

A GIS assessment of development and land use change in the coastal zone
of the Ndlambe and Ngqushwa local municipalities,
Eastern Cape, South Africa

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ABSTRACT

The coastal zone accommodates some of the most diverse ecosystems in the world and offers a wide range of ecosystem goods and services; consequently it has become a focal point of human development. People are attracted to the coast because of access to resources, favourable climate, aesthetic appeal and potential for recreational activities. As pressure for utilisation and development increases, so does the need to manage the coastal system more effectively.

This research focuses on the coastal zone of the Ndlambe and Ngqushwa local municipalities in the Eastern Cape, South Africa, which are physically and environmentally similar, yet have distinct demographic and socio-economic differences. The research integrates information using GIS, from three time epochs, to determine where development and land use change is occurring. The Ndlambe Local Municipality displays high levels of formal development, while the Ngqushwa Local Municipality exhibits little formal development. These differences in development and land use are related to economic, social and legislative ‘*drivers*’ based on an adapted Driver-Pressure-State-Impact-Response model. The model identifies that development and land use changes lead to increased pressure on the natural system, which in turn leads to shifts in the natural *state* of the coastal zone, resulting in adverse impacts on the coastal zone. Changes in the natural functioning of the coastal zone highlight the need for a *response* in terms of changes in legislation governing coastal management and spatial planning.

This research concludes that pressure for development in the coastal zone within the research site is beginning to increase and will adversely affect the coastal zone if not managed effectively. These two local municipalities have the opportunity to move forward and develop in such a way that allows for conservation and sound management of the coastal zone, which will ensure long-term sustainability within the coastal zones of the Ndlambe and Ngqushwa local municipalities.

DECLARATION

The work described in this research project was carried out in the Department of Geography, Rhodes University, Grahamstown during 2007 and 2008, under the supervision of Ms Gillian McGregor (Geography Department, Rhodes University) and Professor Trevor Hill (Discipline of Geography, University of KwaZulu-Natal), in fulfilment of the academic requirements for the degree of Master of Science, Geography. This study represents original work by the author, and opinions expressed and conclusions arrived at are those of the author. The author has read and accepted the Rhodes University plagiarism policy. Where use has been made of the work of others it is duly acknowledged.

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LIST OF ACRONYMS AND ABBREVIATIONS

BCM	Buffalo City Municipality
C.A.P.E	Cape Action Plan for the Environment
CDSM	Chief Directorate: Surveys & Mapping
CES	Coastal & Environmental Services
DEAT	Department of Environmental Affairs and Tourism
DEDEA	Department of Economic Development and Environmental Affairs
DFA	Development Facilitation Act
DPSIR	Driver-Pressure-State-Impact-Response
DTI	Department of Trade and Industry
ECBCP	Eastern Cape Biodiversity Conservation Plan
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
FAO	Food and Agricultural Organisation
FDI	Foreign Direct Investment
GIS	Geographic Information Systems
HSESDS	Human Systems – Ecological Systems – Delivery Systems
ICZMP	Integrated Coastal Zone Management Plan
ICZO	Inland-Coastal Zone-Ocean
IDP	Integrated Development Plan
IDZ	Industrial Development Zone
IGOS	Integrated Global Observing Strategy
IPCC	Intergovernmental Panel on Climate Change
Lo	Longitude of Origin
LUPO	Land Use Planning Ordinance
OECD	Organisation for Economic Cooperation and Development
MCM	Marine and Coastal Management
MEA	Millennium Ecosystem Assessment
MEC	Member of the Executive Council
MSRM	Ministry of Sustainable Resource Management
NEMA	National Environmental Management Act
ND	No Date
NLC	National Land Cover

PGDP	Provincial Growth and Development Plan
PSR	Pressure-State-Response
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
STEP	Subtropical Thicket Ecosystem Planning
SKEP	Succulent Karoo Ecosystem Programme
UNEP	United Nations Environment Programme
USGS	United States Geological Survey
WGS84	World Geodetic System 1984

1.1 OVERVIEW

The coastal zone is the dynamic ecosystem along the margins of the world's land masses (Di Gregorio, 2005), which has remarkable ecological productivity, encompassing a wide range of terrestrial and marine environments (Integrated Global Observing Strategy (IGOS), 2006; Sale *et al.*, 2008). It is considered to accommodate some of the most diverse ecosystems in the world (Martinez *et al.*, 2007) and offers a diverse range of ecosystem goods and services such as fisheries, water purification and coastal erosion protection (Sale *et al.*, 2008). As a consequence of the goods and services it provides, the coastal zone has become a global focus in terms of human activity (IGOS, 2006), and people gravitate to the coast to live, for leisure, recreation and tourism (Martinez *et al.*, 2007). As a result natural coastal environments are changing and being converted to refineries, power stations, ports, marinas, tourist facilities and residential developments (World Resource Institute, 2002). However, these developed coastal areas are increasingly becoming susceptible to natural hazards and extreme weather events, which result in substantial costs to, and impacts upon, communities resident in these coastal areas (IGOS, 2006; Nicholls *et al.*, 2007). A recent example is the devastating impacts of Hurricane Katrina along the Gulf Coast in 2005 where several levees protecting New Orleans failed and the city 'filled' with water, resulting in loss of life and environmental damages (Travis, 2005). It is estimated that between 1980 and 2000 approximately 250 000 people lost their lives globally as a result of tropical cyclones in coastal areas (Nicholls *et al.*, 2007). Despite this, coastal areas still offer, or are perceived to offer, development opportunities which promote local and regional economic development (Department of Environmental Affairs and Tourism (DEAT), 2006). This is particularly relevant in South Africa, where there is a growing reliance on coastal resources (DEAT, 2006). Given the intrinsic value of the coast, pressure to develop near the coast continues to increase and thus the need to improve both conservation and management of development opportunities is imperative.

Man's relationship with, and impacts upon, the environment are highlighted in terms of the United Nations Millennium Development Goals (2000) and the Rio Declaration (1992) on Environment and Development. These documents emphasise that human impacts on the environment need to be addressed to ensure sustainability in terms of development. Goal Seven (Ensure environmental sustainability) of the Millennium Development Goals stresses the need to integrate the principles of sustainable development into countries' policies and programmes (UN Millennium Development Goals, 2008). Principle One of the Rio Declaration, re-affirmed by the Johannesburg Declaration

(2002), states that human beings should be central to sustainable development (United Nations Environment Programme (UNEP), 1992). However, it is difficult to achieve sustainable development if human impacts are increasing leading to dramatic changes in ecosystem functioning. Recent studies have shown that approximately 60% of life supporting ecosystem services are being degraded or used unsustainably (Millennium Ecosystem Assessment (MEA), 2005). In terms of the coastal environment, it is estimated that by 2050 as much as 91% of the world's coastline will be affected by development (Sale *et al.*, 2008). This statistic highlights the need to change the way we plan and manage coastal development and reinforces the fact that environmental protection and sustainable development are critical for the coastal zone.

Concern regarding management of the environment is further promoted by increasing awareness and concern regarding climate change, where coastal environments are highlighted as an area of particular concern (Intergovernmental Panel on Climate Change (IPCC), 2007). It is forecasted that climate change may result in sea-level rise, which will increase exposure of the coastal environment to risk (IPCC, 2007; Nicholls *et al.*, 2007). Risks include increased coastal erosion as a result of altered precipitation and run-off, the potential intensification of tropical and extra-tropical cyclones as well as larger extreme weather and storm events (Nicholls *et al.*, 2007). It is predicted that these effects will be felt the most in the mega-deltas of Asia and Africa (IPCC, 2007). Densely populated, low-lying areas of developing countries are at greatest risk, as they lack the adaptive abilities and resources to cope with changes in their environment (Nicholls *et al.*, 2007).

The coastal environment has attracted attention from a number of international organisations. Agenda 21, Chapter 17 highlights the need for protection of oceans and adjacent coastal areas and highlights the need for improved management of coastal and marine environments at the national, regional and subregional levels (United Nations, 2004). In addition, the UNEP identified coastal areas as one of its *Thematic Areas*, in the form of the Regional Seas Programme. The programme was launched in 1974 following the 1972 United Nations Conference on the Human Environment, in Stockholm (Adler, 2004). The aim of the programme was to establish regional seas action plans, which outline a strategy for the protection of the common water body based on the region's environmental problems and the socio-economic and political circumstances of the region (UNEP, No Date (ND)). Based on this principle, 13 regional programmes involving 140 participating countries were established (Adler, 2004; UNEP, ND). More recently, the IGOS Coastal Theme has recognised that global, regional and local changes in natural processes linked to human demands are jeopardising coastal ecosystems' ability to support human demands for commerce, living resources and recreation (IGOS, 2006). The goal of the IGOS Coastal Theme is to develop a strategy for

integrated observations across the land-sea interface that will ultimately provide data to support informed decision-making in terms of management of the coastal environment (IGOS, 2006).

As pressure for utilisation and development increases in the coastal zone, so too does the need to manage this system more effectively. Increasingly, coastal development and land use change is being driven by the appeal of living at the coast coupled with personal wealth, an increase in coastal holiday homes and resorts and demand for leisure and outdoor activities associated with the coast. These can be related to the economic conditions of increased consumer spending power, increased mobility of people and more available leisure time (Visser, 2003). Today, coastal land is considered by many to be ‘prime land’ for development and recreational activities, which brings with it associated political and socio-economic pressures. Conflicting with this is a strong ‘need’ to conserve the coastal resource due to its distinct but limited spatial area and dynamic nature. As a result, management and planning for development within the coastal environment needs to be considered in a holistic manner in terms of the dynamics of this system that creates this unique link between ecological and socio-economic systems across the land-sea interface (Glavovic, 2000a; Carter, 1999; IGOS, 2006). Human demand for development results in changes in land cover¹ and land use², in response to human needs and wants (Verburg *et al.*, 2004).

This research considers the nature of land use and land cover change and its effect on the coastal zone of the Ndlambe and Ngqushwa local municipalities in the Eastern Cape Province, South Africa. The Eastern Cape Province coastline displays a diversity of land use types, ranging from commercial, residential and recreational to undisturbed natural and protected areas. Of concern is the increasing pressure for commercial, residential and recreational development in the coastal zone of the Eastern Cape as a result of saturated development in other coastal areas in South Africa. This development has the potential to adversely affect the coastal zone of the Eastern Cape if it is not well managed.

¹ Vegetation and man-made features on the earth’s surface

² Man’s activities and impacts on land cover

1.2 AIM

This research aimed to assess and integrate information from three time epochs within the coastal zone of the Ndlambe and Ngqushwa local municipalities (Eastern Cape); to determine where development and land use change are occurring and to relate these changes to economic, social and legislative ‘drivers’, explaining why different patterns are evident in the two local municipalities.

1.3 OBJECTIVES

The objectives of this research were to:

1. Determine land cover of the research sites from aerial photographs;
2. Integrate this data using a Geographic Information Systems (GIS) and determine where change is occurring;
3. Using The DPSIR framework identify and describe the key ‘drivers’ that may have resulted in the development and land use change, based on available literature and interviews with specialists and municipal officials;
4. Relate development and land use change in the research area to the identified ‘drivers’; and
5. Recommend guidelines for long-term management of the coastal zone of the research area

1.4 RESEARCH AREA

The research focuses on the coastal portion of two local municipalities within the Eastern Cape Province of South Africa, the Ndlambe and Ngqushwa local municipalities (Figure 1-1). The Ndlambe Local Municipality is located in the eastern portion of the Cacadu District Municipality, bordered to the east by the Great Fish River and the Ngqushwa Local Municipality (within the Amathole District Municipality). The Sundays River Local Municipality is to the west and Makana Local Municipality inland, both of which fall within the Cacadu District Municipality. The Ngqushwa Local Municipality is located within the western portion of the Amathole District Municipality (Figure 1-1) and is bordered to the west by the Ndlambe Local Municipality (within the Cacadu District Municipality). To the east is the Buffalo City Local Municipality; inland is the Nkonkobe Local Municipality, both of which fall within the Amathole District Municipality.

The Eastern Cape Province is the second largest province in South Africa with an area of 170 600 km², located on the south-eastern coast of South Africa. The South African coastline is some 3 100 km in length, stretching from Alexander Bay (west) to Ponta do Ouro (east) and has

few indentations or natural bays (Malan and Swart, 1997; Fuggle and Rabie, 1992). The coastal portion of the Eastern Cape Province stretches from the Bloukrantz River in the south to the KwaZulu-Natal border in the northeast and accounts for 20% (800 km) of the South African coastline (DEAT, 2000). The 'Sunshine Coast' and the 'Wild Coast' are included as key attractions of the Eastern Cape coastline (Glavovic, 2000a). Land use within the region varies from residential and commercial, in the areas of Port Elizabeth and East London, to rural settlements, agriculture and undisturbed natural landscapes in the former Apartheid homelands of the Transkei and Ciskei (Figure 1-1).

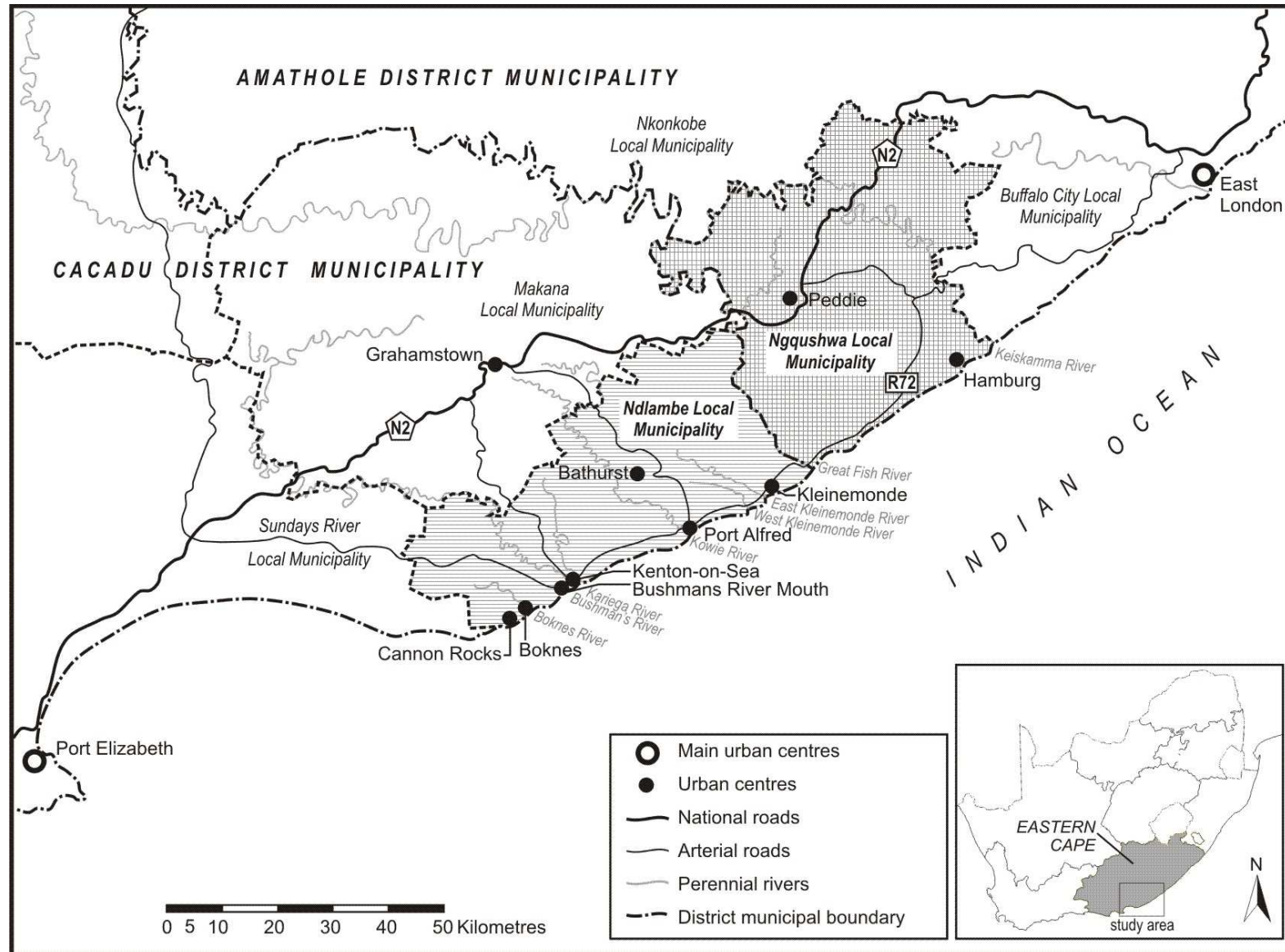


Figure 1-1: Situation of the two local municipalities

1.4.1 PHYSICAL AND ENVIRONMENTAL FACTORS

The Eastern Cape coastline is a transition zone between winter and summer climates (Lubke and de Moor, 1988), being influenced by the subtropical conditions of KwaZulu-Natal, due to the warm southward flowing Agulhas Current and the Mediterranean conditions of the Western Cape, due to the cold Benguela Current (Fuggle and Rabie, 1992), which gives rise to humid, warm temperatures. The coastal portion of the Eastern Cape experiences mild temperatures (14 to 23 °C) and inland areas experiencing more extreme temperatures (5 to 23 °C) (CSIR, 2004). The Eastern Cape receives a mean annual rainfall of approximately 552 mm (DEAT, 2006).

Climate within these two municipalities varies with elevation, being cool, humid and sub-topical at the coast and hot and sub-arid inland (Ngqushwa Municipality, 2007). The municipalities experience approximately 60% of their rainfall in the summer months with the peak periods being October and February. Rainfall varies from approximately 500 mm per year inland to 600 mm per year near the coast. Wind direction is dominated by south-westerly winds in winter and north-westerly winds in summer (Ngqushwa Municipality, 2007).

Vegetation within this area is dominated by the Albany Thicket Biome, which is described as dense, woody, semi-succulent and thorny vegetation with an average height of 2-3 metres (Acocks, 1988). It consists of various vegetation types with a variety of plant communities (Mucina and Rutherford, 2006). Four main vegetation types were identified by Acocks (1988) within the Albany Thicket, namely, Valley Bushveld, Noorsveld, Spekboomveld and False Karroid Broken Veld. Albany Thicket Biome is part of the more loosely defined Subtropical Thicket Biome, which is characterised by subtropical, semi-xeric conditions (Mucina and Rutherford, 2006).

The dominant geological feature is the east-west trending Cape Fold Belt, which consists predominantly of the Cape Supergroup folded strata (Mucina and Rutherford, 2006). In terms of its natural processes, the Albany Thicket demonstrates very little annual fluctuation in perennial cover of biomass, irrespective of variations in mean annual rainfall, and is resistant to drought (Mucina and Rutherford, 2006).

According to Mucina and Rutherford (2006), the vegetation types within both municipalities are Albany Coastal Belt, Cape Estuaries Salt Marshes, Bisho Thornveld and Albany Dune Strandveld. Within Ndlambe there are communities of Kowie Thicket, Suurburg Quartzite Fynbos and

Suurburg Shale Fynbos. In Ngqushwa there are communities of Southern Coastal Forest and Buffels Thicket (Figure 1-2) (Mucina and Rutherford, 2006).

Albany Coastal Belt is one of the dominant vegetation types within both municipalities (Figure 1-2). It is dominated by short grasslands with scattered bush clumps or single *Acacia natalitia* trees. This vegetation is unique to the area; it is only found along the coast from Kei Mouth to Sundays River (Mucina and Rutherford, 2006). Bisho Thornveld is found in the inland areas of both municipalities. It is characterised by small *Acacia natalitia* trees in an open savanna with a short to medium, dense understorey. Other woody species often occur under conditions of overgrazing. Within the coastal portion of both municipalities, Albany Dune Strandveld is found as a narrow coastal strip. It is composed of sclerophyllous shrubs, woody and herbaceous vines with a sparse grassy component (Mucina and Rutherford, 2006).

Kowie Thicket vegetation is dominant in the Ndlambe Municipality (Figure 1-2). This vegetation is dominated by tall thickets, mainly succulent euphorbias and aloes. It has a thick understorey which consists of thorny shrubs, woody lianas and shrubby succulents. This vegetation is found in the river valleys of the Kowie, Bushmans, Kariega and Kleinemonde estuaries. In the Ndlambe Local Municipality, Suurburg Quartzite Fynbos and Suurburg Shale Fynbos are evident in the inland areas. It is predominantly composed of grassy fynbos and there are some localised patches of dense proteoid and ericaceous fynbos. Suurburg Shale Fynbos is dominated by low to medium high, closed, ericoid shrubland or grassland with a closed grass understorey. Cape Estuaries Salt Marshes are found in small pockets along the coast of the Ndlambe Municipality. It is a composition of low herblands and shrublands, which is dominated by succulent chenopods and other flood-tolerant halophytes (Mucina and Rutherford, 2006).

Southern Coastal Forest is found in very small patches near the mouth of the Keiskamma Estuary within the Ngqushwa Municipality (Figure 1-2). It is generally dominated by low forests, and in the eastern reaches of its distribution it has well-developed low-tree and shrub components. In the Ngqushwa Local Municipality, Buffels Thicket is evident in the inland areas. It is a short, dense thicket that can reach a height of ten metres (Mucina and Rutherford, 2006).

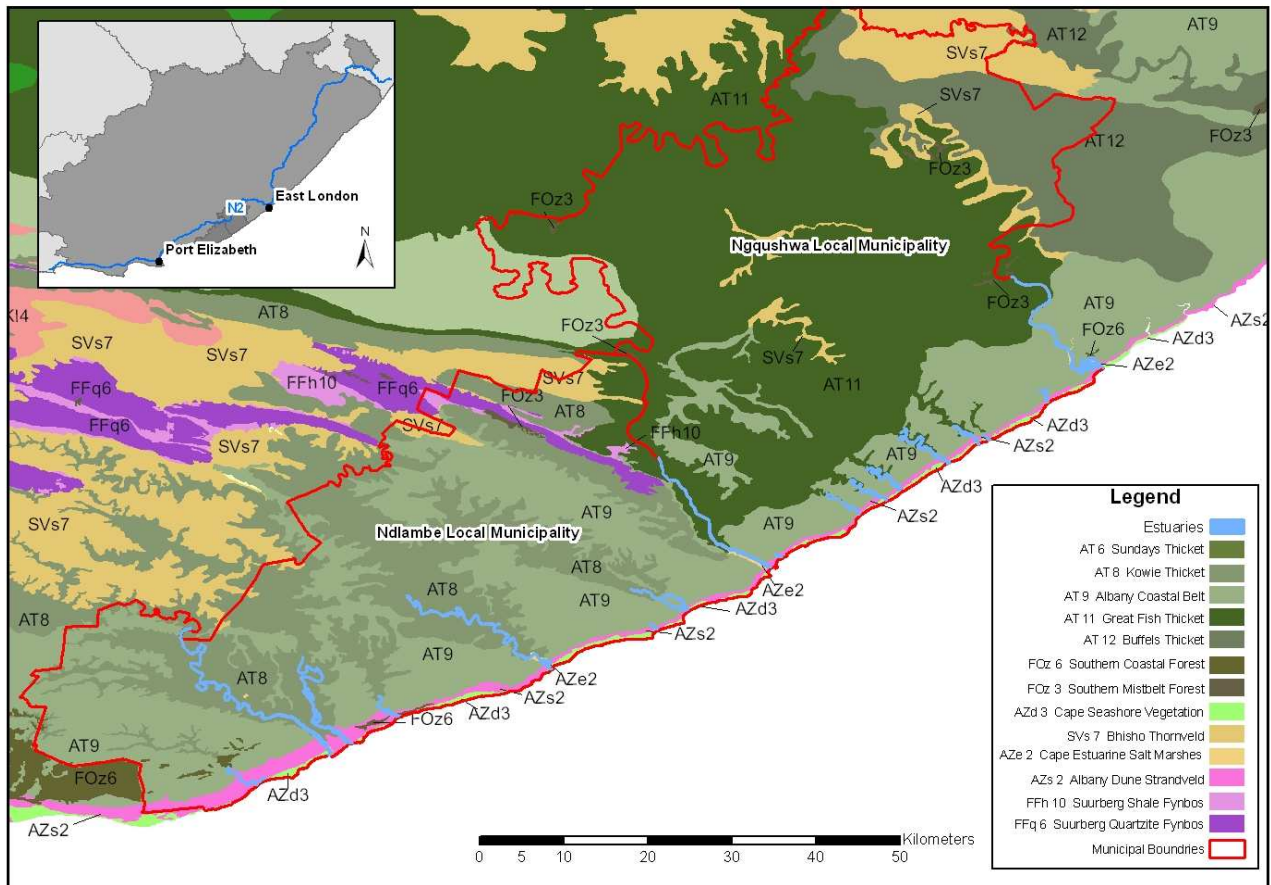


Figure 1-2: Vegetation cover in the research area (Mucina and Rutherford, 2006)

Within the research area there are 18 estuaries (Figure 1-3), nine in each of the two local municipalities. Estuaries are defined as the part of a water course that is permanently or periodically open to the sea, the properties of which are influenced by the twice-daily rising and falling of the tide (Davies and Day, 1998; Republic of South Africa, 2006b). Within South Africa there are 250 functional estuaries and they are considered to be one of the country's most productive habitats (Turpie *et al.*, 2002). They are known to have high biodiversity, are highly productive fish and invertebrate fisheries and provide a number of important services such as nursery areas for marine fish and feeding sites for migratory birds (Turpie *et al.*, 2002).

Within South Africa, estuaries are considered to be one of the most threatened habitats as a result of human disturbance, exploitation and modification of freshwater inflow due to the construction of dams. Estuaries have been prioritised based on conservation importance, which is calculated on the basis of weighted size, habitat, zonal type rarity and biodiversity importance scores (Turpie *et al.*, 2002). According to the estuary prioritisation by Turpie *et al.* (2002) of the 18 estuaries found within the research area, nine rank within the top 50 priority estuaries of South Africa.

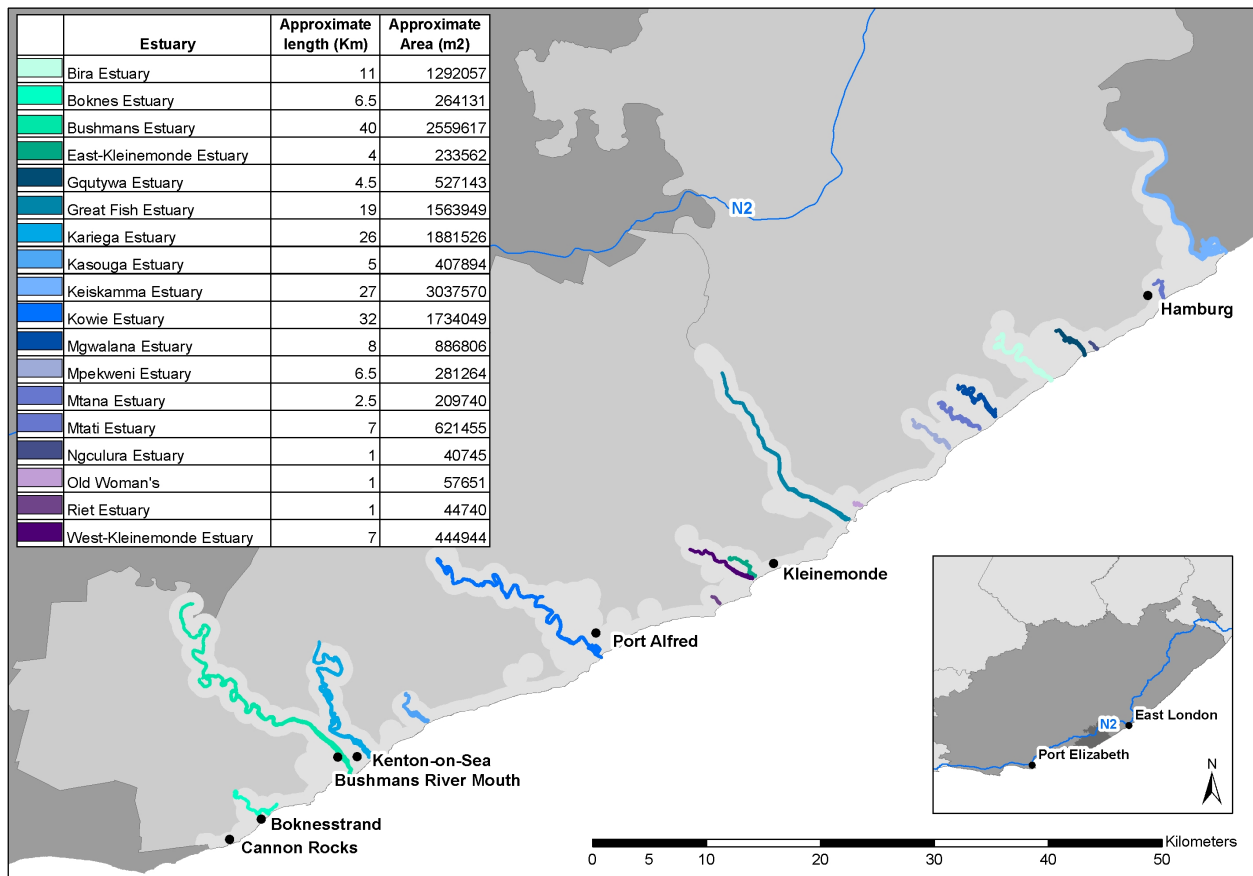


Figure 1-3: Estuaries within the research area

1.4.2 SOCIO-ECONOMIC CHARACTERISTICS

The Eastern Cape Province has a population density of approximately 38 people per km² and accommodates approximately 14% of South Africa's total population, making it the province with the third highest population after KwaZulu-Natal and Gauteng. KwaZulu-Natal and Gauteng have significantly higher population densities due to their smaller geographical area (StatsOnline, 2005). In comparison, the Eastern Cape has a significantly higher proportion of rural population (61%) than KwaZulu-Natal (56%) and Gauteng (5%) (StatsOnline, 2005). The Eastern Cape Province is considered to be the second poorest province in the country, which can likely be attributed to the province's high rural population (StatsOnline, 2005). It is important to note that the population density within the Eastern Cape is highest in the local municipalities that fall within the former Transkei and Ciskei homeland areas (Figure 1-4) (Municipal Demarcation Board; 2001). Of the two local municipalities under investigation, the Ngqushwa Local Municipality falls within the former Ciskei homeland area (Figure 1-1). This is significant for this research, as it allows for comparison between one local municipality that falls within a former homeland system and one that does not.

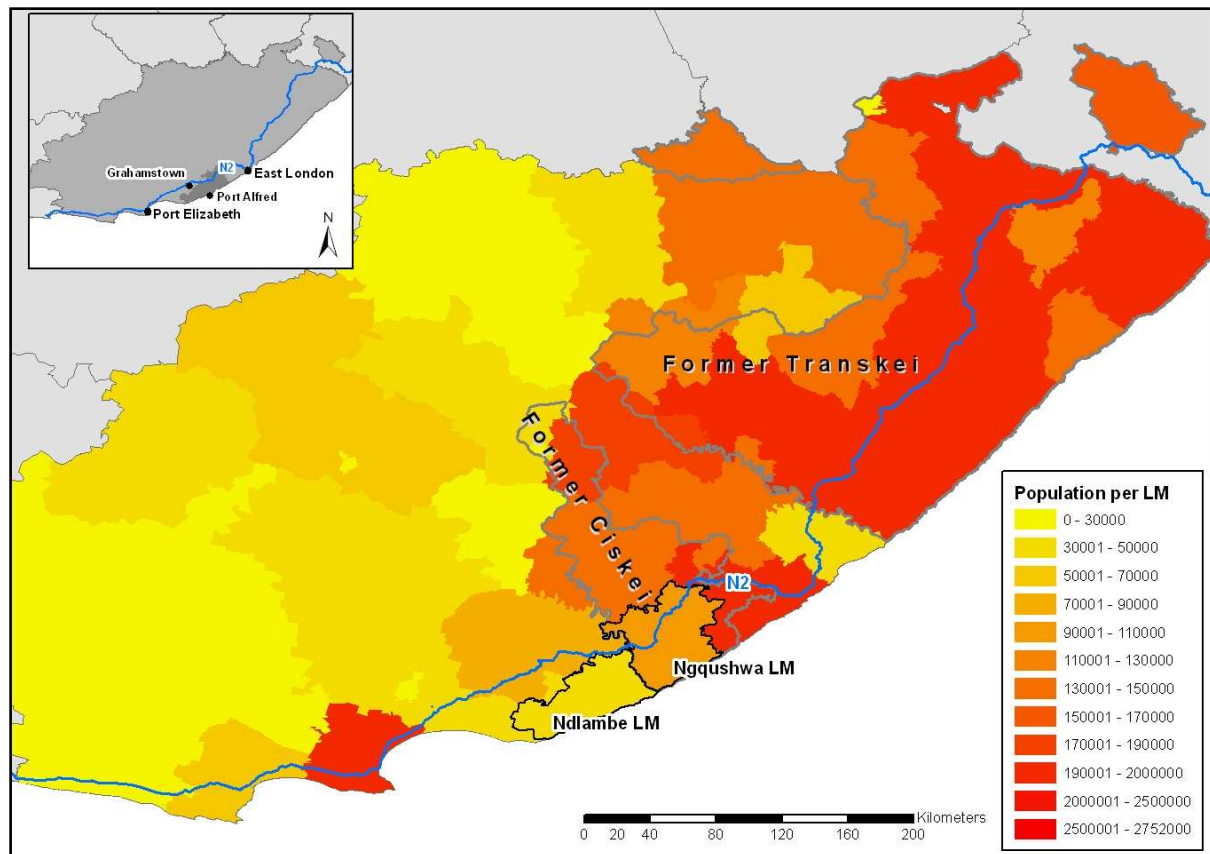


Figure 1-4: Population per local municipality within the Eastern Cape

The Ciskei was established as a homeland for the resettlement of Xhosa people from the Cape Province during the Apartheid regime. It became a self-governing state in 1972 and was proclaimed an independent state in 1981 (Christopher, 2001; Clark and Worger, 2004; Lahiff, 2003). As outlined in more detail in Section 2.3, Apartheid planning was aimed at separating people based on race and ethnicity, which resulted in the forced movement of people into homeland areas. The Ciskei is located on the east coast of South Africa, within what is now the Eastern Cape Province, between the Great Kei and Great Fish rivers (Charton, 1980). The forced movement of people resulted in these homeland areas being over-populated. During independence this land was predominately used for small stock and cattle with limited crop production; as a result the land was over-worked and is badly eroded (Charton, 1980).

The population density of Ngqushwa (38 people per km²) is significantly higher than that of Ndlambe (27 people per km²) (StatsOnline, 2005). This is largely as a result of Ngqushwa being located within the former homeland area of Ciskei. The Ngqushwa Local Municipality has a significant rural population (94%) compared to Ndlambe (20%), which is largely urbanised (StatsOnline, 2005). Within the Ndlambe Local Municipality there are six significant towns as

identified by the Ndlambe Spatial Development Framework (SDF) (Cannon Rocks, Boknesstrand, Bushmans River Mouth, Kenton-on-Sea, Port Alfred and Kleinemonde) that fall within the coastal zone, which together support nearly 65% of the municipality's population, (SetPlan, 2006). Within the Ngqushwa Local Municipality, there are only two urban nodes of significance, Peddie (which is inland) and Hamburg (falls within the coastal zone), which together accommodate 5% of the municipality's population (Ngqushwa Municipality, 2007). The majority of the population (95%) live in dense peri-urban settlements, where there is a shortage of basic essential services such as water, sewerage, electricity and community facilities (Ngqushwa Municipality, 2007).

Associated with these differences in demographics, there are noted differences in terms of socio-economics between the two local municipalities, as can be seen in terms of employment status, income and education level of individuals. From Table 1-1, it is evident that income, although low in Ndlambe Local Municipality, is higher than that of the Ngqushwa Local Municipality. In the Ndlambe Local Municipality 62.4% of people have no income while in the Ngqushwa Local Municipality this value increased up to 79% of people. Furthermore people in the Ndlambe Local Municipality have higher levels of education, with 11.7% of people having no formal education, while in the Ngqushwa Local Municipality 25.4% of people have no formal education. Associated with education and income, 21.5% of people in the Ndlambe Local Municipality are formally employed while in the Ngqushwa Local Municipality only 4.4% of the population are formally employed (Table 1-1).

Table 1-1: Socio-economic characteristics of the Ndlambe and Ngqushwa local municipalities

	Ndlambe Local Municipality (%)	Ngqushwa Local Municipality (%)
Level of income		
No income	62.41	79.02
R 1 - R 800	24.16	17.48
R 801 – R 1600	4.29	1.38
R 1601 - R 6400	6.94	1.84
R 6401 - R 51200	1.97	0.2
R 51201 or more	0.23	0.08
Level of schooling		
No schooling	11.68	25.46
Some primary	15.66	17.18
Completed primary	4.85	6.67
Some secondary	16.33	21.4
Grade 12/Std 10	9.53	8.45
Higher	5.01	3.23
Employment status		
Paid employee	18.89	3.76
Paid family worker	0.77	0.20

	Ndlambe Local Municipality (%)	Ngqushwa Local Municipality (%)
Self-employed	1.92	0.31
Employer	0.67	0.28
Unpaid family worker	0.11	0.07
Not applicable	42.42	53.18

(Source: StatsOnline, 2005).

1.5 OUTLINE

- Chapter One (this chapter) places the research in the context of international and national conservation of coastal ecosystems. It justifies the need for such research to be undertaken based on current trends in coastal resource exploitation and development, and outlines the aim and objectives of the research, providing an overview of how this research was carried out.
- Chapter Two provides the theoretical context in which this research was based, both within the international and national contexts. Additionally, this chapter documents GIS theory in terms of its application as a spatial tool for generating data as applied in the research.
- Chapter Three outlines the methods applied in terms of why the research site was used, delineating the coastal zone and deriving land cover classes. This chapter provides an overview of the GIS tools and techniques applied.
- Chapter Four is a presentation and description of the results.
- Chapter Five discusses the results in detail, which integrates the results with the theory provided in Chapter Two.
- Chapter Six, the concluding chapter, provides a synthesis of land use change and the key ‘drivers’ associated with these changes in land use within the two research sites. Furthermore it recommends guidelines for long-term management of this section of the coastal zone.

2.1 INTRODUCTION

Historically people have relied on the coastal zone because it offers a wide range of resources and provides areas for trading linkages to the international market, in the form of ports (Hinrichsen, 1995). More recently, this association has been driven by the aesthetic appeal of the coast and the recreational opportunities it offers. This 'need' to be at the coast has resulted in coastal zones throughout much of the world being largely over-developed, over-crowded and over-exploited (Hinrichsen, 1995). Development brings with it associated impacts that affect both the ecological functioning of the system and the people that reside there. Problems in the coastal environment were first identified in the mid-1980s, when it was recognised that rapidly growing coastal populations, intense urbanisation and high demand for tourism and recreation led to poorly planned and often high-risk developments along the coast, which can cause degradation of the system and its resources and often has adverse impacts on the people residing in these areas (Hinrichsen, 1995; Glavovic, 2000b). For example in much of Asia, Africa, Europe and North America, coastal fisheries are severely over-exploited resulting in an adverse effect on people's livelihoods. In addition, critical coastal resources such as mangroves and coral reefs are being lost to coastal developments (Hinrichsen, 1995).

One of the critical issues concerning coastal development is that management strategies are difficult to implement and are often not equipped to deal with the level of economic development in such a small zone (Hinrichsen, 1995). A major contributing factor to this problem is that the populations of coastal areas are ever-increasing. For example, within the United States, 54% of all Americans live in 772 coastal areas along the Atlantic and Pacific Oceans, the Gulf of Mexico and the Great Lakes, with population densities of approximately 400 people per km². It is anticipated that by 2025 approximately 75% of all Americans will be living in coastal areas. Another example is China, where 56% of people live within coastal areas, with population densities ranging from 600 people per km² to as high as 2 000 people per km² (Hinrichsen, 1995). Trends in the developing world are no different and coastal cities are seen to be expanding. In Southeast Asia, 65% of all major cities are located along the coast, while in Latin America and the Caribbean, 57 of the 77 major cities are in coastal areas (Hinrichsen, 1995). It is predicted that by 2025 the coastal zone from Rio de Janeiro to Sao Paulo will be a continuous urban zone and in the Mediterranean, it is predicted that the resident population of the basin could reach 555 million people by 2025 (Hinrichsen, 1995).

Like many other regions of the world, South Africa has experienced coastal zone issues and concerns such as those identified above, having recently experienced a number of controversial coastal zone issues. Notable issues include the DEAT, Marine and Coastal Managements (MCM) decision to remove 'illegal holiday homes' along the Eastern Cape coast, the 2007 storm event that hit the KwaZulu-Natal coast and the loss of Blue Flag status for some beaches.

A number of holiday homes were established on the Transkei Coast, where 'white' people 'purchased' land by providing local inhabitants with fishing permits or by buying the local traditional leader gifts of alcohol (Van Niekerk, 2007). The DEAT, MCM took action to have these removed and in 1995 the Transkei High Court ruled 16 such cottages to be illegal and ordered that they be removed and the land restored to its natural state (Kockott, 2005). This decision was appealed but has subsequently been upheld (Van Niekerk, 2007).

In March 2007 a storm hit the KwaZulu-Natal coast with devastating effects. The event caused major damage to infrastructure and erosion of the beach to nearly 100m inland of the high water mark in some places (Mather, 2008). For several months following the storm event, some beaches were still being eroded. Scientists believe that this is a result of the system trying to restore equilibrium, as protective inshore sandbars were lost during the storm event (Carnie, 2007). It is predicted that storm events like this will become more frequent along this section of coast in the future, occurring every ten to 12 years (Mather, 2008), which raises concern about developments along this section of coast and their long-term viability.

More recently the loss of Blue Flag beach status at several sites in KwaZulu-Natal has raised awareness about the state and water quality at South African beaches. The international Blue Flag Programme aims to ensure sustainable development within the beach environment by means of criteria that address issues such as water quality, environmental education, environmental management and safety (Blue Flag, 2008). Over 3 200 beaches and marinas across Europe, South Africa, Morocco, Tunisia, New Zealand, Canada and the Caribbean have been awarded this prestigious status (Blue Flag, 2008). In South Africa, 19 beaches have been awarded Blue Flag status, seven of which fall within the Western Cape region, seven within KwaZulu-Natal and five in the Eastern Cape (Blue Flag, 2008). Several beaches in KwaZulu-Natal lost their status in 2008 after they failed water quality tests as a result of sewage outfall (The Times, 2008). This loss is of great concern for the national and international tourist markets as thousands of people come to South Africa to enjoy these beaches (The Times, 2008). Issues such as these highlight the need for effective management and monitoring within the coastal environment in South Africa.

2.2 THE COASTAL ZONE

The coastal zone is the unique zone of land-sea interface that is difficult to define; it is a complex system that incorporates a number of components and factors that give it shape and definition (Fuggle and Rabie, 1992). In broad terms, it is defined as the terrestrial environment affected or influenced by being near the sea and the portion of the marine environment influenced by being near the terrestrial environment (Carter, 1999; Damassa, 2006). The problem with defining the coastal zone is how far inland does the marine environment influence terrestrial ecological functioning and how far into the ocean does the terrestrial environment influence marine ecological functioning (Martinez *et al.*, 2007).

The coastal zone includes a broad array of terrestrial and marine habitats varying from rivers, coastal forests, wetlands, cities and farms to coral reefs, sea grass beds, soft bottom or rocky benthic substrates. Open waters of estuaries and coastal marine environments are also considered to be part of the coastal zone (Carter, 1999; IGOS, 2006). These areas have enormous economic value in terms of fisheries and provide other ecosystem services such as coastal protection and water purification. Furthermore, coastal environments provide key locations for ports, harbours, urban centres, tourist destinations and recreational activities (Sale *et al.*, 2008). Agardy *et al.* (2005) further define the coastal zone as the terrestrial environment in which people live and affect the delivery of marine derived ecosystem services. This zone is sensitive to human-induced perturbations, including the erection of fixed structures in the sediment-dominated zone and the degradation of wetlands and estuaries (Glavovic, 2000a). Coastal populations have rapidly increased as a result of increased global trade and the development of international ports, which have stimulated job creation and economic development. Associated with these developments have been spin-off effects of improved education, access to health care and services in coastal areas (Tibbetts, 2002; DEAT, 2006). Direct and indirect human activities can cause the collapse of the natural functioning of the system and reduce productivity, leading to a decline in economic returns and an increase in maintenance costs in this zone (Fuggle and Rabie, 1992).

2.2.1 COASTAL DEMOGRAPHICS

Developing countries have experienced high levels of movement of people from the countryside to coastal cities and settlements of all sizes, but the most dramatic increase in coastal populations is occurring in ‘giant’ cities, particularly in Africa and Asia (Tibbetts, 2002). Experts argue that these cities will need to absorb and cope with almost all the population growth in the next two decades (Tibbetts, 2002). To place the magnitude of this growth in context; in 1950 New York City was

considered to be the only ‘megacity’ in the world, with a population of more than 10 million people (Tibbetts, 2002). Today, 33 such cities exist around the world, 21 of which are located within 100 km of the coast (Martinez *et al.*, 2007).

The coast offers a favourable climate, the availability of flat fertile land and proximity to fishery resources (Glavovic, 2000b; Carter, 1999). In recent years there has been a shift in people’s ‘needs’ and ‘wants’ and people now *want* to be at the coast primarily because of its aesthetic appeal and potential for recreational activities (Glavovic, 2000b). Many coastal areas around the world have population concentrations that are above global averages (Agardy *et al.*, 2005; Carter, 1999). Internationally, nearly two thirds of the world’s population live within 150 km of the coast and it is anticipated, based on current trends, that by 2025 75% (6.4 billion people) will reside in coastal areas (Hinrichsen, 1995). South Africa’s urban trends show that 58% of the population reside in urban areas (DEAT, 2006). Rapid urbanisation brings with it associated pressures on the natural system as infrastructure and services are required to maintain these areas of human settlement (DEAT, 2006). Furthermore, 40% of South Africa’s population reside within 100 km of the coastline; coastal areas are therefore highlighted by the State of Environment Report as areas of concern (DEAT, 2006).

The effects of colonialism and Apartheid planning have largely determined the distribution of coastal populations in South Africa, as with elsewhere in the country. The settlement of Europeans and Asians led to the expansion of the port cities of Durban, East London, Port Elizabeth and Cape Town (Matthews, 2001). During the mid- to late-twentieth century, Apartheid policies led to the establishment of homeland areas, and the Eastern Cape housed the homeland areas of the Ciskei and Transkei. People living in these areas had limited access to economic resources and social services, resulting in these areas being largely undeveloped with inadequate infrastructure (Matthews, 2001). Consequently, the economically active people in rural areas in the Eastern Cape are migrating to the large urban centres of Buffalo City, Nelson Mandela Metropole and outside the province, and to smaller sub-regional centres and towns (Provincial Growth and Development Plan (PGDP), 2003). This migration is fuelled by a number of reasons, including the lack of land security in the homeland areas, the lack of employment opportunities and the reduction of staff in the formal agricultural sector (PGDP, 2003). People in these former homeland areas are often considered to be the country’s marginalised and poor, having been adversely affected by the legacy of Apartheid. The poor are often excluded from wealth generation and development opportunities and the gap between the Province’s rich and poor continues to increase (PGDP, 2003). This discrepancy can be clearly observed between the two local municipalities. People in these areas are often unable and

unwilling to engage in risk-taking entrepreneurial activity that may promote economic activities, and the formal economic growth of the area is limited by domestic demand as it fails to attract external interest. The low levels of income in the area mean that people cannot afford charges for services, which in turn affects the local municipalities' ability to maintain or upgrade services (PGDP, 2003).

Historically, coastal residential and holiday type developments in South Africa developed in KwaZulu-Natal and the Western Cape (Visser, 2003) largely due to the availability of infrastructure and services, which are lacking in the Eastern Cape. The coast is a favoured residential and holiday destination as it offers a diversity of resources and development opportunities and supports an ever increasing coastal population and a variety of other human activities (Fuggle and Rabie, 1992). Uses of the coast and coastal resources vary in time and space; some uses complement each other while others conflict (Carter, 1999). Owing to the dynamic nature of the coastal zone, in terms of its landscape, aesthetics and potential to offer a wide range of recreational activities, it ranks as one of the preferred recreational destinations (Sowman, 1987 cited in Moffett and de Ruyck, 1995). This results in increased developmental pressure for infrastructure and services in the coastal zone. In recent years, the coastal areas of KwaZulu-Natal and the Western Cape have become 'over-developed' and the market is now 'shifting' and focusing on other coastal areas that offer favourable conditions. Notably development is moving to areas of the Eastern Cape coast that offer good climate, relatively good infrastructure and service provision and proximity to a metropolitan area (Griffiths *pers comm.*, 2008; Sülther *pers comm.*, 2008). There are a number of large scale-developments, in the form of residential or recreational estates (such as golf estates), planned for the Eastern Cape (Roger, 2008).

2.2.2 ECONOMY OF THE COAST

In spite of the obvious need and want to be near the coast, coastal systems have an economic value which supports human livelihoods (Damassa, 2006). One estimate puts the combined global value of goods and services provided by coastal ecosystems in the region of US \$10 trillion dollars annually (in 1997), approximately 63% of total global value of ecosystem services (Costanza et al., 1997). Figure 2-1 highlights 17 direct and indirect services offered by the coastal environment; specifically by estuaries and marshed areas, mangroves, lagoon and salt pond areas; the intertidal zone, kelp, rock and shell reefs, seagrasses and coral reef areas. It provides a break-down of the relative contributions these coastal systems provide to global value (Damassa, 2006). All eight coastal systems referred to contribute to the provision of food, provide cultural and amenity services

and aid in flood and storm protection (Damassa, 2006). It is important to note the prominence of estuaries in terms of services provided; they contribute to all 17 direct and indirect services highlighted (Damassa, 2006).

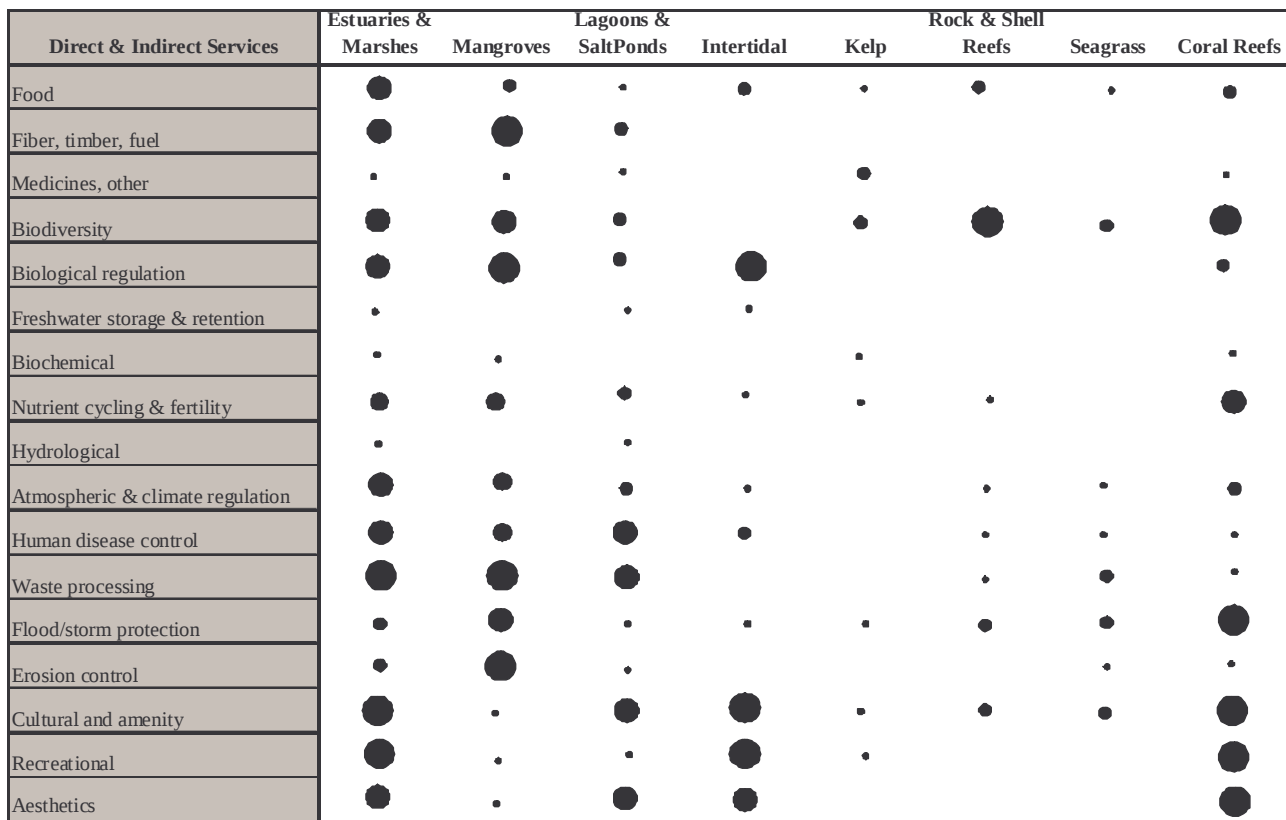


Figure 2-1: Relative contributions of different coastal ecosystems services derived from coastal resources. The larger circles represent a higher relative magnitude of contribution to coastal ecosystems services. (Source: Damassa, 2006 adapted from MEA, 2005)

Following the discovery of gold and diamonds during the late nineteenth century, economic centres in South Africa shifted from the coast to inland regions, and the coast began to take on a supportive role. However, over the past three decades the shift has reversed and the economic development at the coast has escalated (Glavovic, 2000a). This can be largely attributed to the rise of secondary and tertiary activities, such as manufacturing, that are not dependent on primary activities or geographic location. For manufacturing, a coastal location (proximity to ports) has advantages for export of goods and import of raw materials (Glavovic, 2000a). As the economy of South Africa evolves, there is a shift from reliance on natural resource extraction and sale to one of manufacturing and services, resulting in an increased dependence on port facilities (DEAT, 2006). These ports are considered to be the gateway to international trade and their establishment has been critical to

development in South Africa (Glavovic, 2000a). This in turn has led to the rapid development of South Africa's coastal cities.

Economic indicators demonstrate that the coastal portion of South Africa's economy has grown more rapidly than other portions of the country over the last three decades (Glavovic, 2000a). Indicators include an increase in coastal share of South Africa's population and income, the coastal portion of building activity and the coast's contribution to the overall GDP of the country (Glavovic, 2000a). The 'value' of direct benefits resulting from the coast was estimated in 1998 to be in the order of R168 billion annually, which equates to 35% of South Africa's annual GDP (DEAT, 2006). Indirect benefits of the coast, which include functions such as erosion control, amount to R134 billion per annum (DEAT, 2006). More recently there has been a growing trend towards the establishment of Industrial Development Zones (IDZs), which are established to promote competitiveness within the manufacturing sector. The main aim of the IDZs is to attract foreign direct investment (FDI), foreign production and technology and establish links between domestic and zone-based industries (Department of Trade and Industry (DTI), 2006). Each zone is located such that there are direct links to an international port or airport (DTI, 2006) and as a result IDZs are often located within the coastal environment. For example, the Richards Bay, East London and Coega IDZs are all located within the coastal zone of South Africa.

2.2.3 COASTAL TOURISM

Coastal tourism and development in South Africa has been facilitated by the government's neoliberal macroeconomic policy which boosted investor confidence. Furthermore, between 2000 and 2002 the weakening of the Rand made South Africa an affordable market for international property buyers and resulted in the establishment of this market (Preston-Whyte and Oelofse, 2007). This international demand is increasingly shaping coastal resort developments in South Africa. Examples of estates which meet this demand include Pezula, an eco-estate located on the cliffs of the Knysna Heads (Western Cape) and the Zimbali Coastal Resort (KwaZulu-Natal) located in one of three coastal forest areas remaining in South Africa (Preston-Whyte and Oelofse, 2007).

In the past, areas that offered protection, water replenishment and food were used as harbours for the export of raw materials. Richards Bay, Durban, East London, Port Elizabeth, Cape Town, Saldanha Bay and Mossel Bay together handle more than 13 400 vessels with a gross registered tonnage of more than 520 million tons of cargo, annually (Preston-Whyte and Oelofse, 2007). More

recently there has been an increasing demand for the development of ‘pleasure craft marinas’ associated with residential developments. The first residential marina was developed in the early 1960s at St Francis Bay. From the 1980s onwards a number of other residential marinas have emerged, notably Club Mykonos (Saldanha Bay), Marina Martinique (Aston Bay), Royal Alfred Marina (Port Alfred) and Leisure Isle (Knysna) (Malan and Swart, 1997).

In the last decade, local and international demand for coastal resources has increased owing to a number of drivers that in turn inform the spatial classification of coastal areas, as depicted in Figure 2-2 (Preston-Whyte and Oelofse, 2007). These ‘drivers’ are seen to be:

1. Improved linkages to the global economy
2. Increase in expendable income
3. Changes in government policy on environmental management
4. Government’s economic and social reform that relates to resource redistribution and empowerment constructed around the idea of ‘responsible’ tourism
5. Search for undiscovered destinations

(Preston-Whyte and Oelofse, 2007)

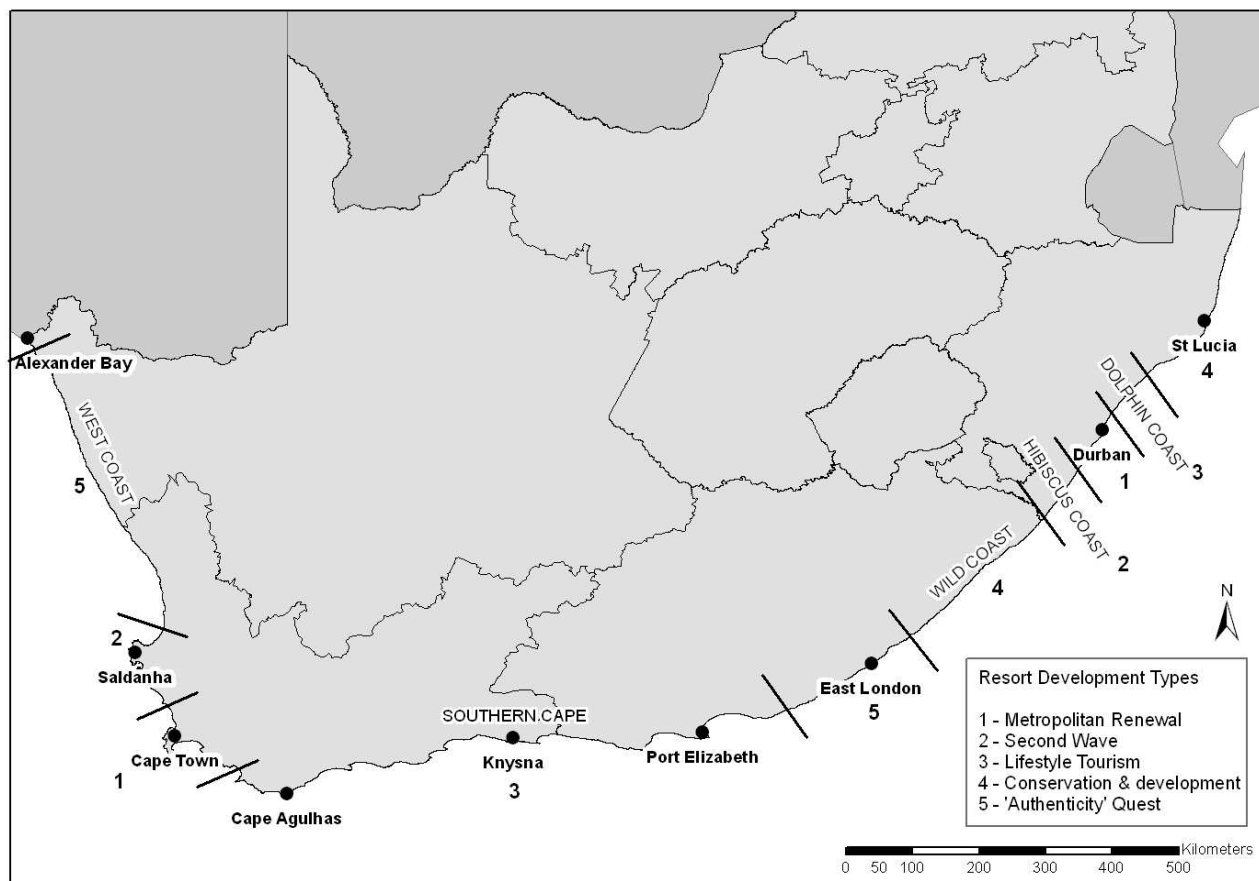


Figure 2-2: Resort development types along the South African coast

(Source: Preston-Whyte and Oelofse, 2007)

These drivers can be seen to apply to most of South Africa’s coastline. However, a number of ‘drivers’ dominate different areas along the coast and give rise to particular development types in these regions. These include metropolitan seaside renewal, second-wave tourism renewal, lifestyle tourism, conservation with development and ‘authenticity’ quest.

Seaside renewal has accrued in the metropolitan areas of Cape Town and Durban. Cape Town’s seaside renewal has been driven largely by the national government’s ability to generate investor confidence associated with the natural environment of Cape Town. Cape Town has attracted international attention, as can be seen by the high property prices for second homes. The Cape Town waterfront was developed in the 1990s with a key focus on tourism; it attracts predominantly middle- and high-income earners who can afford the high prices (Preston-Whyte and Oelofse, 2007). Durban’s seaside renewal has been driven largely as a result of its natural environment and climate, which makes it a popular destination for domestic tourists. As a result, the Durban tourist

market attracts more low- and middle-income earners than Cape Town (Preston-Whyte and Oelofse, 2007).

Coastal development along the KwaZulu-Natal South Coast initially occurred in the 1930s, but in recent years it has received a second ‘wave’ of development or renewal following stagnation in the 1980s, when tourist focus shifted to the southern Cape. Renewed interest in the South Coast was driven by lifestyle preferences and economic renewal, and has led to ribbon development associated with resort type accommodation along the coast (Preston-Whyte and Oelofse, 2007).

The Southern Cape coast and the KwaZulu-Natal Dolphin Coast have been shaped as a result of ‘lifestyle tourism’, which is a form of tourism that has emerged in the last 10 years. This has led to the establishment of tourist towns such as Knysna, Plettenberg Bay and Cape St Francis (Holm and Holm, 2003 cited in Preston-Whyte and Oelofse, 2007). Large areas of land previously used for industry and agriculture are being converted to ‘gated communities’. The Dolphin Coast development began after 1994 when ‘white’ people left Durban’s central business district (Preston-Whyte and Oelofse, 2007). Umhlanga Rocks was the first coastal area to be established as a luxury coastal destination with high property prices ensuring that only the ‘rich’ gain access. From here affluent coastal development rapidly expanded northward (Preston-Whyte and Oelofse, 2007).

More recently, there has been an increasing notion of ‘responsible tourism’ (conservation with development) in coastal areas, which is reflected in the Maputaland and Wild Coast areas (Preston-Whyte and Oelofse, 2007). This type of development is often associated with economic development and community empowerment, as it is recognised that sustainability wildlife or high biodiversity areas are not possible without the involvement of local communities (Preston-Whyte and Oelofse, 2007).

Within South Africa there are areas of *authenticity*, where communities appear to be ‘untouched’, for example along the west coast, where subsistence and commercial fishing and mining occur (Preston-Whyte and Oelofse, 2007). These areas offer a unique traditional cultural experience that appeals to tourists; the problem is that tourist resorts are starting to establish in these areas. These remote settlements can also be found on the Eastern Cape coast and are generally made up of clusters of private holiday homes, self-catering units and bed and breakfast accommodation. These remote areas are becoming more popular with tourists, and it is anticipated that in the near future these areas will become more developed as a result of this demand (Preston-Whyte and Oelofse, 2007).

2.3 COASTAL ZONE MANAGEMENT

Due to the dynamic nature of the coastal zone, management of this zone is often difficult to conceptualise and therefore to define. As a concept, Coastal Zone Management is relatively new. The term came into popular use in the 1970s following the United States Coastal Zone Management Act of 1972 (DEAT, 2000). This Act highlighted the need for a new integrated approach to coastal management and showed that a sectoral management approach, focusing on individual resources, was not achievable (DEAT, 2000). Today, a number of countries have coastal management programmes in place. Although emphasis varies, programmes generally reflect concern for the future of coastal environments, particularly in light of increased pressure in terms of use (Carter, 1999). There are a number of international organisations that recognise the importance of the coastal zone and the effect of human activity on this zone. The UNEP Regional Seas Programme and IGOS Coastal Theme are key international programmes, both aimed at long-term monitoring and management of coastal environments. However, these programmes look at broad changes and the effects of change at the international level. It is also important to have an understanding of what drives development and land use change within the coastal zone at a more localised scale, in order to develop effective management plans for the area.

2.3.1 INTERNATIONAL COASTAL ZONE MANAGEMENT

In the East African region, a need for management of the coastal zone and addressing of environmental threats was first identified in terms of UNEP's Regional Seas Programme. The governments of Somalia, Kenya, Tanzania, Mozambique, Comoros, Madagascar, Mauritius, Seychelles and Reunion came together at the Nairobi Convention in 1985. They identified a need for action plans, conventions and protocol in terms of protection, management and development of the marine and coastal environment (UNEP, 1998). From there, the *East African Coastal Resources Database and Atlas Project* was launched. The project mapped a corridor of 100 km of the marine and coastal environment to provide synthesised information on the coastal environment that would inform future planning and development in this zone, which would ultimately inform the Eastern African Action Plan. Kenya was the first country for which this was completed. It has a coastline of approximately 600 km, which is rich in resources and is considered to be important for agriculture crops, fisheries and timber supply, which supports a population of one million people. The atlas provides an overview of the Kenyan coastal environment, the resources it offers and the proposed management thereof (UNEP, 1998).

Following on from the Nairobi Convention (1985), the Arusha Resolution (1993) and the Seychelles Statement (1996) in 1997, the Secretariat for Eastern African Coastal Area Management (SEACAM) was launched in Maputo, Mozambique. The SEACAM's objective is to assist eastern African coastal countries and the Western Indian Ocean Island States to implement Integrated Coastal Zone Management (ICZM), and is active in Eritrea, Kenya, Mozambique, Tanzania, South Africa, Comoros, Madagascar, Mauritius, Seychelles and Reunion (Fr) (Secretariat for Eastern African Coastal Area Management (SEACAM) and Council for Scientific and Industrial Research (SEACAM and CSIR, ND).

In recent years, human impacts on the marine and coastal environments have created concern amongst numerous international, regional and national organisations. In the past twenty years there has been a notable increase in the number of international instruments directed at dealing with the problems that are threatening marine and coastal biodiversity (Wynberg, 2000).

2.3.2 SOUTH AFRICAN COASTAL ZONE MANAGEMENT

In South Africa, biodiversity conservation has traditionally focused on the terrestrial environment. There is substantial legislation that applies to the marine environment, but this legislation is fragmented as a result of legislation being implemented by a number of national and provincial departments (Wynberg, 2000). In addition to provincial and national legislation, South Africa is party to a number of international agreements, including the United Nations Convention on Biological Diversity (1992), the United Nations Framework Convention on Climate Change (1992), Agenda 21 (1992), the Rio Declaration (1992), the United Nations Convention on the Law of the Sea (UNCLOS) (1982), the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) (1980), the Convention on International Trade in Endangered Species (CITES) (1973) and the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention) (1971) (Wynberg, 2000).

In spite of these national and international agendas and agreements on coastal management in South Africa, a number of coastal management efforts fail for various reasons, including:

- People's limited understanding of the economic, cultural and aesthetic value that a sustainably managed coast can provide (Sale *et al.*, 2008).
- The rate at which development and therefore impacts are occurring in the coastal environment means that long-term management strategies are not relevant in the short term. Short term change is critical and needs to be managed more effectively (Sale *et al.*, 2008).

- Coastal management is fragmented across jurisdictions where different government departments have different mandates and management goals (Sale *et al.*, 2008). Furthermore, in many countries, the land/sea boundary reflects a change in jurisdiction, with the sea being under the control of the State and the land under the control of provincial authorities, which leads to a fundamental discrepancy in administrative structures for coastal regions (Carter, 1999).
- There is a lack of scientific input into coastal management, resulting in management that is reactive as opposed to proactive (Sale *et al.*, 2008).
- Management agencies lack the resources to enforce compliance, especially when management goals are not adopted by the local communities (Sale *et al.*, 2008).

2.3.3 DEFINITION OF THE COASTAL ZONE

A key problem in terms of developing and implementing coastal management policies is the definition of the zone under management (DEAT, 2000). The coastal zone is influenced by a number of factors, including climate, natural resource provision, ecological functioning and socio-economics, which result in ever changing issues that need to be addressed within their local context (Lunkapis, 1999). As a result, some countries do not even try to enforce a uniform definition of the coastal zone, but rather use different definitions for different tasks (DEAT, 2000).

In South Africa, concern regarding coastal environment only came about in the 1970s and, in 1973, a Coastal Management Division was established in the Department of Planning and Environment (Glavovic, 2006). Coastal management policies and legislation were fragmented, both in terms of implementation and responsibility across national, provincial and local levels of government (DEAT, 2006; Coastal & Environmental Services (CES), 2006). Activities were often uncoordinated (Glavovic, 2006) and there was often a lack of clarity as to roles and responsibilities between these departments, resulting in a poorly managed coastal zone (CES, 2006). In the 1980s it was recognised that the coastal zone required more effective management and the DEAT established a dedicated coastal management department (Glavovic, 2006), known as DEAT, MCM. The 1990s saw a marked change in coastal management in South Africa and led to an era of new policy formulation (Glavovic, 2006).

2.3.4 LEGISLATIVE DEFINITIONS OF THE COASTAL ZONE IN SOUTH AFRICA

These changes in management techniques and policies over the years have in turn resulted in an array of definitions in terms of the coastal zone. Definitions in terms of seaward and landward boundaries vary according to the legislations under which they are defined, based on the activities

for which the legislation has been developed (DEAT, 2000). These are depicted in Figure 2-3 and discussed in more detail below.

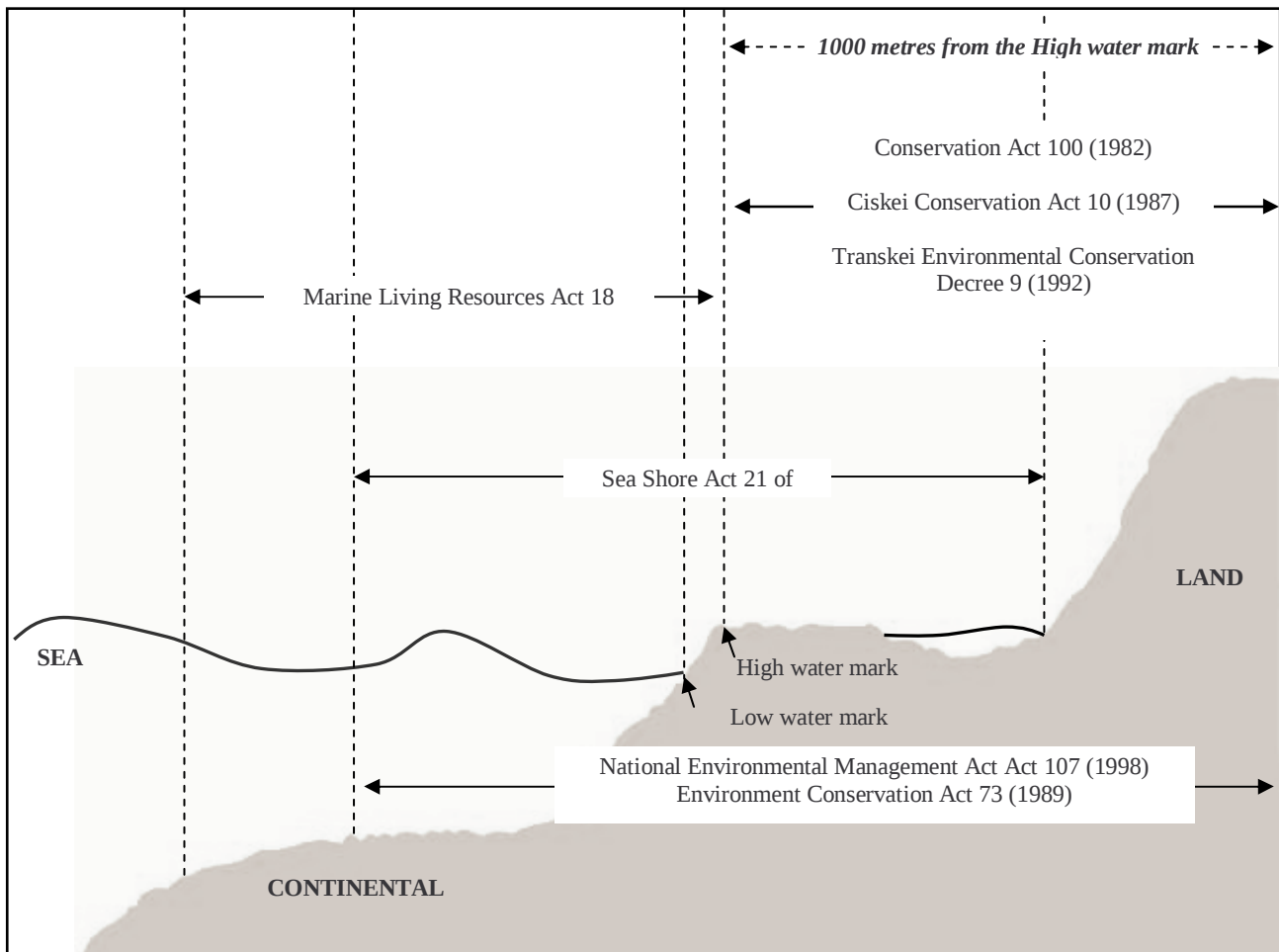


Figure 2-3: Defining the coastal zone

(Source: Adapted from Glavovic, 2000a)

Prior to the advancements of coastal management legislation, the legal context for coastal management was provided by the **Constitution Act (Act No. 108 of 1996)**. Section 24 of the Constitution Act states that *everyone* has the right to an environment that is not harmful to their health or well-being and they have the right to an environment that is protected for the benefit of present and future generations (DEAT, 2000). The Constitution provides a framework for the management of the coast. It highlights the need for co-operative governance and the need to develop lower spheres of government (DEAT, 2000).

The **Sea-Shore Act (Act No. 21 of 1935)** is founded on the principle that ownership of the sea and sea-shore is vested in the President for use by, and benefit of, the public (DEAT, 2000). It defines

the sea-shore as the water and land falling between the low- and the high-water marks (Kidd, 1997). The Act prohibits the establishment of building or structures within the sea-shore unless the land is leased from the state. It further prohibits the dredging of, or deposit on, the sea or sea-shore without consent. It allows for use of portions of the sea-shore for specified purposes or by resolution of Parliament. This Act falls short of coastal zone management as the sea-shore is only part of the coastal zone (Kidd, 1997). The act needs to be updated to be consistent with other environmental and planning legislation (DEAT, 2000). The main aim of the **Marine Living Resources Act (Act No. 18 of 1998)** is to ensure sustainable utilisation of marine living resources. It emphasises the need to ensure equitable access to marine resources and provides national control and co-ordination, and it places responsibility for resource-allocation with the Minister of Environmental Affairs and Tourism (DEAT, 2000).

The promulgation of regulations under the repealed **Environmental Conservation Act (Act No. 100 of 1982)** was the initial step towards recognising the coastal zone as an area requiring legislative attention (Fuggle and Rabie, 1992). It demarcated a strip of land 1 000 metres inland of the high-water mark as a limited area zone. Any developments proposed for this strip would be subject to environmental scrutiny. The regulation also helped focus Coastal Zone Management in South Africa and closed loopholes in planning legislation that permitted unsustainable development in the coastal zone (Fuggle and Rabie, 1992). The Act (Environmental Conservation Act 100 of 1982) was replaced by the **Environment Conservation Act (Act No. 73 of 1989)** and the authorities ceased applying the coastal regulations of 1982 (Fuggle and Rabie, 1992). Parts of this Act have subsequently been repealed by the **National Environmental Management Act (NEMA) (Act No. 107 of 1998)**. NEMA provides a basic framework for the White Paper on Environmental Management Policy for South Africa. It ensures that the environmental rights presented in the Constitution are protected and fulfilled (DEAT, 2000). While the Act highlights the need for co-operative governance, it requires that the Department of Environmental Affairs and Tourism be the lead agent and custodian of the environment.

The **White Paper for Sustainable Coastal Development** (hereafter referred to as the White Paper), released in April 2000, is the result of a partnership between government and civil society and outlines a common vision for coastal management (Glavovic, 2000b). The White Paper signifies a shift in thinking regarding coastal management and stresses the need to change the way in which we manage our coast, emphasising the value of the coast and the need for sustainable coastal development (Glavovic, 2006; DEAT, 2000). It states that the boundaries of the coast extend as far seaward and as far landward as necessary for effective coastal management. The

White Paper recognised that the coast needs to be managed as *a system* for users to benefit from the opportunities it provides, and sets out a vision for the coast as well as principles, goals and objectives for coastal management (DEAT, 2000).

The White Paper proposed the drafting of a new Coastal Management Act to update and build on the Sea-Shore Act and to ensure a framework for sustainable coastal development (DEAT, 2000). This led to the development of the **Integrated Coastal Management Bill**³ (hereafter referred to as the Coastal Bill), which promotes a co-ordinated, holistic approach to integrated coastal management. The Coastal Bill was supported by the National Council of Provinces in September 2008. The Bill still needs to go back to the National Assembly and then to the President for final approval, before it is gazetted as an Act. Should it become an Act it will be the first time that South Africa has a national Coastal Management Act for managing the coastal zone (Republic of South Africa, 2006b).

The Coastal Bill outlines the roles and responsibilities of the National, Provincial and Local levels of government. It specifies what tasks each sphere of government should undertake. Amongst other things, it requires, in terms of Chapter 6, that National, Provincial and Local levels of government prepare and adopt a Coastal Management Programme for managing the coastal zone. Each sphere of government should prepare this programme within four years of commencement of the Act and revise it every five years thereafter (Republic of South Africa, 2006b). The Buffalo City Municipality (BCM) has been at the forefront of coastal management in South Africa, having been one of the first local municipalities to develop a Coastal Management Programme (in the form of an Integrated Coastal Zone Management Plan (ICZMP)) even though it was not a legal requirement at the time it was undertaken by BCM⁴ (CES, 2006). The BCM ICZMP identified key ‘pressure’ areas that required management and developed Coastal Action Plans for the management of these areas. It also identified and developed institutional structures and mechanisms within the BCM that would facilitate the implementation of the ICZMP and coordination between spheres of government and departments.

Two other significant pieces of legislation that should be considered are the **Transkei Environmental Conservation Decree 9 of 1992**, which provides for the establishment of a coastal conservation area 1 000 metres inland of the high-water mark and prohibits certain activities without permission (applicable only to former Transkei) (Kidd, 1997). The **Republic of Ciskei,**

³ It is anticipated that this will be promulgated as an Act by Parliament

⁴ Should the Coastal Management Bill be passed as an Act, it will be a legal requirement for all coastal municipalities to prepare and implement a Coastal Management Programme within 4 years of commencement of the Act

Nature Conservation Act (Act No. 10 of 1987) provides for the establishment of a coastal conservation area on the landward side of the length of the sea-shore 1 000 metres wide, which is measured in relation to the sea, as distinct from a tidal lagoon, from the high water mark and in relation to a tidal lagoon, from the highest water-level reached during ordinary storms during the most stormy period of the year excluding exceptional or abnormal floods (Republic of Ciskei, 1987b).

2.4 SOUTH AFRICAN PLANNING LEGISLATION AND PROGRAMMES

2.4.1 NATIONAL LEGISLATION AND PROGRAMMES

There are a number of national legislations that affect spatial planning and development which need to be taken into account, some of which affect or have resulted in regional planning and conservation plans. Of significance is that land use management in the Eastern Cape is governed by legislation inherited from past administrative systems (dating back to 1934), and will continue to be so until such time as new legislation is promulgated (Procedures Manual, ND).

It is intended that the Land Use Management Bill (Draft December 2004)⁵ will repeal the Restrictions Act (Act No. 84 of 1996); Development Facilitation Act (Act No. 67 of 1995); Physical Planning Act (Act No. 88 of 1967) (Republic of South Africa, 2006a) and all land use and spatial planning Acts and Ordinances. The Land Use Management Bill aims to provide a legislative framework that enables government to formulate policies, plans and strategies for land use and land development. The Land Use Management Bill enforces that Spatial Development Plans (which are prepared by local municipalities) should be a critical component of forward planning in South Africa. It is anticipated that the Land Use Management Bill (when passed as an Act) and the Municipal Systems Act will together form a comprehensive framework for local authorities to engage in development planning (Procedures Manual, ND). Until such time as the Act is promulgated, the existing legislation still governs land use management and planning in the Eastern Cape.

A significant factor in terms of historical settlement patterns is that of Apartheid legislation and planning. Apartheid, meaning ‘apartness’ or separateness, refers to the policy of separating people based on race. It dictated where people lived, went to school and worked (Clark and Worger, 2004). The apartheid philosophy was introduced by the National Party, which came into power in the

⁵ The Land Use Management Bill was first drafted in 1999 (Sülther *pers comm.*, 2008)

general election of 1948, the aim of which was to create a white Christian national state, and was finally abolished in 1994 (Christopher, 2001; Clark and Worger, 2004). Apartheid was the legal division between ‘white’ and ‘black’ people (Christopher, 2001). However, this division of land between ‘white’ and ‘black’ communities had largely occurred prior to the implementation of Apartheid as a result of various other legislations, which are outlined in Table 2-1 (Christopher, 2001).

Table 2-1: List of historical legislation which facilitated the segregation of ‘black’ and ‘white’ people

ACT	YEAR	FUNCTION
Pre-apartheid laws		
Glen Grey Act	1894	Restricted black landholdings (principally in the Cape)
Mines and Works Act	1911	Barred Africans ⁶ from skilled positions
Native Lands Act	1913	Limited African landownership to 7 percent of land (all of which was in ‘native reserves’)
Natives Trust and Land Act	1936	Limited African landownership to 13 percent of land
Native (Urban Areas) Consolidation Act	1945	Established separate locations for the African population. Mandated the carrying of passes in urban areas by ‘African’ people
Apartheid laws		
Prohibition of Mixed Marriages Act	1949	Outlawed interracial marriages
Population Registration Act	1950	Classification of South Africans by ‘race’
Group Areas Act	1950	Outlawed interracial communities and created racially defined residential areas
Suppression of Communism Act	1950	Granted state broad police power to prevent ‘communist’ activity
Bantu Education Act	1953	Consigned Africans to basic education
Reservation of Separate Amenities Act	1953	Outlawed integration of public facilities
Native Labour (Settlement and Disputes) Act	1953	Made African strikes illegal

(Source: Adapted from Bauer and Taylor, 2005)

Apartheid officially came into being in 1948 and Apartheid-specific laws were developed that controlled aspects of South Africans’ lives based on race. These included the prohibition of mixed race marriages, interracial communities and interracial public facilities (Table 2-1) (Clark and Worger, 2004). The Population Registration Act classified people based on their ‘community acceptability’ and appearance as either ‘White’, ‘Coloured’ or ‘Native’. Later Indians were classified as ‘Indian’ (Clark and Worger, 2004). Following this, in accordance with the Group

⁶ Africans in the context of the legislation in Table 2-1 refers to ‘black’ South Africans

Areas Act (1950), the government divided the country into geographic areas based on race. This enabled them to control property rights, ownership and occupancy (Clark and Worger, 2004).

An Apartheid process which has had a major impact on the spatial distribution of the South African population was the forced resettlement of 'Black' people from 'White' areas to homeland areas. The government set up 10 homelands, in accordance with the Native Lands Act, 1913, based on ethnicity, and resettled millions of people (Christopher, 2001; Clark and Worger, 2004). Approximately 3.5 million people were resettled between mid-1950 and mid-1980 as a result of this policy (Clark and Worger, 2004).

Linked to homeland development, is the issue of land tenure and subsequently land reform. Land tenure is defined as the terms and conditions under which land is held, and land reform refers to the planned change to this tenure to secure land rights (Adams *et al.*, 1999). Within the former homeland areas, land was under communal tenure, which is a hybrid form of tenure specific to these homeland areas. It combines individual and collective property rights. Land held in communal tenure is generally owned by the state or in trust for specific tribal communities (Lahiff, 2003). Within South Africa land reform is a part of a national programme and is comprised of three main components, restitution, redistribution and tenure reform. Restitution is aimed at providing relief for victims of forced removal, and 13.5% of the national restitution claims lodged by 2002 were for the Eastern Cape. Redistribution provides discretionary grants that assist people to purchase land from private land owners or the state; in the Eastern Cape this constitutes the bulk of land reform and focuses on groups of black people pooling resources to purchase 'white' owned farms. Tenure reform is aimed at securing and extending tenure rights of victims affected by historically prejudiced legislation, but this is not commonly used in the former homeland areas of Eastern Cape (Lahiff, 2003). Land reform is primarily administrated by The Communal Land Rights Act (Act No. 11 of 2004), which makes provision for the legal security of land, transferring communal land to communities and provides for land rights enquiries to determine the transition from old order rights to new order rights (Republic of South Africa, 2004a). However, land reform is challenged by limited budget, lack of policy direction, inadequate co-operation between government spheres and constraints imposed by the national land reform policy (Lahiff, 2003), resulting in low levels of land reform.

Land reform in Kiepersol (Mpumalanga (the then Eastern Transvaal), South Africa) was facilitated by means of Participatory GIS. Between 1960 and 1982 more that 380 000 people were relocated largely as a result of the abolishment of labour tenancy, which meant that workers resident on the land became illegal squatters (Harris *et al.*, 1995). The project incorporated local knowledge by

means of a series of workshops which led to the production of a mental map which showed quality of land, location of better soils and other relevant land uses, and to some degree highlighted social processes and perceptions of space. This was then compared with existing data for the area and showed that in some instances local knowledge confirmed that data but discrepancies were also seen as a result of participants' perceptions of ecological space (Harris *et al.*, 1995).

During the Apartheid 'era', the Ciskei homeland established its own legislation for governance of the homeland. Once such Act, that to date has not been repealed, is the Land Use Regulation Act (Act No. 15 of 1987). This Act makes provisions for land use planning, the control of land use right and the subdivision of land (Republic of Ciskei, 1987a), and land falling within the Ciskei⁷ is still subject to the requirements of this Act and not the Cape Land Use Planning Ordinance (LUPO). Some provinces put their own planning Acts in place post-1994; the Eastern Cape Government has not done so and followed the advice of the Department of Agriculture, which was to wait for the National Land Use Management Bill to be passed, which would guide all planning legislation (Colman *pers comm.*, 2008).

Other current legislation that is instrumental in shaping development in the Eastern Cape and its coastal zone are Cape LUPO (15 of 1985); the Municipal Systems Act and the Development Facilitation Act (DFA) (Act No. 67 of 1995).

Cape LUPO is an ordinance that regulates land use and provides for matters incidental thereto. It makes provisions for structural plans, zoning schemes and the subdivision of land (Cape LUPO, 1985); as a result any applications for change in land use or subdivision of land are subject to these conditions.

The Local Government: Municipal Systems Act (Act no. 32 of 2000) was developed in order to facilitate social and economic upliftment of communities (Republic of South Africa, 2000). Section 23 of this Act requires all local municipalities to develop an Integrated Development Plan (IDP), of which an SDF is a key component (Section 26(e)). The SDF should provide guidelines for land use management within the municipality (Republic of South Africa, 2000). It is seen to be a strategic forward planning tool in terms of development and ensures social, environmental and economic sustainability within the local municipality (SetPlan, 2006). Section 35 (2) of the Municipal Systems Act, states that the SDF overrides any other plan that may have previously been compiled,

⁷ The Land Use Regulation Act excludes settlement areas that are administrated in terms in terms of the Black Areas Land Regulations R188 in terms of the Ciskei Land Regulations Act (Act 14 of 1982) and areas administered in terms of Townships Proclamation No. R293 of 1962.

including regional development plans, regional structure plans and local Urban Structure Plans. This makes the SDF the main instrument for forward planning and decision-making on land development (Procedures Manual, ND). In line with this, both the Ndlambe and Ngqushwa local municipalities have developed SDFs.

The Ndlambe SDF recognises that development needs to be contained, as far as possible, within an urban edge and has made provision for this. It highlights the need to control development outside the urban edge and recommends three development zones (designated zones 1 to 3). Zone 1 and 2 allow for holiday accommodation and housing that should be linked to a unique resource. Zone 2 specifies that only 5% of the site can be developed (the remainder must be zoned private open space or nature reserve). In Zone 3 development is prohibited (see desired spatial form, Appendix A).

The Ngqushwa SDF is seen to be insufficient as it is not adequately informed by socio-economic and biophysical environmental factors (CES, 2005). Furthermore, it does not delineate an urban edge or provide guidelines for development. In light of this, the Ngqushwa Strategic Environmental Assessment (SEA) is considered in terms of spatial planning for the area. The SEA identifies areas of high ecological sensitivity which should not be disturbed by future development (*no-development areas*). It also recommends the remainder of the coast, excluding existing development nodes, to be a *limited-development* area in which certain types of development may be considered. *Go-development* areas are areas where residential and tourism development should be encouraged. Table 2-2 lists the criteria for distinguishing between the three ‘zones’ (CES, 2005).

Table 2-2: Zoning categories along the Ngqushwa coastline

No-development	Limited-development	Go-development
• Proclaimed nature reserves. • STEP Protected, Process and Critically Endangered areas. • Rivers, estuaries and riparian zones. • Coastal grasslands and thicket. • Dynamic coastal areas: primary and mobile dunes and areas within 50 m of the high water mark.	• All land within the coastal zone not classified as no-development or urban node. • Existing areas of degraded/modified agricultural land. • Any developments must ensure future environmental benefits.	• Existing urban areas within the urban edge. • Identified coastal and tourism nodes.

(Source: CES, 2005)

The DFA was introduced as a integrated legislative framework to facilitate land development projects post-1994 (Rigby and Diab, 2003) and is currently key to all spatial planning processes in South Africa (Procedures Manual, ND). Prior to its development, land development planning was

subject to conflicting laws, regulations and ordinances of the then four provinces and 10 homelands⁸ (Rigby and Diab, 2003). The DFA highlights the need to facilitate development in formal and informal settlements, promotes the integration of different land uses, discourages urban sprawl and promotes sustainable land development (Procedures Manual, ND)⁹. Furthermore the DFA recognises that South Africa's legislation has been moving towards spatial planning and development that aims to integrate environmental concerns and contains some of these environmental provisions (Rigby and Diab, 2003)

It is important to note that the NEMA (No. 107 of 1998) affects all proposed developments in the coastal zone. Chapter 5 of this Act outlines *listed activities*, for which environmental authorisation is required. Should a developer wish to undertake any of these activities, an Environmental Impact Assessment (EIA) would need to be done and authorisation granted by the relevant authority (Republic of South Africa, 1998). An EIA assesses all potential environmental and social impacts in terms of their severity, likeliness to occur and extent of impact (Republic of South Africa, 1998). Furthermore, this Act provides established principles for a framework for environmental management and makes provision for the formulation of Environmental Implementation Plans by provinces for the implementation of the NEMA principles (Procedures Manual, ND). A number of other National Acts need to be taken into consideration in terms of spatial planning, which include:

- **The Conservation of Agricultural Resources Act (No. 43 of 1983)**, which enables the Minister of Agriculture to prescribe control measures in terms of the utilisation and protection of land (Procedures Manual, ND).
- **The National Forests Act (No. 84 of 1998)**, which provides for special measures to protect natural forests, including coastal forests, from damage and disturbance (Procedures Manual, ND).
- **The National Water Act (No. 36 of 1998)**, which makes provision that no development should occur within the 1 in 100-year flood line (development is sometimes permitted up to the 1 in 50-year flood line). This Act also provides for preventative measures against the pollution of wetlands, watercourses, estuaries and the coastline. It allows the Minister of Water Affairs to regulate land-based activities that impact on stream flow (Procedures Manual, ND).
- **The National Heritage Resources Act (No. 25 of 1999)**, which provides for the identification of places that have special national and/or provincial significance in terms of heritage assessment criteria. Heritage resource sites are protected from actions, including alteration, subdivision and/or a change in the planning status (Procedures Manual, ND).

⁸ Some of which have still not been repealed

⁹ It is anticipated that the DFA will be repealed by the Land Use Management Act (Currently a Bill)

2.4.2 REGIONAL LEGISLATION AND PROGRAMMES

National Environmental Management: Biodiversity Act (Act no. 10 of 2004) (hereafter referred to as the Biodiversity Act) makes provision for the management and conservation of biodiversity, the protection of species and ecosystems that merit national protection (Procedures Manual, ND) and legislated the establishment of the South African National Biodiversity Institute (SANBI). The institute is responsible for amongst other things, monitoring the status of biodiversity, the conservation status of all listed threatened or protected species and listed ecosystems, the status of all listed invasive species (Republic of South Africa, 2004b) and includes those related to the marine environment. Section 40 of the Biodiversity Act allows for the determination of bio-regions and bio-regional plans if a region contains one or several nested ecosystems and is characterised by its landforms, vegetation cover, human culture and history (Republic of South Africa, 2004b). In line with this, the SANBI established a bioregional programme whereby bioregional conservation planning and implementation is undertaken by means of various programmes. Of significance to the Eastern Cape are Cape Action Plan for the Environment (C.A.P.E.), the Succulent Karoo Ecosystem Programme (SKEP) and the Subtropical Thicket Ecosystem Planning (STEP) and initiatives (SANBI, ND). It should also be noted that SANBI initiated a marine programme in 2006 in association with the WWF Marine Programme. The programme was aimed at developing a network of offshore marine protected areas as identified in the National Biodiversity Strategy and Action Plan (SANBI, ND).

C.A.P.E is a government initiated programme focused on the protection of the Cape Floristic Region (CFR), which has been identified as one of the world's main biodiversity hotspots (C.A.P.E., 2004). Its biodiversity is currently under threat, largely as a result of its conversion to agriculture and rangelands (C.A.P.E., 2004). SKEP identified and generated broad consensus regarding vision and conservation targets for the Succulent Karoo, by means of scientific input combined with broad land-user participation (SKEP, ND). STEP aims to raise awareness of the thicket biome's global importance as a biodiversity 'hotspot' and to lay the foundation for the implementation of conservation activities (Knight and Cowling, 2006). The STEP planning covers the regions of Ndlambe and Ngqushwa and therefore needs to be considered in this research. STEP is widely accepted as a key spatial and conservation planning tool in the Eastern Cape Thicket Biome. STEP identifies the conservation status of areas as being currently not vulnerable, vulnerable, endangered or critically endangered.

Eastern Cape Biodiversity Conservation Plan (ECBCP) was developed more recently; it was initiated as a result of the recommendations of the Strategic Environmental Assessment (SEA) of

Water Management Area 12 (the northern portion of the Eastern Cape). The aim of the project is to integrate all existing conservation planning projects into one land use decision support system for the Eastern Cape. Critical biodiversity areas, priority aquatic features, land use pressures, population pressures and subsistence resource-use dependencies are all incorporated into this assessment (Berliner and Desmet, 2007). It identifies three primary categories or Critical Biodiversity Areas (CBA) (Terrestrial and Aquatic): CBA1 being critically endangered vegetation or critically important aquatic system; CBA2 being endangered vegetation or important aquatic system; and CBA3 being primary catchment management areas for estuaries (Berliner *et al.*, 2007).

Another planning tool critical to the research area is the proposed Environmental Management Framework (EMF). The EMF is being undertaken by SRK Consulting and covers the section of coastline from Cannon Rocks to Kei River (which incorporates the local municipalities of Ndlambe and Ngqushwa). The zone for which the EMF is defined is 1.5 km¹⁰ inland of the high water mark, 5 km up estuaries that are considered to be under pressure and 3 km up estuaries that are not under pressure. It assesses biological value and sensitivity, visual value and sensitivity, sensitivity to disturbance and agricultural potential. The EMF is aimed at highlighting important process areas such as estuaries and vegetated dunes, and assesses the desired state of the environment against the local municipalities' SDF and other planning legislation and guidelines (Stewart *pers comm.*, 2008).

It is anticipated that when the EMF is in the implementation phase, it will recommend three geographic zones that are directed at ensuring that development occurs within the zones designated for development and not within sensitive areas. Zone One areas are natural areas that would be subject to all of the listed activities¹¹ in terms of the NEMA. Zone Two applies to areas where certain types of development would be encouraged and are subject to a trimmed set of listed activities (they would be exempt from those activities that apply to development recommended for that area) to facilitate development in these areas. Zone Three covers sensitive areas and development in this zone would be subject to additional listed activities to ensure conservation (Stewart *pers comm.*, 2008).

2.5 LAND COVER AND LAND USE

Land cover is the description of natural and man-made features on the earth's surface (Di Gregorio, 2005; Thompson, 1996). Land use refers to the activities and inputs people perform on land cover to

¹⁰ This is made up of 1 km inland as defined by the Coastal Bill and a 0.5 km buffer area

¹¹ Listed activities are those that require environmental authorisation in terms of section 24(2)(a) and (d) of the NEMA (Act No. 107 of 1998) (Chapter 5)

manipulate or maintain it (Di Gregorio, 2005). Any point on the ground can only be associated with one unique land cover type, but it may be associated with several land uses. For example, grassland (land cover) may be used for communal grazing (land use) or a conservancy area (land use). Land use definitions provide an important link between land cover and people's activities and impacts on the environment (DEAT, 2001; Di Gregorio, 2005). Visible changes in land cover reflect the underlying change in land use, which in turn affects the productivity of land and its biological integrity (Biggs and Scholes, 2002). An understanding of these local patterns and processes are important in that land cover change can be linked to sustainability of socio-economic development (Fox *et al.*, 1995).

Land use change has become a central theme of global environmental change research as it has changed dramatically over the last two centuries (Biggs and Scholes, 2002; Verburg and Veldkamp, 2005). Changes in land use come about in response to human needs and wants and are the product of a range of factors, which integrate to provide the existing patterns. Changes are intensified by population growth, particularly in urban areas. Broad changes in land cover usually result in significant economic and environmental effects, which have implications for a range of policy issues including preservation of public open space and maintenance of water quality (Lubowski *et al.*, 2003), which in turn impact on the quality of life for people residing in these areas.

Knowledge regarding land use change is integrated by means of spatial models, which are aimed at explaining the causes, locations, consequences and trajectories of land use change (Verburg and Veldkamp, 2005). Remote sensing has become the most effective method of capturing land cover and land use data (Thompson, 1996). However, due to the scarcity and cost of obtaining data on land use, studies generally use aggregated data for countries or geographic regions. As a result, studies only show indirect information on individual's preferences regarding particular land use changes (Lubowski *et al.*, 2003). Case studies of land cover and land use change are discussed in Section 2.6.

Changes in land cover and land use have been identified as contributing significantly to the loss of biodiversity and productivity in both terrestrial and aquatic ecosystems (Kilic *et al.*, ND; Lambin *et al.*, 2001). Pauleit *et al.* (2005) undertook a study of Merseyside (United Kingdom) to determine the environmental and ecological consequences of urban land use and land cover change in residential areas. Land cover was mapped from aerial photographs and showed that there have been significant changes in land use and land cover within the study area. There was a notable increase in built-up and other impervious surfaces and a decline in green space, and the overall loss of vegetation cover

was estimated at 5.1%. The study determined that these losses in green space have led to a decline in environmental quality in all residential areas within the study area (Pauleit *et al.*, 2005).

According to Giannecchini *et al.* (2006), few studies have undertaken to examine the relationship between land cover change and the socio-economic factors associated with the former homeland areas. Giannecchini *et al.* (2006) undertook a study in three villages of Bushbuckridge in the Limpopo Province in order to assess this link. Population density within these villages is high as a result of Apartheid planning. The influx of Mozambican refugees resulted in changes in social dynamics, which led to changes in traditional control in the villages. Without traditional control in place, resource harvesting by both the local communities and ‘outsiders’ increased and became unsustainable. A temporal analysis of land cover change was undertaken for the three villages based on aerial photographs at three time epochs between 1947 and 1997. The study found that although relative coverage varied between sites and years, all three villages had dominant land cover of mixed woodlands and croplands. In terms of land cover change, all three villages experienced an exponential increase in human settlement and a decrease in vegetation cover of taller vegetation types, with varied trends in cultivation (Giannecchini *et al.*, 2006). This study shows that aerial photographs are a useful tool for the assessment of land cover change, in that it allows for analysis of land cover at different time epochs as will be done in this research.

Changes in land cover usually result from the conversion of natural land to croplands and pastures, abandonment of agricultural lands, deforestation and reforestation, afforestation and urban sprawl (Kilic *et al.*, ND). It is believed that in the past 300 years there has been a global increase in croplands from 265 million ha to 1 471 million ha, and pastoral lands from 524 to 3 451 million ha (Goldewijk, 2001). Hara *et al.* (2005) examined land use change from agricultural land to current land uses in terms of their spatial distribution to gain a better understanding as to urban growth in deltaic Asian mega-cities based on a case study of Bangkok. This was concluded using aerial photographs to produce land use maps for several time periods by means of manual digitising. Interpretation showed that Bangkok was primarily transformed from rice fields to built-up areas between 1952 and 1998 (Hara *et al.*, 2005). This study shows that historical aerial photos are a useful data source for the interpretation of historical changes in land use and enable the interpretation of ‘driver’ of change.

Twenty-six researchers from a variety of disciplines undertook an assessment of the state of land use and land cover change worldwide. The study considered tropical deforestation, rangeland modifications, agricultural intensification and urbanisation in detail (Lambin *et al.*, 2001). The

study found that although increasing population, poverty and shifting cultivation contribute to land use and land cover change, changes are largely the result of cause-connection patterns that operate at the regional and national scales and are influenced by ‘globalisation’ through the incorporation of regions into the world economy that result in rapid changes in land use and land cover (Lambin *et al.*, 2001).

In South Africa, Biggs and Scholes (2002) undertook an assessment of changes in agriculture and cultivation land in South Africa for the period 1911 to 1993 (Biggs and Scholes, 2002). Results showed that patterns of agricultural change are partly linked to population growth, culture, political and economic conditions. Population growth has resulted in increased demand for food products, resulting in expansion of cultivated areas with land under cultivation more than tripling during the twentieth century (Biggs and Scholes, 2002). ‘Man made’ areas have expanded at the expense of natural grasslands and to a lesser degree, forest areas (Goldewijk, 2001). It is estimated that 18% of South Africa’s natural landscape has been transformed due to cultivation (10.46%), degradation (4.47%) urban land use (1.51%) and forestry (1.41%) (DEAT, 2006).

In the Eastern Cape, the transformation of livestock (beef, dairy) and small stock (merino sheep, angora goats) farms to private game reserves has been evident over the last 30 years (Smith and Wilson, 2002; Langholz and Kerley 2006). This transformation can be attributed to the lucrative eco-tourism market of the Eastern Cape (Langholz and Kerley 2006). Other factors contributing to this conversion are the livestock reduction schemes following the 1960 droughts, low cattle prices in comparison to income from game farming, renewed conservation interests, and more recently, due to increased stock theft and increased interest in trophy hunting (Halse, 1983 cited in Smith and Wilson, 2002). Post-1996, there has been an unprecedented boom in game-based operations, with a 40% increase in the number of game farms between 1996 and 2001 (Smith and Wilson, 2002). This change in land use is perceived to be more economically viable as game animals are better adapted to their natural environment and more likely to survive extreme weather events (e.g. drought) (Bothma, 2002).

One of the main problems with land cover and land use mapping is that of classifying land cover and land use, as classification systems are normally designed to meet specific user objectives and are thus not ‘generic’ (Thompson, 1996). Within South Africa, the National Land Cover (NLC) 2000, developed by the CSIR, is most commonly used. The National Land Cover 2000 database was derived from NLC 1994-95 and was the first update of this programme, the aim of which is to establish long-term monitoring of land cover and land use change. The programme mapped land cover for South Africa using a GIS at a scale of 1: 50 000 (Thompson *et al.*, 2001). The NLC 1994-

95, based on LANDSAT Thematic Mapper (TM) satellite imagery for the first time provided South Africa with a standardised baseline inventory of current land cover and land use (Thompson *et al.*, 2001). The project was undertaken with the aim of implementing a long-term monitoring programme to obtain information about the rate, extent and location of resource utilisation as well as land cover and land use change in South Africa (Thompson *et al.*, 2001).

One the key elements of the NLC 2000 was to use a standard classification scheme to ensure consistency and comparability for reporting on land cover and land use (Thompson *et al.*, 2001). The classification was based on three hierarchical levels of land cover:

- Level I: 12 broad land cover types that can be identified from high-resolution satellite imagery such as LANDSAT TM and SPOT
- Level II: 23 subclasses that can be identified from remote sensing data
- Level III: flexible user defined categories – specific to user’s requirements

(Thompson *et al.*, 2001)

This format was proposed as it offers a high degree of flexibility when capturing land cover and land use, and has been the basic structure for several international classification systems, including the AfriCover land cover classification system (Thompson, 1996). The AfriCover programme was established by the FAO to generate a digital database of land cover and geographic features for Africa (FAO, 1998). It was recognised that there is a shortage of quantitative and qualitative information on vegetation and land use throughout the continent, which is in fact a limiting factor in terms of planning, development and management of natural resources (FAO, 1998).

2.6 GEOGRAPHIC INFORMATION SYSTEMS (GIS)

GIS has revolutionised the way spatial data is acquired, stored, managed and displayed (Nwilo, 2005). GIS is defined by Korte (2001 p. 375) as “a system of computer hardware, software, and procedures designed to support the capture, management, manipulation, analysis, modelling and display of spatially referenced data for solving complex planning and management problems.” It is a ‘special class’ of information system that allows us to keep track of not only events and activities, but also where these activities occur or exist in space (Longley *et al.*, 2002). Prior to the advances of GIS, a map product was defined by the physical limitations of a sheet of paper, and maps at different scales were fundamentally different from one another. The map and its scale were generally seen to be a function of the detail required by the end user (Cherinin and LeRoux, 2005). GIS can be used for a range of applications from providing accurate spatial data to a database of

interlinked information. To achieve this, an accurate data source is required, but this can prove to be costly due to the number of complex corrective processes required (Deck, 2005). This raises the question as to whether highly accurate and precise information is needed for all GIS applications (Foote and Huebner, 2006) or whether a correction factor will suffice for certain applications. For this research, GIS facilitated the mapping of historical and current land cover and allowed for the spatial analysis and interpretation of this information.

The primary data source for this research was aerial photographs, predominately because of their availability, but also because they provide a broad view of large areas under observation and can be used for the capture of spatial dimensions and patterns where the environment has low frequency temporal variability, such as patterns of land cover and land use practices (Lillesand *et al.*, 2004; IGOS, 2006). Aerial photographs are a useful source of information, (Longley *et al.*, 2002) although distortions and errors can occur, if used in an ‘uncorrected’ state (Deck, 2005; Dickinson, 1979). When aerial photographs are captured, features on the ground are ‘displaced’ as a result of the altitude and position relative to the principal point (centre) of the photograph. For example, high buildings appear to ‘lean’ away from the centre of the photograph as the top of the feature is displaced outward more than the bottom. Also, features appear to be more displaced towards the edges of the photograph than the centre (Dickinson, 1979; Lillesand *et al.*, 2004). If images are to be used for generating accurate data it must be ‘rectified’ to remove factors that lead to inaccuracies, through the process of orthorectification (Deck, 2005). In simple terms it is the process of ‘flattening’ photographs or images to eliminate displacements and distortions inherent in the image, resulting in a photograph that displays features in their true orthographic position (Erdogan *et al.* 2004; Korte, 2001; Rush and Ollerhead, 2001). However, this is an extremely costly process and it is possible to simply give aerial photo location in space by assigning known coordinates to the photograph through the process of georeferencing. This creates a coordinate system within the photograph but does not remove any of the inherent displacement in the aerial photograph (Rush and Ollerhead, 2001). This is important to note as this research is undertaken with one set of orthorectified aerial photographs (2004 aerial photographs) and two sets of georeferenced aerial photographs (1940 and 1973 aerial photographs). This displacement of features on the aerial photographs can lead to errors¹² and inaccuracy¹³ in spatial data generated from this data source and can influence the integrity of data (Congalton and Green, 1999; Foote and Huebner, 2006). There are a number of other factors that can result in errors and cause inaccuracy in data captured. The quality and age of the geographic data, the scale at which mapping was achieved, the

¹² Error is the level of inconsistency between a feature’s measurement and true value on the earth (Foote and Huebner, 2006).

¹³ Accuracy is the extent to which a measurement or estimated value represents its actual value (Korte, 2001).

aerial coverage of data source and the inherent properties of features in the real world can all result in errors and inaccuracies in the data presented (Foote and Huebner, 2006; Goodchild and Gopal, 1989). The main types of accuracy are relative, horizontal and vertical accuracy:

- Relative accuracy - similarity of shape between a feature and its representation (Ministry of Sustainable Resource Management (MSRM), 1995).
- Horizontal accuracy - the relative location (latitude and longitude) of features represented in relation to its real location on earth (MSRM, 1995).
- Vertical accuracy relates to elevation/altitude above sea level depicted on a map, in relation to its real location on earth (United States Geological Survey (USGS), 1999).

Remotely sensed data has been used successfully in a number of studies, both locally and internationally, to assess land cover and land use change over time. These changes have then been related to environmental and social effects. Showalter *et al.* (2000) captured land cover for three dates over a 25-year time period for a portion of the Rietspruit catchment, a subcatchment of the Vaal River catchment, from remotely sensed data to relate changes in settlement growth to effects on water quality. It considered the Sebokeng-Evaton-Orange Farm portion of the Rietspruit catchment as it experienced the greatest residential growth. Results of the study showed that deterioration of water quality conditions could be attributed to growth in informal settlements (Showalter *et al.*, 2000). López *et al.* (2001), used aerial photographs from three time epochs for the city of Morelia (capital city of Michoacán, one of the poorest states in Mexico) to assess land cover and land use change for the past 35 years and project change for the next 30 years (López *et al.*, 2001). Results of the study showed that the highest change occurred in the urban area increasing from approximately 709 ha in 1960 to approximately 3 368 in 1990. The study also showed that the urban area is now largely (46%) located on former agricultural land, which has resulted in a decline in cropland areas (López *et al.*, 2001). More recently, remotely sensed data was used by Loughland *et al.* (2007) to undertake quantitative analysis on vegetation changes in the coastal zone of Abu Dhabi between 1972 and 2003. Remotely sensed data showed changes in cultivated vegetation, intertidal areas, coastal morphology and coastal development within the study area. The study showed that significant changes in development activities occurred within Abu Dhabi, increasing 7-fold between 1972 and 2003 (Loughland *et al.*, 2007).

However, when working with remotely sensed data it is important to take into account the scale and resolution of the data. Scale and resolution issues have traditionally been a problem in geography and related fields (Cao and Lam, 1997). The development of GIS and remote sensing have reinforced these problems as there is a variety of data available at varying levels and scales (Cao

and Lam, 1997). One of the main problems is the determination of the most appropriate scale and resolution and the assessment of the effects of scale and resolution; for example, when undertaking land cover and land use assessments, what resolution images should one use (Cao and Lam, 1997).

Scale and resolution of aerial photographs are also important for this research, as the quality of the photographs affect the potential for errors and inaccuracies. This research used aerial photographs from different time intervals, that were captured at different scales (1: 25 000 and 1: 27 000 in 1940, 1: 50 000 in 1973 and 1: 10 000 in 2004).

Scale can take on various meanings depending on the context in which it is used, including spatial, temporal and spatio-temporal scales (Cao and Lam, 1997). For the purpose of this research only spatial scale will be considered in more detail. In terms of spatial scale, there are four key components that need to be considered; cartographic, observational, operational and measurement components. These are depicted and explained in Figure 2-4. The four types of scale are closely related in that a small-scale cartographic map will likely be used for large-scale geographic studies and only certain operational process will be observable (Cao and Lam, 1997).

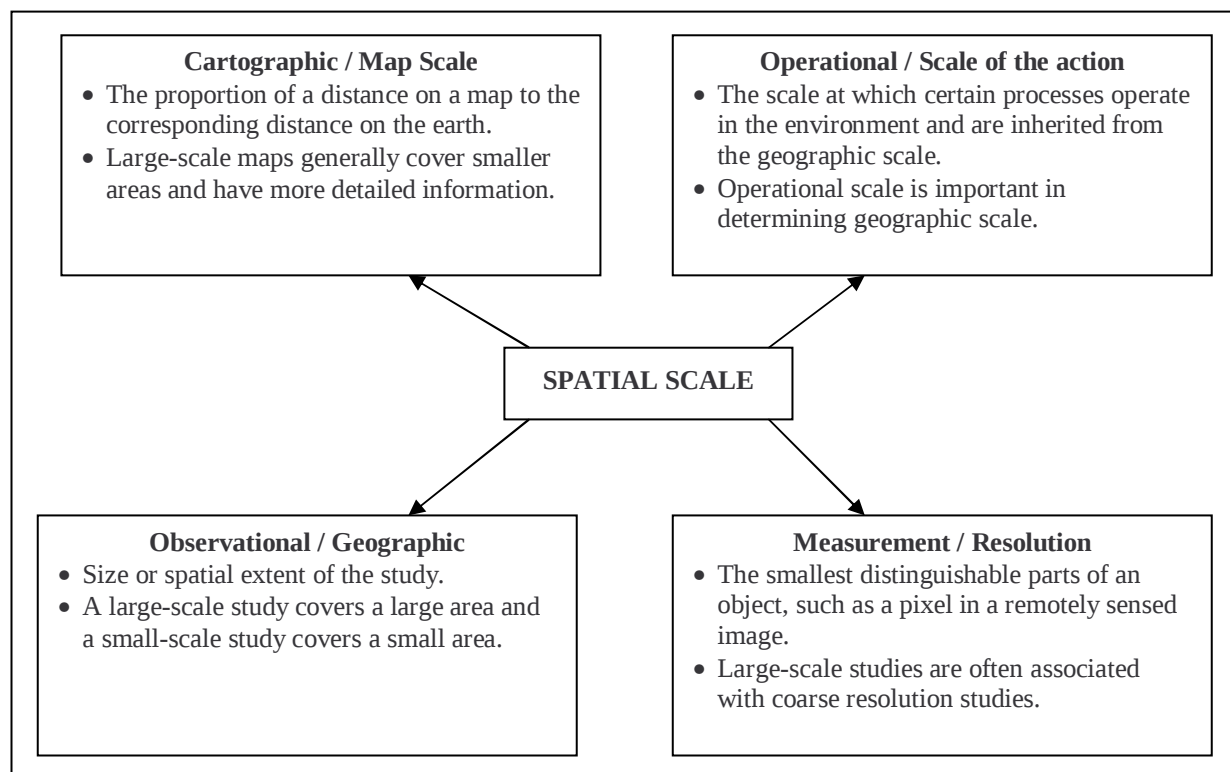


Figure 2-4: Meanings of Spatial Scale

(Source: Adapted from Cao and Lam, 1997)

2.7 ANALYTICAL FRAMEWORK

There are a number of analytical frameworks used for environmental monitoring and reporting, which relates natural and socio-economic indicators in the context of the environment. In South Africa the Pressure-State-Response (PSR) framework and the Driver-Pressure-State-Impact-Response (DPSIR), an adaptation of the PSR framework, are commonly used in state of the environment reporting (DEAT, 2005).

Analytical frameworks have been adapted for coastal environments and aid in the determination of the extent of coastal areas and provided detailed understanding as to the function and value of coastal areas (Agardy *et al.*, 2005). According to Agardy *et al.* (2005), the four main frameworks useful for the evaluation of coastal areas are Inland-Coastal Zone-Ocean (ICZO); Human Systems – Ecological Systems – Delivery Systems (HSESDS); Functional Clustering; and Driver-Pressure-State-Impact-Response (DPSIR) (Agardy *et al.*, 2005).

The Inland-Coastal Zone-Ocean (ICZO) Framework is considered to be a geographic framework which defines the coastal zone in terms of a defined region affected by both land and sea in terms of the transfer of energy, material and information (Agardy *et al.*, 2005). This framework has been used in cases that focus on the extent of the coastal zone and coastal ecosystem functioning (Agardy *et al.*, 2005). *The Human Systems – Ecological Systems – Delivery Systems (HSESDS) Framework* is a new framework that focuses on the three interactive components of the coastal zone. In terms of the human component, key consideration is given to land use patterns and human population dynamics; the ecological component considers land cover and habitat; and delivery systems focus on the water cycle, incorporating the materials, energy and information transferred. This framework enhances the understanding of coastal systems and management (Agardy *et al.*, 2005). *The Functional Clustering Framework* is based on interactions of functional attributes of ecosystems with ecosystem goods and services to allow for coordinated management. This framework is based on the assumption that unique systems share some general functions, which can be defined irrespective of geographic distribution (Agardy *et al.*, 2005). This framework defines functional "clusters" in terms of specific organism and environmental interactions that relate to important issues in coastal ecology, which are then assessed through informatics techniques (Agardy *et al.*, 2005).

The Pressure State Response (PSR) Framework is based on the concept of causality, that human activities exert 'pressures' on the environment resulting in changes in the 'state' of the environment.

This leads to a ‘response’ by society in terms of changes to environmental, general economic and sectoral policies, which feed back to mitigate the pressure on the environment (Dumanski and Pieri, 1996). The PSR framework was developed by the Organisation for Economic Cooperation and Development (OECD) and is used by a number of countries and the World Bank for state of the environment reporting (Dumanski and Pieri, 1996). The components of the PSR Framework are outlined in Figure 2-5.

The PSR framework is used to assess Land Quality Indicators, report on the biophysical condition of the land and assess how land is being managed in terms of the policy and social environment for land management. It considers ‘pressures’ exerted on land by agriculture, such as the number of crops in a cropping system and the number of food and fibre products produced. These are related to changes in the ‘state’ of the conditions of the land and its resilience to withstand change. These changes lead to a ‘response’ by farmers in terms of improved land management systems or complementary activities such as the implementation of conservation practices. This is generally stimulated by economic, agricultural and conservation policies (Dumanski and Pieri, 1996).

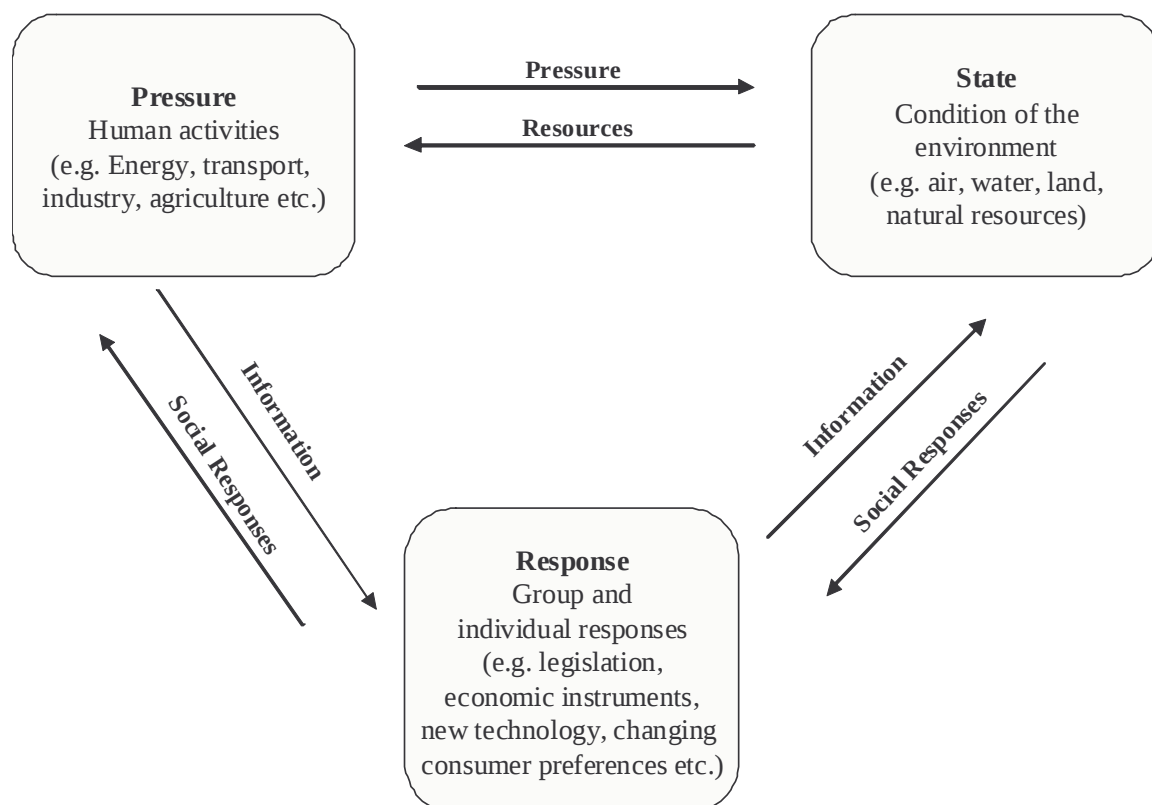


Figure 2-5: PSR Framework (Adapted from Jesinghaus, 1999)

The *Driver-Pressure-State-Impact-Response (DPSIR) Framework* allows for changes in the coastal zone to be related to socio-economic ‘drivers’ at the catchment scale, as human activities within estuarine catchment areas and the coastal zone result in environmental pressures (Pirrone *et al.*, 2005). Within any coastal area a number of socio-economic activities and related land uses exist, and the spatial distribution of these activities ultimately affects the demand for goods and services from a defined area. Common ‘drivers’ include economic, social and demographic changes such as changes in consumption patterns and people's lifestyles (Jago-on *et al.*, 2008). As a result of these socio-economic ‘drivers’, environmental pressure builds up leading to changes in the state of the environmental system. These changes in ‘state’ affect human perceptions and result in perceived social changes, which stimulate management action or ‘response’ to address the changes (Bidone and Lacerda, 2004). The DPSIR framework was adopted by the European Environmental Agency and is based on the Pressure-State-Response (PSR). PSR aimed to highlight the relationship between human activity and environmental degradation (Bidone and Lacerda, 2004; Caeiro *et al.*, 2004; Pirrone *et al.*, 2005). The DPSIR framework provides a more general view of large-scale influences on the system and does not take note of the complexity of ecological interactions (Agardy *et al.*, 2005). The components of the DPSIR framework are outlined in Figure 2-6.

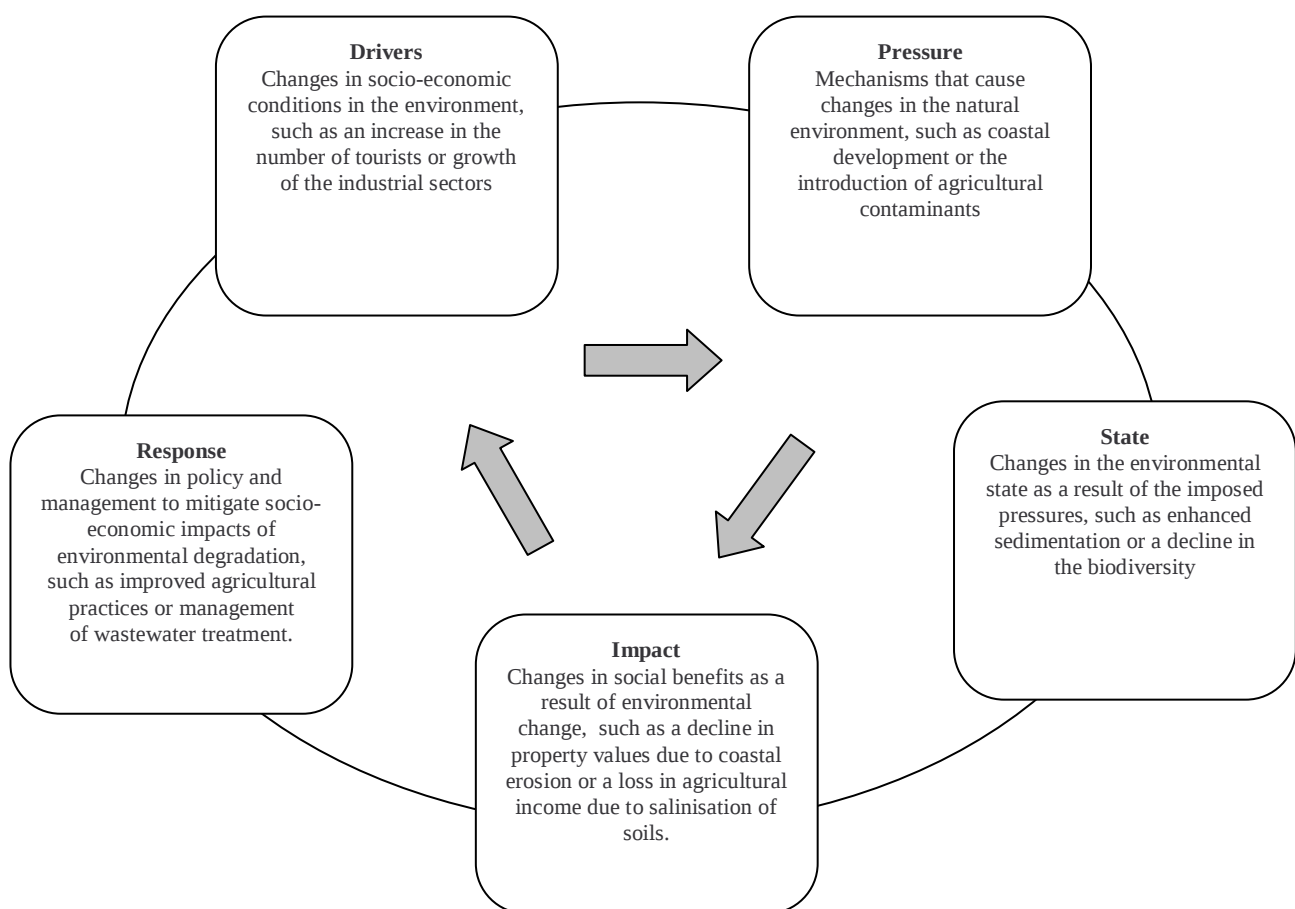


Figure 2-6: Components of the DPSIR framework (Source: Agardy *et al.*, 2005)

This framework was effectively used in a study by Pirrone *et al.* (2005), who evaluated eutrophication issues in the Po Catchment and the North Adriatic coastal zone. The study assessed socio-economic and agricultural activities that generate anthropogenic pressure (which is a major causing factor of eutrophication) which lead to accelerated algal growth and other plant life that produces undesirable impacts (Pirrone *et al.*, 2005). Jago-on *et al.* (2008) used the DRSIR framework to assess the factors contributing to degradation of the subsurface environment during the different stages of urban development in seven Asian metropolitan areas, located in the coastal zone, over the last 50 to 100 years (Jago-on *et al.*, 2008). The subsurface environment is important for urban development in that it affects the development of infrastructure for water supply, sanitation and drainage (Foster, 2001). In this study, the use of the DPSIR framework allowed for identification of the effects of urbanisation and industrialisation on the subsurface environment, which is useful for future urban planning, the aim of which is to aid developing cities in the establishment of effective institutions on groundwater management (Jago-on *et al.*, 2008). Bidone and Lacerda (2004) developed a DPSIR framework for the Guanabara Bay basin (South East Brazil) region in order to evaluate development and sustainability in its coastal area. This study was undertaken under the framework of the Land–Ocean Interactions in the Coastal Zone (LOICZ) Core Project of the International Geosphere Biosphere Project (IGBP), which looks at the role of the coastal zone in the overall functioning of the earth’s system. The study used the DRSIR framework to integrate physical, natural, social and economic factors, from which a cost-benefit analysis was done. DPSIR captured key human welfare impacts that result from changes in processes and functions in coastal systems. This assessment of social costs and benefits aids future coastal management (Bidone and Lacerda, 2004).

Caeiro *et al.* (2004) used the DPSIR framework for the development of an estuarine environmental data management system for the Sado Estuary on the west coast of Portugal. It is an area of high ecological value, which is highly industrialised and populated and there are a number of management conflicts in the area. This study assessed the ‘drivers’ and pressures using the DPSIR framework in conjunction with GIS for data synthesis, visualisation and calculation of results. The resultant management system allowed for the integration of biodiversity conservation and human pressure for development by means of GIS (Caeiro *et al.*, 2004).

The DPSIR framework was used in these studies to integrate variables into a holistic framework. This research aims to integrate variables that affect development and land use change in the coastal zone. The DPSIR framework was used for this research because it allows for a comprehensive approach relating environmental problems to social, economic and legislative changes (Jago-on *et*

al., 2008). Furthermore, this framework tries to link science changes in the system to social, economic and legal changes (as a result of human activity) (Cheong, 2008). Further discussion as to the use of this framework is detailed in Section 3.8.

2.8 SUMMARY

The coastal environment is a unique, dynamic system that includes a broad diversity of terrestrial and marine habitats. As a result of this diversity and the benefits offered by the coastal region, people have settled in coastal areas for centuries. In recent years there has been a shift from the *need* to be near the coast to a *want* to be near the coast for its aesthetic appeal and potential for recreational activities. Due to this increasing urbanisation of the coast, the need for coastal management became evident and the United States initiated the concept of Coastal Zone Management, with other countries following suit. South Africa is no exception, and is now in the process of developing a Coastal Management Act which will govern Coastal Zone Management in South Africa.

To gain a better understanding of development and exploitation in coastal environments it is necessary to look at land use activities that have been, and are being, undertaken in these areas, as land use change is considered to be a central theme in global environmental change. Changes in land use are an associated response to human needs and wants and are exacerbated by population growth. They can result in significant economic and environmental affects, which over time can have far-reaching consequences.

GIS has been demonstrated to be a useful spatial depictive and analytical tool in trying to determine and quantify changes in land use and land cover within the coastal environments. It was used in a range of applications and allows for the provision of accurate spatial data. A common source of data for land cover assessments are aerial photographs, which are invaluable for this research in that they allow for a time series analysis of land cover and enable change detection.

Analytical frameworks are shown to be useful for the assessment of changes in coastal environments, in that they allow for the assessment of the relationship between natural and socio-economic indicators.

3.1 INTRODUCTION

This chapter provides a detailed description of the methodological approach used to assess development and land use change in the Ndlambe and Ngqushwa local municipalities (Figure 3-1). This includes the determination of the research sites, the coastal zone for the research, development of land cover classes and analysis of data captured.

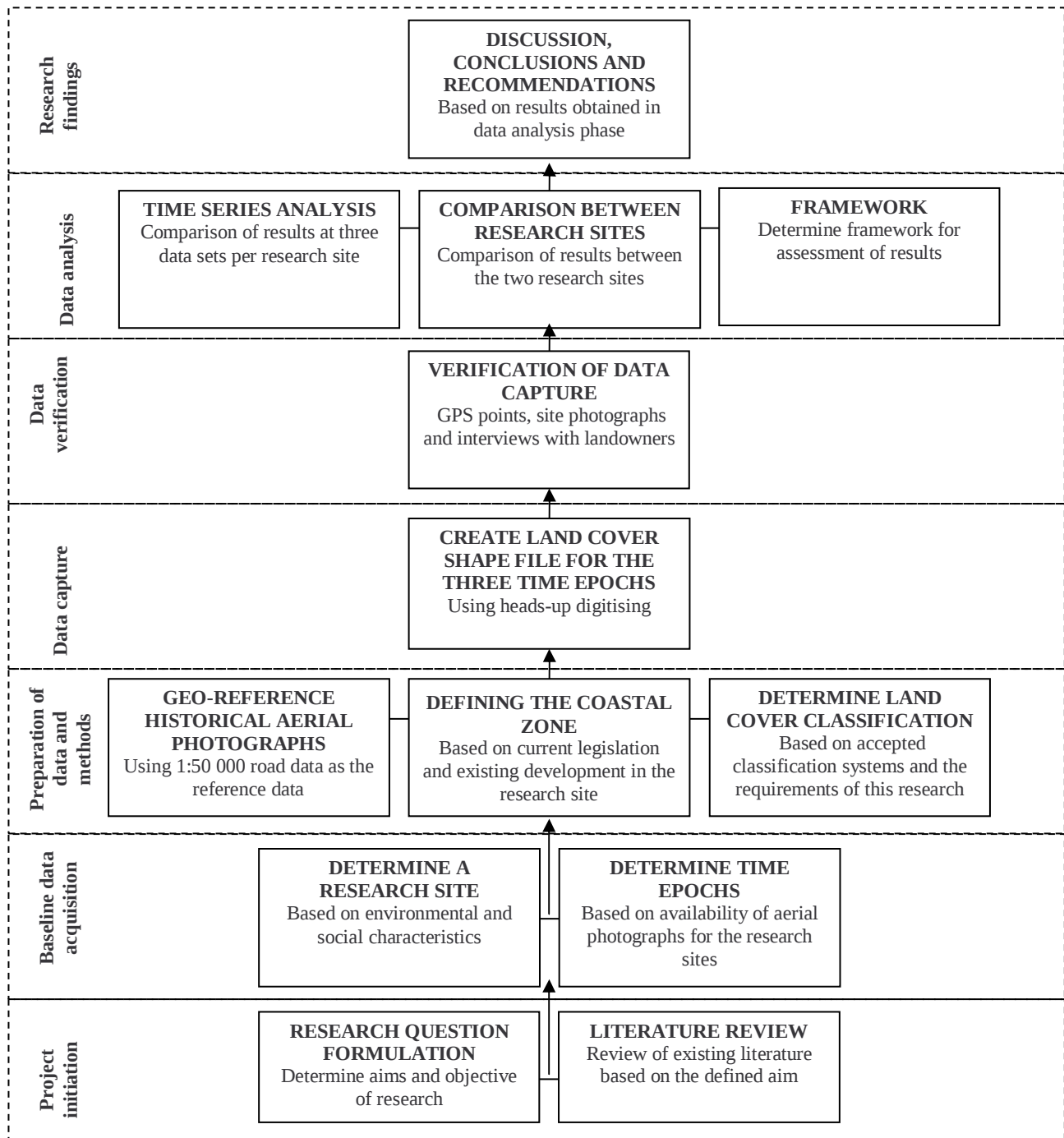


Figure 3-1: Diagram of research steps

3.2 SELECTION OF RESEARCH AREA

There are 46 coastal local municipalities in South Africa, three in the Northern Cape, 16 in the Western Cape, 15 in the Eastern Cape and 12 KwaZulu-Natal. The Eastern Cape is significantly less developed than the Western Cape and KwaZulu-Natal, and coupled with research logistics (distance to research site, time and cost constraints) this resulted in the Eastern Cape being selected as the primary research site. The physical and environmental characteristics of 15 local municipalities in the Eastern Cape are compared in Table 3-1. This table shows that the Ndlambe and Ngqushwa local municipalities have similar areas (2000.81 km² and 2245.79 km² respectively), the fall within the same biome (Albany Thicket), have the same elevation above sea level (0 – 100 metres above sea level), the same annual rainfall (500 – 600 mm) and the same number of estuaries (nine) within the geographic boundaries. The only physical variable is that there is a 30 km difference in terms of coastline length (Municipal Demarcation Board; 2001; Mucina and Rutherford, 2006).

Although there are other local municipalities that portray similar physical and environmental characteristics, the Ndlambe and Ngqushwa local municipalities have the advantage of being adjacent to each other, while still falling within different Districts. Furthermore, it is important to note that the Ngqushwa Local Municipality falls within the former Ciskei homeland, while the Ndlambe Local Municipality has always been a part of South Africa (Table 3-1).

Table 3-1: The physical and environmental characteristics of 15 local municipalities in the Eastern Cape

Local Municipality	District Municipality	Area (Km ²)	Approximate length of Coastline	Elevation of coastal zone (metres above sea level)	Number of estuaries	Average annual rainfall (mm)	Biome	Land Status
Buffalo City	Amathole	2515.98	69	0 - 100	15	500-800	Albany Thicket / Savanna	Partially - former Ciskei
Great Kei	Amathole	1735.64	42	0 - 100	8	600-800	Albany Thicket	South Africa
Ingquza	O.R. Tambo	2456.9	47	0 - 200	3	800-1000	Indian Ocean Coastal Belt / Savanna	Former Transkei
King Sabata Dalindyebo	O.R. Tambo	3019.77	14	0 - 100	4	700-1000	Savanna	Former Transkei
Kouga	Cacadu	2417.42	95	0 - 100	5	500-700	Fynbos / Albany Thicket	South Africa
Kou-Kamma	Cacadu	3575.17	77	0 - 200	6	500-800	Fynbos	South Africa
Mbhashe	Amathole	3030.47	60	0 - 100	13	600-1000	Savanna	Former Transkei
Mbizana	O.R. Tambo	2411.88	24	0 - 100	7	800-1000	Indian Ocean Coastal Belt / Savanna	Former Transkei
Mnquma	Amathole	3323.31	38	0 - 100	11	600-1000	Savanna	Former Transkei
Ndlambe	Cacadu	2000.81	72	0 - 100	9	500-600	Albany Thicket	South Africa
Nelson Mandela	Nelson Mandela Metropolitan	1952.15	93	0 - 200	3	500-700	Fynbos / Albany Thicket	South Africa
Ngqushwa	Amathole	2245.79	42	0 - 100	9	500-600	Albany Thicket	Former Ciskei
Nyandeni	O.R. Tambo	2606.88	21	0 - 100	6	800-1000	Grassland / Savanna	Former Transkei
Port St Johns	O.R. Tambo	1291.46	49	0 - 200	8	800-1000	Indian Ocean Coastal Belt / Savanna	Former Transkei
Sunday's River Valley	Cacadu	3507.61	57	0 - 200	1	400-700	Albany Thicket	South Africa

(Source: Municipal Demarcation Board; 2001; Mucina and Rutherford, 2006)

In spite of the evident similarities in physical and environmental characteristics, the two local municipalities portray distinct differences in terms of demographics and socio-economics (Table 3-2). The Ndlambe Local Municipality is largely urban, while Ngqushwa is predominantly rural. These differences can largely be attributed to the political history of the area. Prior to the democratic election in 1994, the Ngqushwa Local Municipality fell within the former Ciskei homeland.

Table 3-2: Demographics of the two local municipalities

Characteristic	Ndlambe Local Municipality	Ngqushwa Local Municipality
Population	54 717	84 233
Population Density (people per km ²)	27.4	37.5
% Population Black	51.1	99.7
% Population White	9.1	0.1
% Population Coloured	4.7	0.1
% Population Indian or Asian	0.1	0.0
% Urban	79.8	6.4
% Rural	20.2	93.6

(Source: StatsOnline, 2005)

3.3 COASTAL ZONE DEFINITION FOR THIS RESEARCH

The definition of the coastal zone is often influenced by a number of inputs and factors, resulting in a defined zone that is shaped by its intended use, either in terms of management, development or recreation. This research focuses on land-based activities that affect the coastal system; therefore the inland boundary definition of the coastal zone is of particular importance. The Coastal Bill (Section 2.2) defines the inland boundary of the coastal zone as the area comprising coastal public property¹⁴, the coastal buffer zone¹⁵, coastal access land and special protected areas. In terms of this Bill, coastal waters include all waters influenced by tidal activity, thus including estuaries (Republic of South Africa, 2006b).

The Coastal Bill's definition of coastal buffer zone in rural areas (1 kilometre) was used as a guideline for determining the coastal zone for this research, as the research area is classified as being rural. Using GIS, a one kilometre zone inland of the high water mark was determined. A one kilometre zone inland of the estuaries was also determined.

¹⁴ Coastal public property includes coastal waters and land submerged by coastal waters

¹⁵ The coastal buffer zone is roughly defined as 100 metres inland of the high water mark in urban areas and 1 000 metres in rural areas.

In addition, it was considered important to account for zones of intense human activity. Christian *et al.* (2005) recommend that the definition of the coastal zone be based on the social use value they support, such as coastal recreational areas, intense human population dynamics or urbanisation or coastal agricultural areas. With this in mind, notable development ‘nodes’ within the research area were identified and a 1 km buffer around these nodes was generated. These inland buffers were created as it was anticipated that development growth at these nodes will move inland. The resulting ‘coastal zone’ is displayed in Figure 3-2.

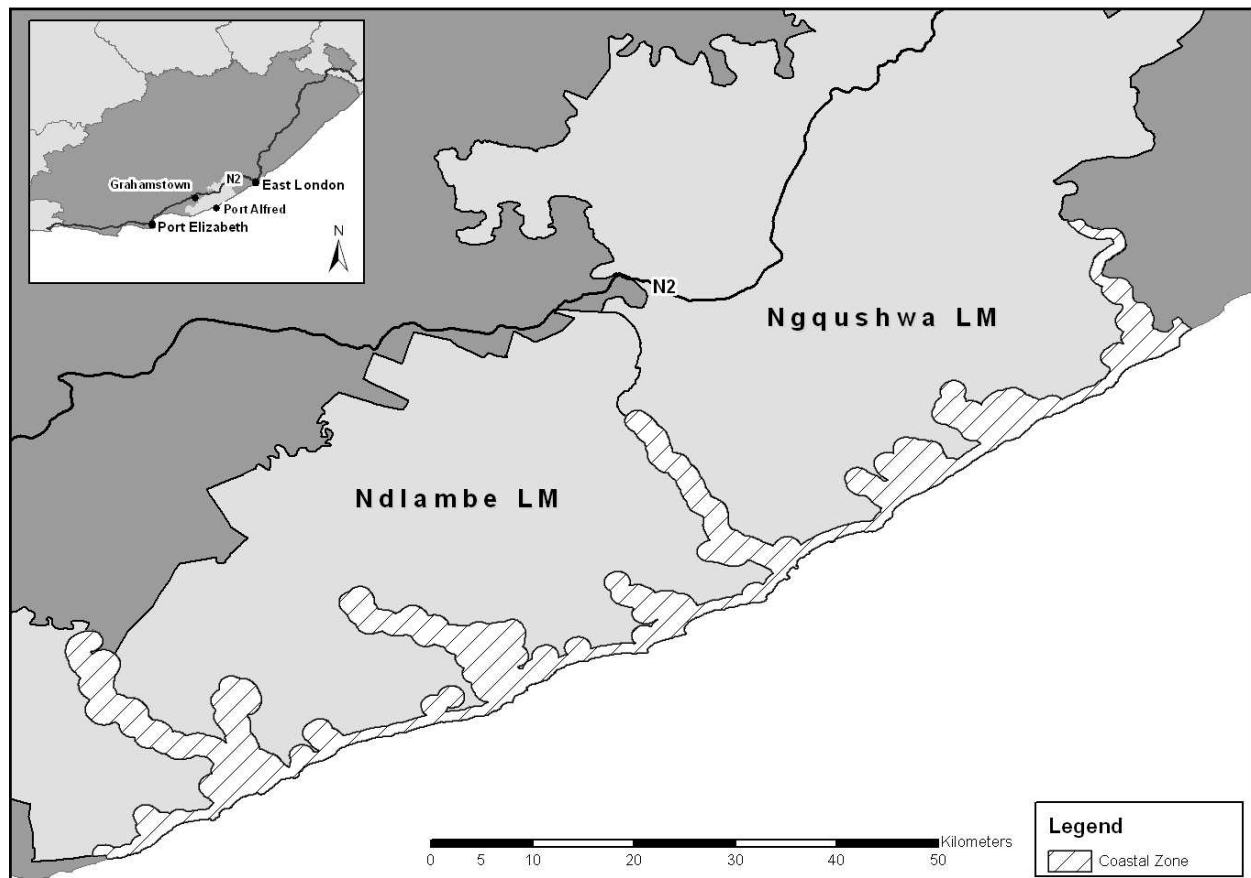


Figure 3-2: The coastal zone as defined for this research

3.4 LAND COVER CLASSIFICATION

The distinction between land cover and land use is important in terms of this research. As mentioned previously (Chapter 2), land cover is confined to the description of vegetation and man-made features on the land surface, while land use refers to the arrangements, activities and inputs people undertake on land cover (Di Gregorio, 2005).

Land cover classification for this research was related to the National Land Cover (NLC) 2000 data, the Coastal Bill and personal observations. Land cover classes that are positively identifiable from aerial photographs were used for this research. This approach was chosen to reduce uncertainty in the data capture process as historical imagery cannot be verified by means of ground-truthing. Relevant land cover categories were extracted and modified to meet the requirements of this research. Two primary groups of land cover were identified: natural areas and altered areas. Each group contains several land cover classes (Table 3-3). Appendix B provides a detailed description of each land cover class with associated images.

Table 3-3: Land cover classification derived for this research

	Land cover	Definition
Primary land cover - Natural	Thicket	Typically composed of woody, self-supporting plants. Total canopy cover is greater than 10%. Indigenous species, including coastal forest.
	Grassland	All areas of grassland with < 10% tree or shrub canopy cover. Non-woody, herbaceous, indigenous species growing under natural or semi-natural conditions.
	Water bodies (Enclosed)	Areas of open water, which are either static or flowing. This includes features such as reservoirs, irrigation dams and lakes. Estuaries are not included.
	Estuaries	Natural body of water that is part of a water course that is permanently or periodically open to the sea (Republic of South Africa, 2006b).
	Wetlands	Natural or artificial areas where water permanently or temporarily inundates the land surface. This includes fresh, brackish and salt water conditions.
	Floodplain	Natural, low lying areas adjacent to rivers and estuaries predominantly formed of river sediment. Areas are prone to flooding when the river is in flood.
	Littoral active zone	Land forming part of, or adjacent to the seashore that is unstable and dynamic as a result of natural processes. Characterised by dunes, beaches and landforms comprised of unconsolidated sand which is unvegetated or partially vegetated.
Primary land cover - Altered	Disturbed	Areas of man-induced low vegetation cover in comparison to surrounding natural vegetation. Includes lands previously used for cultivation.
	Cultivated fields	Areas of land that are ploughed and prepared for crops, includes areas currently under crop, fallow land and land being prepared for planting. Includes areas of subsistence cultivation.
	Residential - high density	Formal built-up areas consisting of permanent structures in which people reside. Identifiable by the high density buildings and associated infrastructure.
	Residential - low density	Formal built-up areas consisting of permanent structures in which people reside. Identifiable by the low density buildings and associated infrastructure.
	Formal township	Permanent structures, usually located within former black residential areas, laid out in an organised, planned manner.
	Informal township	Non-permanent shack type dwellings typically established on an informal, ad hoc basis. Often on the outskirts of formal townships or along main roads.
	Rural clusters	Areas of clustered rural dwelling with a density too low to be classified as a formal village. Often found in close proximity to major roads.
	Built up – non residential areas	Areas that are non-residential and are primarily used for the conduct of commercial, industrial and other business. Includes sites associated with education and social services.
	Recreational land	Areas of open space, used for recreational activities. This includes areas such as schools and public sports fields and golf courses.

3.5 DATA CAPTURE

Land cover was captured from black and white aerial photographs at three epochs over the period 1940 – 2004 (Table 3-4). The availability of aerial photographs restricted the dates for which land cover within the research sites could be assessed.

Table 3-4: Details of aerial and ortho-photographs

Flight year	Job number	Strips	Scale
1938	134	085 to 098	1: 25 000
1942 (make up 1940 set)	03	026 to 039	1: 27 000
1973	721	003 to 013	1: 50 000
2004	498	374, 412 to 413	1: 10 000 (Orthophoto maps)

To capture land cover data in a GIS, a map projection is required. Map projections are mathematical models that allow the network of angular meridians and parallels to be shown two-dimensionally (Dickinson, 1979). For a map to be useful it needs to provide a good representation of the real world (CDSM, 2003). One of the problems with map projections is that properties of distance, direction, area and shape cannot all be preserved simultaneously. Different projections conserve different properties, and maintaining one will result in distortions in the other properties (Dickinson, 1979). The choice of a projection depends on the intended use (Dickinson, 1979).

For this research the **Gauss-conform projection** is used, which is a conform projection, meaning the shape of features on the earth are preserved on the map (Carter, 1997) and to a large degree the area of the feature is also preserved. This system is defined in belts of two degrees in longitude, with every odd meridian being a central meridian of reference. This meridian is referred to as the Longitude of origin (Lo). This meridian is the only line of longitude that is a straight line on the map and the equator is the only line of latitude that is straight on the map (CDSM, 2003, Carter, 1997). Each two degree belt is flattened with reference to the central Lo; for example; Lo 19 has a flat surface representing the area between 18 and 20 degrees east (CDSM, 2003). This projection is the most commonly used projection in South Africa (CDSM, 2003) and is employed in this research with an Lo of 27.

Historical aerial photographs were geo-referenced to the roads vector layer from the 1:50 000 topo series, sheets 3326DA, 3326DB, 3327AC, 3327AD and 3327CA (from CDSM). Geo-referencing was achieved using Manifold x7 Professional. Geo-referencing was done by means of control or tie

points. Once rectified, images were exported as gif files and imported into ArcView 9.2 for further analysis.

Land cover in the research areas was mapped at three time intervals, 1940, 1973 and 2004. These intervals were selected based on the availability of aerial photographs. Land cover data for the research area was generated through the process of heads-up digitising from the three sets of aerial photographs available from the CDSM. All data capture and analysis was carried out using ArcView 9.2 software. Digitising was conducted at a scale of 1: 10 000, and although the unrectified digital images begin to pixilate at a scale of 1:15 000, there is sufficient clarity to recognise land cover features at a scale of 1: 10 000. Data captured was cleaned using the ET BasicClean extension in ArcView 3.2 to ensure that there were no over-shoots or slither polygons in the data sets.

3.6 DATA VERIFICATION

Land cover data classes for the most recent (2004) data were verified by means of ground-truthing using ground observation points and photographs. Site selection was based primarily on uncertainty during data capture, access to the site and ensuring that all land cover classes were sampled. Waypoints were captured with a Thales ProMark 3, Mobile Mapping GPS, which delivers sub-metre accuracy. Access to sites for ground-truthing was limited by terrain such that the upper reaches of the coastal zone along the estuary were not consistently sampled (Appendix C shows the GPS points captured during the ground truthing exercise). During the data verification stage, ten residents who have lived in the research area for several years were interviewed, by means of *informal conversation interviews*, to confirm historical land use activities. Informal conversation interviews generally lack formal structure and questions asked are as a result of the content of the conversation. Respondents are encouraged to relate their experiences and events and issues that are significant to them. This approach is effective in that it allows respondents to talk about any issues in their own words (Kitchin and Tate, 2000).

The years 1940, 1973 and 2004 were assessed in this research. It should be noted that the 2004 ortho-photographs used during this research are the latest freely available imagery for the study area, as more recent imagery would have been too costly to acquire. During the ground-truthing and data verification process, it was apparent that there have been some changes in land use activities within some of the research area post-2004. For the purpose of this research, land cover has been classified and related back to coverage seen on the 2004 aerial photographs, which are the most

recent freely available aerial photographs for the research area. This was so that land cover change could be assessed for equal periods, of approximately 30 years over the 64 year period. These changes in land cover are discussed in terms of current and future development within the study area.

Qualitative data for the research was obtained by means of the “*interview guide approach*” (Kitchen and Tate, 2000 pg. 214). Qualitative research is considered to be ‘soft’ research that is concerned with how people make sense of things (Cloke *et al.*, 2004). Qualitative data is data that reveals the ‘qualities’ of events, phenomena and aspects of the world under study, primarily through verbal descriptions, which try to convey in words the characteristics of the data (Cloke *et al.*, 2004). Qualitative research is more effective at dealing with complex human systems and emphasis the importance of the social context (Cloke *et al.*, 2004).

The interview is one of the most commonly used qualitative techniques as it allows the researcher to produce rich, varied data in the context of an informal setting. Interviews range across structured, semi-structured and unstructured formats and range in terms of questions and manner of presentation (Kitchin and Tate, 2000; Cloke *et al.*, 2004).

The *interview guide approach* has limited structure, and the topics and issues to be covered in the interview are outlined at the beginning of the interview. This type of interview is more conversational, and wording and order of questions can be varied between respondents, this can result in reduced comparability of data and requires the interviewer to keep the conversation based on specific topics. This enables the interviewer to explore specific areas and anticipated gaps in the data can be closed (Kitchin and Tate, 2000).

For this research all interviews, with the exception of one, were undertaken by means of face-to-face meetings, which have the advantage of being more personal and enable the interviewer to gauge the respondents reactions to certain topics through body language (Kitchin and Tate, 2000). One interview was a telephonic interview due to time constraints on the part of the respondent. A telephonic interview, though less personal, does still allow the interviewer to gauge the respondents reactions based on voice inflections (Kitchin and Tate, 2000).

Respondents were selected based on their expert knowledge of the area, legislative issues, coastal management and conservation planning. People working in these areas or who are directly involved with these areas in terms of management and planning were also interviewed. Interviews were

conducted to gain information that is not readily available and relates to the specialist knowledge of respondents. People interviewed are listed in Table 3-5, which details the reasons for consultation with these specialists and municipal officials.

Table 3-5: Specialists and municipal officials interviewed

Name	Position (Company)	Reason for selecting respondent
Dr Carter	Coastal & Environmental Services <i>Senior Consultant and Director of the East London Office</i>	Dr Carter is experienced in EIAs in the Eastern Cape and is involved in a number of coastal related projects. He has extensive experience with coastal management issues in the Eastern Cape. Dr Carter was involved in the development of an Integrated Coastal Management Plan for the BCM, which was the first of its kind in the Eastern Cape.
Mr Sholto-douglas	Kwandwe Private Game Reserve <i>Managing Director</i>	Mr Sholto-douglas was instrumental in the establishment of the Kwandwe Private Game Reserve, which is a well-established game reserve in the Eastern Cape. Mr Sholto-douglas has extensive knowledge about the game industry and its development in the Eastern Cape in general.
Mr Rowlston	Coastal & Environmental Services <i>Director</i>	Mr Rowlston is experienced in the South African water sector and was closely involved with the development of the National Water Policy (1997), the National Water Act (1998) and the compilation of the National Water Resource Strategy (2005). Mr Rowlston was involved in the determination of the costing for the implementation of the proposed Coastal Management Bill.
Mr Naidoo	Tshani Consulting <i>Town Planner</i>	Mr Naidoo has been in the field of town planning for the past seven years. Although based in East London, he deals with a number of town planning and rezoning applications in the Ndlambe Local Municipality. Mr Naidoo also provided background to spatial planning issues in general as well as information on the requirements of SDFs.
Mr Fouché	Ndlambe Local Municipality <i>Environmental Officer</i>	Mr Fouché has been with the Ndlambe Local Municipality for 10 years as the environmental officer. Mr Fouché is responsible for environmental management and conservation and reviews development applications in the area to assess potential environmental impacts.
Mr Dredge	Ndlambe Local Municipality <i>Acting Municipal Manager</i>	Mr Dredge has been with Ndlambe Local Municipality for the past year. Before that Mr Dredge was at the Makana Local Municipality and has a number of years experience working for local government. As acting municipal manager Mr Dredge is responsible for reviewing development applications for the Ndlambe Local Municipality. Mr Dredge also has sound knowledge on developmental issues in the Eastern Cape in general.
Mr Govender	Department of Economic Development and Environmental Affairs (DEDEA), Cacadu Region <i>Regional Environmental Manager</i>	Mr Govender has been in environmental field for several years and has been at DEDEA for 11 months. Mr Govenders responsibilities include compliance and enforcement, Environmental Impact Management, Environmental Education and Coastal Zone Management.
Mr May	Ngqushwa Local Municipality <i>LED Officer</i>	Mr May has been with the municipality for one year and is responsible for the promotion of tourism, agriculture and SMME development.

Name	Position (Company)	Reason for selecting respondent
Mr Colman	Private Consultant	Mr Colman previously worked for the Department of Agriculture, Ciskei Government and was responsible for Forestry, Nature Conservation, Land Administration and was instrumental in the development of the Ciskei Nature Conservation Act 1987. Mr Colman now consults on Land affairs, agricultural, conservation, and forestry development planning and serves as the chairperson of the Eastern Cape Township Board. Mr Colman has integral knowledge about the history, planning and management of the former Ciskei homeland area and his insight is significant for this research.
Mr Griffiths	Wildlife and Environment Society of South Africa, Eastern Cape <i>Conservation Officer</i>	Mr Griffiths has been at WESSA for four years and is responsible for reviewing/commenting on various environmental documents such as EIAs, SDFs, waste management issues, biodiversity conservation work and environmental education, particularly in terms of the coastal environment. Mr Griffiths is also the programme assistant for Blue Flag in the Eastern Cape.
Mr Ntlokonkulu	Ngqushwa Local Municipality <i>Estates and Housing Officer</i>	Mr Ntlokonkulu has been with the municipality for three months. Mr Ntlokonkulu's responsibilities include land administration issues, zoning and sub-division applications, facilitation of low-cost housing development and the evaluation of properties.
Mr Sülther	M.E.H. Sülther & Son <i>Land Surveyor</i>	Mr Sülther is a qualified land surveyor and has worked in the planning field within the Eastern Cape for several years. He has extensive expertise in working in the Ndlambe Local Municipality.
Mr Haschick	Eastern Cape Development Corporation (ECDC) <i>Sector Specialist - Aquaculture, Fisheries & Environmental Management (Investment and Trade Promotion)</i>	Mr Haschick has been at ECDC for four years and is responsible for Aquaculture, Fisheries and Environmental Management in the Eastern Cape. ECDC is responsible for promoting the Eastern Cape, by means of identifying appropriate investment opportunities and supporting development opportunities that will have a positive impact on the province.
Dr Avis	Coastal & Environmental Services <i>Managing Director</i>	Dr Avis has been involved in a number of EIAs and Basic Environmental Assessments in the Eastern Cape and has extensive knowledge about the coastal environment. Furthermore Dr Avis was involved in the development of an Integrated Coastal Management Plan for the BCM, which was the first of its kind in the Eastern Cape.
Ms Mapukata	Department of Economic Development and Environmental Affairs (DEDEA), Amathole Region <i>Regional Environmental Manager</i>	Ms Mapukata is responsible for compliance and enforcement issues and Environmental Impact Management in the Amathole Region.
Mr Stewart	SRK Consulting <i>Senior Environmental Scientist</i>	Mr Stewart is currently involved in the development of the Environmental Management Framework for the coast from Cannon Rocks to Kei River, which includes the Ndlambe and Ngqushwa local municipalities.

3.7 ANALYSIS

Analysis was based on a comparison of the results between the three data sets (1940, 1973 and 2004), as shown in Figure 3-3 and specifically focused on changes in land cover and land use features. Change over time per local municipality was assessed and the results of change were then compared between the two local municipalities (Figure 3-3).

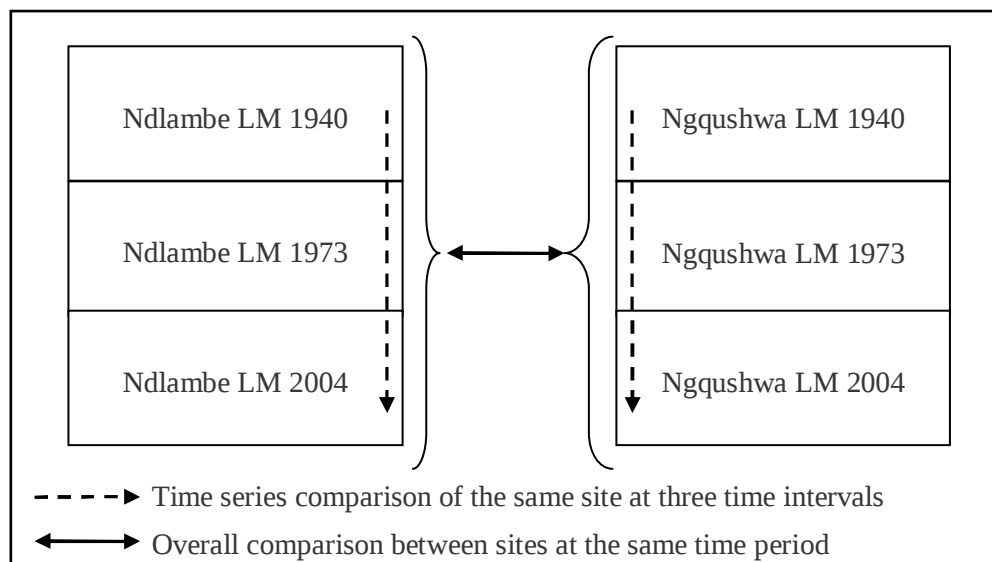


Figure 3-3: Matrix showing site and time comparison

This research aims to assess land use change based on development and transformation of land cover. For this, land cover classes have been grouped into four primary land cover classes, as depicted in Figure 3-4. This grouping allows for further assessment to determine what transformation occurred within the municipalities. Analysis was undertaken by means of GIS processes and procedures. Data layers per research site were unioned using ArcView 9.2, whereby the layers are ‘overlaid’ and the resulting layer contains a composite of all input layers and has unique areas for each date (Korte, 2001). The unioned layers were first cleaned in ArcView 3.2 (as above), then polygons smaller than 1 000 metres square were “dissolved” according to the largest adjacent polygon using the Dissolve Adjacent Polygons (1.8a) extension in ArcView 3.2. This procedure was adopted to remove sliver polygons that were generated through the union process as a result of differences in data capture at the three dates. The unioned data was then used to determine where and when change occurred within the 64-year period.

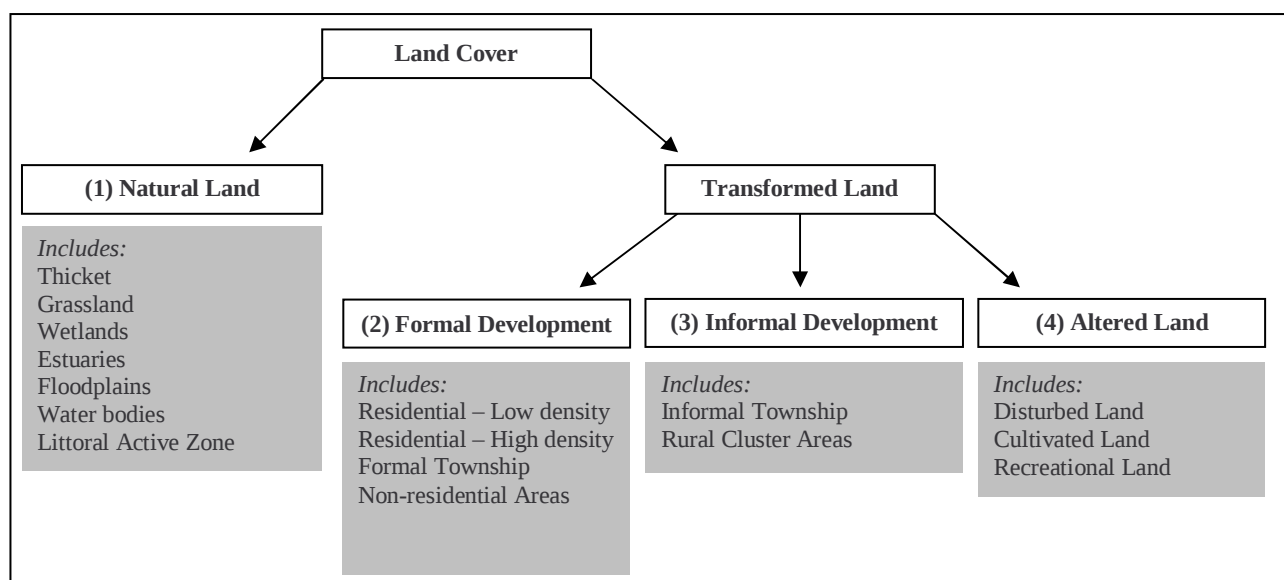


Figure 3-4: Land cover classification grouping based on a distinction between natural and transformed areas

Areas of change were identified by means of post-classification change detection, which is done by means of an assessment of change between two (or more) independently *classified products* where areas of change are determined through direct comparison of the classified data (Thompson *et al.*, 2001). This method removes any limitations that one may have associated with the ‘normalisation’ of multi-date imagery, as is the case for this research (Thompson *et al.*, 2001). The limitation of this method is that its accuracy is dependent on the accuracy of the input data, as erroneously captured data will result in false areas of change (Thompson *et al.*, 2001).

It was anticipated that there would be two primary areas of change, namely inter-class conversions and intra-class transformations (Thompson *et al.*, 2001). Inter-class *conversions* are from one primary classification to another, such as natural to transformed (refer to Figure 3-4), for example grassland to residential (low density). Intra-class *transformations* are transformations within a primary classification such as cultivated to disturbed (refer to Figure 3-4), whereby the primary classification remains the same.

Table 3-6 provides a matrix of possible changes and unlikely changes that may occur between the four primary classification classes outlined in this section. This ‘matrix’ can also be used to identify areas of errors in classification of input data. The likelihood of a given change is estimated as highly possible, possible and not possible in the matrix. It also allows for the elimination of some changes that are virtually impossible, such as the conversion of formally developed areas to natural land

(based on Thompson *et al.*, 2001). This matrix was used in this research to verify data capture and determine if any unlikely changes have been shown and therefore erroneously captured for the research.

Table 3-6: Matrix of change showing possibility of the change between primary land cover classes

			Transformed		
	(B) → (A) ↓	Natural Land	Formal Development	Informal Development	Altered Land
	<i>Natural Land</i>				
Transformed	<i>Formal Development</i>				
	<i>Informal Development</i>				
	<i>Altered Land</i>				

	No change in cover type	Highly possible	True
	Change from natural land cover to a transformed cover type	Highly possible	True
	Change from a transformed cover to natural land cover	Not possible	False
	Change from a transformed cover to natural land cover	Possible	True
	Change from one transformed to another transformed cover type	Highly possible	True
	Change from one transformed to another transformed cover type	Possible	True
	Change from one transformed to another transformed cover type	Not possible	False

(Source: Adapted from Thompson *et al.*, 2001)

3.8 ASSESSMENT

The factors that drive development and land use change in the coastal zone will be assessed against the DPSIR framework. The DPSIR model highlights the human components of the system and integrates socio-economics with environmental observations. It provides a general overview of the nature of large-scale ‘drivers’ that affect the state of an environment, takes cognisance of the need to address impacts that result from change, and serves as a tool to manage changes based on social and environmental impacts (Christian *et al.*, 2005). The constituents of the DPSIR framework have been adapted as detailed in Figure 3-5 to assess the ‘drivers’ of development and land use change in the coastal zone of the Ndlambe and Ngqushwa local municipalities. The term ‘driver’ for this

research means a factor that either promotes or hinders development and land use change within the research site.

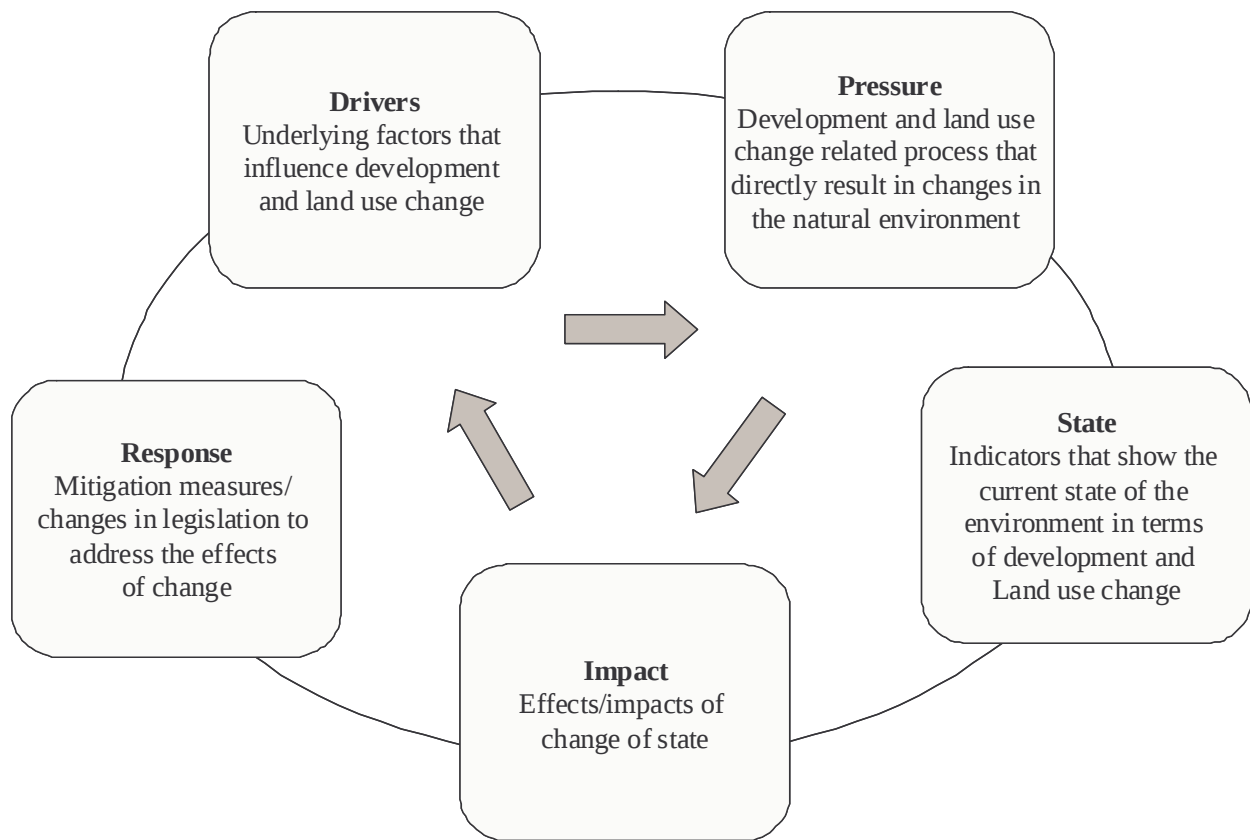


Figure 3-5: Details of the adapted DPSIR framework for this research

(Source: Adapted from Christian *et al.*, 2005; DEAT, 1999; Jesinghaus, 1999; SEACAM and CSIR, ND)

3.9 SUMMARY

This chapter outlines the steps taken in conducting this research, which have led to the results detailed in Chapter 4. It has justified why the research sites were selected, how the coastal zone was determined and details the land cover classification system used during the data capture phase. It also provides an overview of how the data was captured, analysed and assessed.

4.1 INTRODUCTION

This chapter presents the main finding of the GIS research and provides a description thereof. The two local municipalities are presented separately. Each section provides a general overview of the land cover at the three time intervals, specific land cover changes according to the groupings outlined in Section 3.6, and are then discussed.

4.2 NDLAMBE LOCAL MUNICIPALITY

Figures 4-1 to 4-3 depict the land cover in the Ndlambe Local Municipality for the periods 1940, 1973 and 2004. The distributions of land cover classes throughout the research site of the Ndlambe Local Municipality are depicted. Results of the research indicate that the region was dominated by thicket vegetation cover over the period 1940, 1973 and 2004. Grassland vegetation is also dominant over this period, with evidence of disturbed and cultivated lands.

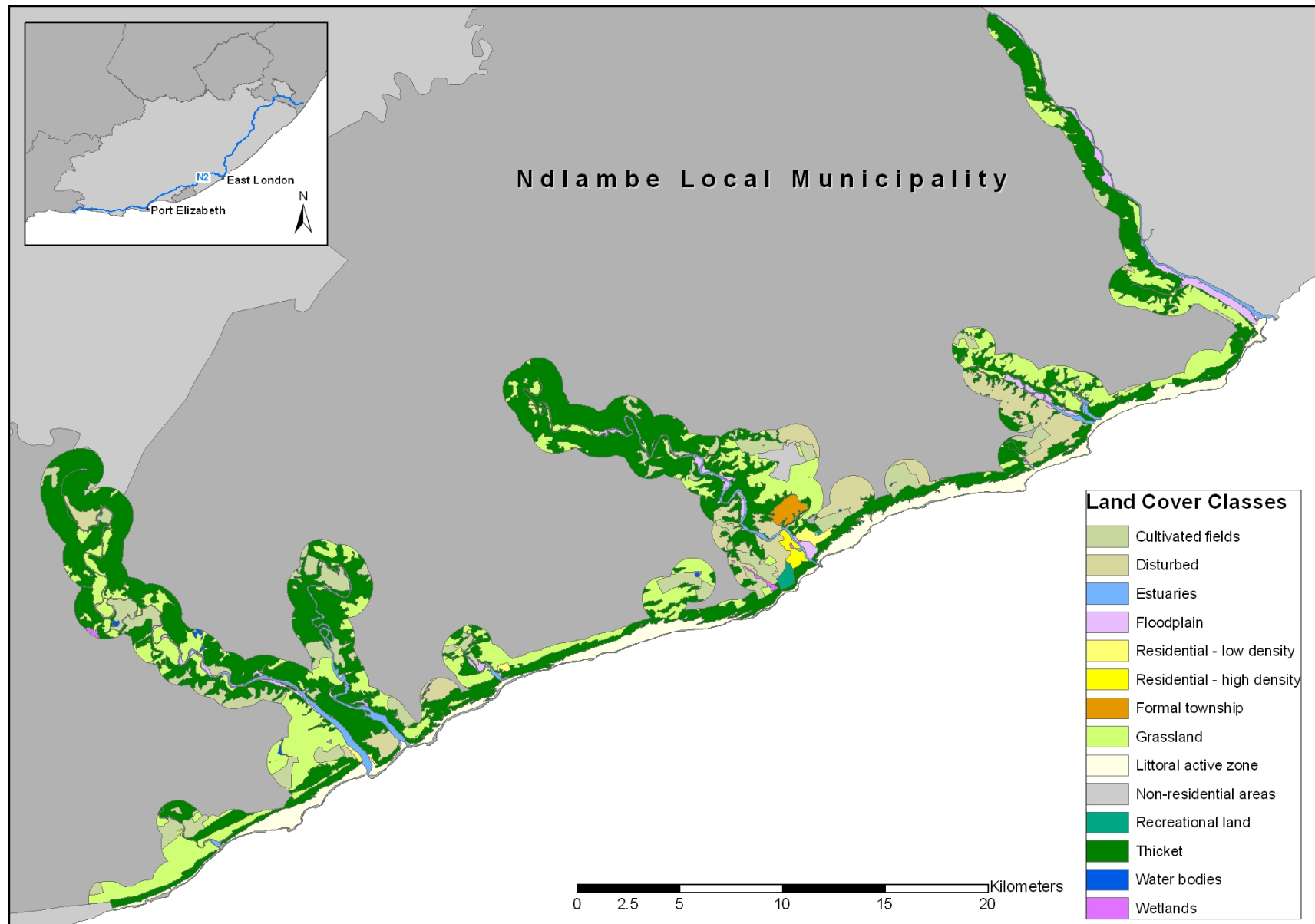


Figure 4-1: Land cover of Ndlambe Local Municipality in 1940

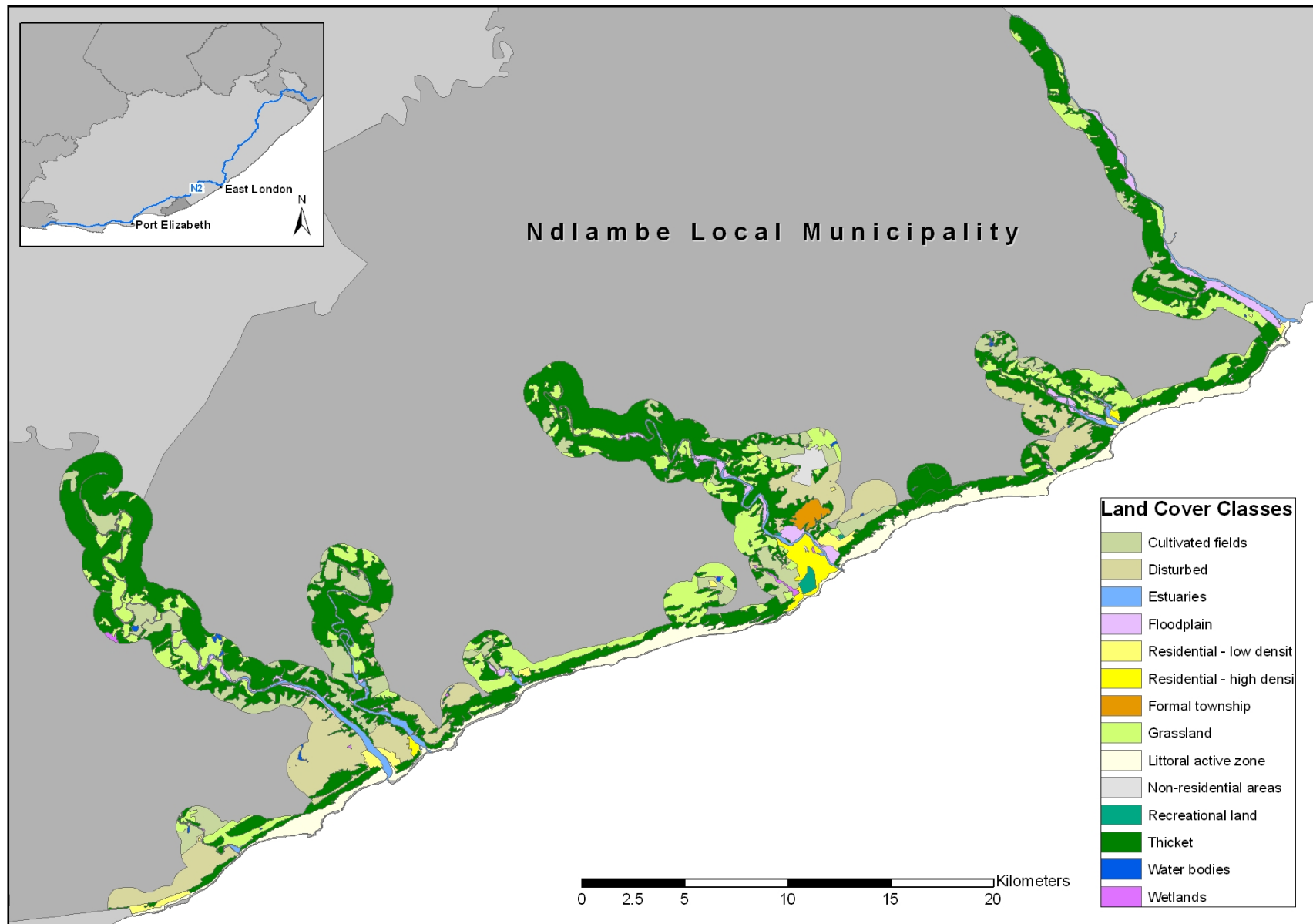


Figure 4-2: Land cover of Ndlambe Local Municipality in 1973

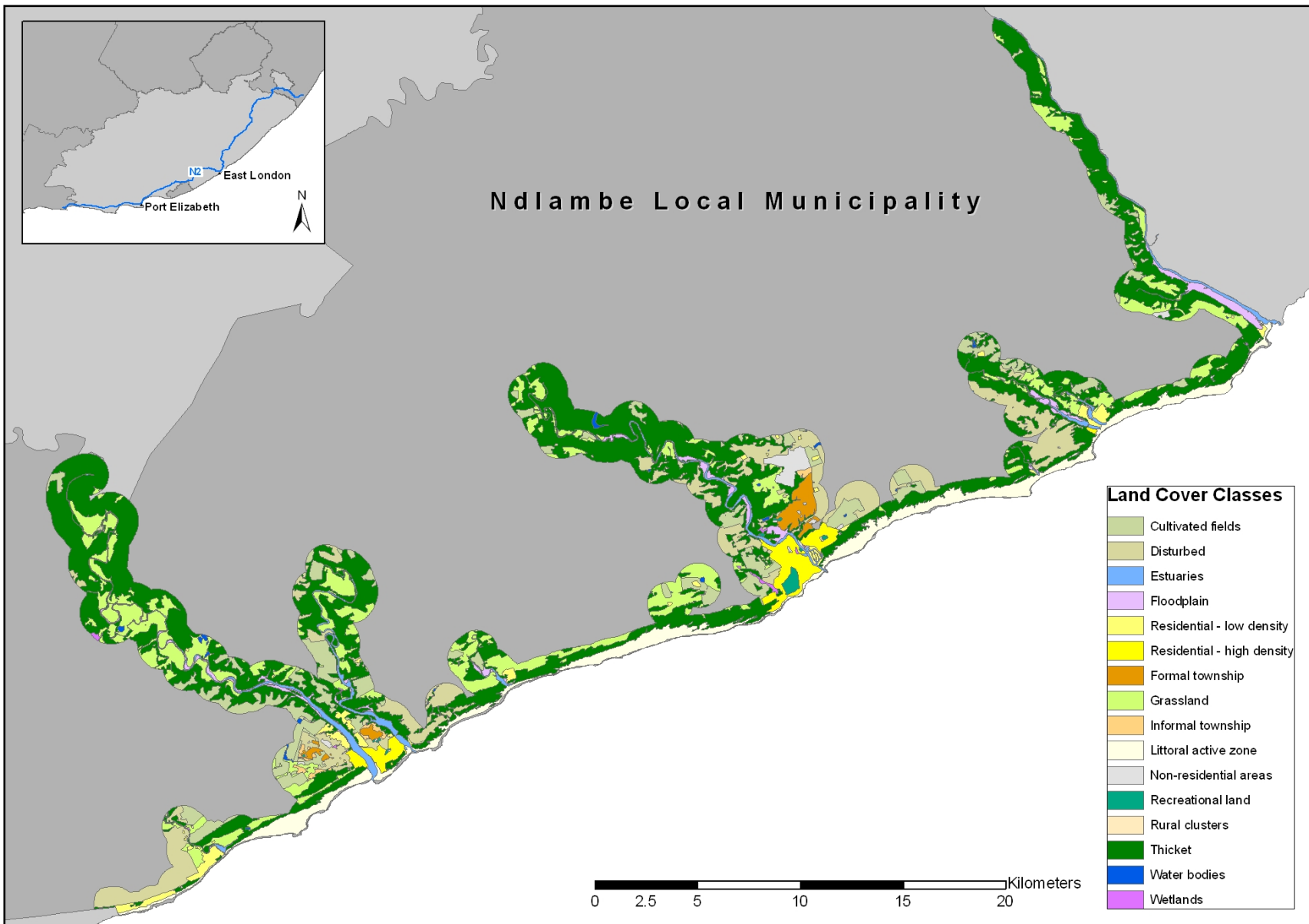


Figure 4-3: Land cover of Ndlambe Local Municipality in 2004

Table 4-1 provides a breakdown of the overall extent of the different land cover classes for the Ndlambe Local Municipality for all three time periods (1940, 1973 and 2004). Of significance is the emergence of two new land cover classes, informal township and rural cluster, between 1973 and 2004. This table also shows the percentage increase or decrease of each land class relative to itself between time periods (1940 to 1973 and 1973 to 2004) and provides the overall relative change in land cover class between 1940 and 2004.

Table 4-1: Area and percentage area of each land cover class within the Ndlambe Local Municipality

	Land Cover Class	1940		1973		2004		Change (%) 1940 - 1973	Change (%) 1973 - 2004	Overall Change (%) 1940 - 2004
		Area (km ²)	Percentage (%)	Area (km ²)	Percentage (%)	Area (km ²)	Percentage (%)			
1	Thicket	143205.9	46.42	142267.3	46.38	141386.3	45.87	-0.66	-0.62	-1.27
2	Grassland	68771.04	22.29	46611.57	15.20	44723.5	14.51	-32.22	-4.05	-34.97
3	Water bodies	606.6561	0.20	784.1859	0.26	1049	0.34	29.26	33.77	72.92
4	Estuaries	9206.379	2.98	9161.741	2.99	9371.512	3.04	-0.48	2.29	1.79
5	Wetlands	552.9653	0.18	564.4232	0.18	492.9513	0.16	2.07	-12.66	-10.85
6	Floodplain	6982.515	2.26	5462.373	1.78	5705.32	1.85	-21.77	4.45	-18.29
7	Littoral active zone	20947.25	6.79	20795.3	6.78	20524.99	6.66	-0.73	-1.30	-2.02
8	Disturbed	22320.53	7.23	38801.61	12.65	35491.92	11.51	73.84	-8.53	59.01
9	Cultivated fields	29161.1	9.45	30457.38	9.93	27716.87	8.99	4.45	-9.00	-4.95
10	Residential - high density	1094.975	0.35	4039.935	1.32	7451.254	2.42	268.95	84.44	580.50
11	Residential - low density	1305.401	0.42	3291.24	1.07	5471.84	1.78	152.12	66.25	319.17
12	Formal township	1531.59	0.50	1531.59	0.50	3880.434	1.26	0.00	153.36	153.36
13	Informal township	0	0.00	0	0.00	1069.019	0.35		NEW	NEW
14	Rural clusters	0	0.00	0	0.00	11.36337	0.00		NEW	NEW
15	Non-residential areas	2112.082	0.68	2224.493	0.73	2931.523	0.95	5.32	31.78	38.80
16	Recreational land	728.6612	0.24	761.8337	0.25	968.9797	0.31	4.55	27.19	32.98

The area (as a percentage) of the different land cover classes and change over the three time epochs is shown in Figures 4-5 and 4-6. Figure 4-4 represents the total area of each land cover class per time interval for the Ndlambe Local Municipality. Figure 4-4 shows that the Ndlambe Local Municipality is dominated by natural thicket at all three time intervals (approximately 46% in 1940, 1973 and 2004), followed by natural grassland (22% in 1940 and 15% in 1973 and 2004) and disturbed areas (7% in 1940, 13% in 1973 and 12% in 2004). All other land cover classes make up less than 10% of the total area of the local municipality at all time intervals. Significantly, it shows that formally developed areas, formal residential (both high and low density) and formal township areas comprise a small percentage of the overall area of the local municipality, although these areas are demonstrating the greatest extent of change, as is clearly seen in Figure 4-5.

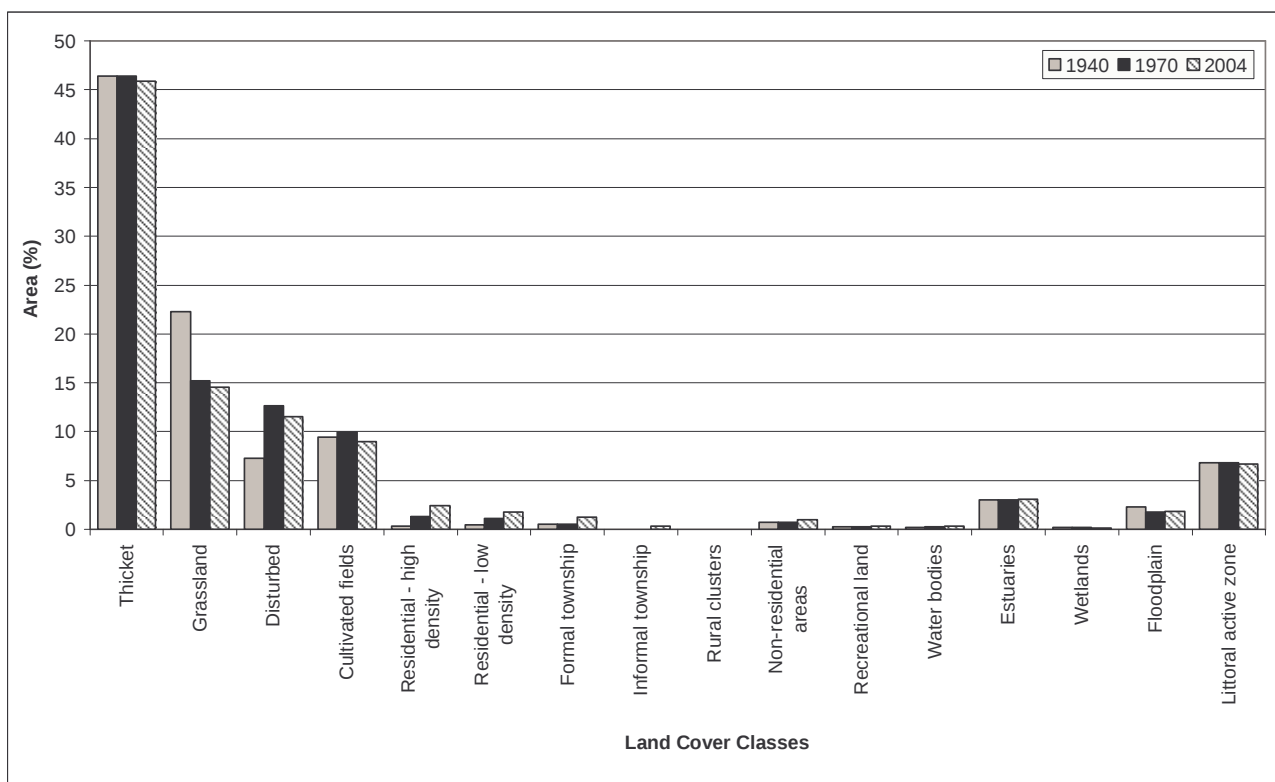


Figure 4-4: Percentage area of land cover for the Ndlambe Local Municipality over the years 1940, 1973 and 2004

Figure 4-5 shows that formal residential (high density) class increased by 267% for the period 1940 to 1973 and by a further 84% for the period 1973 to 2004. For the same time intervals, formal residential (low density) increased by 152% and 66%, respectively. While formal township areas experienced no change between 1940 and 1973 there was an increase of 153% between 1973 and 2004. Non-residential areas and recreational lands both make up small percentages of the overall

area of the local municipality. Between 1940 and 1973 both experienced very little increase (5%), as can be see in Figure 4-5, however between 1973 and 2004 both experienced significant growth (32% and 27% respectively)

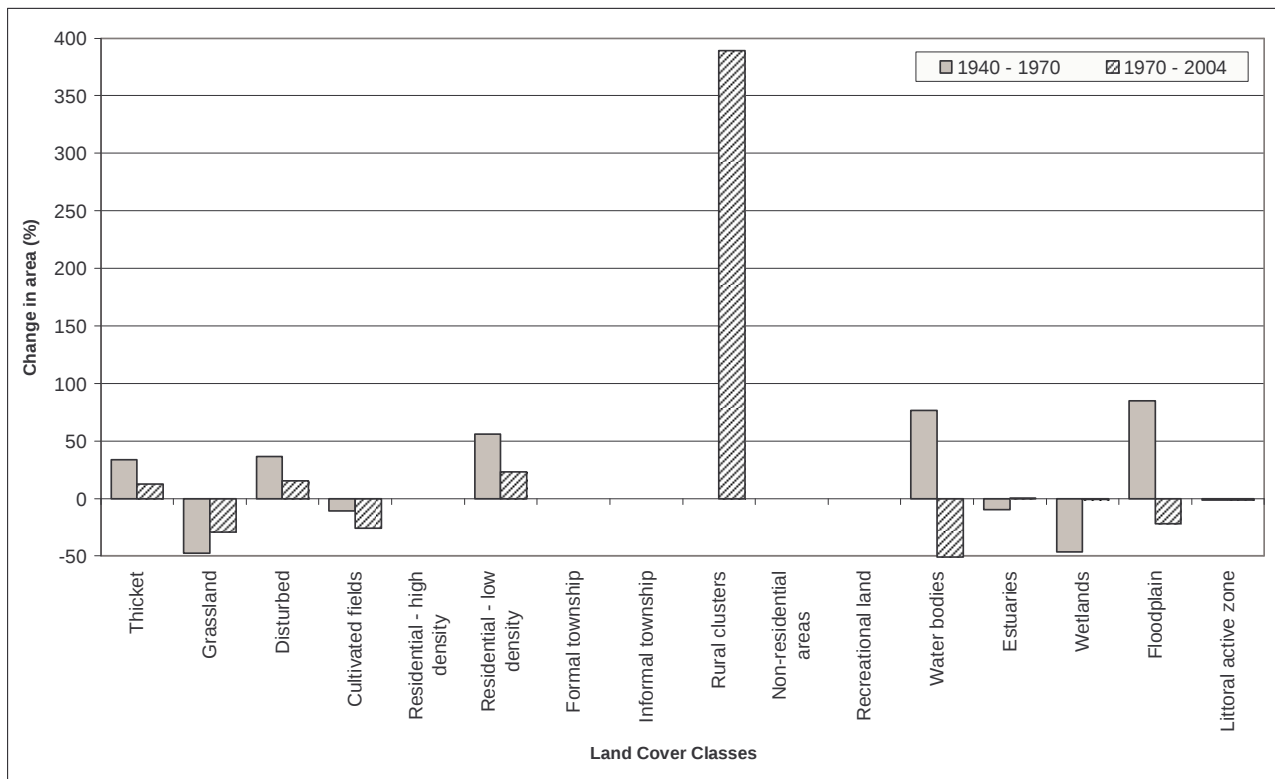


Figure 4-5: Percentage change per land cover class for the Ndlambe Local Municipality. Negative values indicate a reduction in the area extent of land cover classes

Based on land cover groupings, as outlined in Section 3.7, Figure 3-4 and the potential for change as discussed in Section 3.7 (Table 3-6), the matrix of changes in the Ndlambe Local Municipality was derived (Table 4-2). Percentages in brackets indicate percentage of primary land cover class (A) converted during indicated time period to primary land cover class (B), which result in the overall net change per land cover class as indicated in Figure 4-6. From this it can be determined that the greatest changes in land cover classes occurred in terms of natural land being converted to transformed land cover classes (indicated in dark blue in the matrix), and altered land being transformed to other transformed land cover classes (indicated in light blue in the matrix). Transformation from altered land to natural land is also evident (indicated in green in the matrix).

Table 4-2: Ndlambe Local Municipality matrix of land cover change

	(B) → (A) ↓	Natural Land	Transformed		
			Formal Development	Informal Development	Altered Land
Transformed	Natural Land		1940-1973 (1.1%) 1973-2004 (1.1%)	1973-2004 (0.1%)	1940-1973 (12.9%) 1973-2004 (6.8%)
	Formal Development				
	Informal Development				
	Altered Land	1940-1973 (23.5 %) 1973-2004 (22.4%)	1940-1973 (4.0%) 1973-2004 (8.5%)	1973-2004 (1.2%)	

	No change in cover type	Highly possible	True
	Change from natural land cover to a transformed cover type	Highly possible	True
	Change from a transformed cover to natural land cover	Not possible	False
	Change from a transformed cover to natural land cover	Possible	True
	Change from one transformed to another transformed cover type	Highly possible	True
	Change from one transformed to another transformed cover type	Possible	True
	Change from one transformed to another transformed cover type	Not possible	False

Figure 4-6 shows the proportion of change in each primary land cover class over the three time epochs. The results show that formal development within the Ndlambe Local Municipality has increased at the greatest rate, between 1940 and 1973 by 83% and by another 78% between 1973 and 2004. Thus over the period, an overall increase of 227% was observed. Altered lands have changed at a much lower rate and have experienced both increases and decreases in area. Between 1940 and 1973 there is an increase of 34%, but there is an 8% decrease between 1973 and 2004, resulting in an overall increase between 1940 and 2004 of only 23%. Informal development does not show any change over time, as it only emerged between 1973 and 2004. Change in natural land has been relatively low, with a decrease of 10% between 1940 and 1973 and a further 1% between 1973 and 2004, resulting in an overall decrease in natural land of 11% between 1940 and 2004.

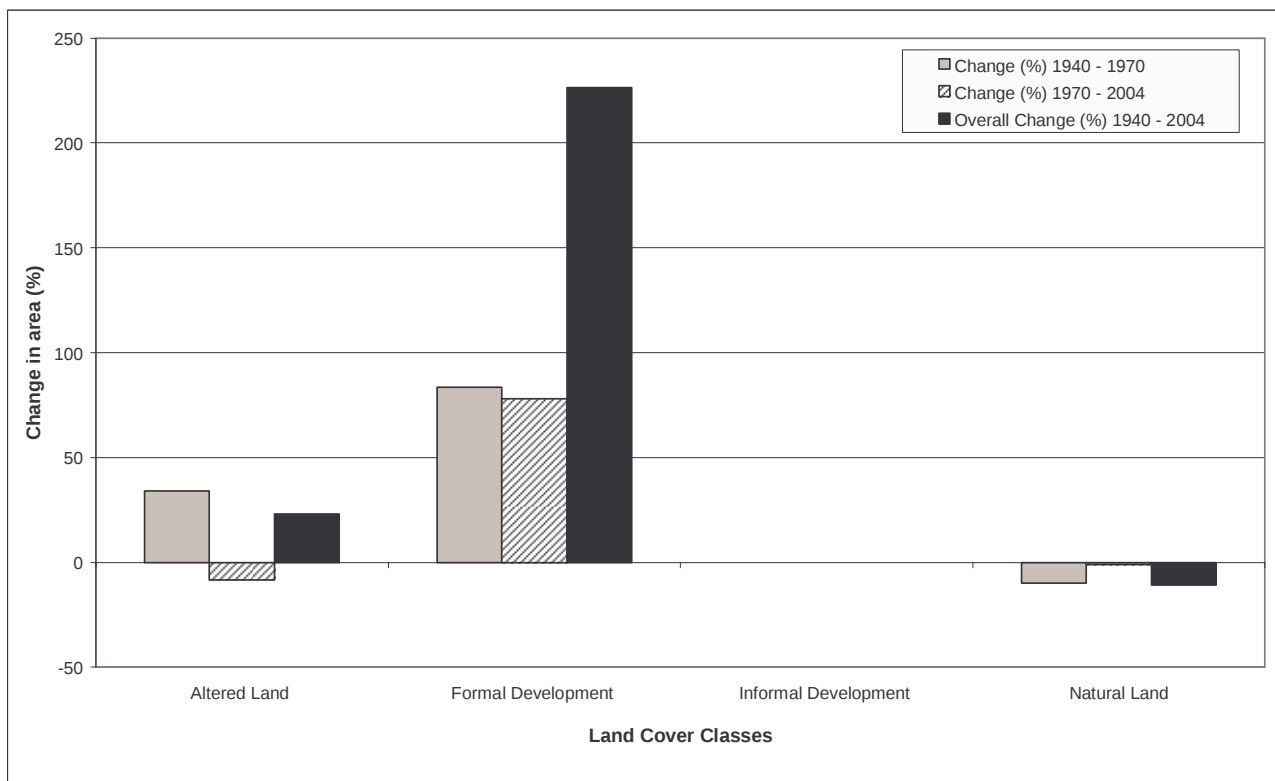


Figure 4-6: Percentage change in primary land cover classes

4.2.1 FORMAL DEVELOPMENT

Figure 4-7 shows the progression of formal development within the Ndlambe Local Municipality at the three time intervals (1940, 1973 and 2004). Although formal development makes up a small percentage of the overall land cover of the Ndlambe Local Municipality (2% in 1940, 4% in 1973 and 6% in 2004), the rate of change is significant, doubling between 1940 and 1973 and increasing by a further 50% between 1973 and 2004. This figure shows that formal development has concentrated near estuary mouths and includes the coastal towns of Cannon Rocks, Boknesstrand, Bushmans River Mouth, Kenton-on-Sea, Port Alfred and Kleinemonde (referred to in Section 3.2). Figure 4-8 to Figure 4-11 provide detailed maps of the four nodes and show when development occurred and what land cover classes have been transformed.

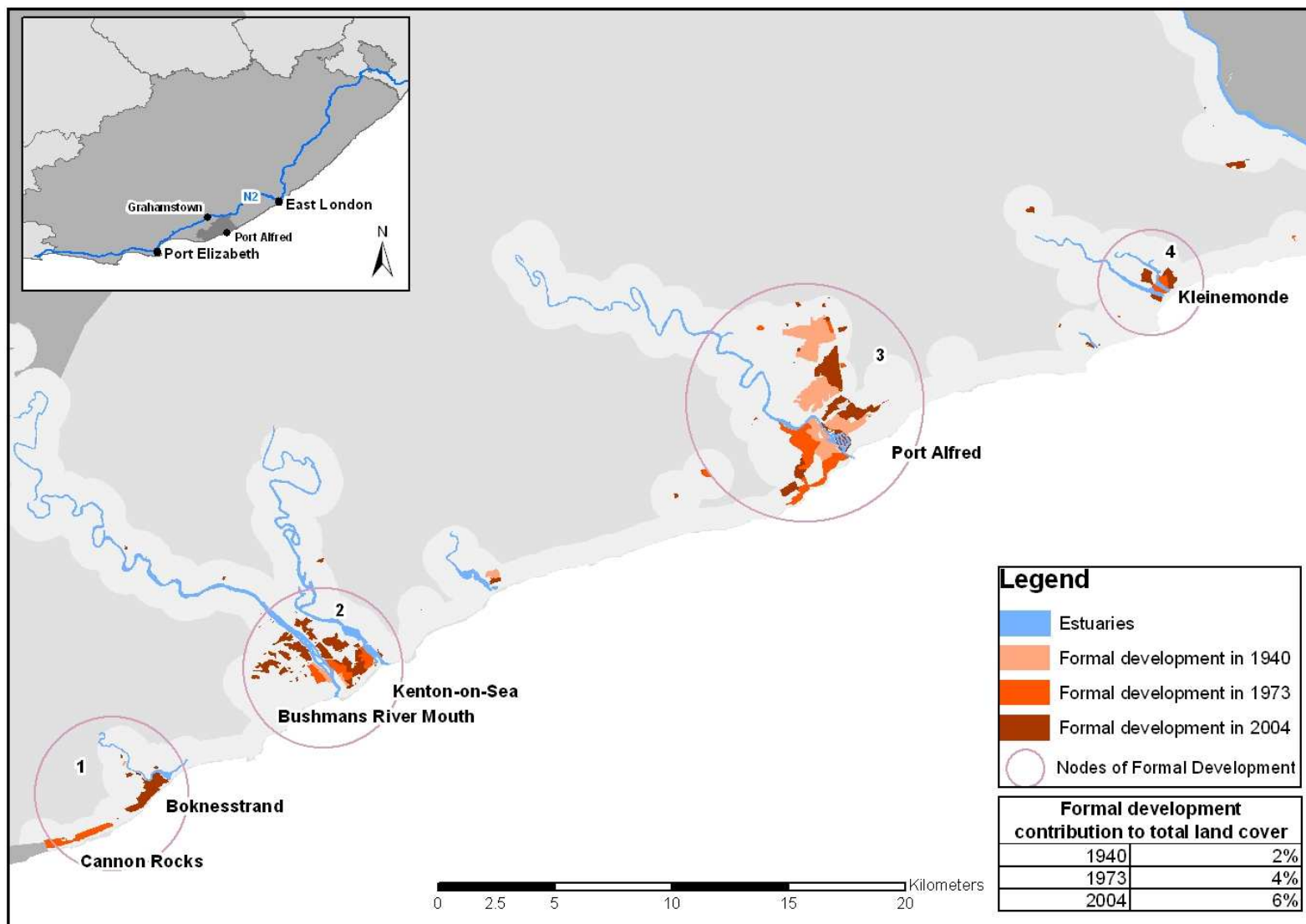


Figure 4-7: Formal development at three time intervals (1940, 1973 and 2004) within Ndlambe Local Municipality

Figure 4-8 shows Node 1, the Cannon Rocks/Boknesstrand area. The Cannon Rocks site developed by 1973 and was dominated by thicket vegetation prior to development. The Boknesstrand side developed later, by 2004, and prior to this transformation vegetation was dominated by disturbed areas and thicket vegetation.

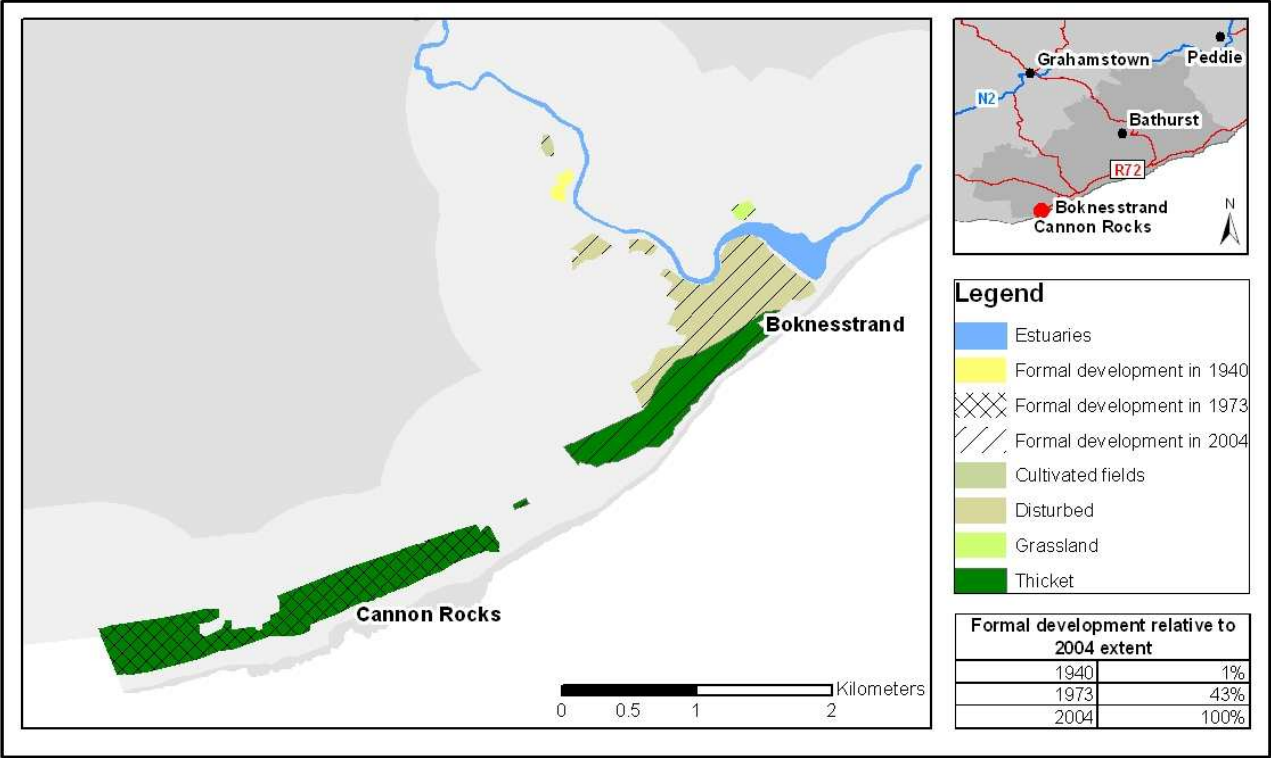


Figure 4-8: Historical land cover and change in development for the Boknesstrand and Cannon Rocks area (Node 1)

Figure 4-9 shows Node 2, the Bushmans River Mouth and Kenton-on-Sea area. It shows that development started on the banks of the Bushmans River Estuary and has progressed both upstream of the mouth along the estuary and outward over time. Major development of this area occurred between 1973 and 2004, with formally developed areas being only 30% of their 2004 extent in 1973. Prior to development in this area, vegetation was dominated by disturbed areas and cultivated fields.

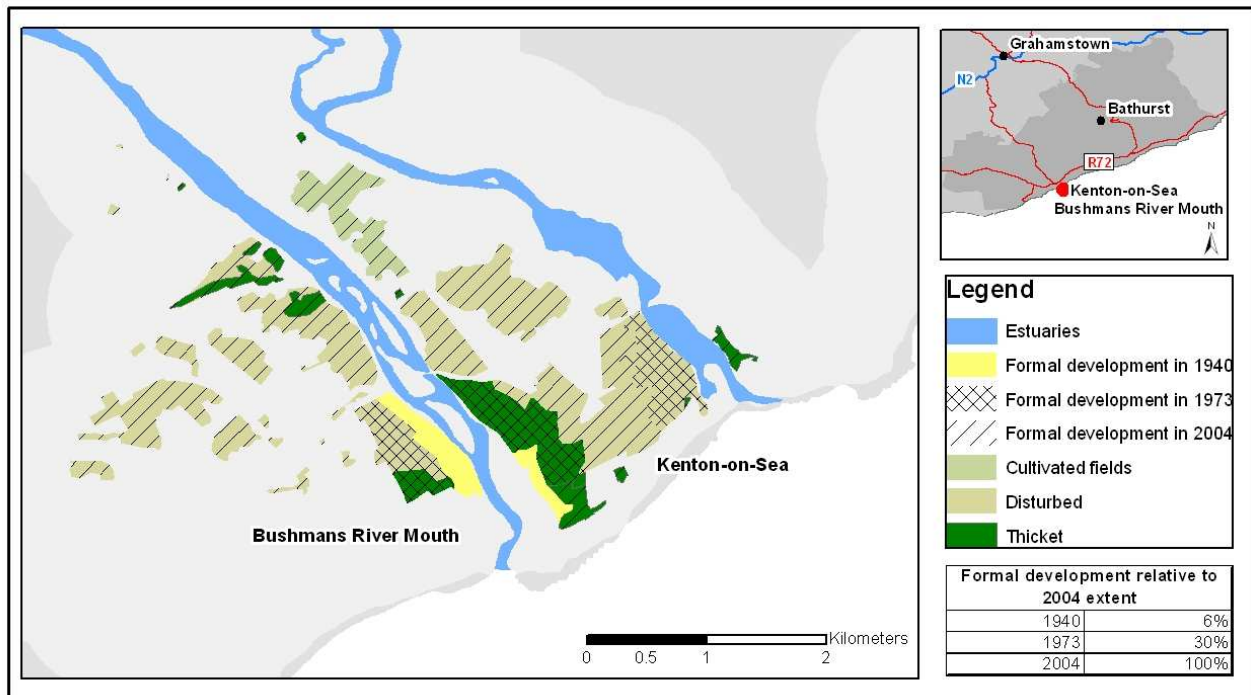


Figure 4-9: Historical land cover and change in formal development for the Bushmans River Mouth and Kenton-on-Sea area (Node 2)

Figure 4-10 shows Node 3, the Port Alfred area. Although this area was relatively well developed in 1940, there has been a steady increase in development in this node, with a 23% increase in formal development between 1940 and 1973 and 28% between 1973 and 2004. As with the Bushmans River Mouth and Kenton-on-Sea node, formal development in the Port Alfred area has a clear association with the Kowie River Estuary. Development has largely occurred on previously altered land, although between 1973 and 2004 some areas of thicket and floodplain have been lost as a result of formal development at this node.

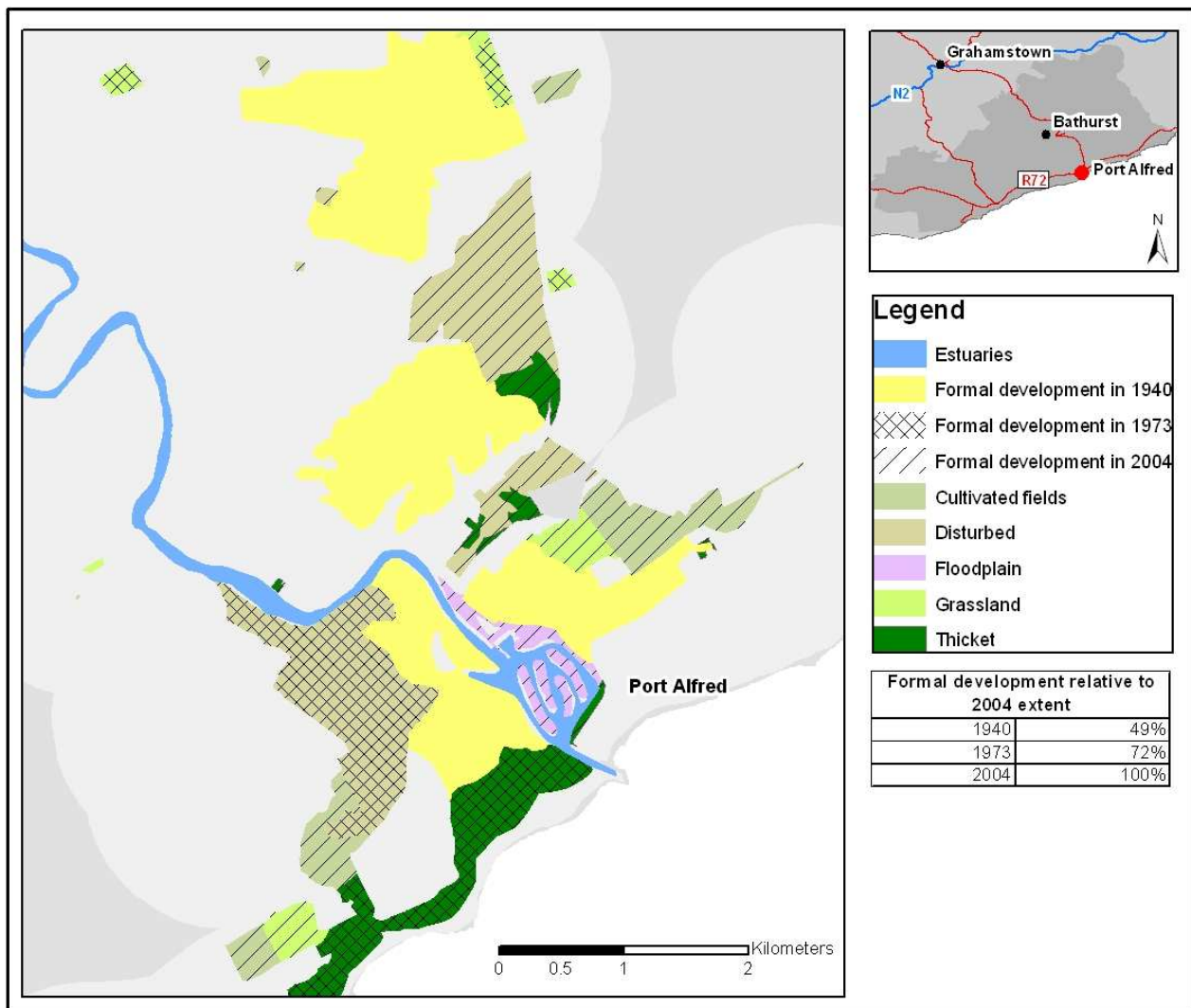


Figure 4-10: Historical land cover and change in development for the Port Alfred Area (Node 3)

The historical land cover in the Kleinemonde area (Node 4) is shown in Figure 4-11. Prior to 1940 there was no formal development. Between 1940 and 1973 formal development increased by 32% relative to the 2004 development extent. Development in this area has resulted in a decrease in thicket and grassland areas.

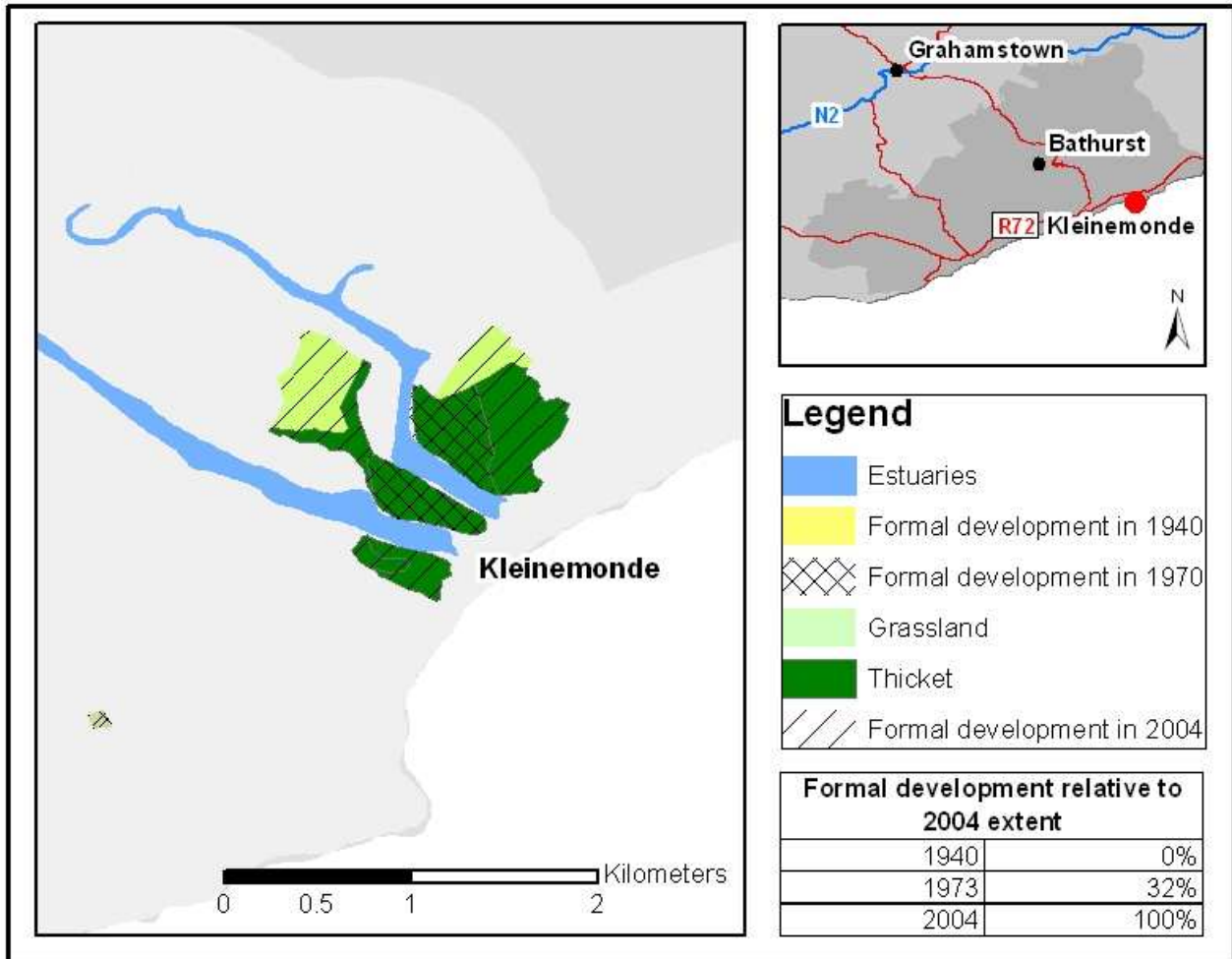


Figure 4-11: Historical land cover and change in development for the Kleinemonde area (Node 4)

4.2.2 INFORMAL DEVELOPMENT

The informal developments in the Ndlambe Local Municipality have only developed near the Port Alfred and Kenton/Bushmans River areas (Figure 4-12). It is important to note that informal development occurs within areas that have experienced high level of formal development growth (refer to Figure 4-7). Figure 4-12 shows that informal developments only established between 1973 and 2004. This figure also shows that prior to these informal developments the area of the Port Alfred site was natural land while in the Kenton/Bushmans River site land was already disturbed by 1973.

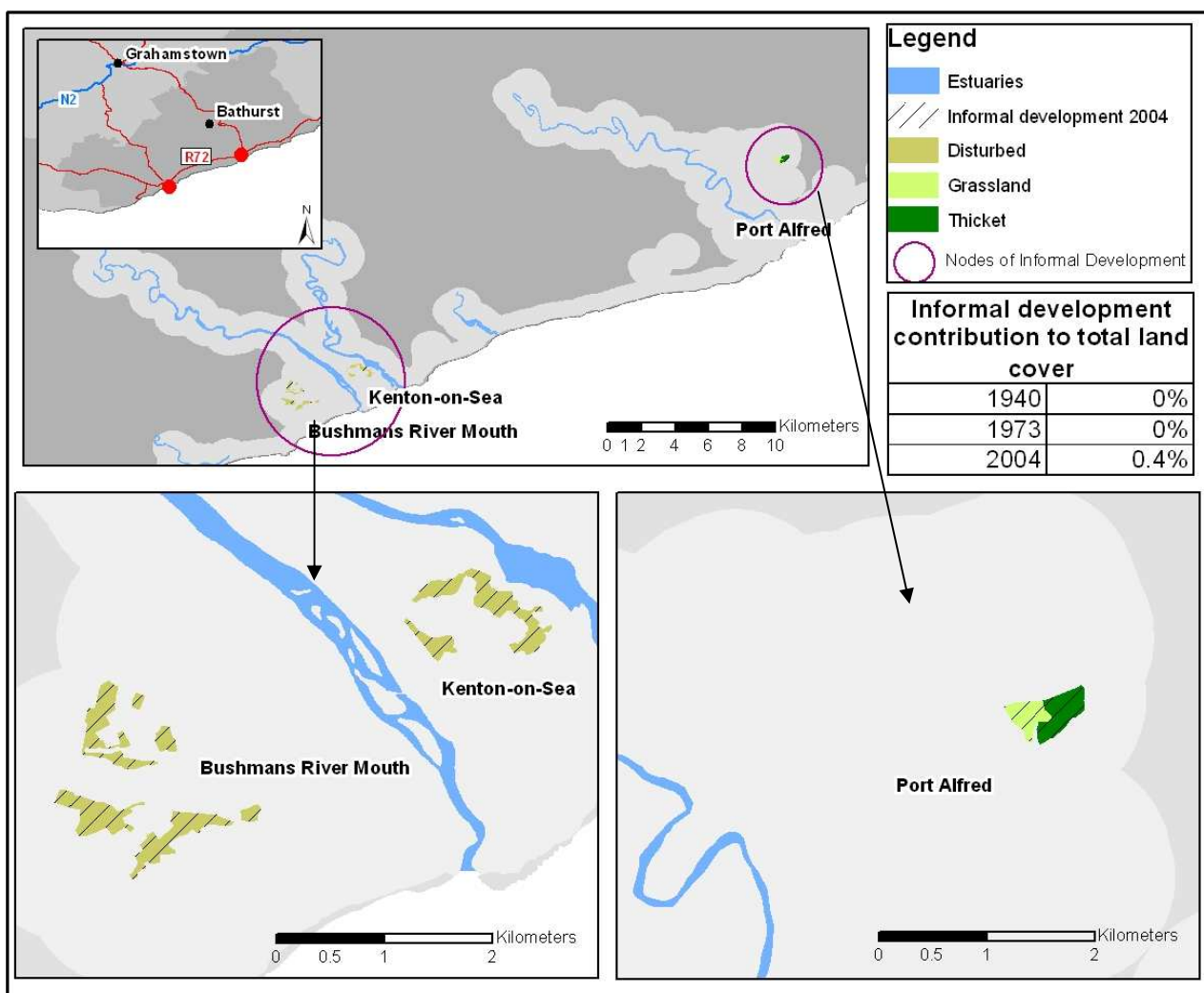


Figure 4-12: Informal development in Ndlambe Local Municipality

4.2.3 ALTERED LAND

Altered lands have a decrease in area (negative change) as land cover is being converted to other uses, most likely formal and informal development. Figure 4-13 shows the extent of altered land for 1940, 1973 and 2004, and areas that were altered in 1940 and 1973 but have since been transformed into an alternative land use. This figure shows that the highest level of change, in terms of increases and decreases in altered land, is occurring in the Port Alfred and Kenton/Bushmans River Mouth areas. Figure 4-14 and Figure 4-15 show these areas in more detail and show the extent of altered lands in 2004 and what land cover was there prior to transformation. Secondly, these figures show areas that were previously altered (in 1940 and 1973) and what they have changed to in 2004.

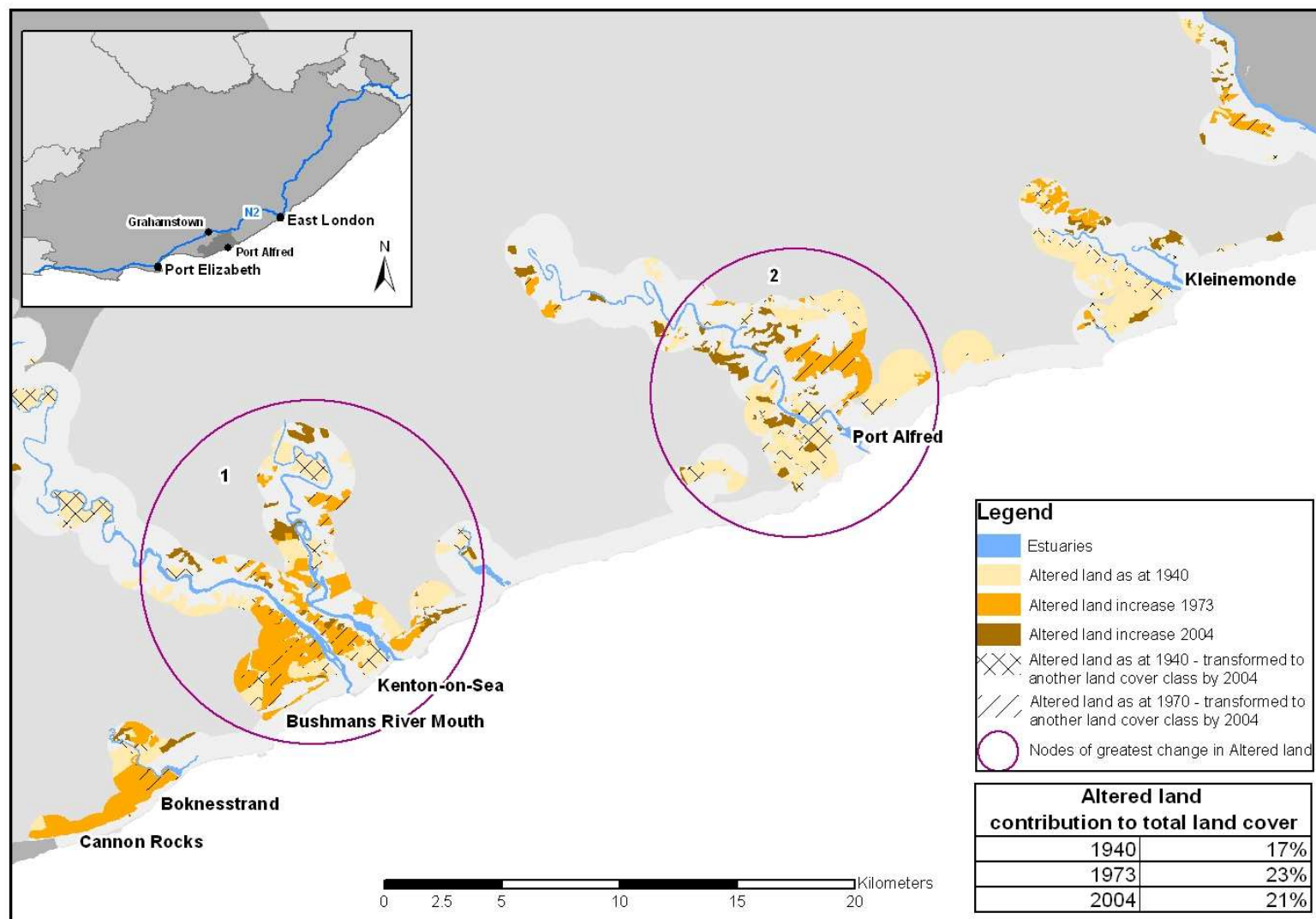


Figure 4-13: Altered land in the Ndlambe Local Municipality

Figure 4-14 focuses on the Kenton/Bushmans River Mouth area. It shows that there have been changes in altered lands; these changes can be related to changes in other land cover classes. The overall effect is an increase in altered land of 120% between 1940 and 1973 and by a further 12% between 1973 and 2004.

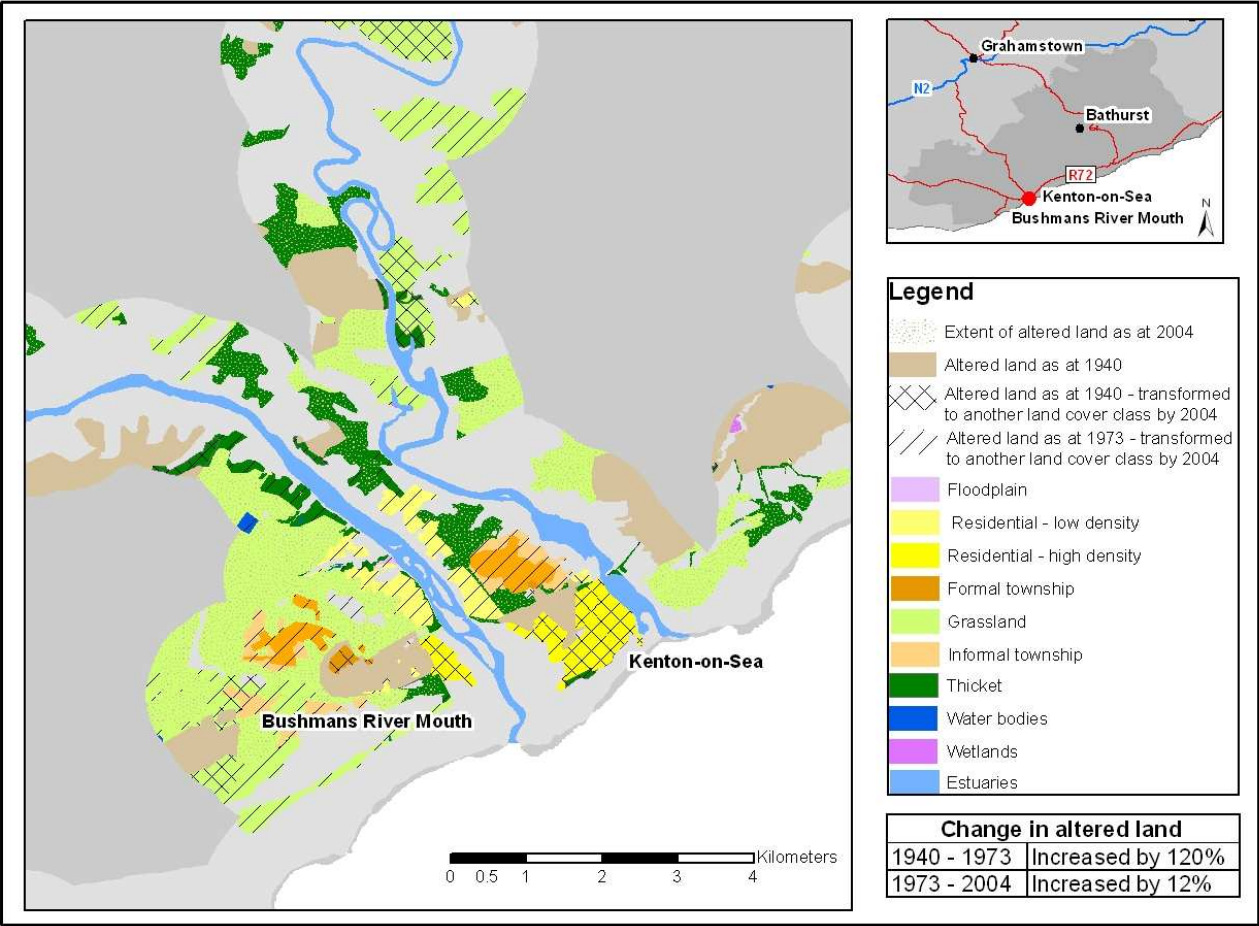


Figure 4-14: Historical land cover and change in altered land for the Kenton/Bushmans River Mouth area

Figure 4-15 focuses on the Port Alfred area and illustrates that changes in altered areas are varied. In general, the Port Alfred area has experienced an 11% overall decrease in altered land, between 1940 and 1973 and between 1973 and 2004 a 57% increase.

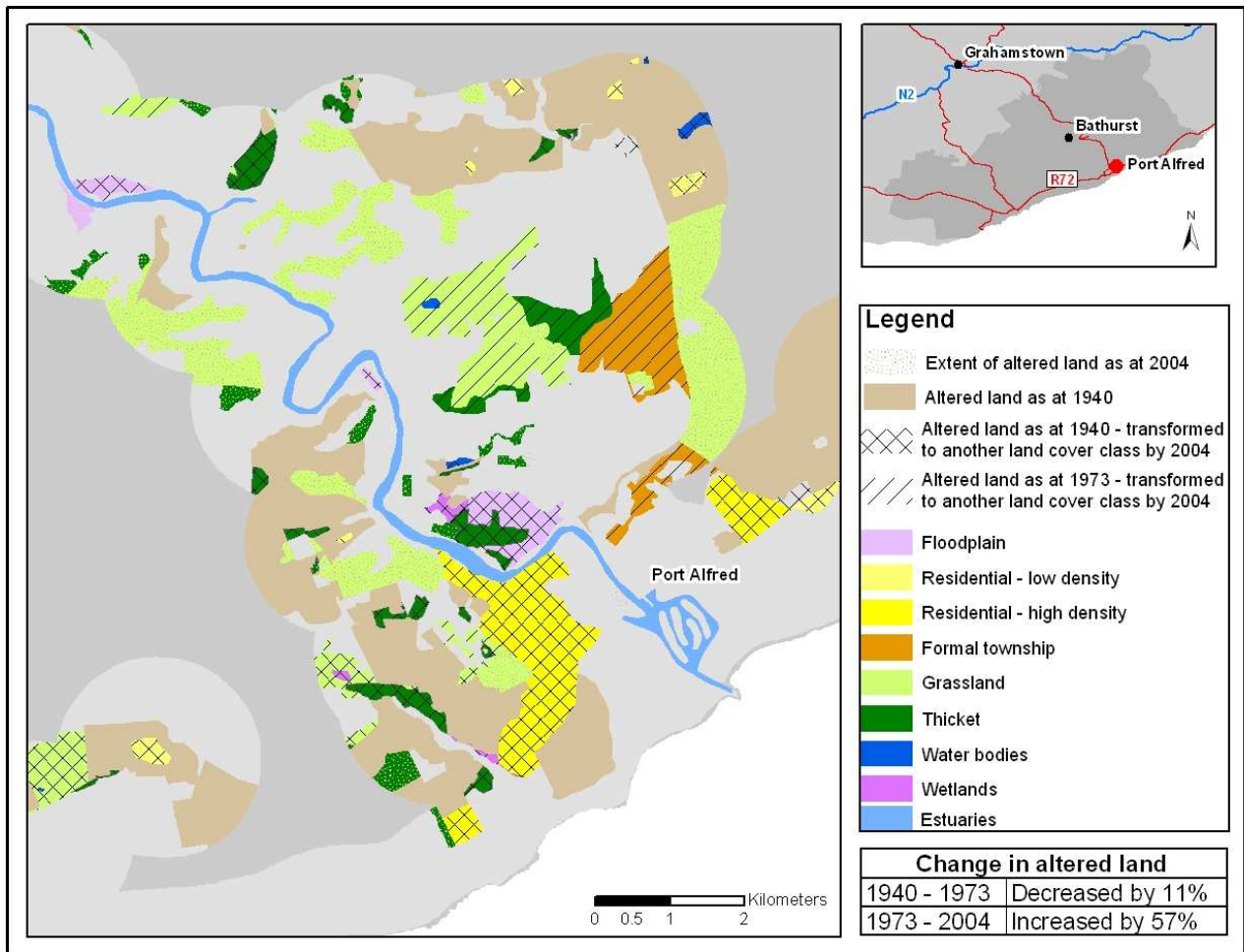


Figure 4-15: Historical land cover and change in altered land for the Port Alfred area

4.3 NGQUSHWA LOCAL MUNICIPALITY

The land cover in the Ngqushwa Local Municipality for the three time periods of 1940, 1973 and 2004 is depicted in Figures 4-16 to 4-18. They show the distribution of land cover classes throughout the research site of Ngqushwa. These figures show that this research site is largely dominated by grassland, thicket and disturbed land for all three time periods.

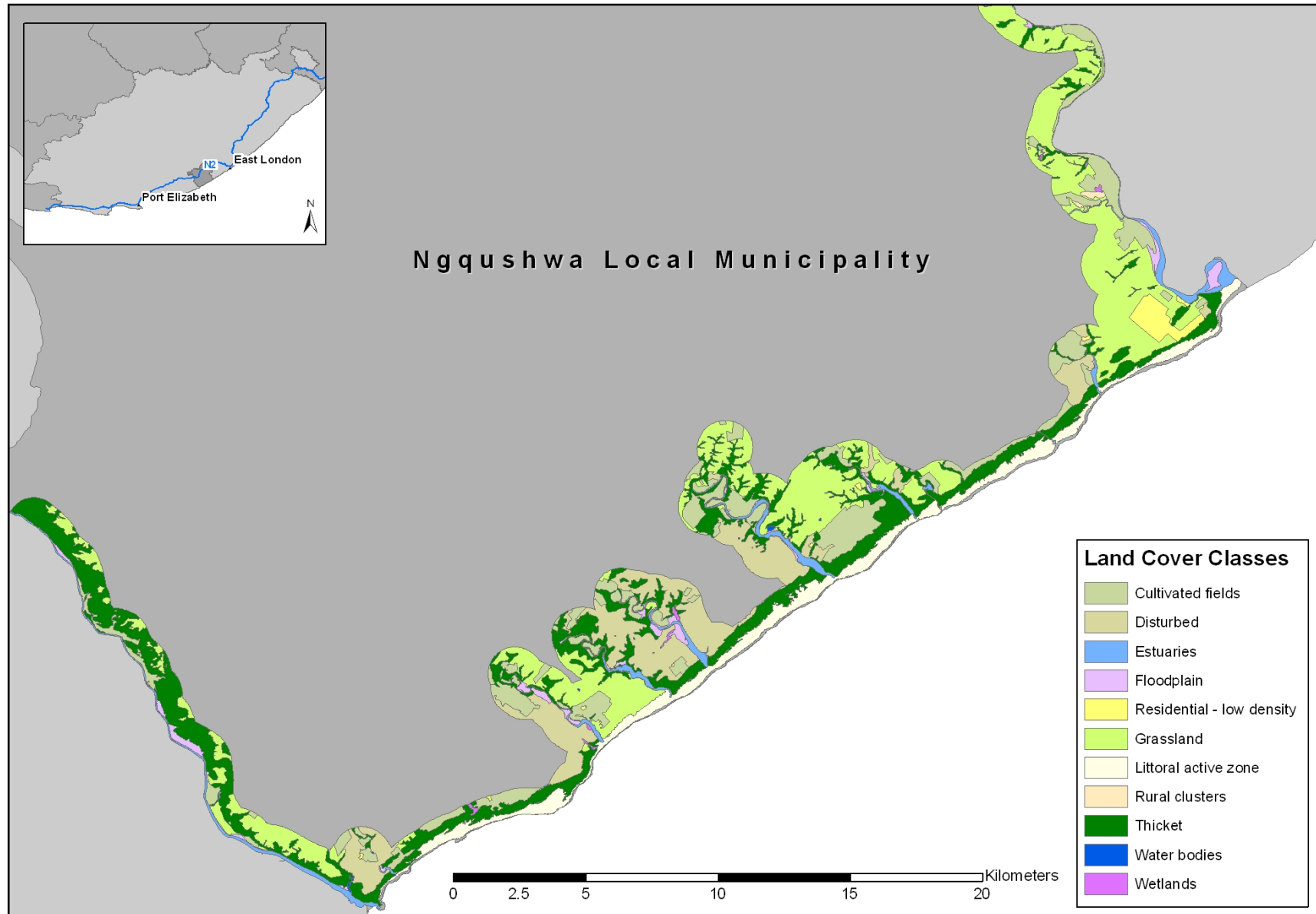


Figure 4-16: Land cover of Ngqushwa Local Municipality in 1940

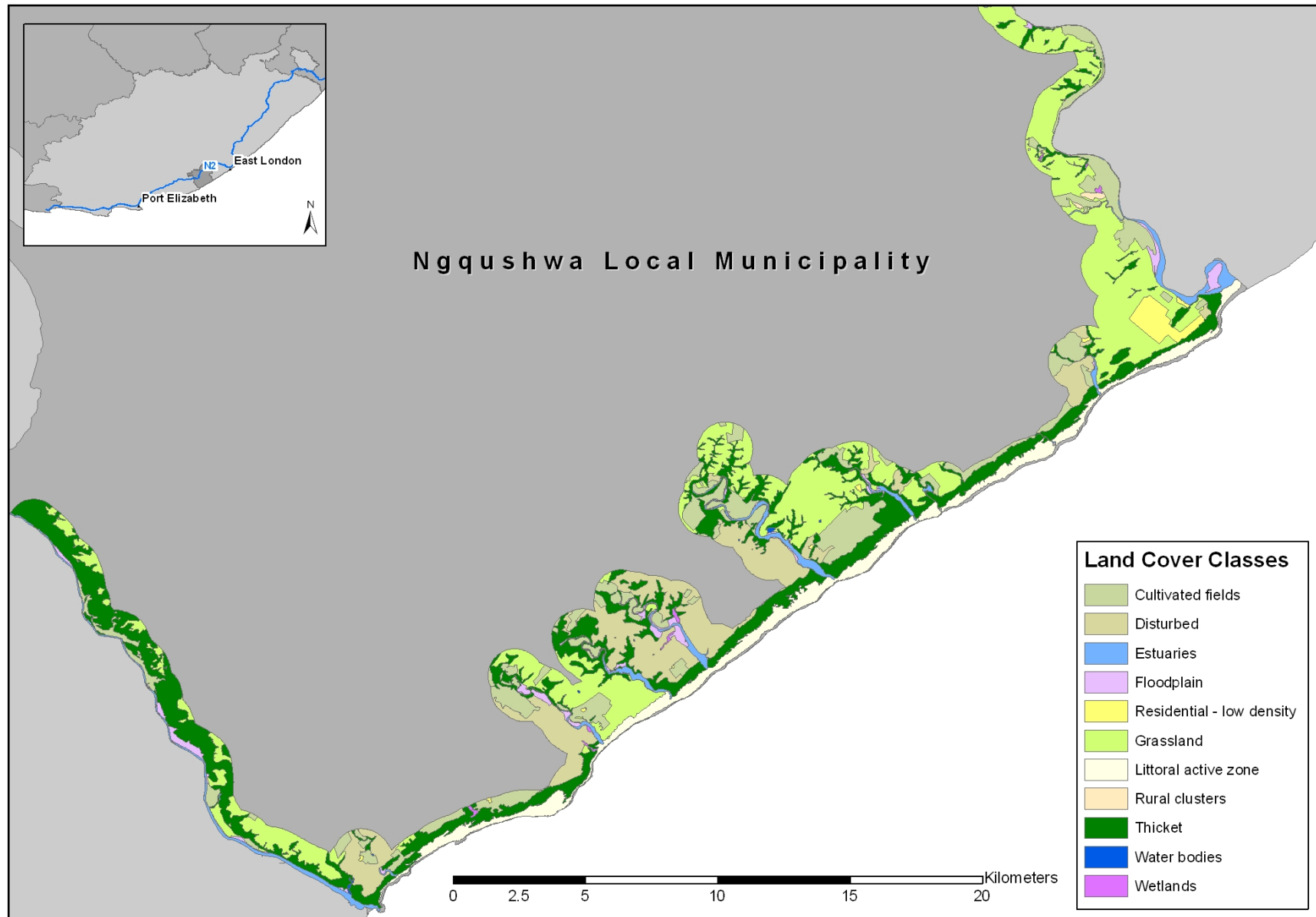


Figure 4-17: Land cover of Ngqushwa Local Municipality in 1973

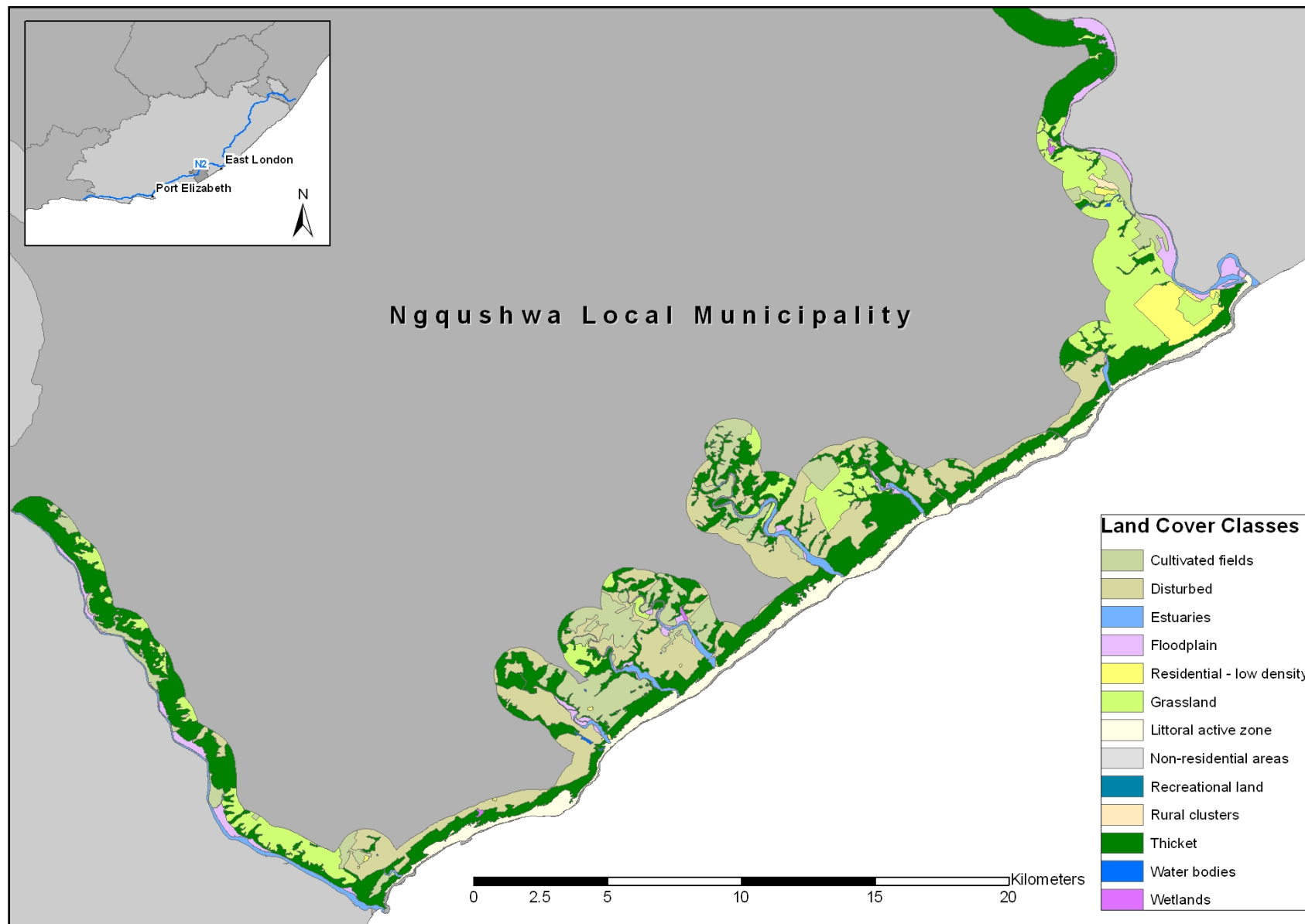


Figure 4-18: Land cover of Ngqushwa Local Municipality in 2004

Table 4-3 provides a breakdown of the overall extent of the different land cover classes for the Ngqushwa Local Municipality for all three time periods (1940, 1973 and 2004). It shows the area (m²) of each land cover class and its proportion of the total area of the site. This table also depicts the proportional increase or decrease of each land class relative to itself between time periods (1940 to 1973 and 1973 to 2004) and provides the overall relative change in land cover class between 1940 and 2004.

Table 4-3: Area and percentage area of each land cover class within the Ngqushwa Local Municipality

Land Cover Class		1940		1973		2004		Change (%) 1940 - 1973	Change (%) 1973 - 2004	Overall Change (%) 1940 - 2004
		Area (km ²)	Percentage (%)	Area (km ²)	Percentage (%)	Area (km ²)	Percentage (%)			
1	Thicket	41763.57	25.61	55775.78	34.19	62653.57	38.41	33.55	12.33	50.02
2	Grassland	49240.49	30.20	25770.36	15.80	18291.52	11.21	-47.66	-29.02	-62.85
3	Disturbed	23838.34	14.62	32476.56	19.91	37486.36	22.98	36.24	15.43	57.25
4	Water bodies	128.2905	0.08	226.6647	0.14	111.289	0.07	76.68	-50.90	-13.25
5	Estuaries	6410.036	3.93	5802.795	3.56	5818.682	3.57	-9.47	0.27	-9.23
6	Wetlands	404.4652	0.25	217.485	0.13	215.2141	0.13	-46.23	-1.04	-46.79
7	Floodplain	3361.84	2.06	6212.968	3.81	4845.661	2.97	84.81	-22.01	44.14
8	Littoral active zone	11808.11	7.24	11668.89	7.15	11515.86	7.06	-1.18	-1.31	-2.47
9	Cultivated fields	23426.86	14.37	20938.78	12.84	15490.94	9.50	-10.62	-26.02	-33.88
10	Residential - high density	0	0.00	0	0.00	0	0.00			
11	Residential - low density	2418.024	1.48	3776.085	2.32	4642.326	2.85	56.16	22.94	91.99
12	Formal township	0	0.00	0	0.00	0	0.00			
13	Informal township	0	0.00	0	0.00	0	0.00			
14	Rural clusters	247.251	0.15	247.2184	0.15	1208.943	0.74		389.02	389.02
15	Non-residential areas	0	0.00	0	0.00	150.7682	0.09			
16	Recreational land	0	0.00	0	0.00	684.3647	0.42			

The area (as a percentage) of the different land cover classes and change over the three time epochs is shown in Figure 4-19 and Figure 4-20. As depicted in Figure 4-19, the Ngqushwa Local Municipality is dominated by natural thicket (26% in 1940, 34% in 1973 and 38% in 2004) and natural grassland (30% in 1940, 16% in 1973 and 11% in 2004) at all three time intervals. This is followed by disturbed areas (15% in 1940, 20% in 1973 and 23% in 2004) and cultivated areas (14% in 1940, 13% in 1973 and 10% in 2004), with all other land cover classes comprising less than 10% of the total area of the local municipality at all time intervals. Thicket coverage has gradually increased over time, and based on Figure 4-16, Figure 4-17 and Figure 4-18 it is evident that this increase in coverage occurred in the estuarine areas.

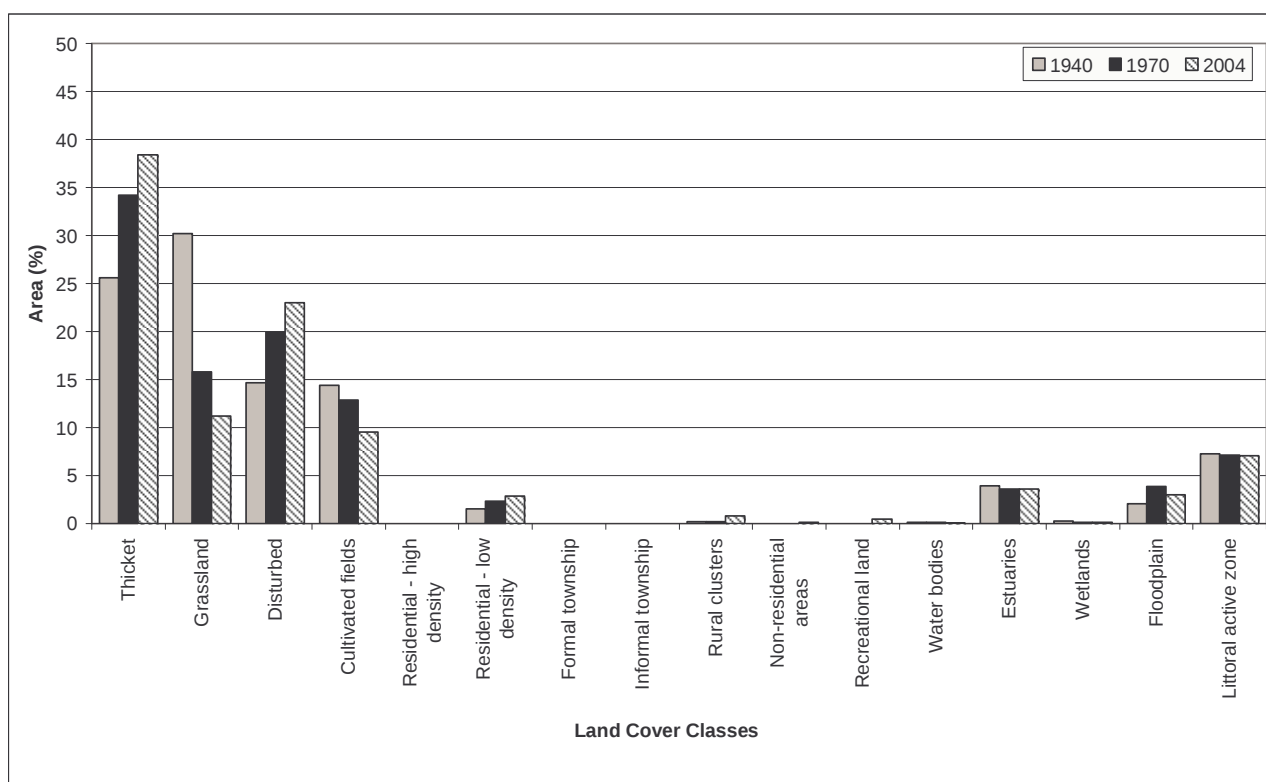


Figure 4-19: Percentage area of land cover per year for the Ngqushwa Local Municipality

There is a noted increase in disturbed areas and a decrease in cultivated areas (Figure 4-19) between 1940 and 2004. Disturbed areas increased by 36% between 1940 and 1973 (Figure 4-20) and by a further 15% between 1973 and 2004. During the same time, cultivated areas decreased by 23% and 26% respectively (Figure 4-20).

Figure 4-19 and Table 4-3 show that the Ngqushwa Local Municipality does not have any formal residential (high density), formal township or informal township areas. Formal development only occurs in terms of formal residential (low density), which makes up less than 3% at all three time

intervals, while informal development occurs in the form of rural cluster areas, which make up less than 1% of the total area for the local municipality at all three time intervals. Of significance is that both these land classes have experienced significant growth between 1940 and 2004. Figure 4-20 shows that formal residential (low density) areas increased by 56% between 1940 and 1973 and a further 23% between 1973 and 2004. Rural cluster areas experienced growth later, between 1973 and 2004 (389%).

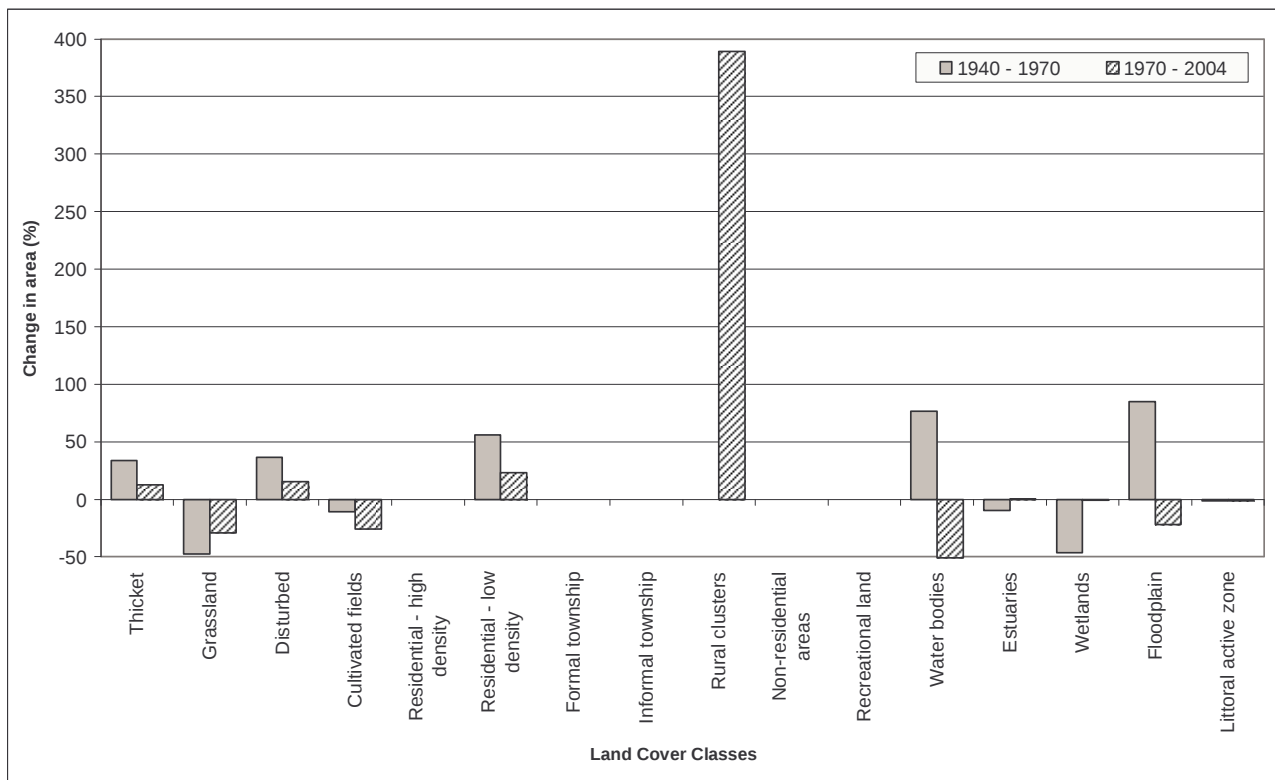


Figure 4-20: Percentage change per land cover class for the Ngqushwa Local Municipality

A significant increase in thicket coverage (50%) has been noted, while at the same time grassland areas have decreased (63%). This change is depicted in Figure 4-21, it shows that thicket coverage has increased around the estuaries. An increase in thicket coverage of 16% between 1940 and 1973 and 6% between 1973 and 2004 is noted.

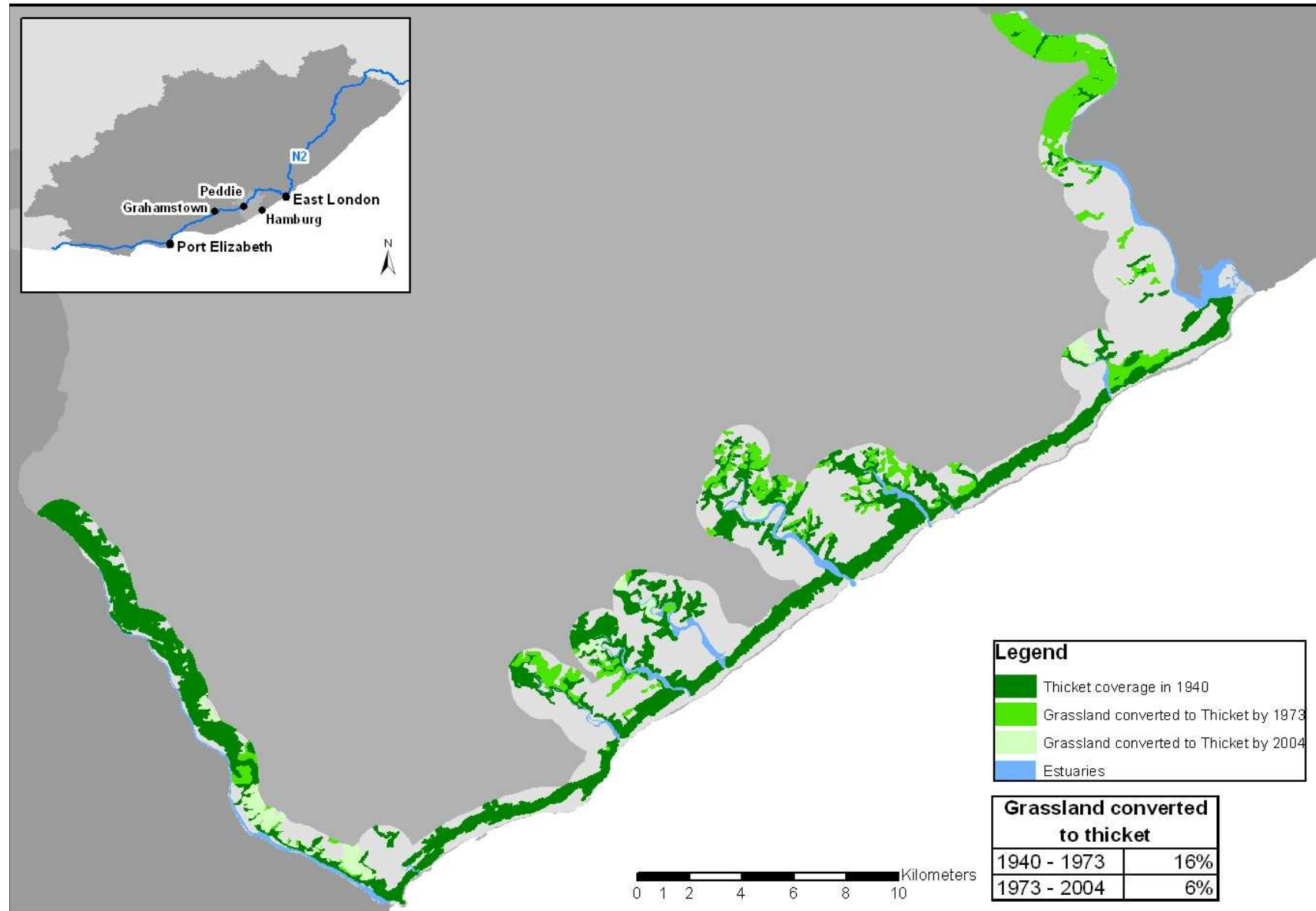


Figure 4-21: Grassland areas transformed to thicket between 1940 and 2004

Based on land cover groupings, as outlined in Section 3.7 (Figure 3-4), and the potential for change as discussed in Section 3.6 (Table 3-5), the matrix of change in the Ngqushwa Local Municipality indicated that the greatest changes in land cover occur in terms of natural land being converted to transformed land cover classes (indicated in dark blue in the matrix) (Table 4-4). Values in brackets indicate percentage of primary land cover class (A) converted during indicated time period to primary land cover class (B), which result in the overall net change per land cover class as indicated in Figure 4-22. This matrix shows that natural land is being converted to transformed land cover classes (indicated in dark blue in the matrix), altered land is being transformed to natural land (indicated in green in the matrix) and altered land is being transformed to other transformed land cover classes (indicated in light blue in the matrix).

Table 4-4: Ngqushwa Local Municipality matrix of land cover change

			Transformed		
	(B) → (A) ↓	Natural Land	Formal Development	Informal Development	Altered Land
Transformed	Natural Land		1940-1973 (1%) 1973-2004 (0.9%)	1940-1973 (0.1%) 1973-2004 (0.8%)	1940-1973 (16%) 1973-2004 (9%)
	Formal Development				
	Informal Development				
	Altered Land	1940-1973 (25.2%) 1973-2004 (21.2%)	1940-1973 (5%) 1973-2004 (0.3%)	1940-1973 (0.3%) 1973-2004 (0.2%)	

	No change in cover type	Highly possible	True
	Change from natural land cover to a transformed cover type	Highly possible	True
	Change from a transformed cover to natural land cover	Not possible	False
	Change from a transformed cover to natural land cover	Possible	True
	Change from one transformed to another transformed cover type	Highly possible	True
	Change from one transformed to another transformed cover type	Possible	True
	Change from one transformed to another transformed cover type	Not possible	False

The transformed land cover classes (Formal Development, Informal Development and Altered Land) are considered to determine where these transformations have taken place within the Ndlambe Local Municipality. Figure 4-22 shows the percentage change of each primary land cover class. Informal development increased significantly between 1973 and 2004 (389%), but between

1940 and 1973 there was no change in this land cover class. Formal development increased by 56% between 1940 and 1973 and by another 27% between 1973 and 2004, resulting in an overall increase of 98% between 1940 and 2004. Altered lands show very little change. Between 1940 and 1973 they increase by 13%, with a further increase of only 1% between 1973 and 2004, resulting in an overall increase between 1940 and 2004 of 14%. As shown in Figure 4-19 and Figure 4-20, cultivated fields and disturbed lands may offset each other, resulting in a low overall change in this primary land cover class. Change in natural land has been relatively low, showing a decrease over time. Between 1940 and 1973 there was a decrease of 7% and a further 2% between 1973 and 2004, resulting in an overall decrease in natural land of 9% between 1940 and 2004.

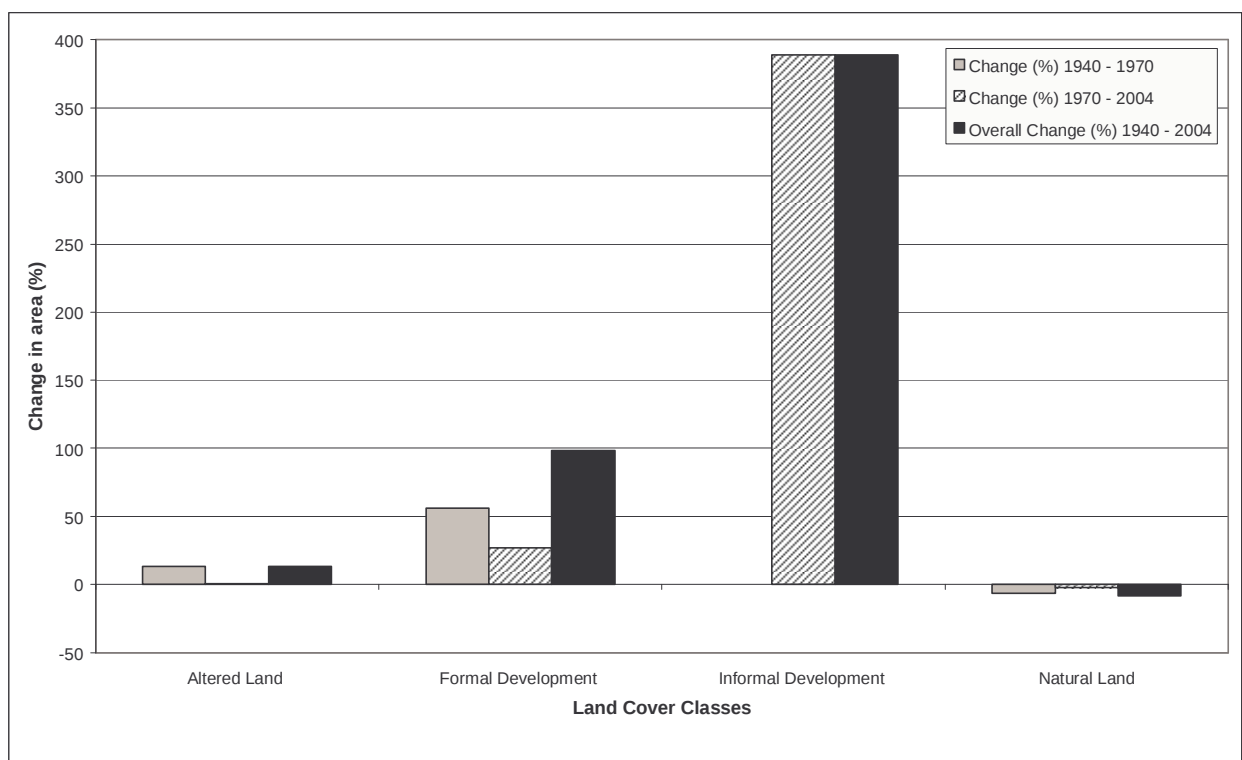


Figure 4-22: Percentage change in primary land cover classes in the Ngqushwa Local Municipality

4.3.1 FORMAL DEVELOPMENT

Figure 4-23 depicts formal development within the Ngqushwa Local Municipality at the three time intervals (1940, 1973 and 2004). Formal development constitutes a small percentage of the land cover of the Ndlambe Local Municipality (1.5% in 1940, 2% in 1973 and 3% in 2004), and change occurs at a relatively low rate. This figure shows formal development associated with the estuaries of Fish River, Mpekweni and Bira, with the only notable development being Hamburg.

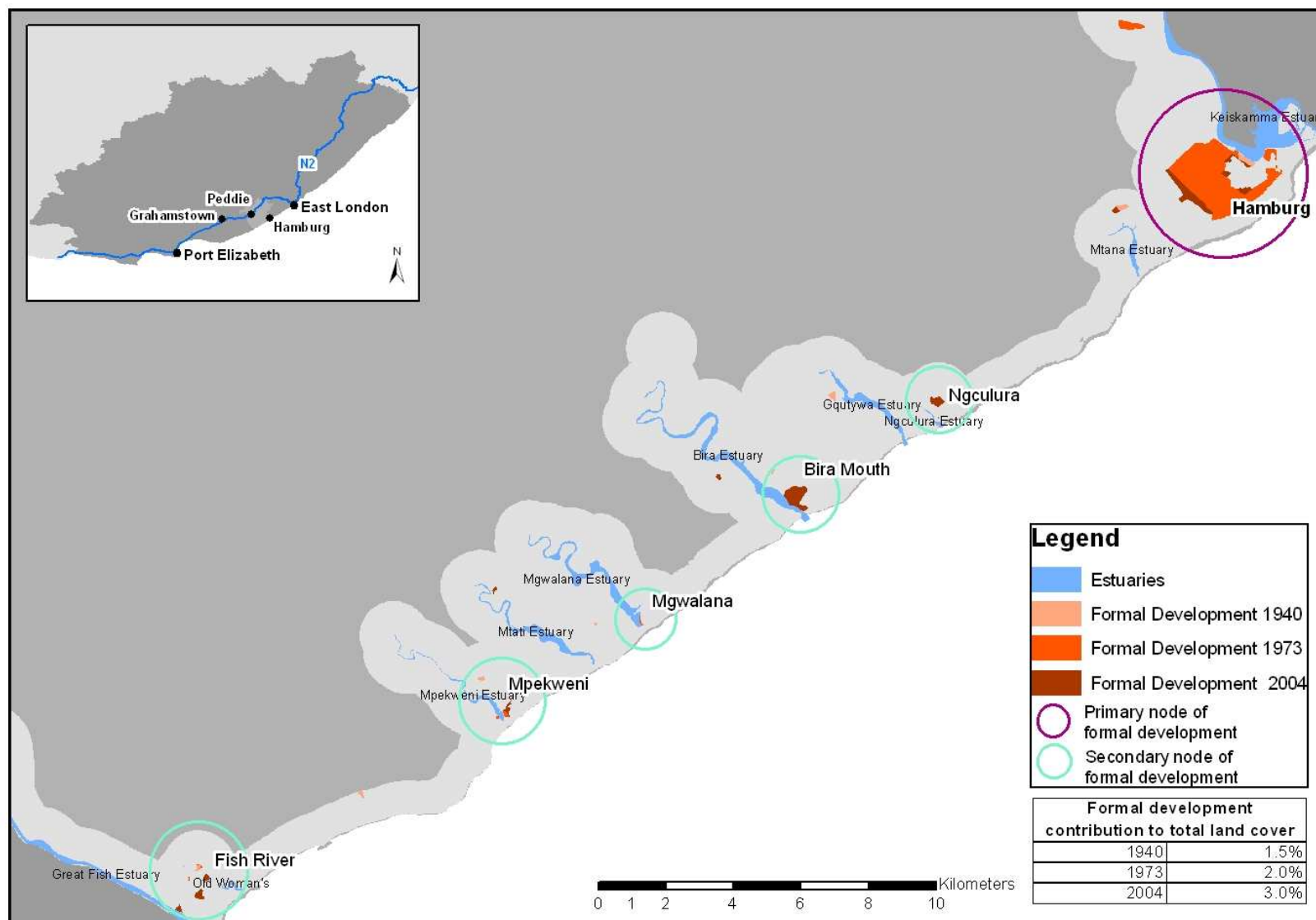


Figure 4-23: Formal development in the Ngqushwa Local Municipality

Figure 4-24 shows the Hamburg area. The Hamburg area was largely developed by 1973 (86% of its 2004 extent) and was dominated by cultivated land and grassland prior to development.

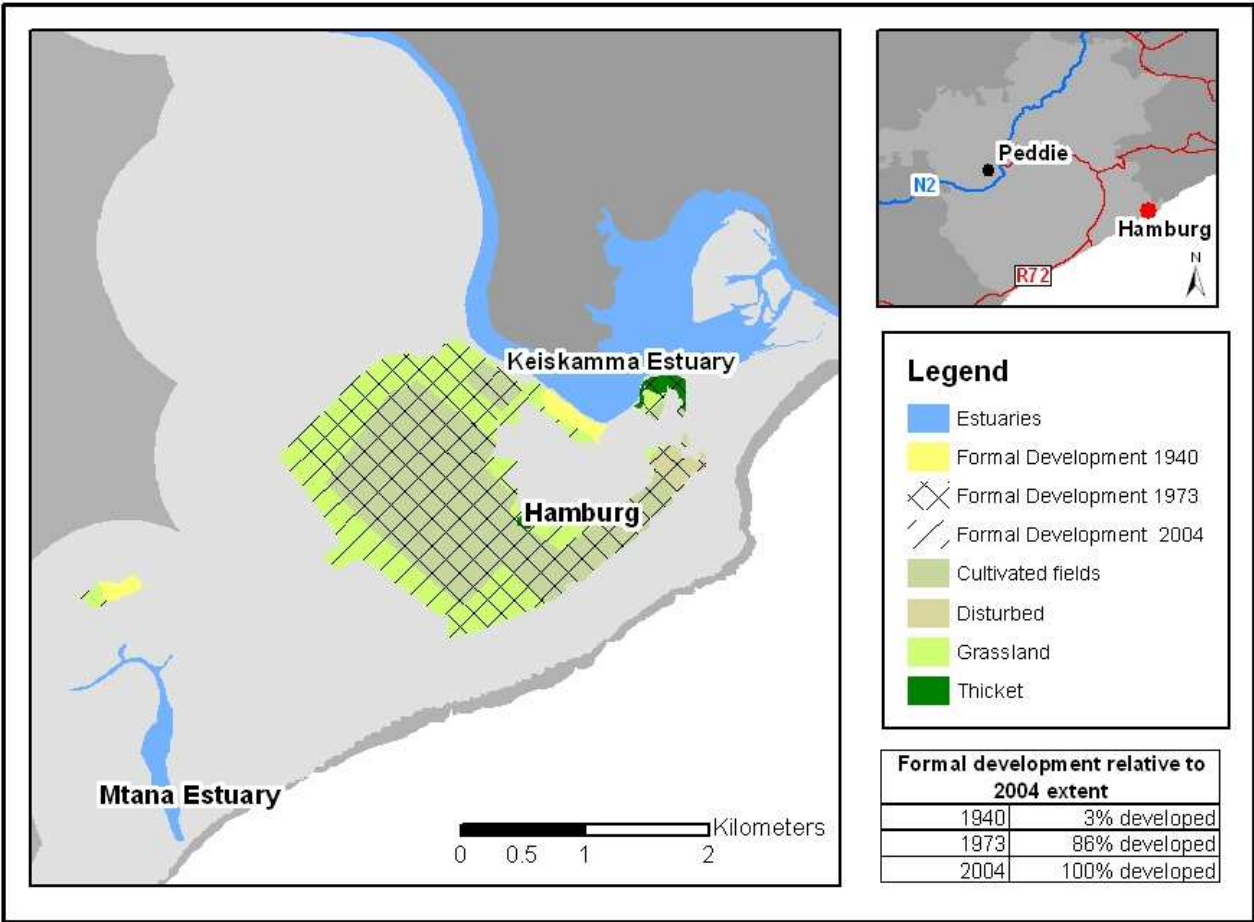


Figure 4-24: Historical land cover and change in development for the Hamburg area

4.3.2 INFORMAL DEVELOPMENT

Informal development in the Ngqushwa Local Municipality is limited to the middle reaches of the Keiskamma Estuary (Figure 4-25); this area developed primarily between 1973 and 2004. Prior to the development of these informal areas, the land cover was primarily grassland and cultivated land.

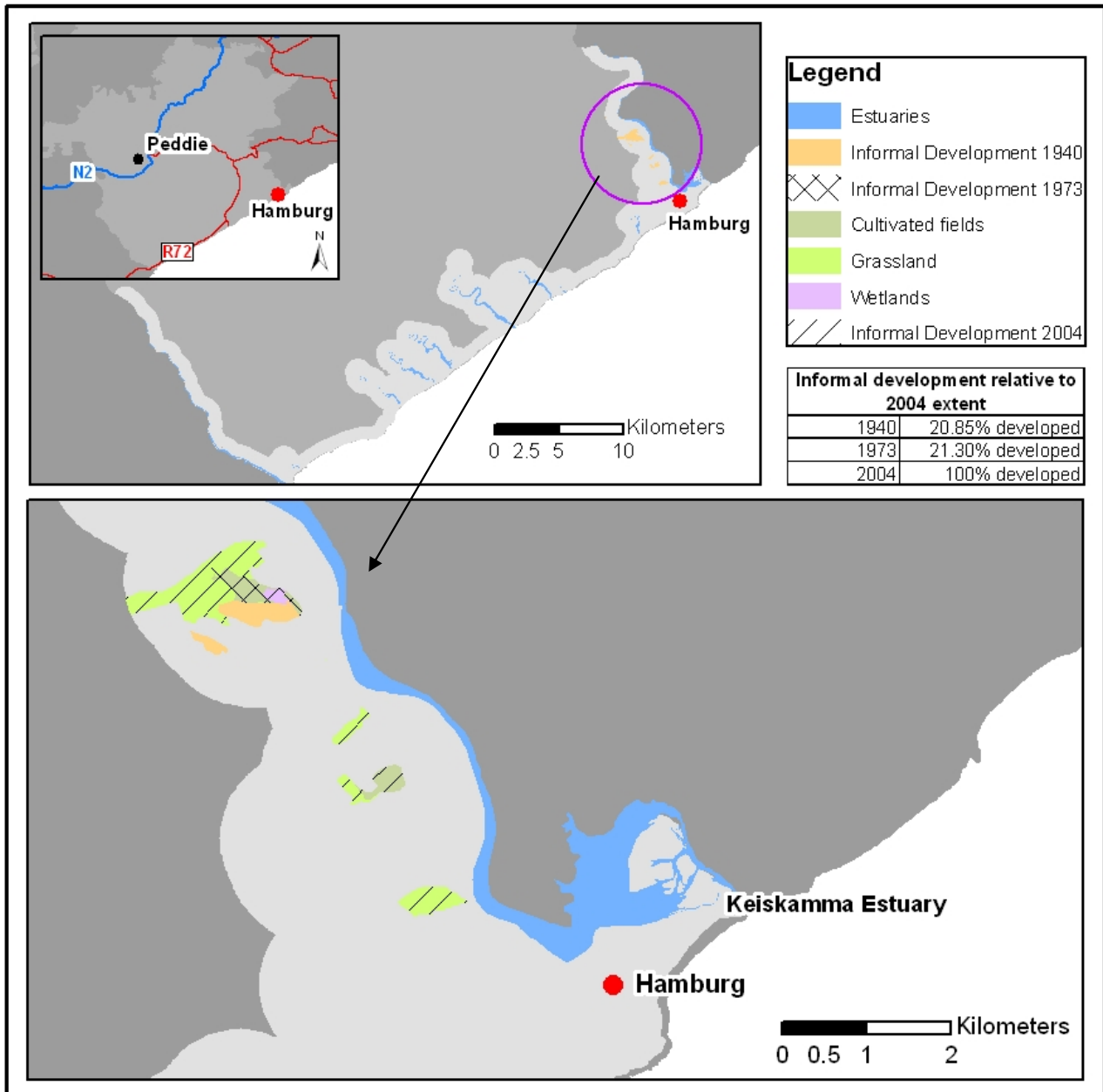


Figure 4-25: Informal development in the Ngqushwa Local Municipality

4.3.3 ALTERED LAND

Altered lands can have a decrease in area (negative change) as land cover is being converted to other land cover types, such as formal development. Figure 4-26 shows the extent of altered land for 1940, 1973 and 2004. This figure also shows areas that were altered in 1940 and 1973 but have since been transformed to a different land cover class. It is important to note that within this local municipality there has been a notable ‘shift’ between cultivated lands and disturbed lands, which both fall within this category, resulting in a low overall change for this land cover category of 23% between 1940 and 2004.

Figure 4-26 shows that the highest level of change in altered land is in close proximity to the estuaries of Mpekwani, Mtati and Mgwana and the Bira and Gqutywa estuaries. Figure 4-27 and Figure 4-28 depict these areas in more detail and illustrate the extent of altered lands in 2004, and what land cover was there prior to transformation. Secondly, these figures show areas that were previously altered (in 1940 and 1973) and what they have changed to in 2004.

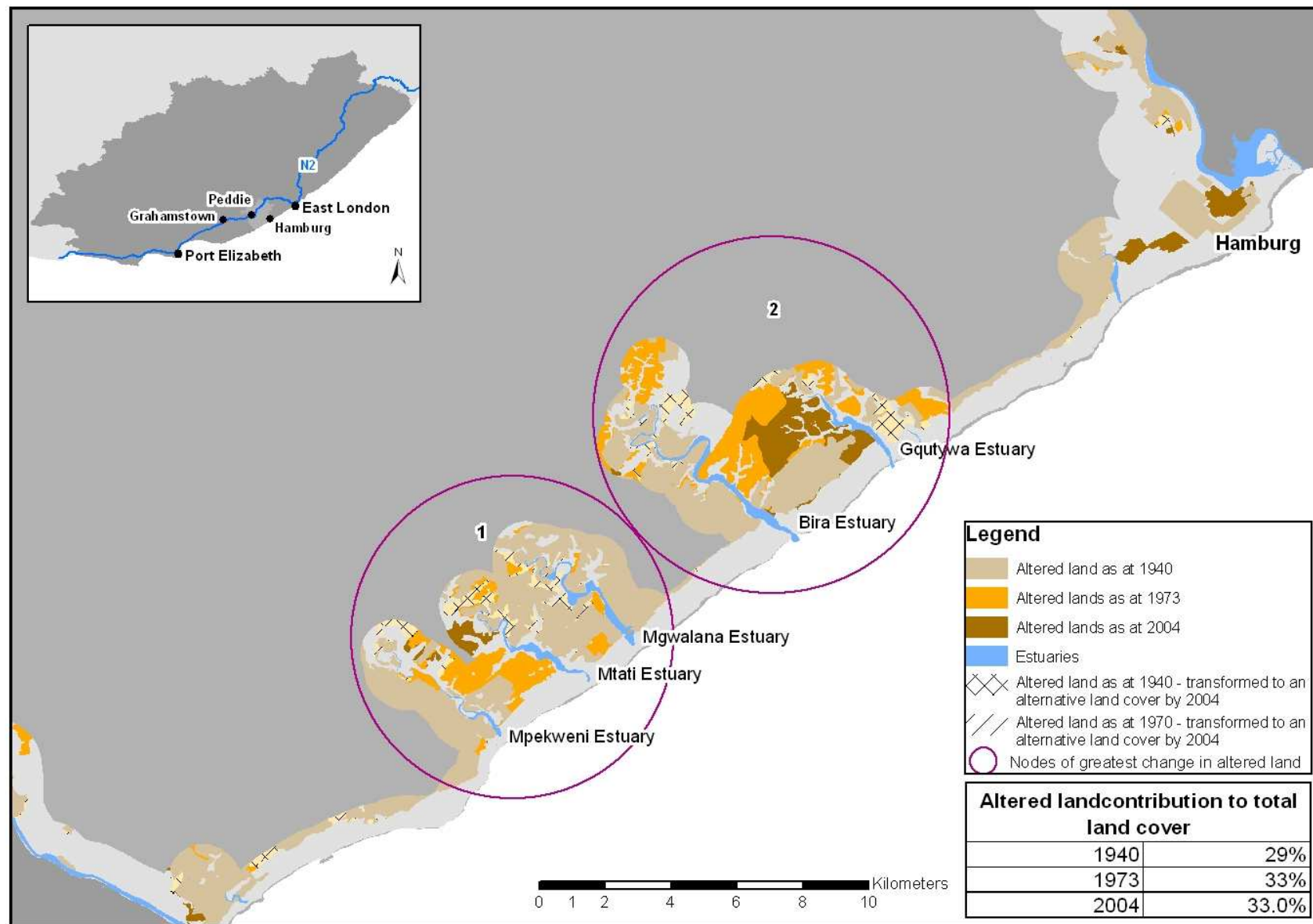


Figure 4-26: Altered lands in the Ngqushwa Local Municipality

Figure 4-27 depicts the altered lands in the vicinity of the Mpekweni/Mtati/Mgwalana area. Between 1940 and 1973 altered land increased by 25% and by a further 10% between 1973 and 2004. Within this area there was limited transformation of altered land to other land cover classes.

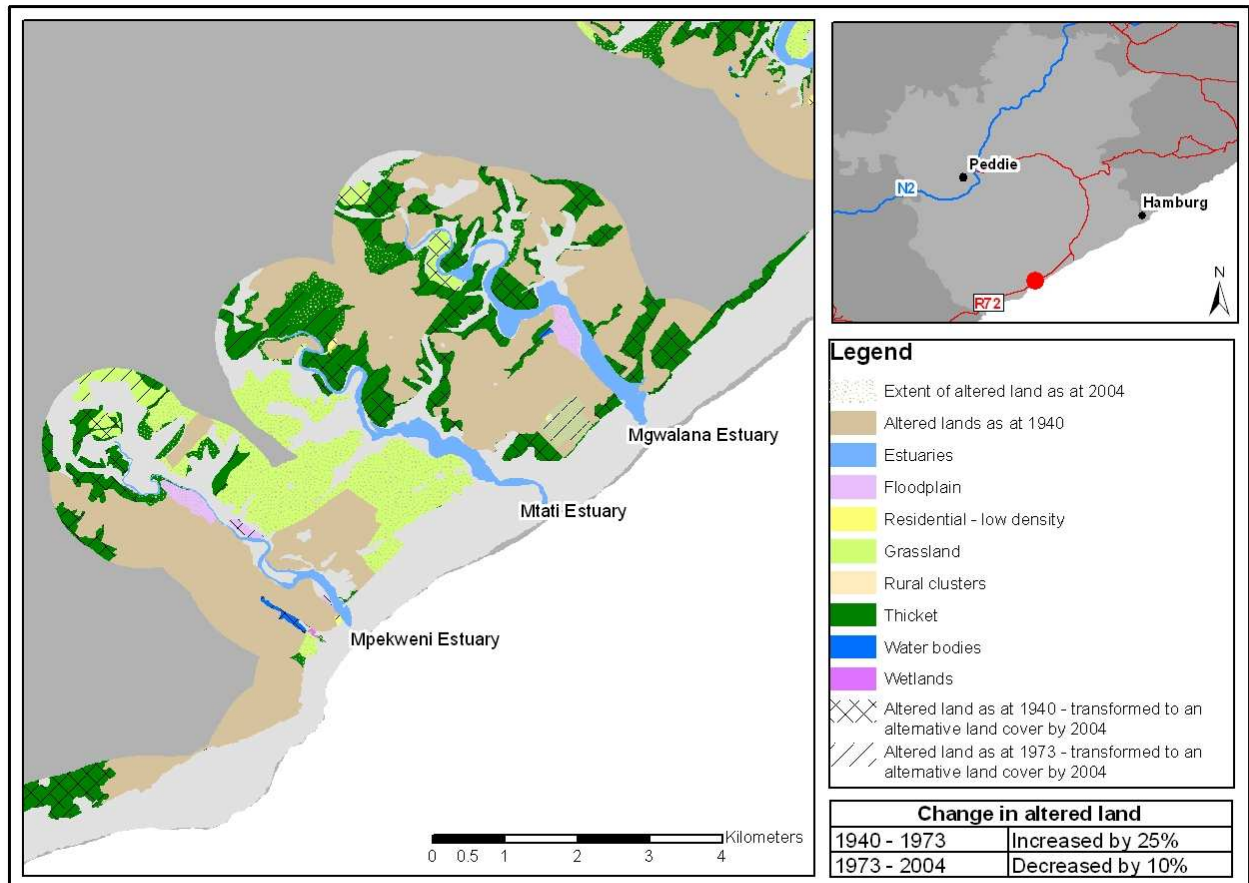


Figure 4-27: Historical land cover and change in altered land for the Mpekweni/Mtati/Mgwalana estuaries area

Figure 4-28 focuses on the Bira/Gqutywa estuaries area. Within this area altered land increased by 64% between 1940 and 1973 and by a further 34% between 1973 and 2004. There has been some ‘recovery’ of altered lands in this area to thicket and grassland.

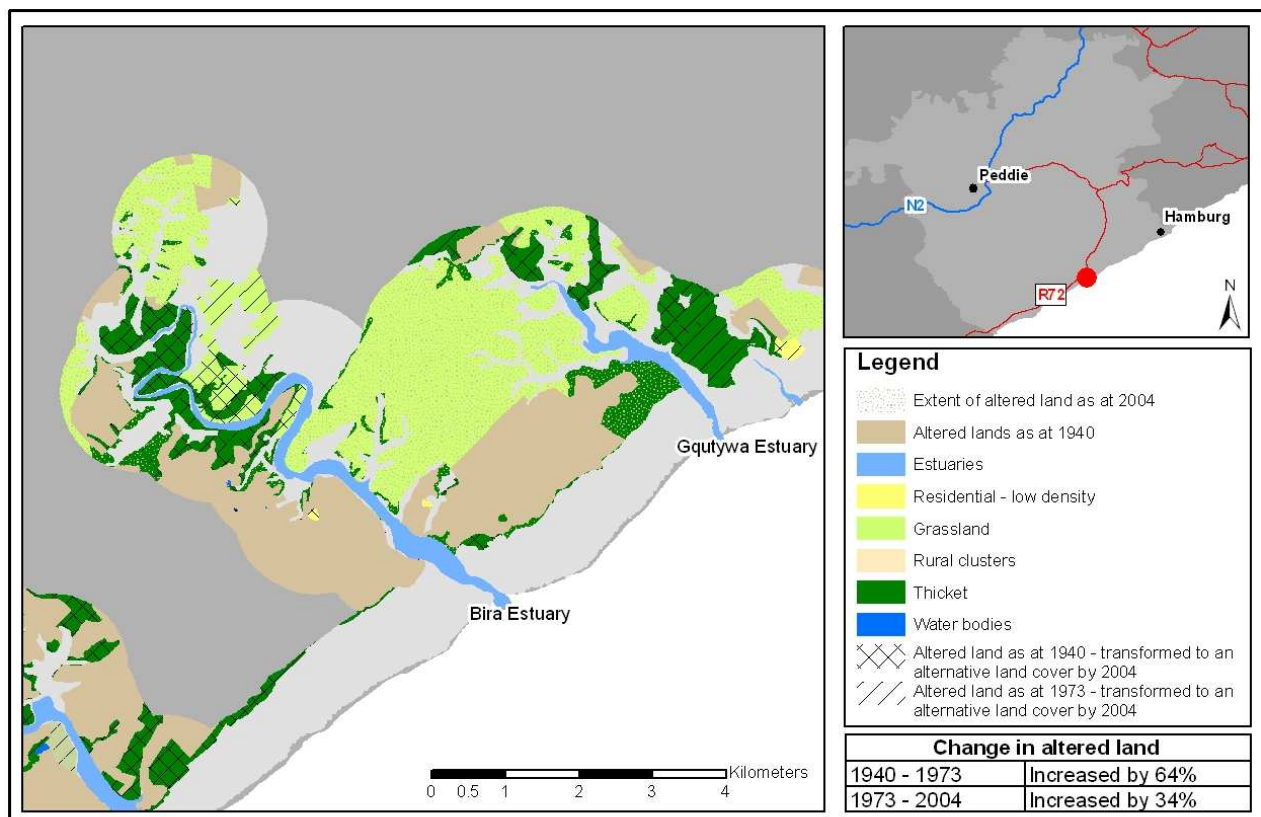


Figure 4-28: Historical land cover and change in altered land for the Bira/Gqutywa estuaries area

4.4 INTERVIEW RESULTS

As outlined in Section 3.6, 16 specialists, consultants and municipal officials were interviewed for this research (Appendix D details the topics discussed and the minutes of the interviews). The following main points were raised.

One hundred percent of respondents agreed that the main driver of coastal development relates to the attractiveness of the coastal environment, which has led to an increased demand for homes, holiday homes and recreational facilities in the coastal zone (Avis *pers comm.*, 2008; Carter *pers comm.*, 2008; Colman *pers comm.*, 2008; Dredge *pers comm.*, 2008; Fouché *pers comm.*, 2008; Griffiths *pers comm.*, 2008; Govender *pers comm.*, 2008; Haschick *pers comm.*, 2008; May *pers comm.*, 2008; Mapukata *pers comm.*, 2008; Naidoo *pers comm.*, 2008; Ntlokonkulu *pers comm.*,

2008; Rowleston *pers comm.*, 2008; Sülther *pers comm.*, 2008; Sholto-douglas *pers comm.*, 2008; Stewart *pers comm.*, 2008). Development has shifted to the Eastern Cape largely as a result of ‘over-development’ in KwaZulu-Natal and the Western Cape, as there is now very little land available for development in those regions. Development has shifted away from the Western Cape; it is very difficult to get developments approved in this region (Griffiths *pers comm.*, 2008).

According to 13% of respondents, the Eastern Cape coast is becoming increasingly attractive due to the fact that land is available and prices are affordable compared to other areas in the country. Property prices are seen to have ‘lagged’ behind other regions, making the area appealing to people investing in land and development (Griffiths *pers comm.*, 2008; Haschick *pers comm.*, 2008). Furthermore this section of coastline offers favourable weather conditions, affordability as a tourist destination and proximity to a metropolitan area (Griffiths *pers comm.*, 2008; Sülther *pers comm.*, 2008). Development along the coast is largely associated with estuaries as these areas generally provide the best opportunity for development in terms of accessibility and availability of flat land (Naidoo *pers comm.*, 2008). Another key reason for development and land use change in this region, according to 6% of respondents, is the lack of economic certainty in terms of agriculture that has led to farmers opting for development or selling land for development (Sholto-douglas *pers comm.*, 2008).

Thirteen percent of respondents raised concerns as to the evident development boom along the Eastern Cape coastline, the main concern being that if development is not controlled effectively there is a high risk that ribbon development will occur along the coast (Dredge *pers comm.*, 2008; Naidoo *pers comm.*, 2008). Other concerns relate to the permanent transformation of the natural environment and negative impacts of development on the natural environment, such as additional outfall (Dredge *pers comm.*, 2008). Legislation needs to be appropriate to prevent ribbon development occurring along the Eastern Cape coastline (Sholto-douglas *pers comm.*, 2008). Respondents noted that there has been a definite shift in terms of development; ten years ago local municipalities had investment policies to attract development to the Eastern Cape, now developers are paying more to get land for development in the area (Dredge *pers comm.*, 2008).

Concern as to the sustainability of this coastal development based on its seasonality was expressed by 13% of respondents, as the area is predominantly holiday type development. Normally residential development of this magnitude would be associated with industry of some sort (Carter *pers comm.*, 2008; Dredge *pers comm.*, 2008). For example, in Port Alfred the new mall is only considered to be sustainable in peak seasons (Dredge *pers comm.*, 2008). However, an increasing

resident population has been observed in this area, schools in the area are under pressure to accommodate additional students, meaning that there is an increasing younger resident population (Fouché *pers comm.*, 2008). Coastal development is considered by 6% of respondents as unsustainable as the financial streams are erratic. In most of these coastal areas houses are closed for the greater part of the year and therefore are not generating income for the local economy, but infrastructure and services still have to be maintained (Dredge *pers comm.*, 2008).

A key problem in this region, raised by 25% of respondents, is the availability of potable water (Colman *pers comm.*, 2008; Fouché *pers comm.*, 2008; Dredge *pers comm.*, 2008; Govender *pers comm.*, 2008), and alternative water sources need to be found. The Port Alfred area is already a registered drought area (Dredge *pers comm.*, 2008). There is a proposed regional water supply scheme that will draw water from the Gariep Dam to supply the area, but 19% of respondents expressed concern about this scheme as it is believed that the Gariep Dam is already over-subscribed and this costly alternative may not be sustainable (Dredge *pers comm.*, 2008; Fouché *pers comm.*, 2008; Haschick *pers comm.*, 2008). Although water is needed for the area, there is concern by 6% of respondents that additional water supply will create a mechanism for additional development. This will generate additional problems for the local municipality as they will be required to provide services to these areas (Dredge *pers comm.*, 2008).

Six percent of respondents believed that in principle, local municipalities should be able to cope with the additional development, as the rates base expands with development and human capacity can be increased (Dredge *pers comm.*, 2008). The problem is that there are insufficient funds allocated to upgrading existing infrastructure and bulk service provision. Local municipalities are now required to look after much larger areas than in the past and in many cases they have taken over infrastructure that is old and in need of upgrading; local municipalities do not have the financial means to do this (Dredge *pers comm.*, 2008). Before additional development is allowed, bulk infrastructure needs to be improved. One of the problems is that developers say they will contribute financially to the upgrade of infrastructure but municipalities are strained financially and money is often allocated elsewhere and services are not upgraded (Govender *pers comm.*, 2008).

If development continues to take place without regard for service provision, 13% of respondents believe this will have an adverse affect on tourism in the area, as is the case in Durban with the recent loss of Blue Flag beaches due to pollution. This in turn has caused tourism to shift north and south of Durban, with Durban's hotel occupancy being significantly lower than in previous years

(Govender *pers comm.*, 2008; Griffiths *pers comm.*, 2008), which shows the impact this has had on tourism.

Seventy-five percent of respondents were of the opinion that local municipalities lack the capacity to deal with additional developmental pressure in terms of the provision of services (Avis *pers comm.*, 2008; Carter *pers comm.* 2008; Dredge *pers comm.* 2008; Fouché *pers comm.* 2008; Griffiths *pers comm.* 2008; Govender *pers comm.*, 2008; Haschick *pers comm.*, 2008; Mapukata *pers comm.*, 2008; Naidoo *pers comm.*, 2008; Rowlston *pers comm.*, 2008; Sülther *pers comm.*, 2008; Stewart *pers comm.*, 2008). In many local municipalities environmental capacity is lacking, for example the Ngqushwa Local Municipality does not have an environmental officer due to lack of resources and financial constraints (May *pers comm.*, 2008; Ntlokonkulu *pers comm.*, 2008).

Nineteen percent of respondents feel that the Department of Economic Development and Environmental Affairs (DEDEA)¹⁶ has low levels of efficiency in terms of reviewing EIA applications; as a result the EIA process is seen to be a limiting factor to development as it can be extremely lengthy and frustrating to developers, and also deters investors (Griffiths *pers comm.*, 2008; Fouché *pers comm.*, 2008, Govender *pers comm.*, 2008). This is because the DEDEA has a lack of experienced staff (at present most of the staff have less than one year's experience) and inexperienced staff cannot review scoping and EIA applications, which results in delays in terms of reviewing applications and issuing a decision (Govender *pers comm.*, 2008). DEDEA gives preference to infrastructure and housing project applications over leisure type developments such as golfing estates (Govender *pers comm.*, 2008).

Of concern is the fact that EIA applications take so long to get approval that developers get tired of waiting and go ahead with the development without approval. The problem is that the consequences of not following the process are not strict enough and it is felt that DEDEA has enforcement problems; there is no one following up on compliance with authorisation conditions (Fouché *pers comm.*, 2008). Furthermore, it is felt that DEDEA lacks significant capacity in terms of coastal management (Griffiths *pers comm.*, 2008); however, they are in the process of setting up a coastal management team, which will include compliance and enforcement officers (4 officers) (Govender *pers comm.*, 2008).

An SDF is considered by 19% of respondents to be a good planning document, but the problem is that council / the local municipality has the authority to make changes to it (Fouché *pers comm.*,

¹⁶ DEDEA is the Eastern Cape provincial environmental authority

2008; Dredge *pers comm.*, 2008; Griffiths *pers comm.*, 2008). This has been shown to happen in a number of cases, particularly in the Ndlambe Local Municipality, whereby the urban edge has been moved on several occasions to accommodate new developments (Dredge *pers comm.*, 2008; Griffiths *pers comm.*, 2008). The moving of the urban edge is highlighted by 48% of respondents as a concern as it could, over time, result in ribbon development along the coast (as is the case in KwaZulu-Natal) (Carter *pers comm.*, 2008; Dredge *pers comm.*, 2008; Fouché *pers comm.*, 2008; Griffiths *pers comm.*, 2008; Haschick *pers comm.*, 2008; Stewart *pers comm.*, 2008).

In the Ngqushwa Local Municipality the issue of land ownership and the land reform process was identified by 25% of respondents as the main limiting factor to development (Avis *pers comm.*, 2008; Colman *pers comm.*, 2008; Haschick *pers comm.*, 2008; Sholto-douglas *pers comm.*, 2008). Land is currently held in trust and it is difficult to get land for development, which means that investors find alternative sites for development (Haschick *pers comm.*, 2008). In addition, according to 13% of respondents, there are a number of land claims along the coast and people do not want to invest in infrastructure and services on this land as there is uncertainty as to the status of the land (May *pers comm.*, 2008; Ntlokonkulu *pers comm.* 2008).

Another limiting factor in the Ngqushwa Local Municipality, according to 13% of respondents, is that it has limited infrastructure and people prefer to go to areas that have good infrastructure and service provision (Haschick *pers comm.*, 2008; Ntlokonkulu *pers comm.* 2008). If Ngqushwa Local Municipality can improve infrastructure and services, the area will be more appealing to tourists. The number of applications for sub-division in the Hamburg area shows that there is a growing demand for residential accommodation in the area (Ntlokonkulu *pers comm.* 2008). There is a proposed *Arts Colony Project* in the Hamburg area. The project will create improved access to the Hamburg area, which will increase the accessibility of the area and more tourists will visit (Ntlokonkulu *pers comm.* 2008). Respondents agreed that at present the Ngqushwa coast is largely unspoilt, but the question is, should it be maintained like this or should development be encouraged? Local communities in the area need development, but there needs to be a balance between development and conservation along the Ngqushwa coastline (May *pers comm.*, 2008). The White Paper for local government says that local municipalities must change and promote development into the area (Ntlokonkulu *pers comm.* 2008). Coupled with this, local municipalities are trying to grow their rates base, which results in them simply supporting all developments proposed in their jurisdiction (Govender *pers comm.*, 2008). Respondents agreed that once the land issues are resolved, it is likely that development will take place in this area; there just needs to be an

initial development that creates an urban environment, which will attract other development to the area (Dredge *pers comm.*, 2008).

4.4.1 THE COASTAL MANAGEMENT BILL

Nineteen percent of respondents agreed that the proposed Coastal Management Bill is sound legislation that provides for pro-active management of the coastal zone. It is seen to be sound in terms of its requirements for equitable access to the coast and the provision of coastal public property and coastal access land (Avis *pers comm.*, 2008; Haschick *pers comm.*, 2008; Rowlston *pers comm.*, 2008). This will prohibit the creation of private coastal access as is currently seen along some of the Eastern Cape coastline, such as Mpekweni and Fish River Sun (Colman *pers comm.*, 2008; May *pers comm.*, 2008).

The Coastal Management Bill allows for the delineation and development of urban nodes in the coastal zone, the aim of which is to prevent ribbon development along the coast, as is the case along the KwaZulu-Natal south coast (Griffiths *pers comm.*, 2008). In terms of planning for development, nodal development is seen to be far better as it facilitates easier service provision (Naidoo *pers comm.*, 2008). It is anticipated by most of the respondents that the Coastal Management Bill will aid in governing coastal areas as it provides a clear buffer zone (100 metres in urban areas and 1000 metres in rural areas) as to where development should not be allowed. According to 13% of respondents, this will also aid DEDEA in reviewing EIA applications as the zone is clearly defined (Griffiths *pers comm.*, 2008; Govender *pers comm.*, 2008).

There is concern that the Coastal Management Bill doesn't give guidelines as to what is appropriate coastal development and too much is left up to interpretation by the implementing authority (Carter *pers comm.*, 2008). Coupled with this, a key problem, identified by 13% of respondents, is that of enforcement of the legislation. Since the DEDEA doesn't have the capacity to follow up on compliance issues (Fouché *pers comm.*, 2008; Rowlston *pers comm.*, 2008).

Concern was expressed by 38% of the respondents as to the capacity of local municipalities to implement the Bill's requirements, since many local municipalities are seen to lack the human and financial capacity (Avis *pers comm.*, 2008; Carter *pers comm.*, 2008; Dredge *pers comm.*, 2008; Haschick *pers comm.*, 2008; Rowlston *pers comm.*, 2008; Stewart *pers comm.*, 2008). Local municipalities would require additional human and financial capital to enforce the requirements of the Bill (Ntlokonkulu *pers comm.*, 2008), which is problematic as it is an unfunded mandate and

local municipalities therefore do not have the means to implement its requirements (Fouché *pers comm.*, 2008). In order for the Bill to be implemented effectively, local municipalities will need assistance in determining exactly what is required of them (Dredge *pers comm.*, 2008). Another concern is that the Bill requires a high level of cooperative governance for implementation between different departments and spheres of government and there is concern that this cannot be achieved (Rowlston *pers comm.*, 2008).

4.5 SUMMARY

This chapter presents the findings of the research. It depicts the results attained per local municipality at each of the three time intervals to show where land cover change is occurring and the relative rate at which this is happening. This chapter provides detailed results of further analysis achieved on the primary land cover classes (as defined in Section 3.6). It shows detailed examples of places that show significant changes in the specified land cover. Reasons for these changes are discussed and explained in Chapter 5. In addition, this chapter details the results of interviews with specialists and municipal officials. This is done so that changes in land cover can be related spatially to development and land use change within the local municipalities based on the DPSIR framework as discussed in Chapter 5.

The Ndlambe and Ngqushwa local municipalities are environmentally similar, as discussed in Sections 1.3 and 3.2. However, the results of this research depict distinct differences over time in terms of development and land use change. This chapter discusses development and land use change in the two local municipalities and considers similarities and differences between the two. It explains some of these differences based on an understanding of the key ‘driving’ factors of land use change (economic, socio-economic and legislative), which are likely to influence the development patterns evident along this section of coast. It then considers management in the coastal zone, in terms of national, provincial and local legislation and planning guidelines. Finally, the chapter considers the way forward in terms of planning for development and conservation for this section of the Eastern Cape coastline.

5.1 OVERVIEW OF DEVELOPMENT AND LAND USE CHANGE

5.1.1 NDLAMBE LOCAL MUNICIPALITY

In the coastal zone of the Ndlambe Local Municipality, there have been notable changes in land cover and land use over the 64-year period. However, the landscape is still primarily dominated by natural vegetation (as was the case in 1940 and 1973). Only by interrogating the changes in specific land cover classes can the extent and rate of change be recorded. The main transformation in terms of formal development is in the residential (high and low density) and formal township areas, with the highest increase being in terms of high density residential areas. Furthermore, there are a number of other developments currently underway that will expand the urban centres in the near future. Proposed developments include the Kenton Eco-Estate, Bushman’s Creek, Bushman’s Sands, Sunshine Lakes, Port Alfred Country Club Estate and Settlers Sands (Pam Golding Properties, 2008; MacGregor, 2008; Smuts, 2008). No single ‘trigger’ has resulted in development in the Ndlambe Local Municipality and the rapid rate of development may be attributed to a number of factors. On a national scale, formal development in the coastal zone of this local municipality, as with many of South Africa’s coastal areas, has come about as a result of improved economic activity through investor confidence and the stabilisation of inflation (Preston-Whyte and Oelofse, 2007). As a consequence, people are more willing to invest in this area. In addition, there has been a change in social attitudes, resulting in a ‘need’ to reside and spend vacations in coastal areas due to its climatic, aesthetic and recreational appeal (Glavovic, 2000b). This is made possible as people are better economically placed in terms of personal wealth and consumer spending power, with greater

mobility, and have more free time for leisure and outdoor activities associated with the coast (DEAT, 2006; Visser, 2003). In general the Eastern Cape has become increasingly favoured as a coastal destination, largely as a result of ‘over-development’ along the KwaZulu-Natal and the Western Cape coastlines (Griffiths *pers comm.*, 2008).

Historically development in coastal areas was restricted to accessible areas, such as natural bays and estuaries, a pattern which is clearly evident in the Ndlambe Local Municipality. Where development has concentrated around the estuaries of Boknes, Bushmans, Kariega, Kowie and East and West Kleinemonde, resulting in four distinct ‘nodes’ of development. In these areas, formal development has increased by 227% over the 64-year period. Associated with formal development in this local municipality is informal development, which is evident in 1973 and 2004. Informal development in this local municipality consists of informal township areas, which are associated with the formal township areas of Port Alfred and Bushmans River Mouth/Kenton-on-Sea. This informal development has resulted primarily because of the rapid rate of formal development, which brings with it employment opportunities both during and after development, resulting in economically active people in rural areas migrating to urban centres of sub-regional centres and towns (PGDP, 2003). Formally developed areas cannot accommodate the influx of people, which has resulted in the rapid growth in informal and peri-urban settlements over the last decade (PGDP, 2003) as is evident in the Ndlambe Local Municipality.

Changes in the agricultural sector have come about as a result of economic uncertainty in terms of agriculture production (Sholto-douglas *pers comm.*, 2008), resulting in decreasing labour needs on farms and the migration of farm labourers into neighbouring towns to seek alternative employment. In many farming areas, farm labourers are no longer resident on farms and live in nearby townships while a number of livestock farms have been converted to less labour intensive game farms (Smith and Wilson, 2002). The shift from livestock farming to game farming has resulted in an intra-class transformation between disturbed and cultivated lands (altered lands). As cultivation or intense grazing declines, due to conversion to game farming, cultivated land changes to disturbed land over time and eventually could return to a near-natural state, as properly managed indigenous game are considered to contribute, in the long term, to land restoration. It is anticipated that these game farm developments have, and will continue to increase tourism, attracting both national and international tourists, and promoting economic activity in the surrounding urban areas. This in turn could lead to increased formal development in these areas.

Cannon Rocks / Boknesstrand

The Cannon Rocks / Boknesstrand area developed between 1973 and 2004, with an increase of 57% in development during this time. It is likely that development in this area came about primarily as a result of people wanting to reside and retire in a quiet coastal area. The observed trend is associated with a shift in economic development and the escalation of coastal development in the last three decades (Glavovic, 2000a). As the attraction of coastal areas increases, more attention is being paid to this area and there are a number of future developments proposed for the area. The Ndlambe SDF states that development required in this area includes low cost housing, cemetery space and land for bulk water storage facilities (the desired spatial form to accommodate these requirements is shown in Appendix E, Figure E-1). The SDF defines the urban edge so as to ensure densification of the node by means of developing vacant land along the northern boundary of the town (SetPlan, 2006). It is recommended that there be no development to the north of the Boknes Estuary as there is sufficient land inland of this node to accommodate any future developments (Stewart *pers comm.*, 2008).

Bushmans River Mouth / Kenton-on-Sea

The Bushmans River Mouth / Kenton-on-Sea area developed significantly between 1973 and 2004, with formal development increasing by 70% and informal development emerging. This development could be attributed to the fact that during the 1970s there was a national shift in economic development, driven by a rise in secondary and tertiary activities, which led to escalating coastal development. This in turn meant that people had more freedom to choose where they resided, as tertiary activities are not dependent on primary activities or geographic location (Glavovic, 2000a). It is likely that informal development has emerged in this area primarily as a result of people moving to the area from surrounding areas in search of employment opportunities associated with the escalating formal development in the area. There have also been significant changes in the extent of altered lands (Figure 4-14). Between 1940 and 2004 much of the change in altered lands could be attributed to the establishment of formal development in the area, which would have been associated with a decrease in agriculture and stock farming.

In terms of the Ndlambe SDF, land is required for a number of future planning needs, such as low cost housing, commonage for grazing, cemetery space, land for new solid waste facility and protection of land, particularly adjacent to the Bushmans and Kasouga rivers due to the sensitivity of these systems (the desired spatial form to accommodate these requirements is shown in Appendix E, Figure E-2). A number of new developments are currently underway in this area, including the

Kenton Eco-Estate, Kariega Heights and Norfolk Ridge (Pam Golding Properties, 2008), and the informal settlement to the west of Bushmans River Mouth is currently being formalised (Stewart *pers comm.*, 2008). It is recommended that the area to the northeast of the Kenton Eco-Estate should be a no-development / limited development area (Stewart *pers comm.*, 2008) to prevent ribbon development occurring along the coast between Kenton and Port Alfred. Ribbon development along the coast is identified by the Eastern Cape State of Environment as an area of concern, as the western and central regions of the province are already characterised by ribbon development and high levels of utilisation (CSIR, 2004). Ribbon development is an aesthetic problem and creates problems in terms of service provision, whereas nodal development is seen to be far better as it facilitates easier service provision, since services are concentrated in one area rather than a number of smaller systems spread along the coast (Naidoo *pers comm.*, 2008).

Port Alfred

According to Carter (1999), one of the main reasons for residing in coastal areas was, and still is, for trade and political links. This is particularly evident in Port Alfred, which developed primarily for economic reasons in the 1820s as a port to allow access to the outside world for the lower Albany area. It developed and operated as a coastal trade centre until the 1930s when rail and road transportation became more economically viable (Malan and Swart, 1997).

Formally developed areas have expanded outward, between 1940 and 2004, from the original development node, which in turn has resulted in changes (increases and decreases) in the extent of altered land in this area. Formal development attracts people in search of employment opportunities, which formal infrastructure cannot accommodate, resulting in informal development on the outskirts of existing formal township areas. A significant change in the Port Alfred area was the establishment of the Royal Alfred Marina in 1989, which has resulted in an increased demand for 'pleasure craft marinas' associated with residential developments (Malan and Swart, 1997).

Development in the Port Alfred area is booming. A number of new estate developments are proposed for the area including the Port Alfred Country Club Estate, West Beach Manors, umDoni, Riverside Eco and Equestrian Estate and Emerald View and Settlers Sands (MacGregor, 2008). The Cacadu District Municipality SDF identifies Port Alfred as a regional centre in the Eastern Cape. Based on this classification, Port Alfred needs to be provided with adequate funding to develop economic opportunities and attract the attention of private sector investment (SetPlan, 2006). There is concern, expressed by 13% of interview respondents, that development in this area has occurred

rapidly and that it is not sustainable. Normally residential development of this magnitude would be associated with industry of some sort, which is not the case in Port Alfred (Carter *pers comm.*, 2008; Dredge *pers comm.*, 2008). Income generated for the developments will be highly seasonal, which is considered to be an unsustainable financial stream (Dredge *pers comm.*, 2008).

The Ndlambe SDF highlights that land is required for a number of future planning needs including low cost housing, middle and high income housing, commonage for grazing, cemetery space, land for water purification facilities and a new solid waste facility, expansion of the industrial zone, social and institutional facilities and protection of land adjacent to the Kowie River (SetPlan, 2006). The desired spatial form to accommodate these requirements is shown in Appendix E, Figure E-3. The urban edge for this area is defined with the aim of preventing urban sprawl by containing development to the east of the R72. Furthermore, to the west of Port Alfred there should be no development to the west of the river valley as this area is biologically and visually important (Stewart *pers comm.*, 2008). It is important that this urban edge be clearly defined, as growth in this area is increasing steadily. This research shows that development in Port Alfred increased by approximately 50% over the 64-year period and it is anticipated that the rate of development will increase.

Kleinemonde

The Kleinemonde area started in the 1800s as a small collection of holiday homes belonging to farmers in the Lower Albany region (Murray, 2005). The formally developed Kleinemonde area has only come into existence in the past 31 years and is now experiencing rapid growth, with a number of new developments planned for the area, such as the exclusive Kleinemonde River Development (Johnston Commercial Industrial Properties, 2005).

In terms of the Ndlambe SDF, land is required for low cost housing, water storage (due to increased water demand) and new sewage treatment facilities (See Appendix E, Figure E-4 for the desired spatial form). The urban edge includes vacant land to the northwest of the existing town so as to allow for growth of the area (SetPlan, 2006). However, it is recommended that infill development occurs prior to expansion of the node and the area to the west of Kleinemonde should be a no-development area (Stewart *pers comm.*, 2008).

5.1.2 NGQUSHWA LOCAL MUNICIPALITY

Within the coastal zone of the Ngqushwa Local Municipality there have been few changes in land cover and land use over the 64-year period and much of the landscape is still dominated by natural vegetation and disturbed areas (as was the case in 1940 and 1973). Only through a more detailed study of the changes in specific land cover classes can one observe where change has occurred. The most notable changes have occurred in the grassland and thicket vegetation, disturbed areas and cultivated fields. There has also been a notable increase in rural cluster areas between 1973 and 2004, increasing by 389.02% during this time.

The Ngqushwa Local Municipality's population is predominantly rural (93.6%) and there is very little formal development, which is reflected in the coastal zone where there is only one recognisable 'urban' node, Hamburg. Hamburg was founded in 1858 by German soldiers, who were settlers of the British Government and was later expropriated for incorporation into the Ciskei homeland under Apartheid (Dimensions Development Network (DDN), 2008). The Hamburg area was formally developed by 1973. It comprises of a large resident community and scattered holiday homes. In terms of the Ngqushwa SDF, it is identified as a sub-regional service centre. The objective for this area in terms of the SDF is to ensure that development is undertaken in such a way as to meet households' needs (Appendix F shows the desired spatial form for the Ngqushwa Local Municipality). It also highlights that land related issues need to be resolved to promote tourism development and ensure proper conservation of the sensitive coastal and river areas (CES, 2005). The SDF was not adequately informed by socio-economic and biophysical environmental factors (CES, 2005), and in light of this, the Ngqushwa SEA is used to consider future development in the Ngqushwa Local Municipality. The SEA recommends that future development in this area needs to be concentrated within the existing urban node with a clearly delineated urban edge. Sensitive areas such as the saltmarsh and wetlands should be conserved through the establishment of a saltmarsh reserve (CES, 2005). This is important as development at other nodes, such as Port Alfred (in the Ndlambe Local Municipality) have shown development encroaching into sensitive areas.

In the Hamburg area a joint venture project between Amathole Economic Development Agency (AEDA), the Ngqushwa Local Municipality, the Development Bank of Southern Africa (DBSA) and other stakeholders, is being undertaken for the development of an Artist Residency (DDN, 2008; Ntlokonkulu *pers comm.*, 2008). The residency will provide African artists with an opportunity to participate in sabbaticals for periods of two to three months. Part of the proposed project is to offer an annual programme with flagship activities that offer a culture experience

linked to other activities (DDN, 2008). Furthermore the number of applications for sub-division in the Hamburg area shows that there is a growing demand for residential accommodation in this area (Ntlokonkulu *pers comm.* 2008).

In terms of formal development in other areas (as with the Ndlambe Local Municipality), development in the Ngqushwa Local Municipality has only occurred near estuary mouths. Estuaries provide the best opportunity for development in terms of their accessibility and availability of flat land (Naidoo *pers comm.*, 2008). Private residential, holiday homes, self-catering holiday units and bed and breakfast accommodation (Preston-Whyte and Oelofse, 2007) have developed at the estuary mouths of Mgwalana, Bira and Ngculura. In terms of the Ngqushwa SEA, all development in these nodes needs to be consolidated within the node (CES, 2005). The Fish River, Old Womans and Mpekweni estuaries have developed into holiday resorts, in the form of the Fish River Sun and the Mpekweni Sun. The Nguqushwa SEA identifies that the Fish River Sun is situated within an area of *high environmental sensitivity* (CES, 2005). Future development in this area and in the vicinity of Mpekweni Sun should be limited and an appropriate development boundary, taking into account the environmental selectivity of the area, needs to be defined (CES, 2005).

Rural cluster development in the Ngqushwa Local Municipality is associated with the urban node of Hamburg, having developed up-stream along the Keiskamma Estuary and is within walking distance of Hamburg. The development of these areas has lagged behind the development of Hamburg and developed primarily between 1973 and 2004. This is most likely due to both the remoteness of the area and the lack of available infrastructure. It is likely that people resident in this area commute to Hamburg for employment. However, employment opportunities in the area are limited and it is likely that most of the economically active people are migrant workers working in the urban centre of Buffalo City and smaller sub-regional centres and towns within the Buffalo City and Ndlambe local municipalities (PGDP, 2003). This has an effect on land use and therefore land use change in that income is generated from working in urban centres, leading to a reduced need for subsistence agricultural activities.

Changes in disturbed areas and cultivated fields can partially be explained through a review of legislative factors. Prior to Apartheid (during the 1940s) and the establishment of homeland areas¹⁷ the Ngqushwa area was largely dominated by ‘white’ owned commercially productive farms (Figure 4-19 shows cultivated fields to be at their highest in 1940). The establishment of the Ciskei homeland meant that land in what is now the Ngqushwa Local Municipality was purchased by the

¹⁷ Homeland establishment was facilitated by Native Lands Act (1913)

Apartheid government for the resettlement of Xhosa people from the Cape Province. Between 1950 and 1980 people were resettled into the area (Clark and Worger, 2004). As a result commercial cultivation activities in the area declined in favour of subsistence land uses, leading to a more 'natural', albeit disturbed state. This results in the high proportion of disturbed land evident in the results (15% in 1940, 20% in 1973 and 23% in 2004, Figure 4-19), as land was in a state of transition.

The Apartheid legacy and incorporation of what is now Ngqushwa Local Municipality into the Ciskei homeland resulted in this area being managed by, and subject to, its own legalisation. All land in the Ciskei was held under communal tenure and therefore owned and managed by the Ciskei government, which meant that people could not buy or sell land in this area. Lack of ownership has resulted in poor land management in the former Ciskei area. Figure 4-21 depicts the intra-class transformation of grassland cover to thicket cover; it is likely that this has come about as a result of overgrazing by domestic livestock as a result of poor management practices in the area (Ward, 2005; CES, 2005).

The Ciskei government produced sound conservation legislation that ensured the protection of much of its coastal areas. In terms of the Nature Conservation Act (Act no. 10 of 1987) a coastal conservation area of 1 000 metres inland of the high water mark was proclaimed and any clearing or development without authorisation from the government was prohibited (Republic of Ciskei, 1987b). This formal protection of the coastal zone has resulted in a relatively undeveloped coast, as can be seen along the Ngqushwa Local Municipality's coastline. It should be noted that during this time of independence, the Ciskei Department of Agriculture and Forestry undertook a rural development project, which provided a detailed assessment of the area and proposed a long-term development plan. The report series provided an overall development framework for the entire area as well as detailed development plans for specific areas including the coastal zone (Ciskei Department of Agriculture and Forestry and Loxton Venn and Associates, 1983). Following on from their work, Hill Kaplan Scott Incorporated Consulting Engineers (1984) undertook an assessment to provide guidelines for the development of the Ciskei coastal zone in terms of its tourism and recreational potential. Extensive work and detailed planning were undertaken, but the projects were never implemented. These plans, though never realised, were sound in terms of spatial planning for development and ensuring conservation and should be considered in light of future development plans for the area. Ciskei legislation coupled with government ownership of land meant that development along the coast was constrained, resulting in the evident lack of development along the coast of Ngqushwa (Figure 4-23).

5.2 COMPARISON BETWEEN NDLAMBE AND NGQUSHWA

In terms of development and transformation, it is clear that there are distinct differences between the Ndlambe and Ngqushwa local municipalities. Table 5-1 shows the differences in the changes in primary land cover classes. Ndlambe has experienced a high increase in formally developed areas and little informal development (which only emerged between 1973 and 2004). In contrast, the Ngqushwa Local Municipality has experienced a substantial increase in informally developed areas and a relatively low increase in formal development. In terms of changes in altered lands, Ndlambe Local Municipality's area has increased as a result of the conversion of livestock and cultivated farms to game farms, which allows the land to return to a more natural state, albeit disturbed, while the Ngqushwa Local Municipality's area of altered land has increased as a result of the abandonment of cultivated fields. These differences have resulted from a number of influencing factors, referred to as 'drivers' and 'responses', which are discussed in terms of the DPSIR framework in the following section.

Table 5-1: Summary of changes in primary land cover classes

Overall change (%) 1940 - 2004	Ndlambe	Ngqushwa
Altered Land	22.92	13.53
Formal Development	226.52	98.22
Informal Development	New land cover class	388.95
Natural land	-10.80	-8.54

5.3 DPSIR FRAMEWORK FOR DEVELOPMENT AND LAND USE CHANGE

The key differences in development and land use change evident in the Ndlambe and Ngqushwa local municipalities discussed above can be attributed to a number of 'drivers' and are discussed in terms of the DPSIR framework as outlined in Figure 5-1. 'Drivers' are factors that either promote or hinder development within the research sites. This research has shown that there are high levels of formal development and limited informal development evident in the Ndlambe Local Municipality. In the Ngqushwa Local Municipality there is very little formal development and limited informal development. This section proposes that the Ndlambe Local municipality's development is driven largely by economic and social factors, whilst the Ngqushwa Local Municipality development is inhibited to a large degree by social and legislative 'drivers'.

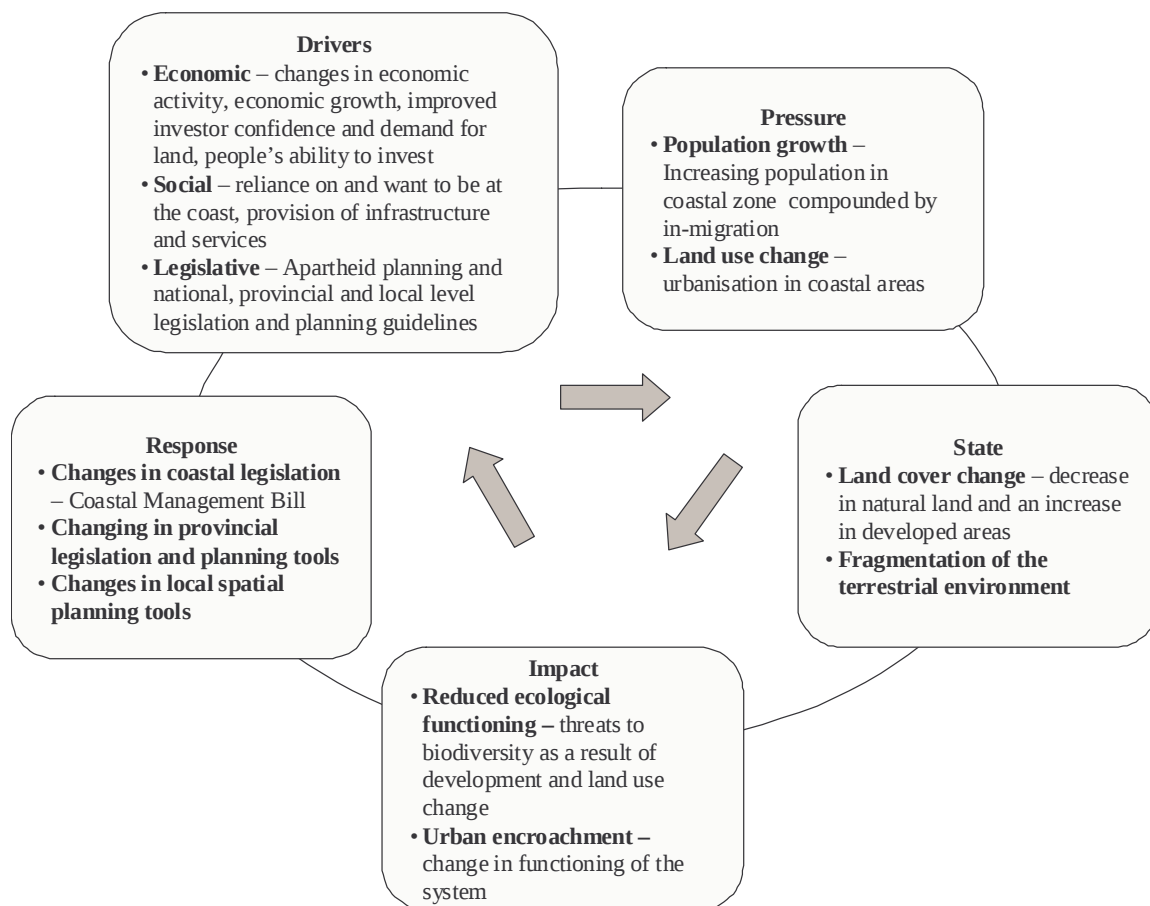


Figure 5-1: DPSIR framework for development and land use change in the Ndlambe and Ngqushwa local municipalities. The components of each of the constituents have been adapted and are based on an interpretation of what is occurring specifically in the research sites.

5.3.1 DRIVERS

Economic

Development at the coast has fluctuated over the years as economic activities have increased or declined. The late ninetieth century saw development shift away from the coast to the interior as a result of the discovery of gold and diamonds (Glavovic, 2000a). More recently, the rise of global trade and improved linkages to the global economy have led to the development of international ports and stimulated the development of coastal regions (Preston-Whyte and Oelofse, 2007). In turn, over the last three decades, secondary and tertiary activities have increased in coastal areas and economic indicators show that South Africa’s coastal economy has grown more rapidly than inland parts of the country. More recently the weakening of the Rand (between 2000 and 2002) has made South Africa attractive and affordable to international investors. This coupled with the stabilisation

of inflation has led to the establishment of an international property market (Preston-Whyte and Oelofse, 2007).

The government's neoliberal macroeconomic policy has also been significant in boosting investor confidence in the country (Preston-Whyte and Oelofse, 2007). This, coupled with national scale economic growth, has been a key 'driver' promoting development in the Eastern Cape Province (Zacharianm, 2008). According to Investec Bank Limited Regional Head, four years of good equity returns, GDP growth in excess of 5%, low interest rates and a stable currency coupled with the province playing 'catch up' in terms of development have resulted in high investor confidence in the Eastern Cape Province (Zacharianm, 2008). The Eastern Cape coast has land available for development at affordable prices compared to other areas in the country, according to 13% of respondents (Griffiths *pers comm.*, 2008; Haschick *pers comm.*, 2008). The establishment of the Coega IDZ is likely to further attract Foreign Direct Investment (FDI) in the Eastern Cape (Zacharianm, 2008). The Eastern Cape has also benefited significantly from South Africa's export, tourism, industrial and infrastructural development (Zacharianm, 2008), largely because it has, in the past, been undeveloped. This recent development boom is evident in the Ndlambe Local Municipality, where growth in formal development between 1940 and 2004 was 226.52%. There are a number of new developments currently underway in the area. In contrast, development in Ngqushwa is limited, increasing by only 98.22% for the same time period.

In the Ndlambe Local Municipality land is privately owned and investing in this area is considered to be low risk with high returns on investment (approximately 20% – 50%) (International Property Investment Network, 2008). On the other hand, land in the Ngqushwa Local Municipality is still predominantly controlled by the state and purchasing land for development is difficult. An alternative to purchasing land would be to lease land from the state for development, in which case the investor takes the risk of providing infrastructure and services on land they do not own. The Ndlambe Local Municipality's development is being 'driven' by the evident property boom and investor confidence in the Eastern Cape. However, in spite of the general development boom in the Eastern Cape, there is no notable development in the Ngqushwa Local Municipality, as the economic risk of investment in this area is simply too great. This economic risk acts as a preventative 'driver', resulting in the Ngqushwa Local Municipality remaining untouched by development.

Infrastructure and service provision, though considered to be social 'drivers', have the potential to limit or adversely affect development and tourism, thus affecting the economy of the area,

according to 13% of respondents. As is the case in Durban, where poor maintenance of infrastructure resulted in the recent loss of Blue Flag beaches. Tourism has shifted away from Durban and Durban's hotel occupancy is significantly lower than in previous years (Govender *pers comm.*, 2008; Griffiths *pers comm.*, 2008).

With regards to local development opportunities for people resident in these local municipalities, people in the Ndlambe Local Municipality are better placed to undertake such ventures as they have higher levels of education and income than the Ngqushwa Local Municipality (Section 1.3, Table 1-1), which relates to the fact that Ngqushwa's population is over 90% rural, while Ndlambe's population is 80% urban. People in Ndlambe Local Municipality have better access to resources and capital to invest in development ventures, while residents of the Ngqushwa Local Municipality are considered to be part of the country's marginalised poor and are often excluded from wealth generation and development opportunities, leading to an increased gap between the Province's rich and poor (PGDP, 2003). This discrepancy can be clearly observed between the two local municipalities. As a result, people in the Ngqushwa Local Municipality are often unable to engage in entrepreneurial activity that may promote economic activities and the formal economic growth of the area is limited to domestic demand as it fails to attract external interest. Furthermore, the low levels of income in the area means that people cannot afford charges for services (PGDP, 2003), which in turn affects the local municipality's ability to maintain or upgrade services. This situation is difficult to reverse and often results in ongoing poverty and decline of basic services in these areas. This, coupled with the high levels of poverty and unemployment in the area, ultimately deters private investors.

Social

In the past people's reliance on the coast was strongly linked to the resources it offered in terms of its favourable climate, the availability of flat fertile land and proximity to fishery resources, as these sustained livelihoods (Glavovic, 2000b; Carter, 1999). As economic activity has improved and people have higher levels of expendable income and greater mobility, this association is largely driven by aesthetic appeal and recreational opportunities, which has led to the development and expansion of urban coastal areas. Many people are still reliant on the natural resource base the coast provides for their livelihoods, and people migrate to coastal areas in search of job opportunities and a better quality of life (DEAT, 2006) as a result of the reduction of staff in the formal agricultural sector (Smith and Wilson, 2002).

In terms of the aesthetic appeal of coastal development, much of the research area of the coast has a high foredune, and development behind the dune prevents sea views, thus development tends to concentrate near the mouths of estuaries, which have limited space for development. Although this may prevent ribbon type development along the coast, the concern is that development will continue upstream along the estuaries, where there is still suitable land available for development. Estuaries are extremely dynamic and are considered to be one of the most threatened habitats in South Africa, and human disturbance of these areas will lead to further degradation of the estuarine systems and its associated environmental services (Turpie *et al.*, 2002).

Coastal urban development is strongly linked to the current social conditions of the local municipality in which development is occurring. This section of coast has, until recently, been relatively remote, which has inhibited development. To a large degree, the Ngqushwa coast is still inaccessible; however, within the Ndlambe Local Municipality road networks have improved making it more accessible to domestic and international tourists. In addition, the Ndlambe coastline is located between the airports of Port Elizabeth and East London (with Port Alfred being approximately halfway) and the R72 road provides access to most of the coastal towns. This is a contributing factor as to why development is taking place more rapidly in the Ndlambe Local Municipality than the Ngqushwa Local Municipality. The national road (N2), though inland of the coast, has one main road and a number of arterial roads that provide linkages to the coast of Ndlambe. Within Ngqushwa, access to the area is primarily via secondary roads with the exception of one arterial road (to the Hamburg area). In addition, the R72, which links Port Elizabeth and East London along the coast, passes through all of the coastal towns in the Ndlambe Local Municipality (with the exception of the Cannon Rocks/Boknesstrand area). Although this route passes through most of the coastal areas of the Ngqushwa Local Municipality, it bypasses the Hamburg node and access from the R72 to Hamburg is via a secondary road. This limitation of access to the area has prevented development within the Ngqushwa area, as it is difficult to transport necessary building materials and goods to the area. If the Ngqushwa Local Municipality can improve infrastructure and service provision, the area will be more appealing to tourists and development will be encouraged (Ntlokonkulu *pers comm.* 2008).

One of the main limiting ‘drivers’ in terms of development along this section of coastline (Ndlambe and Ngqushwa), identified by 25% of respondents, is the provision of potable water, as there is already a scarcity of water in existing coastal towns (Colman *pers comm.*, 2008; Fouché *pers comm.*, 2008; Dredge *pers comm.*, 2008; Govender *pers comm.*, 2008). This scarcity of potable water is a reality for a number of developments proposed and underway in the Ndlambe Local

Municipality; for example the Kenton Eco-Estate proposes the use of a desalination plant for water provision. The Golden Mile development in Cannon Rocks has been suspended due to water provision limitations (Smuts, 2008). A regional water supply scheme has been proposed for the Ndlambe area that will utilise water from the Orange River/Gariep Dam system (Rowlston *pers comm.*, 2008), but 19% of respondents are concerned that the proposed regional water supply scheme is not the most appropriate alternative for water supply, as it is believed that the Gariep Dam is already over subscribed (Dredge *pers comm.*, 2008; Fouché *pers comm.*, 2008; Haschick *pers comm.*, 2008). Associated with this there is the concern that additional water supply will facilitate further development in the area and in turn create future problems for the local municipality as they will be required to provide services to these areas (Dredge *pers comm.*, 2008).

Land in the Ngqushwa Local Municipality is still predominantly controlled by the state, as it is still subject to land reform. This has been identified by 25% of respondents as a key limiting ‘driver’ of development in this area. Land is held in trust meaning that it is difficult for developers and locals to get land for development (Avis *pers comm.*, 2008; Colman *pers comm.*, 2008; Haschick *pers comm.*, 2008; Sholto-douglas *pers comm.*, 2008). An additional problem, identified by 13% of respondents, is that the Ngqushwa Local Municipality’s coastal area has been subject to a number of land claims, therefore the status of land is uncertain and the risk of development too high (May *pers comm.*, 2008; Ntlokonkulu *pers comm.* 2008).

Legislative

The legacy of Apartheid is key to spatial planning in South Africa is, which resulted in the development of homeland areas and forced movement of people. In the Eastern Cape the homelands of Transkei and Ciskei were established (Christopher, 2001). Population density in the former homeland areas is high and basic service provision is poor. Apartheid planning resulted in the establishment of independent states, which developed their own planning and management legislation. Existing legislation still governs land use management and planning in the Eastern Cape, because the Land Use Management Bill, which is meant to repeal current legislation has been not yet been passed as an Act. The Province is effectively in a legislative ‘vacuum’, particularly in terms of areas that fall within the former Transkei and Ciskei homeland areas as they are still governed by their former homeland legislation. Land in these homeland areas is held in trust by the provincial government and it is difficult to get land for purchase or lease (Haschick *pers comm.*, 2008).

Land within the Ndlambe Local Municipality falls within the former Republic of South Africa (Cape Province) and is therefore subject to the conditions of the (Cape) LUPO (15 of 1985) (Procedures Manual, ND). According to LUPO, the local municipality is responsible for approving applications of rezoning and land use change. In contrast, the Ngqushwa Local Municipality falls within the former Ciskei area and land is under the control of the Provincial Department of Land Affairs. Changes in land use and rezoning applications are subject to the provision of the Land Use Regulation Act (Procedures Manual, ND). As a result of this, land is still registered in the name of the state and is subject to land reform (which is the planned change in ownership) to ensure people's land rights (Adams *et al.*, 1999). Land reform issues have, to date, not been resolved in the Ciskei, meaning land ownership is effectively 'in limbo', and people cannot purchase and sell land in these areas, leading to no development. Furthermore there have been a number of land claims along the Ngqushwa coast, meaning that people cannot sub-divide or rezone this land (Ntlokonkulu *pers comm.* 2008). This manifests itself in the Ngqushwa Local Municipality, where there is no formal development evident in the area. This means that development and spatial planning are not consistent along this section of coastline. These legislative concerns have been commented on by Hauck and Sowman (2001) in terms of coastal environments and fisheries stocks.

Developments on land in both the local municipalities are subject to an EIA approved by the environmental authority (provincial or national), in accordance with NEMA (Act No. 107 of 1998). Nineteen percent of respondents are of the opinion that DEDEA has low levels of efficiency in terms of reviewing EIA applications, which results in unnecessary delays to development and could hinder future development. These delays lead to frustration on the part of the developer and can deter investors (Griffiths *pers comm.*, 2008; Fouché *pers comm.*, 2008, Govender *pers comm.*, 2008). DEDEA recognises that they have inexperienced staff that cannot review scoping and EIA applications, which places pressure on those with the experience who are unable to deal with all the applications. This in turn results in delays in terms of reviewing applications and issuing a decision (Govender *pers comm.*, 2008). However, it should be noted that not all delays are on the part of the DEDEA; DEDEA has approximately 200 applications, 85% of which have outstanding information (Govender *pers comm.*, 2008).

In light of current delays in terms of development and rezoning of land in urban and rural areas, the Development Facilitation Act makes this easier to some degree, and is seen as a way to bypass the requirements of the Subdivision of Agriculture Land Act and speed up the NEMA EIA process¹⁸. The DFA was introduced with the aim of facilitating and speeding up development programmes and

¹⁸ EIA process is governed by NEMA, 1998 (Chapter 5)

projects in relation to land development. It provides for uniform procedures in terms of the subdivision and development of land in urban and rural areas, which will promote the provision for, and development of, land for residential, small-scale farming or other needs and uses. This is achieved through the establishment of a development tribunal, which takes responsibility for approvals of land under this Act and resolves conflicts in relation to land development projects (Rigby and Diab, 2003), thus bypassing the requirements for government to issue authorisation. As a result, it is seen to be a controversial piece of legislation; nevertheless it is being used more and more to approve development applications.

In spite of the apparent development boom in the Eastern Cape, it is important to note that the cost and availability of space is perceived to curb development in this area. Land availability is influenced by, amongst other things, provincial and local municipal spatial planning, which designates land for specific land uses (such as conservation and low cost housing). This in turn results in a limited supply of land available for development.

5.3.2 PRESSURE

Ongoing pressures in terms of development and land use change relate to increasing coastal populations. In South Africa, approximately 40% of the total population live within 100 km of the coastline and population growth in these areas is compounded by the in-migration of job seekers, people retiring to the coast and people seeking a better quality of life (DEAT, 2006). Population growth results in an increased demand for land for residential and other development. An increasing demand for land for development is evident in the Ndlambe Local Municipality. Associated with this is an increased demand for food and fresh water. These pressures are usually higher in urban areas (DEAT, 1999), as can be seen in the urban nodes of Ndlambe; in comparison, development pressure in the Ngqushwa Local Municipality is low.

Human demand for fresh water can place increased pressure on estuaries, as it can result in reduced freshwater inflows due to the abstraction of water for domestic consumption and irrigation (DEAT, 1999). Along this section of the coast, fresh water is limited (outlined under the social driver), and could inhibit further development, as is the case for the proposed Golden Mile development in Cannon Rocks. Pressures on coastal resources, as a result of development and land use change linked to human demand (IGOS, 2006), will continue indefinitely. It is anticipated that even if coastal populations stabilise, improved standards of living will result in people becoming more consumerist and wasteful, leading to ongoing impacts on the natural resource base (DEAT, 1999).

Changes in land use come about as a result of people's 'needs' and 'wants' in terms of development in the coastal zone, resulting in high demand for urban areas, which leads to urbanisation along the coast. Coastal development along this section of the coast (Ndlambe and Ngqushwa) is strongly associated with estuaries, and human occupation surrounding these fragile systems could result in them being cut-off from the surrounding terrestrial environment and bio-physical process that link the marine and terrestrial components of the estuarine system (DEAT, 1999). Furthermore, if future development within the coastal zone is too close to the high water mark, this unique land-sea interface will be further adversely impacted.

5.3.3 STATE

Development and land use change drivers and pressures affect the state of natural land habitats within the coastal zone, and changes in land cover have been identified in both the Ndlambe and Ngqushwa local municipalities. Within Ndlambe, natural land has been converted to formal and informal developed areas, while in Ngqushwa, although rates of formal and informal development are low, there is evidence of natural land being developed. This change in land cover, as a consequence of development, leads to fragmentation of the terrestrial environment; this is of particular concern if linear developments are allowed (DEAT, 1999). This fragmentation is evident at the estuary mouths within this section of coast, as this is where formal and informal development is concentrated. It is important that ecosystem functioning is preserved to ensure the provision of goods and services for people resident in these areas, as highlighted in Chapter One.

5.3.4 IMPACT

One of the main concerns, in terms of coastal management, is that there is a lack of holistic knowledge and understanding of the impacts of rapid formal and informal development along the coast. This concern relates to the effects of rapid population growth, rather than population growth itself (DEAT, 1999). These areas are becoming increasingly susceptible to natural hazards and extreme weather events (IGOS, 2006; Nicholls *et al.*, 2007), as was the case along the KwaZulu-Natal coast. This section of coast needs to be conserved and managed effectively to ensure that it can withstand such extreme events, which have recently been noted in the Eastern Cape. In October 2008 a storm event resulted in severe damage in the Eastern Cape (SABC News, 2008).

Primarily there is significant concern that the coastal development boom along the Eastern Cape coastline will, over time, lead to ribbon development (Dredge *pers comm.*, 2008; Naidoo *pers comm.*, 2008). Other concerns relate to the permanent transformation of the natural environment as

a result of development, such as additional outfall (Dredge *pers comm.*, 2008). It is evident from this research that development in the research site is currently concentrated around the mouths of estuaries. According to DEAT (1999), this ‘urban encroachment’ around estuaries coupled with a reduction in fresh water supply to estuaries can lead to sedimentation of the estuarine system and can reduce the intervals of estuary mouth opening. Furthermore, human interference and developments within the coastal zone can cause the collapse of the natural functioning of the system (Fuggle and Rabie, 1992). As highlighted in Chapter One, 60% of life-supporting ecosystem services are currently being degraded or used unsustainably. An example where humans have altered the natural system in the research site is the development of the Port Alfred Marina which has resulted in sedimentation occurring in the lower reaches of the Kowie Estuary (Schumann *et al.*, 2001).

5.3.5 RESPONSE

Along much of the South African coast, the conversion of land from undeveloped to developed is occurring at a rapid rate. This needs to be effectively monitored and managed to preserve coastal land resources (DEAT, 2005). There are a number of policies and legislation that provide a means for conserving the coastal environment, but implementation and responsibility are increasingly fragmented (DEAT, 2006). The Coastal Bill, when it is passed as an Act, will be the first legislation in South Africa specific to the management of the coastal zone.

The Coastal Management Bill is perceived to be a good legislative framework that unpacks what is required for sound management and provides for pro-active management within the coastal zone (Avis *pers comm.*, 2008; Rowlston *pers comm.*, 2008). However, it brings with it a number of concerns as it is more focused on conservation, which contradicts the local municipalities’ mandate to promote development (Avis *pers comm.*, 2008). The main concern amongst experts in this field is that it is an onerous piece of legislation that requires high levels of cooperative governance for implementation (Rowlston *pers comm.*, 2008) and it expects too much from the local municipalities in terms of planning. Local municipalities do not have the capacity to understand the requirements, nor do they have the financial means to implement these requirements (Avis *pers comm.*, 2008). Furthermore local municipalities need to follow their mandate, which is to promote development but at the same time are required to adhere to sustainable development, as well as environmental and coastal conservation legislation, which to a large degree contradicts pro-development planning. It is impossible and often ridiculous to expect municipalities to satisfy all of these requirements. There is concern that the Coastal Management Bill does not give guidelines as to what is

appropriate coastal development and too much is left up to interpretation by the implementing authority (Carter *pers comm.*, 2008).

Each coastal local municipality is required to undertake various tasks for the implementation of the Coastal Management Bill, including the preparation and adoption of a municipal coastal management programme¹⁹ for the management of the coastal zone and specific parts of the coastal zone²⁰. Coastal local municipalities must constitute a by-law that designates coastal access land to ensure public access to coastal public property (s18(1))²¹. The local municipality is required to signpost entries to coastal access land, control the use of coastal access land, protect and enforce the rights of the public to use that land, to gain access to coastal public property, and provide facilities such as parking areas, toilets, boardwalks and amenities that promote access to coastal public property (s20) (DEAT, 2006). Coastal municipalities are further required to ensure that the coastal set-back line, as determined by a Member of the Executive Council (MEC), is delineated on a map or maps that form part of the local municipality's zoning scheme so that the public can determine the position of the set-back line (s25(3)) (Rowlston *pers comm.*, 2008; DEAT, 2006). The Coastal Bill also recommends that coastal local municipalities establish a coastal committee (s42(2)), which may promote integrated coastal management and coordination of effective implementation of the Coastal Bill (DEAT, 2006). However, the capacity of local municipalities to address and manage coastal issues has been questioned by 38% of respondents (Avis *pers comm.*, 2008; Carter *pers comm.*, 2008; Dredge *pers comm.*, 2008; Haschick *pers comm.*, 2008; Rowlston *pers comm.*, 2008; Stewart *pers comm.*, 2008). Municipal officials are in agreement that they would not have the capacity to deal with the additional requirements of the Bill and would require additional human and financial capital to enforce the requirements of the Bill. Local municipalities will need assistance in determining exactly what is required of them (Ntlokonkulu *pers comm.*, 2008; Dredge *pers comm.*, 2008). A key problem is that it is an unfunded mandate and local municipalities do not have the financial means to implement its requirements (Fouché *pers comm.*, 2008).

At a local level, the local municipalities have various policy and planning tools that aid in the planning of development in the coastal zone, of which the SDF is key. The SDF is seen to be an extremely useful tool for the local municipalities but guideline documents need to be developed to aid local municipalities in how to prepare plans and integrate them with existing policies and plans (Avis *pers comm.*, 2008). The Municipal Systems Act allows the SDF to override other plans making it the main instrument for forward planning and decision-making on land development

¹⁹ This must be done within four years of the commencement of the Act (s48(1)(a)) (DEAT, 2006)

²⁰ This programme should be reviewed every five years after completion (s48(1)(b)) (DEAT, 2006)

²¹ This should be completed within four years of commencement of the Act (s20(1)(j)) (DEAT, 2006)

(Procedures Manual, ND). However, implementation of the SDF is heavily reliant on the capacity of the local municipality, which is often lacking. Furthermore the SDF is developed and administered at the local level, which means that the local municipalities have the right to make changes to the SDF, such as to the urban edge, as they see fit (Fouché *pers comm.*, 2008; Dredge *pers comm.*, 2008; Griffiths *pers comm.*, 2008). This has occurred in the Ndlambe Local Municipality whereby the urban edge has been moved on several occasions to accommodate new developments (Dredge *pers comm.*, 2008; Griffiths *pers comm.*, 2008). Planning for development and conservation is often very difficult for local municipalities as they are mandated to be developmental and must promote development into the area, in accordance with the White Paper for local government (Ntlokonkulu *pers comm.* 2008), which contradicts conservation planning guidelines.

Within the Ndlambe Local Municipality, the rate of development is high, fuelled by an ever increasing demand for coastal homes and holiday homes. The SDF for Ndlambe has defined an urban edge in all major development nodes to prevent ribbon development, which is critical for this section of coastline. However, the delineation of this urban edge does not accommodate the demand for development in these nodes, resulting in the development of resort accommodation, holiday homes, golf estates and eco-estates in non-urban areas (SetPlan, 2006), which in terms of the SDF are identified as rural developments. Examples of these in the Ndlambe Local Municipality include the Seaview resort near the Kasouga River and Carpe Diem Eco Estate near Port Alfred (Roger, 2008). This ‘rural’ development allows for the development of closed estate type developments along the coast which resemble permanently inhabited areas and are thus urban in nature, and could, over time, lead to ribbon development. The Ndlambe SDF does recognise that development outside the urban nodes needs to be controlled and it aims to control this through identified development zones, as outlined in Section 2.4. The different zones allow for different development types and densities outside the urban edge.

Within Ngqushwa current development rates are low, with Apartheid planning and land reform issues being a key reason for this (Avis *pers comm.*, 2008). However, it is anticipated that when the land reform issues are resolved there will be renewed interest in this area and increased pressure for development. It is therefore critical that spatial planning be well informed to ensure the conservation of natural systems, sensitive areas and functioning land uses. Furthermore it should ensure that future development occurs in the appropriate areas for development. The Ngqushwa SDF is considered to be inadequate for this, as there is no delineation of an urban edge and no guidelines for development (Avis *pers comm.*, 2008; Stewart *pers comm.*, 2008). The SEA does

provide guidelines for development along the Ngqushwa coast in terms of *no-development areas*, *limited-development areas* and *go-development areas*. However, this has been done at broad scale based on aerial photographs (Appendix G shows the detailed zonation plan for the Ngqushwa coast) and needs to be refined in order to focus on specific areas. Furthermore the urban edge for areas defined as *go-development areas* needs to be defended to prevent urban sprawl and ribbon development.

At a broader regional scale conservation planning initiatives such as STEP and ECBCP aim to ensure that landscape processes are catered for (Berliner *et al.*, 2007). Planning tools for this section of coast have been developed for the STEP and ECBCP projects (refer to Section 2.4). In the Ndlambe and Ngqushwa local municipalities all estuaries are identified as being critically endangered in terms of STEP and all fall within CBA3 in terms of ECBCP and therefore should be managed in such a way as to prevent loss of ecosystem integrity (Berliner *et al.*, 2007). The remainder of the Ndlambe and Ngqushwa local municipalities' coastal zone is identified as being currently not vulnerable, with the exception of the Fish River Estuary, which is identified as vulnerable in terms of STEP (Appendix H). In terms of ECBCP, land is identified as falling within CBA1 and 2 (Appendix I). CBA1 land is considered to be in a natural state where biodiversity should be maintained; the only land use recommended in these areas is conservation. CBA2 land is in a near natural state and to be maintained as far as possible with land use activities such as conservation, game farming and communal farming. Furthermore, STEP identifies a coastal corridor which runs through much of the coastal zone of these two local municipalities (Appendix H).

More recently, the Eastern Cape has seen the development of a coastal EMF (Stewart *pers comm.*, 2008) which covers the coastlines of Ndlambe and Ngqushwa. The EMF, if implemented, will be key to spatial planning for these two local municipalities as it will be administered at a provincial level and the findings will have to be incorporated into the municipal SDFs. The EMF should aid in streamlining development and land use change applications in both local municipalities, ensuring that appropriate development occurs in the appropriate zone.

Concern has been expressed as to local municipalities' ability to cope with additional development in terms of infrastructure and service provision. In principle local municipalities should be able to cater for additional development because the rates base expands with the increased number of units, which allows the local municipality to employ additional human capacity (Dredge *pers comm.*, 2008). The constraint is that there are insufficient funds to upgrade and provide new infrastructure

and bulk services (Dredge *pers comm.*, 2008). Ideally, before additional development is allowed, infrastructure and bulk services need to be improved. This is unlikely due to the local municipalities' mandate to promote development and their need to increase rates bases (Govender *pers comm.*, 2008).

5.4 SUMMARY AND WAY FORWARD

It is evident that the Ndlambe and Ngqushwa local municipalities have developed differently in light of different development 'drivers' based on the DPSIR framework. Figure 5-2 provides a summary of DPSIR framework for the Ndlambe Local Municipality, while Figure 5-3 shows the DPSIR framework for Ngqushwa Local Municipality. These figures show that development and land use change in the Ndlambe Local Municipality is primarily 'driven' by economic factors of economic growth, improved investor confidence, affordability of land and ability to invest. However, development and land use change in the Ngqushwa Local Municipality is primarily 'driven' by legislative factors as a result of Apartheid planning, land reform issues and land claims.

Due to these differences in 'drivers', the resultant pressures, state and impacts vary between the two local municipalities. Both local municipalities have pressure in terms of the provision of potable water; however, the Ndlambe Local Municipality has higher population growth pressure than the Ngqushwa Local Municipality. The Ndlambe Local Municipality, and to a lesser degree the Ngqushwa Local Municipality, experiences changes in land cover and fragmentation of the natural environment. The impacts of potential ribbon development and transformation of the natural ecosystem functioning are more significant in the Ndlambe Local Municipality than in the Ngqushwa Local Municipality. Furthermore in the Ndlambe Local Municipality there is concern that this section of coast is increasingly becoming susceptible to natural hazards.

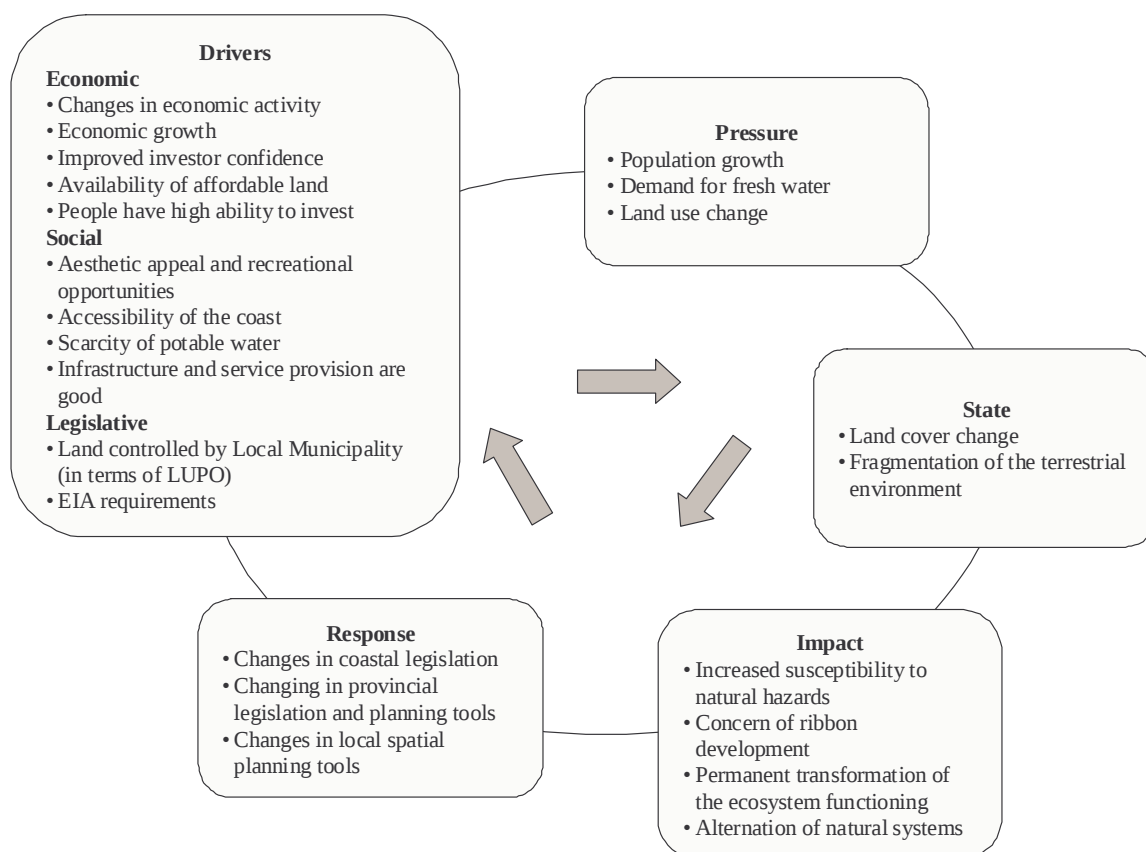


Figure 5-2: DPISR framework for the Ndlambe Local Municipality

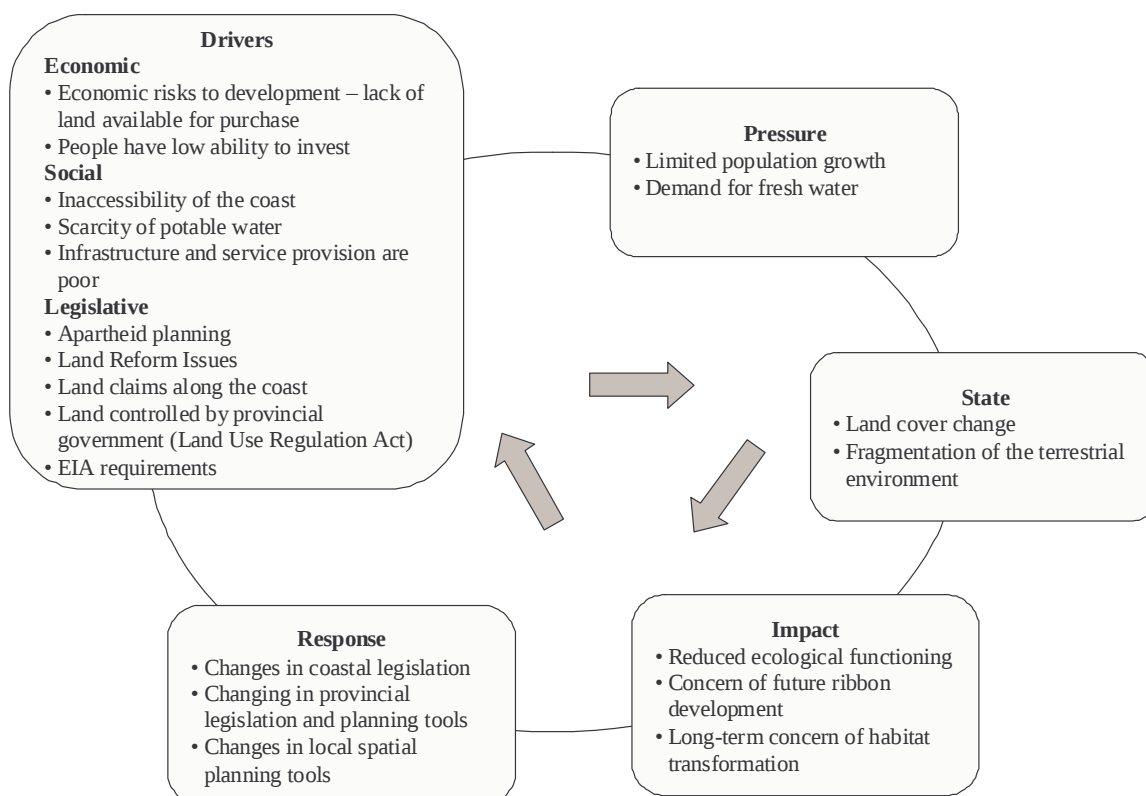


Figure 5-3: DPSIR framework for Ngqushwa Local Municipality

In spite of these differences in ‘drivers’, pressures, state and impacts, the response for both local municipalities remains broadly the same. Responses require changes in national coastal legislation and provincial and local level development planning guidelines and legislation.

Legislative and planning tools are fundamental in ensuring effective coastal zone management along the coasts of Ndlambe and Ngqushwa, and national, provincial and local level policies and programmes need to be aligned. The Coastal Management Bill is a landmark piece of legislation in terms of coastal management and provides a framework for sound pro-active management within the coastal zone. Although it is recognised that the requirements of the Coastal Management Bill are onerous and the local municipalities may lack capacity to implement them, coastal local municipalities need to ensure that their SDFs and other local planning documents are in line with the requirements of this Bill.

Furthermore the Ndlambe and Ngqushwa local municipalities need to ensure that planning documents are aligned with broader scale conservation plans (STEP and ECBCP) and that a common vision in terms of development and conservation areas is identified. In the Ndlambe Local Municipality, if this does not take place, it is anticipated that development pressure will lead to uncontrolled, unplanned development along this section of coast, which ultimately leads to a risk of ribbon development. It is imperative that clear boundaries be delineated as to where development can occur and where conservation should take priority in order to prevent urban type developments occurring in non-urban designated areas and non-coast dependent developments occurring within the coastal zone. Furthermore, planning guidelines need to be explicit in terms of development types and densities acceptable for each section of the coast. While Ngqushwa Local Municipality’s land is currently in a state of ‘limbo’ and development is currently not occurring, it is anticipated that in time, as other sections of the coast develop, this unspoilt section of coastline will attract the attention of developers. Furthermore if land reform issues are resolved, the risks currently associated with development will be significantly reduced and this section of the coast will be more attractive to developers. In order to pre-empt pressures, the Ngqushwa Local Municipality must identify and delineate priority conservation areas and demarcate areas for future development. Planning and guideline documents should align with both existing and proposed legislation for the area, as it is anticipated that the Land Use Regulation Act (Act 15 of 1987) will be repealed by the Land Use Management Bill.

It must be highlighted that future development within the coastal zone of both these local municipalities should be achieved in terms of infill development as far as possible before the

expansion of nodes occurs. Development close to the dune system should be prohibited and a set backline should be developed and enforced, both along the coastline and around estuaries within the local municipalities (Stewart *pers comm.*, 2008). The proposed coastal EMF from Cannon Rocks to Kei River, if gazetted, should inform all spatial planning within the coastal zone of Ndlambe and Ngqushwa. Both local municipalities need to ensure that their SDFs align with, and take into consideration, the finding of the EMF. This will allow for the development of an SDF that will enable informed land use planning decisions at the local municipality level. However it is still imperative that future planning takes into consideration the requirements of the local municipality, who are mandated to promote development, and the conservation planning tools and Acts that provide for the protection of sensitive ecologically important areas. Furthermore, planning legislation and guidelines need to be flexible to cater for various social, cultural and ecological needs within the local municipalities.

Although the municipalities portray distinct differences in terms of current development and land use change, they both offer opportunities for conservation of sensitive coastal environments. Due to the fact that the Ndlambe Local Municipality is developing at a significantly higher rate, it is imperative that this local municipality ensures its planning documents are aligned with current conservation plans and the proposed EMF.

The DPSIR framework has been useful for this research in that it has allowed for the identification of economic, social and legislative drivers of development and land use change. The limitation of this framework is that it is primarily designed for environmental reporting and therefore relates to environmental ‘drivers’. This research has considered social, economic and legislative ‘drivers’, which are diverse and often difficult to categorise as they relate to more than one constituent. However, this framework was useful as it allowed flexibility in determination of ‘drivers’ and allowed for the determination of clear links between environmental problems as a result of social, economic and legislative changes. It is further enhanced by GIS analysis and visualisation of the results of these ‘drivers’.

The coastal zone is a unique dynamic system that requires effective management and spatial planning to ensure its long-term sustainability. This research has focused on the local municipalities of Ndlambe and Ngqushwa as an example of development and land use change in the coastal zone. It has shown that in spite of their similar biophysical characteristics, they portray distinct differences in terms of development patterns and land use change, as a result of key 'drivers'. These changes were determined and analysed by means of GIS processes and findings interpreted based on existing literature regarding this section of the coast.

Firstly, this research captured land cover from aerial photographs at three time epochs (1940, 1973 and 2004) for the Ndlambe and Ngqushwa local municipalities through a GIS process of heads-up digitising, GIS was useful for this process in that it allowed for efficient data capture at a consistent scale. It should be noted that the scale of data capture and accuracy of produced data is limited by the resolution of the aerial photographs from which data was captured. The results of this demonstrate the distribution of land cover classes throughout the research site. It shows that the Ndlambe Local Municipality's dominant vegetation at all three dates is thicket cover followed by grassland and then disturbed and cultivated areas. Ngqushwa's land cover is more mixed with no single dominant land cover class. The main land cover classes are grassland, thicket and disturbed land. GIS processes were used to integrate the three data sets from each research site to detect land cover and land use change. This was used to determine the rate of change of land cover within the research site, to assess where the greatest change is occurring. The results are that in the Ndlambe Local Municipality formal residential (high and low density) areas increased rapidly between 1940 and 2004, as did formal township areas between 1973 and 2004. In the Ngqushwa Local Municipality the most significant increase is recorded in terms of rural cluster areas between 1973 and 2004.

Based on the changes identified, land cover was grouped into primary land cover classes (natural, formal development, informal development and altered land) to determine where development and land use change is primarily occurring within the research site. The results of this showed that the greatest changes in the Ndlambe Local Municipality was the transformation of natural and altered lands to formally developed areas and to a lesser extent to informally developed areas. This trend was also evident in the Ngqushwa Local Municipality, although at a significantly lower rate.

This research identified key ‘drivers’, based on available literature and interviews with key experts, that have led to the development and land use patterns evident in the research area. The key ‘drivers’ of development and land use change were identified as relating to economic, social and legislative factors. These ‘drivers’ were then related to development and land use change by means of an adapted DPSIR model. *Economic ‘drivers’* contributing to development and land use change relate to national level economic growth and improved investor confidence, which have led to a property boom in the Eastern Cape, evidence of which can be seen in the Ndlambe Local Municipality. The driver also considers economic risk of development; land in the Ndlambe Local Municipality is under private tenure and development is considered to be low risk with high returns. However, land in the Ngqushwa Local Municipality is owned by the provincial government and is still under communal tenure and thus development in this local municipality is considered to be high risk. *Social ‘drivers’* include people’s reliance on the coast, people’s ‘need’ and ‘want’ to be at the coast and the provision of infrastructure and services available at the coast. Increased mobility of people, increased consumer spending power and more available leisure time, coupled with improved access to the Ndlambe Local Municipality’s coast have made it more attractive to the domestic and international tourist markets. *Legislative ‘drivers’* encompasses historical and recent national, provincial and local level spatial planning legislation and guidelines that either promote or hinder development. Historical Apartheid planning is the main ‘driver’ limiting development in the Ngqushwa Local Municipality, as legislative and land reform issues have not yet been resolved, resulting in limited development in this municipality.

This model demonstrates that these changes lead to additional *pressures* on the coastal environment as a result of continued population growth in the coastal zone and urbanisation of coastal areas. These result in shifts in the natural *state* of the coastal zone, as natural land is transformed to developed areas, resulting in loss of natural areas and fragmentation of the terrestrial environment, which in turn leads to *impacts* such as urban encroachment, which can alter the functioning of the system, in terms of reduced ecological functioning and loss of biodiversity. Changes in the natural functioning of the coastal zone highlight the need for a *response* in terms of changes in legislation governing coastal management and spatial planning. This, at a national level, has led to the development of the Coastal Management Bill which, if promulgated as an Act, will be key to coastal management in South Africa. Furthermore, at a provincial level, there are a number of spatial planning tools, such as STEP, ECBCP and the proposed EMF, that can aid local planners. It is important that this national and provincial information be fed into the local municipalities’ key planning tool, the SDF, to ensure area-appropriate development occurs. It is important to note that the coastal system is a finite resource and can only withstand a certain amount of pressure from

development. If pressure exceeds this threshold it will result in devastation, irreversible impacts on both the coastal environment and communities resident in these coastal areas.

It is important to note that these two local municipalities are currently at different stages in terms of development. The Ndlambe Local Municipality is currently experiencing a development boom and current management and spatial planning guidelines and legislation need to be carefully implemented. The Ngqushwa Local Municipality is not yet developing, which offers the opportunity to prepare more detailed spatial planning and management guidelines for the coastal zone. However, development in the coastal zone is inevitable, and as opposed to attempting to completely conserve the coastal zone or create antagonism with development, town planners and developers need to work together to ensure that development is restricted to existing development nodes and disturbed areas or areas of low environmental sensitivity, thus ensuring the conservation of sensitive coastal areas. If this is not done, the ecological functioning of the natural system will be reduced, making it more susceptible to degradation, coastal erosion and extreme weather events, thus reducing its ability to sustain coastal livelihoods. Integrated coastal management and effective spatial planning are fundamental to ensuring long-term sustainability of the coastal zone and it is important that the legislation and planning that allows for this be implemented. The concern is that this is largely implemented at the local municipality level and therefore relies on their capacity, which is often lacking, especially in the more rural local municipalities where effective coastal management is imperative. Future research should seek to align legislation, guidelines and planning documents amongst all coastal municipalities and a common vision for coastal management should be identified and implemented. This will aid in preventing fragmented management along the coast based on municipal management extent. In line with this thinking, there needs to be cooperative governance amongst coastal local municipalities.

This research has contributed to research regarding land cover and land use change and associated ‘drivers’ in a former homeland area. As noted by Giannecchini *et al.* (2006), few studies have been done in this regard. Furthermore this research highlights that ‘drivers’ affect development and land use change differently in areas that were incorporated into former homelands compared to areas that have always been in South Africa. This research contributes to literature on land use change and coastal zone development and management. It relates development and land use change to key ‘drivers’, which has not previously been done in the Eastern Cape.

Internationally, management of the coastal zone is highlighted in terms of Agenda 21 (Chapter 17), the UNEP Regional Seas Programme and the IGOS Coastal Theme programme. They recognise

that coastal systems are being jeopardised as a result of human demand and impact, and stress the need to protect this unique system and improve management thereof. This research has shown that pressure for development in the coastal zone within the research site is beginning to increase and will adversely affect this zone if not well managed. These two local municipalities have the opportunity to move forward and develop in such a way that allows for conservation and sound management of the coastal zone, within the existing and proposed legislative frameworks. If accomplished, this will ensure long-term sustainability within the coastal zones of the Ndlambe and Ngqushwa local municipalities.

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APPENDICES

APPENDIX A: NDLAMBE SDF PLANNING MAPS

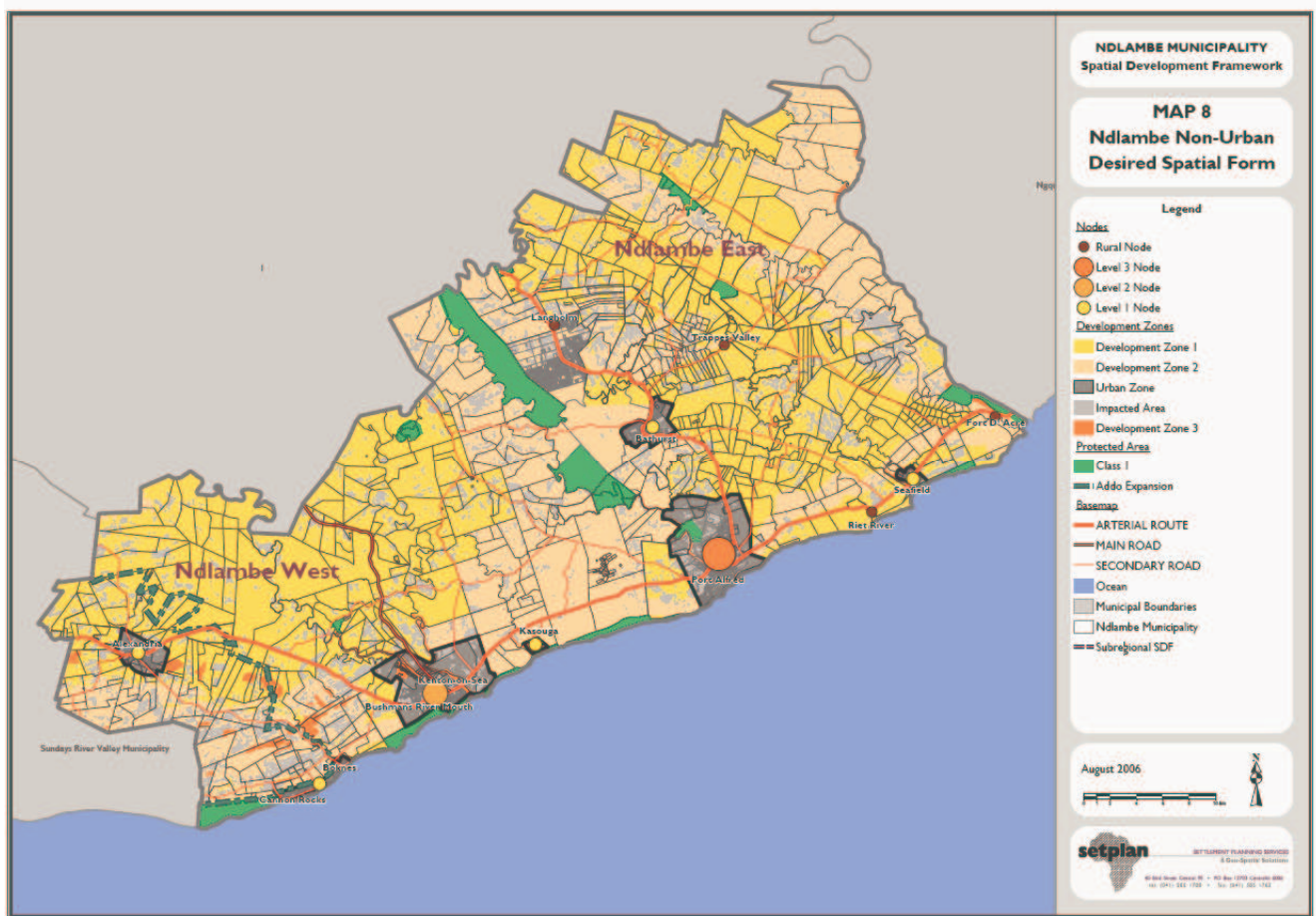


Figure A-1: Desired spatial plan for the Ndlambe LM (SetPlan, 2006)

APPENDIX B: LAND COVER CLASSES

Land cover can be defined as the observed cover of the earth's surface. When one considers land cover it should be confined to the description of vegetation and man-made features on the land surface that are recognisable from the arial photographs.

PRIMARY LAND COVER – NATURAL

1. Thicket

Communities typically composed of tall, woody, self-supporting, single or multi-stemmed plants (branching at or near the ground), with, in most cases no clearly definable structure. Total canopy cover is greater than 10%, with canopy heights between 2 – 5 metres. Indigenous species, including coastal forest. Areas appear dark on the aerial photo. Size, tone and texture differences relate to age and species. Presence of shadows also give information about the object's height, shape, and orientation.



2. Grassland

All areas of grassland with < 10% tree and/or shrub canopy cover. Dominated by grass-like, non-woody, rooted herbaceous plants. Essentially indigenous species growing under natural or semi-natural conditions. The better the condition of the grassland the darker and more even in tone it will appear (Lawns show as even medium grey tone).



3. Water bodies (enclosed)

Areas of open water, generally permanent. The category includes both natural and man-made water bodies, which are either static or flowing, and fresh, brackish and salt water conditions. This category includes features such as rivers, major reservoirs, farm-level irrigation dams, permanent pans, lakes. Excludes estuaries, wetlands and floodplain areas.



4. Estuaries

Natural body of surface water that is part of a water course that is permanently or periodically open to the sea; and in which a rise and fall of the water level as a result of the tides is measurable at spring tides when the water course is open to the sea. Estuaries are defined as the part of a water course that is permanently or periodically open to the sea, the properties of which are influenced by the twice-daily rising and falling of the tide (Davies and Day, 1998; Republic of South Africa, 2006b).



5. Wetlands

Natural or artificial areas where the water level is permanently or temporarily at (or very near) the land surface, typically covered in either herbaceous or woody vegetation cover. The category includes fresh, brackish and salt water conditions. Examples include pans (with non-permanent water cover), and reed-marsh or papyrus-swamp.



6. Floodplain

Natural low lying areas adjacent to rivers and estuaries predominantly formed of river sediment. Areas are prone to flooding when the river is in flood.



7. Littoral active zone

Any land forming part of, or adjacent to the seashore that is unstable and dynamic as a result of natural processes. It is characterised by dunes, beaches, sand bars and other landforms comprised of unconsolidated sand, pebbles or such material which is either un-vegetated or only partially vegetated.



PRIMARY LAND COVER – ALTERED

8. Disturbed

Permanent or near-permanent, man-induced areas of very low vegetation cover (i.e. removal of tree, bush, or herbaceous cover) in comparison to the surrounding natural vegetation cover. This can be associated with subsistence level agriculture, where overgrazing of livestock and / or wood-resource removal has been locally excessive. Often associated with severe soil erosion problems. This includes lands previously used for cultivation, that are returning to their natural state.



9. Cultivated fields

Areas of land that are ploughed and/or prepared for raising crops, includes areas currently under crop, fallow land, and land being prepared for planting. Characterised by uniform, well managed field units (often with the aim of supplying regional, national and possibly export markets). Includes fallow lands. There is enormous variety when looking at cultivated lands - photographs taken around harvest time offer the most positive identification. It is possible to distinguish between different types of farming techniques.



10. Residential - high density

Formal built-up areas consisting of permanent structures in which people reside. Identifiable by the high density buildings and associated infrastructure (predominantly roads). Residential structures are either single or multi-level (often refers to 'middle-class' and 'upper class' residential areas). This may include areas of commercial business activities where these are not easily identifiable.



11. Residential - low density

Formal built-up areas consisting of permanent structures in which people reside. Identifiable by the low density buildings and associated infrastructure (predominantly roads). Residential structures are either single or multi-level (often refers to 'middle-class' and 'upper class' residential areas). In these areas this will generally include any areas of commercial business activities, as they are not easily identifiable.



12. Formal Township

Permanent structures, usually located on serviced sites within former black residential areas, laid out in an organised, pre-planned manner. Includes both low and high building densities.



13. Informal township

Non-permanent shack type dwellings (i.e. tin, cardboard, wood etc) typically established on an informal, ad hoc basis, on non-serviced sites. Either high or low building densities, often on the outskirts of formal townships (an expansion of them) or new main roads.



14. Rural clusters

Areas of clustered rural dwelling (i.e. kraals) whose structural density is too low to be classified as a formal village, but are of sufficient level to be easily identifiable as such on imagery. Small scale cultivation / garden plots often form a major spatial component, and are located amongst the residential structures. These are often found in close proximity to major and secondary roads.



15. Non residential areas

Areas that are clearly non-residential and are primarily used for the conduct of commerce, industrial and other mercantile business. It includes sites associated with educational (i.e. schools, universities), business development centres such as industrial ‘techno-parks’, and/or social services (i.e. hospitals). (Note: only mapped if clearly identifiable, otherwise included within residential, high or low density).



16. Recreational land

Areas of open space, predominantly grassland, used for recreational activities. This includes areas such as school and public sports fields and golf courses.



APPENDIX C: GPS RESULTS FROM GROUND TRUTHING EXERCISE

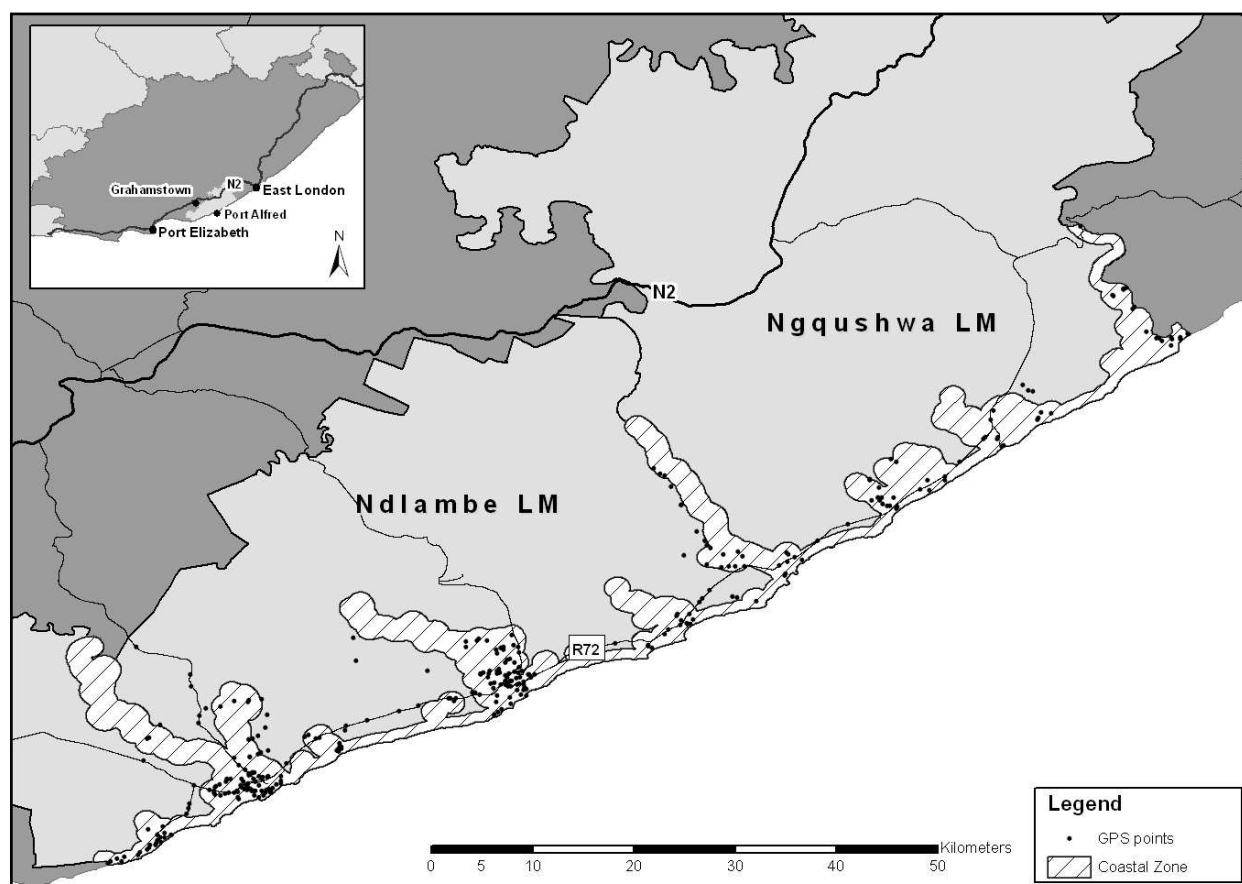


Figure C-1: GPS points captured during the ground truthing exercise

Topics discussed with respondents

- Spatial planning
 - SDFs and other guideline documents
 - The proposed EMF that covers this section of coast
- Local Municipality's capacity to cope with additional development
 - Financial and human capacity
- The proposed Coastal Management Bill
 - Local Municipality's capacity to meet requirements of the Bill
- DEDEA's capacity to deal with EIA applications and coastal management issues
- Drivers of development
- Limitations to development

Dr Avis**Coastal & Environmental Services, Managing Director**

- The Integrated Coastal Management Bill is useful in that it provides for pro-active management of the coastal zone
- It draws attention to the ecological set back line – which has always been important but never enforced
- In terms of the Bill development in the coastal buffer zone can happen but this area should be limited to a low development area
- The problem with the Bill is that it expects too much from the local municipalities in terms of planning – they do not have the capacity to understand the requirements, nor do they have the financial means to implement these requirements
- Local municipalities are required to develop an ICZMP, estuaries management plan and determine special management areas,
- Should establish coastal committees - may be possible in the bigger local municipalities but not in the smaller ones
- The requirements are far too onerous
- Some of the requirements could be incorporated into the ICZMP

- Local municipalities are required to do so many different things – IDP, SDF, SEA, EMF and ICZMP – coastal EMF, SEA – there is a high degree of overlap between all of these – very complicated process that people don't seem to understand
- The less developed the coast is the more emphasis should be put on management and planning for development – generally in these areas the capacity of the local municipalities is too low to do this – areas require planning but authorities don't have the knowledge
- SDFs are extremely useful – but guideline documents need to be developed in order to aid local municipalities in how to prepare plans and integrate them with existing policies and plans
- The coastal Bill is leaned towards / focused on conservation but local municipality needs to develop and promote development – needs to be a balance between the two – sustainable development
- The coastal bill is too onerous and may result in it being ignored if people don't know how to implement it or it results in too many delays
- It is good framework legislation – it unpacks exactly what needs to be done
 - Problem is the human and financial capital are lacking
- There needs to be a significant amount of training for the local municipalities so they can gain an understanding as to why they need to do things etc
- There need to be guideline documents on how to implement things and how they align
- Development in the coastal zone
 - EC has a lower population than other coastal areas
 - Apartheid and land reform issues are a key reason for lack of dev in this area
 - The coastal road is not that close to the coast in comparison to the KwaZulu-Natal and Western Cape
 - Farmers in the area are 'settler' farmers and are concerned about conservation in the area
 - Only now is the EC attracting the international market's attention
 - EC government has low levels of efficiency which can frustrate developers and deter them from developing in this area

Dr Carter

Coastal & Environmental Services, Senior Consultant and Director of the East London Office

- Proposed development near Mpekwini is concerning
 - The developer wanted 120 units – DEDEA gave permission for 12 – it was appealed and DEDEA (Head office) permitted 47 units – This decision is being appealed again by interested parties

- The Coastal Bill is a good start
 - Concerned that it doesn't give guidelines as to what is appropriate coastal development
 - Too much is left up to interpretation
 - Guidelines are necessary to ensure appropriate decision making.
 - A lot of onus is placed on the local municipality – concern as to their capacity to apply the legislation
 - Potential for corruption in the local municipality / people being paid off
 - Too much is left up to the local municipality – decentralization is good but this is open to abuse
 - The bill is only as effective as its implementation
- The SDF is a good document – however the local municipality should not have the authority to make changes to the urban edge unless they have the means to provide the additional services needed.
 - People need to engage in the process
- The biggest problem is that we need people to challenge what is happening along the coast
 - Need coastal watchdogs and people need to engage with what is happening.
- There is development at all of the estuaries – this should not be used as a reason to allow / encourage additional development
- There needs to be a middle ground between development and conservation of land
- The EMF is good – but will we agree with its findings ?
- The White Paper has excellent principles – but they are not taken seriously and are not being applied
- Drivers of development
 - Finances and desire for coastal homes
 - Ndlambe Local Municipality has a better capacity than Ngqushwa Local Municipality to provide services
 - Ndlambe Local Municipality is close to PE
 - Ngqushwa – capacity is limited, it is difficult to get approvals
 - There is a problem of land being owned by the state
- The property boom is hopefully over – might get another one after 2010
- There is a lot of development occurring –
 - Concerned as to its sustainability
 - Is there a market for this development?

Mr Colman

Independent Consultant

- Ciskei Planning Acts / Ciskei Nature Conservation Act – for coastal zone definition
 - There was a paper published by either CSIR or NRF by George Branch
- The Ciskei land use planning act – is still used for planning in this area
- EC conservation Bill
- Need to look at the 1:50 000 cadastral information
- Need to get 1:250 000 maps
- Access at Old woman's, Mpekweni and Mqwalana have been lost due to private developments
- Gqutywa and Mtana have limited access – therefore are the best to promote conservation
- Farm Bradford – is now private nature reserve
- Arm Matland – sold to a white consortium
- Mtana to Hamburg there is coastal forest reserve
- The Ciskei proposed a Nature reserve all along the coast
- Some farms (Gquywa) were given to the Ciskei defense force for a period
- Ownership of most farms is still in Limbo – some farms are owned and others are leased by black individuals
- Land is still under the control of department of land affairs
- Most of the land has still not been transferred – government wanted to restructure farms, they were consolidated into Farm 261 and resurveyed but never registered with the deeds office, because there was a problem with some of the title conditions
- Ciskei was all state land – due to Ciskei land use registration Act – government has still not sorted it out
- Ngqushwa – was white farms then converted to homeland – now in limbo
- There has been a change from indigenous to stock – now some areas are going back to indigenous animals
- The Ciskei coast is well protected – due to historical policy. Now there are EIA regulations that limit / control development. Planning and approval is more difficult
- People living in this area do not have the capital for development. They are also not motivated to promote development / find investors
- Only areas with potential for development are the estuary mouths
- In Ndlambe development is facilitated by private tenure (ownership of land)

- Ciskei land controlled by the Land use board (Provincial- department of housing and public works) not the Local Municipalities (not LUPO)
- Ndlambe – land controlled by Local Municipalities (Municipals structures act) – subject to LUPO
 - o Problems with SDF
- Development in Ndlambe coast could be a result of dev inland e.g. game reserves
- Need info on tourism trends and links
- Logical that once land issues in Ciskei are sorted out – farms will convert to game farming
- Ciskei – landing limbo since 1994 there has been no planning
- Need info on property market – annual reviews for property market
- Development also linked to changes in labour market / changes in labour legislation
 - o But wildlife also creates jobs – look at wildlife economics
- Need to consider effects / impacts of DFA (Tribunal) and Act 70 of 70
- Limitations to development
 - o Water – limits dev potential
 - o Location of this section of coast
 - Midway between EL and PE
 - No major road leading to it
 - No airport
 - Access to domestic market is limited – area is remote

Mr Dredge

Ndlambe Local Municipality, Acting Municipal Manager

- New development in the Port Alfred area – shopping mall, has been included into the urban edge for Port Alfred
- There is a new development of 5000 units – Thornhill development
- Driving development
 - o Development over the last two years has boomed
 - o Concerned that development is sustainable – trade is very seasonal
 - o Still high level of holiday development – not a lot of full time residents
 - o Normally development like this is associated with industry of something
 - In Port Alfred there is only the mall – which is sustainable during peak seasons, concerned about the off peak season

- Additional development has high impact on the environment
 - E.g. additional sewage outfall
- Potable water supply is a problem
 - Port Alfred is a registered drought area
 - Proposed regional water supply scheme is good
 - The area needs water but don't know that the regional water supply scheme is the way to go
 - If you bring in additional water supply – it creates a mechanism for additional development
 - Generates additional problems for the local municipality – in terms of services
 - Need better ways to cope with development
- Financial base expands with development and money can be used to provide improved facilities. Human resources – should be able to cope with development
- Problem is that now local municipalities have to look after large areas – in many cases local municipalities have taken over infrastructure that is old and there is not enough financial capacity to upgrade infrastructure
 - Rates and taxes can't cover the expense
 - Funding for maintenance is a problem
- Coastal development is unsustainable – financial streams are erratic and unsustainable.
- Boknes / Cannon Rocks etc the houses are closed for most of the year.
 - They don't generate any money – there is only rates and taxes coming in, but infrastructure etc still has to be maintained
- Concerned that development has happened to quickly
- Limitations to development include the existing infrastructure and the lack of water in the area
 - But if infrastructure can't cope – should it stop development?
 - Development needs to be stopped until infrastructure has been upgraded
- Proposed Coastal Bill is good but local municipality won't have the capacity to meet it's requirements
 - Will need someone to assist and explain exactly what is required of the local municipality
 - Need to know what the zones are for the coast
 - Need to know where additional development is permitted
 - Concerned as to what happens to people that already own land in the coastal zone
- The problem is that development is occurring before development / spatial plans are in place
- The Ndlambe SDF urban edge keeps getting moved to accommodate additional development

- o Council meet and make decisions as to the movement of urban edge then it goes through public participation process
 - o Concern that this may result in ribbon development
 - o Council keeps approving developments
- Development will move to Ngqushwa in the next few years
 - o Just need someone to develop something that creates an urban environment – this will lead to other development taking place in the area
- People from Ndlambe are moving to Ngqushwa to the quieter environment
 - o Don't like the 'hassle' of Ndlambe
- Ngqushwa development is limited in terms infrastructure
- Development is driven by the demand for coastal land
 - o 10 years ago local municipalities had investment policies to attract development to the Eastern Cape
 - o Now developers are paying more to get land for development in the area
 - There has been a noted shift
- Business is moving out of the urban areas
 - o E.g. pineapple farm moving to Bathurst
 - o Eco-tourism is becoming a big thing – loss of agriculture is a problem
- The EIA process is good – prevents development happening too fast
 - o Even if it takes too long it is a good process
 - o Do have cases that people just develop – because they don't want to wait for approval
 - The problem is that the consequences of not following the process are not strict enough
 - Implementation not good – need to take a stand against unauthorised development
 - There should be consequences of not following the requirements

Mr Fouché

Ndlambe Local Municipality, Environmental Officer

- The SDF focuses on areas within the urban edge – doesn't give enough attention to land outside the SDF
 - o Council can make the decision to amend the SDF at any time
- The Ndlambe Local Municipality plans to do an SEA for the coast (cover the area from the R72) and up the estuaries

- o The SEA will determine what can and can't happen in what areas
 - o It will also look at the value of agriculture land
 - o The SEA can only be changed at MEC level
 - o Will be informed by STEP and ECBCP
- The EMF will be legislated and changes can only be done by the MEC / Minister
 - o The SEA will be more focused than the EMF
 - o The EMF will feed into the SEA
- In terms of the SDF – conservation and open space is all the same
 - o There is high development pressure within the urban edge therefore the Ndlambe Local Municipality has begun to tender public open space for development
- Farming is no longer considered to be viable for a number of reasons including the effects of fuel costs
- All the development in the area creates pressure for additional infrastructure and service provision
 - o The biggest problem is that of water
 - There is a proposed regional water supply scheme – concerned about it – the Gariep dam is already over subscribed
- Drivers of development
 - o Residential development is increasing – people are investing in coastal areas
 - There is increased pressure on the schools – shows an increasing number of younger residents
 - o There is an increase in tourist facilities and retirement villages
 - o Development is mostly upper-class e.g. Kenton-eco estate
 - o People are attracted to the un-spoilt beaches and estuaries of the Eastern Cape, unlike KwaZulu-Natal
- There is a concern that if the EMF and SEA don't work, the coast will go like KwaZulu-Natal. Infrastructure is not good enough to deal with development pressure in the area
- If there is enough political pressure – development will occur
- Where is the tax base for Ngqushwa?
 - o Issues with infrastructure and service delivery
- Coastal Management Bill
 - o Onus is on the local municipality to come up with a coastal management plan
 - If left to local municipality – will go like the SDF
 - o Enforcement is a problem

- o There are so many legislative requirements to comply with in terms environmental compliance
- DEDEA has enforcement problems – there is no one following up
 - o There is no enforcement of compliance with ROD
 - o Local Municipalities only have limited power in terms of enforcement
- Environmental capacity is lacking
- Delays with EIA applications – discourage development
 - o There is the risk of people just going ahead with development – and there is no enforcement, so it snowballs and other people do the same
- The Coastal Bill is long over-due, must give local municipalities authority to make bylaws for enforcement
 - o The problem is that it is an unfunded mandate
 - o Local municipality won't cope
 - o Ndlambe has the capacity to implement requirements – but what about Ngqushwa?
 - They do not even have an environmental officer
- Developers come in and offer jobs – and the council supports the development
 - o It is left up to DEDEA to make the decision

Mr Griffiths

WESSA – Eastern Province Region, Conservation Officer

- Ndlambe Local Municipality is fortunate to have an environmental officer like Fanie Fouché – they need to keep him there
- Ngqushwa do not have the capacity at all – there is no environmental officer there
- The Western Cape is good at driving off big inappropriate developments such as golf estates
 - o Seen shift in these developments to this area
 - o There are 20 – 24 golf estates in the Humansdorp area
- There are good environmental watch dogs in the Ndlambe area
 - o E.g. In the Port Alfred there is the Kowie Environmental Watchdog
 - o Kasuga residents are environmentally sensitive
 - o There is nothing like this in the Ngqushwa area
- Drivers of Development
 - o Ndlambe coastal areas are within 3 hours of a major metropolitan area
- Proposed Carpe Diem development was turned down – due to it being inappropriate coastal development

- Capacity is a big problem – environmental officers are needed
- Port Alfred is growing beyond its means – just approving everything
 - And every year they run out of water
- The SDF is a good document – the underlying layer of it is STEP – which aids in working out ‘go’ and ‘no-go’ areas
 - Council doesn’t stick to the SDF
 - The problem is that the councilors vote to have the urban edge moved
 - If the SDF was followed the area would be well managed
- Kenton area is small – but the informal settlement is negatively impacting on the Kariga
- Port Alfred is drawing more water than they are legally allowed
- The proposed EMF is very good but again it comes down to the councils ability to implement it and not make changes to it
 - Concerned that the EMF is done at too broad a scale – it needs to be more localized, there needs to be more fine scale detail
- The area needs a bio-regional plan
- Main limitation is water
 - Additional development will be supported by desalination
 - Can’t extract more from the rivers – as this affects the salinity of the estuaries
 - Infrastructure is poor (roads)
- In Ngqushwa the EIA regulations appear to have been effective at preventing development
 - Building costs in Ngqushwa are expensive in comparison
 - Further to transport materials etc
- Drivers of development
 - Development has been ‘pushed’ out of the Western Cape
 - There is more open land available in the Eastern Cape at cheaper prices
- DEDEA is under capacitated – the problems are mainly with head office (Bisho)
 - Coastal section defiantly doesn’t have the capacity
- Regional coastal group no longer happening anymore
 - This is required in terms of the coastal bill, but it is going to struggle to get people to participate
- Coastal Bill
 - In terms of EIAs the 100m / 1000m defined by the coastal bill is very helpful
 - The recognition of sea level rise is very good and will be effective in terms of management

- o Allows one to look more at the cumulative impacts
- o and allows for defining of nodes for development in the coastal area
- o only allows coastal access if there has been traditional access
- o it entrenches the rights of people
- o danger with the bill is that cabinet has the right to sell land and give people exclusive rights
 - was not the case with the sea shore act, the land belonged to the people in trust by the government – according to Bill the government owns the land
- Development is driven by the need for holiday accommodation
 - o The current economic situation should have an impact on this
 - o Electricity is another problem
 - o Water is a big problem that is not given enough attention
 - Coupled with this is the problem of sanitation
- The loss of blue flag beaches in KwaZulu-Natal has had a dramatic impact on tourism
 - o Also causing tourism to move North and South
 - o Durban's hotel occupancy being significantly lower than in previous years
- The EIA process is not the stumbling block, it is DEDEA
 - o Risk of people going ahead without approval, but your big developers / developments won't run that risk

Mr Govender

Department of Economic Development and Environmental Affairs, Regional Manager: Environmental Affairs, Cacadu Region

- Main issue is that people who own land seldom have it changed to open space, people want to develop land
- Most of the land in the Eastern Cape is zoned as agriculture – therefore one has to apply for re-zoning for development
- There is the challenge of food security – therefore Agriculture needs to comment on applications for change in agricultural land use to an alternative land use
 - o The problem is that you often cannot get comment from the agricultural sector , therefore have to use the SDF as a guideline for where development can take place
- Need to consider environmental impacts of proposed developments
- The biggest limiting factor, currently, of development is the lack of water in the area
 - o But this doesn't seem to stop development - they find alternatives

- Waiting for the Coastal Bill to be passed – it will be good legislation to aid in governing coastal areas
 - It gives a clear buffer zone (100m / 1 km) where development should not be taking place
- Local municipalities need to curb coastal development
- Where developments are allowed to occur this needs to be kept in line with the SDF
- Studies need to be done on developments to ensure that they are in fact sustainable
- Local Municipalities just want to grow their rates base – so they support new developments
- Council can take a decision the change the urban edge as delineated by the SDF
 - This is a problem because DEDEA makes decisions on developments based on the SDF and say development is in appropriate due to being outside the urban edge – then council changes the urban edge
- Development is taking place and there is no upgrading of infrastructure
 - If municipalities don't upgrade the infrastructure it will adversely effect tourism in the area
 - E.g. Durban's loss of blue flag beaches – due to open sewer outfalls
- The EMF is still being done – once it is in place it will give more of a tool for development guidelines
 - It adds value in terms of assessing developments
- Developments seen in the coastal zone
 - Historically people had developmental rights
 - Local municipalities often don't comply with environmental legislation
 - Engineers say – they can mitigate against the impacts
- People all want access to the beach – and there is often no concern for the environmental impacts
- Normal environmental services are being lost as a result of coastal development and this ultimately effects natural services
- In Cannon Rocks there is a big problem with the sand moving onto the properties – legally they are not allowed to move the sand
- Bulk infrastructure needs to be provided before development is allowed
 - Developers agreeing to contribute financially to the upgrading of infrastructure is a problem – municipalities are strained financially and money is often allocated elsewhere and services are not upgraded
 - Developments are not providing everything in house – their own sewage works etc
 - Developers are trying to cover all the bases

- Kenton area – the water consumed is more than what is produced by the desalination plant in low season
- Proposed regional water supply scheme is still under assessment
- DEDEA has approximately 200 applications – 85% are still waiting for information and 15% are active
 - In the Eastern Cape (DEDEA) capacity is a problem
 - Staff come in, get experience and move on
 - Currently most staff have less than one years experience – cannot get them to review scoping and EIA applications – therefore there are delays in terms of reviewing applications
 - Infrastructure and housing projects are given preference
 - There are too many applications to deal with – it is not necessarily their ability, but their capacity to deal with the applications that is the problem
- Local municipalities are seriously under capacitated – they need better environmental capacity
- KwaZulu-Natal north coast – the development is frightening , there is such increased run-off in these areas that is adversely affecting the coastal environment
- Local municipalities are mandated to bring in development and the environmental department is largely under resourced
- Drivers of development
 - Foreign market open up – exchange rate is favorable for foreign investors
 - People want to get away from the big cities to the coast – development is mostly for holiday type development
- In terms of the coastal bill – municipalities are required to set up a coastal management forum – DEDEA wants to be the driver of this
- DEDEA is in the process of setting up a coastal management team
 - There are also going to be compliance and enforcement officers (4 officers)
 - There are 13 compliance and enforcement activities to manage

Mr Haschick

Eastern Cape Development Cooperation, Sector Specialist - Aquaculture, Fisheries & Environmental Management (Investment and Trade Promotion)

- The land ownership of the former Ciskei is a major issue
 - Land is held in trust and it is difficult to get land for development
 - Therefore it doesn't facilitate development in the area

- Investors are impatient and it takes time to set up a lease etc – it is quicker to find alternative land elsewhere
- The private sector is driving development
 - Good places for development are often in conflict with existing land use practices
 - The proposed development near Mpekweni is a good example of inappropriate development
- Investment promotion is based on existing plans
 - Need to market investment opportunities in the most appropriate area
 - E.g. in the IDZ – you know what is there and what is allowed, it is then easy to market
 - Other land use plans need to be the same
 - The EMF will be useful because it is legally binding
- The EIA process is important particularly in green areas
 - The EMF will be very good because it identifies zones and should streamline the EIA process
- The proposed Coastal Management Bill is good on Paper
 - Concern as to the local municipalities capacity
 - The Bill is sound in that it ensures equitable access and provides for public property
 - Capacity is not the only problem – municipalities seem to just do what they want
- SDFs are good but local municipalities have the authority to change it
 - Example the Ndlambe local municipality seems to keep changing the urban edge
 - This is a problem – run the risk of becoming like KwaZulu-Natal south coast (Ribbon Development)
 - Also look at the Wilderness / Plett / Knysna area
- Limitations to development
 - In Ngqushwa the land tenure is a problem
 - Infrastructure is another limiting factor – there are only 2 formal settlements along the coast of Ngqushwa
 - If land issues are resolved this area will be under pressure for development
- Drivers of development
 - Property values in the Eastern Cape have lagged behind much of the country
 - In Ndlambe it is relatively easy to purchase and develop land
- Development is mainly tourism and holiday type accommodations
 - This results in a permanent transformation of the environment – there is no changing it again

- If you were doing mining – you could rehab the area after mining
- The problem with state facilities is that municipalities are pressured to develop and make it economically viable – at the same time they need to maintain access for the public
- There is increasing risk of inappropriate developments taking place
- If infrastructure is a problem for the local municipality – they need say no more development until infrastructure and services have been upgraded
 - Now developments are providing their own infrastructure and services
 - This happens regardless of the size of the development
- Water is a major problem for this area
 - The regional water supply scheme is critical – Ndlambe needs water
 - But if there is not enough water available – an alternative needs to be found
- A lot of land is zoned for agriculture and the Department of Agriculture is very strict when it comes to re-zoning agriculture land
 - What is happening now is that the developer has off-sets
 - Make other land and money available for community projects
- Game farming is good for the land and biodiversity, as land is kept in a natural state – but it doesn't create as many jobs as agriculture

Mr May

Ngqushwa Local Municipality, Local Economic Development Officer

- There is no environmental officer at the Ngqushwa Local Municipality
 - there is no environmental officer due to the lack of resources at the local municipality
 - The District and DEDEA assist on environmental matters
 - A consultant has been appointed to do a coastal clean up – and assist in terms of service provision
- The main limitation to development in this area is that the land
 - It is uncertain as to who owns what
 - The private land has land claims on it
 - Some land is owned by public works
 - It is difficult to invest in areas that have land claims on them, due to the uncertainty of it

- In terms of the municipalities capacity – cannot comment on their capacity in terms of service provision, but there is a very small rates base for the local municipality – finances are a problem
- There is a development proposed for the Hamburg area which will be funded by DEDEA
 - The local municipality is involved in this project
- The proposed EMF will be useful and will assist the local municipality
 - There are problems of people wanting to privatise the coast
 - E.g. At Mpekweni and Fish River Sun there is no access for the public and communities living in the area
- The coastal bill will also be good because it ensures that no one can privatise access to the sea / coast
 - In terms of the Bill the local municipality can try and provide public access etc, but it will have to be done jointly between the local municipality and developers
 - If the local municipality doesn't have the capacity to implement the requirements of the Bill they will get assistance from the District, or get consultants in to assist.
- There is very little development happening in Ngqushwa, but if the land issues are resolved then we will see pressure for development
 - At the moment the coast is un-spoilt – the question is do we keep it like it is with no development or allow development
 - If it is kept as it is, then what about the local communities? They need development and the economic benefits of it
 - The communities are suffering
 - There needs to be a balance between development and conservation – we need job creation, but the environment should be looked after
 - Development needs to be maintained in nodes and the rest can be conserved

Ms Mapukata

Department of Economic Development and Environmental Affairs, Regional Manager: Amathola Region

- Local municipalities lack the capacity to deal with new developments
 - Important to note that some local municipalities do have the capacity
- In all municipalities planning is lacking and the SDF is often not being implemented
- The department needs to work hand in hand with the local municipalities to ensure that something gets done

- This is not being done – mostly responses are reactive to issues
- In a number of local municipalities they don't have the capacity – they need to get the budget to ensure that they have the officials and the capacity
- Drivers of development:
 - The coast is attractive to all people
 - Problem is that there is pressure for development and people forget about the legislation and go ahead with development regardless
- The coastal Bill is a helpful tool and a useful guideline but until it is rolled out it is just Policy
 - It is good in that it identifies buffer zones
 - Capacity is a problem – especially in smaller municipalities where they do not have the rates base to bring in financial capital

Mr Naidoo

Tshani Consulting, Town Planner

- Development along the coast is largely associated with estuaries
 - They generally provide a good opportunity for development – they are accessible
- There is high demand from high income earners for development along estuaries
 - Estuaries have the appeal of the coast and that people can have jetties etc on the estuary
 - Water attracts people
 - High income earners like to have property at the coast – they like direct access to the coast
 - People want to be at the coast – results in additional pressure on the local municipality to provide services
- People wanting to be at the coast results in the risk of ribbon development
- In terms of planning it is better to have nodal development than ribbon development
 - Need to create urban edge – based on growth trends from the last five years and the anticipated future tend for the next 20 years – then work out how much land is required
 - Also need to consider direction of development growth
- High income earners are closest to the coast
 - This results in the need for domestic workers – leading to the need for low-cost housing
- The economic boom over the last few years has resulted in development in the Kenton and Port Alfred areas

- o The Port Alfred Marina has made a big difference to the town – promotion of high income area
- Outside the urban edge – densities for development are lower – there are more restrictions on development
 - o Building footprint must be concentrated in one area
 - o Local municipality needs to stick to the recommendations of the SDF
 - o Movement of urban edge – must have to justify the economic benefit of doing so
- Planning along the coast is critical – don't want the coast to go like KwaZulu-Natal
- Nodal development is much better for service provision
- Government is promoting densification of urban areas
- EMF – must meet the requirements of it, but there must be give and take
 - o You can't stop development from taking place – but must find a medium ground
- Drivers of development
 - o Economic growth
 - o Population growth
 - o It is natural for people to be attracted to the coast
 - o People are also drawn to services and infrastructure
 - People are attracted to areas where there is proper sewage systems and good road networks
- Concern as to the local municipalities capacity to provide services

Mr Ntlokonkulu

Ngqushwa Local Municipality, Estates and Housing Officer

- The coast is predominantly made up of farms
- Fish River and Mpekwini are private farms, but now there are land claims on them
- There are a number of other land claims along the coast
- The Restitution Act prohibits the sub-division or rezoning of land parcels that have land claims on them
- Land is predominantly owned by the state
- Land is accursed on tenure ship or caretaker ship basis (whereby you don't pay rent but are responsible for the maintenance of the land)
- The problem is that the land has not yet been transferred to them – if this is resolved it is likely that they would want to develop

- Uncertainty as to ownership of land leads to people not wanting to develop as they do not know what will happen in the future
- People cannot even apply for grants / funding because the land claim issues have not been resolved – so there is no land security for people to start farming etc
- The Local municipality has a small operational budget – and they depend on grants for the upgrading of infrastructure and services
- There is a land use zoning scheme for the Hamburg and Peddie areas
- This is used with the SDF and housing sector plans when considering development applications
- Aware that there is an EMF being undertaken, but have only been at the local municipality for 3 months so have not yet attended a meeting
- Don't think that the local municipality would be able to handle the additional requirements of the Coastal Bill – they would need additional human capital
- Example – in terms of upholding building controls – there is only one building control officer for the entire local municipality, that person cannot possibly deal with everything – so you find transgressions taking place
- The local municipality needs people – a better staff complement
- E.g. There is no environmental officer due to financial reasons
 - Get assistance from DEDEA for this
- Delays in responses on EIAs etc is not as a result of lack of capacity within the department, but rather that there are so many applications and the volume is too much for them to handle
- Driver of development
- People are attracted to infrastructure
- And want to be near the coast
- If the local municipality could improve infrastructure and services then there would be more tourists
- There is a proposed project in the Hamburg area – Arts Colony Project
 - As part of this project there will be a tarred road from the R72 to Hamburg – this will increase the accessibility of it and more people will visit the area
 - The number of applications for sub-division in the Hamburg area shows that there is a growing demand for residential accommodation
 - Hamburg currently uses septic tanks, this will need to be improved
- The local municipality wants to promote development
- The white paper for local government says that municipalities must be seen to be changing and to be developmental – must bring in development

- The local municipality has land reform and settlement plans aimed at finalizing these villages
- Have applied for funding and appointed town planner and land surveyor to formalize the township
 - The challenge is that people don't want to wait for this to be done – they are putting pressure on the authorities for the demarcation of additional sites (which is done by the department of agriculture in rural areas)
- In terms of land restitution – don't know if people were ill informed or if they are ignorant for not lodging claims in time – now they are coming to the local municipality with their claims and want something done
- Some people want the claims period to be re-opened

Mr Rowlston

Coastal & Environmental Services, Director

- The Coastal Bill is another piece of legislation in South Africa that adds responsibilities to the local municipality
- It is an onerous piece of legislation. The Coastal Management Bill requires a high level of cooperative governance for implementation. It requires cooperation between different departments and spheres of government.
- Local municipalities are not able to do what is being asked of them, they do not have the capacity or the financial ability to address management concerns
- There is no capacity building in place to help local authorities – even when the legislation/guideline say there will be, it never seems to happen
- Implementation and enforcement is a problem for smaller local municipalities
- Coastal municipalities are required to do a number of things. For example they must ensure that the coastal set-back line is determined
- Municipalities simply do not have the institutional or financial capacity to implement all the requirements of the Coastal Bill
- A regional water supply scheme from Seafeld to Alexandria is proposed – it will utilize water from the Orange River/Gariep Dam system
- Drivers of Development
 - People are inherently attracted to water
 - Availability of services (power, water and infrastructure) could be a limiting factor of development – people want all these services

- o Ndlambe is relatively accessible
 - o Ngqushwa – former homeland area therefore is not well developed
- Capacity for management and development is a big problem

Mr Sülther

M.E.H. Sülther & Son, Land Surveyor

- Applications for land use change and rezoning are subject to:
 - o Ordinance 15 of 85
 - o NEMA EIA regulations
 - o 21 of 1940 – advertising of roads and ribbon development Act
- For bigger developments Department of Water Affairs and Forestry, Department of Minerals and Energy and Eskom
- Development Facilitation Act is increasingly being used for development applications – as it facilitates development and speeds up the process
 - o only know of 2 instances where it has been used in the Eastern Cape
 - o Eastern Cape town planners don't like to use it as it is seen to bypass existing legislation such as Act 70 of 70, but is often used in Gauteng
- Land Use Management Bill should it become an Act will repeal Removal of Restrictions Act (Act No. 84 of 1096); Development Facilitation Act (Act No. 67 of 1995); Physical Planning Act (Act No. 88 of 1967)
 - o The Bill was first drafted in 1999, consultation during public release was poor
- Municipalities lack capacity to deal with applications
 - o Appointments often political and not based on ability, people are often not qualified to deal with applications
 - o People can apply for exemption from LUPO
- No policy in terms of conservation planning related to NEMA
- Problem with SDFs is that the local municipality can alter spatial planning
 - o For example this happened with the Kenton-eco-estate in Kenton and the Sea Side lakes in Port Alfred
- 'Drivers' of development
 - o Good weather
 - o The weak rand
 - o Foreign investment
 - o The coast is still a relatively cheap option in terms of tourism

- o Development in the Eastern Cape is further facilitated by relatively cheap labour
- Development limited by:
 - o The EIA process is very lengthy and frustrating
 - o Other 'red tape' legislation
 - o Limited availability of water
- If the process was more streamlined and not as lengthy there would be more development occurring along the coast
- There are a number of issues regarding land within the Ciskei
 - o Applications are authorized by the provincial government
 - o Agriculture land within Ciskei is still subject to Act 70 of 70

Mr Sholto-douglas

Kwandwe Private Game Reserve, Managing Director

- Development is largely being driven by lack of economic certainty in terms of agriculture
 - o There is this misconception that 'developers' are coming into the Eastern Cape and buying up land, but people have to be willing / want to sell land (there are exceptions to this)
 - o We still work on the willing-buyer, willing-seller principle
- The Great Fish River area is known to be marginal in terms of agriculture and good for game farming
- Land ownership is not necessarily the problem in terms of the development – if we had an efficient lease system development could still go ahead
 - o Efficiency of implementation is the problem
 - o If lease system works correctly – once changes in land use has occurred it is difficult to change land use again this secures the new land use
 - o Ownership of land is not critical
 - o The rest of Africa works on a lease system for game farms
 - o But this needs to be governed by appropriate laws; the tender process needs to be transparent. In South Africa there is a lack of responsibility associated with leases
- Coastal areas offer the additional attraction of the beach
- Eastern Cape coastline is relatively undeveloped – in comparison to KwaZulu-Natal south and north coasts, there is not much land left there for development
 - o There is now a large development proposed in Zululand by the Arabs
- Legislation needs to be appropriate to prevent this happening along the Eastern Cape coastline

- The process (EIA process) is what limits development – it takes too long and developers get tired of waiting for approval, this will lead to people going ahead with developments without approval
 - Because of the delays with development applications, the DFA route makes a lot of sense
- Decentralization of government to the local level is a problem, they are not equipped to run the local municipality and now they are expected to come up with programmes and plans

Mr Stewart

SRK consulting, Senior Environmental Consultant

- SRK is undertaking an EMF for the section of coastline from Cannon Rocks to Kei River
- Looking at a zone 1.5 km inland of the high water mark, 5 km up estuaries that are considered to be under pressure and 3 km up estuaries that are not under pressure
- Status quo assessment look at biological value and sensitivity, visual value and sensitivity, sensitivity to disturbance and agricultural potential
- Highlights important process areas – importance of estuaries and vegetated dunes
- Assess the desired state of the environment against the SDF and other planning leg
- Working on getting a setback line from the dune system – in peri-urban and rural areas would be higher than in urban areas
- The SDF recommends densities but is not explicit enough
- Kleinemonde
 - Recommend infill development before expanding the urban node
 - The area needs to shift to water born sewage
 - There should be no development to the west of Kleinemonde
- Port Alfred
 - North east side: encourage development to the north of the R72 – especially activities that are not coastal dependent
 - West of PA there should be no development to the west of the river valley – as this is biologically and visually important
- Kasuga
 - Retain in a natural state – development should be concentrated around existing development
- Kenton
 - Kenton Eco Estate is going ahead and there is no buffer near the coast

- o To the north east of the Kenton Eco Estate no development should be allowed – or if so should be low density
- o Need an adequate buffer for any development adjacent to the estuary
- o The informal settlement to the west is currently being formalized
- o Need as much infill development as possible
- o There should be no development close to the dunes
- o There needs to be a set back line around estuaries and the tributaries
- Cannon Rocks / Boknes area
 - o The dune system up to Dyers cross is important
 - o There should be no development to the north of the Bokness estuary
 - o There is sufficient land inland of this node to accommodate development
 - o Makes sense that this area becomes 1 node
 - o There needs to be a setback line
- Implementation
 - o The EMF will identify 3 geographic areas
 - One that is subject to existing EIA regulations
 - One that is subject to ‘trimmed’ regulations in order to facilitate development in these areas
 - One that will have additional listed activities in order to ensure conservation
 - o There will also be guidelines for geographic areas
- Ndlambe Local Municipalities is in the process of revising the SDF and the EMF will inform this
- Ngqushwa SDF doesn’t define an urban edge and there are no guidelines for planning linked to the SDF

APPENDIX E: PROPOSED DESIRED SPATIAL PLAN FOR DEVELOPED NODES OF THE NDLAMBE LOCAL MUNICIPALITY

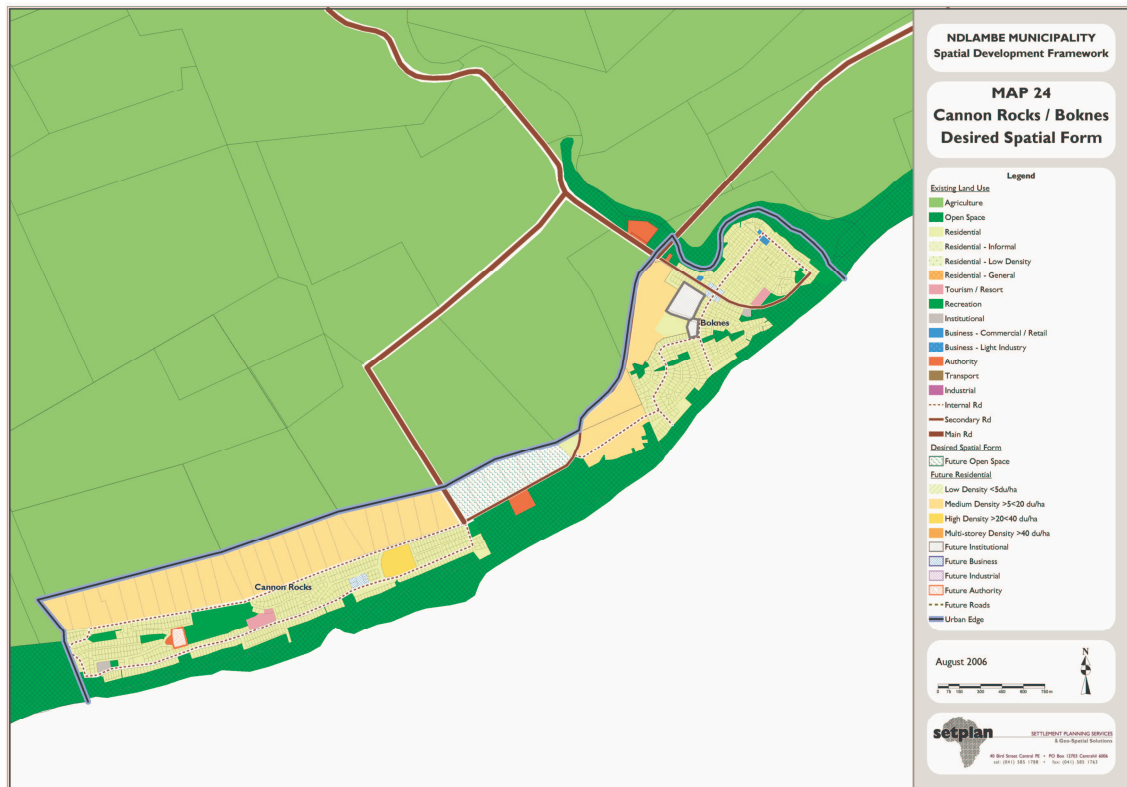


Figure E-1: Desired spatial form for Cannon Rocks / Boknesstrand area (SetPlan, 2006)



Figure E-2: Desired spatial form for Bushmans River Mouth / Kenton-on-Sea area (SetPlan, 2006)

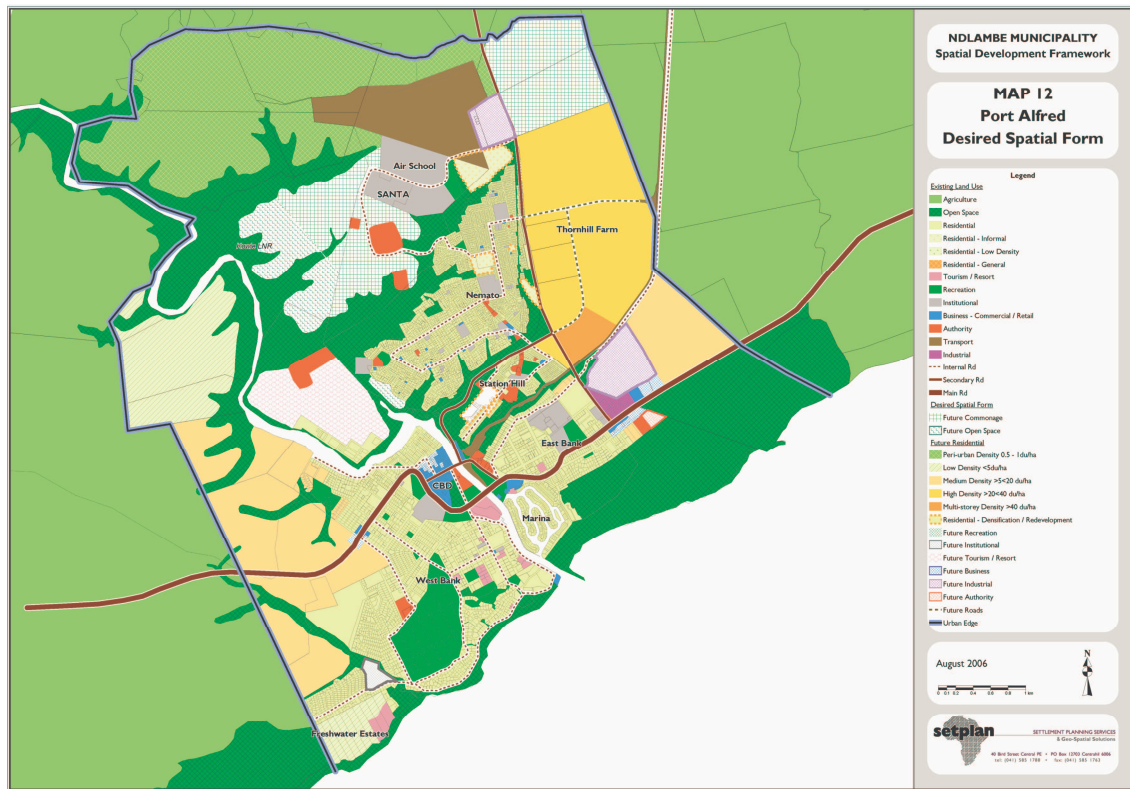


Figure E-3: Desired spatial form for Port Alfred area (SetPlan, 2006)

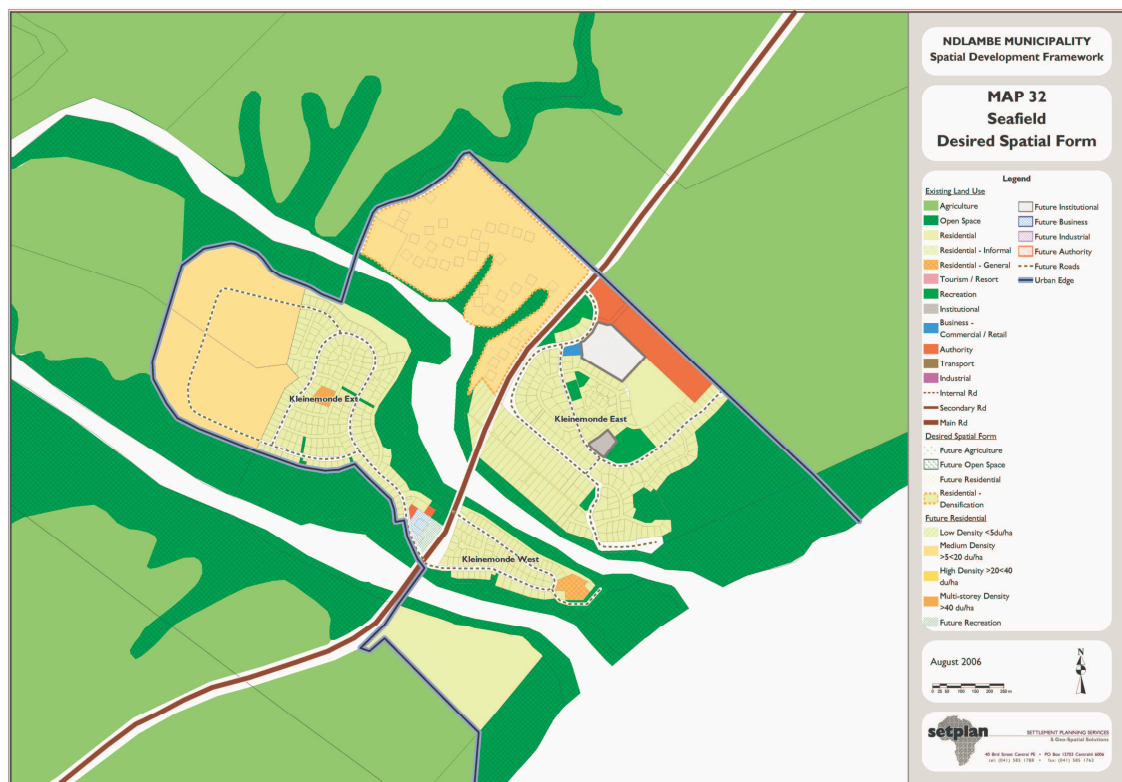


Figure E-4: Desired spatial form for the Kleinemonde area (SetPlan, 2006)

APPENDIX F: NGQUSHWA SDF MAPS

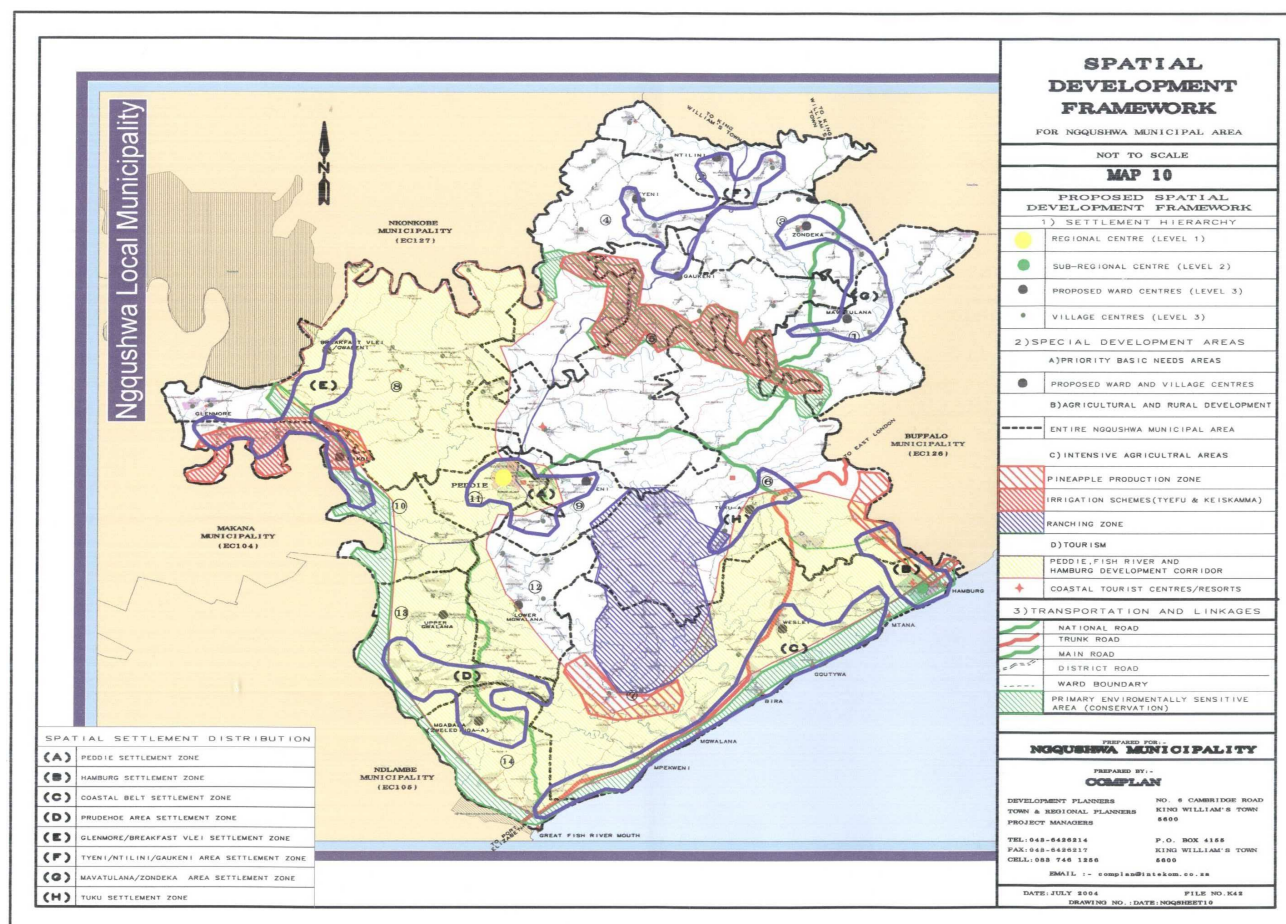


Figure F-1: Desired spatial plan for the Ngqushwa LM (Complan, 2004)

APPENDIX G: NGQUSHWA SEA COASTAL ZONE PLAN

Table G-1: References to numerical values on maps that follow. Description of area zoned on the maps (CES, 2005).

1	Rock promontory, Category B reserve
2	Coastal thicket, dynamic Frontal Dune (proposed Coastal Dune Reserve along entire stretch - Category B).
3	Thicket vegetation
4	Thicket vegetation
5	Riparian Thicket, Steep slopes
6	Thicket, Steep slopes & wetland drainage area
7	Coastal Thicket, dynamic frontal dune cordon (very tall dunes steep slopes. Susceptible to Blowouts)
8	Proposed Mpekweni Wildlife Resource Area. Fish - Mpekweni bordering Trunk Road & Shore. This vegetation is best defined as a grassy fynbos subtropical thicket mosaic. More specifically, an <i>Aloe-Eullece</i> dominated valley thicket with <i>Restio-Tristallice leucospermin</i> coastal grassy fynbos
9	Riparian Vegetation, Salt mash & wetland thicket
10	Riparian Zone, salt marsh & wetlands steep slopes
11	Mpekweni Node Limited expansion.
12	Coastal thicket vegetation
13	Riparian Vegetation, saltmarsh & wetlands
14	Riparian zone, thicket vegetation steep slopes, wetlands and salt mashes (Conservation Value)
15	Riparian vegetation buffer zone, wetlands and salt marshes, drainage lines
16	Riparian buffer zone, wetlands and salt mashes. Steep slopes
17	Proposed Mgwalana wildlife reserve. 5.5 Km long, 550ha extends between the Bira – Mgwalana rivers
	Potential conception zone / ecotourism zone because main road is from the coast
18	Riparian buffer zone, wetlands and salt mashes. Steep slopes
19	Riparian buffer zone, wetlands and salt mashes. Steep slopes
20	Riparian buffer zone, wetlands and salt mashes. Steep slopes
21	Riparian buffer zone, wetlands and salt mashes. Steep slopes
22	Proposed marine reserve. Category A.
23	Proposed Keiskamma salt mash reserve. Category A, riparian zone
24	Salt Marsh habitat
25	Mobile dune systems - important ecological / process areas
26	Urban development of Resort or farm ?
27	Undesirable development within the coastal thicket and dune system
	red line -network boundary
	white line - 1Km from shoreline

Key:

White line – Approximate 1 km coastal buffer

Dashed line – STEP boundary

(CES, 2005)



Figure G-1: Fish River to Old Woman's River



Figure G-2: Old Woman's River to Thatshana River



Figure G-3: Thatshana River eastward



Figure G-4: Mpekweni and Mtati rivers



Figure G-5: Mgwālana River



Figure G-6: Mgwālana to Bira River



Figure G-7: Bira to Gqutywa River



Figure G-8: Gqutywa River eastwards

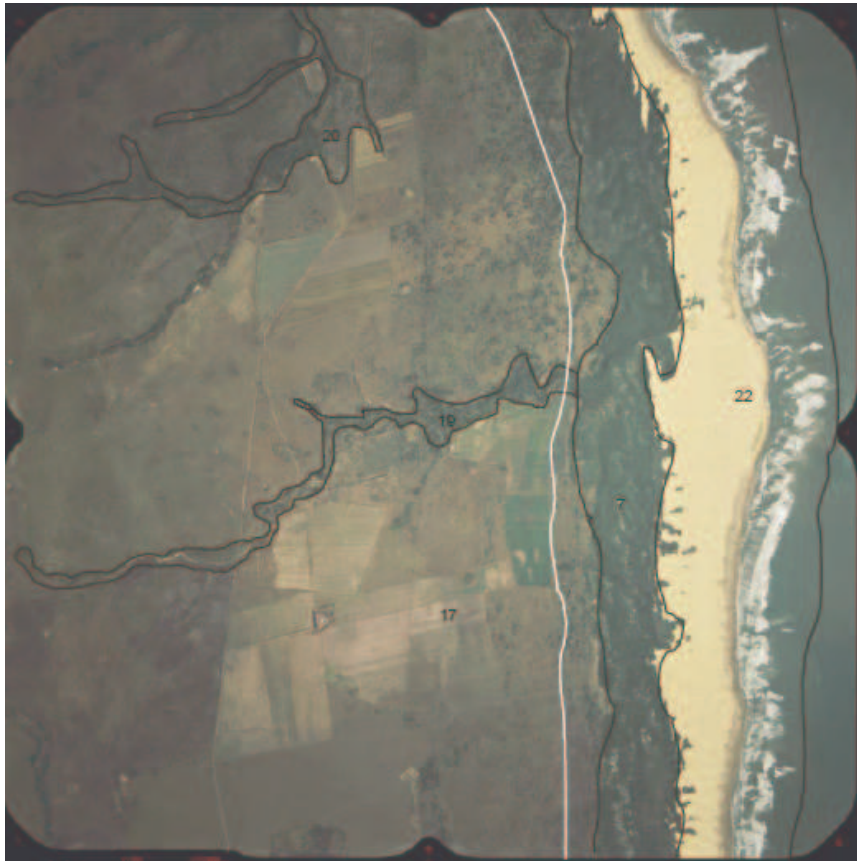


Figure G-9: East of Ggqutywa River



Figure G-10: Mtana River



Figure G-11: Keiskamma River

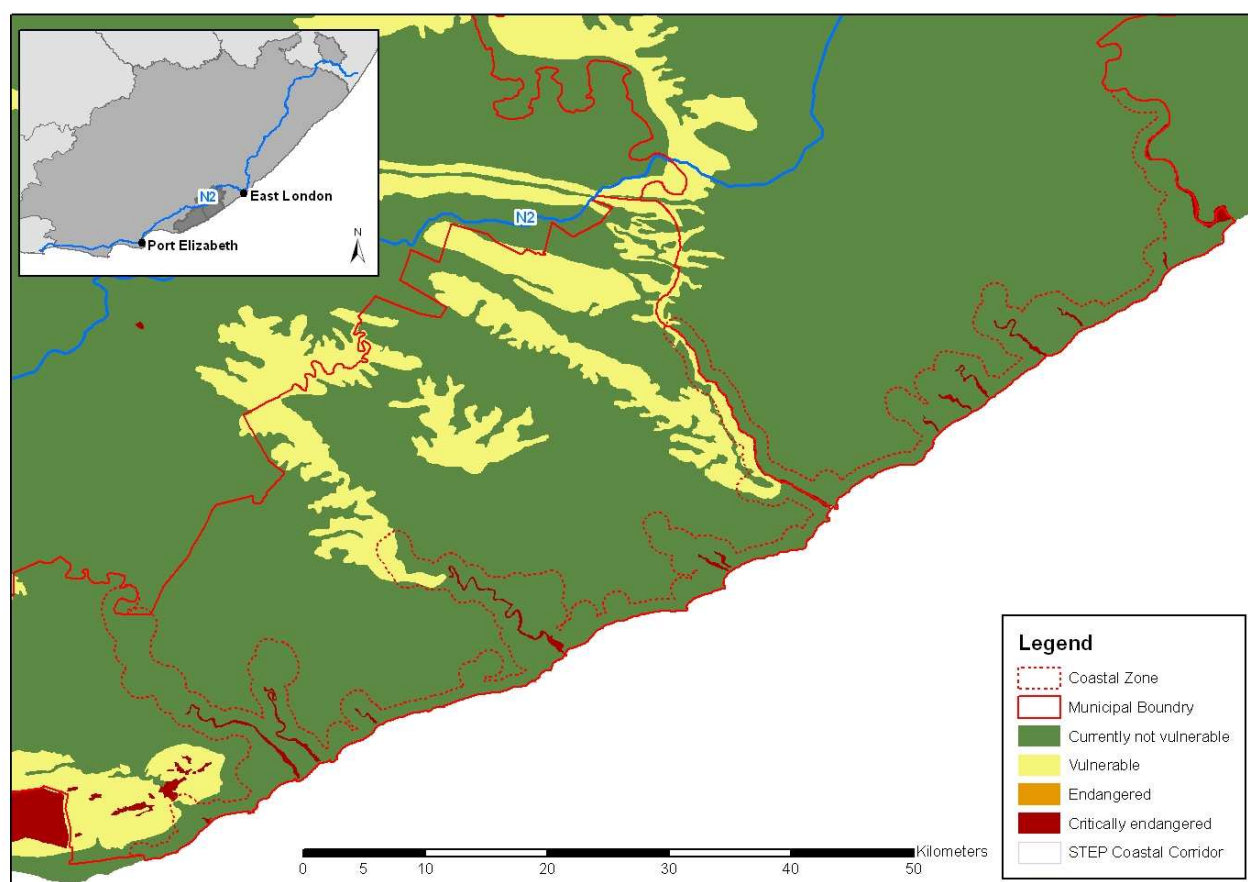


Figure H-1: STEP map showing sensitivity within the Ndlambe and Ngqushwa LMs

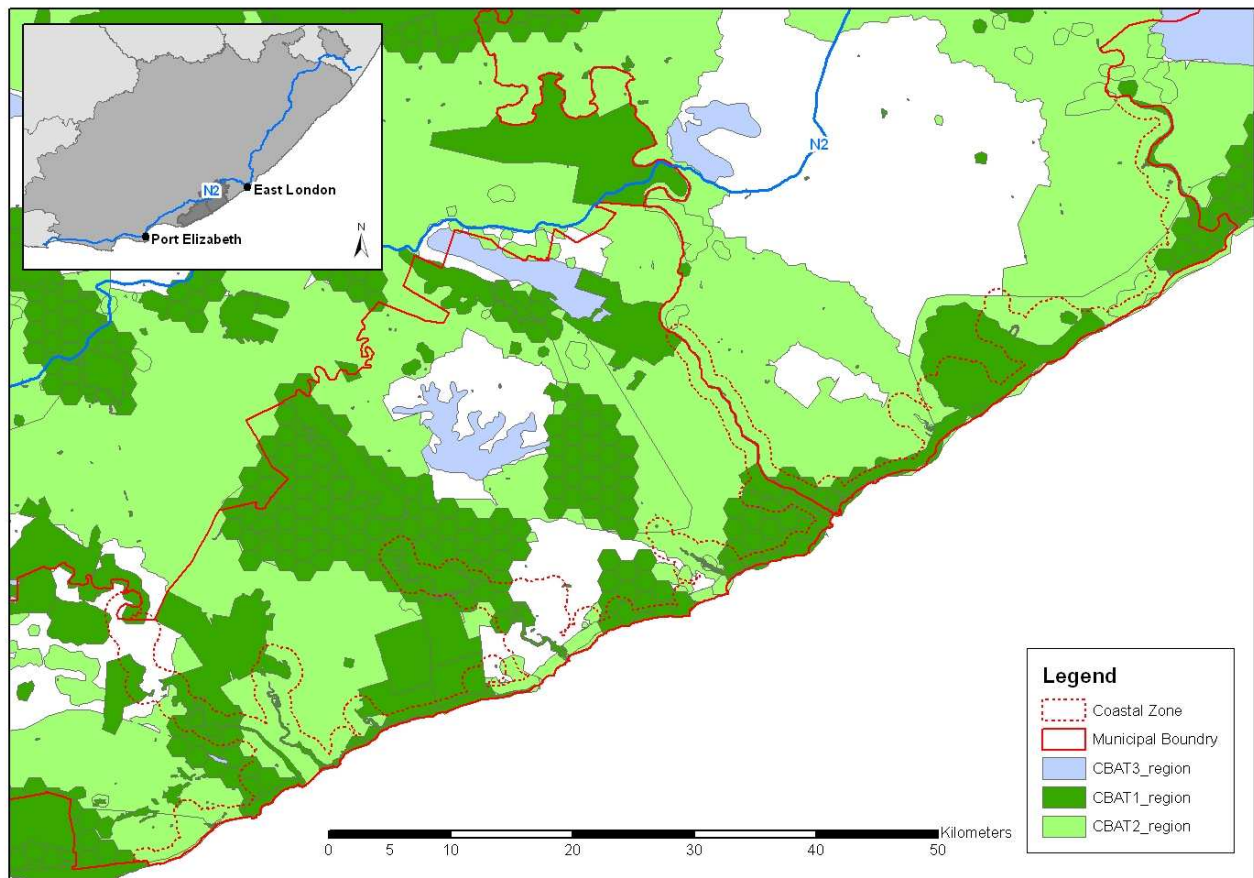


Figure I-1: ECBCP map showing sensitivity within the Ndlambe and Ngqushwa LMs