



**Western Cape  
Government**

Environmental Affairs &  
Development Planning

**BETTER TOGETHER.**

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# State of the Environment Report

Department of Environmental Affairs and Development Planning

**STATE *of the* ENVIRONMENT REPORT 2005**  
*Year One*

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PROVINCIAL GOVERNMENT OF THE WESTERN CAPE



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# FOREWORD



*The Western Cape Department of Environmental Affairs and Development Planning took up the challenge towards implementing sustainable development goals through State of the Environment Reporting.*

*The environment is all encompassing. This is reflected in the Western Cape's State of Environment Report and the fourteen themes relating to the natural, social and economic elements of sustainable development. The State of Environment Report could directly influence and guide policy development and decision-making processes which are directly linked to the environment. The drafting of the State of Environment Report is not a requirement in terms of any legislation; however this report is testimony to the serious light in which we see our responsibility as custodians of the environment. The purpose of the State of Environment is therefore to inform decision-making and the formulation of policies where the environment is concerned.*

*This Report shows us that the Western Cape remains an attractive place to live in, however there are still serious challenges such as poverty, AIDS and the poor state of our rivers and we can therefore not afford to be complacent.*

*The Report provides pertinent and credible information about the state of the environment in the Western Cape. Where possible it compares and evaluates the condition of our environment against other provinces, targets and international standards. However, since this is the first report, trends and targets have in many instances not been established. The report will serve as a baseline for future monitoring and evaluation of the environment.*

*I would like to thank all the departments, authors and stakeholders who contributed to the report and assisted the Department in compiling the analysis of our environment. I urge you to use the report and become involved in sustainable development best practice and decision-making.*

A handwritten signature in black ink, appearing to be 'J. G. ...', written over a horizontal line.


MINISTER OF ENVIRONMENT,  
PLANNING AND ECONOMIC DEVELOPMENT

November 2005





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# LIST OF ACRONYMS

<b>ABET</b>	Adult Basic Education and Training	<b>GET</b>	General Education and Training	<b>PSDF</b>	Provincial Spatial Development Framework
<b>ACSA</b>	Airport Company South Africa	<b>GHGs</b>	Greenhouse gases	<b>RHP</b>	River Health Programme
<b>ARC</b>	Agricultural Research Council	<b>HW</b>	Hazardous waste	<b>SA</b>	South Africa
<b>BEE</b>	Black Economic Empowerment	<b>HDI</b>	Human Development Index	<b>SANBI</b>	South African National Biodiversity Institute
<b>CAPE</b>	Cape Action for People and the Environment Programme	<b>HE</b>	Higher Education	<b>SAPS</b>	South African Police Service
<b>CDM</b>	Clean Development Mechanisms	<b>IDP</b>	Integrated Development Plan	<b>SDF</b>	Spatial Development Framework
<b>CH<sub>4</sub></b>	Methane	<b>IMWP</b>	Integrated Waste Management Plan	<b>SKEP</b>	Succulent Karoo Ecosystem Programme
<b>CITES</b>	Convention on Integrated Trade in Endangered Species	<b>IPCC</b>	Intergovernmental Panel on Climate Change	<b>SLAG</b>	Settlement / Land Acquisition Grant
<b>CMA</b>	Cape Metropolitan Area	<b>ITDF</b>	Integrated Tourism Development Framework	<b>SMME</b>	Small, Micro and Medium Scale Enterprise
<b>CNC</b>	Cape Nature and Conservation	<b>IUCN</b>	World Conservation Union	<b>SO<sub>2</sub></b>	Sulphur dioxide
<b>CO</b>	Carbon monoxide	<b>IWM</b>	Integrated Waste Management	<b>SoER</b>	State of the Environment Report
<b>CO<sub>2</sub></b>	Carbon dioxide	<b>JPOI</b>	Johannesburg Plan of Implementation	<b>STD</b>	Sexually Transmitted Disease
<b>CoCT</b>	City of Cape Town	<b>LRAD</b>	Land Redistribution for Agricultural Development	<b>STEP</b>	Subtropical Thicket Ecosystem Plan
<b>CRF</b>	Cape Floristic Region	<b>MDG</b>	Millennium Development Goals	<b>TAC</b>	Total Allowable Catch
<b>DEA&amp;DP</b>	Department of Environmental Affairs and Development Planning	<b>MPA</b>	Marine Protected Area	<b>TB</b>	Tuberculosis
<b>DEAT</b>	Department of Environmental Affairs and Tourism	<b>MRC</b>	Medical Research Council	<b>TEU</b>	Twenty-foot Equivalent Units
<b>DMA</b>	Disaster Management Act	<b>NAP</b>	National Action Plan	<b>UCT</b>	University of Cape Town
<b>DME</b>	Department of Minerals and Energy	<b>NBI</b>	National Botanical Institute (Now SANBI)	<b>UN</b>	United Nations
<b>DoH</b>	Department of Housing	<b>NEMA</b>	National Environmental Management Act	<b>UNDP</b>	United Nations Development Programme
<b>DPSIR</b>	Drivers – Pressures –State –Impacts –Response	<b>NEPAD</b>	New Partnership for Africa’s Development	<b>UNEP</b>	United Nations Environmental Programme
<b>Du</b>	Dwelling unit	<b>NO<sub>2</sub></b>	Nitrogen dioxide	<b>UWC</b>	University of the Western Cape
<b>DWAF</b>	Department of Water Affairs and Forestry	<b>NSBA</b>	National Spatial Biodiversity Assessment	<b>VCT</b>	Voluntary Counselling and Testing
<b>ECA</b>	Environmental Conservation Act	<b>NTCP</b>	National TB Control Programme	<b>VOCs</b>	Volatile organic compounds
<b>ECD</b>	Early Childhood Development	<b>PAWC</b>	Provincial Administration of the Western Cape (now PGWC)	<b>WC</b>	Western Cape
<b>EIP</b>	Environmental Implementation Plan	<b>PGWC</b>	Provincial Government of the Western Cape	<b>WCED</b>	Western Cape Education Department
<b>ESTA</b>	Extension of Security of Tenure Act	<b>PHC</b>	Primary Health Care	<b>WMA</b>	Water Management Area
<b>FET</b>	Further Education and Training	<b>PHP</b>	Provincial Healthcare Plan	<b>WSSD</b>	World Summit on Sustainable Development
<b>GW</b>	General waste	<b>PM<sub>10</sub></b>	Particulate matter (of particular size 10 microns)		
<b>GDP</b>	Gross Domestic Product				





## INTRODUCTION

The Western Cape is a unique province, renowned for its biodiversity and natural beauty. It is also a province grappling with high unemployment, poverty and crippling inequalities. Recognising this, the Provincial Government of the Western Cape (PGWC) is striving towards alleviating poverty and promoting economic growth in a manner that does not undermine the life systems on which our survival depends.

In the Western Cape the linkages between the social and the natural environments are clearly evident. Fundamentally the environment is the source of what every one of us needs to survive – air, water, food. It is also the source of the materials for shelter, clothing and the infrastructure of collective human settlement. The absence or denial of these basic necessities constitutes absolute poverty while unequal access to basic necessities is the foundation of relative impoverishment (Killeen and Rahman; 2001). In order to illustrate these linkages between poverty and environment more clearly, this report has adopted a broad definition for the term “environment” and includes aspects of the biophysical and socio-economic environment.

The State of the Environment Report (SoER) for the Western Cape aims to provide credible information to inform strategies and track interventions in order to assist politicians and decision-makers as they strive towards the goal of achieving a sustainable province.

This is the first SoER compiled for the Western Cape. In order for key issues to be effectively tracked and trends monitored, the SoER will be updated on an annual basis. It is intended that the issues and indicators presented in this report will be refined and improved in successive years and that new data will be acquired to fill information gaps and update data.



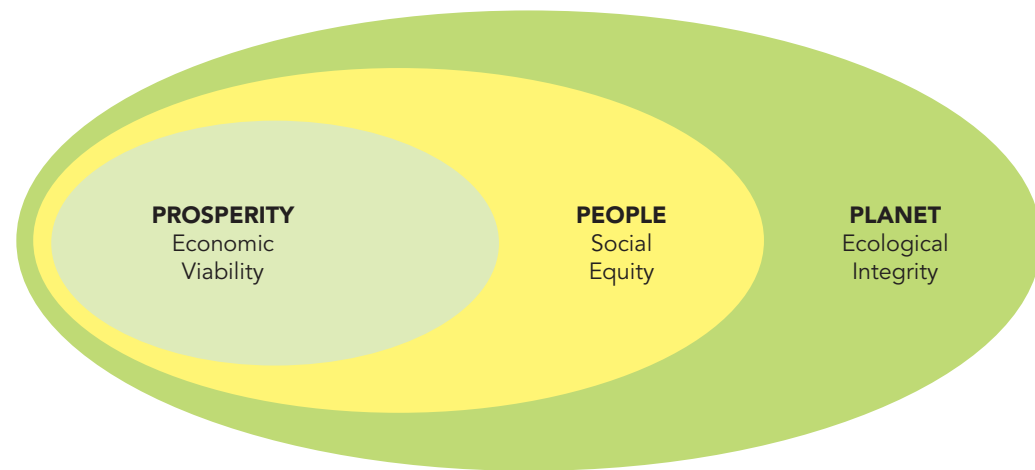


## SoE REPORTING

SoE reporting has its origins in the concept of sustainable development and the increasing international focus on the linkages between the natural environment, economic stability and social well-being. Sustainable development integrates these three inter-related components, as depicted schematically in Figure 1.1.

Agenda 21, the international action plan for implementing sustainable development, calls for improvement in the quality and availability of environmental information. SoERs are tools that facilitate this by providing information about how we affect the environment and how the environment affects us.

The purpose of SoE reporting is to provide information about the condition of the environment to enable us to understand and manage environmental problems. SoE reporting provides a link between scientists or “knowledge generators” and decision-makers or information users (DEAT and CSIR, 2002).



**Figure 1.1:** Schematic Representation of Sustainable Development Concept (Source: WSSD, 2001)



**SoERs are usually produced annually, commencing with a Year One Report. Typically, SoERs will:**

- discuss the driving forces and pressures that influence environmental change;
- identify and provide an analysis of key environmental issues;
- interpret the implications and impacts of these issues; and
- assess societal responses to these environmental issues.

## SoE REPORTING IN SOUTH AFRICA AND THE WESTERN CAPE

SoE reporting is not yet a legal requirement in South Africa, but there are a number of laws, policies, conventions and treaties that require environmental reporting and the provision of environmental information to the public.

In South Africa, the national Department of Environmental Affairs and Tourism (DEAT) launched the first SoER in 1999. Since then the initiative has been expanded with several reports completed at a national, provincial and local level, e.g. the City of Cape Town has produced SoERs annually since 1999.

The provincial Department of Environmental Affairs and Development Planning (D:EA&DP) is coordinating the Western Cape SoE initiative. SRK Consulting has been appointed to compile the Western Cape SoER (Year One), which is the first SoER for the Western Cape Province.

## THE PURPOSE OF THE WESTERN CAPE SoER

The Western Cape SoER will assist the PGWC, local authorities and other decision makers to formulate sustainable policies and plans and make informed decisions about our environment. The report will also provide the wider

public with access to information about the environment in which we live.

The Western Cape SoER is not intended to be a database or a comprehensive inventory of all provincial data, but focuses on key priority issues in the Province, presented in a format that is easily accessible to politicians, officials and the general public.

The report is aligned to the priorities set by the National SoER initiative as well as the priorities identified by the United Nations Environmental Programme (UNEP), the Millennium Development Goals (MDG), the Johannesburg Plan of Implementation (JPOI), other key national and provincial legislation and the principles inherent in the New Partnership for Africa's Development (NEPAD). At the same time the SoER seeks to capture a uniquely Western Cape "flavour" by also including and emphasising the priority issues unique to the province.

At a conceptual level the main objectives of the Western Cape SoER are to:

- Inform and guide provincial policy and management;
- Increase public understanding of environmental issues;
- Complement, enhance and inform a number of provincial planning, monitoring and reporting initiatives;
- Help develop and report on a set of provincial environmental indicators;
- Integrate environmental reporting functions amongst various Provincial Departments; and
- Provide input to the South Africa Environment Outlook (National SoER) and other municipal SoER programmes in the Western Cape.



## INDICATORS

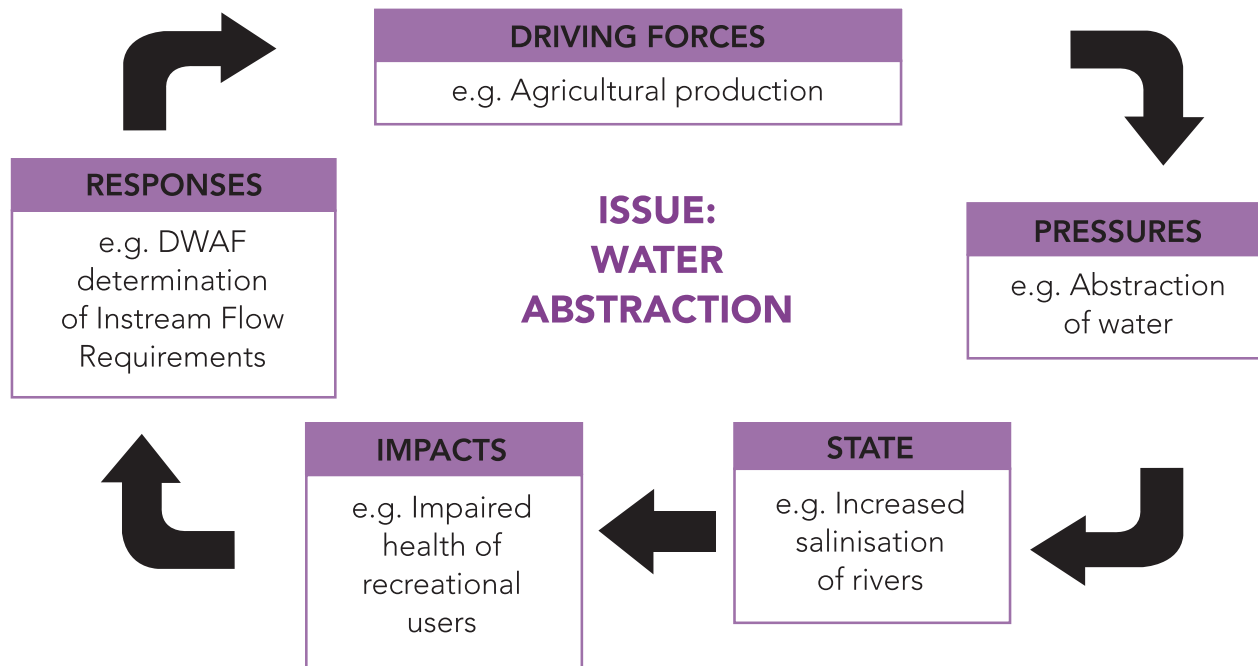
Indicators are the key tool used in SoE reporting. An indicator is a measurement that gives information about the change of something over time. Some common examples are:

- Body temperature is an indicator of health; and
- Gross Domestic Product (GDP) is an indicator of economic achievement.

Indicators are helpful as they express a large quantity of data or complex information in a simple way (DEAT, 2001). Indicators can be used to track environmental issues over time so that progress towards sustainable development can be monitored and goals and targets established.

## THE DPSIR REPORTING FRAMEWORK

Several different reporting frameworks or systems are available for SoE reporting. The framework commonly used in South Africa is an Environmental Processes Framework, known as the Drivers-Pressures-State-Impacts-Responses (DPSIR) reporting framework. This framework is used in the Western Cape SoER. The definitions of the components of the DPSIR framework are presented in Table 1 opposite.



**Figure 1.2:** An example of the components of the DPSIR Framework

**Table 1.1:** DPSIR Framework Definitions

<b>Driving forces</b>	The human influences and activities that, when combined with environmental conditions, cause environmental change (e.g. population growth, poverty, mining, and industry).
<b>Pressures</b>	The pressures acting on the environment which result from human activities (e.g. pollution of air, soil and water from industry).
<b>State</b>	The condition of the environment including recent trends (e.g. level of air pollution)
<b>Impacts</b>	The consequences of the pressures on the environment (e.g. loss of biodiversity and ecosystem functioning, poor human health).
<b>Responses</b>	The societal responses to address, correct or prevent negative impacts and environmental damage, or conserve natural resources and maximise opportunities.

# THE WESTERN CAPE: AN OVERVIEW



## THE WESTERN CAPE: AN OVERVIEW

The Western Cape is one of South Africa's nine provinces and is located at the south-western tip of Africa. It is situated between 30°30'– 34°45' S and 17°50'– 24°10' E, and occupies an area of 129 370 km<sup>2</sup>. It is bound by the cold Atlantic Ocean to the west and the warmer Indian Ocean to the south east, and comprises a region of internationally renowned scenic beauty. The province shares provincial borders with the Northern and Eastern Cape. The L-shaped Cape Fold Mountains form a barrier that separates the wetter coastal strip from the drier interior. These fold mountains can be considered the "spine" of the Western Cape. Cape Town is an important and burgeoning international tourist destination and, aside from being the economic powerhouse of the provincial economy, is also the capital city of the province. Away from the coast, agriculture is an important land use and includes extensive fruit and vine growing.


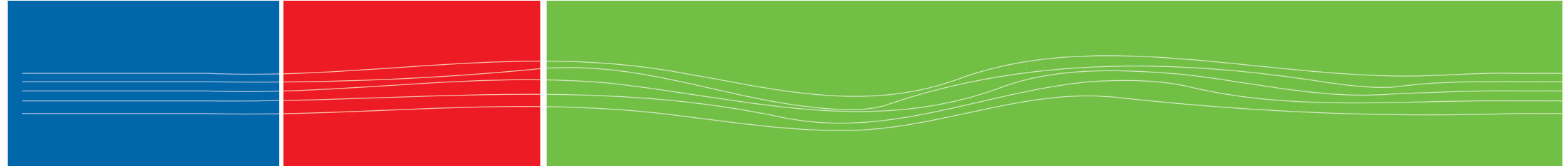
## WEATHER AND CLIMATE

The Western Cape's climate differs markedly from prevailing climatic conditions in the rest of South Africa. Most of the province, especially in the extreme south west, experiences a Mediterranean-type climate, typically characterised by cool, wet winters and warm, dry summers. In summer, the climate is influenced by the high pressure cells over the South Atlantic Ocean. The resultant south easterly winds blow offshore along South Africa's south west coast, having lost most of the moisture they may have picked up over the warm Indian Ocean. Strong coastal winds are a feature of the Western Cape. Winter rainfall, which is associated with westerly frontal depressions, is dominant in the south west, although up to 25% of the Cape Peninsula's rain falls in the summer months (October to March).





Figure 2.1: Overview of the Western Cape Province



This percentage increases towards the east of the province, as well as in the north east interior. Much of coastal summer rain is associated with post-frontal conditions when the high pressure cells advect moist air from the south and south east. In the extreme east of the province, summer rainfall patterns which prevail over South Africa also occur, resulting in a small area which receives year-round precipitation, supporting indigenous forests in the wider Knysna area. Rainfall in the Western Cape Peninsula shows great variation from as little as 100mm/year up to 3 000mm/year in some mountainous areas. Rainfall in the arid interior and on the west coast is generally very low.

Variations in temperature are fairly pronounced in the interior, but less so near the coastline, e.g. Cape Peninsula (mean annual temperature of 18-20°C) where the ocean has a moderating influence. In contrast the interior can be much hotter (in summer) and much colder (in winter) – Sutherland has the reputation as the coldest town in South Africa, with night minima below -10°C. Snow is rare, except on the higher mountains. However, frost occurs fairly regularly, although almost exclusively in the interior.



### Focus Issue: Climate Change

Climate change is caused by **internal** fluctuation in the global climate system and **external** factors, which can be both natural and human. According to the Intergovernmental Panel on Climate Change (IPCC), the balance of evidence suggests a discernible human influence on the global climate. The observed warming over the past 50 years is believed to have been caused by the increase in greenhouse gas concentrations. It is predicted that by 2100 Carbon Dioxide (CO<sub>2</sub>) concentrations will be 90 - 250% above levels in 1750 (before the industrial revolution) (IPCC, 2001). Global climate change will affect different regions of the world in different ways; it is predicted that climate change may manifest itself in the following manner in the Western Cape (IPCC, 2001):

- Average surface temperature rise of 1 - 3°C by 2050;
- Sea-level rise (caused by thermal expansion of sea water and ice melting) of 30 - 50cm by 2050;
- Annual rainfall decrease of 10 - 20%. This may result in increased water stress;
- Increased frequency of extreme weather events, including more frequent cyclones, floods and droughts.

More detailed information on climate change is provided in the chapter on Air Quality and Climate Change.

## TOPOGRAPHY AND GEOLOGY

A principal feature of the physiography of the Western Cape is the pronounced topographical variation which results in spectacular scenery. This topography includes two landscape features of international renown – Table Mountain and Cape Point. Cape Agulhas, the southernmost tip of Africa, is also within the Western Cape.

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. Inland, the Fold Belt grades into the plains and koppies of the Great Karoo and Namaqualand to the east and north east, and north, respectively.

The sandstones and shales of the Cape Supergroup, the predominant rocks of the Fold Belt, were deposited on ancient sediments and intruded granites at the margin of an inland sea, between 450 and 340 million years ago. These Malmesbury Group sediments and intruded granites of the Cape Granite Suite form the coastal plains and undulating hills between the Atlantic Ocean and the mountain front of the Fold Belt.

Cape Fold Belt landscapes are ancient, having changed little during the past 60 million years and having been spared extreme climatic conditions (including glaciation) during this period. These sediments were uplifted during a period of mountain building between 215 and 280 million years ago and substantially eroded during the Mesozoic era (215-65 million years ago). Geological stability during the subsequent Tertiary period has resulted in slow denudation of the hard sandstones, principally along fault lines and fractures, resulting in remnant massifs (e.g. Table Mountain) surrounded by extensive colluvial deposits on gentler slopes underlain by the older, softer rocks.

The Quaternary period is represented by narrow strips of alluvium, best developed in intermontane valleys, and extensive areas of siliceous (older) and calcareous (younger) sands. Alluvial deposits are best developed in the Breede and Hex River Valleys and the thickest and most extensive sand deposits in coastal areas such as the Cape Flats, Atlantis, Langebaan, and Vredendal, and further inland near Hopefield.



## SOILS AND LAND

The soils of the Western Cape are highly variable and are influenced by the nature of the underlying host geology and the degree of weathering. Climate and geology play a large role in soil formation. In the wetter coastal areas deeper soil profiles generally occur due to chemical weathering while the dryer inland areas tend to have thin or poorly formed soil profiles. The West Coast region tends to be dominated by soils derived from wind blown sands. Further inland, the

soils tend to be more clayey and are mainly derived from the weathering of basement Malmesbury Group rocks. These areas support winter wheat farming. The soils in the Cape Fold Belt are mainly sandy and nutrient-poor. The most impoverished soils – shallow, grey, acidic, leached sands deficient in nutrients – are associated with the sandstone summits, plateaux and upper slopes. These soils are mostly well-drained. High-lying ground (>600 m), subject to high

winter rainfall and southeast cloud precipitation during summer, gives rise to the very acidic sands with high levels of organic matter. The deep soils of the colluvial slopes that are underlain by shale or granite are heavier, orange to red in colour, less acid and richer in nutrients than the residual, sandstone-derived soils. Soils associated with the older Quaternary deposits are mainly deep, moderately acid sands that are marginally more fertile than those derived from sandstone. The younger sands along the coastal margin are poorly consolidated and highly alkaline.

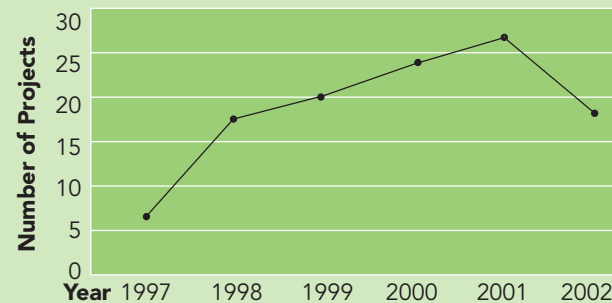
### Focus issue: Land Redistribution

In the Western Cape, as in the rest of South Africa, the Land Reform programme is driven by the National Department of Land Affairs. It is composed of three initiatives: tenure reform, land restitution and land redistribution.

Tenure reform deals with the form of ownership or holding of the land. Land restitution deals with land claims and the return of the rights of land to its historical owners. Land redistribution deals with changing ownership patterns of land from predominantly white ownership (currently approximately 87% in the Western Cape) to black ownership, (currently approximately 13%). Government hopes to redistribute approximately 30% of agricultural land in the country by 2015 (CNdV, 2004).

The target - set in 2000 - for land redistribution of State land in the Western Cape is 17 380 ha (2,65% of the total area targeted nationally). In 2002, only 22% of this targeted land had been redistributed. In the Western Cape 112, land redistribution projects accommodating 6170 households have been approved since the inception of the Reform Program in 1997 until 2002. These projects include Land Redistribution for Agricultural Development (LRAD), Commonages, Share Equity, Extension of Security of Tenure Act (ESTA), and Settlement

/ Land Acquisition Grant (SLAG). The graph indicates the number of land redistribution projects in the Western Cape from 1997 – 2002 (Vink, 2003). Recently, the national Department of Land Affairs announced that they would not reach this national redistribution target, mainly due to a lack of funds. The biggest obstacle the Western Cape faces in reaching its land redistribution targets is also a lack of budget, and current land redistribution processes, which are slow and costly. Additionally, agricultural land in the Western Cape tends to be more capital intensive than land in many other parts of the country.



**Figure 2.1:** Land Redistribution in the Western Cape  
(Source: Vink, 2003 in PSDF, 2005)



Little rain occurs inland of the Cape Fold belt and the soils, that are mostly derived from the Karoo Sequence (mudstones, siltstones and sandstone), tend to be thin and are generally not suitable for agriculture. This area, however, provides good small stock farming land.

Generally speaking, the less accessible mountainous regions and more remote areas in the Western Cape are undeveloped, whereas lowland vegetation has been transformed, often for agricultural use. Aside from Cape Town, there are a limited number of urban nodes. Many of these areas are susceptible to urban sprawl. Land use along the coastal strip is changing rapidly as a result of development pressures. This is particularly noticeable along the Garden Route. In the dry interior, vast areas are utilised mainly for stock grazing: 60% of the province is fit for little more than this purpose, leading to high demand for and pressure on more productive land.

## HYDROLOGY AND GEOHYDROLOGY

The rugged upstanding topography developed in the Cape Fold Belt Area has had a profound effect on water supply within the Western Cape. The high winter rainfall associated with these mountains produces large volumes of runoff, which is captured in numerous dams for municipal and irrigation water supply. The largest of these dams is Theewaterskloof, near Villiersdorp. Numerous small farm dams have also been constructed.

Notwithstanding the higher rainfall in the mountains, the Western Cape is a semi-arid region and a relatively limited number of major rivers traverse the spectacular landscapes described earlier. These include the Doring, Olifants, Berg, Breede, and Gourits Rivers, which, with the possible exception of the Gourits, are rivers with higher winter flow and much diminished flow in summer.

Both the Table Mountain sandstones and the quaternary sand deposits contain important groundwater resources. The Table Mountain Group Aquifer is one of the most important in the country and the mountainous areas between Grabouw and Tulbagh are being investigated to assess their potential to supplement the water supply to the Cape Metropolitan Area. Many towns in the Western Cape already obtain much of their water supply from this aquifer, e.g. Hermanus, Ceres, Caledon and Botriver. The Cape Flats Aquifer is developed in the sandy Quaternary formations and has the potential to supply massive volumes, although urbanisation has complicated the development of this aquifer.

## FLORA AND FAUNA

The Cape Floristic Region (CFR), one of only six such regions in the world, is located mostly in the Western Cape. The five largest plant families are the daisy family (*Asteraceae*), the iris family (*Iridaceae*), the legume family (*Fabaceae*), the protea

### Focus Issue: Threatened plant species of the Cape Floristic Region

The last red list of plant species was completed in 1997. At the time, there were 1961 plants listed on the red list that occurred in the Cape Floral Region (CFR). Of the plants on the list, 42 were declared extinct and 413 threatened with extinction. This means that in 1997 6% of the Cape flora was threatened with extinction.

South African National Biodiversity Institute's (SANBI) Threatened Species program is currently updating the red list for plants, and although this update has just started, for the CFR some interesting trends are becoming apparent. In the predominantly Western Cape based plant family the Proteas (*Proteaceae*), there has been a dramatic 31% increase in the number of species threatened with extinction since 1997. Similarly, the Western Cape based family of geophytes (*Amaryllidaceae*) have had a 12% increase in the number of threatened species with 15 new species threatened with extinction. The increasing number of threatened species is also seen in other families such as the heathers (*Ericaceae*) that have shown an increase of 25% in the number of threatened species.

family (*Proteaceae*) and the heather family (*Ericaceae*). The three major vegetation types represented in the CFR are the predominant Cape Fynbos shrubland, the rare Renosterveld shrubland and associated grasslands, and patches of Forest and Thicket. Although not strictly correct, the vegetation of the Western Cape is often simply (colloquially) referred to as fynbos (literally "fine bush").

The Western Cape has exceptionally high plant species richness as well as numbers of endemic and threatened species. The Western Cape has over 8 000 plant species, more than all of Europe. Some areas in the interior of the

The main reason for the increase in the number of threatened species is the high rate of transformation of these species' habitats. Many species endemic to the West Coast Sandveld and to the Cedarberg escarpments, for example, have appeared for the first time on the red lists.

There are currently 756 plants species listed as threatened with extinction in the CFR (8.3% of the total flora). The threatened species team based at SANBI predict that once the red list for the Western Cape has been completed



(March 2006), the red list will show a minimum of a 20% increase in the number of species that have become threatened with extinction over the past 10 years, a very serious indication of the degradation of biodiversity currently taking place in this province.

province fall outside the Cape Floristic Region and comprise karroid vegetation, characterised by dry shrublands.

The Western Cape's fauna is less well known than the flora and the province does not boast the habitats or fauna of many of South Africa's northerly provinces. Nevertheless, there are a large number of endemic faunal species, often found in more remote regions. The general pattern for vertebrate groups is moderate species richness and low endemism, while certain vertebrate groups are very speciose and have exceptionally high levels of endemism. The province provides habitat for many Red Data Book species (mammals, birds, reptiles, amphibians, insects) as well as fish species.

## DEMOGRAPHICS

According to Census 2001, the Western Cape is home to approximately 4 525 000 people, or 10.1% of South Africa's population. Almost 69% of the Western Cape's population resides in Cape Town. Between 1996 and 2001 the population of the Western Cape grew by 2.7%, more than the national average of 2.0%. This is partially explained by lower unemployment levels and perceived better prospects in the Western Cape, resulting in in-migration from other provinces, which boosts the population growth rate.

Black Africans comprise 26.7% of the population, Coloureds/Asians a further 54.9%, and Whites 18.4%. This is very different from the national profile and is reflected in the cultural diversity, another distinctive and attractive feature of the Western Cape. Afrikaans is the predominant home language at 55.3% followed by isiXhosa at 23.7% and English at 19.3%. Females comprise 51.5% of the population. The age demographic pyramid of the Western Cape indicates a slightly older population than for the rest of SA.

### Focus issue: Population growth and migration

Population growth and migration patterns directly and indirectly affect human well-being and influence the way we understand the relationships between people and the environment. The Western Cape's population growth rate is estimated at 1.8% per annum (81 000 people) and studies indicate that the net migration into the Western Cape is about 48 000 people per year. (Bekker, 2002). Most in-migration is from the Eastern Cape, where there is widespread poverty and a lack of employment opportunities, especially in rural areas. As a result, the working age population in the Western Cape is growing at almost double the pace recorded nationally. This is believed to be placing additional pressure on the provincial labour market.

## ECONOMY

The Western Cape has a diverse, balanced and comparatively stable economy. It is characterised by a dynamic range of economic activities with no single industrial sector dominating the regional economy. The province contributes just under 15 % towards South Africa's Gross Domestic Product (GDP). Manufacturing is a major sector with the clothing and textile, oil, food processing and wine industries constituting the core of this sector. The two major primary sectors are agriculture and fishing. Agriculture is an important employer with the focus on deciduous fruit, grapes, vines and citrus. The Western Cape is the centre of the country's fishing industry and 85% of the tonnage and value of fish caught in South Africa comes from the province. The service industry has grown over the years, especially the tourism sector. The Western Cape was visited by 23% of the total number of visitors to South Africa in 2003 (SA Tourism, 2004). Cape Town has become the second largest financial centre (after Johannesburg) for many business and financial institutions. Unemployment levels are high, although far lower than the national average.

While there is a significant inflow of migrants into Western Cape, migration patterns are complex and in practice the movement of people, notably between the Western Cape and Eastern Cape, is fluid and multi-directional. For example, many people return to the Eastern Cape when they are old or sick and there is a high incidence of people with AIDS returning to the Eastern Cape. Additionally, "modern" homes in Eastern Cape villages, built with remittance money earned in the Western Cape, are becoming a common feature in rural areas and are eventually occupied by returning migrants when they retire. (Cousins, et. al., forthcoming).

### Focus Issue: Black Economic Empowerment

Black<sup>1</sup> Economic Empowerment (BEE) is a strategy that has been adopted by the South African Government and is an integral part of South Africa's transformation process. It is aimed at redressing the imbalances of the past by seeking to substantially and equitably transfer and confer the ownership, management and control of South Africa's financial and economic resources (BEE Commission, 2001). In the Western Cape, there is the perception that the implementation of BEE has lagged a bit behind Gauteng. Despite this, BEE is increasingly influencing the way in which business operates and work is tendered for and awarded within the Western Cape. There is a relative scarcity of skilled black candidates in Western Cape and the resulting demand for qualified black managers and professionals has seen salary packages rising fast and very high job mobility (BEE Commission, 2001). This scarcity is compounded by many black professionals moving to Gauteng, where opportunities and packages are generally higher.


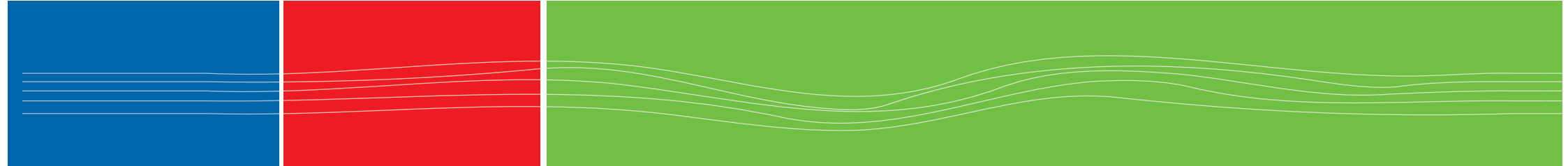
## INFRASTRUCTURE AND SERVICES

The Western Cape has a well-developed infrastructure and a network of transport routes links it to major cities in Africa by sea, air, road and rail. The port of Cape Town serves as a quick and efficient route for imports and exports from Europe, America, Asia and East and West African countries. Cape Town International Airport is rapidly growing in importance as a leading gateway to South Africa.

Compared to the rest of South Africa, the people of the Western Cape have better access to services and facilities. Schooling levels are significantly better than the national average but still not good, e.g. 11.2% of those 20 years and older have post-matric education (SA average: 8.4%).

1. In the Broad-Based Black Economic Empowerment Act (2003) the definition for "black" includes Africans, Coloureds and Indians.





Furthermore, the adult literacy level is 94% (Stats SA, 2001). The availability of basic services is also consistently better than the national average, e.g. about 67% of households have piped water compared to 32% nationally and about 83 % of households have access to electricity (Stats SA, 2001).

Due to its urban character, the population of Western Cape has better access to medical facilities, with more than half living less than one kilometre from the nearest medical facility. Approximately 30 % of people in the Western Cape have access to medical aid. Nevertheless, AIDS, TB and alcohol and substance abuse are critical health concerns which adversely affect economic productivity.



## SPATIAL PLANNING

In the Western Cape, 89% of the population is urbanised, compared to 40% in the Eastern Cape and 70% in the Northern Cape (the national average being about 50%). The large majority of the population (69%) live in the Cape Metropolitan Area and 35.2% are collectively located in the other five district municipalities, namely Cape Winelands (previously called Boland), Eden, West Coast, Overberg and Central Karoo (Stats SA, 2001).

At a local level, each district is further split into local municipalities (24 – giving a total of 30 metropolitan, district and local municipalities). The various spheres of government have different competencies and responsibilities in terms of service delivery and other functions.

In the Western Cape inappropriate and outdated planning is hindering sustainable development in the province and the social geography of many of the towns, including the City of Cape Town, is still markedly divided along racial lines. To try to remedy these unsustainable spatial patterns, new planning initiatives are underway.

The Western Cape Provincial Spatial Development Framework (PSDF), local municipal Spatial Development Frameworks (SDFs) and Integrated Development Plans (IDPs) determine the policy framework for spatial development and settlements within the province. All SDFs are required to assess environmental opportunities and constraints and to integrate social, economic and biophysical considerations.

The Western Cape PSDF will be launched later this year and is the planning flagship to redirect planning in the province. It adopts a natural systems approach to planning and uses the triple bottom line concept (ecological, social and economic) for decision making.

### Focus Issue: Urban Sprawl

The Western Cape generally has a low urban population density (average people per km<sup>2</sup>), resulting in inefficient urban settlements that are costly to run and place increasing pressure on the natural environment. Low population densities results in what is commonly termed “urban sprawl”. Urban sprawl has a number of impacts on the economy and environment of the province. For example, it makes the provision of economically viable public transport and other infrastructure difficult and influences the viability of small business.

The Western Cape PSDF has identified urban sprawl and densification as two key issues that need to be addressed in the Western Cape. The Draft PSDF proposes to increase the low average density of approximately 12 dwelling units (du) per hectare (ha) to 25du/ha, with 3-6 du/ha on the urban periphery and 40-60 du/ha in the urban core (CNdV, 2004).

## ENVIRONMENTAL GOVERNANCE

Internationally, good governance is seen as central to achieving goals such as poverty alleviation and sustainable development. The World Bank defines governance as the traditions and institutions by which authority in a country is exercised for the common good. This includes (i) the process by which those in authority are selected, monitored and replaced, (ii) the capacity of the government to effectively manage its resources and implement sound policies, and (iii) the

respect of citizens and the state for the institutions that govern economic and social interactions among them (World Bank: [www.worldbank.org/wbi/governance](http://www.worldbank.org/wbi/governance)).

According to World Bank research, South Africa ranked in the second highest quartile for each governance indicator except political stability (See Figure 2.2). This indicates that South Africa's performance on governance is significantly above world average.

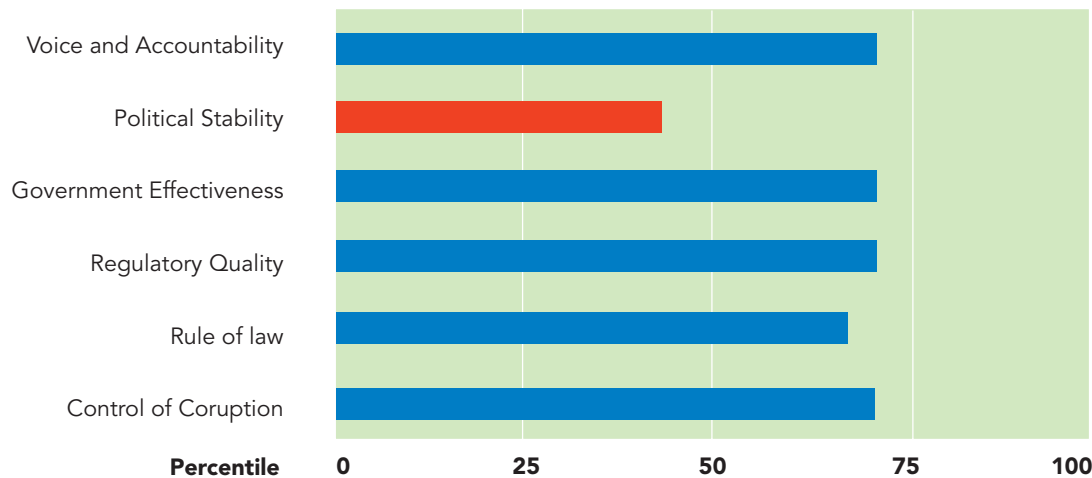
Environmental Governance is the term used to describe a number of tools that are used to administer, supervise or handle the environment. Environmental Governance traditionally involves government (the public sector), business, and non-government and community-based organisations (the private sector).

In the Western Cape, the Provincial Government of the Western Cape works in co-operation with National Government to create laws for, and provide services pertaining to the environment. Environmental management functions are extremely diverse, making the associated legal performance requirements complex. This places substantial and complex demands on the resources of the Western Cape Government. The department specifically responsible for environmental governance in the Western Cape is the Department of Environmental Affairs and Development Planning (D:EA&DP).

In 2002 D:EA&DP produced an Environmental Implementation Plan (EIP) for the Western Cape (D:EA&DP, 2002). While the EIP lays the foundation for environmental co-operation between governmental departments, many

challenges face the province in its implementation. These challenges include lack of funds and capacity, lack of awareness and education, poor participation from district municipalities, insufficient staff (and funding) for the enforcement of environmental law, and poor co-ordination and communication between departments.

Co-ordination of environmental governance is difficult because environmental management encompasses a broad range of concerns and is by nature cross-sectoral, whereas government administration, in contrast, is divided into narrow functional areas. Co-operative governance and the resolution of intergovernmental disputes are specifically elaborated on in the National Environmental Management Act (NEMA), notably in Section 3 which provides "Procedures for Co-operative Governance".



**Figure 2.2:** South Africa's Performance on Governance Issues, 2002 (Source: Kaufmann, Kraay and Mastruzzi, 2003)





## INTRODUCTION

Air, weather and climate are important factors that have a significant impact on the quality of people's lives. Weather and climate influence the environment we live in and affect human activities such as agriculture and housing design. The air we breathe influences human health and, for example, polluted air can cause chronic illnesses. Understanding the state of air, weather and climate is therefore important for determining policies for the future.

The recently promulgated National Environment Management: Air Quality Act No 39 of 2004 specifically requires effective air quality monitoring. It also demands reporting on, and public access to, air quality information<sup>2</sup>. These processes will be guided by a framework that is due to be published within the next two years. In the Western Cape, there are 12 air-quality monitoring stations in the Cape Metropolitan Area (CoCT) and three outlying monitoring stations in the province. These are controlled and monitored by CoCT: Scientific Services (Air Quality Monitoring). Polluting substances monitored include carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), sulphur dioxide (SO<sub>2</sub>), and particulate matter (PM<sub>10</sub>). A high standard of monitoring and enforcement is an essential part of ensuring the continuous availability of clean air to citizens of the Western Cape, especially in the Cape Metropolitan Area (CMA), where air pollution is a particular concern.

Climate change is one of the most alarming consequences of global warming and is predicted to affect almost every region of the world in some way. According to the Intergovernmental Panel on Climate Change (IPCC), the balance of evidence suggests a discernible human influence on the global climate. This human influence is primarily the result of increasing amounts of greenhouse gases (GHGs) released into the atmosphere. The most important GHGs are CO<sub>2</sub>, methane (CH<sub>4</sub>) and NO<sub>2</sub>. The Kyoto Protocol, negotiated in 1997, came into force in February 2005 and sets legally-binding limits to GHG emission for industrialised Annex B<sup>3</sup> countries.

<sup>2</sup> sections 7 (2) and 8

<sup>3</sup> Annex B countries are the developed or industrialised countries listed in the Kyoto Protocol, which have legally binding emission limits

The two priority issues reported on for air quality and climate in the Western Cape are:

- Air pollution; and
- Climate variability and change.

## DRIVERS AND PRESSURES

Some of the driving forces and pressures and influence the air emissions and greenhouse gas levels in the Western Cape include:

**Industrialisation and energy generation** – Energy generation and other industrial activities emit high levels of air pollutants and GHGs (mostly CO<sub>2</sub> and NO<sub>2</sub>). Most energy is generated outside of the Western Cape but the province does have industrialised areas which are concentrated around the CMA, Saldanha Bay and Mossel Bay.

**Transportation** – Transportation, especially by motor vehicles and aeroplanes, is a dominant contributor to air pollution and the release of GHGs in the Western Cape. The number of registered vehicles has increased by about 80% over the past 20 years and is expected to rise by 3-5% per year over the next few years (Wicking-Baird et. al. 1997). Within the province, vehicle emissions (such as CO, CO<sub>2</sub>, SO<sub>2</sub>, NO and volatile organic compounds) are expected to impact most dramatically on Cape Town's air quality, where approximately 70% of the Western Cape's population resides.

**Local atmospheric conditions** – The province's air quality is also influenced by regional and global atmospheric conditions. These cause temperature inversions<sup>4</sup> mainly between May and October (Wicking-Baird et. al. 1997), which trap emitted gases and lead to "smog episodes".

**Domestic fuel use** – The use of domestic fuels such as wood, paraffin and coal for subsistence and leisure in informal and

formal communities and the burning of household and garden waste causes localised air pollution. This condition is often exacerbated when the atmospheric conditions described above (temperature inversions) prevail.

**Agricultural** – The agricultural sector contributes to the deterioration of air quality through the emission of particulate matter and, to a lesser degree, GHGs such as CH<sub>4</sub> and NO<sub>2</sub>, from livestock farming, fertiliser use, crop spraying and crop burning. The clearing of natural vegetation for agriculture also reduces CO<sub>2</sub> absorption levels.

**Mining** – Mining activities cause air pollution mainly through the release of airborne particulate matter. In the Western Cape, quarrying is the main mining activity, although there are localised mining activities for heavy minerals and diamonds on the north west coast.

**Landfills and Wastewater Treatment Works** – Landfills and waste water treatment works are both a source of atmospheric emissions and odours. Typically, CH<sub>4</sub> and CO<sub>2</sub> constitute approximately 50% of landfill gases produced. Additionally, the production of sulphur oxide based compounds result in unpleasant odours and emissions from fishmeal factories also generate odours, which is a particular concern along the West Coast.

**Natural sources of emissions** – Biogenic emissions from soil and plant processes generates NO<sub>2</sub> and VOCs.

## ISSUE: AIR POLLUTION

It has been estimated that the CMA generates approximately 80% of the air pollution within the Western Cape (*Ravenscroft, pers. comm.*) as it is the centre of economic activity.

Air pollution within CMA is well documented through the Brown Haze 1 Study (Wicking-Baird et. al. 1997) and in the Brown Haze 2 Study, which has not yet been released (*Annegarn, pers. comm.*). The data in these reports clearly illustrates that vehicle emissions contributed significantly to visible and not-visible air pollution in the Cape Metropolitan Area.

Every day approximately 15 000 tons of industrial and domestic emissions, e.g. CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>2</sub> and PM<sub>10</sub> are emitted into Cape Town's atmosphere (Wicking-Baird et. al. 1997). Invisible CO<sub>2</sub> constitutes approximately 97.5% of these emissions. Hotspots include the Bellville and Milnerton industrial areas (Walton et. al., 2003) and Khayelitsha specifically with regard to high PM<sub>10</sub> levels.

The major industrial areas of concern in terms of air pollution (in addition to the Cape Metropolitan Area), are the Saldanha/Vredenburg region (metal and steel industry); Robertson and Riebeeck Wes (cement and raw materials processing); Mossel Bay (PetroSA refinery); Knysna (wood milling activities); Oudtshoorn (brick works) and George (numerous industrial activities).



4. a condition in which the temperature of the atmosphere increases with altitude in contrast to the normal decrease with altitude. When temperature inversion occurs, cold air underlies warmer air at higher altitudes

## STATE

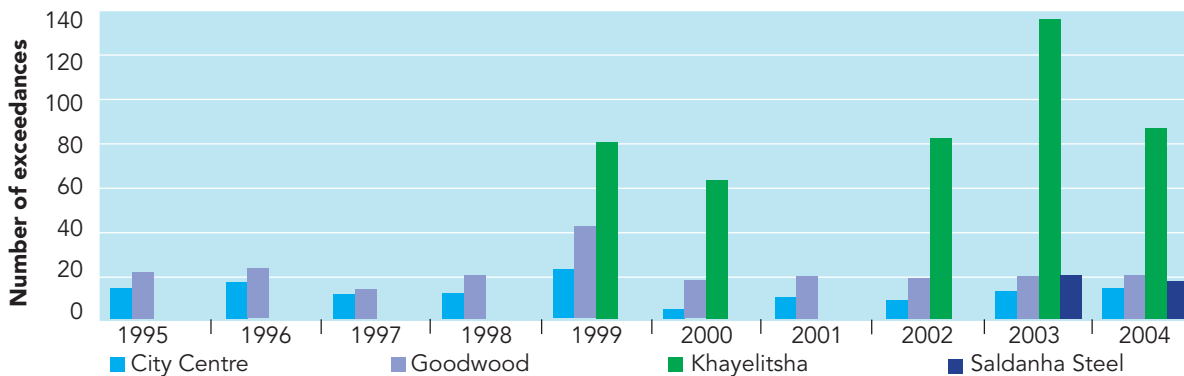
### The number and distribution of monitoring stations in the Western Cape

Air quality is currently monitored at 15 stations in the Western Cape, 12 within the CMA, two in Saldanha, one in Vredenburg and PetroSA's mobile unit in Mossel Bay. Only the City Centre and Goodwood monitoring stations have long term data.

### Trends in PM<sub>10</sub>, SO<sub>2</sub> and NO<sub>2</sub> levels and international guidelines exceeded per year

#### Particulate Matter (PM<sub>10</sub><sup>5</sup>)

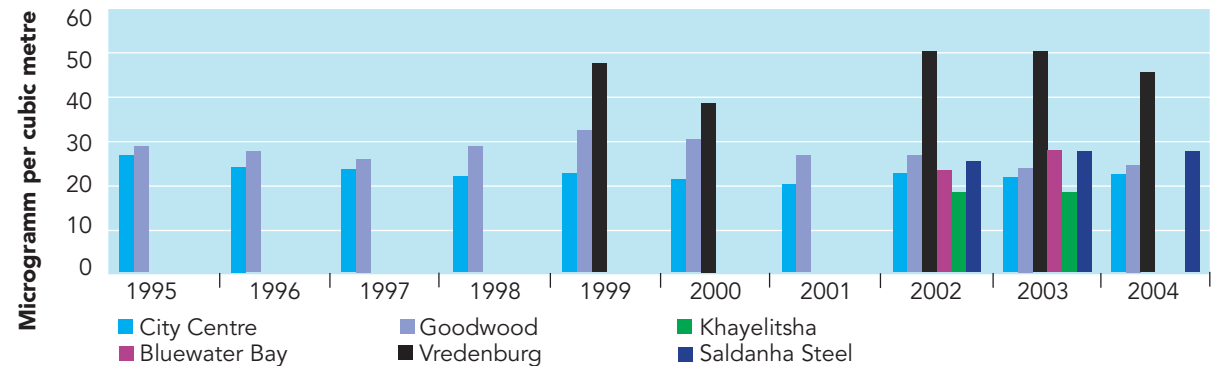
Particulate matter (PM<sub>10</sub>) is the general term used for a mixture of solid particles and liquid droplets in the air. These particles originate from both human and natural sources. Annual trends suggest that generally PM<sub>10</sub> levels in the CMA are fairly stable and below the South African guideline. At the Khayelitsha monitoring station levels are significantly higher compared to the rest of the CMA, but are not increasing. At the Saldanha Steel, Vredenburg and Bluewater Bay monitoring stations levels are stable.



5. PM<sub>10</sub> is particulate matter that has a micron size of 10

**Table 3.1:** Air quality monitoring stations in the Western Cape (Source: G.Ravenscroft CoCT, pers comm.)

		1984-1998	1999	2000	2001	2002	2003	2004
<b>CMA</b>	No of Stations	2	6	8	9	9	11	12
	No. of Measured Pollutants	8	27	36	41	40	44	45
<b>Outside CMA</b>	No of Stations	0	1	1	3	3	3	3
	No. of measured Pollutants	0	2	2	2	3	4	4



**Figure 3.1:** PM<sub>10</sub> Annual Trend Data (Source: CoCT, 2005)

Note: 1. 2002 Khayelitsha data are for 8 months only.  
2. International guideline specifies a limit of 50 micrograms per cubic metre, DEAT guideline specifies a limit of 60 micrograms per cubic metre.

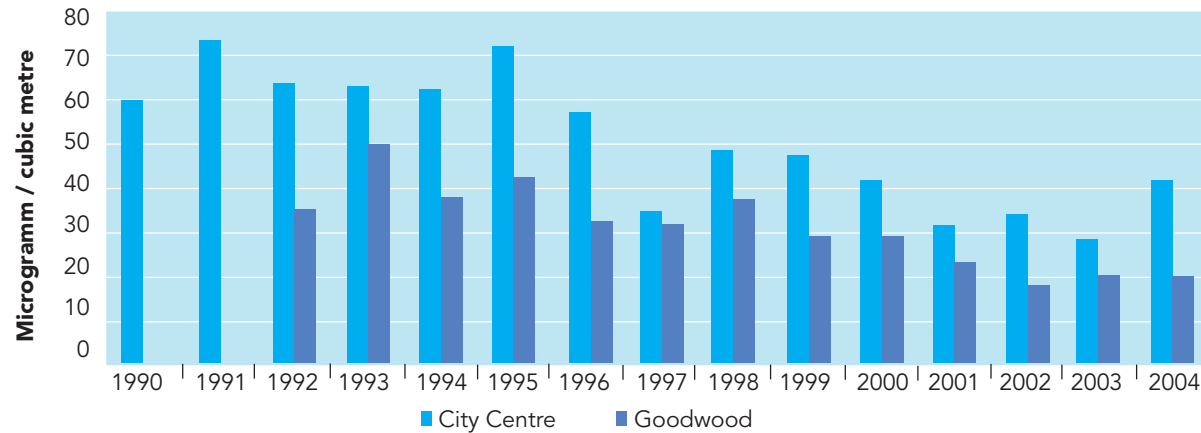
**Figure 3.2:** PM<sub>10</sub> Daily Exceedances (Source: CoCT, 2005)

Note: Exceedances are measured relative to DEAT Guideline of 180 micrograms of PM<sub>10</sub> per cubic metre

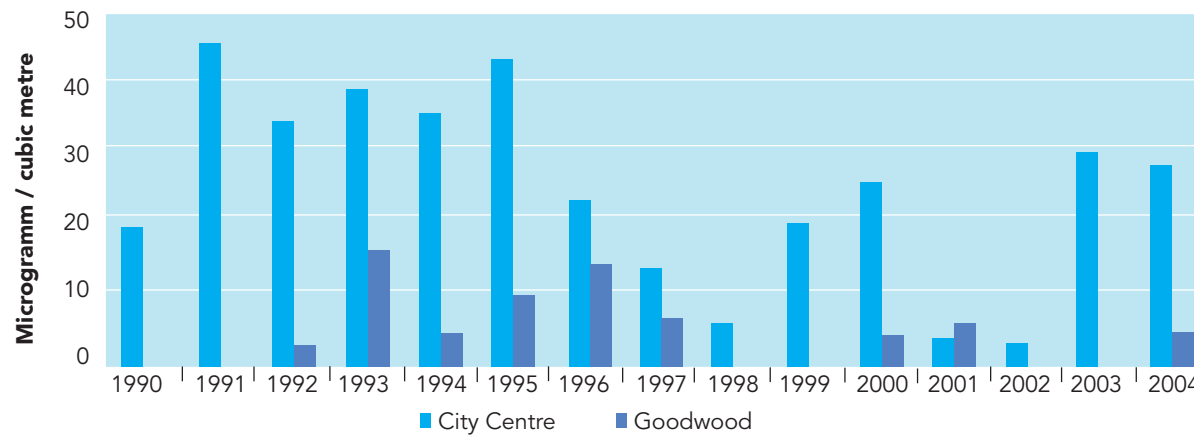
The numbers of exceedances of the daily guideline at the Goodwood and City Centre stations have been relatively constant. At the Khayelitsha station the numbers of exceedances are high relative to other areas. In 2003 and 2004, 21 and 17 exceedances were recorded at Saldanha Steel, while at the Vredenburg station no exceedances were recorded.

#### Nitrogen Dioxide<sup>6</sup> (NO<sub>2</sub>)

Annual trend data suggests that since 2002, NO<sub>2</sub> levels have dropped gradually from 1996 but have now stabilised. Annual averages are below the South African guideline. Daily exceedances appear to have dropped off during 2001/2, but significant increases were registered in 2003/4.



**Figure 3.3:** NO<sub>2</sub> Annual Trend Data (Source: CoCT, 2005)  
Note: DEAT guideline specifies a limit of 80 micrograms per cubic metre



**Figure 3.4:** NO<sub>2</sub> Daily Exceedances (Source: CoCT, 2005)  
Note: Exceedances are measured relative to World Health Organisation Guideline of 200 micrograms of NO<sub>2</sub> per cubic metre.

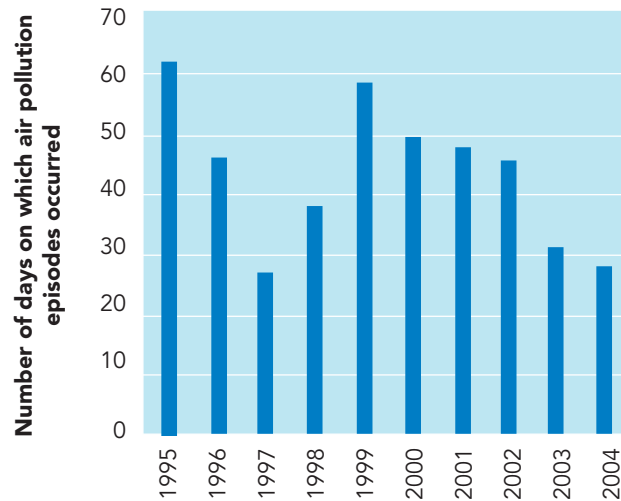
6. Data is only available for the CMA

## Sulphur dioxide (SO<sub>2</sub>)

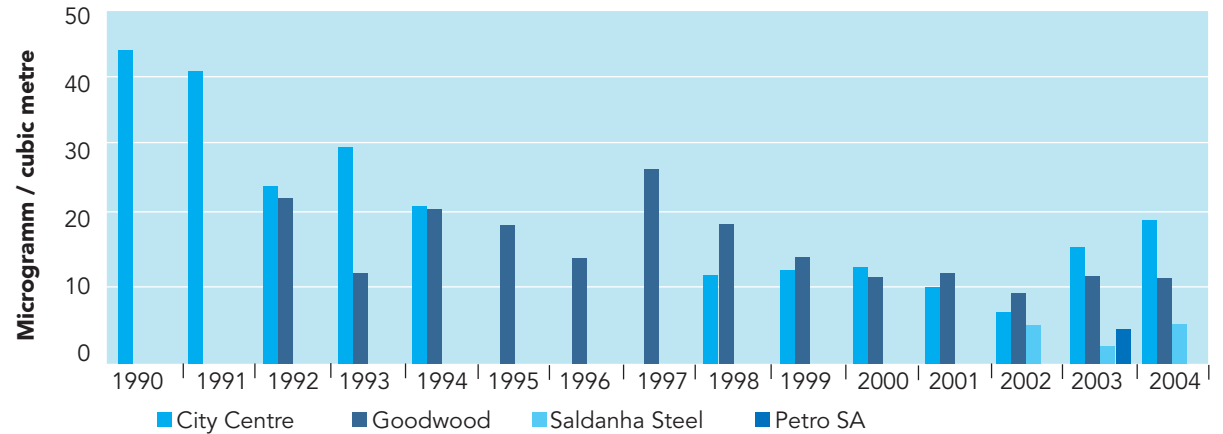
Annual trend data suggest that SO<sub>2</sub> levels are gradually increasing within the CMA, after dropping from 1997 highs. Levels are highest in the area around the Tableview monitoring station, where the Caltex refinery and a number of other polluting industries are located. In the Mossel Bay area, PetroSA's sampling data (August 2002 - August 2004) shows that levels were virtually undetectable. At the Saldanha Steel monitoring station SO<sub>2</sub> levels are also low.

### Number of air pollution events

Monitoring data<sup>7</sup> suggests that annual number of air pollution episodes/events (i.e. number of days that the monitoring guideline for SO<sub>2</sub>, Ozone or PM<sub>10</sub> was exceeded) in the CMA has decreased steadily from 1999 (see Figure 3.7). However, the nature of the events is becoming more severe (CoCT, 2002).

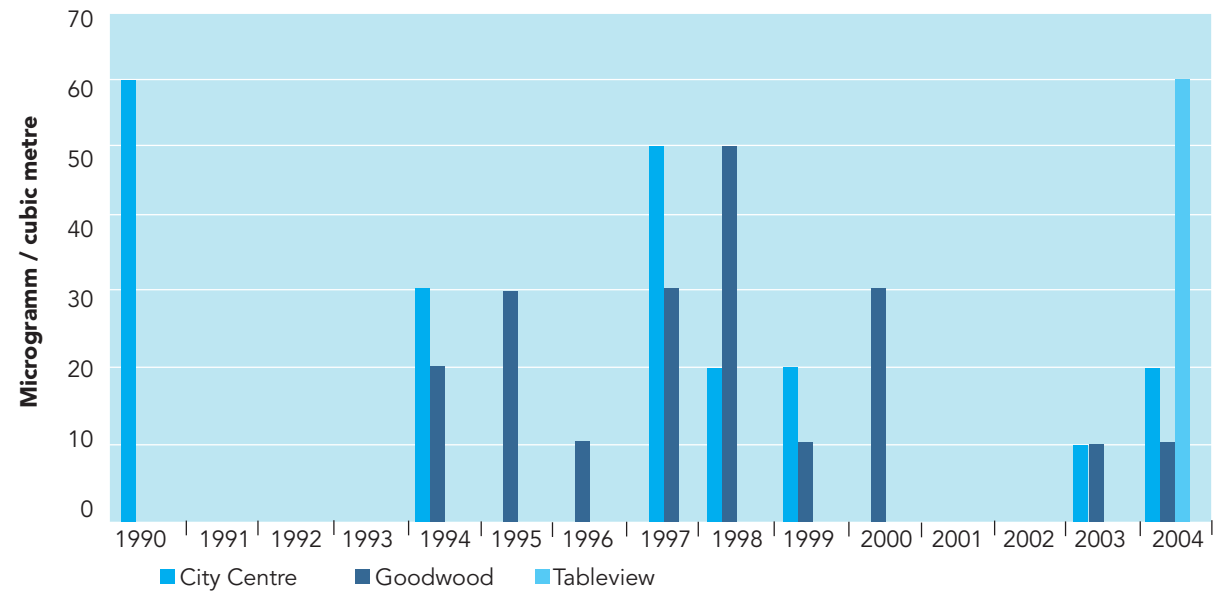


**Figure 3.7:** Air pollution Episodes per Annum (Source: CoCT, 2005)



**Figure 3.5:** SO<sub>2</sub> Annual Trend Data (Source: CoCT, 2005)

Note: DEAT/UK guideline specifies a limit of 50 micrograms per cubic metre



**Figure 3.6:** SO<sub>2</sub> Daily Exceedances (Source: CoCT, 2005)

Note: Exceedances are measured relative to DEAT/UK guideline of 125 micrograms of SO<sub>2</sub> per cubic metre. Number of air pollution event

7. Data for the Khayelitsha area, where monitoring only commenced in 2000, is not included.



## IMPACTS

Poor air quality has the following consequences:

- Poor air quality impacts on human health, especially when the level of pollution is high over a long period. It can cause disease, illness (specifically respiratory and cardiovascular illnesses) and even death (Kinney 1999).
- Smoke-related air pollutants contribute to incidences of brown haze (prevalent over most the CMA), which reduces visibility and degrades the aesthetic quality of an area.
- Degradation of both natural and man-made features in the environment, especially in case where acid rain is present.
- Air pollution can cause a reduction in plant growth as well as crop yields.
- Air emissions contribute to the release of greenhouse gases into the atmosphere, which result in global warming.

A shortage of monitoring stations in the province means that the true state of air quality in the province cannot be obtained and the performance of a certain area and/or industry in meeting international guidelines and/or the Air Quality Act requirements cannot be established. Furthermore, lack of air quality monitoring data makes the enforcement of regulations difficult.

## ISSUE: EMISSION OF GREENHOUSE GASES AND CLIMATE CHANGE

South Africa is by far the largest emitter of greenhouse gases (GHGs) in Africa. (EIA, 2004). GHGs emissions result largely from the burning of fossil fuels and the destruction of natural forest vegetation<sup>8</sup>. Globally increasing concentrations of GHGs are contributing to relatively rapid global warming. This process is expected to alter global and regional climate patterns, which may impact on people's lives by altering existing rainfall and temperature patterns.

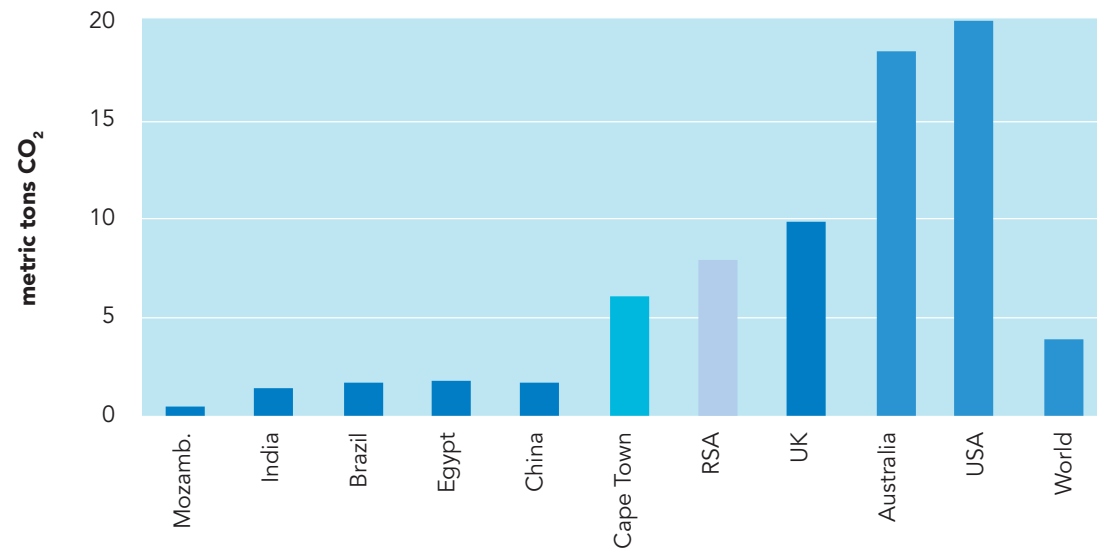
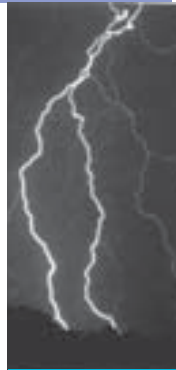
8. Natural forest vegetation absorbs CO<sub>2</sub> from the atmosphere

## STATE

### Greenhouse gas emissions per capita in the Western Cape

Data for the CMA serve as a proxy for the Western Cape. Total greenhouse gas emissions in the CMA (2000/2001) amounted to approximately 17 million tonnes of CO<sub>2</sub> equivalents. The main sources of these GHGs in the CMA were from transport and gases emitted from landfill sites. 17 million tonnes of CO<sub>2</sub> equivalents translates into an emission of approximately 5.8 tonnes of CO<sub>2</sub> equivalents per capita, which is lower than the SA average (see Figure 3.8).

The lower emission per capita in the Cape Metropolitan Area relative to the South African average reflects the fact that most coal-based electricity, which causes high GHG emissions, is generated in other provinces of South Africa.



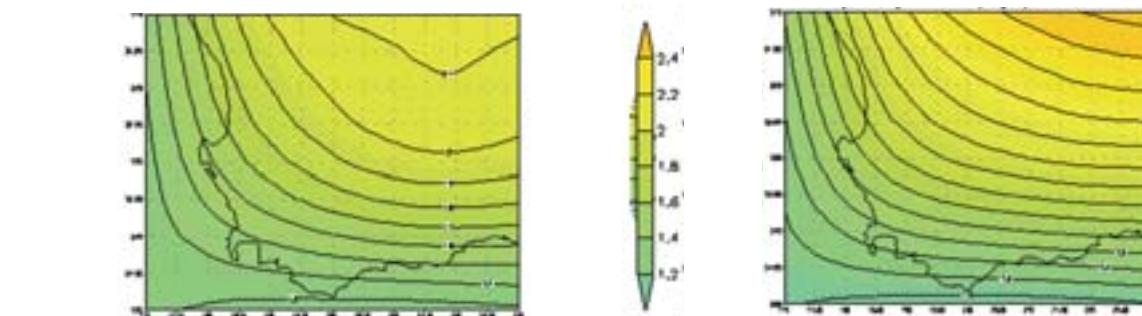
**Figure 3.8:** Per Capita Emission of Greenhouse Gases (Source: World Bank, Little Green Data Book 2005)



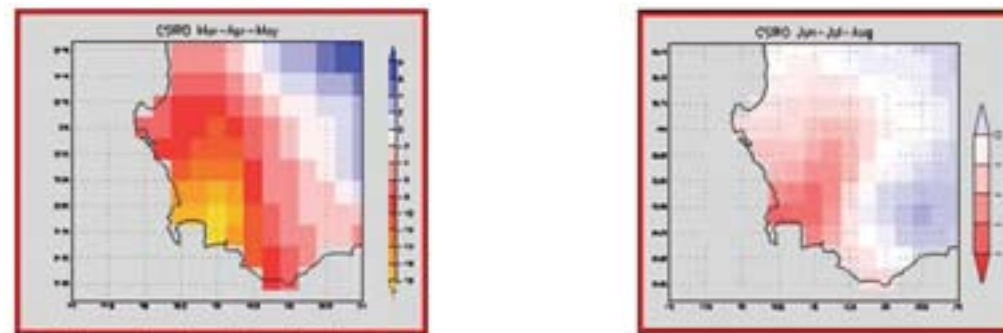
### Predicted effect of climate change on the Western Cape

The Western Cape experiences highly variable climatic conditions. Although not very frequent, droughts and flooding do occur on a recurring basis. These upper and lower limits of variability, rather than average values, guide the vulnerability assessment of the region to cope with climate change. Climate models have been widely used to approximate physical characteristics of the ocean and atmosphere to gain insight into possible modifications to climatic conditions on a global, and more recently, on a regional scale. Scenarios of increased CO<sub>2</sub> emissions are used as the starting point for making future projections.

According to various climate models, including those developed by the Hadley Centre for Climate Prediction and Research (UK), Geophysical Fluid Dynamic Laboratory (USA) and the Commonwealth Scientific and Industrial Research Organisation (Australia), the Western Cape



**Figure 3.9:** Average Change in Minimum and Maximum Temperature in °C from Present to 2050  
(Source: Geophysical Fluid Dynamics Laboratory (GFDL) model - Hewitson, 2005).



**Figure 3.10:** Change in monthly precipitation 2070-2100 compared to present day in mm per month<sup>9</sup>  
(Source: CSIRO Global Climate Change model, Hewitson, 2005)

could experience an increase in maximum and minimum average temperatures of between 1-2.4°C by 2050, with lower temperature increases on the coast and higher temperature increases inland (see Figure 3.9). In the last 25 years the region has experienced an increase of between 0.3 and 1.6°C in average temperature. Very warm days have become warmer or have occurred more regularly particularly during January, April and August (Wand and Midgley, 2003; Midgley et al, 2005).

Annual average precipitation could be reduced by 60-120 millimetres per annum (See Figure 3.10). This is significant when compared to a current average annual rainfall of 350 mm in the South-Western Cape. Several models predict wetter summers (particularly February/March) in the interior of the province and drier winters (April to September) in the south-western region of the province (Midgley, 2005). Although the average rainfall over the last 25 years seems to be stable, the number of rainfall events has been decreasing.

9. Note: Scale ranges from +8 mm (top) to -18 mm (bottom)

The intensity of rain events however appears to be increasing and is thereby heightening the risk of floods.

Although research on sea level rise is limited, if global models are applied it is estimated that the sea level along the Western Cape coast could rise by between 30-50 centimetres over the next 50 years.

### IMPACTS

- Climate change increases the likelihood of extreme weather events such as droughts, floods and heat waves. This makes the Western Cape's resource management more challenging.
- The Western Cape might become even more water stressed due to a forecasted reduction in rainfall and increased evaporation. Figure 3.10 illustrates the potential future gap between water supply and with different scenarios of Water Management Demand (WMD), Climate Change (CC) and an assumed population growth of 2.81%.
- A change in average temperatures and rainfall may be sufficient to change agricultural conditions and the crop species that can be commercially farmed in the province.
- Climate change may also trigger the destruction or migration of indigenous plant and animal species that are already at their temperature and rainfall tolerance limits.
- A rise in sea levels will increase the vulnerability of beaches, shore lines and coastal developments to storm surges and erosion.
- A change in climate patterns can alter the optimal conditions and thus distributions of diseases such as malaria (although not in the Western Cape) and bilharzia. With the predicted increase in temperature, this may render the Western Cape more vulnerable to currently uncommon diseases.

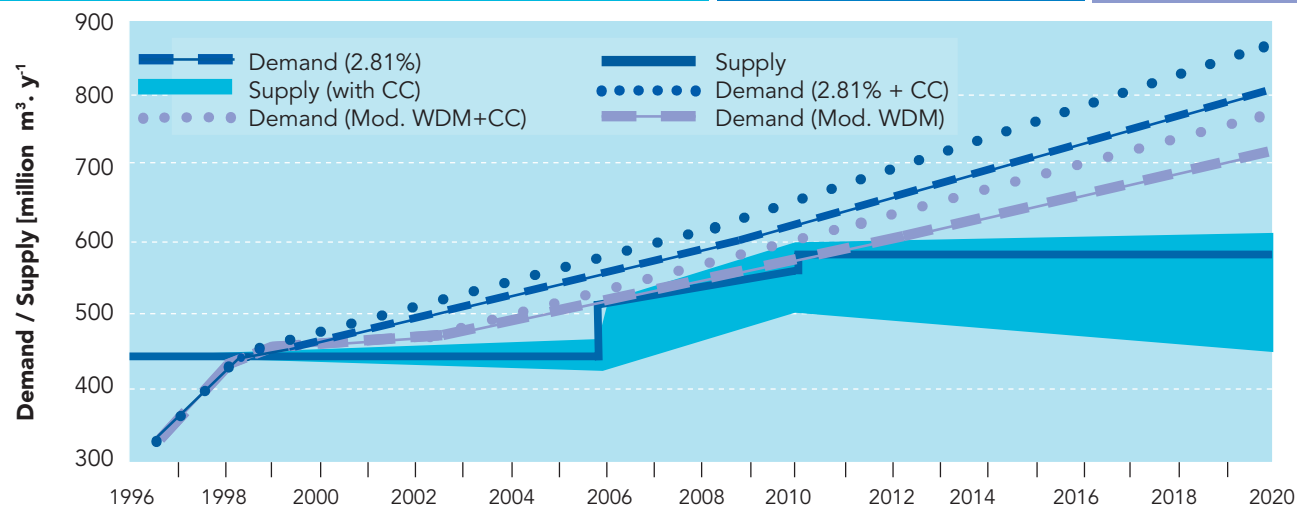


Figure 3.11: Western Cape predicted water supply versus water demand with climate change<sup>10</sup> (Source: New, 2002)

### Summary and status of indicators used in this chapter

Air Quality and Climate Indicators	How we are doing?	Comment
The number and distribution of air monitoring stations	☹️ ☹️	in CMA in rest of the province
Daily exceedances of international guidelines per year for PM <sub>10</sub>	☹️	near Khayelitsha monitoring station
Levels of PM <sub>10</sub> per year	☹️	near Khayelitsha monitoring station
Daily exceedances of international guidelines per year for NO <sub>2</sub>	☺️	gradually decreasing in CMA
Levels of NO <sub>2</sub> per year	☺️	gradually decreasing in CMA
Daily exceedances of international guidelines per year for SO <sub>2</sub>	☹️	gradually increasing in CMA
Levels of SO <sub>2</sub> per year	☹️	gradually increasing in CMA in rest of province
Number of air pollution episodes per year	☹️	fewer episodes but more severe
GHG emission per capita in the Western Cape	☹️	Less than in many other provinces, but energy demand in Western Cape contributes to GHG emissions

10. Note: Showing population growth of 2.81% pa, with Water Demand Management (WDM)

### Indicator Suggested for Future Monitoring

- as climate change indicators are developed and become more regional in their scope, they should be incorporated in future SoERs. This may include indicators such as the consumption of ozone depleting substances

## RESPONSES

The table below summarises some of the legislation and other initiatives that have been implemented in response to the air quality and climate change issues.

<b>International</b>	<ul style="list-style-type: none"> <li>• Montreal Protocol on Substances that Deplete the Ozone Layer (ratified by South Africa in January 1990)</li> <li>• United Nations Framework Convention on Climate Change (UNFCCC) (ratified by South Africa in August 1997)</li> <li>• Kyoto Protocol (ratified by South Africa in March 2002)</li> <li>• Air Pollution Information Network Africa</li> <li>• Clean Air Initiative Africa</li> <li>• United Nations Industrial Development's Cleaner Production Programmes</li> </ul>
<b>National</b>	<ul style="list-style-type: none"> <li>• National Environment Management : Air Quality Act No 39 of 2004</li> <li>• National Climate Change Strategy for South Africa</li> <li>• Cities for Climate Protection Campaign</li> <li>• South South North Clean Development Mechanism</li> <li>• Phasing out of leaded fuels in 2006</li> <li>• Joint international initiatives to reduce greenhouse gas emissions.</li> <li>• National Electrification Programme</li> <li>• Energy Efficiency Strategy</li> </ul>
<b>Provincial</b>	<ul style="list-style-type: none"> <li>• Brown Haze Study and Volatile Organics Study</li> <li>• Limited increased in monitoring stations</li> <li>• The Dept. of Environmental Affairs and Development Planning is increasing its capacity in preparation for the implementation of the Air Quality Act</li> <li>• Provincial Climate Change Report: A Status Quo, Vulnerability and Adaptation Assessment of the Physical and Socio-economic Effects of Climate Change in the Western Cape</li> </ul>
<b>Other (Local)</b>	<ul style="list-style-type: none"> <li>• City of Cape Town Air Pollution Strategy and Air Quality Management Plan</li> <li>• Integrated Metropolitan Environmental Policy (IMEP) Air Pollution Strategy</li> <li>• City of Cape Town Air Pollution Control By-Law</li> <li>• City of Cape Town's Diesel Vehicle Emission Testing</li> <li>• Establishment of Belville South Environmental Forum (and monitoring station)</li> <li>• The Cape Town Energy and Climate Change Strategy (currently a draft)</li> </ul>

## LINKS

The air quality and climate change theme has the strongest links to:

**Economics and Poverty** – economic development, with the associated increase in industry and urbanisation, results in activities and processes that produce potentially harmful air emissions.

**Health** – Long term exposure to high levels of air pollution have a negative impact on human health, e.g. asthma and lung cancer.

**Energy** – The provision of energy to an ever-growing population results in larger quantities of pollutants entering the atmosphere (although switching to more energy-efficient forms may reduce pollution levels).

**Land** – the viability and nature of existing agricultural crops may be affected by changes in rainfall patterns and evapo-transpiration.

**Biodiversity** – Climate change may impact the composition of species biodiversity found in the Western Cape.

**Inland water** – Climate change may impact the inland water resources (both surface and groundwater) available in the Western Cape through changed precipitation patterns.

## CONCLUSION

Overall the Western Cape has better air quality and releases fewer GHG emissions than provinces such as Gauteng and Mpumalanga, where coal-powered energy is generated and industrial activity is concentrated. The air quality in the CMA is considerably worse than in the rest of the province, particularly in certain hotspot areas such as Bellville, Milnerton, Table View and Khayelitsha.





Long term air quality data is limited to the CMA, with some recent data being available for the Saldanha Bay/Vredenburg and Mossel Bay areas. The data suggest that air quality in parts of the CMA have stabilised, although a high number of daily measurements are still exceeding guidelines (particularly in and around informal settlements and during winter temperature inversions). Levels of  $PM_{10}$  in and around Khayelitsha are frequently exceeding guideline requirements and remain a key concern for health. The number of air pollution episodes in the CMA is decreasing gradually, although the intensity of episodes is increasing. This could change with a predicted decrease in rain events in winter. Data from areas outside of the CMA indicate that air pollution levels are satisfactory, with  $SO_2$  and  $PM_{10}$  rarely exceeding local or international guidelines. However there are very few monitoring stations outside of the CMA.

The number of monitoring stations and the number of air pollutants they are measuring in the Western Cape has increased since 1999. These however need to continue to increase in order to gain a true reflection and better understanding of the province's air quality.

The emission of GHGs per capita in the CMA is relatively low compared to national and international emission levels but demand for energy in the Western Cape contributes to elevated South African GHG emission levels. Despite low

GHG emission in the province, as climate change is a global phenomenon, it is forecast to have an impact on the Western Cape. Models predict that the province might become warmer and experience less precipitation as a result of climate change. This impact has serious implications for the province as it may affect crop production, biodiversity, air pollution and the spread of diseases currently not found in the province. Vulnerability, mitigation and adaptation assessments are recommended.

The recently-enacted Air Quality Act No. 39 of 2004 specifically requires effective air quality monitoring and demands reporting on, and public access to, air quality information. This will help to address the relatively high levels of air pollution in the CMA, as well as to reduce GHG emissions. Provincial authorities have placed a strong emphasis on successfully implementing the Air Quality Act: however, it will require the co-operation of all role players to reduce air pollution in the CMA.

## NOTES ON DATA

- Long term air quality data is limited to the CMA. Saldanha Bay/Vredenburg and Mossel Bay areas have some data for recent years.
- Climate change models used here incorporate uncertainties by the use of rates of change.

