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BETTER TOGETHER.

State of Environment Outlook Report for the Western Cape Province

Drivers and Pressures

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ABBREVIATIONS AND ACRONYMS

CCT	City of Cape Town
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
NDP	National Development Plan
PERO	Provincial Economic Review and Outlook
PSDF	Provincial Spatial Development Framework
WCG	Western Cape Government

GLOSSARY

Climate change	A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forces such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use. According to the Intergovernmental Panel on Climate Change (IPCC), climate change refers to any change in climate over time, whether due to natural variability or as a result of anthropogenic activities. Note that the Framework Convention on Climate Change (UNFCCC) differs in that it defines climate change as in addition to natural climate variability, i.e. 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition, and climate variability attributable to natural causes.
Greenhouse gases	Gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation and includes carbon dioxide, methane and nitrous oxide.
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

1 OVERVIEW OF KNOWN DRIVERS AND PRESSURES

The environment that we live in is in a constant state of change. Humans influence the system balance and introduce elements and forces into the natural system that throw the system into disarray. These forces are defined as either drivers or pressures in state of environment reporting.

Drivers determine the extent to which human activity influences the environment either positively or negatively. Pressures, on the other hand, refer to actual activities or interaction between humans and the environment that affect the state of environmental variables directly.

This chapter provides a description of the key drivers and pressures at play in the Western Cape, with additional reference to these in various theme chapters where applicable.

The key drivers and pressures discussed in this chapter include:

- Over-exploitation of resources;
- Invasive species;
- Climate change;
- Fires and altered fire regimes;
- Pollution;
- Damage to marine resources;
- Population growth and population dynamics;
- Income inequality and social well-being;
- Spatial development;
- Housing and municipal services;
- Informal settlements;
- Human settlements and urbanisation;
- Land use and access to land;
- Industry;
- Energy;
- Transportation;
- Mining and oil and gas exploration and extraction;
- Agriculture and agricultural expansion; and
- Governance.

What are drivers and pressures?

Drivers (human induced or natural) are the primary agents driving change in the environment. These underlying socio-economic and political agents of change, determine where and how people use and consume natural resources.

Pressures are human activities and processes that act on the environment and directly cause environmental change. They are distinct from the driving forces since they relate directly to the use and exploitation of natural resources, as opposed to the driving forces that determine the scope or extent of the pressures.

Pressures can be divided into three main types: (i) use of environmental resources, (ii) changes in land use, and (iii) emissions (of chemicals, waste, radiation, noise) to air, water and/or soil.

A background to some of these drivers and pressures is provided in the Western Cape Profile incorporated in Annexure A of the Introduction Chapter. In addition to the drivers and pressures discussed above, a number of emerging issues/activities/planning policies have been identified, which are likely to place additional pressure on the environment in the Western Cape. Although not yet recognised as key drivers of environmental change, they have the potential to create adverse effects in the future, or perhaps the negative effects are already manifest, but are expected to intensify. Emerging issues have been discussed in the Conclusions Chapter.

1.1 Overexploitation of resources

Overexploitation refers to the utilisation or exploitation of a resource, i.e. where demand exceeds supply, to the point where diminishing yields are obtained from the same level of effort, affecting the ability of the resource to regain positive rates of regeneration. Just about every renewable natural resource has levels of regeneration which, if overexploited, will lead to a depletion of the resource. Typically, this will also have knock-on or cumulative effects on elements of the natural system that are directly dependent on the dwindling resource. Once overexploited, recovery rates are usually lower than at normal regeneration rates (DEA&DP, 2013). The increasing population of the Western Cape exerts strain on the province's resources, including water, agricultural products, living space, and other ecosystem goods and services.

1.2 Invasive species

The spread of invasive species is evident on land, in surface water, as well as in marine systems, and typically occurs wherever the natural balance of an ecosystem has been compromised, either through the lowering of its inherent ability to absorb or accommodate changes or shocks, or through the introduction of an element that has no natural control mechanisms present. (DEA&DP, 2013).

Invasive alien species present an array of challenges to the natural environment and society. These include higher levels of surface and ground water uptake leading to reduced water availability, increased fire risk and intensity, out competing of indigenous species leading to habitat loss, and increased erosion of topsoil. Invasive alien plants are a widespread problem in the Western Cape despite massive efforts by CapeNature and the Working for Water, Working for Wetlands, and Working for the Coast Programmes to control alien plants.

1.3 Climate change

The Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2014) defines climate change as a change in global or regional climate patterns, due to natural variability and or as a result of human activity. The latest science confirms that this change has been accelerated through anthropogenic (human) activities, including the increased release of greenhouse gases (GHG) into the atmosphere. These GHGs have the same effects as a greenhouse, trapping the heat from the sun in the earth's atmosphere, leading to an increase in global temperatures. The more GHGs that are emitted, the warmer the planet becomes. The resultant increase in global temperatures results in decreased predictability of weather patterns and an increase in the frequency and intensity of extreme weather events¹ such as severe rainfall events, increased duration of drought, heat waves, unusual cold spells and unseasonal wind conditions (IPCC, 2014).

The Western Cape Province has been identified as particularly vulnerable to climate change as the region is highly dependent on water storage capacity due to the dominant winter rainfall patterns and its coastal location (DEA&DP, 2017a). According to projections, climate change will bring about an increase in average temperatures and possibly lower annual rainfall to the Western Cape (DEA&DP, 2014a).

¹ An extreme weather event is an event that is rare at a particular place and time of year. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g. drought or heavy rainfall over a season) (IPCC, 2014)

1.4 Fires and altered fire regimes

Within the Western Cape Province, veld fires occur naturally during the dry summer, when temperatures rise and vegetation tends to dry out. Dry, windy conditions are also common in the Western Cape during this period. The size and intensity, as well as the occurrence (both in space and time), of veld fires depend directly on weather conditions, the composition of the vegetation (e.g. moisture content, volatile oils, percentage of moribund materials), and the weight of the consumable fuel/biomass per hectare (i.e. available fuel loading). Major fires have occurred in the Eden District, City of Cape Town and the Cape Winelands areas. The increased frequency of fires is strongly linked to the manifestation of climate change across the province as this causes hotter and drier conditions, which increases fire risk. Veld fires adversely affect air quality as a form of distinct pollution events dispersed across vast areas. When fires occur too frequently or too infrequently, a decline in species in ecosystems is observed. This in turn reduces the long-term viability of rare and unique plants, animals and habitats.

In addition to veld fires, fires are also used to burn agricultural wastes and other waste streams. Burning of flammable organic compounds, such as tyres and plastics, emits dense black smoke or soot consisting of impure carbon particles.

1.5 Pollution

Pollution, or the unacceptable accumulation of substances in certain locations, is a typical consequence of the concentration of humans. Human activity generates waste as by-products of resource extraction, materials processing, goods transportation and consumables use, and ultimately through the disposal of waste products. This accumulation of waste tends to affect the state of the environment if accumulation exceeds the rate at which natural systems can break down the contaminants. Polluted environments have few or no naturally functional ecosystems and therefore lose productivity and ability to provide ecosystem services on which humans rely e.g. floodwater retention (DEA&DP, 2013). Causes of pollution in the Western Cape include agriculture (pollution of freshwater resources due to pesticide and fertiliser run-off), industry (air pollution), lack of access to sanitation (use of water resources for bathing and ablutions), illegal dumping and improper disposal of waste.

1.6 Damage to marine resources

As in many coastal areas, human activity in the Western Cape tends to concentrate along the coastline, inevitably placing strain on marine resources and ecosystems. This activity takes place on land and in the ocean, and is both consumptive, such as fisheries, and non-consumptive, such as tourism. Along with the significant land use change through urbanisation or physical development, coastal activities tend to exploit resources at or above their rates of replenishment and may cause excessive pollution, and disturbance of the natural equilibrium.

The effects on coastal resources can be seen in declining marine resources stocks, changes to marine species assemblages, water pollution and alteration of the natural coastal processes such as longshore sand transportation (drift) (DEA&DP, 2013).

1.7 Population growth and population dynamics

Society unavoidably places pressure on environmental resources which feeds back to quality of living and social wellbeing. However, the societal impact on the environment is not necessarily a direct function of the number of individuals in a community: population dynamics such as residential density, household character, age structure, socio-economic welfare and cultural affiliations all contribute to the net impact.

About 6.5 million people reside in the Western Cape, and this number is increasing constantly (WCG, 2017b). This has increased the pressure on the environment to provide basic needs (including energy needs), to accommodate people in space (land) and to process their waste products (increasing pressure on landfills and waste water treatment works).

Most households in the province have access to basic services as well as a radio, television, refrigerator, landline telephone and at least one cellular telephone (StatsSA CS, 2016). At the same time the province has a dependency ratio of 0.46, and an unemployment rate around 30%. The Gini-coefficient for all district municipalities within the Western Cape is improving, but the province is still regarded as an unequal society (WCG, 2017b).

Social indicators for the Western Cape paint a picture of a society developing slowly but consistently. The adult portion of the Western Cape population is growing in size, leading to a corresponding growth in the demand for material goods. Dependence on transport also increases as formal employment levels increase. These escalations in the standard of living, aspirations and consumption, combined with population growth signal that increasing and unrelenting pressure will be placed on the environment unless patterns of consumption change. Ultimately, a slowdown in the pace of consumptive growth will be required to lower the per capita impact to a steady state before it overreaches sustainable levels.

1.8 Income inequality and social well-being

The Gini Coefficients for the Western Cape and each municipality are between 0.58 and 0.63, indicating a high level of inequality. Income inequality and poverty are directly correlated with health and social problems, as is environmental degradation, which is inversely correlated with environmental sustainability. It is recognised that the higher the income inequality the worse the performance against environmental indicators such as waste production, water use, biodiversity loss and environmental composite indices such as ecological footprint.

1.9 Spatial development

The National Development Plan (NDP) identifies the following critical action with respect to urbanisation in South Africa (WCG, 2017a).

“New spatial norms and standards – densifying cities, improving transport, locating jobs where people live, upgrading informal settlements and fixing housing market gaps.”

Spatial challenges in the Western Cape and each of the municipalities are evident in the current distribution and desirability of land uses within the regional planning context which places pressure on infrastructure and services, open spaces and social well-being. To give effect to the goals and objectives of sustainable spatial development, the National Planning Commission called for a National Spatial Framework, which encompasses principles that seek the reversal of spatial segregation, and promotion of sustainable consumption patterns, resilience to environmental degradation, access and inclusion of people with disabilities and efficient commuting patterns and circulation of goods. In order to meet these national objectives as well as to give effect to the Provincial Strategic Objectives, the Western Cape developed a Provincial Strategic Development Framework (PSDF), which provides a policy framework in which to rollout the Western Cape's spatial agenda and to open up new opportunities (WCG, 2017). These are:

- **Resource Management:** Proactive management of resources as social, economic and environmental assets supported by sustainable living technologies;
- **Space-economy:** Spatially aligned infrastructure, prioritisation and investment to increase access to opportunities and balance the rural and urban space-economy; and

- **Settlement:** An urban rather than suburban approach to settlement, which promotes intensity, integrations, consolidation and sense of place.

Various growth management zones anticipated to experience rapid growth are identified in the PSDF. One such zone is the resource related port and industrial development in Saldanha Bay and surrounding areas, targeting upstream exploration and production services.

1.10 Housing and municipal services

As at July 2017, a total of 535 802 households were registered on the Western Cape Demand Database. Roughly 60% of registered housing applicants in the Western Cape are in Cape Town (WCG, 2017b).

Service delivery is essential to support housing initiatives; in this respect, access to electricity, piped or tap water, sanitation and weekly refuse removal in the Western Cape is shown in Figure 1-1.

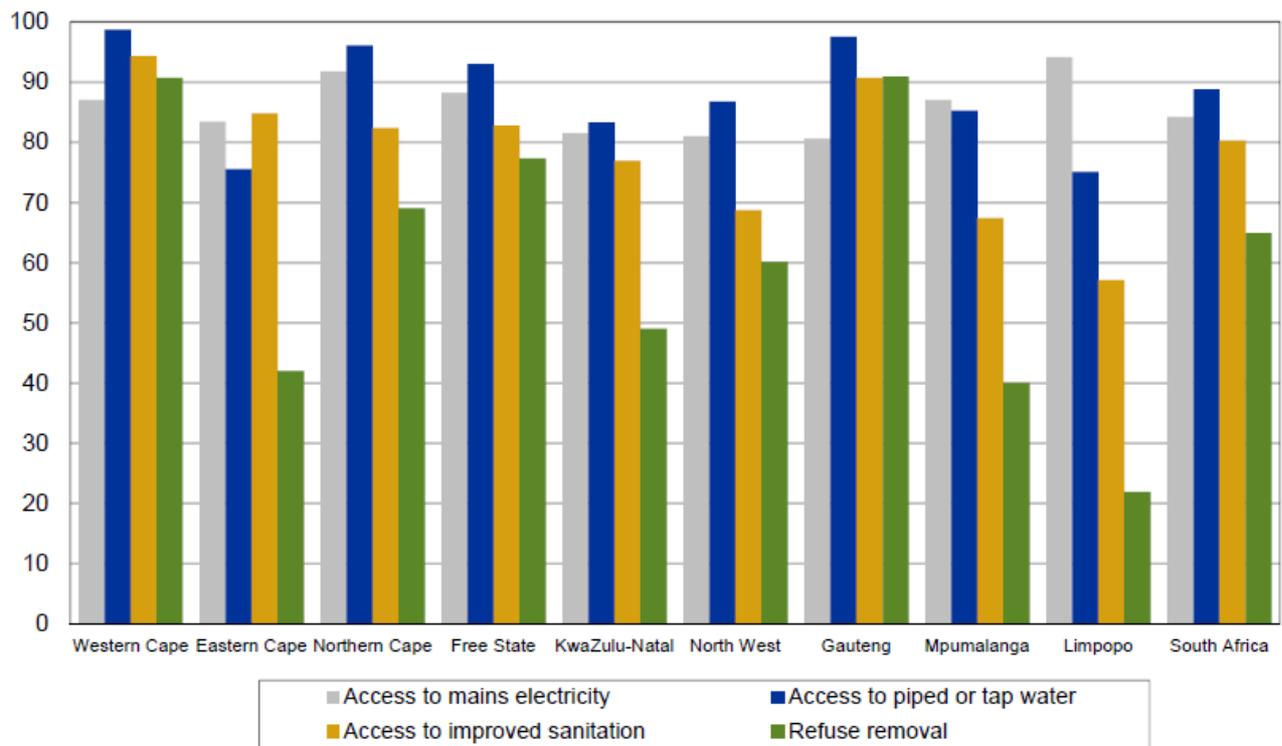


Figure 1-1: Percentage of households with access to four main municipal services in 2017 by province

Source: WCG, 2017b

As can be seen in Figure 1-1, the Western Cape's delivery of four main municipal services is better than that of the other provinces and the national average. Provision of bulk services such as landfill airspace and capacity to collect solid waste, needs to be scheduled for new or planned housing.

1.11 Informal settlements

The number of households in informal settlements in the CCT rose from 198 000 in 2012 to 300 000 in 2014 (WCG, 2014). The persistence of informal settlements with poor living conditions has a significant impact on the environment and the lack of access to basic services (electricity, water, sanitation and refuse removal) leads to illegal dumping, waste disposed in rivers and burning of waste causing land, water and air pollution. The unsuitable location of many

settlements and proximity of natural features and flood-prone locations compounds these unsustainable practices.

The number of households living in formal dwellings in the Western Cape increased marginally between 2011 and 2016, with a commensurate reduction in informal dwellings (WCG, 2016a). The Western Cape Informal Settlement Support Plan: Draft Strategic Framework (2016), recommends in-situ upgrading of informal settlements, including the provision of waste management infrastructure.



Figure 1-2 depicts the number of informal settlements per district municipality in the Western Cape. Unsurprisingly, the CCT has the highest number of informal settlements (WCG, 2015b).

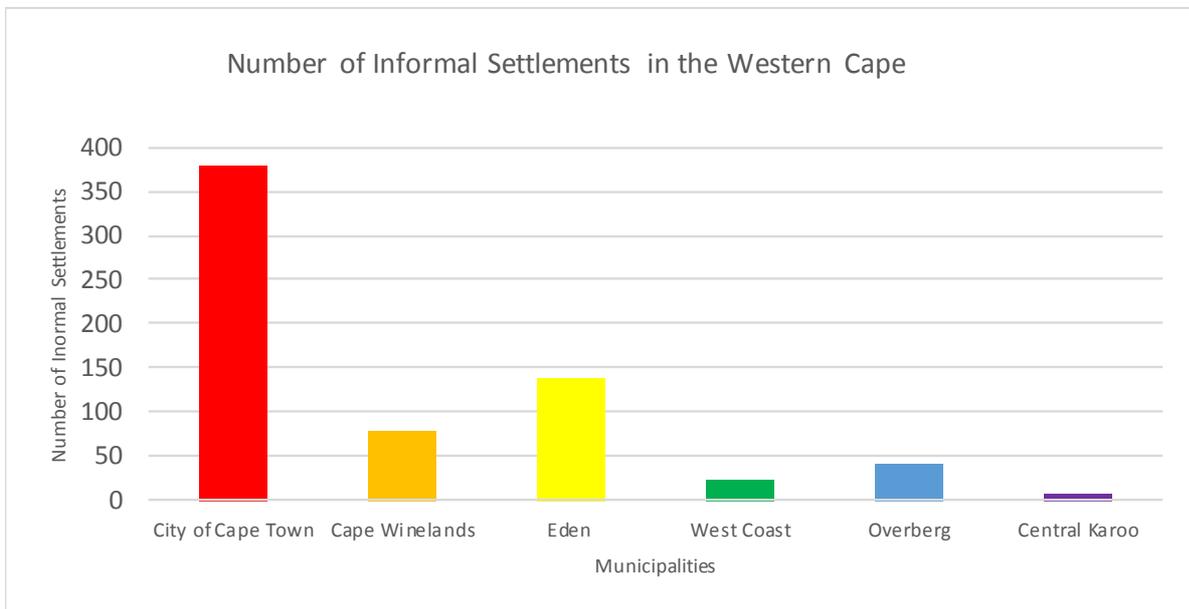


Figure 1-2: Number of informal settlements per municipality

Source: WCG: Human Settlements: Strategic Plan, 2015 – 2020

1.12 Human settlements and urbanisation

Urbanisation is a major global challenge (and opportunity) and the Western Cape is no exception. The influx of people into urban areas alters lifestyles and increases consumerism, putting strain on service delivery backlogs and the availability of living space. The influx of people into urban areas has implications for planning, service provision and resource consumption and is a key demand side pressure in the province.



Urban areas in the Western Cape most affected by change in human settlement growth are located in the City of Cape Town (CCT) (northern suburbs), Vredenburg, Langebaan, Mossel Bay,

George, Knysna and Plettenberg Bay and rural towns such as Malmesbury, Worcester, Wellington, Robertson, Caledon, Oudtshoorn, Bredasdorp, Swellendam, Riversdale and Beaufort West. Areas with the least change include the southern suburbs of CCT and parts of ODM, EDM and CWDM. Saldanha Bay has expanded rapidly due to infrastructural expansion of the deep-water port.

1.13 Land use and access to land

The Western Cape PSDF (2014) aims to change the current prevalence of “greenfields” developments and low density sprawl to more densified “brownfields” developments. Greenfield developments utilise undeveloped land for a new project and can have a detrimental effect on the province's natural resources, e.g. by utilising arable land for urban development. Brownfield developments use previously occupied, derelict or contaminated land, requiring preparative work prior to the new development proceeding. Large mixed-use development, especially in the CCT are increasingly located on brownfields sites.

The PSDF acknowledges that compromises must be made in pursuing the province's spatial goals. It states that *“risks associated with implementing the transformation agenda (e.g. urban compaction requires more ‘brownfields’ development where land is expensive, often difficult to procure, and opposition from ‘not in my back yard’ factions is likely)”*.

A legacy of spatial segregation and displacement of people has resulted in the unequal distribution of the Western Cape's land resources. With this has come the entrenchment of unsustainable land practices, which have contributed significantly to the degradation of land in the province (DEA&DP, 2013). This is particularly true of the urban fringe, agricultural and rural areas, where informal settlements and a lack of security of tenure has created a high dependence on ecosystem services, resulting in unsustainable land use practices largely driven by an ever-growing population that does not have access to basic services or knowledge systems on sustainable land use and management practices. In the Western Cape, the result has been extensive land degradation. One solution to unequal access to land is land restitution and reform; however, the roll out of the process is slow and complex. Between 1994 and 2012, 131 439 people benefited from successful land claim restitution in the Western Cape, on properties covering 4 178 hectares. Since most restitution has occurred in urban areas, the land footprint awarded is small and poor land use management in rural, agricultural areas remains a concern (CRLR, 2015).

1.14 Industry

The Provincial Economic Review and Outlook (PERO) Report (2015), indicates that manufacturing contributes approximately 15% towards GDP in the Western Cape, and is expected to grow by 2.2% per annum (pa) between 2015 and 2020 (WCG, 2015b).

In terms of industrial hubs in the Western Cape, the major clusters are located in or near Cape Town, Stellenbosch, Saldanha Bay and Mossel Bay. Power is mostly supplied from the national grid, i.e. coal-fired power stations, and industry in the Western Cape, therefore, emits high volumes of Greenhouse Gases (GHGs). In addition to GHG emissions, industry contributes to the degradation of the environment through air emissions, water use and discharge of effluent to natural systems.

In combination, the industrial, residential, public service and commerce sectors, consumes some 44% of total energy in the province (DEA&DP, 2017b). This energy use is determined by the characteristics of industrial processes, manufacturing, commercial activities and buildings. Thermal inefficiency and unnecessary reliance on non-renewable energy sources are the prime reasons why buildings have high energy consumption and GHG footprints.

1.15 Energy

One of the key drivers of change in both energy production and energy demand management has been the suite of energy policies and strategies developed and implemented in the last five years. Strategic goals underpinning these policies, include ensuring energy (supply) security, demand management, an efficient and diverse energy mix in a transformed energy sector and implementation of policies to mitigate carbon emissions and adapt to the effects of climate change. Together with sectoral strategies and policies to facilitate and promote more sustainable sources of energy, there has seen a substantial shift in focus from non-renewable energy supply, to a more diverse supply base with increased investment in cleaner energy.

According to the 2016 Community Survey, 97.5% of households in the Western Cape have access to electricity (StatsSA CS, 2016). However, burning of domestic fuel (e.g. wood, paraffin, coal, etc.) for heating and cooking remains common within both rural and urban settlements, especially in informal residential areas. In areas supplied with electricity, some households tend to persist with domestic fuel, partly in response to high energy tariffs or out of personal preference.

Domestic fuel burning gives rise to indoor air pollution, exposing occupants to a number of pollutants that include Particulate Matter (PM), Carbon Monoxide (CO), Nitrogen Dioxide (NO₂), Sulphur Dioxide (SO₂), formaldehyde and polycyclic organic matter. Exposure to these pollutants can cause a number of health issues such as respiratory problems. Unsustainable harvesting of natural resources (e.g. wood) for domestic fuel is also a concern.

1.16 Transportation



Transportation is a primary constituent of urban systems and a key sector in the Western Cape economy, and is a foundation of nearly all economic activity in the province. However, transport is extremely inefficient from a cost, energy, emissions and lifestyle perspective, and transportation networks often have extensive physical footprints.

Transport in urban spaces is shaped by urban spatial structure, which in the Western Cape is characterised by low-density development and urban sprawl, and a historical emphasis on road transport. This leads to intensive use of private transport, long average commute times and high petrol and diesel consumption.

1.17 Mining and oil and gas

Mining in the Western Cape is comparatively insignificant compared to the rest of the country; however notable mineral deposits along the West Coast do exert pressure on resources in the province. Limestone, dolomite, sand, salt and diamond mining and quarrying all occur in the province, at varying levels of intensity (DEA&DP, 2013).



Phosphate mining in the Western Cape

The exploitation of construction materials, typically in close proximity to infrastructure and sometimes in sensitive habitats, is often undertaken in support of economic growth in the province. Sand mining, in particular, is becoming more prevalent with a proliferation of sand mines in the West Coast landscape, including illegal sand mines.

Minerals and metals mined or quarried in each district in the Western Cape are tabulated in Table 1-2.

Table 1-2: Minerals and metals mined in districts of the Western Cape

District Municipality	Minerals and Metals
City of Cape Town	Construction materials
West Coast District Municipality	Rare earths; agricultural lime; dimension stone and sandstone; limestone; heavy minerals; titanium and zirconium; phosphate; construction materials.
Cape Winelands District Municipality	Limestone
Overberg District Municipality	Pharmaceutical grade manganese; limestone; agricultural lime
Eden District Municipality	Construction materials
Central Karoo District Municipality	Gypsum for construction material and agri-use; construction materials and (proposed) uranium and shale gas;

While current mining activities remain largely restricted to the West Coast, future oil and gas exploitation is likely to increase, particularly shale gas exploration in the Central Karoo and offshore oil and gas on the West Coast and South Coast. Challenges to the growth of mining in the province include maintaining sense of place, preserving natural landscapes and safeguarding ecosystem services.

Large-scale uranium mining in Beaufort West has been identified as a potential economic development driver in CKDM and is likely to take place in the future. This is significant as both prospecting and mining of uranium have well-documented potential environmental impacts, if not appropriately managed, including air quality impacts (DEA&DP, 2015).

Mining is intrusive with significant environmental impacts and, while good for economic diversification, the growth of the sector in the province has consequences for habitat/biodiversity loss, land transformation, water pollution and air pollution. Mineral resources are found throughout the province and, as such, more intensive mineral extraction is a realistic possibility in future.

Shale gas exploration commonly makes use of hydraulic fracturing, a high-pressure drilling technique used to release natural gas trapped in shale rock. Shale gas extraction in the Karoo is particularly contentious but likely, as the national Department of Mineral Resources (DMR) has recently given exploration the go ahead, following preliminary research into the likely impacts associated with exploration and production.

1.18 Agriculture and agricultural expansion

The Western Cape is a key contributor to South African agricultural exports (22% by value) (GreenCape, 2016). An estimated 89% of the total arable land in the province is given over to agriculture and cultivation (70% grazing, 16% arable and the rest irrigated). Agriculture contributes over 8% to the total GDP of the province (WCG, 2016).

The agriculture sector in the Western Cape is reported to be growing and, as a resource-intensive sector, the



pressure it places on the environment is noteworthy, largely due to certain unsustainable farming methods. These include use of chemical pesticides (which contaminate water resources and reduce biodiversity), tillage (which is a leading cause of soil degradation) and burning of fossil fuels on farms (which contributes to air pollution and carbon emissions) (GreenCape, 2016). Cultivation agriculture tends to replace natural habitat with single crops (monoculture), which compromises natural ecosystem processes and creates opportunities for pests and diseases to multiply in the absence of natural controls. Agrochemicals are also known to accumulate in foodchains. Agriculture may also involve irrigation, which diverts water from either surface resources or groundwater aquifers (DEA&DP, 2013).

A number of factors has prompted a transition to sustainable agriculture in both South Africa and the Western Cape. In the Western Cape, these factors include water scarcity and climate change, deteriorating soil condition, escalating energy costs and increasing food demand. This, coupled with a new consumer awareness of diminishing nutritional value in food, pesticide residues, ecosystem degradation and pollution have encouraged positive responses in land management in the Western Cape.



Climate change, particularly water scarcity associated with it in the Western Cape, is fast becoming a leading pressure to move to more sustainable farming methods. This movement seeks to encourage the adoption of technologies and practices that have lower water consumption and actively improve the soil health, promote retention of water and improve yields in water stressed conditions (ARC, 2014).

1.19 Governance

Governance refers to the practice of using authoritative structures to determine strategic direction and regulate society. Good governance will involve governmental and non-governmental partners creating an economically and environmentally sustainable social and developmental state. It follows that environmental governance, as a subset, entails the responsible management of environmental assets and resources on behalf of society (DEA&DP, 2013).

Policies, strategies and regulatory controls etc. formulated and implemented by governance structures determine much of how societies operate, and consequently influence the pressures on the natural environment. Importantly, this influence extends to many aspects of governance that are not necessarily directly related to environmental aspects. Social welfare interventions, for example, can influence the degree of self-reliance in communities or households and, consequently, the pressures placed on natural resources. It is therefore important to recognise governance in State of Environment Outlook reporting as a key determinant of environmental change (DEA&DP, 2013).

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