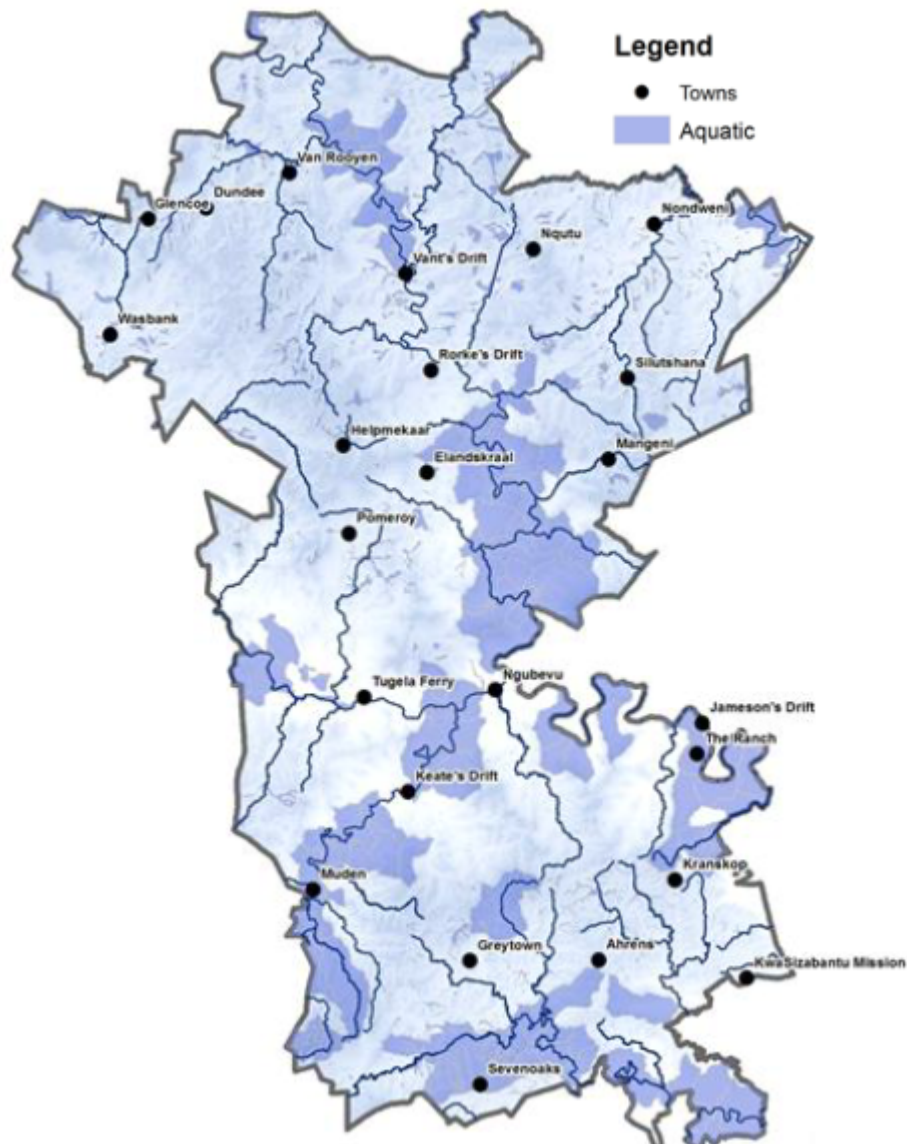


Figure 32: Aquatic Biodiversity EMZ (Nemai Consulting 2016c)

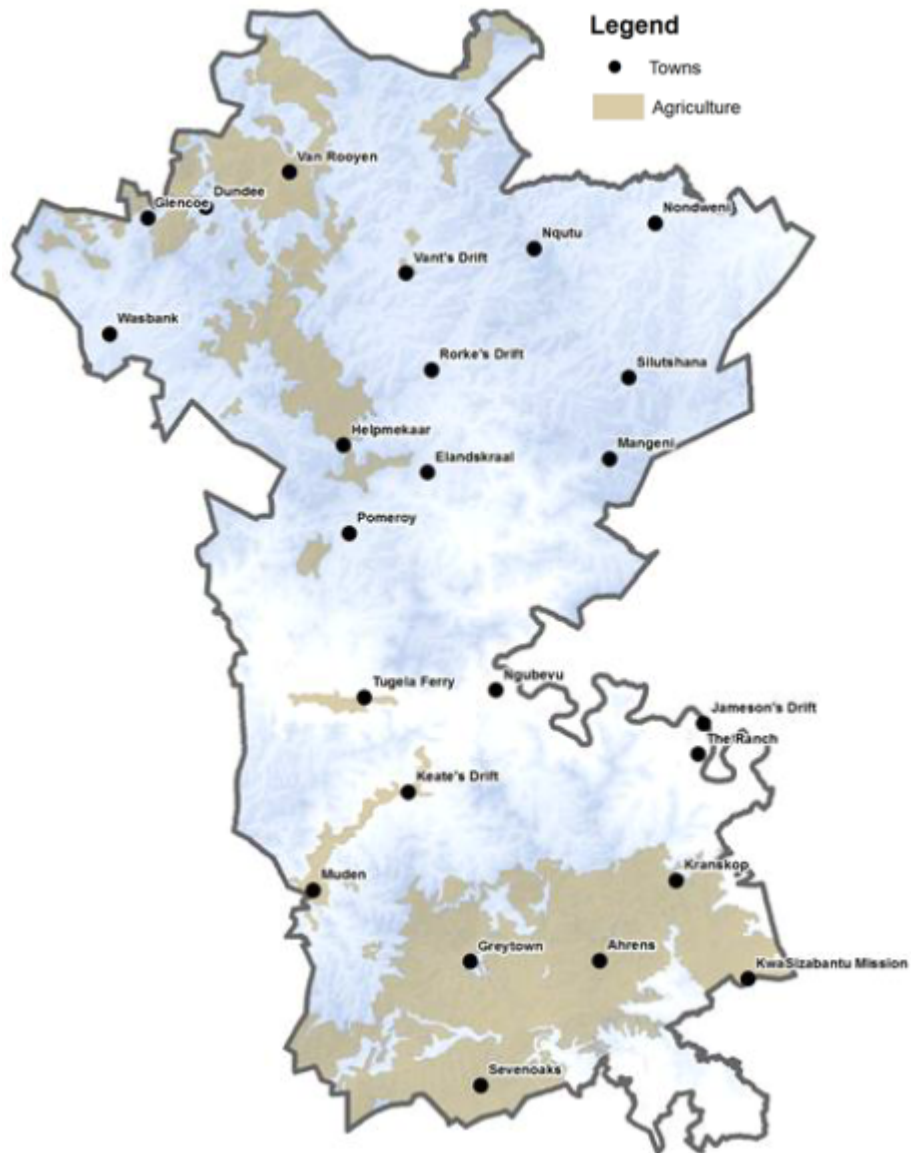


Figure 33: Agriculture EMZ (Nemai Consulting 2016c)

Appendix 2: Umzinyathi Disaster Risk Maps (UMzinyathi District Municipality 2015a)

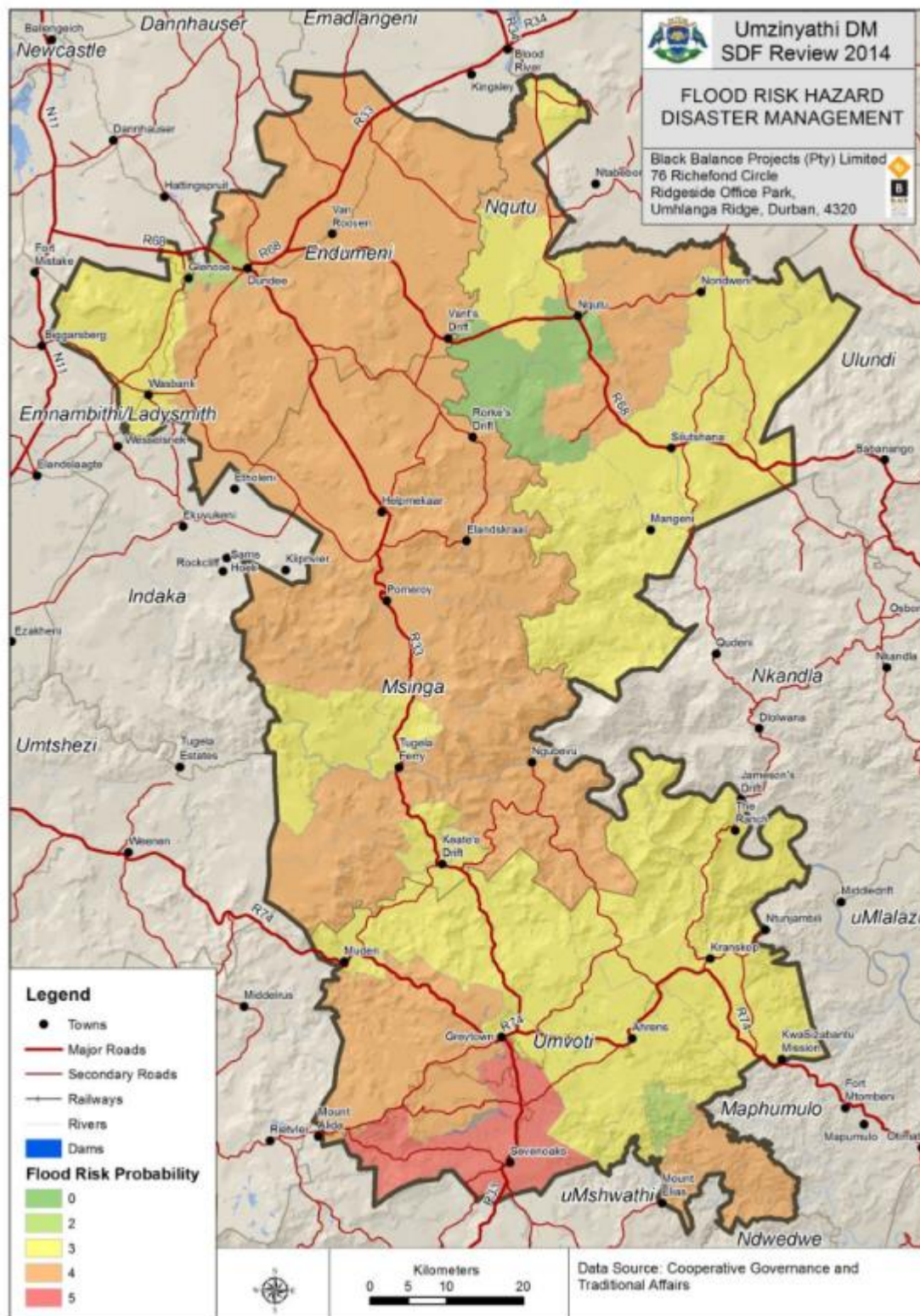
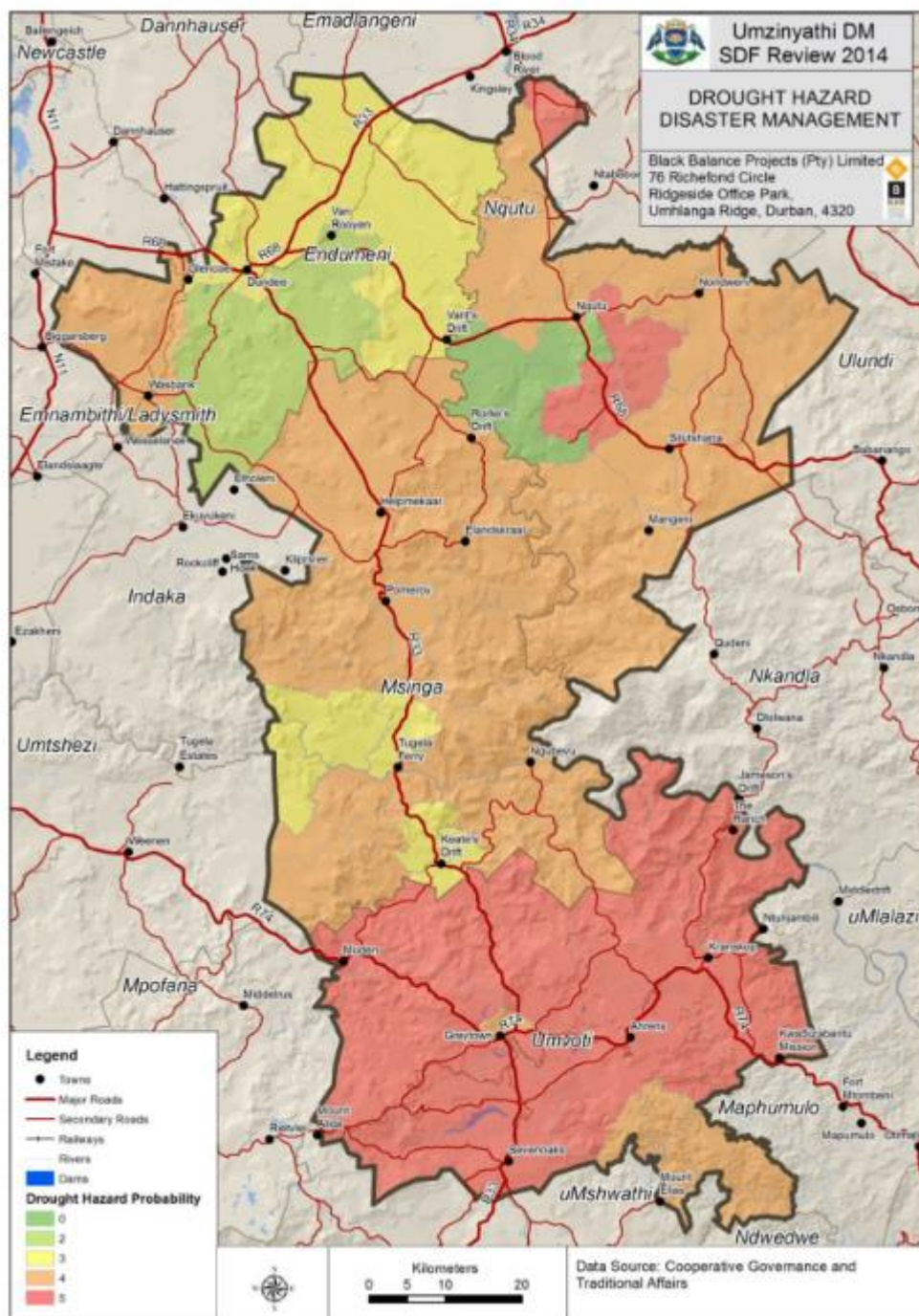


Figure 34: Flood risk map for Umzinyathi District Municipality (UMzinyathi District Municipality 2015a)



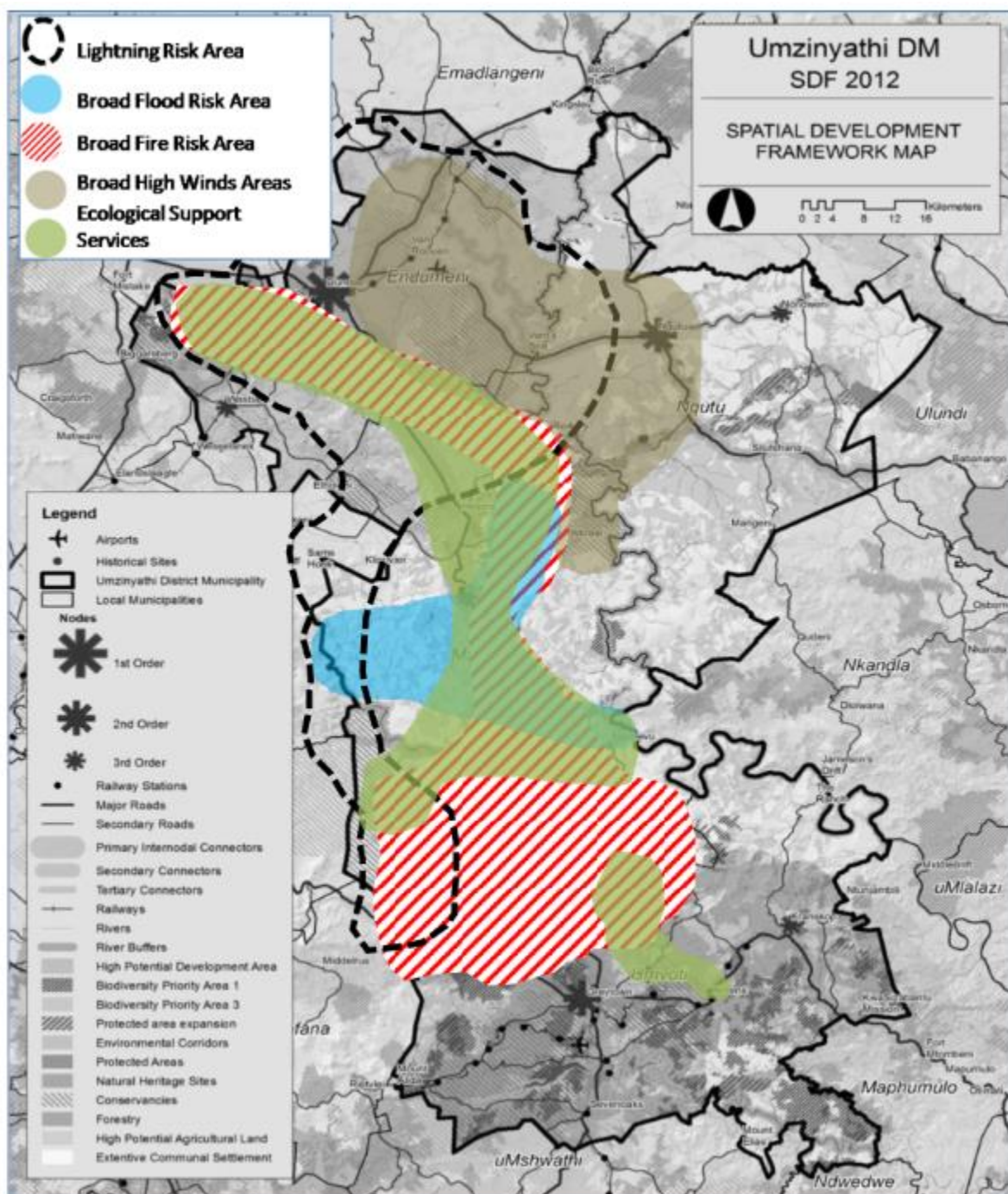


Figure 36: Combined Disaster Risk Map for Umzinyathi District Municipality (UMzinyathi District Municipality 2015a)