4. THE WESTERN CAPE PROVINCE TODAY

Figure 3.1 provides a conceptual structure for analysing the current opportunities and challenges facing the Province.

The various components of the analysis are ordered that the text according to the logic of sustainable development, beginning with the bio-physical environment which provides the finite resources for socio-economic development. The built environment provides the means by which society is able to structure its relationship with the national environment so as to continue reproducing. The economic sectors of Agriculture and Mining are discussed under the bio-physical because of these sectors' close relationship with the natural environment.
4.1 NATURAL SYSTEMS
4.1.1 GEOLOGY AND SOILS

4.1.1.1 INTRODUCTION

South Africa has a complex geological history dating back millions of years, and some of the oldest rocks on earth have been found here. Many geological formations in South Africa are rich in mineral deposits such as the Witwatersrand quartzites (gold), the Bushveld Igneous Complex (platinum) and the coal deposits found in formations of the Karoo sediments. However, the Western Cape is not well endowed with high-value mineral resources.

Most of the Western Cape’s rock types comprise sedimentary rock that was formed from material that has over years been laid down by wind and water erosion. The rivers carry the soil to the ocean where it is deposited. Over millions of years the sediment compacts, and due to heat and other factors, form into rock. Sandstone, limestone and shale are examples of sedimentary rock.

The mountains from Paarl to Piketberg were formed from lava or volcanic activity and comprise igneous rock. Granite, basalt and andesite are examples of igneous rock formations.

A prominent feature of Western Cape geology is the Cape Folded Mountains, which are rocks that have already been formed due to either lava activity or sedimentation and reformed under extreme heat and pressure - Metamorphic rock. Gneiss, quartzite and schist are examples of metamorphic rock formations (http://www.environment.gov.za/Enviro-Info/nat/geol.htm).

4.1.1.2 GEOLOGY

The major geological associations, which are groupings of geological formations into larger associated units, found in the Western Cape are as follows, and are shown in Figure 4.1.1.1. (http://www.environment.gov.za/Enviro-Info/nat/geol.htm).

Geology has a major influence on soil types and thus on agricultural potential.

- The Adelaide Subgroup: covers the whole Central Karoo area; consists mainly of mudstone, siltstone, sandstone and thin cherty beds;
- The Ecca Group: located south of the Central Karoo, stretching from the Eastern Cape to the Northern Cape; consists of sandstone, siltstone, mudstone shale and greywacke;
- The Cape Supergroup (Table Mountain Group and Bokkeveld Group): found widely across the entire Province from Plettenberg Bay in the east to Gansbaai in the south and Klawer in the west; consists mainly of shale, siltstone, sandstone, grit, greywacke and conglomerate;
- Soils derived from this parent material are usually not suitable for cultivation;
- The Malmesbury Group: covers the mountain area from Cape Town to Piketberg; includes materials such as greywacke and phyllite with beds and lenses of quartz schist, limestone and grit;
- This substrate provides the Province’s best soils for wheat, deciduous fruit and vineyards;
- The Vanrhynsdorp Group: located around Nuwerus and Vanrhynsdorp; consists mainly of sandstone, siltstone, mudstone, conglomerates and shale;
- The Namaqua Metamorphic Complex: found in the Namaqua area; consists of granite, granite-gneiss, gneiss, charnockite, amphibolite, schist and quartzite;
- The Enon Formation: covers mainly the Oudthoorn, Heidelberg and western Mossel Bay area; consists of conglomerates, sandstone, mudstone, siltstone and clay;
- This substrate provides soils that are usually not suitable for cultivation; and,
- The Various Coastal Deposits: cover mostly the coastal areas; consist of sand, dune and beach sand, mudstone, clay, lignite, limestone, calcarenite, calcruclite, sandstone, conglomerates, and calcareous sand. Coastal deposits are prone to erosion if the natural vegetation is disturbed, for example by cultivation.
4.1.3 SEISMIC ACTIVITY

During 2003 several seismic activities were recorded in the Western Cape. Although low activities were recorded in the Majtiesfontien, Prins Alfred and Bellville area, most of the activities occurred in the Ceres area, see Figure 4.1.1.2.

However, according to the Hazard Assessment Report, the area with the highest seismic intensity in the Western Cape is an area of approximately 80km wide and stretches from Bellville to Touwsrivier. Simply put, there is a 10% probability that an event with a seismic intensity of 7 or 8 will occur within the next 50 years in this area. (Gasson, 1998)

4.1.4 SUMMARY

- South Africa has a complex geological history dating back millions of years. Although many geological formations in South Africa are rich in mineral deposits, the Western Cape is not well endowed with high-value mineral resources;
- The major geological associations found in the Western Cape are: Adelaide Subgroup, Ecca Group, Cape Supergroup, Malmesbury Group, Vanrhynsdorp Group, Namaqua Metamorphic Complex, Enon Formation and Various Coastal Deposits. The substrates of the Malmesbury Group provide the Province’s best soils for wheat, deciduous fruit and vineyards; and,
- Although the Western Cape does not have a high occurrence of seismic activities, there is a slight risk of a major event.

REFERENCES AND ACKNOWLEDGEMENTS

- Gasson, B. The Biophysical Environment of the Western Cape Province in relation to its economy and settlements, School of Architecture and Planning, University of Cape Town for the Department of Local Government and Housing (Directorate of Development Promotion) of the Province of the Western Cape, 1998.
4.1.2 CLIMATE

4.1.2.1 INTRODUCTION

The Western Cape has a warm temperate Mediterranean climate along the coast with hot dry summers and cold winters, often below freezing inland. The Province is currently in a state of climate crisis. The western part of the Province is currently in the throes of a three year drought, with low dam levels and water restrictions in the City of Cape Town, while the Southern Cape has experienced severe floods in recent years.

Climatic features

The country’s subtropical location, on either side of 30°S, accounts for the warm temperate conditions so typical of South Africa, making it a popular destination for foreign tourists. The country falls within the subtropical belt of high pressure making it dry with an abundance of sunshine.

The wide expanses of ocean on three sides of South Africa have a moderating influence on its climate and particularly on the Western Cape. More apparent, however, are the effects of the warm Agulhas and the cold Benguela Currents along the east and west coasts respectively. While Durban (east coast) and Port Nolloth (west coast) lie more or less on the same latitude, there is a difference of at least 6° C in their mean annual temperatures.

Gale-force winds are frequent on the coasts, especially in the southwestern and southern coastal areas, mainly in the Western Cape.

4.1.2.2 BACKGROUND

Rainfall

South Africa has an average annual rainfall of 464 mm, compared with a world average of 860 mm. About 20% of the country has a total annual rainfall of less than 200 mm, 48% between 200 and 600 mm, while only about 30% records more than 600 mm. In total, 65% of the country has an annual rainfall of less than 500 mm (average of 600mm – 60% of the world average) usually regarded as the absolute minimum for successful dry-land farming.

South Africa’s rainfall is unreliable and unpredictable. Large fluctuations in the average annual rainfall are the rule rather than the exception in most areas of the country. Below-average annual rainfall is more commonly recorded than above-average total annual rainfall. South Africa is periodically afflicted by drastic and prolonged droughts, which often end in severe floods.

The Western Cape has three dominant rainfall zones, namely the winter, late summer and constant rainfall regimes. The Province has the highest rainfall variation of any of the South African provinces, with a low of 60mm and a peak of 3345mm (Gasson, 1998).

In Cape Town, the capital city of the Western Cape, the average rainfall is highest in the winter months, while in the capital cities of the other eight provinces, the average rainfall is highest during summer.

The interior of the Western Cape, namely the Karoo, experiences the severest conditions, and ranges in rainfall from as low as 100mm on the west coast to 300mm to the east. The decrease in the number of rain days also takes place along the same direction.

The above mentioned rainfall pattern along with the high temperatures and high evaporation rates produces periods of severe droughts, i.e. when the annual rainfall is less than 60% of the average annual total. This generally happens over the whole of the Province except for the South Cape Region. This produces insufficient soil moisture for continued plant growth over the large parts of the Province, namely the Central, Little and Doring Karoo and the northern part of the West Coast Region, see Figure 4.1.2.1. When this is combined with the degradation of soil cover apparent in parts of the Karoo, especially around Beaufort West, the danger of extensive desertification becomes apparent.

Figure 4.1.2.2 shows the desert and possible desert expansion projections between 1950 and 2050.
**Temperatures**

Temperature conditions in South Africa are characterised by three main features. Firstly, temperatures tend to be lower than in other regions at similar latitudes, for example, Australia. This is due primarily to the greater elevation of the subcontinent above sea level.

Secondly, despite a latitudinal span of 13 degrees, average annual temperatures are remarkably uniform throughout the country. Owing to the increase in the height of the plateau towards the northeast, there is hardly any increase in temperature from south to north as might be expected.

The third feature is the striking contrast between temperatures on the east and west coasts; this is due to the different sea currents, the warmer on the Eastern/Indian Coast (Agulhas current) and the colder current on the Western/Atlantic Coast (Benguela Current). In the Western Cape the variation of temperature as well as rainfall is also due to the proximity to the ocean, and change to range in elevation and mountain-valley relations (Gasson, 1998).

The temperature differences between summer and winter widen along a transect from the coast to the interior and with increasing variation. The Western Cape and the Northern Cape experience the highest moisture losses (in terms of potential evaporation rates) of any region in South Africa.

Sutherland has the highest number of days (202) when the temperature is less than 5°C followed by Grabouw and Ceres (106). Beaufort West and Klawer have the highest number of days with temperatures above 30°C, namely 97 and 93 days respectively.

The highest temperatures along with the high mean annual evaporation rates correlate with the areas that have a no-moisture growing season which means that the agricultural production in these affected areas will be dependent on irrigation (Gasson, 1998).

**Frost, humidity and fog**

Frost often occurs on the interior plateau during cold, clear winter nights, with ice forming on still pools and in water pipes. The frost season is longest (from April to October) over the eastern and southern plateau areas bordering on the Escarpment. Frost decreases to the north, while the coast is virtually frost-free. Average annual relative humidity readings show that, in general, the air is driest over the western interior and the plateau. Along the coast, the humidity is much higher and at times may rise to 85%. Low stratus clouds and fog frequently occur over the cool west coast, particularly during summer and the Cape Flats. The only other area that commonly experiences fog is the ‘mist belt’ along the eastern foothills of the Escarpment.

It is likely that when temperatures are below 5°C frost will occur. This has an impact for agriculture as no significant growth will occur when temperatures are approximately at freezing point (0°C).

80% of the Western Cape has a predicted average frost period (i.e. the time between the first and last frosts and between which frost days are expected) of only 10 days, 50% has an average frost period of 70 days, and 20% a period of 114 days. The attached Figure shows the spatial pattern of °C to -5°C areas, i.e. moderate to heavy frost prone areas. These are the higher elevation and the interior areas (Gasson, 1998).

**Sunshine**

The Western Cape is well known for its sunshine. January and February are the most pleasant months when the rainy season in the summer-rainfall region has ended, and before the rainy season in the western area has begun.

In other areas of South Africa, notably the hot, humid KwaZulu-Natal coast, Mpumalanga and Limpopo, June and July are the ideal holiday months. The Western Cape has some of its best weather on fine days in winter and needs to promote this season.

The Western Cape experiences extremely high solar radiation with high levels of ultra-violet rays exacerbating the danger of skin-cancer in light skinned people.

**Wind**

The prevailing wind directions at the coastal areas area roughly northwesterly and south-easterly in the south-western cape, easterly and westerly along the south coast and north-easterly and south-westerly along the south-east and east coast. On the west coast the main wind direction
is southerly in summer and north-westerly in winter. There tend to be direct on-shore and off-shore winds during this season (Weather Bureau, Dept of Environment Affairs, 1994).

Cape Town experiences severe southerly winds in summer and predominately north-westerly winds in winter. The coastal areas have off-shore winds in the winter and on-shore winds in the summer. In the interior the seasonal change in wind conditions are visible with the western interior having winds mainly from the south western sector in summer and the northern sector in the winter.

The area that experiences the windiest weather in August is generally the Beaufort West area. In the western and south-western coastal belt the strongest winds occur in midsummer (Cape Town) and in spring for the rest of the Province. Autumn and early winter have the least wind. The annual range of wind speed is greatest on the west coast and least in the northern interior.

Flood Hazards

Major flooding occurred in the Province in 1961 over the central part of the Karoo (Laingsberg, etc), in 1971 over the southern and eastern Cape between Mossel Bay to Port Shepstone. The 1981 floods in the south-western Cape produced the highest rainfall and some of the highest flooding peaks experienced in the South Africa (Gasson, 1998).

The Laingsberg flooding of 1971, regarded as South Africa’s greatest natural catastrophe, was due to the intensity of the flooding over a short duration of heavy storms. The Buffelsriver catchment received the highest one day rainfall of 160mm ever experienced in South Africa and over the three days a total of 280mm was recorded.

The Mossel Bay flood (238mm at Cape Blaize over 24 hours) of 1998 exceeded the 100 year event (Adamson, 1981).

Climate Change

Climate change refers to how the earth adapts to change in the amount of energy it receives from the sun. The climate normally takes hundreds of years to complete a warm-to-cold cycle, and the biosphere normally adapts easily when changes happen over such long periods. However, when the changes happen too quickly due to human intervention the biosphere is not able to adapt easily and negative effects result. Models predict that climate change over South Africa will increase with an estimated 2°C over the next century (Winkler, 2004). Those models suggest that if growth in emissions continues, global average temperatures are expected to rise between 1.4 and 5.8°C by the end of the 21st century. They have increased between 0.3 – 0.6°C during the last century and the warmest years globally have occurred since 1990. This suggests that right now the earth is in the midst of severe climate change.

The change in energy due to increased heat is caused by the excessive trapping of several “greenhouse” gasses (carbon dioxide from energy production and use and from deforestation, methane and nitrous oxide from agriculture and land use changes, and three artificial chemicals including halocarbons (FCs and PFCs and sulphur hexafluoride)). The trapping of these gasses in the atmosphere heats the earth, and is vital for life. However, concentrations of these gasses have increased by 26% since the pre-industrial age and 10% in the last 30 years. The increased concentration of greenhouse gasses due to burning of fossil fuels, (oils, coals, natural gas) and deforestation leads to more solar radiation (energy and heat). This process is called the greenhouse effect.

Researchers at the South African National Biodiversity Institute have explored the likely impacts of climate change in South Africa (see The Heat is On: Impacts of Climate Change on Plant Diversity in South Africa, National Botanical Institute, 2001).

Climate will not change uniformly across the globe. Land areas will warm up faster than the oceans and polar latitudes faster than temperate latitudes. Coastal temperatures will generally rise more slowly than inland temperatures, because of the moderating effect of the ocean.

In the Northern Hemisphere global warming may actually benefit agriculture, as areas that are currently too cold to farm become warmer. On the other hand, agriculture faces an uncertain future in the Southern
Hemisphere, where large areas will become as much as 3°C warmer and much drier. Higher temperatures are predicted over the whole of South Africa. January temperatures are expected to increase most in the central interior and Northern Cape and least at the coast. In general, summer rainfall will decrease by between 5% in the northern regions and 25% in the Eastern and southern Cape. Parts of the Western Cape may lose a significant portion of current winter rainfall.

In other words, over the next 50 to 100 years, the Western Cape will become hotter and dryer. Maps of changes in soil moisture days and biome shifts (see Figure 4.1.2.1) show clearly that the western part of South Africa, including the Western Cape, is likely to be more dramatically affected than the eastern part of the country. More recent research has refined these predictions, suggesting that they may be slightly less dramatic, but strongly confirming the overall "hotter and dryer" trends (Midgley, pers com).

The three main biomes in the Western Cape (see Section 4.1.5 on Biodiversity and Figure 4.1.2.1) will all be substantially affected by climate change. Within 50 to 100 years, areas that support succulent karoo vegetation may become so arid that only the hardest plants of that biome will be able to survive. Plants of the desert biome may colonise these areas, creating new plant communities not previously recorded. The Nama karoo will become drier and more desert-like, particularly in the west. The fynbos biome, which is also one of only six floral kingdoms in the world, is also likely to be severely impacted by climate change, especially in the west. The mountains in the fynbos region are likely to play an important role in providing cooler habitats at higher altitudes where plants and animals can survive. Coastal fynbos may experience less extreme changes in climate, thanks to the moderating effect of the ocean.

In addition to direct impacts on the ability of indigenous species to survive, climate change is likely to have a series of indirect impacts:

- As the climate becomes hotter and drier, fires may become more frequent and more extensive;
- Climate change may encourage the growth of invasive alien plants. Increasing levels of carbon dioxide in the atmosphere encourage the growth of these woody plants, while fynbos vegetation is less responsive to increased levels of carbon dioxide. Woody alien plants use scarce water resources and are a fire hazard; and,
- Climate change affects plants and animals in different ways. Animals that pollinate plants are important not just for natural vegetation but also for some of the Provinces major agricultural crops. Their ability to survive could be affected.

The South African Weather Service has noted that the resulting increases in heat and temperature in the atmosphere will have the following effects:

- Rainfall will increase in some parts of the country and decrease in others;
- Evaporation patterns will change and will strain much needed and limited water resources, particularly in the Western Cape;
- Malaria could increase as an insect carrying disease that is sensitive to the climate;
- Increased rainfall will generally result in increased carbon dioxide and would lead to an increase in wheat and maize production. Slightly warmer temperatures may lead to reduction in wheat yields with little effect on maize;
- Higher carbon dioxide will lead to less protein in grass and less rainfall will lead to less animal production;
- Rising carbon dioxide could help to reduce water use by plantations;
- Global warming will cause the mean sea level to rise due to the melting of the polar icecaps. Sea level has risen between 10 and 25cm during the last 100 years and it is expected that this rise will be between 15 and 95cm by the year 2100, causing flooding in low-lying areas (Winkler, 2004). The British Prime Minister, Tony Blair, noted during September 2004 that "if sea level rises as expected by 2100, 100 million people around the world who currently live below this level will be threatened";
- 50% of the Western Cape's 1100km coastline is sandy beaches and these are most at risk with likely effects such as erosion, landward retreat, flooding, tidal inundation of low-lying areas, salt water intrusion into coastal aquifers, elevated coastal zone water tables and greater exposure to storm events (Gasson, 1998), see Figure 4.1.2.2 indicating the sandy shorelines likely to have the severest effects;
- Changes in the oceans will impact on fish resources;
- The rapid rate of climate change means that some populations of plants and animals, especially local endemics, will not be able to move in response to changing habitat conditions, leading to extinctions and loss of biodiversity; and,
There is likely to be greater frequency of extreme events and longer droughts.

The Kyoto Protocol is an international agreement that aims to slow climate change down by increasing the "sinks" (processes to remove greenhouse gasses from the atmosphere, e.g. growing trees which in turn extract carbon dioxide for photosynthesis) and by decreasing the sources of greenhouse gasses (e.g. coal burning). This protocol targets amounts to 5.3% reduction from the 1990 greenhouse gas levels for industrialised countries. Unfortunately, one of the largest producers of these gasses, the United States, has refused to sign the Protocol.

Winkler (2004) compares South Africa with other countries in the world to determine its performance in terms of the Kyoto Protocol in and notes that South Africa had a 1% increase in the global contribution to carbon dioxide concentrations during the 1950 to 2000 period and a 17% increase in the carbon dioxide emissions between 1990 and 2000.

4.1.2.3 KEY ISSUES

- Climate change will impact negatively on the availability of water in the Western Cape, already a semi-arid Province. Protecting the functioning of freshwater ecosystems now, including rivers, wetlands and groundwater, will help to mitigate the impacts of this. For example, if rainfall is reduced and more variable, the functional role of wetlands in groundwater recharge, moderating water flow and purifying water becomes even more important;
- One of the main employment sectors in the Western Cape is agriculture that is dependent on rain and irrigation. The impact of climate change – reduced water provision and increased heat – will have a detrimental impact on agriculture;
- Climate change is currently occurring too quickly for the biosphere and humankind's interventions in the built and natural environment to adapt adequately;
- Climate change is likely to impact negatively on biodiversity, with changes in the distribution of biomes in the Province, possibly more frequent fires and increased growth of alien invasive plants;
- A climate change programme is needed to reduce the occurrence and effect of climate change;
- The use of more low carbon technologies or cleaner technologies are needed reduce amount of carbon dioxide released into the atmosphere;
- The need to raise the minimum standards for the energy performance of new buildings to an acceptable level is required. This is particularly relevant in housing and;
- The Province should play a role wherever possible in addressing the underlying causes of climate change. Although a large proportion of South Africa's Greenhouse Gas Emissions emanate from the industrial heartland of Gauteng and the coal burning power stations in Mpumulanga it is imperative that the Western Cape maximises its efforts to meaningfully reduce contributions to processes that are accelerating climate change. The Province could also play a role in and lobbying national government and the international community to take a stronger stance on reduction of emissions.

4.1.2.4 SPATIAL SUMMARY

- As the Western Cape climatic conditions vary from warm-moist in the South Cape, to dry-hot in the interior, to temperate in the south-west, the architecture and settlement planning need to be sensitive to these conditions (Gasson, 1998); and,
- The western part of South Africa and the Western Cape is likely to be the hardest hit by climate change, becoming hotter and drier over the next 50 to 100 years. This reinforces the importance of the key issues and recommendations in Sections 4.1.3 and 4.2.4 on water resources and water infrastructure, including reducing water demand and investigating water-efficient ways of expanding the agricultural economy.

REFERENCES AND ACKNOWLEDGEMENTS

- Gasson, B. The Biophysical Environment of the Western Cape Province in relation to its economy and settlements, School of Architecture and Planning, University of Cape Town for the Department of Local Government and Housing (Directorate of Development Promotion) of the Province of the Western Cape, 1998;
• Hewitson, B. Climate change – a cause for concern in Water Wheel, May / June 2004;
• http://www.number-10.gov.output/page6333.asp “British Prime Minister’s speech on climate change”, 2004;
• http://www.weathersa.co.za/references/climatechange.jsp “Climate Change: what, when and where?”;
• http://www.weathersa.co.za/references/fcterms.jsp;
• Midgley, G, South African National Biodiversity Institute;
• Mukheibir, P and Sparks, D. Water resource management and climate change: visions, driving factors and sustainable development indicators, Energy and Development Research Centre, UCT, 2003;
• Schulze, BR. Climate of South Africa Part 8, General Survey, Department of Environment Affairs, Weather Bureau, 1994;
• South African Weather Bureau (DEAT). The weather and climate of the extreme Western Cape, 1996;
• UCT. Sustainable development and climate change in South Africa: Two case studies for the development and climate change project, Energy and Development Research Centre, UCT, 2003;
• Winkler, H. Climate change overview, energy research centre, UCT, 2004;
• CSIR, A Status Quo, Vulnerability and Adaptation Assessment of the Physical and Socio-economic Effects of Climate Change in the Western Cape, CSIR Transport Report No. ENV-S-C 2005-073, 2005;
• Department of Environmental Affairs and Development Planning, Lutert Climate Change Study, 2005.
Figure 4.1.2.1 Impact of Climate Change
(source: Midgley et al)
Figure 4.1.2.2 Climate
4.1.3 WATER RESOURCES - HYDROLOGY

4.1.3.1 INTRODUCTION

Water resources in South Africa are limited and it is critically important to manage them effectively for the sustainable development of the country. It is projected that South Africa will experience water stress or water scarcity by 2025 under all United Nations population growth projections. The annual average amount of water available per person has been projected to decrease by more than 50% from over 1,300 m³ in 1990 to less than 700 m³ in 2025 as a result of population growth (River Health Programme RHP, 2003a).

4.1.3.2 BACKGROUND

Rivers

Rivers contribute to welfare and economic growth by providing goods and services. A healthy river provides food and medicinal plants; water for agricultural, industrial and domestic use; tourism, recreational and cultural use; and enhance property values. Examples of human activities that can impact rivers include water abstraction; disturbance to river-bank and -bed (e.g. dam and bridge construction in rivers; presence of invasive alien fauna and flora); development below the 1 in 50 year floodline (e.g. housing, sand mining, vineyards, forestry); and discharge of waste water or effluent of poor quality (RHP, 2003a).

River ecosystem status is based on assessment of ecological integrity, determined by the condition of instream and riparian (river bank) habitat, as well as water quality and flow. River signatures that are largely degraded or severely degraded are considered critically endangered – their ecological functioning and ability to provide ecosystem services is at risk.

River ecosystem status was used to assess the overall state of South Africa’s 19 Water Management Areas (WMAs), four of which fall in the Western Cape: Berg, Breede, Gouritz and Olifants Doring. Five of the 19 WMAs have more than 95% of their mainstems in a critically endangered or endangered state. Three of these – Berg, Breede and Gouritz – are in the Western Cape. The Olifants Doorn WMA is in the next worst off category (75-95% of mainstems in a critically endangered or endangered state).

<table>
<thead>
<tr>
<th>River ecosystem status</th>
<th>Proportion of WCape mainstem rivers</th>
<th>Proportions of SA mainstem rivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critically endangered</td>
<td>72%</td>
<td>41%</td>
</tr>
<tr>
<td>Endangered</td>
<td>25%</td>
<td>26%</td>
</tr>
<tr>
<td>Critically endangered +</td>
<td>97%</td>
<td>67%</td>
</tr>
</tbody>
</table>

Table 4.1.3.1: River ecosystem status in the Western Cape compared with whole of SA
(source: SANBI (2005) National Spatial Biodiversity Assessment)

Estuaries

Estuaries are unique habitats where rivers interact with the sea. Estuaries provide many goods and services to society, including food and bait collection; nurseries and refugia for birds; fish and crustaceans; tourism and recreation; cultural and spiritual activities; and materials for craftwork.

Estuaries are not only directly influenced by human activities such as over-exploitation of fish and waste discharges, but also indirectly through activities taking place in the catchment. Storage and abstraction of water within the catchment reduce the amount of freshwater that reaches the estuary, thereby increasing the marine influence on the estuary. Waste discharge affects estuarine water quality, and erosion in the catchment leads to deposition of silt in the estuary (RHP, 2003b).
Wetlands
Wetlands result from periodic flooding of land for varying durations. They have characteristic vegetation, soils and fauna and include mountain seeps, midland marshes, swamp forests, stream bank wetlands, estuaries or open coasts. Wetlands are valuable for natural water purification, flood control, water storage, flow regulation, soil erosion protection, as recreational areas or as habitat for aquatic life (RHP, 2003).

Riverine wetlands are connected to river systems and gain their water from rivers. These wetlands are directly influenced by stream conditions and threats to rivers. Wetlands that get water from seeps and overland flow are water sources for river systems— they influence the rate and quality of water that enters into adjacent systems, and have the potential to buffer rivers from factors such as flash flooding (Van Nieuwenhuizen et al, 1999). The conservation of the remaining wetlands is becoming increasingly important, because more than half of South Africa’s wetlands have already disappeared (RHP, 2003).

Water Quality in the Western Cape
The quality of water has been described according to the four Water Management Areas (WMAs), see Figure 4.1.3.1.

Berg River Water Management Area
- Several mountain streams, certain reaches of the Berg River, and also the estuary, are of high ecological significance;
- Wetlands occur in the area, of which the Rietvlei Wetland is of particular ecological significance, and there are however no natural lakes in the WMA (the renowned Langebaan being a saltwater system connected to the ocean);
- The natural quality of the surface water is of a high standard in the upstream reaches and mountainous areas;
- Commercial afforestation is insignificant, and with most of the urban development concentration along the coast, this has little impact on surface runoff;
- Due to the underlying geological formations, tributary inflows to the lower reaches of the Berg River are of high salinity, which limits their usability;
- Water quality in the estuaries and lower tidal reaches of the rivers are characteristically of high salinity (including the Diep River), and requires careful management when used for irrigation purposes;
- The water quality of several small rivers in the vicinity of Cape Town is impacted by effluent return flows and wash-off to streams from urban areas. Special attention also needs to be given to the management of water quality in the lower Berg, Eerste and Kuil Rivers; and,
- Quality of groundwater is of a high standard in southern and south-eastern parts of the WMA – mineralization problematic towards the north-west. There are concerns about the potential pollution of sandy aquifers through infiltration of urban effluent, especially in the City of Cape Town.

Breede River Water Management Area
- The only natural lakes in the WMA are Soutensdalsvlei on the Nuwejaars River and De Hoop Vlei, which is a blind water body at the end of the Sout River;
- Extensive wetlands also occur in the vicinity of these lakes as well as at the Kars River Vlei. Some relatively undisturbed estuaries are found, of which the Botrivier Vlei and Kleinrivier Vlei are of particular high ranking from a conservation perspective;
- Commercial forests in the Overberg West sub-area and in the upper reaches of the Breede and Riviersonderend Rivers have notable impact on the runoff. Significant areas of invasive alien vegetation are also found in parts of the WMA;
- In its natural state the quality of surface water is of a high standard in the upper reaches of rivers and in the mountainous areas;
- Due to the influence of geological formations, however, water quality starts to deteriorate in the middle reaches of the Breede River with an increase in salinity further downstream;
- Water in the eastern coastal rivers is of natural high mineral content, with salinity in the Sout River unacceptable for most uses (as implied by the name of the river);
- Water quality in the Breede River is also highly impacted upon by irrigation return flows. In the middle reaches of the Breede River downstream of Brandvlei Dam, the salinity rapidly deteriorates as a result of irrigation return flows, which is diluted further downstream by blending with inflow from the Riviersonderend River. About 20 million m³ per year is also released from Brandvlei Dam for freshening purposes downstream; and,
- Groundwater quality in the higher lying areas and in the western part, of a very high standard, but deteriorates rapidly in the lower areas to the east and south-east, where water is unfit for most uses. - It is
important that groundwater levels along the coast be carefully managed to prevent the intrusion of seawater into aquifers.

Gouritz River Water Management Area
- Several important coastal lakes and estuaries are found, with the Knysna Estuary being rated as the estuary of highest conservation importance in South Africa, with high rankings also given to the Swartvlei, and Keurbooms and Wilderness estuaries;
- Land use impacts mainly relate to a reduction in runoff in coastal rivers as a result of afforestation as well as due to substantial infestations by invasive alien vegetation in the southern parts;
- Water quality in the inland (Karoo) rivers is generally poor as result of high salinity of the water;
- In most of the tributaries the quality tends to deteriorate downstream as a result of the geology and evaporation from the rivers, with water in the Groot River of particular poor quality. Water quality in the upper reaches of the Olifants River is of a high standard, but also becomes highly mineralised downstream;
- Water in the lower reaches of the Gouritz River is unacceptable for most uses due to high salinity. Water quality in the coastal rivers is generally good and suitable for most uses, although not ideal. Impacts of human activities are also evident in some of these rivers;
- In the Gouritz River catchment the development of surface water resources has reached its capacity and all the water is fully utilised; and,
- Generally the quality of groundwater is suitable for most use, although brackish water is commonly found in drier areas.

Olifants Doring River Water Management Area
- The estuary at the mouth of the Olifants River is ranked third amongst the estuaries in the country in terms of conservation importance, whilst the Olifants River system contains the highest number of endemic fish in any system south of the Zambezi River;
- The wetland area at Verlorenvlei has been designated Ramsar status as a wetland of international importance, and there are no natural lakes in the WMA;
- Land use impacts mainly relate to reduction in runoff due to infestations by invasive alien vegetation, mainly along watercourses in the Sandveld and along the Olifants River;
- In the natural state, water in the Olifants River upstream of the Doring River confluence as well as in the Groot River, is of high quality;
- Surface runoff from the drier parts of the Doring River catchment (excluding the Groot River catchment) is typical of high salinity, but with the salinity concentrations varying seasonally and with the flow in the river;
- As a result of the mixing of waters from the Groot, Doring and Olifants Rivers, a unique salinity regime exists in the Olifants/Doring River system, which is of specific importance to the local aquatic ecosystem. Irrigation return flows add to the salinity levels in the lower Olifants River Estuary; and,
- Quality of groundwater varies greatly over the area, at several locations water is too mineralised for any direct use and desalination is required. In general groundwater is of a good quality, but becomes highly mineralised (brackish to saline) in the drier regions.

Reserve requirements
Implementation of the reserve would have a significant impact on the potential yields of existing and future schemes, with most estimates of the ecological component being provisional at this stage. The ecological component refers to that portion of streamflow which needs to remain in the rivers to ensure the sustainable healthy functioning of aquatic ecosystems, while only part of the remainder can practically and economically be harnessed as usable yield. Current provisional assessments indicate, as a national average, about 20% of the total river flow is required as an ecological reserve which needs to remain in the rivers to maintain a healthy biophysical environment.

4.1.3.3 CONSERVATION OF RIVERS

According to Impson quoted in SoER (2004) rivers in the Western Cape, especially their middle and lower reaches, are poorly conserved, resulting in their biota encountering ever-increasing levels of anthropogenic disturbance. The longitudinal nature of rivers makes them extremely difficult to conserve in formal protected areas, as ideally, whole systems including their catchments require protection. Few if any of the protected areas within the Province were designed to conserve representative and functional riverine ecosystems and their fishes. There is an almost total bias towards conserving montane areas and their associated headwater river...
zones, due to the proclamation in the 1970s of Mountain Catchment Areas to conserve water supply to the Province. Generally the middle and lower reaches of rivers, where endangered species such as Clanwilliam sandfish, sawfin and whitefish occur, are highly impacted and poorly conserved.

River areas of critical importance to the conservation of freshwater fishes in the Province were mapped at the 1:50 000 scale. The key considerations were biodiversity hotspots, river areas of critical importance to the conservation of a threatened species or unique population of a species and adopting a catchment approach when identifying the boundaries to critical areas. 35 river areas were identified as being of critical conservation importance to freshwater fishes, with the majority in the Olifants River System (habitats and areas are situated across the Province in both mountainous and lowland areas). The existing protected area network, especially provincial nature reserves, makes a substantial contribution towards freshwater fish conservation. However, several highly threatened species are not conserved and fishes in reserve areas frequently share reserve habitat with highly predatory invasive alien fish species (Impson et al., 2000).

Freshwater Biodiversity Assessment
This project forms part of the National Biodiversity Strategy and Action Plan, and is a joint DWAF-CSIR-WRC initiative. The project aims to develop a policy and planning tool for the systematic conservation of river biodiversity in South Africa.

River Health Programme
As the custodian for water resources in South Africa, the Department of Water Affairs and Forestry (DWAF) is responsible for the protection of the health of aquatic ecosystems and for ensuring their sustainable use. The River Health Programme (RHP) was initiated in 1994, and forms a key part of this responsibility. The RHP assesses the biological and habitat integrity of rivers (e.g. fish, aquatic invertebrates and riparian vegetation). This assessment enables reporting on the ecological state of river systems in an objective and scientifically sound manner, and identification of those areas where unacceptable ecological deterioration is taking place. At the national level, DWAF plays the leading role while the Department of Environmental Affairs and Tourism and the Water Research Commission are active partners, with implementation of the programme being co-ordinated at a provincial scale (RHP, 2003a).
Figure 4.1.3.1 Hydrology
4.1.3.5 LEGISLATIVE CONTEXT

Key legislation and policy framework include the following:

- **National Water Act, 1998 (NWA)** – the principle legal instrument relating to water resource management in South Africa. The act requires that the health of aquatic ecosystems is monitored, and upholds certain legal principles such as water quality and quantity of the ecological reserve;

- **Water Services Act, 1997** – provides for the rights of access to basic water supply and basic sanitation, a regulatory framework for water services institutions and water services intermediaries. Identifies municipalities as water services authorities and requires that they prepare, and each year update the Water Services Development Plan;

- **Water Service Sector Strategy for the Western Cape** – aimed at promoting close collaboration amongst sector partners, and focussing on strategic areas that require combined and joint efforts;

- **National Water Resource Strategy, 2004 (NWRS)** – provides the framework within which the water resources of South Africa will be managed in the future. The NWRS sets out policies, strategies, objectives, plans, guidelines, procedures and institutional arrangements for the protection, use, development, conservation, management and control of the country’s water resources. Objectives for the strategy include, to achieve equitable access to water, to achieve sustainable use of water, and to achieve efficient and effective water use;

- **Catchment Management Strategies (CMS)** – The country has been divided into 19 Water Management Areas (WMAs), with four being located in the Western Cape. The delegation of water resource management from central government to catchment level will be achieved through the establishment of Catchment Management Agencies (CMAs) at a WMA level. Each CMA will progressively develop a Catchment Management Strategy (CMS) for the protection, use, development, conservation, management and control of water resources within its WMA. DWAF’s aim is to eventually hand over certain water resource management functions to CMAs, but until such time as the CMAs are established and fully operational, the Regional Offices of DWAF will continue to manage the water resource in their areas of jurisdiction;

- **Internal Strategic Perspectives (ISPs)** – the objective of the ISPs is to provide a framework for DWAF’s management of the water resources in each WMA, until such time as the Regional Offices can hand over its management functions to an established CMA;

- **National Environmental Management Act, 1998**;

- **Environment Conservation Act, 1989**; and,

- **National Biodiversity Act, 2004**.

4.1.3.6 KEY ISSUES

- 97% of all of the mainstem river ecosystems in the Western Cape are in a critically endangered or endangered state. This is an alarming state of affairs and requires widespread and urgent action;

- Poor water quality in the middle and lower reaches of most rivers - special attention need to be given to the management of water quality especially in the lower Berg River. Poor water quality impacts on limited use for human consumption, high water quality standards for export purposes, causes health risks etc.;

- Highly saline water in most rivers – need to prevent salinisation of soils, and address the impact of irrigation return flows on salinity levels, high costs associated with desalination;

- Strong connectivity between surface and groundwater recharge from surface water is induced through lowering of water table, groundwater abstraction along the coast also needs to be carefully managed to prevent intrusion of seawater into aquifers; and,

- Co-operative governance, planning and implementation in the management of water resources- good coordination between the various role players require an integrated, holistic approach.

4.1.3.7 SPATIAL SUMMARY

The mainstem rivers in all the WMAs in the Western Cape are in trouble, owing to over-extraction of water, disturbance of riparian habitat, and impacts of land use in catchments. Their ecological functioning has been compromised. The Berg, Breede and Gouritz WMAs are particularly severely affected.

Some tributaries throughout the Province, and some mainstem rivers in the Southern Cape, are still in a good ecological condition. It is important to keep these rivers in at least their present condition, and to rehabilitate others.
Rehabilitation can be pursued through implementation of the National Water Act, as well as through programmes such as Working for Water, Working for Wetlands and C.A.P.E.

It is clear that the measures contained in the National Water Act (36 of 1998) and Conservation of Agricultural Resources Act (43 of 1983) to protect riparian zones have not been effective. The reasons for this must be urgently assessed and effective measures put in place.

REFERENCES AND ACKNOWLEDGEMENTS

- River Conservation Unit (DWAF - CapeNature) River Health Programme (RHP), 2003;
- Pers comm. Mr Willie Enright, Department of Water Affairs and Forestry, Cape Town Regional Office;
- Pers comm. Mr Gerrit van Zyl, Department of Water Affairs and Forestry, Cape Town Regional Office;
4.1.4 TOPOGRAPHY, VISUAL AMENITY AND ARCHITECTURAL STYLE (SCENERY)

4.1.4.1 INTRODUCTION

The Western Cape’s topography ranges from coastal plans edged with steep cliffs and sandy beaches, over dramatic mountain ranges often enclosing secluded valleys, to the wide cosmic inland plains of the Karoo. This pattern has resulted in some of the most dramatic and varied landscapes in South Africa. Covering some 129 370 km² (making it the fourth largest Province in South Africa in land area), the landscape varies from semi-desert in the west and north to forests fringing the southern coasts, see Figure 4.1.4.1.

Spectacular mountain ranges are to be found throughout the Province. These mountains form the backdrop to or enfold the spectacular and dramatic scenery, thereby contributing to the diversity of natural landscape experiences and scenic routes, and the popularity of the Western Cape as a tourist destination.

The impact of human activity has had a pronounced impact on the natural landscape and the need to manage and control such impacts are key to protecting the scenic qualities and visual resources of the Province.

4.1.4.2 BACKGROUND

Topography
The Cape Fold Belt, is an L-shaped band at the south-western corner of Africa, comprising erosion-resistant, quartzitic sandstone mountains alternating with plains and valleys underlain by softer shales, and mantled at the coastal margin with young siliceous and calcareous sediments (see Section 4.1.1). Inland the Fold Belt grades into the plains and koppies of the Central Karoo and Namaqualand, to the east and northeast, and north, respectively (SoER, 2004).

The eastern region (Eden, Overberg and Central Karoo districts) of the Province is characterised by alternate east-west mountain ranges and valleys starting at the coastal plains and undulating hills of the Southern Cape and Overberg, which are backed by the Riviersonderend, Langeberg, Outeniqua and Tsitsikama mountain ranges (refer to Figure 4.1.4.1), before giving way to the Little Karoo including the Langkloof. The Swartberg and Baviaanskloof mountain ranges fringe the great plains of the Central Karoo, which is characterised by semi-desert landscapes with flat-topped inselbergs and koppies.

The central region (Cape Town and Cape Winelands districts) starts with the world-renowned Table Mountain in the southwest which descends to the Cape Flats, which in turn gives way to the spectacular rolling country (Boland) of the Cape Winelands district, including Stellenbosch, Franschhoek, Breede River, Ceres, Tulbagh and Hex River. This region is bounded by the Hottentots-Holland, Wemmershoek, Du ToitsKloof and Hex River Mountain ranges which, in turn, fringe the Bokkeveld plains.

The West Coast region includes the coastal plains and undulating hills of the Sandveld and Swartland, which are broken by the Olifants River and Winterhoek Mountains, giving way to the Olifantsrivier Valley and the Cederberg and Swartkraggens mountain ranges to the east and Namaqualand Plains, Knersvlakte and the Bokkeveld Escarpment to the north.

Landscape Types and Visual Carrying Capacity
The structure of an area’s topography impacts on the spatial qualities of that landscape. For example one can distinguish between a continuous environment such as the Central Karoo and an area of sub-places e.g. valleys such as the Breede River Valley. These different landscapes evoke different feelings and experiences.


- Cosmic landscapes comprise large flat plains where cadastral boundaries tend to be geometric or based on arbitrary subdivisions such as the original hexagonal farm boundaries of the Agulhas plain based on the radius that a horse could be ridden from a central point;
Examples include the large plains of the Central Karoo, the Agulhas Plain and the Strandveld and Sandveld of the West Coast:

- **Romantic landscapes** consist of rolling undulating hills often forming an interface zone between the mountains and the plains, for example, the Boland Hills of Stellenbosch and Drakenstein municipalities;
- **Classical landscapes** are formed by the dramatic cliffs and escarpments of mountain ranges and steeply enclosed valleys in between, for example the mountain ranges of the south western cape from the Cedarsberg, Hottentots Holland, through to the Swartberg and Outeniqua / Tsitsikama; and,
- Often there are zones of overlap between these three broad areas resulting in a profusion of different landscape types. These are known as complex landscapes and tend to present locations of opportunity such as the entrance to mountain passes or river crossings. Hence, most settlements tend to be located in this landscape.

It is often at the junctions between the different landscapes where settlements are located, for example, where the mountains meets a plain, e.g. Beaufort West, or where there is a pass linking one plain to another across a mountain range e.g. Ceres, De Rust.

There is a strong relationship between landscape type and visual carrying capacity. For example, a number of buildings on a flat plain will be far more exposed than the same number of buildings located between rolling hills. Such buildings could be completely hidden from view in a mountainous landscape. Thus, visual carrying capacity tends to be higher the more undulating the landscape.

**Visual Impact, Layout and Style**

The visual impact of urban settlements structures and activities within different environments should enhance and respond to the natural environment and built heritage in which they are located. This raises the issue of appropriate layout and architectural character within the Province. There is increasing concern about the appropriateness of globalised styles such as Tuscan architecture that are increasingly imported into the Western Cape notwithstanding its own existing rich settlement making tradition and architectural context. This concern is not just being raised by certain design professionals but by the popular press, (Burger, 2004) and the property industry.

"Tuscan villas may look great in Tuscany but they look terrible here. There is a crying need for the emergence of an authentically South African style. Come on - we're a modern emerging African nation that believes in democracy, openness and transparency. We're multi-cultural and tolerant. Surely, there is a way of using all of that to create our own unique architecture". (Valli Moosa: 2004 : 17) (See Figure 4.1.4.3)
Scenic Routes
There have been various responses to this issue, for example, as part of the preparation of the Western Cape Integrated Tourism Development Framework the various district tourism organizations were asked to do an inventory of the tourism products on offer within that district (ref: KPMG, 2001). As part of the product offer scenic routes were identified, see Figure 4.1.4.4.

Most of these routes relate to the mountain passes in the Province where the spectacular surrounding mountain topography or the views across the adjacent valleys create the enjoyment of that environment.

The N1, N2, N7 and N12 national roads which link Cape Town and the Western Cape to the surrounding Provinces have in their totality also been identified as scenic routes as these roadways are the main carriers of road vehicle visitors to the Province and traverse the valleys, mountains and plains (e.g. Central Karoo and Namaqualand) of the Province.

Visual Resource Management
The impact of human activity particularly with respect to urban development, agriculture and forestry has had a pronounced impact on the natural landscape.

The need to classify and control the impact of such activity on the landscape is moving strongly to the forefront, and although visual impact assessments and design guidelines are becoming standard requirements for large developments in the urban and peri-urban environments, a number of activities such as farming buildings are not covered by such requirements.

A number of visual resource management and impact assessment systems are being applied in the Western Cape, but what is required for the Province is a standard system through which the scenic values of the landscape can be identified and evaluated to determine the appropriate levels of visual management.

Some of the classifications that are used to accurately describe the visual attributes of a particular landscape include:

- Landscape usage: this relates to the extent of human usage as well as categorizing the type of use e.g. urban, peri-urban, rural, agricultural and wilderness areas which can be further subdivided into the density or structure of urban areas, the type of agriculture and remoteness of the wilderness;
- Landscape type: the classification describes the overriding physical features of the landscape e.g. mountains, escarpment, valley, lake, estuary, etc. Many landscapes contain more than one of these types;
- Landscape description: the classification describes the landscape in terms of the predominant vegetation found e.g. grassland, forest, wetland, semi-desert, etc. Many landscapes contain more than one of these types;
- Human Intervention in the landscape: The classification describes the built elements found in the landscape e.g. roads, agriculture activities, quarries, airfields, communications towers, etc.;
- Position in the landscape: this describes the landscape in terms of the relationship between the elements located within e.g. foreground, middle ground and background; and,
Qualitative description: an attempt to qualify the feel of the landscape e.g. pristine, degraded or polluted, but although certain guidelines can be used this description is not always scientific and quantifiable.

Visual Resource Management Assessments can be used as a forward planning tool to analyse and make recommendations for the control of future development in scenically sensitive areas.

**4.1.4.3 KEY ISSUES**

- The impact of human activity on the landscape is seldom controlled outside of larger urban areas and even in this context the effects of control are indiscernible or questionable. Not only does this have an impact on the natural scenic qualities of the environment, but also on existing heritage attributes. Therefore, it is important that a standard classification and management system be introduced, but that takes into account the nuances of the different landscape types;
- Large-scale developments such as holiday resorts, golf courses, golf estates and polo estates as well as powerlines and, possibly in the future, windfarms are having a significant impact on the natural landscape in areas such as the Southern Cape. Controls need to be put in place to manage the impact and the extent of these types of developments;
- Adventure and eco-tourism are two of the most significant tourist activities in the Province. These tourism categories both centre around, and are dependent on, the Western Cape’s natural environment and therefore the nature of these environments needs to be protected and managed, if tourism’s role as a growth sector in the Province is to continue;
- There has been significant growth in the film-making industry in the Cape Town environs in recent years as the environmental location, “sense of place”, natural beauty with mountains and beaches, combined with the comforts of an established urban infrastructure, make it an attractive location. The film industry however also impacts directly on the physical environment as the making of films often require the temporary modification of the environment, which may cause environmental damage; and,
- The natural diversity of the topography of the Western Cape allows for a great number of outdoor sports, including hiking, abseiling, biking and mountain biking, 4X4 trails, etc. Again, the interaction of these activities with the environment is two-fold in that these activities benefit from the scenic qualities and landscape attributes, but unmanaged use may result in permanent environmental damage.

**4.1.4.4 SPATIAL SUMMARY**

- The topography and settlement patterns of the Western Cape have resulted in a unique matrix of Romantic, Cosmic, Classical and Complex landscapes, ranging from the complex landscape of the City of Cape Town to the cosmic landscape of the Central Karoo. Human settlement need to be understood in the context of the natural place that ‘contains’ them and therefore it is important that more emphasis is put on defining guidelines for the appropriateness of different forms of human settlement within different landscapes;
- Areas with exposure to large numbers of people, especially passing tourist traffic, require special consideration; and,
- The preparation of guidelines for site planning and choice of building materials and their implementation, including settlement on farms need to be prioritized, especially in areas identified as pure cosmic, romantic or classic landscape areas (for example the Tulbagh Valley) and Scenic Routes.

**REFERENCES AND ACKNOWLEDGEMENTS**

- Moosa, MV. In an Interview with Sue de Groot, The Property Magazine, 2004;
- Die Burger, 2004;
- KPMG. Integrated Tourism Development Framework for the Western Cape, Department of Economic Development and Tourism, PGWC, 2001;
- CNDV Africa. Wind Farm Landscape Assessment Methodology, in the course of preparation, PGWC, 2005.
Figure 4.1.4.1 Topography
4.1.5 BIODIVERSITY

4.1.5.1 INTRODUCTION

The term biodiversity refers to genes, species (plants and animals), ecosystems, and landscapes, and the ecological and evolutionary processes that allow these elements of biodiversity to persist over time. South Africa ranks as the third most biologically diverse country in the world, and as such is of major global importance for biodiversity conservation. Within South Africa, the Western Cape is particularly rich in biodiversity.

The Province is internationally renowned for its biodiversity and houses two of the world’s 34 global biodiversity hotspots – the Cape Floristic Region (CFR) (or fynbos biome) shared with the Eastern Cape, and the Succulent Karoo biome shared with the Northern Cape and southern Namibia. Global biodiversity hotspots are characterised by the fact that they contain more than 0.5% of the world’s endemic species and are under great pressure from human impacts. The Cape Floristic Region is one of only six world plant kingdoms, and has recently been approved as a natural heritage site under the World Heritage Convention (DEADP, 2004). South Africa’s first National Spatial Biodiversity Assessment recently confirmed the Cape Floristic Region and the Succulent Karoo as two of the country’s nine national biodiversity priority areas.

The three main biomes in the Western Cape are fynbos (most of the coastal plains and mountains), succulent karoo (in Namaqualand and the Little Karoo), and nama karoo (in the Central Karoo). A significant proportion of the country’s remaining indigenous forest biome occurs in the Garden Route, and there are small patches of Albany thicket in the Southern Cape. (Biomes not found in the Western Cape are grasslands, savanna, and desert.) The biological richness of these biomes and other ecoregions in South Africa is well documented in the Endangered Wildlife Trust’s publication The Biodiversity of South Africa, see Figure 4.1.5.1.

4.1.5.2 BACKGROUND

Two statutory bodies manage national and provincial conservation areas in the Western Cape. South African National Parks (SANParks) is responsible for managing national parks, and Cape Nature is responsible for managing provincial conservation areas, including wilderness areas such as the Cedarberg. Cape Nature’s mandate extends to protecting biodiversity throughout the Province, not just in protected areas but also in productive landscapes, i.e. agriculture and horticulture. A wealth of conservation research has emerged from the Western Cape over the past decade that has placed this Province on the global map of biodiversity importance, and assisted in channelling international donor funds towards conservation initiatives within the Province. The Western Cape is a forerunner for conservation initiatives in the country.

Systematic Conservation Planning

Over the last decade there has been a growing awareness that a systematic approach is more effective at conserving biodiversity than the ad hoc approaches of the past. Systematic Conservation Planning offers a systematic and scientifically defensible method of selecting and prioritising areas to achieve explicit conservation goals. Three major regional Systematic Conservation Planning exercises have already been undertaken in the Western Cape. Each of them has led to a multi-sectoral biodiversity conservation programme, building on the results of the planning phase.
i) Cape Action for People and the Environment (C.A.P.E.)
This programme focuses on the Cape Floristic Region (CFR), and was the first of these exercises to be undertaken in 1999. Subsequent to the planning phase, the CAPE Programme, funded through the Critical Ecosystem Partnership Fund and the Global Environmental Facility, was launched to ensure the conservation of biodiversity of the CFR, and through this to deliver sustainable economic benefits to the people of the region. This programme has facilitated interaction among key individuals and organisations, and led to formalised interaction and inter-agency cooperation agreements. CAPE's broad-scale spatial plan targets over 60% of the remaining natural vegetation of the CFR for conservation action. Remnants of the last remaining natural veld in lowland areas have been identified as "irreplaceable" conservation priorities (DEADP, 2004). Additionally, three sites with adequate natural habitat to create conservation units greater than 500,000 hectares were identified as potential regions for biodiversity corridors, namely the Gouritz Initiative, Greater Cedarberg Biodiversity Corridor and the Baviaanskloof Conservation Area.

ii) Subtropical Thicket Ecosystem Programme (STEP)
The STEP project was initiated in 2000 to improve the safeguarding of the unique biodiversity of the subtropical thicket biome, straddling the Western and Eastern Cape Provinces. As part of this process, a STEP Handbook was also produced to assist municipalities in integrating the biodiversity conservation priorities into land use decisions.

iii) Succulent Karoo Ecosystem programme (SKEP)
The SKEP programme was initiated in 2002 in the Succulent Karoo biome, which straddles Namibia and South Africa (Northern Cape and Western Cape). It involves a 20-year strategy, identifying priority areas for conservation action and promoting the conservation of succulent biodiversity in nine identified priority areas (DEADP, 2004).

The National Spatial Biodiversity Assessment (NSBA) was recently completed as part of the drafting of a National Biodiversity Strategy and Action Plan. The NSBA aims to identify broad spatial priority areas for conservation action, and to provide a national context for conservation planning and the sub-national scale. It also identifies threatened ecosystems, in the terrestrial, freshwater, estuarine and marine environments. The terrestrial and river assessments are reflected in this report (see Section 4.1.3 on water resources, and Section 4.1.5.3 below).

Conservation Initiatives
In addition to, or as part of, the C.A.P.E., SKEP and STEP programmes, there are numerous spatially based conservation initiatives in the Province. Figure 4.1.5.2 shows where most of them are located, including the locations of current and proposed fine-scale biodiversity planning initiatives in the C.A.P.E. programme. The focus of most of these initiatives is on landscape-scale conservation, which enables conservation of a whole suite of plant and animal species as well as ecosystem functioning.

i) Agulhas Biodiversity Initiative (ABI)
SANParks has successfully launched this cross-sectoral conservation initiative in the Agulhas Plain lowland area, which forms an integral component of the C.A.P.E. programme. ABI is designed to address the main pressures on the globally significant lowland fynbos biodiversity of the Agulhas Plains, and to improve the livelihoods of the local communities through a multiplicity of inter-linked conservation, development and socio-economic activities (DEADP, 2004).

ii) Greater Cederberg Biodiversity Corridor (GCBC)
Cape Nature is the lead agent for the implementation phase of this partnership initiative between communities, landowners, local authorities, NGOs and conservation agencies that aims to conserve the biodiversity of the greater Cederberg region.

iii) Gouritz Initiative (GI)
This initiative strives to create a broad band of conservation-friendly land use from the mouth of the Gouritz River to the Swartberg Mountains, along the course of the Gouritz and Gamka Rivers. It is envisaged that the conservation corridor will comprise formally protected areas as well as land that is used for agricultural or other purposes (includes provision of incentives to farmers to switch from extensive to intensive ostrich farming).

iv) Garden Route Initiative (GRI)
SANParks is leading this C.A.P.E. project, aiming to consolidate conservation areas in the Garden Route, establish two priority freshwater and estuarine protected areas, two priority marine protected areas and to develop sustainable management effectiveness.
v) Conservation Farming Project
This project was undertaken by the National Botanical Institute to assess the ecological and economic costs and benefits of various agricultural practices, including both conventional and conservation farming methods. The project promotes land use practices that conserve biodiversity and provide sustainable livelihoods for farmers and rural communities. Two of the project’s research sites were in the Western Cape: Niewoudtville and Beaufort West.

vi) Cape Lowlands Renosterveld Project
The Cape Renosterveld Lowlands in the Overberg and the Swartland, where less than 10% of the original habitat remains, were identified as one of the top conservation priorities in the CFK, through the C.A.P.E. programme. A fine-scale systematic conservation planning study was done for the lowland renosterveld area, to guide immediate conservation action towards priority sites and to influence land-use planning in this threatened region. This unprecedented focus on the critically endangered lowland ecosystems of the Cape signalled an important shift away from previous conservation efforts that tended to concentrate almost exclusively on the mountains.

vii) Conservation Stewardship
This two-year pilot project, a partnership between the Botanical Society and Cape Nature, was funded by the Critical Ecosystem Partnership Fund. The project investigated ways of encouraging conservation stewardship of privately owned areas in the Western Cape lowlands, with the ultimate goal of expanding formal conservation beyond the boundaries of state-owned conserved areas to the benefit of landowners, their immediate environment, and the country as a whole. Private and communal landowners in biodiversity priority areas can now enter into Contract Nature Reserve agreements with Cape Nature, in which the landowner benefits from management assistance from Cape Nature and a municipal rates exclusion, in return for a commitment to conserve all or part of the property concerned in perpetuity.

viii) Putting Biodiversity Plans to Work
This two-year project undertaken by the Botanical Society in partnership with provincial departments and agencies, municipalities etc., aims to mainstream the use of systematic conservation plans in the land-use planning and decision-making system in the Province, with the purpose of curtailing habitat loss in priority areas for biodiversity conservation. The project builds on the Cape Lowlands Renosterveld Project, incorporating its outputs into biodiversity maps and land-use guidelines for four pilot municipal areas (Drakenstein, Swartland, Cape Agulhas, and Theewaterskloof). One of the outcomes of this project is the drafting of guidelines to provide guidance on how to use (or not to use) maps from C.A.P.E., SKEP, STEP and the NSBA in environmental assessments and land-use decision-making.

ix) City of Cape Town Biodiversity Strategy
The City is currently implementing its Biodiversity Strategy that involves the establishment of a city-wide Biodiversity Network which protects and enhances a minimum set of the unique biodiversity in Cape Town. The Biodiversity Network will consist of existing protected areas as well as a number of areas without any current conservation status. This network of conservation areas aims to conserve at a minimum, sufficient area and habitat to meet biodiversity targets and ensure the long-term sustainability of the remaining biodiversity.

x) Fine-scale biodiversity planning
As part of the C.A.P.E. programme, a series of fine-scale biodiversity plans will be undertaken for biodiversity priority areas within the Cape Floristic Region during 2005 and 2006. The Cape Lowlands Renosterveld fine-scale biodiversity plan covered only parts of the Overberg and the Swartland. Additional areas that will be covered by the upcoming fine-scale biodiversity plans are: North West Sandveld, Saldanha Peninsula, Upper Breede River Valley, Riversdale Plain, and Niewoudtville. Fine-scale biodiversity planning for the Garden Route is being done as part of the GRI.

Biosphere Reserves
Two biosphere reserves have already been registered in the Western Cape, namely the Kogelberg Biosphere Reserve, and the Cape West Coast Biosphere Reserve. These areas encompass properties under both private and public ownership that support conservation through the protection of ecosystem processes, and aim to fulfill the three functions of a biosphere reserve, namely conservation, development and research (DEADP, 2004). Bioregional planning, as advocated by the provincial Department of Environmental Affairs and Development Planning, aims to accommodate both conservation of biodiversity and the need for development within the landscape. By clearly identifying conservation
priorities early in the planning process, this approach to planning allows for development to be proactively guided away from priority biodiversity areas (Gelderblom et al, 2002). The spatial planning categories as put forward in the bioregional planning framework, are currently under revision, to provide for adequate conservation status of the various biodiversity priorities identified through systematic conservation planning initiatives.

According to the CSIR (2004) report on the integration of Systematic Conservation Planning into the drafting of Integrated Development Plans (IDPs), there are already several initiatives underway that provide for a strategic spatial perspective and strengthening of the IDP process. However, there is a need for more resources to be focused on cross-sectoral collaboration, and the many broad scale conservation plans require extensive interpretation for local implementation.

4.1.5.3 TERRESTRIAL ECOSYSTEM STATUS

The National Spatial Biodiversity Assessment (Driver et al, 2005) assessed the status of terrestrial ecosystems. The results report how intact and well-functioning the ecosystems are, based on the amount of natural habitat that remains in each ecosystem. As natural habitat is lost in an ecosystem, its functioning is increasingly compromised, leading eventually to the collapse of the ecosystem and its associated ecosystem services.

Ecosystems can be defined in many ways, at different spatial scales. The NSBA used the new South African vegetation map, recently published by the South African National Biodiversity Institute (SANBI), to define terrestrial ecosystems. Vegetation types provide a good indication of biodiversity other than plant species, because most animals, birds, insects and other organisms are associated with particular vegetation types. Of the 440 vegetation types in South Africa, 163 occur in the Western Cape.

The NSBA analysis showed that 21 of the country’s 440 vegetation types are critically endangered. Of these 21, 15 are in the Western Cape. The Province also has 27 of the country’s 58 endangered vegetation types. Most of these critically endangered and endangered vegetation types are lowland fynbos and renosterveld types (renosterveld forms part of the fynbos biome). At the same time, most of the protected areas in the Western Cape are in mountainous areas – our protected areas do not do a good job of protecting threatened lowland ecosystems. Figure 4.1.5.2 shows threatened ecosystems as well as the protected area network, illustrating this point clearly. (Note that the levels of protection of each ecosystem do not influence the assessment of its ecosystem status.)

In many critically endangered ecosystems, only fragments of natural habitat remain. Conserving these fragments, especially those that are still relatively well connected to other natural habitat, is a priority from a biodiversity conservation point of view. Because threatened ecosystems often occur in our most economically productive regions, this is a challenge. It requires mainstreaming of biodiversity priorities in production sectors, developing mechanisms for conserving privately owned land, and an approach to conservation that goes beyond traditional formal protected areas, encompassing sustainable management of land and resources within production landscapes.

4.1.5.4 LEGISLATIVE CONTEXT

Biodiversity conservation and environmental management are currently the concurrent responsibility of national and provincial government. Key legislative and policy framework include the following:

- Convention on Biological Diversity – South Africa is a signatory, hence certain obligations;
- National Environmental Management Act, 1998 (NEMA) – provides the framework for the protection and sustainable development of environmental resources. Includes overarching principles, structures for co-operative governance, and environmental duty of care;
- Environmental Conservation Act, 1989 (ECA) – existing environmental impact assessment regulations promulgated under ECA are still in force, but are currently being revised under NEMA. A problem with the existing ECA regulations is that no commencement date was set for cultivation of virgin soil as a listed activity. This means that, in effect, the EIA regulations do not apply to cultivation of virgin soil, which is a major cause of loss of natural habitat in the Western Cape;
Figure 4.1.5.2  Biodiversity and Production Potential
• National Environmental Management: Biodiversity Act, 2004 – provides a framework for biodiversity management for the country, assist in implementation of biodiversity policy through a coherent approach of identification, planning and management of priority biodiversity resources, including co-ordination and management of essential biodiversity information. Enables establishment of South African National Biodiversity Institute, to research and co-ordinate priority interventions;
• National Environmental Management: Protected Areas Act, 2004 – revising the classification and management of protected areas in South Africa to conform to international standards;
• National Biodiversity Strategy and Action Plan (NBSAP) – coherent vision and long-term plan currently being drafted for conservation of biodiversity, sustainable use of its components and fair and equitable sharing of benefits arising from the use of genetic resources; links up with requirements of Biodiversity Act;
• South African World Heritage Convention Act, 1999;
• National Water Policy, 1996 and National Water Act, 1998 – facilitate significant advances in conservation of biodiversity associated with the management of water resources in South Africa;
• Conservation of Agricultural Resources Act, 1983 (CARA), National Policy on Agriculture, National Veld and Forest Fire Act, 1998 – provide specific regulatory control of the management of agricultural resources and invasive alien plants;
• The Sustainable Use of Agricultural Resources Bill will replace CARA, placing further emphasis on the effective integration of biodiversity concerns in agricultural planning, development and management. CARA focuses solely on soil conservation and makes no mention of biodiversity conservation;
• Land Use Management Bill, 2003- will provide guidelines, framework, standards for land use management;
• Land Use Planning Ordinance, 1985 & Planning and Development Act, 1999;
• Municipal Systems Act, 2000;
• The Nature Conservation Ordinance, 1974;
• The Western Cape Nature Conservation Board Act, 2000;
• Biosphere Reserve Bill, 2003;
• Municipal Property Rates Bill, 2003 – extends rates base to entire municipal areas, not just towns; land that is formally contracted to statutory conservation agencies and declared a protected area in terms of the Protected Areas Act, is excluded from rates;
• Mineral and Petroleum Resources Development Act, 2002 – more extensive and stringent environmental requirements, and provides good incentives for rehabilitation; and,
• International Convention on Cultural and Natural Heritage.

4.1.5.5 KEY ISSUES

• Loss of natural habitat is the greatest cause of biodiversity loss, therefore agriculture and urban development place great pressure on biodiversity resources and ecosystem functioning;
• Invasion of alien species is the next greatest threat to biodiversity;
• Fire plays a vital role in fynbos ecosystems. If fires occur too frequently or not at all, fynbos ecosystems and their species cannot survive. Fire regimes need to be carefully managed;
• Strategies for conserving biodiversity need to focus on keeping natural habitat intact and minimising fragmentation of natural habitat, especially in threatened ecosystems and along key ecological corridors. This will involve working with private landowners, and strengthening options for formal protected area status on private land, through CapeNature’s stewardship programme;
• The impact of climate change on biodiversity is uncertain. Maintaining corridors of intact natural habitat between the coast and the mountains and along mountain ranges will increase the likelihood that species will be able to respond to climate change;
• Lowland fynbos, lowland renosterveld and succulent karoo ecosystems are poorly protected, even though they are of global biodiversity significance; fynbos mountains are relatively well protected;
• Biodiversity priorities need to be mainstreamed in sectors whose core business is not biodiversity, and the link between biodiversity and socio-economic development needs to be demonstrated;
• The intrinsic value of biodiversity – the critical natural capital which supplies humanity with an array of free services – needs to be acknowledged as crucial for sustainable development;
• The image of biodiversity needs to change from exclusiveness to inclusiveness; people and the landscape to be reconciled;
• A decline in public conservation funding requires public-private-partnerships, and strategic interventions to capitalise on opportunities
for partnerships that serve both the conservation and development agenda;

- Biodiversity planning outputs need to be translated into meaningful, accessible products for users/municipalities, to inform local-level decision-making in all sectors; and,
- Harvesting of plant products from the wild needs to be sustainably managed.

4.1.5.6 SPATIAL SUMMARY

There has been an enormous amount of work in biodiversity conservation over the past few years, see Figure 4.1.5.3. The challenge is to synthesise this into easily understood planning and management systems that communicate easily and are easily implementable.

A synthesis is required between biodiversity conservation and agricultural land uses in rural areas as well as between open space and urban development in urban areas. The bioregional spatial planning categories are likely to be useful in this regard as they can also be linked to a zoning scheme for the Province. Because the areas of highest biodiversity priority are also often areas of high agricultural and/or urban potential, an urgent challenge is to develop clear thresholds or limits of acceptable loss of natural habitat, to guide land-use planning and management of land and resources in a sustainable way.

REFERENCES AND ACKNOWLEDGEMENTS

- Bowie V, CapeNature (pers com);
- Council for Scientific Investigation and Research (CSIR), 2004;
- Daitz D, Previous Chief Executive Officer of CapeNature;
4.1.6 COASTAL MANAGEMENT

4.1.6.1 INTRODUCTION

The Western Cape Province has over 1000km of coastline, stretching from the Olifants River in the north to the Blaaukrantz River in the east. The Province’s coastal environment is characterised by unique, diverse and beautiful natural habitats, as well as a wide variety of communities and industries from all sectors of the economy, which are dependent on coastal resources for their livelihoods. Unless sensitive, holistic and integrated coastal management takes place, these habitats and livelihoods will be degraded and destroyed, and the very attributes that make the coastal zone attractive will be lost (DEADP, 2003).

The White Paper for Sustainable Coastal Development in South Africa, 2000 (hereafter referred to as the ‘White Paper’) signalled a new approach to coastal management in South Africa. It recognises the coast as a distinctive system, a national asset, a place of value and a place of opportunity. In contrast to previous management approaches, the White Paper advocates a holistic, integrated and people-centred approach to Integrated Coastal Management (ICM). Implementation of many of the recommendations of the White Paper has commenced, but the proposed restructuring of the legal and institutional framework for coastal management is largely dependent on the National Environmental Management: Coastal Zone Bill being enacted (DEADP, 2003). The Coastal Zone Bill is currently in draft form.

The Province has, as a whole, experienced strong economic growth, often related directly to coastal activities such as port activities, fishing, manufacturing, tourism and recreation. Due to a lack of understanding and knowledge of the impact of actions on the natural environment, much indigenous coastal vegetation and areas important for birds (e.g. African Black Oystercatcher) and animals (e.g. Cape clawless otter) is being lost. As a result there is an urgent need to identify and sustain sensitive and important ecological coastal areas.

4.1.6.2 BACKGROUND

The coast of the Western Cape Province comprises the following four regions:

**West Coast (260km of coastline)**

The coast is indented by several bays, including Saldanha, the only deepwater bay in South Africa. Sandy beaches interspersed with occasional rocky outcrops along the shores of St Helena Bay give way to a more rugged, rocky shoreline at Columbine and Saldanha, and long sandy beaches to the south. Sandy beaches comprise 73% of the coastline, which rocky shore and wave-cut rocky platforms comprise the remaining 27% (DEAT, 1998). There are several significant river and wetland systems, notably the Olifants and Berg rivers, Verlorenvlei, Rocher Pan and Langebaan Lagoon, which provide important habitat for wading birds.

Key natural areas on this stretch of coast regularly support a significant number of bird species which are globally and nationally threatened or near-threatened (Birdlife South Africa, 1998). The West Coast National Park is the largest coastal conservation area following by Rocher Pan and Verlorenvlei, which are significantly smaller.

The West Coast region has displayed significant growth and a relatively strong economy, although rural areas remain poor. Impetus for growth has come from the deepwater port of Saldanha and the proximity of the region to Cape Town. Despite the limited supply of fresh water, substantial investment has been attracted to the region for mariculture, shipping, industrial, manufacturing, tourism and recreational activities. The region is also well known for its Strandveld and fynbos vegetation, which attracts many visitors to the region each spring. The region is at the centre of South Africa’s fishing industry, with rich fishing grounds supporting capital-intensive industries.

Economic development through industrialisation, property development and tourism has brought challenges for the management of the coast, including air and water pollution, salinisation of the coastal aquifer,
restricted access to coastal resources, ribbon development and inappropriate land use. Economic development is also attracting many job seekers to the region, increasing the need for infrastructure and government services. Potential exists in the region for the development of small-scale industries that add value to fishing, floriculture and mariculture, and for tourism-promotion initiatives, including the development of rail and air links.

**Cape Metro (195km of coastline)**

There are several bays along this rugged coastline, including two of the largest bay systems in South Africa – Table Bay and False Bay. The shore consists of a mix of sandy beaches (43%) and rocky shores (57%) (DEAT, 1998). There are no large river catchments, but some important estuarine wetlands are found at Rietvlei, the mouth of the Diep Rivers, the Disa River, Wildevoëlvlei, Die Mond at Cape Point and Sandvlei. Furthermore, the Cape Peninsula lies at the junction of the cool-temperate west coast and the warm-temperate south coast and consequently has a particularly high levels of biodiversity.

Key areas along the coastline regularly support a significant number of globally and nationally threatened or near-threatened bird species (Birdlife South Africa, 1998). Key coastal conservation areas are the Table Mountain National Park and the smaller Blouberg Nature Reserve.

Most of the Cape Metro coast is dominated by human settlement. Infrastructure is well developed and in addition to the port of Cape Town, important small-craft harbours are located at Hout Bay, Simon’s Town, Kalk Bay and Gordon’s Bay. High demand for residential housing along the coast reflects a vibrant regional economy, however, urbanisation is a serious challenge – increasing the demand for services and amenities, and putting pressure on natural resources. The demand for coastal land is exerting tremendous pressure on the natural assets of the Cape Metro coast.

**City of Cape Town Coastal Zone Strategy**

The City of Cape Town drafted a Coastal Zone Strategy as part of its Integrated Metropolitan Environmental Policy, which is currently being implemented. The coastal zone has been divided into 43 coastal zone management units based on geophysical characteristics as well as coastal use, and the purpose of the Strategy is to focus management activities on specific coastal issues (City of Cape Town, 2003).

**Agulhas Coast (335km of coastline)**

This coastal region has several large bays, for example Walker Bay and St Sebastian Bay, and many smaller bays. About 43% of the coast is sandy beach, 39% rocky shore and 18% wave cut rocky platform (DEAT, 1998). The region contains several important wetlands, such as Botrivier Vlei, Kleinrivier Vlei, Heuningnes and De Hoop Vlei, and river systems, such as the Breede and Gouritz rivers. The region is home to the De Hoop Nature Reserve which contains 50km of protected coastline.

This stretch of coast regularly supports a significant number of restricted-range bird species as well as globally and nationally threatened or near-threatened bird species (Birdlife South Africa, 1998).

Proximity to Cape Town, good road networks, natural features and the scenic beauty of the Agulhas Coast have resulted in rapid development and economic growth, especially in the holiday- and tourism-related sectors. However, this has not led to a large amount of job creation, as the economy of the coastal region is seasonal and is not diverse or labour-intensive. Private property development has reduced access to the seashore. Increased demand for offshore, in-shore and intertidal coastal resources has intensified illegal practices and user-conflicts.

The region is rich in natural assets. It is the centre of the Cape Floral Kingdom and provides excellent opportunities for shore-based whale watching. This region is also the centre of South Africa’s abalone industry. If the diversity, health and productivity of the region’s coastal ecosystems can be retained, significant opportunities exist in the property development, agricultural, forestry, nature-based tourism and fishing industries.

**Garden Route (225km of coastline)**

The coast comprises 44% rocky headlands, 18% wave-cut rocky platforms and 38% sandy beaches, as well as five major bays: Visbaai, Vleesbaai, Mossel Bay, Buffalo Bay and Plettenberg Bay (DEAT, 1998). The region has many rivers. Some of the important estuaries include those at the mouths of the Gouritz, Klein Brak, Groot Brak, Swartvlei, Knysna, Keurbooms, Sout and Blaauwkrantz rivers. Three protected areas incorporate 13% of the
coastline: the Goukamma Nature Reserve, the Robberg Marine Reserve and the Western most portion of the Tsitsikamma Coastal National Park (DEAT, 1998). High dunes occur along the coast, particularly in the area of the Wilderness lakes. This stretch of coast regularly supports a significant number of restricted-range bird species (Birdlife South Africa, 1998).

The scenic beauty and high biodiversity of the Garden Route, with its bays, river, estuaries and lakes, underlie the region’s relative economic success. Conservation has been a priority in the region, however the region’s popularity as a holiday and retirement area has led to rapid property development along the coast. Further inappropriate developments will seriously detract from the region’s scenic qualities, which are its main marketing feature. There are large areas of indigenous coastal forest and timber plantations, with fynbos and high-potential agricultural land comprising the remaining undeveloped areas.

Disadvantaged residents face limited access to coastal resources, highly seasonal employment, high levels of unemployment and low investment in infrastructure. Since the scenic nature of the region is important to its economy, there is an urgent need for effective management of the natural resource base, while creating jobs, dealing with the challenges of urbanisation and developing the enormous tourism potential of the region.

4.1.6.3 COASTAL CORRIDOR/ZONE

The cumulative ecological impacts of coastal ribbon development are a major concern. The coastal zone is a sensitive area in terms of ecological processes such as sand movement corridors and the interaction between terrestrial, freshwater and marine ecosystems. The continued productivity of the coast as a socio-economic resource depends on the continued functioning of these ecological processes. Appropriate ecological setback lines should be determined for any proposed coastal development. These should be based not just on the physical environment and coastal dynamics, but also on terrestrial and coastal biodiversity issues including the functioning of ecological processes. A physical setback line may not be sufficient for some sites and the receiving environment must be assessed to determine sensitive areas, which should dictate where development should and should not occur.

The draft Coastal Zone Management Bill includes provision for a 1km coastal buffer zone in which a range of restrictions on development and other human activities would apply. Note that this does not mean a decrease in public access for recreation and other sustainably managed activities – indeed the opposite, as inappropriate development in the coastal corridor often results in reduced public access to the

4.1.6.4 CURRENT INITIATIVES

Draft Coastal Zone Policy for the Western Cape, 2004

This policy is consistent with the White Paper and provides the framework for the implementation of the Coastal Management Programme (see below). The policy aims to provide a coherent and integrated planning, management and development policy framework for the entire coastal zone of the Province. It incorporates the bioregional planning approach and identifies spatial planning categories which should form the main framework within which planning and design policy guidelines for specific types of places within the coastal zone should be prepared, see Figure 4.1.6.1.

However, the draft Coastal Zone Policy is not based on a systematic spatial assessment of the sensitivity or conservation priority of different coastal ecosystems, since such an assessment has not been done.

The Integrated Coastal Management Programme (CMP) for the Western Cape, 2003

The CMP has been prepared according to the requirements of the Coastal Zone Bill, and builds on the policy statements presented in the Coastal Zone Policy. The objective of the CMP is to facilitate improved planning of coastal resources as well as allow for better targeted investment from government and non-government organizations to support sustainable coastal development. The programme proposes specific lead agents for all the programme objectives. The initiatives described below are seen as part of this programme.

Provincial Coastal Committee

DEADP initiated the establishment of a Western Cape Provincial Coastal Committee in 2002. This committee provides a communication forum for role players in coastal management at a strategic level, and also serves as an advisory forum to coastal managers. The committee will obtain formal
status upon commencement of the Coastal Zone Act. DEADP is also in the process of establishing Regional Coastal Committees that will feed into the Provincial Coastal Committee.

Sustainable Coastal Livelihoods Programme (SCLP)
This programme aims to support the first three years of a five-year cycle of implementation of the ‘Plan of Action’ outlined in the White Paper. The Sustainable Coastal Livelihoods Study undertaken by DEAT in 2002, provides guidance as to the understanding of coastal livelihoods and associated opportunities and constraints, as well as the identification of practical interventions to improve livelihood prospects for poor people living along the coast (DEAT, 2002). The following projects are currently being implemented through a partnership between DEADP and MCM, with the aim of creating sustainable coastal livelihoods:

- Hout Bay Fisheries Living Museum Project – involves capacitating the Hout Bay previously disadvantaged community to manage the Hout Bay Fisheries Museum;
- West Coast Trails Project – a multi-day hiking trail along five West Coast towns will be developed, and is to be managed by previously disadvantaged communities; and,
- West Coast community based tourism project – a public-private partnership, with previously disadvantaged communities around the West Coast National Park being trained to develop and manage a holiday accommodation facility within the Park.

Coastcare
Coastcare is a public-private partnership led by DEAT to promote sustainable coastal development in order to address the needs of poor coastal communities in South Africa.

Awareness, education and training
There are a number of programs including:
Blue flag – Blue Flag status is annually awarded to beaches that meet criteria covering four aspects of coastal management, namely water quality, environmental education and information, environmental management, and safety and services. Pilot applications have been received from Clifton 4th beach, Mmandi beach (Strandfontein), Bikini beach (Gordon’s Bay), Kleinmond beach, Santos beach in Mossel Bay and the Dunes at Plettenberg Bay.

Interpretive signage – the project, running from January 2003–early 2005, aims to raise awareness and disseminate information about South Africa’s coast. The objective is to enhance the visitor’s experience to the coast by providing environmental and local cultural information at strategic sites.

Adopt-a-Beach – is a national initiative that will provide a platform for coastal communities, schools, NGOs and individuals to actively engage with their coastal environment while monitoring various bio-physical and socio-economic aspects of the coast.

Capacity building and empowerment - Training programmes relating to the White Paper for municipalities, coastal managers and key stakeholders along the country’s coast have been developed and are being implemented to boost the capacity of smaller coastal municipalities. At the same time, nature conservation agencies are also involved in co-management initiatives with community groups.

4.1.6.5 GOVERNMENT STRUCTURES

National government
Department of Environmental Affairs and Tourism (DEAT), through its Marine and Coastal Management branch (MCM), has a number of different responsibilities in relation to coastal matters, including policy formulation, coordination of management activities, biodiversity protection, offshore resource management, research and environmental education. In practice, the national office has a largely advisory role and has limited capacity (DEADP, 2003).

Provincial lead agent
The Department of Environmental Affairs and Development Planning (DEADP) of the Western Cape is the provincial authority that deals primarily with the planning, management and use of coastal resources. DEADP is also currently fulfilling the lead agency role for coastal management in the Province. A provincial coastal co-ordinator (funded by the United Kingdom Department for International Development [DFID] for a period of four years) was seconded to DEADP in 2001 and has been responsible for facilitating the implementation of the White Paper in the Province under the Coastcare initiative. This interim arrangement was intended to provide initial resources and support to Provinces with regard to their coastal
management responsibilities. DEADP has in the meantime, since 1 April 2004, established a Sub-directorate Coastal Management, which is dedicated to integrated coastal management activities.

4.1.6.6 LEGISLATIVE CONTEXT

The existing legal/policy context of coastal management in the Western Cape includes the following:

- White Paper for Sustainable Coastal Development in South Africa, 2000 – this policy is guided by the constitutional imperatives, the principles underpinning the National Environmental Management Act 107 of 1998 (NEMA), as well as international trends in Integrated Coastal Management (ICM);
- National Environmental Management: Coastal Zone Bill, 2003 – this bill is to replace the Seashore Act, 1935, and ensure consistency with South Africa’s Constitution and other recent environmental and development planning legislation. The Bill requires that each of the coastal Provinces compile a Coastal Management Programme (CMP);
- Draft Coastal Zone Policy for the Western Cape, 2004 – discussed in Section 4.1.6.4;
- Draft Integrated Coastal Management Programme (CMP) for the Western Cape, 2003 – discussed in Section 4.1.6.4;
- The National Environmental Management Act, 1998;
- The Constitution of South Africa, 1996;
- The Maritime Zones Act, 1994;
- The Seashore Act, 1935;
- The Marine Living Resources Act, 1998;
- The National Heritage Resources Act, 1999;
- Sea Fisheries Act, 1988;
- Land Use Planning Ordinance, 1985 & Planning and Development Act, 1999;
- Conservation of Agricultural Resources Act, 1983 – will be replaced by the Sustainable Use of Agricultural Resources Bill;
- Mountain Catchment Areas, 1970;
- Mineral and Petroleum Resources Development Act, 2002;
- The Environment Conservation Act, 1998;

4.1.6.7 KEY ISSUES

- Cumulative ecological and visual impacts as a result of increased development pressures and ribbon development – coastal development must concentrated into compact nodes;
- The need to maintain coastal ecosystem processes and ensure sustainable use of natural resources, so that the economic, social and cultural value of the coast is not eroded;
- Lack of systematic identification of sensitive or threatened coastal ecosystems and habitats – needed in order to guide development to less sensitive ecosystems. Such an assessment has been done only at a very broad scale as part of the National Spatial Biodiversity Assessment;
- The need to delineate a coastal corridor, in which clear restrictions are placed on the types of development and other activities that are permitted;
- Privatisation of access to the coast for recreation and economic opportunities – the coast is a public asset and access should be equitable;
- The need to create sustainable livelihoods – making a long-term difference to the lives of poor people living along the coast;
- The need to redress of past imbalances – development opportunities for previously disadvantaged communities have to be created in the coastal region;
- Lack of co-ordination between different coastal role players – clarification of roles, responsibilities and authority is needed;
- The need for institutional strengthening – currently there is a lack of capacity at implementation/local management level;
- Lack of understanding regarding the value of the coast – education and capacity building required;
- Lack of law enforcement and compliance; and,
- The need to implement pollution control and waste management programmes for each coastal region – pollution from industrial and sewage effluent, litter, oil spills, mariculture operations and run-off from fertilised lands pose a threat to the ecological integrity of the coast.

4.1.6.8 SUMMARY

The coast is a public asset and a valuable socio-economic and ecological resource, which is being degraded by inappropriate development.
particularly ribbon development. The benefits of this inappropriate development often accrue primarily to the wealthy, reinforcing past inequities in access to coastal resources. Challenges in addressing these problems include institutional strengthening and collaboration, a systematic assessment of the sensitivity of coastal ecosystems, delineation of the coastal zone, and much firmer regulation to prevent further ribbon development and other inappropriate development in the coastal zone.

REFERENCES AND ACKNOWLEDGEMENTS

- Barnes, KN. Birdlife South Africa. The Important Bird Areas of Southern Africa, 1998;
- Department of Environmental Affairs and Development Planning. Towards A Sustainable Development Implementation Plan for the Western Cape: Concept Paper on Sustainable Development, Provincial Government Western Cape, 2005;
- White Paper for Sustainable Coastal development in South Africa, 2000;
- The Sustainable Coastal Livelihoods Study undertaken by Department of Environmental Affairs and Tourism in 2002;
- du Toit J, Coastal Co-ordinator for the Western Cape Province (pers com.);
- Bowie V, Cape Nature (pers com).
Figure 4.1.6.1 Coastal Management
Figure 4.1.6.2  Global Climate Change and Sea Level Rise

KEY:
- Sandy Shorelines Susceptible To Sea Level Rise
  (Source: Barrie Gasson UCT)
4.1.7 MINERAL RESOURCES AND BUILDING MATERIALS

4.1.7.1 INTRODUCTION

Mining and quarrying, as an economic sector, contributed only 0.2% to the Western Cape’s GDP in 2003 (R284 million). In fact the contribution of this sector to the provincial economy declined in real terms (i.e. inflation included) from 0.9% in 1995 to 0.2% in 2003 (see Table 4.1.7.1).

This sector also contributed the least towards employment in the Western Cape. According to Statistics South Africa (Provincial Profile 1999 Western Cape, 1999, p. 55), only 3,829 people (0.25%) out of a total of 1,530,445 economic active people were employed in this sector in 1999.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, forestry and fishing</td>
<td>5.22%</td>
<td>5.04%</td>
<td>5.06%</td>
<td>5.17%</td>
<td>5.13%</td>
<td>5.28%</td>
<td>5.07%</td>
<td>5.01%</td>
<td>4.89%</td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>0.91%</td>
<td>0.76%</td>
<td>0.80%</td>
<td>0.79%</td>
<td>0.86%</td>
<td>0.76%</td>
<td>0.82%</td>
<td>0.80%</td>
<td>0.79%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>22.41%</td>
<td>22.49%</td>
<td>22.95%</td>
<td>22.87%</td>
<td>22.70%</td>
<td>24.06%</td>
<td>24.70%</td>
<td>24.95%</td>
<td>24.52%</td>
</tr>
<tr>
<td>Electricity, gas and water</td>
<td>1.78%</td>
<td>1.90%</td>
<td>1.92%</td>
<td>1.94%</td>
<td>1.97%</td>
<td>1.98%</td>
<td>2.00%</td>
<td>2.00%</td>
<td>2.00%</td>
</tr>
<tr>
<td>Construction</td>
<td>3.61%</td>
<td>3.61%</td>
<td>3.95%</td>
<td>3.74%</td>
<td>4.15%</td>
<td>3.64%</td>
<td>3.66%</td>
<td>3.96%</td>
<td>3.86%</td>
</tr>
<tr>
<td>Wholesale trade, catering and</td>
<td>14.68%</td>
<td>15.38%</td>
<td>15.51%</td>
<td>15.91%</td>
<td>17.48%</td>
<td>19.21%</td>
<td>20.30%</td>
<td>20.57%</td>
<td>21.89%</td>
</tr>
<tr>
<td>accommodation</td>
<td>8.54%</td>
<td>8.01%</td>
<td>8.82%</td>
<td>10.60%</td>
<td>11.27%</td>
<td>12.16%</td>
<td>12.39%</td>
<td>13.09%</td>
<td>14.70%</td>
</tr>
<tr>
<td>Transport, storage and</td>
<td>26.10%</td>
<td>27.81%</td>
<td>28.75%</td>
<td>28.39%</td>
<td>30.15%</td>
<td>31.35%</td>
<td>34.46%</td>
<td>36.29%</td>
<td>38.43%</td>
</tr>
<tr>
<td>communication</td>
<td>5.37%</td>
<td>5.32%</td>
<td>5.30%</td>
<td>5.44%</td>
<td>6.07%</td>
<td>6.36%</td>
<td>6.95%</td>
<td>6.64%</td>
<td>6.90%</td>
</tr>
<tr>
<td>Financial intermediation, insurance,</td>
<td>14.26%</td>
<td>14.81%</td>
<td>14.73%</td>
<td>13.92%</td>
<td>13.58%</td>
<td>13.14%</td>
<td>13.04%</td>
<td>13.17%</td>
<td>13.49%</td>
</tr>
<tr>
<td>real estate and business services</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: Statistics South Africa, Gross Domestic Product Annual Estimates, November 2004

TABLE 4.1.7.1 Sector (and %) Contributions to The Western Cape’s GDP by Constant 2000 Prices – Rand Million

4.1.7.2 BACKGROUND

As at January 2004, 458 mining licences were active in the Western Cape of which 369 were issued for construction commodities such as building sand, stone aggregate, gravel (road material) and brick clay, with the majority (212) being for building sand. Seventy-four licences were for industrial materials such as limestone, dolomite, kaolin, ball clay, gypsum, salt, bentonite, mineral pigment, dimension stone, heavy minerals, silica sand, phosphate and iron. Fourteen licences were for diamond mining and one for rare earths (Council for Geoscience, February 2004).

The predominant mineral resources in the Western Cape Province are industrial, exploited by open cast mining, and in the case of marine diamonds and heavy beach sands, by other appropriate methods. However, although the Council for Geoscience has drawn up a database of all the current active mines in the Western Cape, the available information regarding output and available resources of each mine is limited. This will change within the next five years since the Mineral and Petroleum Resources Development Act (Act 28 of 2002), requires that detailed records of every mine must be made.

According to the Council for Geoscience the major minerals profile can be subdivided into three categories: currently producing operations, presently unexploited deposits with potential, and resource areas. Because geological maps and information are complex and difficult for the layperson to read and understand, brief descriptions of the most important commodities and a map indicating the relevant commodity are given below. See also map 4.7.1.6 at the end of section 4.1.7.

Currently Producing Operations

i) Sand and Gravel (Building Material)

Sand and Gravel is generally considered as a strategic limited resource and concerns have been raised regarding the limited lifespan of the available resources that are left. As such, there is an inherent conflict between utilising all available resources, and maintaining the integrity of the receiving environment within which these resources occur (DEADP, March 2004). Sand and Gravel mining is normally short to medium term operations that create relatively few job opportunities in local areas, but it does contribute
significantly to the local and regional economy. It is found and exploited in the vicinity of most major towns in the Western Cape as shown in Figure 4.1.7.1.

iii) Stone Aggregate (Building Materials)

Aggregate stone is also a strategic resource in the construction industry and contributes extensively to the local and regional economy. Most of these mining operations constitute hard rock quarries and are medium- to long-term operations of varying scale. As such these mines does provide for a sustained number of jobs over a prolonged period, although the numbers thereof is limited (DEADP, March 2004, p. 34).

Stone aggregate for the building industry is quarried close to local markets from any suitable rock type, e.g. Andesite north of Worcester and from hornfels adjacent to plutons of the Cape Granite Suite. A total of five working quarries are exploiting the hornfels in the greater Cape Town area. Two working quarries near Saldanha and one north of Malmesbury are exploiting granite of the Cape Granite Suite. Aggregate quarries in sandstone of the Table Mountain Group occur at Caledon, Mossel Bay, George, Knysna and Plettenberg Bay. Dolomite is quarried at Vredendal and limestone at Robertson. Alluvial gravel from terraces of the Berg River is exploited at four sites south of Paarl. Figure 4.1.7.2 indicates the location of the major Aggregate Stone mines.
Concerns against aggregate mining are the visual effect of the scaring of mountains, the waste (soil) dumps as well as the impact of truck movement on the roads.

iii) Clay Minerals (Building Materials)

Since long-distance transport costs are excessive, bricks are produced from local clayey material adjacent to most major towns in the Western Cape, as can be seen in Figure 4.1.7.3. The best reserves have been delineated within 50 km of Cape Town, where they are presently exploited at 17 sites.

Similar to sand mining, clay mining is normally short- to medium-term operations that create few job opportunities in local areas. It also contributes significantly to the local and regional economy. Since clay mining takes place in two major vegetation types, Renosterveld and Lowland Fynbos, clay mining is in direct conflict with conservation. Both these vegetation types have high conservation value and are irreplaceable as most of its original distribution areas have been transformed by agricultural activities (DEADP, March 2004, p. 33).

In the Noordhoek Valley and Brackenfell-Somerset West region, good quality kaolin is currently exploited from weathered zones of the Cape Granite Suite for the ceramic and paper industries, and as an inert filler in certain industrial processes.

Small isolated deposits of ball clay are present in palaeochannels excavated into bedrock in the Kraaifontein and Albertinia areas. They are presently exploited for the ceramics industry.

Sedimentary plastic clay of Neogene age is present in small depressions and palaeochannels between Stellenbosch and Atlantis, and is exploited at six sites as a plasticiser for brick-making by mixing it with residual brick clay.

Further concerns regarding clay mining is the impact of truck movement on roads as well as the sterilisation of land for future land use options.

iv) Limestone, Gypsum & Phosphate

These minerals are mainly used to manufacture cement (for the construction industries) and fertilizer (for the agricultural industries). Figure 4.1.7.4 shows the location of limestone, gypsum and phosphate mines in the Western Cape.

Limestone, Gypsum & Phosphate mines are usually situated in remote areas (e.g. West Coast) with low economic activity. As such, these mines contribute significantly to the local economy through direct and indirect job opportunities (DEADP, March 2004, p. 37).

Limestone is quarried for cement at De Hoek and Riebeek-Wes, for agricultural lime at Vredendal, Saldanha, Bredasdorp and Riversdal, for feed lime at Saldanha, for limestone sand at Witsand, and for water treatment and chemicals at Vredendal. Dolomite is exploited for agricultural purposes at Vredendal and Bridgetown, for aggregate and refractories at Vredendal, for metallurgical flux at Bridgetown and for
building lime and chemicals at Robertson. These commodities are presently produced at 11 quarries.

Gypsum is being produced north of Vanrhynsdorp and at Yzerfontein, while Ferruginised shales of the Bokkeveld Group are mined as mineral pigment northwest of Albertinia.

Numerous phosphate deposits occur in a 10-30km wide zone within Neogene sediments along the West Coast up to Lamberts Bay. There are also extensive low-grade, off-shore deposits along the Cape coast.

Concerns with regard to the mining of limestone, gypsum and phosphate are similar to the mining of aggregate stone, since the former is also usually situated in environmentally sensitive areas.

---

v) Salt

Salt extraction is limited to sites north of Darling, at Velddrif, and northwest of Koekenaap. Many isolated pans occur within 30 km of the coast and on the estuarine margins of the Berg and Oliphants Rivers. Since the exporting of salt is minimal, it has a much localised benefit.

The impact on river functioning and estuaries are aspects of concern related to the mining of salt. Uncertainty with regards to rehabilitation success also needs addressing and there is a need for proper closure planning (DEADP, March 2004, p. 38).

vi) Dimension stone (building materials)

Dimension stone has a variety of uses, of which granite and marble tiles, kitchen tops and tombstones are the most widely known. Only a few sites are actively being mined in the Boland area and in the West Coast interior. However, most of these materials are exported to Europe and Asia.

The socio-economic value of these mines on the immediate local environment depends on where they are situated. In remote areas (e.g. West Coast), these mines are normally situated in areas of low economic activity. As such, these mines contribute significantly to the local economy through direct and indirect job opportunities (DEADP, March 2004, p. 36).

Concerns against mining Dimension stone are also the visual effect of the excavations, the scarring of mountains, the amount of waste stone, the construction of new roads and the fact that new sites are most often situated within environmentally sensitive areas.

vii) Heavy minerals

Heavy mineral mining is usually a long-term operation and usually covers extensive areas in the Western Cape, in some instance more than 25 000 ha as in the case of Namaqua Sands north of the Olifants River. Figure 4.1.7.5 indicates the location of the major Heavy Mineral mines in the Western Cape.
The minerals ilmenite, rutile, zircon and leucoxene, are currently exploited from mineral-bearing beach and aeolian (windblown) sand by Namaqua Sands. Zircon is used for abrasive in foundries (steel & glass), TV tubes and the ceramic industry. Titanium is mostly supplied in the form of titanium dioxide, which is used in coatings, plastics and paper. Other applications include fabrics, textiles, floor coatings, printing ink and roofing granules, as well as metal alloy, which are mainly used in aircraft constructions. Titanium is also exported to North America, Europe and the Asia (DEADP, March 2004, p. 45).

With such huge areas being mined, specific corridors need to be identified and left undisturbed (DEADP, March 2004, p. 45).

viii) Diamonds

Diamond mining in the Western Cape is concentrated in the coastal regions with beach mining and shore-based mining taking place along the coast in the Vredendal District and continues northward into the Namaqualand District. Diamonds have been extensively exploited and are currently mined from the surf zone at 15 sites between Blinkwaterbaai and Papendorp. Ancient diamondiferous marine placers, of lower grade, are also mined north of Vamrhynsdorp. A great concern on these types of mining activities is the impact they have on the coast.

Presently Unexploited Deposits with Potential & Resource Areas

According to the Council for Geosience, the following deposits have the potential to be exploited.

i) Rare earths and rare metals

The Steenkampskraal mine near Vamrhynsdorp, which in the past produced rare earth elements and thorium is to be re-opened shortly. The niobium and thorium-bearing Saltpeterkop in the Sutherland District is also under consideration, as rare metals become more sought after with improved technology.

ii) Tungsten-molybdenum

A substantial but subeconomic skarn deposit associated with a pluton of the Cape Granite Suite is present in the subsurface at Riviera, near Piketberg.

iii) Uranium-molybdenum

Limited resources in sub-economic, low-grade uranium-molybdenum deposits, occur in sandstones of the Beaufort Group, northeast of Laingsburg, and continue into the Northern Cape and Eastern Cape.
iv) Dimension Stone

Substantial quantities of good limestone are present in the Cango Group, north of Oudtshoorn, and have not been exploited.

vi) Kaolin

Isolated kaolin deposits occur in two areas northwest of Vredendal between Nuwerus and the coast. North of Vredenburg, several small, good-quality, kaolin deposits are present along fault zones in the Cape Granite Suite.

vii) Glass sand

Glass sand is present in the subsurface west of Hopefield, but further investigations are needed in order to ascertain the potential of this deposit.

National initiative

In mid-October 2000, at the request of the Minister of Minerals and Energy, Ms Phumzile Mlambo-Ngcuka, the Council for Geoscience prepared a proposal for the production of a portfolio of possible mineral development opportunities in or near those parts of South Africa where poverty is most severe. The objective of this portfolio was to stimulate interest in and development of mineral deposits in and adjacent to these poor rural areas thereby creating employment and improving the standard of living of the local inhabitants.

Largely through a desk study based on existing information, 14 projects were selected in South Africa, of which four were located in the Western Cape. The four projects were ranked 8th (marble – Farm Widouw 309, 12km south of Vanrhynsdorp), 9th (glass sand – Farm Elandsfontein 349, 8km west of Hopefield), 10th (plastic clay – farm Zouterivier 22, 10km east and Klipvlei 28, 18km ESE of Atlantis) and 16th (diamonds – from Donkin’s Bay to Tieties Bay along the West Coast). Although problems such as current mineral rights holdings, environmental issues and transport/infrastructure have largely been ignored in the selection process, the possible development of these projects should be investigated (Council for Geoscience).

4.1.7.3 KEY ISSUES

In the late 1990s the then Cape Metropolitan Council identified a need for a Structure Plan on Mining (CMC & Duxburys, 2000) to assist local authorities within greater Cape Town with decision-making regarding applications for land-use changes for mining. This document identified a few crucial problems and issues relating to mining in general that need to be highlighted:

- Insufficient person power to monitor land uses and mining operations on a regular basis. Inspections are usually conducted in response to complaints;
- Officials have no jurisdiction beyond that provided for by the ordinances and by-laws applicable to their particular local authority. If inspections reveal that there are problems related to the activities or area of jurisdiction of other Departments, these can only be reported to the relevant authority, but cannot be acted upon;
- Not all zoning schemes provide a mining category, and officials are consequently not always fully equipped to deal with this;
- Not all local authorities have compiled a zoning map and register that confirms the zoning of all land in their areas of jurisdiction, which could lead to disputes regarding the legality of mining operations in terms of land-use permission;
- Lack of co-ordination between planning legislation and procedures, administered by Municipalities, and the requirements of the Minerals Act, administered by DME, leads to poor control of, and sometimes unauthorised mining activities;
- Rehabilitation and environmental management plans are not always implemented strictly;
- Mining activities lead to the loss of soils and the consequent loss of agricultural land, pristine land or urban development. The reverse is also true, that urban and agricultural development sterilizes any mining opportunity; and,
- By definition, mining activities are not sustainable, since the activity cannot be continued on an indefinite basis without a net loss of resources.

A significant issue relating to mining is the need to find a balance between economic and environmental considerations since minerals are recognised as vital resources for building purposes as well as other industrial...
applications. Consequently, the exploitation of mineral resources is an essential component of economic development (CMC & Duxburys, 2000) and a model of some kind needs to be developed to find such a balance.

Furthermore, it has been extremely difficult to find relative data on the current (and future) demand and supply of materials (especially building minerals) mined in the Western Cape (and if, any materials are being imported from elsewhere). According to the Department of Minerals and Energy, they are working towards a system that would document all the extractions and future life expectancies of all current mines in the Western Cape, which will in future be a very useful tool to determine trends, possible shortfalls and possibly preventing shortages.

With regard to the future building material needs of the Western Cape, and to what extent it can be met, it is important that a model be developed to monitor the demand and supply of these materials, especially in and around the fast growing centres of the City of Cape Town, Drakenstein, Stellenbosch, Breede River Valley and the Southern Cape part of the Eden District. It is furthermore also important that the use of renewable materials for the building industry be investigated as a matter of urgency.

4.1.7.4 LEGISLATIVE CONTEXT

The legislation listed here have bearing on the subject:

- The National Environmental Management Act, No 107 of 1998 (NEMA);
- The Environmental Conservation Act, No 73 of 1989;
- The Physical Planning Act, No 125 of 1991;
- The Land Use Planning Ordinance, No 15 of 1985 (LUPO);
- The Conservation of Agricultural Resources Act, No 43 of 1983;
- The Water Act, No 54 of 1956;
- The Precious Stones Act, No 73 of 1964;
- The Strategic Mineral Resources Development Act, No 88 of 1964;
- The Mining Titles Registration Act, No 16 of 1967;
- The Mining Rights Act, No 20 of 1967;
- The Mineral Laws Supplementary Act, No 10 of 1975;
- The Minerals Act, No. 50 of 1991; and,

4.1.7.5 KEY ISSUES

- The minerals of the Province are a non-renewable resource, so by definition mining is not a sustainable activity;
- Extraction and mining activity can have a major environmental impact;
- Lack of co-ordination between planning legislation and procedures, and the requirements of the Minerals Act;
- Loss of agricultural land, pristine land and land for urban expansion to mining;
- Urban development can sterilize the mineral extraction potential of an area. This can happen even if urban development does not actually cover the deposit, because when development is permitted nearby the deposits, pressures build up for mining activities to close down and then the deposits are sterilized; and,
- The need to find a balance between economic and environmental considerations.

4.1.7.6 SUMMARY

- 458 mining licences were active in the Western Cape in January 2004;
- The predominant mineral resources in the Western Cape are industrial, exploited by open cast mining;
- The most important construction commodities found in the Province are building sand, stone aggregate, gravel (road material) and brick clay;
- The most important industrial materials are limestone, dolomite, kaolin, ball clay, gypsum, salt, bentonite, mineral pigment, dimension stone, heavy minerals, silica sand, phosphate and iron;
- There is an urgent need to develop a model that monitors the demand and supply of building materials in the Province, particularly in and around the fast growing centres of the City of Cape Town, Drakenstein, Stellenbosch, Breede River Valley and the Southern Cape part of the Eden District; and,
- In the meantime the use of renewable materials for construction should be strongly promoted.
REFERENCES AND ACKNOWLEDGEMENTS

- Council For Geoscience: Poverty Alleviation Program, (www.geoscience.org.za);
- Council for Geoscience: Summary of Economic Geology of Provinces: Western Cape, (www.geoscience.org.za);
- Cole, Dr. D.I. Council for Geoscience (pers com);
- Viljoen, Dr. J.H.A. Council for Geoscience (pers com);
- Mr Johan Snyman, Medium Term Forecasting Associates;
- Mr Johan Borman, Department of Mineral and Energy;
- Department of Environmental Affairs and Development Planning (DEADP). Mining & Co-operative Governance in the Western Cape, March 2004.
4.1.8 AGRICULTURE

4.1.8.1 INTRODUCTION

The Western Cape contributes approximately 14.5% to the country’s Gross Domestic Product and generates about 23% of the total gross income of the agricultural sector, which amounted to R51.3 billion in 2001. The Province is South Africa’s largest producer of deciduous fruit, accounting for 85% of total deciduous fruit exports (WCPDC, 2004).

Although the Western Cape has access to only 12.4% of the farming area in South Africa, it contributes 22.4% to gross farming income. The total output of the primary agricultural sector in the Western Cape grew from R10.4 billion in 1999 to R11.8 billion in 2001 (an increase of 13.5% over the two-year period). The main industries in the sector include fruit (R2.4 bn), winter grain (R1.8 bn), white meat (R1.6 bn) and vegetables (R1.4 bn). The Province’s two most important export products (which together are responsible for more than a third of the value of the Province’s exports) are linked to the agricultural sector (fresh and canned fruit, fruit juices and wine, beer and spirits). A third, hides, skins and leather, is an extremely important product originating in the extensive rural areas of the Province (WCDoA, 2004b).

Western Cape agriculture is relatively more labour intensive than the national average, and the sector also has higher levels of remuneration than the national average. Over the period 1996 to 2001, the agricultural sector gained 32 000 permanent employment opportunities. Recent research has underlined the importance of stimulating exports from the agricultural sector as part of a job creation strategy. A 5% growth in the value of exports of selected competitive agricultural industries could create almost 23 000 jobs, about 41% of these in primary agriculture and the balance in the rest of the economy (WCDoA, 2004b).

Agricultural sub-regions

The Province is subdivided into five agricultural sub-regions, which have been aligned with the district municipalities:

- **West Coast**, the predominantly pastoral northern part of the winter rainfall region with irrigated vegetable and grapevine production along the Olifants River, and irrigated seed potato farming in the sandveld area, especially along the coast; includes Swartland, predominantly the wheat and pastoral producing areas along the southwest coast;
- **Cape Winelands** (previously Boland), predominantly the fruit and grape producing areas of the winter rainfall region;
- **Eden**, includes the Little Karoo, predominantly semi-arid pastoral, with some dryland grain production and irrigated fruit and grapevine production in the west; and the **Garden Route**, predominantly dairy and also vegetable production;
- **Overberg**, including cultivation on the Riversdale Plain, and pastoral areas and flower harvesting along the coast and on the Agulhas Plain; and,
- **Central Karoo**, predominantly a pastoral region, with growing interest in game farming.

These sub-regions are further subdivided into agricultural systems, in which the main agricultural production types are fairly uniform with similar climatic and soil resource characteristics (DEADP, 2004).

Agricultural land use

As shown in Table 4.1.8.1, agriculture is by far the biggest land use in the Province, using approximately 11 000 000 hectares which has a total area of about 13 million hectares.

<table>
<thead>
<tr>
<th>Land use</th>
<th>% of land in Province</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal production, including dairy, cattle, sheep and ostriches on natural veld, also planted pastures used for grazing animals, and commercial wildlife ventures</td>
<td>43%</td>
</tr>
<tr>
<td>Croplands (including fallow land less than 10 years old) for wheat, barley, citrus, deciduous fruit, viticulture, vegetables and indigenous crops like rooibos tea and wild flowers</td>
<td>36%</td>
</tr>
<tr>
<td>Settlements and infrastructure</td>
<td>13%</td>
</tr>
<tr>
<td>Commercial forests, protected areas, or other land use types e.g. mining</td>
<td>8%</td>
</tr>
</tbody>
</table>

Table 4.1.8.1: Broad breakdown of land use in the Western Cape
2,500,000 hectares are under cultivation and approximately 270,000 ha under irrigation. Since 1988 there has been a general decrease in the area of land used for grazing. Croplands have decreased in the Karoo but increased in the western districts. The relative percentage of vineyards has recently increased in the Southern Cape and along the West Coast (DEADP, 2004). Broadly speaking, intensive agriculture is concentrated on the productive lowland coastal plains, while extensive agriculture is the dominant land use in the interior of the Province. The Provinces mountain ranges are generally unsuitable for agriculture.

**High potential agricultural land**

It is difficult to map high potential agricultural land, for two main reasons:
- The potential of the land usually depends on whether there is water available for irrigation. Land that has no potential without irrigation can have high potential with irrigation. In the Western Cape, there are more high potential soils than there is water to irrigate them. The limiting factor on agricultural expansion is water availability, not availability of land in the first instance; and,
- The potential of the land depends on the crop. For example, some shallow sandy soils that are unsuitable for most crops are highly suited to particular grape cultivars. The sandy soils of the sandveld on the west coast are not suitable for most crops, but are highly suited to seed potato farming (see below).

This means that it is not possible for the Western Cape Department of Agriculture to provide a map of high potential agricultural land. Agricultural potential of land needs to be assessed on a case by case basis, taking into account the availability of water for irrigation and the type of crop. This type of assessment is a costly exercise, because it is very detailed, and so is only done when the need arises.

**Expansion of agricultural land use concentrated on West Coast**

Analysis by Cape Nature (Love & Burger 2004) [Love, VC and Burger, JC, 2004. Sandveld in Crisis. Poster presentation, Fynbos Forum, 10-13 August 2004.) of applications to cultivate virgin land (pristine veld or land that has been uncultivated for more than ten years) shows that between 1989 and 2003, the National Department of Agriculture approved approximately 45,550 hectares of new cultivation in the Province. Almost 80% of the approved applications were on the West Coast, mainly for cultivating seed potatoes using borehole irrigation. Of the applications approved on the West Coast between 1989 and 2003, 25% of these were approved in 2003. This suggests strongly that the rate of expansion of agriculture on the West Coast is increasing. The sandveld area of the west coast, especially along the coast, is considered the best area in the country for the seed potato industry. Cultivation of potatoes in this area relies on irrigation using groundwater, and on large amounts of fertilisers and pesticides which contaminate freshwater ecosystems.

**Agricultural development strategy**

At the Western Cape Growth and Development Summit held in November 2003, the need was identified to develop a sector strategy for the agricultural and agri-business sectors to ensure that the sector is a global success, competitive, inclusive, socially responsible and in balance with nature. The development of this strategy is currently underway (DoA, 2004a). It has a central role to play in the long-term sustainability of a prosperous agriculture and agri-business sector in the Western Cape (WCPDC, 2004).

Agricultural sub-sectors that are growing in the Western Cape include vineyards, potatoes, canola, apples, ostriches, and lucerne (mainly as feed for ostriches) (Chris Venter, pers com).

**Land reform and settlement**

One of the most significant policy shifts over the past two years has been the realignment of the Western Cape Department of Agriculture towards the establishment of services rendered to emerging black farmers. In the Western Cape, the Land Reform Implementation Strategy identified the need to design a shared vision and strategy to meet the national directive to distribute 30% of commercial agricultural land in the country, within the next 15 years (approximately 4 million hectares of agricultural land in the Western Cape) (DEADP, 2004).

This land reform process has to be fast tracked to settle 7000 land reform beneficiaries in the first five years of the Land Redistribution for Agricultural Development programme. More specifically, commercial farmer settlement is being implemented within the context of the Land Redistribution for Agricultural Development (LRAD) programme, which will increase the number of farmers in the Western Cape. The objective of the programme is to facilitate the transfer of targeted state-owned agricultural land, as well as the purchase of private land by black people of the
Western Cape Province (DoA, 2004a). Land reform is discussed more fully in Section 4.3.8.

**Subdivision of agricultural land**

The subdivision of agricultural land in the Western Cape is based on the principle of sustainable agriculture, according to which farming should not occur to the detriment of the environment and should be economically sustainable and acceptable to the community.

The Western Cape Department of Agriculture has a clear policy on minimum farm size. Small farms are problematic from both an agricultural and a biodiversity point of view – they are much less likely to be sustainable in the long term. Minimum farm sizes for different agricultural sectors are adjusted according to the agricultural potential of the land. For high potential land, the size could be adjusted downwards, and vice versa (DoA, 2002).

The Department of Agriculture commented on 920 applications for subdivision and/or change of land use during 2003 (DoA, 2004a). When the agricultural sector is struggling financially, for example because of market conditions or drought, the number of applications tends to increase. The sector is currently going through such a period (Hennis Germishuys, pers com).

**Sustainable resource management through LandCare Area Wide Planning**

Sustainable natural resource use is underscored by the LandCare programme which aims to conserve, protect, improve, and sustain natural resources and the environment, by means of integrated planning of farms, the design of soil conservation works, as well as control over the judicious fragmentation of agricultural land. LandCare Area Wide Planning is a community-based natural resource management methodology that has been adopted by the Western Cape Department of Agriculture to enable local people to identify and address the concerns of their community while striving to improve or maintain the health of the land. Area Wide Planning aims to integrate social, economic and ecological concerns over defined geographical areas, at a scale larger than an individual farm plan (DoA, 2003). Area Wide Planning involves partnerships with other government departments, non-governmental organisations and international resource agencies (DoA, 2004a). By introducing pro-active land-use planning as an integrated part of Area Wide Planning projects, spatial information is generated which can be fed into municipal Spatial Development Frameworks (DoA, 2004b).

The Slanghoek area close to Worcester is one of the examples where Area Wide Planning has been successfully undertaken. There are several pilot Area Wide Planning projects underway in the Province, with plans to roll the programme out further. Where possible, Area Wide Plans are linked to fine-scale biodiversity plans (see Section 4.1.5).

**Presidential nodes**

Agricultural projects in the Central Karoo and the Metro areas will be supported under the banner of the two presidential nodes, namely Beaufort West, the Integrated Sustainable Rural Development Programme (ISRDP) and Mitchell’s Plain and Khayelitsha, Urban Renewal Programme (URP). Six food security projects will be implemented in the Urban Renewal node in the current financial year (DoA, 2004a).

### 4.1.8.2 LEGISLATIVE CONTEXT

The existing legal/policy context for arable land in the Western Cape includes the following:

- Strategic plan for South African Agriculture, 2001 – this national strategy sets out a national perspective on where agriculture should be heading in the medium term;
- Conservation of Agricultural Resources Act, 1983 – to be replaced by the Sustainable Use of Agricultural Resources Bill, 2003;
- Sustainable Use of Agricultural Resources Bill, 2003 – provides for the sustainable use of natural agricultural resources, including control over the subdivision and change of use of agricultural land and prime- and unique agricultural land;
- Subdivision of Agricultural Land Act, 1970;
- Water Services Act, 1997;
- Water Act, 1998;
- Land Redistribution Policy for Agricultural Development;
4.1.8.3 KEY ISSUES

- Sustainable resource management, including managing increased pressure on the agricultural resource base, must find a balance with limited natural resources (land and especially water) and stopping urban sprawl;
- Optimal use of limited water resources – irrigation constitutes 43% of all water use in the Province. Water availability is the biggest limiting factor on agricultural expansion in the Western Cape;
- Provision of adequate transport infrastructure such as roads, railways, ports, airports in support of various agricultural sectors, and to strengthen international competitiveness;
- Creating additional capacity in agricultural extension services, especially in the light of increasing numbers of emerging farmers in the Province, and the need to roll out the Area Wide Planning programme.
- Sustainable land reform and black economic empowerment;
- Vulnerability of agricultural export market, for example in terms of the exchange rate – strengthening of the Rand resulted in a loss of income in various agricultural industries;
- International competitiveness, in the context of large agricultural subsidies in other countries, and dumping on international markets;
- Food safety and security – increased demands for household and national needs, and consumer and international concerns on food safety;
- Predicting and managing risks inherent to the agriculture environment such as droughts, floods and major animal disease outbreaks;
- Investments in Integrated Sustainable Rural Development Programme (ISRDP) in Beaufort West and Urban Renewal Programme (URP) in Mitchell’s Plain and Khayelitsha; and,
- Clarity is required on the relationship between commercial and small scale agriculture. This includes the need to have a sustainable and vibrant commercial sector while at the same time providing opportunities for small scale farming, black economic empowerment and sharing the ownership of land.

4.1.8.4 SUMMARY

The agricultural sector is by far the biggest land user and a major water user in the Province. Intensive agriculture is concentrated on the productive lowland coastal plains, while extensive agriculture is the dominant land use in the interior of the Province. Agriculture forms a significant part of the provincial economy, generates exports, and shows potential for job creation in certain sub-sectors. However, expansion of agriculture is a major pressure on the Province’s natural environment, in terms of water use and loss of natural habitat, especially on the West Coast. It can also be threatened by inappropriate urban development. Agriculture is also significantly affected by the pressing need to achieve transformation of the sector. These factors need to be carefully balanced in decisions about how and where to grow the provincial agricultural economy.

REFERENCES AND ACKNOWLEDGEMENTS

- Germishuys H, Western Cape Department of Agriculture (pers comm.), 2004;
- Troskie D. Strategic issues in the agriculture sector of the Western Cape Province. First draft. Western Cape Department of Agriculture, Elsenburg, 2004;
- Venter C, Department of Agriculture, Western Cape. (pers comm.);
- Western Cape Department of Agriculture. Landcare Area Wide Planning. Provincial Government of the Western Cape, Cape Town, 2003;
- Western Cape Department of Agriculture. 2004b. Strategic Plan 2004/2005 of the Western Cape Department of Agriculture. Provincial Government of the Western Cape, Cape Town, 2004; and,
Figure 4.1.8.1  Agriculture

- CULTIVATED LAND (Intensive Agriculture)
- FORESTRY
- EXTENSIVE AGRICULTURE - Grazing on natural veld.

Map Name: AGRICULTURE
Category: Built Environment

Source: ENPAT 2001
Scale at A3 - 1:2500000

CndV Africa
Environmental planning, landscape architecture, urban design

PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK
7 NOVEMBER 2005