

CHAPTER 4

Environment

Natural Assets

Background

The Western Cape's natural assets include the scenic mountain ranges, extensive inland and coastal plains, three major river systems and 1 015 km of coastline. These assets provide arable land, water, clean air, scenic landscape and construction materials. They generate income and support agriculture (wheat, fruit, meat and vegetables), large commercial and recreational fisheries, industry, tourism and human settlements. The province's indigenous vegetation – the Cape Floral Kingdom (or fynbos biome) and the Succulent Karoo biome are two of the world's 34 global biodiversity hotspots and are unique in the world. Approximately 21% of the province has been set aside for conservation. South African National Park (SANParks) and Cape Nature respectively manage the national and provincial conservation areas.

The key natural assets considered to be major significance for the SIP are biodiversity, the coastal zones and agriculture and construction materials. This section briefly describes these assets and their management and identifies strategic priorities to enhance their control and management.

Priority projects that will enable the improved management of the natural assets have been identified only for the agricultural sector. Whilst there are no specific priority projects in the biodiversity, coastal zone and construction materials categories, key strategic priorities are required to conserve, manage or improve these natural assets during the development of proposed infrastructure projects in areas such as tourism which are directly linked to the biodiversity and coastal zone assets. These strategic priorities involve further investigations or development of processes or guidelines to assist in the management of the natural resource.

Biodiversity

Background

The term biodiversity refers to genes, species (plants and animals), ecosystems and landscape and the ecological and evolutionary processes that allow these elements of biodiversity to exist over time.

South Africa is ranked as the third most biologically diverse country in the world. The Western Cape is particularly rich in biodiversity and houses two of the globally recognised hotspots, namely the Cape Floral Kingdom and the Succulent Karoo. The Cape Floral Kingdom, one of the world's six floral kingdoms, has over 9 000 plant species, half of which are found nowhere else on earth. The Succulent Karoo, which contains highly specialised plants and animals in an arid environment, has more than 40% of its 6 300 plant species endemic to the region. The Nama Karoo is the third main biome in the Western Cape. Smaller but significant biomes include the forest biome in the Knysna region and small patches of Albany Thicket in the Southern Cape.

This rich and varied biodiversity in the Western Cape plays a key role in the healthy functioning of the ecosystems which provide important natural assets such as arable

land, water, clean air and scenic landscape. These and other national assets are increasingly (negatively) affected by the social and economic demands of human activities in the Western Cape. The State of the Environment Report of 2005 and the PSDF describe these impacts in some detail.

Almost 18% of the land in the Western Cape is now cultivated, resulting in significant loss and fragmentation of the natural habitat. Other human activities such as settlements, forestry, mines etc contribute further to the degradation and loss of biodiversity. South Africa, and particularly the Western Cape, has undertaken extensive conservation research into the loss of habitats and this has placed the Western Cape on the global map of biodiversity importance.

The National Spatial Biodiversity Assessment (NSBA) identified that 21 of the country's 440 vegetation types are critically endangered. Of these 15 are in the Western Cape. The province also has 27 of the country's 58 endangered vegetation types.

A systematic approach is now being adopted to provide more effective biodiversity planning. Systematic conservation planning offers a systematic and scientific method of selecting and prioritising areas to achieve explicit conservation goals.

Three programmes are presently underway:

- Cape Action for People and the Environment (CAPE) is an internationally-funded programme, focused on the Cape Floral Kingdom, which targets 60% of the remaining natural vegetation for conservation. Three sites of greater than 500 000 hectares have been identified, namely the Gouritz Initiative, the Greater Cederberg Biodiversity Corridor and the Bivaanskloof Conservation Area;
- Subtropical Thicket Ecosystem Plan (STEP) aims to improve the safeguarding of the subtropical thicket biome straddling the Western and Eastern Cape;
- Succulent Karoo Ecosystem Plan (SKEP) involves a 20-year strategy to identify priority areas and promote conservation in the Succulent Karoo biome which straddles the Western and Northern Cape Provinces.

In addition to, and as part of the CAPE, SKEP and STEP programmes, there are a range of conservation initiatives. These generally focus on conservation of a suite of plant and animal species on a broad scale. These initiatives include:

- Agulhas Biodiversity Initiative;
- Greater Cederberg Biodiversity Corridor;
- Gouritz Initiative;
- Garden Route Initiative;
- Conservation Farming Project;
- Cape Lowlands Renosterveld Project;
- Conservation stewardship;
- City of Cape Town biodiversity strategy; and
- Fine-scale biodiversity planning.

The importance of the province's biodiversity is highlighted in the two biosphere reserves that have already been registered in the Western Cape. These are the Kogelberg Biosphere and the Cape West Coast Biosphere Reserve. Other biosphere reserves are envisaged including the proposed Knessvlakte Biosphere Reserve north of Vredendal and the Cederberg Biosphere Reserve.

Bioregional planning, advocated by the Department of Environmental Affairs and Development Planning, aims to accommodate both the conservation of biodiversity and the need for development. The process identifies conservation priorities early in the planning process and allows for development to be guided away from the important biodiversity areas.

Whilst most of the threats to the biodiversity are directly related to humans, for example in the form of agriculture and urban sprawl, alien vegetation also constitutes a significant threat. Many thousands of plant species have been introduced into the Western Cape for a variety of purposes of which a relatively small number become invasive. Typical of these are rooikrans and Port Jackson, which are well-known in the Province. Up to 70% of the remaining natural fynbos is invaded to some degree by alien plants, and about 2,5% severely so. The need to control and eradicate alien vegetation resulted in the successful implementation of the Working for Water Programme which has now spread to the entire country.

Beside the plants there are other invasive species in the form of fish invertebrates and mussels which are increasingly displacing indigenous species in the Western Cape.

Strategic priorities

The PSDF identified 12 key issues relating to biodiversity that need to be addressed. Only three of these are considered specifically relevant to the SIP. The three issues give rise to a single project, namely clearing of alien vegetation, the use of the materials and associated job creation. The three issues are as follows:

- Develop a strategy for conserving biodiversity which will focus on keeping natural habitat intact and minimise fragmentation of natural habitat especially in threatened ecosystems and key ecological corridors;
- Clear alien vegetation from natural habitats and other environmentally sensitive areas and use materials for job creation;
- Develop public private partnerships and strategic interventions to capitalise on opportunities that serve both the conservation and development agenda.

Table 2 summarises the proposed project.

Table 2 Proposed SIP project for biodiversity

Project	Priority	2005 – 2010	2011 – 2005	Elihlumayo targets
Clearing of alien vegetation and job creation	Underway	✓		

Coastal zone

Background

The province's 1 000 km coastline is characterised by unique, diverse and beautiful natural habitats supporting numerous communities and industries which are dependent on the coastal resources for their livelihoods. The coastline stretching from the Olifants River on the west coast to the Blaaukrantz River in the east is well known for its bays, rocky shores, beaches, estuaries, and lakes, and the ports at Saldanha and Cape Town and many smaller harbours, particularly in the Cape Metro area.

The coastal zone is a relatively narrow band and is influenced by the direct interaction between land and sea. It includes estuaries and wetlands, sandy beaches and rocky shores. The sub-tidal area is made up of offshore reefs and sand flats.

Most people in the Western Cape live within 25 km of the coast. Consequently development and other pressures on the coastal zone will continue and are expected to increase. Typical pressures on the coastal zone include:

- Development in the form of coastal resorts, and residential areas has led to alteration, fragmentation and loss of coastal habitats;
- Various inland activities such as water abstraction, have reduced freshwater flows to the coastal zone;
- Coastal mining, and in particular sand and diamond mining on the West Coast, has modified the coastal habitats;
- Invasive alien plant and animal species have resulted in a loss of biodiversity;
- The coastal zone is particularly vulnerable to the increase in temperature and sea level rise associated with global climate change;
- Increased residential and industrial development has increased the effluent discharge and stormwater runoffs have reduced estuarine water quality;
- Poor agricultural and forestry practices in the hinterland have resulted in deterioration in river water quality which effects the coastal wetlands and estuaries;
- Migration of people to the coastal area due to perceived job opportunities places pressure on available resources;
- Ship traffic and dredge dumping result in pollution and litter of the water and associated loss of habitat and species; and
- Poor resource management results in over-exploitation of marine resources. The primary cause is excessive fishing.

The State of the Environment Report concludes that the

health of the coastal zone is of concern in the Western Cape. The marine environment is facing significant and increasing pressure from tourism, urban development and economic growth, much of which is occurring close to or in the coastal zone. Generally the health of the estuaries in the province is below the national average, and the Western Cape has the highest percentage of estuaries that are in a poor condition. Additionally 32% of all of South Africa's effluent discharged into the marine environment is discharged in the Western Cape. Applied fishing effort is still excessive in the Western Cape and some marine resources are severely depleted. Poaching of abalone is a particular problem in the Western Cape and abalone populations have been severely depleted and face collapse. Other species that are similarly threatened include the West Coast Rock Lobster, Giant Periwinkle (Alikreukel) and various line fish species.

Awareness of the pressures on the coastal zone have resulted in the preparation of the White Paper for Sustainable Coastal Development in South Africa, 2000. 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. The bill is currently in draft form.

The various initiatives presently underway to provide coherent planning management and development of the coastal zone include:

- Draft Coastal Zone Policy for the Western Cape 2004. This policy provides the framework for the implementation of the Coastal Zone Management Programme; and
- Draft Integrated Coastal Management Programme (CMP) for the Western Cape, 2003. The objective of the CMP is to facilitate improved planning of coastal resources as well as to allow for better targeted investment from government and non-governmental organisations to support sustainable coastal development.

The following initiatives are part of the CMP and are described in some detail in the PSDF 2005.

- Provincial coastal committee;
- Sustainable Coastal Livelihoods programme;
- Coastcare; and
- Awareness, education and training, including Blue Flag beaches, interpretive signage, adopt-a-beach and capacity building and empowerment.

Strategic priorities

The PSDF 2005 has identified 12 key issues relating to the coastal zone. Of these, two are considered strategic priorities to the SIP, as follows:

- to develop and implement a process for the systematic identification of sensitive and threatened coastal ecosystems and habitats; and
- to delineate a coastal corridor in which clear restrictions are placed on the types of development and other activities that are permitted.

Table 4 provides a proposed programme for the coastal zone project.

Table 3 Proposed SIP project for coastal zone

Project	Priority	2005 – 2010	2011 – 2005	Elihlumayo targets
Delineate a coastal corridor indicating development restrictions	✓	✓		

Agriculture

Background

The agricultural sector is the biggest land user in the province using approximately 80% of the total area of about 13 million hectares. This sector contributes to approximately 14,5% of the country's gross domestic product and generates about 23% (R11,8 billion) of the country's total gross income (R51.3 billion 2001). In 2001 the agricultural contribution was made up of the following major products: fruit (R2,4 billion), winter grain (R1,8 billion), white meat (R1,6 billion) and vegetables (R1,4 billion). The Western Cape's two most important exports are linked to the agricultural sector (fresh and canned fruit, fruit juices and wine, beer and spirits). These crops are generally grown in an intensive way on the productive lowland coastal plains. A third export group (hides skins and leather) originates in the extensive rural areas of the province.

The Western Cape agricultural sector generally has a higher level of remuneration than the national average and is relatively more labour-intensive than agriculture in the rest of the country. The agricultural sector enjoyed an increase of 32 000 permanent employment opportunities during the period 1996 to 2001. Recent research quoted in the PSDF suggests that 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.

Water is the biggest limiting factor for agriculture in the Western Cape. There are extensive areas of high potential soils but there is insufficient water to irrigate them.

The PSDF 2005 records that between 1989 and 2003 the national Department of Agriculture approved the use of more than 45 00 hectares for new cultivation in the province. Almost 80% of this was on the West Coast, mainly for the cultivation of seed potatoes using borehole irrigation.

The provincial Department of Agriculture's Draft Environmental Synthesis Report of 2003 for the Western Cape Olifants Doring River Irrigation Study identified extensive areas of land suitable for irrigation in the Olifants Doring basin. The study identified the Coastal area, parts of the Atties Karoo and Klaver area and the Melkboom area as potential development scenarios, with water supplied from a dam to be built on the Doring River.

The study investigated the best development scenario considering the economic viability, ecological impact, job creation, establishment of emerging farmers and empowerment of disadvantaged communities as well as overall sustainability. The opportunity to provide agricultural land in the West Coast to emerging black farmers forms part of government's land reform implementation strategy. This strategy supports the national directive to distribute 30% of commercial agricultural land in the country to black farmers within the next 15 years. This equates to approximately 4 million hectares of agricultural land in the Western Cape.

The subdivision of agricultural land is of concern to the Department of Agriculture. It has therefore developed a clear policy on the minimum farm size necessary to render farming economically sustainable, acceptable to the community and not detrimental to the environment. The Western Cape Department of Agriculture have adapted the policy of sustainable resource management through Landcare Area Wide Planning. This planning aim to integrate social, economic and ecological concerns over defined geographical areas at a larger scale than an individual farm plan.

In spite of a significant contribution to the Western Cape economy the agricultural sector, especially the farmers in the more rural areas, suffer from serious disadvantages particularly when compared to overseas competitors. The lack of irrigation water, droughts, distance from markets and rising costs play a major role. A priority is the identification of new water resources for irrigation or provision of alternate supplies for domestic purposes (eg desalination) in order to free up more irrigation water. Furthermore the farming community requires improved and additional infrastructure to enable them to compete with overseas competitors.

Strategic priorities

Strategic priorities are as follows:

- There is a need to investigate new sources of water for the irrigation sector such as the Olifants/Doring River Scheme and new or alternate sources (such as desalination) for municipal supplies. Alternative methods of efficient irrigation also need to be investigated.

The following additional infrastructure is required to improve the agricultural sector:

- Handling facilities for fresh produce at the ports and airports;
- Improved road and rail infrastructure including the condition of the roads and rail rolling stock;
- Improved communication and information transmission infrastructure in the province.

Table 4 summarises information on the proposed SIP projects in the area of agriculture.

Table 4 Proposed SIP projects in respect of agriculture

Project	Priority	2005 – 2010	2011 – 2005	iKapa Elihlumayo targets
Investigate and develop new water resources	✓	✓		
Improve handling facilities for fresh produce at ports and airports	✓			
Improve road and rail infrastructure in farming areas	✓			
Improve communication and information transmission infrastructure in rural areas	✓	✓		

Construction materials

Mining and quarrying as an economic sector contribute only a small proportion to the Western Cape's GDP (0,2% in 2003). This sector also contributes a very limited number of job opportunities (3 829 people in 1999). In spite of this there were 458 active mining licenses in the Western Cape as at January 2004. Of these, 369 were issued for construction materials such as sand, stone, road gravel and brick clay. The other licenses were mainly for industrial minerals such as limestone and heavy minerals etc.

Details of the quantities of construction materials supplied to existing projects are not readily available, nor are the estimated remaining reserves of the materials. However these figures should be more readily available in the next four years as the Mineral and Petroleum Resources Development Act (Act 28 of 2002) requires that detailed records of every mine must be prepared. Such figures are required to obtain an understanding of the supply and demand of construction materials, particularly if the SIP is implemented in the context of a 6% growth rate.

Anecdotal information and data provided by the Council for Geoscience provide an indication of the current situation in respect of different construction materials. Table 5 shows the breakdown of mines and quarries by product and district.

Table 5 Mines and quarries in the Western Cape

Product	Western Cape	Overberg/Boland	Eden	Total
Gravel and sand	122	35	26	183
Aggregate	182	59	47	288
Clay	50	34	35	119
Total	354	128	108	590

Cement is presently supplied from Piketberg in the Western Cape. Reserves of raw materials for the manufacture of cement are considered to be sufficient for the next 25 years.

Concrete stone, clay and gravel and sand are mined at 590 localities in the Western Cape.

Gravel and sand are mined at 183 places in the Western Cape. Most of these sites are in the vicinity of the major towns. The high demands for sand also results in numerous illegal borrow pits and small-time operators. The mining is usually for a short- to medium-term operation that creates few job opportunities.

The gravel and sand are normally mined in three types of environments, namely deep coastal sand (dunes), riverbeds and low-lying inland areas. All of these have a significant impact on the natural environment. The large exposed areas and non-cohesive nature of the sand result in such areas being susceptible to wind and water erosion. Although the supply of sand generally meets the demand, there is concern about the long term.

There are 288 aggregate quarries in the Western Cape. Most of these mining operations are hard rock quarries with medium to long term operation periods. There appear to be sufficient resources to meet the increased production demand required for the infrastructure projects proposed in terms of this SIP. However, the nature and location of hard rock quarries usually results in their location and operation in elevated and exposed positions, leaving scars on the landscape.

Bricks are produced from the local clays derived mainly from the Malmesbury Formation. These deposits are usually in the lower-lying valleys, competing with the natural vegetation and agricultural activities. Large quantities of clay are available and are presently exploited at 119 sites in the Western Cape. These mines include clay for other purposes beside brick-making, such as kaolin and allied clays for the ceramics industry.

The geo-technical characteristics of the clay quarries make them ideal locations for waste disposal sites. The filling of the excavations with waste provides an opportunity for the rehabilitation of the excavation. The clay quarry owner would otherwise have to import material, reshape and revegetate the quarry at his or her own cost. The rehabilitation of a quarry is a requirement in terms of the Mines and Minerals Act.

Some recycling of construction materials is undertaken in the province. Materials such as road layer works, concrete and other builders rubble are crushed and screened to provide materials for new roadworks and paved areas. The quantity of recycled material produced is small when compared to the total stone production in the province. Recycling often takes place on site near a demolished structure. The procedure assists in reducing transport costs and wear and tear to the road infrastructure.

The manual production of concrete stone by knapping large rocks or discarded concrete blocks is undertaken in some other African countries where stone is in short supply. This is a labour-intensive operation which could be considered in areas of the province where there is no stone supply.

The strategic priority in this area is to investigate and report on existing construction material supplies and remaining/future resources in the Western Cape in the form of stone, sand, clay bricks and cement. Table 6 presents this as a proposed project for the SIP.

Table 6 Proposed SIP project in respect of construction materials

Project	Priority	2005 – 2010	2011 – 2005	Elihlumayo targets
Investigate source and supply of construction materials in Western Cape	✓			

Water, wastewater and solid waste

This sector covers a wide array of facilities and infrastructure including dams and rivers, sewage treatment works and waste disposal facilities. Each sub-sector is discussed in turn.

Water

The main providers of water infrastructure in the province are the water boards, the Department of Water Affairs and Forestry (DWAF) and the municipalities. The facilities will be co-financed by grant funds from the Municipal Infrastructure Grant (MIG) set aside by the National Treasury.

All living systems depend on water and as such it is a crucial resource. Society aims to have safe, clean water for cooking, drinking and washing and water for cleansing wastes, mining and manufacturing, forestry, watering stock and crops, marine-culture and recreation. This places immense pressure on this limited resource. It is predicted that some time around 2040 South Africa's water supply - surface and groundwater - will dip below water demand (Davies and Day, 1998).

South Africa, including the Western Cape, is a water-stressed country. A number of factors contribute to the relatively small volumes of naturally occurring surface water. These include the generally dry climate, high evaporation rates and the flat topography. The climate in South Africa ranges from semi-arid to hyper-arid. Mean annual rainfall (MAR) decreases while evaporation increases westwards and northwards across the southern part of Africa. South Africa's average rainfall is 452 mm/year and the Western Cape's annual rainfall is substantially lower over large areas, although precipitation on the high mountain ranges is significant. The Western Cape's high evaporation rates almost always exceed rainfall, meaning that little water finds its way into the region's rivers, dams and wetlands.

With South Africa having a relative high population growth rate and the influx of people from other provinces into the Western Cape, pressure on the already stressed Western Cape's water resources is increasing rapidly. The challenge for the province's water managers is extremely daunting. Not only do they have to supply water to a huge and rapidly growing population but they must also design reservoirs or utilise other resources (such as groundwater) to contend with droughts of unpredictable magnitude at unpredictable times.

Rivers

The diversity of the Western Cape's rivers in terms of river morphology, chemistry, flows and biodiversity reflects the climatic and rainfall variations that occur in the province. Generally the higher-rainfall east coast of the Western Cape has many, relatively short, perennial rivers compared to the much drier west coast which has relatively few, longer rivers, many of which are seasonal or episodic. Rivers in the semi-arid Karoo interior consist mainly of tree-lined fossil riverbeds with typically seasonal to episodic flows.

Approximately 13% of South Africa's MAR is channeled to the southern and western coastal regions, mainly via the Olifants, Berg, Palmiet and Breede Rivers, while approximately 56% is channeled via rivers on the east coast of South Africa, mostly outside the Western Cape.

Geochemistry plays an important role in river water quality and ecology and also determines whether the water is fit for human consumption. In the Western Cape the majority of the westward-flowing rivers originate or flow across sediment-rich formations (for example, Malmesbury shales) and therefore carry more saline, nutrient-rich water. The majority of rivers flowing to the east, which have their sources in the Table Mountain Group (TMG) sandstones, carry cool, acid, clear or 'black' waters. These cool acid waters are of high quality and are heavily targeted for human consumption.

The West Coast's rivers are very sensitive primarily because of high levels of evaporation and the complex geochemistry of their catchment areas. The Olifants-Doring system, one of the few permanent westward-flowing systems, has a particularly complex catchment geochemistry. The system receives high quality, acidic water from fynbos-covered mountainous areas and more sediment-rich, saline water from the Karoo areas east of the Cederberg. This results in unique aquatic conditions and high levels of species endemism. The system is regarded as an endemic fish hotspot with eight endemic species all threatened with extinction (Impson et al., 2000). Water abstraction from the Olifants River for vineyards and orchards is so great that at times the river ceases flowing. Water quality is also steadily declining as a result of salinisation, primarily because abstraction removes higher quality water, thereby increasing the contribution of more saline water.

Most of the Western Cape's river systems that flow into the Indian Ocean (i.e. east of Cape Agulhas) flow in an easterly direction, and are relatively short, perennial rivers that carry high quality water. Arguably the most significant of these systems is the Breede River, which has its origins in the Cape Fold Mountains near Ceres and issues into the Indian Ocean at the coastal town of Witsand. Due to the high quality and high volume of water in the Breede River system, the river has been heavily exploited for water supply. Two major impoundments have been constructed – the off-channel Greater Brandvlei Dam and Theewaterskloof Dam. Salinisation as a result of the heavy exploitation of the upper reaches of the Breede River is a growing concern. The system supports a growing ecotourism industry involving river rafting and overnight camps situated on the river's banks.

With the exception of the Gouritz and Keurbooms rivers, whose upper catchments comprise much of the Karoo interior, the majority of the province's rivers in the Southern Cape all contain high quality water (mostly acidic, clear or dark water). Major impacts to the rivers occur primarily in their middle and lower catchments and are primarily a consequence of agricultural practices, which include diffuse source pollution from land application of fertilizers and pesticides and invasion of riparian zones by alien plants. Although rainfall in much of the eastern part of the Western Cape is higher, year-round water supply remains a critical issue because the area has poorly developed water supply infrastructure.

Coastal towns and holiday resorts have developed at the point where some of the rivers flow into the sea, because of the attractiveness of these environments. Towns such as Knysna, are developing rapidly, and increasing development is placing increasing pressure on the lower reaches and estuarine systems of these rivers.

Much of the dry Karoo Interior falls within the Goums River catchment and to a lesser extent the Orange River basin. Due to highly seasonal and unpredictable flows and the relatively poor quality of the Karoo's surface water, much of the water for urban supply is obtained from underground sources.

Wetlands

Wetlands are recognised globally as being of high conservation importance on account of their high biodiversity and complex and sensitive ecosystems. They also provide essential goods and services such as plant material for crafts, food, water purification and storm water attenuation. These goods and services are particularly important to people who rely on subsistence and resource-based economies.

Wetlands vary from minute, water-filled depressions in a single rock to swamps such as the sprawling Okavango Delta in Botswana. In the Western Cape, wetlands comprise predominantly pans, vleis (swamps) and floodplains. Estuaries are also often regarded as wetlands.

On the West Coast there are a number of ephemeral pans. These are important in terms of their biodiversity and conservation status, but many have been negatively affected by agricultural activities. Verlorenvlei near Elands Bay and the Berg River estuary near Veldrift are both RAMSAR sites. These sites are wetlands of particular significance which have been designated under the Convention of Wetlands of International Importance of 1971. In Cape Town, the largely artificial Rietvlei system is also a RAMSAR site and has been designated a protected natural environment by government, primarily because of its importance as a refuge for waterfowl and migratory birds.

Blackwater wetlands are a characteristic feature of the South Western Cape. These occur in fynbos areas overlying TMG sandstones. In certain areas such as Pringle Bay and Betty's Bay these wetlands have been degraded by poorly managed urban development.

The Agulhas Plain probably has the greatest concentration and diversity of wetlands in the Western Cape. The Heuningnes River flows through an extensive system of wetlands including Voelvlei and Soetendalsvlei before it reaches the sea at De Mond. At this point it forms the Heuningnes Estuary, also registered as a RAMSAR site. Further east is another RAMSAR estuary, De Hoop Vlei, which is a proclaimed site of international importance.

In the mountainous parts of the Western Cape (particularly in the Cape Fold Mountains) are a multitude of high altitude mountain seeps. These seeps are the source of many of the Cape's rivers. Although very little is known about them scientifically, they are regarded as having a high conservation status.

The coastal strip of the better-watered eastern part of the Western Cape district contains a number of shallow coastal lakes or vleis. Particularly noteworthy are the interlinked Wilderness Lakes, which include four freshwater lakes namely Langvlei, Bo-Langvlei, Rondevlei, and Groenvlei and one saline, tidal lake, Swartvlei. These lakes are mostly connected to the sea via one or more channels, except where the connection is lost such as with Groenvlei.

There are a number of ephemeral endorheic pans in the Karoo interior. These are wetlands in closed basins with inflows of water but no outflows. Because of the aridity of the area and their inward-draining characteristic, the pans typically accumulate salts and are highly saline. Although not useful for human purposes they are unique and of critical conservation significance.

Reservoirs, dams and inter-basin transfer schemes

Due to the extremely limited storage capacity of the province's naturally occurring surface water bodies, a large number of reservoirs and dams have been constructed. Their primary function is the storage of water for irrigation, stock-watering and urban water supply. The main reservoirs include the Theewaterskloof, Steenbras, Greater Brandvlei, Voelvlei and Clanwilliam dams.

With the rapidly increasing demand and increasing frequency of water shortages in the South Western Cape, the DWAF has proceeded with the planned new Skuifraam Dam and Skuifraam Supplement Schemes. The project - known as the Berg River Water Project (BRWP) - is the largest water project currently being implemented in Southern Africa. It will increase the yield of the Western Cape water system by 81 million cubic metres (18%) to 523 million cubic metres per year by 2007.

In addition to the province's large dams or reservoirs, there are over 40 000 farm dams storing in excess of 100 million cubic metres of water. When compared to the rest of South Africa, the concentration of dams in the Western Cape is by far the highest.

There are few viable opportunities for increasing the amount of water available in the Western Cape by transferring water from the better watered parts of the country, as has been done for Gauteng. The two main inter-basin water transfer schemes – the Rivieronderend-Berg-Eerste and the Palmiet scheme – are relatively small in comparison to other schemes elsewhere in South Africa. The Rivieronderend-Berg-Eerste scheme supplies water for urban use to the Greater Cape Town Metropolitan Area, including Stellenbosch, as well as for urban and agricultural use in the Berg River catchment and demand centres in the West Coast. The Palmiet scheme has been established primarily for generating hydroelectric power.

Groundwater

In comparison to the rest of South Africa, the Western Cape is relatively well-endowed with groundwater resources. The mountainous areas of the south western Cape receive some of the highest rainfall in the country (more than 2 500 mm per annum). This water recharge potential compensates to some extent for the lack of storage space in aquifers, which is due to the host formations being mostly geologically old rocks in which pore spaces have been destroyed by compaction.

The groundwater resources of the Western Cape Province are generally under-utilised, although in some areas large-scale use is taking place, mainly for irrigation. This happens, for example, in the Hex River and Koo Valleys, and for town supply purposes in Atlantis and in the Karoo towns such as Prince Albert.

There are two basic types of water-bearing openings or aquifers in the Western Cape, namely:

- Primary (intergranular) openings or pores that originate contemporaneously with the genesis of sedimentary and igneous rocks; and

- Secondary (fracture) openings that originate from processes, such as tectonic deformation and weathering, that affect the rock after they were formed.

As regards groundwater potential, there are four main units in the Western Cape Province, each of which has varying potential.

- The Beaufort Group (age 230-240 million years) comprises alternating shaley and sandy rocks. Two distinct aquifers exist in these fractured rock aquifers. Borehole yields are commonly less than 2 to 5 litres per second and the quality of the groundwater is variable, though usually within the maximum acceptable water quality parameters for town supply;
- The Table Mountain Group (age 395-500 million years) rocks constitute the most important water-bearing unit or aquifer system in the Western Cape. Water-bearing fractures may extend several hundred metres and sometimes thousands of metres below the surface, and deep groundwater circulation along discrete zones is one of the unique characteristics of this aquifer system. This is evidenced by a number of thermal springs, such as Caledon, Montagu, The Baths near Citrusdal, Calitzdorp and the hottest spring in South Africa, Brandvlei at 62°C. Borehole yields generally vary between 0,5 to 5,0 litres per second. The quality of the groundwater in the Table Mountain Group is excellent.
- The Bokkeveld Group (age 365-395 million years) consists of alternating shale and sandstones. Borehole yields vary from less than 1 to more than 5 litres per second. Groundwater quality is variable (as with Beaufort Group).
- The Malmesbury Group (age 700-800 million years) provides erratic potential, and borehole yields and water quality vary considerably.

The DWAF produced a 'harvest potential' map of South Africa in 1998 (Baron et al, 1998). Harvest potential is defined as the maximum volume of groundwater that can be abstracted per square kilometre per annum without depleting the aquifers. Socio-economic factors are not considered. The harvest potential of the province is approximately 3 198 200 m³ per annum, while the sustainable abstraction rates vary between 2 000 to in excess of 100 000 m³ per km² per year. The high-lying, TMG outcrop areas in the southern portion of the province have the highest harvest potential, whilst the lowest harvest potential is found in the extreme northwest.

The biggest potential well-field development in the Western Cape is taking place in the mountains to the east of Cape Town. A number of target areas are being investigated and it is intended to develop a pilot well-field which is expected to yield approximately 3,5 million m³ per annum. Yields of 100 litres per second are proposed for successful production boreholes, which may be as deep as 1 000 m.

The Klein Karoo Rural Water Supply Scheme was commissioned in 1987. The original design yield was 4,7 million m³/annum from two well-field areas, an Eastern Well-field near Dysseldorp and a Western Well-field near Calitzdorp. Other municipal well-field schemes include those at Ceres, Hermanus, Bredasdorp, Prince Albert, Kleinmond and Citrusdal.

The main areas of existing groundwater use in the Western Cape include the greater Cape Town area, as well as Rawsonville.

Table 7 shows details of groundwater usage in the province.

Table 7 Groundwater location and use

Area	Approximate abstraction (m ³ /annum)	Use	Aquifer
Atlantis	6	Domestic	Coastal Primary
Bot River	0.6	Domestic	TMG
Greater Cape Town Area	20	Domestic	Coastal
		Irrigation	Primary/Malmesbury
Rawsonville	22	Irrigation	Primary
Bredasdorp	0.25	Domestic	TMG
Hermanus	1	Domestic	TMG
Beaufort West	0.7 to 2.3	Domestic	Karoo

In the Western Cape, the majority of households have access to running water. In the Eden district, 59% of households have access to running water from within their dwelling, while 25% have access to water points on their erven. Only 20% of the households in the City of Cape Town do not have access to water within their dwelling. Many isolated rural settlements face water shortages, especially in the Central Karoo, the West Coast and certain areas of the Cape Winelands and Eden districts.

Wastewater

Sewerage treatment is an essential service in urban areas with the result that most urban areas have formal sewerage reticulation and wastewater treatment works. However, many small rural and coastal resort towns in the province rely on septic tanks. The limited extent of the allowable development in these areas makes the development of wastewater treatment plants non-viable. The lack of formal sewerage infrastructure in many of these towns is not likely to impact negatively upon the environment, but may be a constraint to further development.

Competition for limited funds means that sewerage infrastructure is not always adequately maintained and upgraded. This presents a significant problem in both the City of Cape Town and smaller urban areas in the Eden and Overberg districts. Sanitation provision in informal settlements remains a problem, especially in fast-growing urban areas.

Within the metropolitan area, the upgrading and expansion of wastewater treatment capacity and bulk sewerage conveyance is necessary in order to meet the housing and industrial development needs. A key challenge is to find new funding mechanisms to address the need for wastewater treatment and other bulk infrastructure. Financial analysis has shown that current methods of funding (e.g. taxes, levies and government grants) are insufficient to address the infrastructural needs created by city growth.

The main challenge for 2005/06 is to provide infrastructure to accommodate the N2 Gateway programme as well as to head towards providing 100% of households living in informal settlements with free basic sanitation (toilets) and water (stand pipes).

Wastewater re-use

Recognising the value of the treated wastewater which is discharged from treatment plants, this resource is coming under increasing demand. For many years, irrigation of golf courses with treated effluent has been the main consumer, increasing as the number of golf courses increases. In addition, the treated effluent has been used increasingly for sports fields and environment enhancement projects such as Canal

Walk. Current projects include agricultural use (Durbanville small farmers) and industrial (Caltex refinery).

Many local authorities have been approached by potential users of wastewater effluent or have been proactive in planning for the future use of this resource. City of Cape Town completed an investigation on the availability of treated effluent at each of the wastewater treatment works under their control. This investigation identified the potential for re-use, and outlined the possible routes for distribution pipelines.

Desalination

The Western Cape has a very long coastline, and with the cost of desalinated water dropping gradually, this is becoming a resource that must be developed in the future if the demands are to be met.

At present, the greatest pressure is for the development of small coastal resorts, where desalination of sea water is becoming the only option to sustain further growth. The long-term planning for supply to towns like Hermanus, Mossel Bay, Knysna and Cape Town includes the acknowledgement that growth in the future can only be met with desalinated seawater. Cape Town is currently carrying out a study to pave the way for the implementation of a desalinated water supply in approximately 2012.

Projects

The following waste water treatment works in the City of Cape Town are to be extended and upgraded during the course of the next two years:

- Athlone;
- Borchard's Quarry;
- Potsdam; and
- Zandvliet.

New waste water treatment works will be constructed in the North / North-east area of Fisantekraal.

Strategic priorities are to:

- Continue with encouraging wise water use, conservation, and implementing water re-use projects;
- Encourage all SIP infrastructure to use re-cycled water, which is an available (but limited) resource in the Western Cape;
- Develop ground water from the TMG aquifer; and
- Expand the current desalination of sea water programmes and long-term planning projects in this respect. Investigate overseas and private funding options.

Table 8 summarises the proposed SIP projects.

Table 8 Proposed SIP projects

Project	Priority	2005 – 2010	2011 – 2015	Elihlumayo targets
Complete the Berg River Scheme	Underway	✓		
Improve the assured raw water supply, and treated water quality at several coastal towns which are increasingly dependant on the tourist trade	Underway in Knysna	✓		
Implement desalination projects in Hermanus and Cape town	Underway	✓	✓	

Solid waste management

In recent years, it has been recognised that waste produced by society has escalated in quantity to a point where active management is necessary. This realisation has grown from the experiences of developed countries in Northern America and Europe, and has been introduced into the thinking and planning of government and the private sector in South Africa. With specific reference to the formulation of the SIP, the need to include waste management principles has accordingly received recognition as being an imperative as opposed to a strategy.

In this report, waste is taken to mean solid and liquid wastes arising from domestic and industrial sources – but not wastewater and sewage.

Waste classification

Waste can be described as being those materials or substances that are discarded as being of no worth, or of a problematic nature. At a more philosophical level and within the context of the SIP, waste has been described as being the inevitable consequence of development.

In order to deal with waste it needs to be understood, and a classification system has been adopted in South Africa for this purpose. According to this system, waste is classified as:

- G: General waste: This is waste that, because of its composition and characteristics, does not pose a threat to public health or the environment if properly managed. Examples include domestic, commercial, certain industrial wastes and builders' rubble.
- H: Hazardous waste: This is waste which can, even in low concentrations, have a significant adverse effect on health and/or the environment if not properly managed. This would be because of its inherent chemical and physical characteristics, such as toxic, ignitable, corrosive, carcinogenic or other properties. Hazardous wastes are further broken into High hazard (H) or Low hazard (h) categories.

The classification of a waste determines how it is handled, treated and disposed of.

Waste generation

Waste is generated by various industrial and commercial processes, as well as by the general population as part of their domestic activities. The study of generation patterns and trends is complex, due to the unreliable nature of data. In the case of domestic waste, this is further complicated by the differences in social conditions and habits.

Approximately 2,2 million tonnes of waste per year (excluding mining waste) is generated in the Western Cape. The City of Cape Town deals with some 75% of this quantity, approximately 5 000 tonnes of waste each day. The total translates to between 0,18 and 0,36 tonnes of waste per capita per year. This range is a further illustration of the effect of differing social conditions on waste generation.

Legislative framework

Increased environmental awareness and regulation at an international level have accelerated similar processes in South Africa. In spite of its being a developing nation, the country is generally on a par with international, environmental best practice. The last 15 years have seen the publication of the Environmental Conservation Act (73 of 1989), the National Environmental Management Act (107 of 1998), the National Waste Management Strategy (Oct 1999), the National Water Act (36 of 1998) as well as the Minimum Requirements for Waste Disposal by Landfill (1st edition 1994). These documents provide a legislative structure that guides and governs waste management.

Other aspects of legislation deal with the responsibilities placed upon municipalities and provinces in terms of which they are required to provide waste management services.

One aspect of the prevailing legislation is the need to obtain a permit to own and operate waste disposal facilities. Here the pure environmental requirements are integrated with those of a waste management nature. The environmental process requires that the concerns and interests of the affected public are taken into consideration while at the same time technical requirements governing methods and means are included.

A further legislative element that has been created is the formulation of integrated waste management plans (IWMPs). In recognition of the fact that planning for waste management has historically been fragmented and poorly considered, municipalities and provinces are required to draw up IWMPs. Typical areas examined in such plans are the sufficiency of present facilities and services, operational requirements, finances and budgetary planning.

The function related to issuing the permits is currently being transferred from DWAF to the Department of Environmental Affairs and Tourism. Meanwhile, amendments to regulations have, for instance, given rise to the Integrated Disposal Site Authorisation procedure. Such changes have the potential to cause an already lengthy and costly process to become more so.

Methods of disposal

Currently, some 85% of waste is disposed of at disposal, or landfill, sites. Recycling accounts for the remainder. As noted above, newer disposal sites have been required to have a permit and have been constructed in accordance with strict technical guidelines. Accordingly, newer generation landfills have been classified in terms of:

- The type of waste being disposed of (general or hazardous);
- The quantity of waste being disposed of (large, medium, small, communal)
- The likelihood of the generation of leachate, a liquid product of the bio-degradation of the waste.

Based upon this classification, the technical configuration of the engineered barrier is determined and a series of natural or synthetic layers are constructed in order to contain the waste and emissions.

The City has a number of waste transfer stations in use. These are facilities where waste is transferred from conventional waste collection vehicles and placed in purpose-built containers for more economical, bulk transport, to the disposal sites. Transfer stations are not true disposal facilities, but they represent a place where recycling may be carried out, thereby reducing the amount of waste transported and disposed of. Currently, both road and rail transport is used for transferring the waste to the disposal sites. The continued use of road is not sustainable and the use of rail needs to be increased. Spoornet transport costs are not competitive at present.

Other disposal methods include incineration. The City does not own nor operate any incinerators, but there are some in the hands of private contractors. These facilities are generally used for the incineration of medical wastes.

Lifespan of a disposal site and availability of airspace

Due the high costs of disposal site development, it is not feasible to develop an entire site at one time. Instead, individual disposal cells are phased in over time. The phasing in period is often influenced by the funds available in the annual budget. Because the capacity of cells is limited by the available funds, they are often designed to last for about one year only.

Most landfill sites in the province have limited airspace available. The City of Cape Town is in the process of closing some of its seven sites as they reach capacity. These closures will place extreme pressure on the remaining facilities. At the present rate, the City has sufficient airspace for approximately five more years only.

Initiatives for the development of new disposal sites include the Visserhok North site (approximately 18 years life) and the regional site near the coast around the Atlantis area (approximately 30 years life). Both of these initiatives are at an early stage of public participation. In the case of the regional site, the exact location has not yet been finalised. Should it not be possible to issue permits for these sites, waste disposal in the City Metropole will be a very serious problem.

Costs

New generation disposal sites are very costly because there is a price to pay for environmental responsibility. The process leading up to the issuing of a permit can take up to 10 years and cost in excess of a million rand. Given the time-consuming process which must be followed, as well as the public's aversion to having disposal sites close to residential areas, the process of seeking a permit is extremely costly and does not have a guarantee of success.

Assuming that a permit is obtained, the construction costs of a landfill site place severe pressure on the financial resources of a municipality. Development costs for the three large sites serving the City (Visserhok, Bellville South and Coastal Park) amount to between R10 and R15 million annually. Operational costs are of a similar scale.

The vast majority of disposal sites are owned and operated by local government, and most municipalities are finding it difficult to obtain funds to develop new sites.

This is particularly true in the case of the smaller municipalities. Some relief is experienced by funds obtained from municipal infrastructure funding mechanisms. However, the provision of these funds has been sporadic and cannot be relied upon for longer term planning.

Currently, users pay less than R100 per ton to dispose of domestic/general waste. This is a fraction of what users in other industrialised countries pay. While one accepts that South Africa is endeavouring to deal with waste responsibly, there seems to be an imbalance between the costs of waste management, and the monies collected by municipalities as disposal fees. Too little is being collected and funds thus have to be sought elsewhere. In addition, there are intense political pressures that stand in the way of excessive increases in charges or rates. The privatisation of various functions, or the creation of incentives, may assist here.

Development of new disposal sites

It is understandable that the development of a disposal site close to a residential area would not enjoy any community support. At the same time, the need for safe disposal of waste is easily understood. Historically, the sites chosen for disposal activities have been poorly planned. These are numerous examples of sites being placed unacceptably close to poor communities, or in environmentally sensitive areas. The country still carries the legacy of this lack of foresight.

A sensible balance needs to be struck between an acceptable distance between a disposal site and the communities it serves, and the cost to establish and operate a waste management service over these longer distances. In addition to these social and economic considerations, the technical suitability of potential sites has to be addressed. Thus geological, geohydrological, geotechnical and engineering criteria need to be satisfied.

In an effort to resolve the seemingly unresolvable, the strategy has been to place disposal sites far from built up areas. In addition, the size, lifespan and location of the site are selected with a view to its serving a larger region, rather than a single municipality. These regional disposal sites have to be used in conjunction with long-haul transport and transfer stations.

Recycling

There are numerous recycling initiatives underway – with varying degrees of success. Within the context of waste management and the SIP, the prime reason for considering recycling is to reduce the amount of waste going to landfill, and thereby reduce the amount of airspace (and hence cost) required for disposal. Other aspects, such as job creation, perceived business opportunities or even misguided enthusiasm, are an unavoidable part of recycling initiatives. It is however clear that society cannot continue on the route of indiscriminate disposal of inappropriate wastes. This has been recognised internationally and no less, in South Africa. Indeed, the first National Waste Summit, hosted by the Department of Environmental Affairs and Tourism in Polokwane in September 2001 gave rise to the Polokwane Declaration. A goal captured in this document, seeks to ‘...Reduce waste generation and disposal by 50% and 25% respectively by 2012 and develop a plan for ZERO WASTE by 2022.’

While recycling is an essential consideration, successful and sustainable implementation is exceedingly difficult. Fragmentation, and hence the dilution of efforts, is possibly one of the biggest stumbling blocks. Cost is also a factor, as without

a sustainable 'end user' for recycled material, it is not economically viable. Subsidisation in some form is often necessary.

Landfill gas and climate change

Gaseous emissions as one of the by-products of waste decomposition are a reality on the majority of landfills. Methane is a combustible and potentially toxic gas that forms the largest part of landfill gas. Typically the gas is collected via a network of pipes and is either vented to the atmosphere or flared. These actions are generally planned and implemented as part of landfill management operations. In recent times, landfill gas management has been recognised as being a meaningful tool in the combating of climate change. This has given rise to schemes such as renewable energy and green power, all intended to reduce carbon-based emissions and to utilise the gas.

This movement grew primarily as a result of the Kyoto Protocol of 1997. Signatories have undertaken to achieve certain targets for the reduction in the emissions of greenhouse gases and are also permitted to assist non-signatory countries to reduce emissions and thereby still honour signatory targets (so-called 'carbon credits'). Many clean development mechanism (CDM) projects have been launched, some funded by the World Bank. While South Africa is a prime candidate for this initiative, it has experienced great difficulty in obtaining the necessary authorisations from the environmental authorities. The obstacles have primarily been of an enviro/regulatory nature rather than of a technical nature.

Challenges and opportunities

Historically, too little attention was given to the need for waste management. Even less importance was attached to the need to include it in development planning. It is thus essential that this be incorporated in the SIP, but at the same time it is important to understand that the SIP is not the vehicle to resolve all the waste problems of the province. Waste management should be seen as a supporting service for a chosen development(s) that supports the smooth and economic functioning of the elements making up the development.

Developments that are contemplated must be understood in such a way as to enable the waste stream quality and quantity to be predicted. At an early stage, a waste information system must be set up in order to predict, measure and monitor the waste stream(s).

While compliance with prevailing regulations is necessary, processes that take up excessive time and increase costs must be streamlined. The provincial Department of Environmental Affairs and Development Planning is currently undertaking a law reform project that seeks to consolidate existing legislation and integrate sensible land use and environmental/heritage legislation. This may be a vehicle to facilitate speedy handing down of decisions.

Any sensible strategies by means of which the life of a disposal site can be extended, must be supported. Wastes that are not readily bio-degradable (builders' rubble, plastics, glass) consume transport and operational resources and occupy large amounts of valuable airspace. Clearly, minimising the amount of waste sent to landfill is one of the most far-reaching solutions. Waste minimisation encompasses the principles of recycling, resource recovery etc. Current initiatives have resulted in approximately 15% of the waste stream being recycled. However, a great deal more needs to be done.

One significant obstacle in South Africa, and hence the Western Cape, is the socio-economic composition of the population. Effective waste minimisation requires buy-in and support from all sectors of the community. However, the noble goals of recycling lie far from the reality of day-to-day life for the majority of our population. Hence an education process needs to be initiated in order to help the communities understand the need to reduce waste.

Strategic priorities

The strategic priorities for the province are thus:

- to incorporate waste management principles in the SIP;
- to implement a waste information system;
- to encourage local government to support, provide input to the law reform project and thereby accelerate the completion of the project;
- to lobby local government to improve decision-making turnaround time.
- to support existing recycling and resource recovery initiatives by integrating them in SIP projects;
- to initiate education campaigns;
- to include waste minimisation principles in SIP projects by placing requirements and incentives on participating industries;
- to include waste minimisation champions in planning;
- to encourage industry to support and fund initiatives driven by the City;
- to introduce incentives (tax cuts, rates cuts) as well as well-enforced disincentives, to encourage good waste management practice amongst SIP projects;
- to investigate privatisation options;
- to investigate CDMs as a means to offset costs of landfill gas management; and
- to investigate overseas funding options.

Projects

Table 9 summarises the proposed SIP projects in the area of waste management.

Table 9 Proposed SIP projects in waste management

Project	Priority	2005 - 2010	2011 - 2015	Ehlanzeni targets
Include waste management principles in SIP	Immediate – underway			
Implement a waste information system	Immediate	✓		
Support law reform project	Immediate	✓		
Lobby government on decision making	Immediate	✓		
Support and extend current recycling initiatives	Immediate	✓	✓	
Embark on education campaigns	Immediate	✓	✓	
Include waste management principles in SIP initiatives	Immediate	✓	✓	
Introduce incentives/dis-incentives for SIP industries	Immediate	✓	✓	
Investigate alternative funding options	Immediate	✓		

Cemeteries

Introduction

The increasing population and rise in deaths due to HIV/AIDS is placing pressure on the available space in existing cemeteries in the Western Cape. This is particularly evident in the Metropolitan area where there is currently a crisis in terms of a shortfall of graves in certain areas. The shortfall has resulted from the uncoordinated management of cemeteries by the seven separate municipalities (six local authorities and the Cape Metropolitan Council) that now form part of the metropolitan area.

The creation of a single metro has provided an opportunity to overcome the problems, to plan strategically and implement planning in a coordinated manner to achieve common standards and practices. To this end a Metropolitan Cemetery Study commenced in 2002 and was extended into 2003. The recommendations, adopted by the Metro authorities, made provision for the development of new cemeteries, the extension of some existing cemeteries and the infill of graves in areas not previously used in some cemeteries.

While good progress has been achieved regarding the identification of five new cemetery sites in the Metropolitan area, little information on cemetery needs is available from most of the rural areas. However, anecdotal data and a limited number of studies done by Arcus Gibb in the Western and Eastern Cape indicate that cemetery space in rural areas is being rapidly depleted. In some towns there is sufficient space for just a few years and planning structures seldom provide for new cemeteries. A strategic plan for cemeteries in the Western Cape is thus a priority for the SIP. The national strategic plan for cemeteries that is presently being prepared should assist in determining the cemetery needs for the Western Cape.

The location of a cemetery site must be sensitive to the natural environment and planning requirements. Detailed geotechnical studies are necessary to identify a suitable site. The issue of soil and ground water pollution, water table depth and ease of excavation are some of the key issues relating to the geotechnical suitability of a cemetery site.

The Metropolitan Cemetery Study identified 31 municipal cemeteries covering 5 232 ha, in the Metropolitan area. A further 10 private cemeteries (mainly Muslim) are also located in the Metropolitan area. The study predicts an increase in the overall death rate due to AIDS up to 2011 and thereafter a decrease in the mortality rate. Table 10 shows the estimates grave requirements in the Metropolitan area between 2005 and 2020.

Table 10 Grave requirement in the Metropolitan area

Date	Graves
2005 – 2007	12 958
2007 – 2009	19 442
2009 – 2012	20 000
2012 – 2020	92 000

Based on these predictions, a further 99,41 ha of land is required for cemeteries up to 2011 and a further 125,58 ha from 2012 to 2020. The city is in the process of identifying this additional land and five new cemetery sites have already been identified as follows:

- Metro South East – Mfuleni (32 ha);
- Delft (13,5 ha);

- Khayelitsha (20 ha);
- Vaalfontein (Helderberg) (24 ha); and
- Wallacedene (9 ha).

The disposal of the dead is a sensitive issue. Cremation is an alternative to burial but is not accepted in many cultures and communities. In 2001 cremation only accounted for 37% of interments in the Cape Metropolitan area. Burial in the ground remains the preferred option.

Other alternative methods for disposal of the dead need to be investigated. These could include recycling of graves and mausoleums. The latter are reported to accommodate 1 000 coffins in the space of 80 normal graves.

Strategic priorities

The following have been identified as strategic priorities:

- to investigate and report on the existing and future space requirements for cemeteries in all municipalities in the Western Cape; and
- to investigate alternative burial sites (for example, use of buffer zones around waste disposal sites for cemetery purposes) and alternative burial methods such as mausoleums.

Table 11 provides information on the SIP project in the area of cemeteries.

Table 11 Proposed SIP project for cemeteries

Project	Priority	2005 – 2010	2011 – 2005	Elihlmayo Targets
Investigation of cemetery needs in Western Cape	✓			

Mortuaries

Introduction

In the past, the South African Police Services (SAPS) have been responsible for the custody of corpses presumed to have died from unnatural causes. These corpses are transported to and stored at 'medico-legal mortuaries' by SAPS. At these mortuaries pathologists and doctors provided by the Department of Health provide medical expertise and the "medico-legal investigation of death". Now, in terms of Section 27(2) of the Health Act, 2003, the provincial Departments of Health will be responsible for the development and implementation of the entire forensic pathology services excluding the forensic laboratories which will remain a national responsibility.

Detailed investigations and meetings regarding the existing mortuary services and their proposed upgrade, expansion or closure have been undertaken over the past year by a team of staff from the various provincial Departments of Health, Public Works, SAPS and Treasuries. This has resulted in a strategic plan for the establishment and development of the Forensic Pathology Services and the transfer of mortuaries to the Department of Health. Minor details of the plan remain unresolved. These relate to the final transfer date which has now been set for 1 April 2006. The transfer will be guided by a memorandum of understanding between SAPS, Department of Health and Department of Public Works.

The upgrading of facilities is planned over a three- to five-year period. Some of the existing facilities will be closed, some retained and expanded and others moved to

more suitable locations. Regional referral centres will also be developed where forensic pathologists will provide the appropriate expertise.

The organisation of the services has been designed on the basis of available autopsy statistics and national guidelines. Available autopsy statistics, shown in Table 12, indicate that the Western Cape undertakes the fourth largest number of cases in the country.

Table 12 Distribution of autopsies by province

Province	Number of post mortems
KwaZulu-Natal	24 400 (estimated)
Gauteng	16 184
Eastern Cape	11 355
Western Cape	9 141
Mpumalanga	5 480
Limpopo	5 275
North West	4 265
Free State	4 178
Northern Cape	1 665

Mortuaries will be designed to accommodate the number of autopsies in a specific area based on the model shown in Table 13.

Table 13 Mortuary types

Mortuary type	Number of autopsies per year
M1	<250
M2	251 – 500
M3	501 – 750
M4	751 – 1 000
M5	1 001 – 1 250
M6	>1 251

It is planned that the Western Cape will be divided into four regions:

- Metro Region
- West Coast/Winelands;
- Boland/Overberg; and
- Southern Cape/Karoo.

The Western Cape Forensic Pathology Services will be managed through a dedicated forensic pathology services manager in the Department of Health. Use will be made by existing SAPS facilities, building of new facilities and in certain cases private mortuary facilities.

In total there will be 18 forensic pathology laboratories in the Western Cape of which four will be “holding” facilities (for transfer to the forensic pathology laboratories) (Type M6) will be the Salt River forensic pathology laboratory (associated with University of Cape Town) and Tygerberg forensic pathology laboratory (associated with University of Stellenbosch). Each of the three geographical regions in the Western Cape will have large forensic pathology laboratories (referrals) (M3). These will be based at Paarl, Worcester and George and will each have a full-time specialist responsible for the autopsies and (M3) forensic pathology laboratories at Stellenbosch and Oudtshoorn. Table 14 summarises the proposed placement of mortuaries in the province.

Table 14 Proposed forensic pathology laboratories in Western Cape

FPS laboratory grade	Location	FPS laboratory grade	Location
6	Salt River	2	Knysna
6	Tygerberg	1	Vredendal
3	Paarl	1	Vredenburg
3	Worcester	1	Malmesbury
3	George	1	Swellendam
3	Stellenbosch	1 Holding	Wolseley
3	Oudshoorn	1 Holding	Beaufort West
2	Hermanus	1 Holding	Laingsburg
2	Mossel Bay	1 Holding	Riversdale

The Western Cape mortuaries will require a staff complement of 188 in the first year rising to 223 in the third year. This excludes the current Department of Forensic Medicine establishment in Health.

The Directorate of Forensic Pathology Services created by the national Department of Health will be responsible for the development, oversight and support of the Forensic Pathology Services in each of the nine provinces.

Table 15 shows the estimates costs for upgrading and development of the facilities in the Western Cape. The total estimated national costs are R394 942 297. Western Cape thus accounts for about a third of the total budget.

Table 15 Estimated costs of mortuary facilities in Western Cape

Emergency repair works	R6 478 836
Repairs to facilities	R12 048 588
Proposed additions	R45 610 978
Maintenance per annum (three years)	R6 920 838
Total	R72 070 340

Strategic priorities

The strategic priority is to continue with the implementation of the strategic plan for the establishment and development of the Forensic Pathology Services and the transfer of the mortuaries from SAPS to the Western Cape provincial Department of Health. Table 16 provides the summary for this proposed project.

Table 16 Proposed SIP project for mortuaries

Project	Priority	2005 – 2010	2011 – 2005	Elihlmayo Targets
Commence Implementation of the FPS Strategic Plan on 1 April 2006	Underway	✓		

References

Western Cape : State of the Environment Report. Western Cape Province : Department of Environmental Affairs and Development Planning, 2005