UGU DISTRICT MUNICIPALITY
ENVIRONMENTAL MANAGEMENT FRAMEWORK, KWAZULU-NATAL

LANDSCAPE CHARACTER ASSESSMENT

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Lourens du Plessis from MetroGIS (Pty) Ltd undertook the Landscape Character Assessment in his capacity as a geographer, visual assessment specialist and Geo-Information Science (GISc) professional. Lourens has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990. He has extensive practical knowledge in spatial analysis, environmental modeling and digital mapping, and applies this knowledge in various scientific fields and disciplines. His GIS expertise is often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Frameworks.

1. INTRODUCTION

The **Ugu District Municipality** is a coastal district located in the KwaZulu-Natal (KZN) Province. It is the most southern of the province's districts and is bordered by the Eastern Cape Province to the south and the eThekwini District Municipality (city of Durban) to the north. The region is commonly referred to as the KZN south-coast and is a popular holiday destination due to its location along the Indian seaboard and its subtropical climate.

The region is easily accessible from Durban via the N2 national road. Besides tourism, the district is also known as a large producer of bananas, sugar cane and forestry products. It does not have a large industrial or manufacturing component, and has largely escaped any formal mining activities.

The district is home to the famous Oribi Gorge Nature Reserve, and the largest town is Port Shepstone. Other major conservation or protected areas include Umtamvuna, Mbumbazi, Vernon Crookes and two unnamed reserves located along the Ngele escarpment.

The district has a rich cultural heritage and the takes its name from the Zulu word *Ugu*, meaning "coast". The interior of the district is commonly referred to as Pondoland and has a largely rural character, with great tracts of land still in its natural state.

2. METHODOLOGY FOR THE LANDSCAPE CHARACTER ASSESSMENT

The methodology for the assessment of the landscape/land use character for the Ugu District Municipality includes an investigation into the general topography of the region, the terrain morphology, the broad land cover and land use patterns, and a visual assessment aimed at determining the visual exposure within the district.

These individual data categories are evaluated, rated and merged in order to determine the *landscape value* or *scenic quality index*. The result of this index is further analysed in order to identify zones with similar characteristics (in respect of the aforementioned categories), to delineate zones and to provide management guidelines (where applicable) for each zone.

3. DATA CATEGORIES

3.1 Topography/Shaded Relief Map

The surface elevation (or altitude) of the Ugu district ranges from 0m (sea level) to 2267.7m above sea level. The highest point within the district is the peak of

the Ngele mountain (part of the Ngele escarpment), which forms the western boundary of the district. Large parts of the district towards the coast line and along the many river valleys have an elevation below 600m above sea level. The most prominent of these valleys are the Mtamvuna (southern boundary of the district), Mzimkhulu and Mkomazi rivers. Please refer to **Map 1** below.

Besides the many river valleys, the district is further characterized by a great variation in slope elevation (i.e. steep slopes), resulting in a very undulating and hilly topography. These topographical features and the terrain morphology are discussed in more detail under the next heading.

Figure 1: Google Earth Street View of the Ngele mountain range.

Ugu District Municipality Environmental Management Framework

Map 1: Shaded Relief Map.

LEGEND

- Ugu District Municipality Boundary
- Town/Built-up Area
- Rural Settlement (low density)
- Mines/Quarries
- Perennial River
- Estuary
- Secondary Road
- Arterial/Main Road
- National Road
- Nature Reserve

SHADED RELIEF MAP
Elevation above sea level (m)

- 150
- 300
- 450
- 600
- 750
- 900
- 1050
- 1200
- 1350
- 1500
- 1650
- 1800
- 1950
- 2100
- 2250
- 2400

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3.2 Terrain Morphology

The terrain morphological units were derived from a combination of inputs or analyses. They have as their basis the South African Land Types, as supplied by the Agricultural Research Council (ARC), supplemented with a detailed slope analysis and an elevation range analysis.

The Land Type units were merged with the slope analysis in order to determine the percentage of steep slopes (slope greater than 25% or 1:4 ratio) per Land Type. The result of this determines the level of undulation for each Land Type (i.e. whether it is flat, undulating or severely undulating). This analysis is then combined with the elevation ranges in order to determine the elevation of each land type unit above **ground/base** level in order to identify mountains and tall hills. Alternately, a considerable drop in base level would indicate prominent river valleys or gorges. Where needed, or in some cases where the land type units were too broadly delineated, the terrain morphological units were supplemented by manual interpretation and mapping. The terrain morphological units (as indicated on **Map 2** below) are described in more detail below.

High Mountains
Terrain morphological features with an elevation exceeding 600m above base level were indicated as high mountains. This height above base level may not be representative of international or even national standards for high mountains (i.e. comparative to mountains along the Drakensberg escarpment), but is intended as a regional perspective.

Three areas with high mountains were identified within the Ugu District. These include the Ngele Mountains (the highest of the three – see **Figure 1**), mountains north of the Mzimkhulu River and mountains along the Mkomazi River (where it forms the northern boundary of the district).

Mountains and Tall Hills
Features with base elevation heights between 300m and 600m were indicated as mountains and tall hills. These topographical units occur throughout the study area (especially the interior) due to the strongly undulating nature of the terrain. They are generally found along the river valleys or as foot hills of the taller mountains.

Strongly Undulating Plains and Hills
This terrain morphological unit includes land types where the percentage of steep slope makes up 25-50% of the unit, but where the elevation does not exceed 300m above base level. These units are prevalent throughout the study area, but are especially noticeable along the coastal inland region between Port Shepstone and Scottburgh. These units, together with Undulating Plains, are highly preferred for the cultivation of sugar cane (see **Figure 2** below).

Figure 2: Strongly undulating plains (also note sugar cane cultivation and forestry activities).

Undulating Plains and Plains

Undulating plains are land types where the terrain has a slope elevation of less than 5% or no discernible slope (*plains*). Both these categories are considered to be flat (see **Figure 3** below).

Figure 3: Undulating plains and plains with limited slope elevation.

Prominent River Valley
Four prominent river valleys were identified within the study area, being the central reaches of the Mtamvuna River, the Mzimkhulu River, Mtwalume River and the Mkomazi River Valleys.

These valleys make up some of the most breath taking views within the district (see **Figure 4** below).

Figure 4: Aerial view of the prominent Mkomazi River valley.

Incised River Valley and Gorge
These terrain morphological units are similar to the previous category, with the exception that they have an even more dramatic appearance due to the presence of sheer cliffs and exposed rock faces. These canyon-like features were literally carved in the landscape by millions of years of erosion by the Mzimkhulu River (Oribi Gorge – see **Figure 5** below) and the Mtamvuna River.

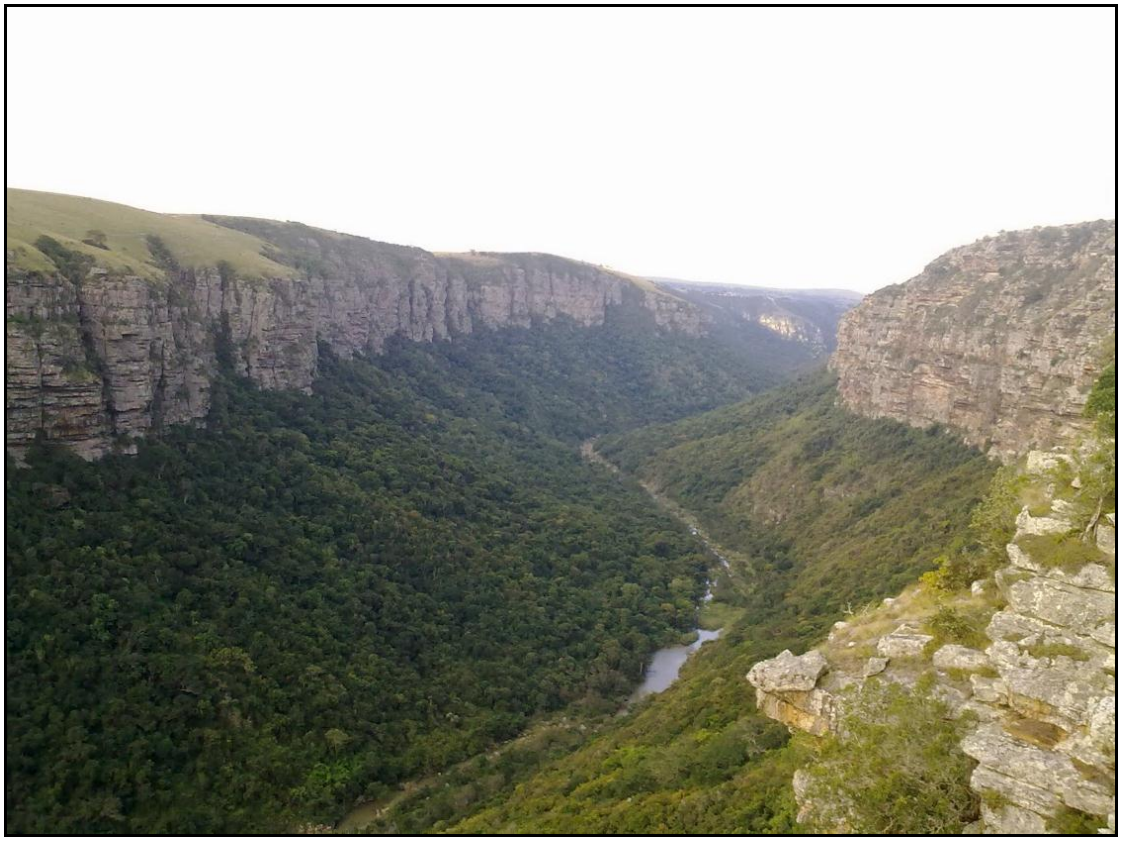
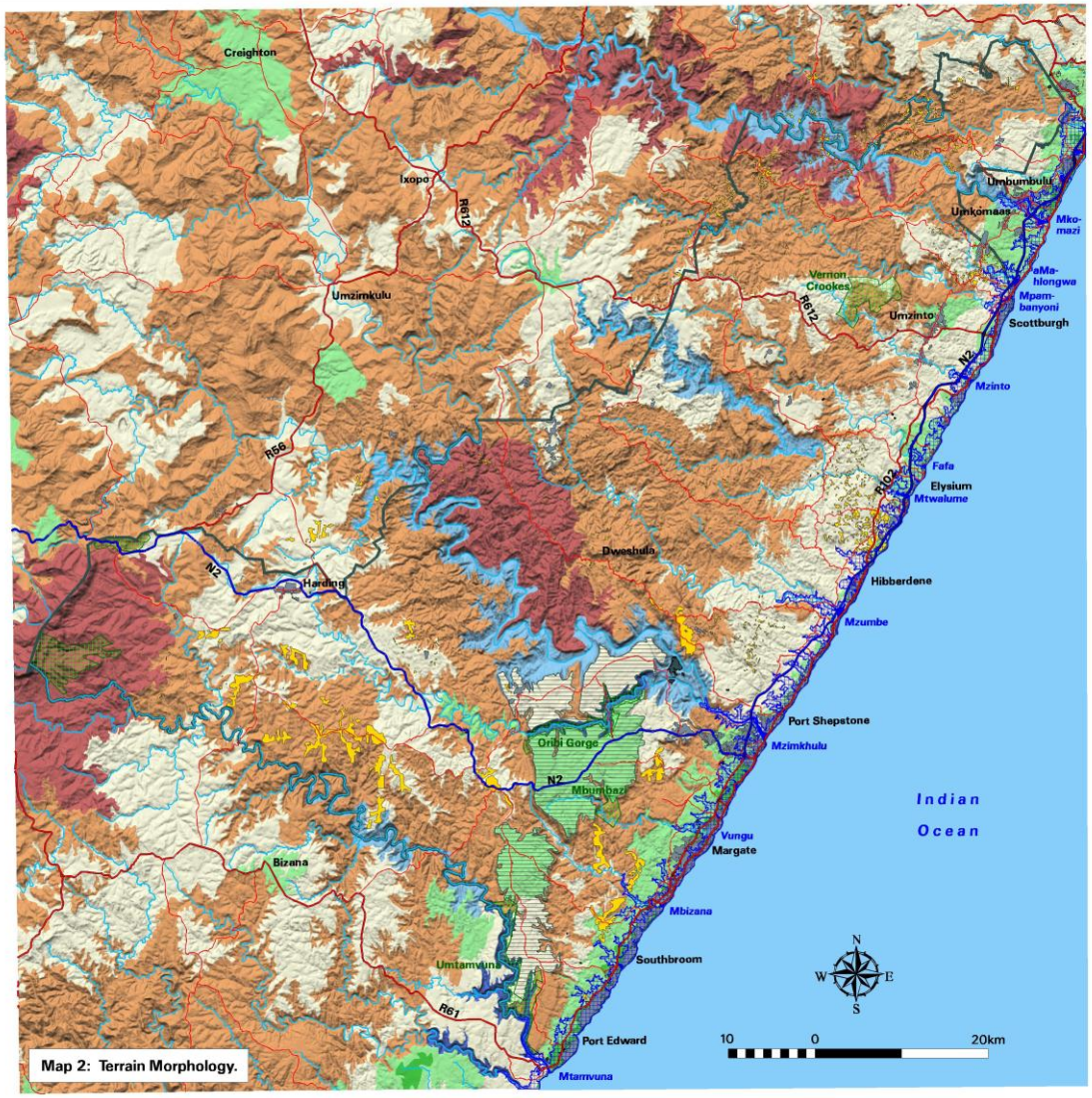


Figure 5: Hells gate at Oribi Gorge (example of incised river valleys and gorges).

Coastal Foreland and Estuaries

The *coastal foreland* includes a thin strip of land (in relation to the surface area of the rest of the district) immediately adjacent to the Indian Ocean (see **Figure 6** below). It includes all land located below 60m above sea level. It further includes approximately 40 estuaries, almost 140km of coastline, 72km^2 of urban development/towns (31% of the total 231km^2 surface area of this zone) and billions of Rand's worth of beach-front real estate. It is the zone with the highest development pressure due to its sought-after location on the Indian seaboard with its magnificent ocean views.

Figure 6: Aerial view of the coastal foreland at St. Michaels (including urban developments, beachfront and estuary).



Map 2: Terrain Morphology.

Ugu District Municipality Environmental Management Framework

LEGEND
- Ugu District Municipality Boundary
- Town/Built-up Area
- Rural Settlement (low density)
- Mines/Quarries
- Perennial River
- Estuary
- Secondary Road
- Arterial/Main Road
- National Road
- Nature Reserve

TERRAIN MORPHOLOGY
- High Mountains
- Mountains and Tall Hills
- Strongly Undulating Plains and Hills
- Undulating Plains
- Plains
- Prominent River Valley
- Incised River Valley or Gorge

Sub-category
- Table-land
- Coastal Foreland & Estuaries

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3.3 Land Cover/Broad Land Use Patterns

The *Land Cover/Broad Land Use Patterns* for the district are displayed in **Map 3** below. Three categories of land cover types were identified. These include *Transformed, Altered* and *Natural* Land Cover Types.

Transformed Land Cover Types
This category includes all areas where the natural vegetation had been removed and transformed (built-up), due mainly to urban development, rural settlements and mining activities. High density urban developments/towns occur along the coast line, where the highest concentration of people is situated (see **Figure 6** above). Lower density rural settlements occur throughout the study area (see **Figure 7** below), but are especially noticeable in the area between the N2 national road and the Mtamvuna River, and along the N2 north between Port Shepstone and Durban.

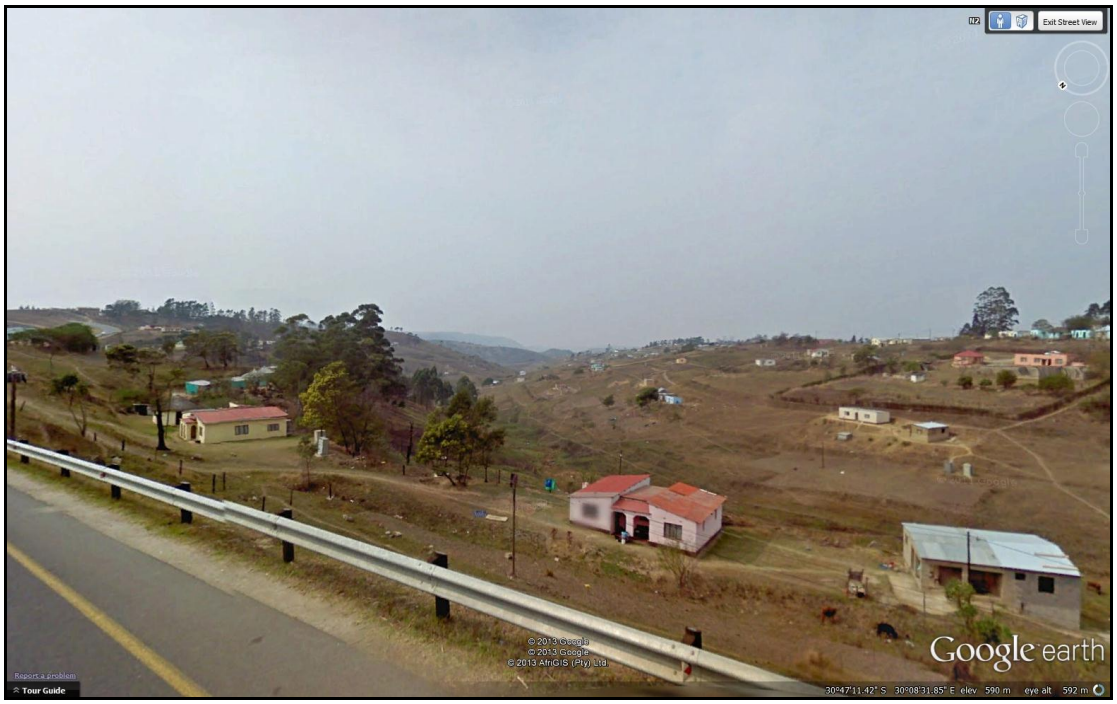
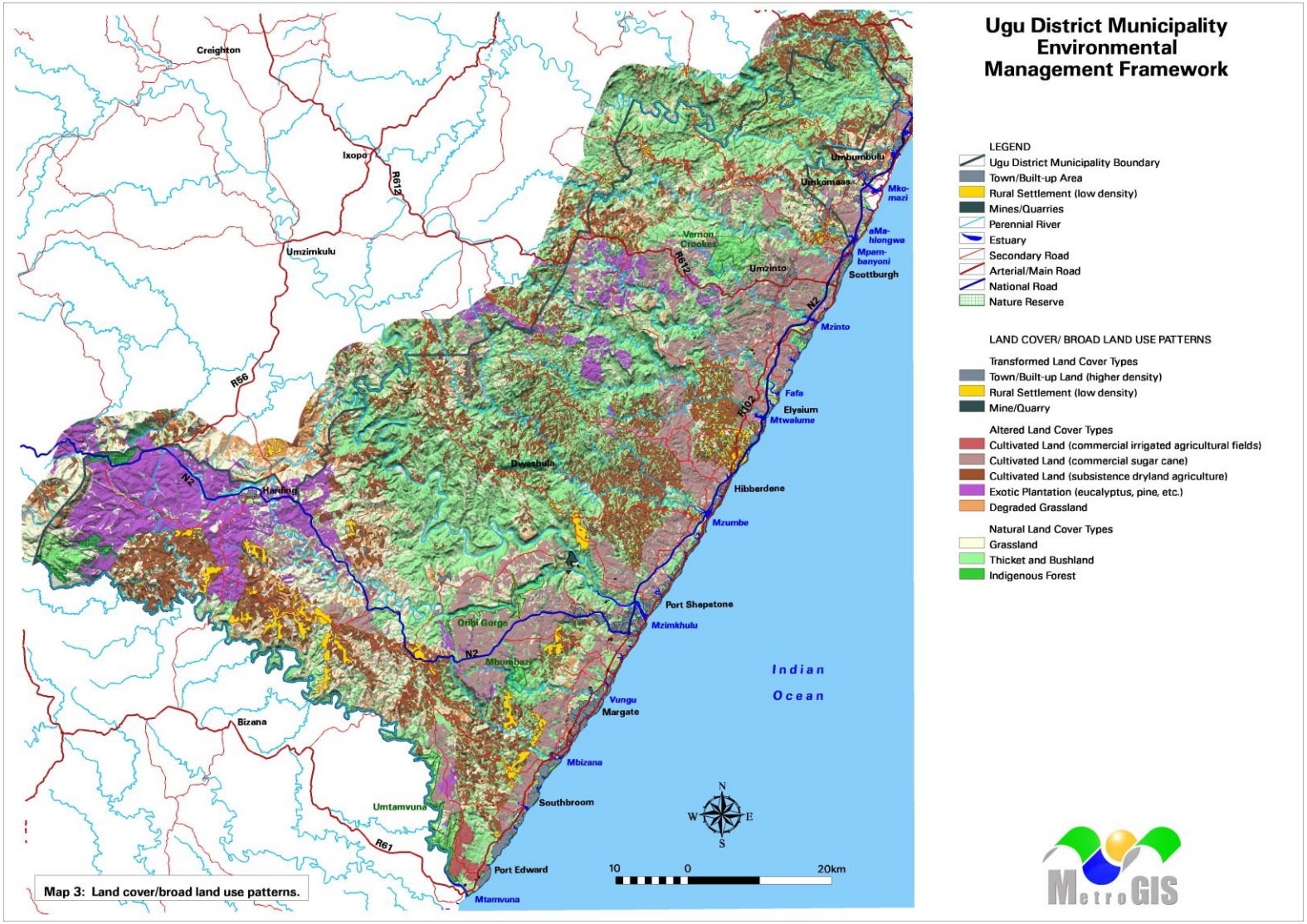


Figure 7: Rural settlement.

Altered Land Cover Types
Altered land cover types generally refer to areas where the natural vegetation had been removed, but not necessarily permanently transformed (i.e. not built-up).

These include all forms of agricultural activities, both subsistence and commercial agriculture (e.g. sugar cane cultivation), forestry, degraded land (e.g. over-grazed or where excessive wood harvesting takes place), etc.

Natural Land Cover Types
Large tracts of land, especially in the more remote or less accessible parts of the district, are still in a natural or pristine state. These land cover types include natural grassland, *thicket and bushland*, indigenous forests (see **Figure 5** above) and riverine vegetation along rivers and estuaries.



Map 3: Land cover/broad land use patterns.

Ugu District Municipality Environmental Management Framework

LEGEND

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LAND COVER/ BROAD LAND USE PATTERNS

Transformed Land Cover Types

- Town/Built-up Land (higher density)
- Rural Settlement (low density)
- Mine/Quarry

Altered Land Cover Types

- Cultivated Land (commercial irrigated agricultural fields)
- Cultivated Land (commercial sugar cane)
- Cultivated Land (subsistence dryland agriculture)
- Exotic Plantation (eucalyptus, pine, etc.)
- Degraded Grassland

Natural Land Cover Types

- Grassland
- Thicket and Bushland
- Indigenous Forest

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3.4 Visual Assessment

The visual assessment sets out to identify areas of higher or lower visual exposure within the district. The visual exposure map, or viewshed analysis, is based on the number of terrain observations from the national, arterial or major local roads within the study area. Literally thousands of line-of-sight visibility analyses were undertaken from these roads at 100m intervals, for a radius of 10km from each vantage point.

The combined result is displayed on **Map 4** below. The *zone of higher visual exposure* generally includes elevated or exposed topographical features, whilst the *zone of lower visual exposure* identifies remotely located and visually enclosed valleys. The premise being that the visual quality/character within the latter zone is not compromised by the sight of human development or activities (e.g. night time lighting, noise, etc.) and that the sense-of-place is still intact.

Ugu District Municipality Environmental Management Framework

Map 4:
Visual assessment (zones of higher or lower visual exposure).

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VISUAL ASSESSMENT
Zones of Higher or Lower Visual Exposure
(based of terrain observations from major roads)

- Zone of Higher Visual Exposure
  (elevated and exposed topographical units located in close proximity (< 10km) to National, Arterial and Major Secondary Roads)
- Zone of Lower Visual Exposure
  (remotely located and visually enclosed valleys)

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4. LANDSCAPE VALUE/SCENIC QUALITY

Each of the data categories described in the previous chapter was evaluated per data feature in terms of scenic value, visual quality, level of disturbance and visual remoteness.

Terrain morphological units such as high mountains, mountains, gorges, prominent river valleys, etc. were rated higher than plains due to their inherent scenic value and exposed topographical nature.

Pristine or natural vegetation types or land cover types and existing conservation or protected areas were similarly rated higher than disturbed, altered or transformed land cover types.

Visually remote or enclosed regions within the district, where the visual character or sense-of-place is still intact, scored a higher rating than areas exposed to human activities.

The resultant scenic quality index or landscape value map is displayed on **Map 5**. The index reflects the combined calculated value for each of the data categories. Heavily disturbed or built-up land (e.g. quarries or towns) lack the scenic quality or landscape value that is inherent to, for example, protected or natural land set against a mountainous backdrop, within a highly enclosed or protected visual catchment.

Map 5: Landscape value (scenic quality index).

Ugu District Municipality Environmental Management Framework

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- National Road
- Nature Reserve

LANDSCAPE VALUE
(Scenic Quality Index)
- Very High
- High
- Moderate
- Low
- Very Low

Based on:
- Terrain Morphology/Topography
- Visual Remoteness
- The level of Land Cover transformation

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5. LANDSCAPE/LAND USE CHARACTER

The landscape/land use character map is a summation of all the facets (as discussed previously) that make up the character, appearance and feeling of a certain area. Zones were delineated in order to provide a regional overview of the varying landscape character precincts within the district. It is not intended as a definitive partitioning of the district into land use compartments, but rather a guide for possible future planning and land use management.

Four distinct landscape character zones, displaying similar characteristics for each of the input data categories, were identified. These are displayed on **Map 6** and are discussed in more detail below.

Zone 1: Predominantly natural areas

Natural areas, with high scenic quality and landscape value are found along the Mtamvuna River valley (see **Figure 8**), all the way up to the Ngele Mountains. These areas include the Mtamvuna Nature Reserve as well as the two unnamed reserves located along the Ngele Mountains. It also correlates well with the *priority conservation corridors* (also displayed on the map).

The Mzimkhulu River Valley is another prominent feature within this zone. It is connected to the Oribi Gorge Nature Reserve and to a lesser degree the Mbumbazi Nature Reserve. Similar characteristics for this Zone are displayed along the upper reaches of the Mzumbe and Mhlabatshane Rivers, and the Mtwalume, Quha and Fafa River valleys.

Further north, the Vernon Crookes Nature Reserve (located north of the Mzinto and south of the Mpambanyoni rivers) is also representative of this landscape character zone. The Mkomazi River valley and mountains also adhere to the requirements for this zone and generally coincide with the Mkomazi River's *priority conservation corridor.*

Characteristics for Zone 1 are:

- scenic topographical features
- lower levels of land cover transformation
- enclosed viewshed catchments and visual remoteness
- includes existing conservation/protected areas

Activities preferred within this zone are conservation, low impact eco-tourism, the expansion of existing protected areas, etc.

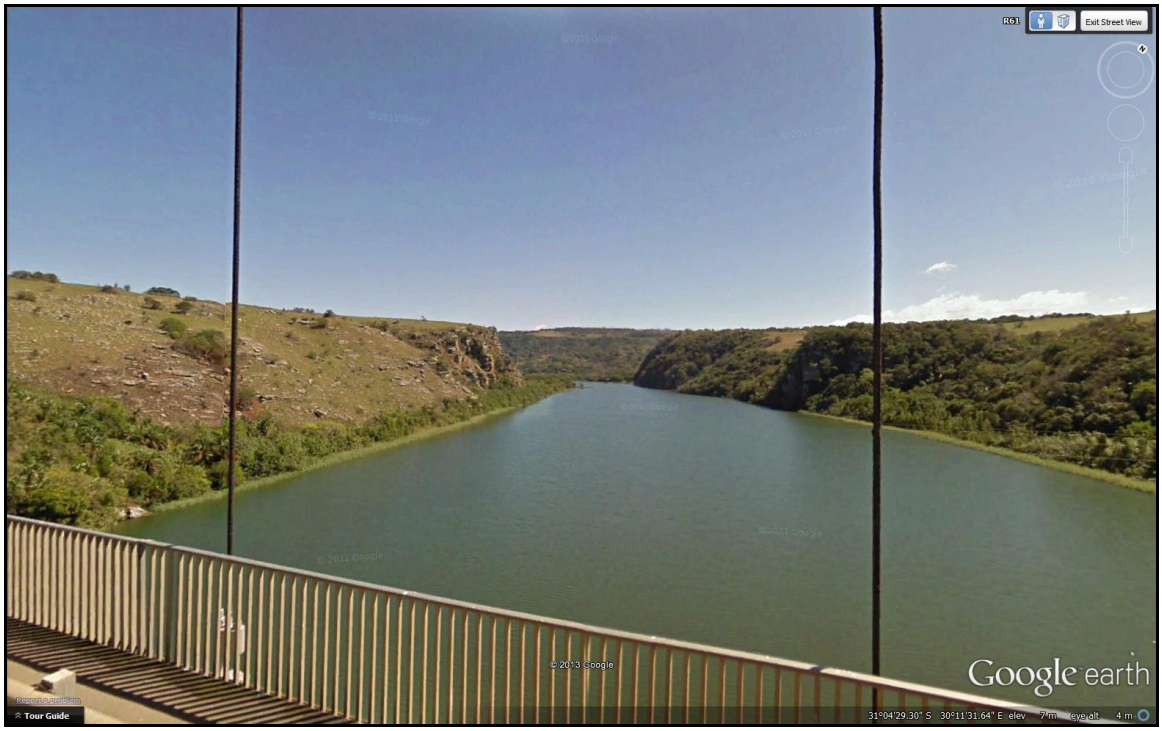


Figure 8: Mtamvuna river mouth.

Zone 2: Altered Landscapes within a Natural Setting

An area where there is some human settlement activity and that is still located within predominantly natural land with some degree of visual enclosure is generally included in this zone. Often these precincts coincide with the location of traditional rural villages that add an additional cultural aspect to it (see **Figure 9** below). These villages differ from other major rural settlements in the sense that they still have a traditional appearance, with relatively limited visual clutter or undue land degradation (i.e. very limited subsistence agriculture).

Characteristics for Zone 2 include:

- moderate scenic value in terms of topography
- some land cover transformation/alteration due to subsistence agriculture, forestry and human settlement
- relatively visually remote

Preferred **activities** to be considered within this zone are nature-based tourism, cultural tourism and to act as *environmental support areas* for conservation areas or precincts from the previous zone (Zone 1), where connected.

Figure 9: Example of a traditional village located within Zone 2.

Zone 3: Transformed Landscapes within a Rural Setting

This zone has a number of sub categories but they generally share the following **characteristics**:

- absence of elevated or scenic topographical features
- higher concentration of rural settlements and agricultural/forestry activities with limited natural vegetation remaining
- generally visually exposed from major roads

Rural settlements where extensive subsistence agriculture is practised (see **Figure 7** above) differ from the traditional villages mentioned in Zone 2. They have a higher settlement density, more outside influences with respect to building styles and architecture, and generally more visual clutter in the form of services and infrastructure (e.g. power lines).

Sugar cane cultivation and **forestry areas** are generally more dynamic in appearance. Depending on the season or the growth of a specific plantation, the sugar cane (see **Figure 2** above) or trees may be harvested, altering the appearance of the landscape. There is, however, a certain rural charm associated with these land use activities due to their pastoral character. Large tracts of land along the coast line are under sugar cane cultivation (with forestry intertwined) and have become somewhat of a visual trademark for visitors to the region. Large exotic forest plantations (e.g. pine, eucalyptus, wattle. etc. – see **Figure 1** above) are located inland (at Harding) and are reminiscent of alpine scenery when viewed against the backdrop of the Ngele Mountain range.

There are not many **mining** or **quarrying** areas within the district. The single largest quarry (Simuma limestone quarry – see **Figure 10** below) is located near the confluence of the Mzimkhulu and Mzimkhulwana Rivers, within an area with

Zone 1 characteristics. This quarry is generally in conflict with its surroundings in terms of the proposed land use activities suggested for Zone 1. It is recommended that this quarry be rehabilitated once decommissioned and restored to its original natural state, if possible.

Figure 10: View from the Simuma limestone quarry.

Zone 4: Coastal and Urban Zone

This zone is generally considered to be the most complex from a landscape/land use perspective due to the visual diversity brought about by its urban character, intermingled with scenic sea vistas and estuarine habitats (see **Figure 11** below). **Characteristics** of this zone include:

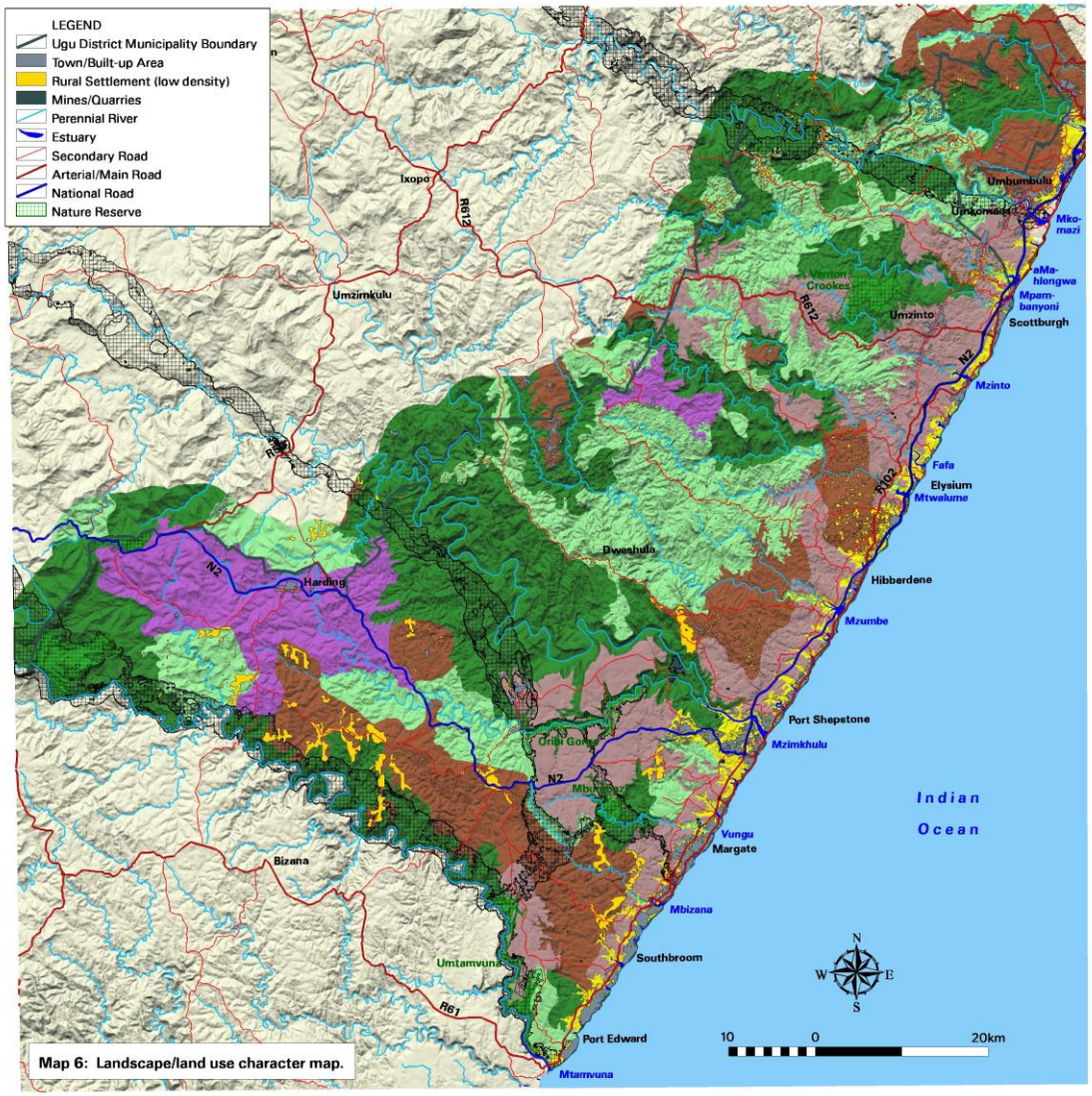
- scenic beaches and the high occurrence of estuaries/lagoons
- very high development pressure due to tourism activities along the Indian sea board
- very high scenic quality/attraction due to ocean vistas

Zone 4 potentially requires the highest level of management amongst all the zones in order to protect its visual resources and landscape character.

Recommended activities proposed within this zone include predominantly tourism and tourism related developments, as well as lower density residential land uses that are sensitive to the environment. Specific attention should be given to the protection of beaches, dunes and estuaries, with an additional focus on the management of natural open spaces within this zone. Development should not infringe on these scenic features and should preferably be located within already disturbed areas, or favour *in-fill* developments. Future industrial or

large scale commercial developments within this zone should ideally be discouraged or located to more suitable areas with a compatible land use character.

Figure 11: Southport beach.



Map 6: Landscape/land use character map.

Ugu District Municipality Environmental Management Framework

LANDSCAPE/LAND USE CHARACTER MAP

Predominantly Natural Area

Characteristics:
- scenic topographical features
- lower levels of land cover transformation
- enclosed viewsheds and visually remote
- includes existing conservation/protected areas

Altered Landscapes within a Natural Setting

Characteristics:
- moderate scenic value in terms of topography
- some land cover transformation/alteration due to subsistence agriculture, forestry and human settlement
- relatively visually remote

Transformed Landscapes within a Rural Setting

- Rural settlements and subsistence farming
- Sugar cane cultivation
- Forestry (exotic plantations)
- Mining/quarrying

Characteristics:
- absence of elevated or scenic topographical features
- higher concentration of rural settlements and agricultural/forestry activities
- generally visually exposed from major roads

Coastal and Urban Zone

Characteristics:
- scenic beaches and high occurance of estuaries
- very high development pressure due to tourism activities along the Indian sea board
- very high scenic quality/attraction due to ocean vistas

Priority Conservation Areas Corridors

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Photographs: *Sourced from Google Earth* (assumed to be in the public domain).