

13. CLIMATE CHANGE

13.1 CLIMATE CHANGE IN THE WESTERN CAPE

The earth's climate systems have demonstrably changed on both global and regional scales since the pre-industrial era. The 1990's was the warmest decade in the instrumental record since 1861. There is new and stronger evidence that most warming observed over the last 50 years is attributable to human activities. Climate change implies that the earth's biophysical and ecological systems are altering. These changes are predicted to manifest as, inter alia, more frequent and severe weather events, increases in temperature in many regions and resulting changes in precipitation patterns.

It is argued by many that the recent increases in extreme events across the globe are as a result of climate change. We can however, with a fair amount of certainty predict that the Western Cape will face some degree of change in the 2030 to 2050 period. (DEA&DP, 2007)

The following paragraphs summarize the most likely impacts based on the application of a range of regionalized (down-scaled) climate change models.

13.2 PREDICTED CHANGES

13.2.1 The Western Cape Climate

The Western Cape has a Mediterranean climate characterised by dry summers and wet winters. This is largely due to the position of the subcontinent relative to the low-pressure systems between 40° and 50° south (Midgley et al 2005). These low-pressure systems bring winter rainfall to the south-western part of the country by means of a procession of cold fronts, when the westerly waves shift northward. Dry conditions are attributed to variations in the westerly wave and high pressure cells' positions annually. Mountain ranges stretching north-south along the west coast and east-west in the south act as orographic barriers. These topographical features create a dry interior and in the coastal region they also augment the rainfall through orographic rain. The regional climate is also influenced by coastal low pressure systems, resulting in hot, dry 'berg' winds, blowing from the interior and causing above normal warm conditions during spring and late winter. Frontal systems sometimes result in cut-off low pressure conditions that may cause extreme rainfall events during spring and autumn. (Preston-Whyte and Tyson 1988; Midgley et al 2005)

13.2.2 Changes in rainfall and precipitation

Moisture availability, a suitable mechanism and environmental conditions to induce cloud formation are prerequisites for precipitation. Increased atmospheric moisture (predicted) suggests increased precipitation, should the other factors be in place. Both historical and projected changes however suggest circulation conducive to subsidence – suppressing convective activity. (The rain-bringing mechanism moves south during winter) (Louw 2007)

- In the far south-west of the province there is a general decrease in precipitation in all seasons, with the highest impact in early and mid-winter. These changes are likely to lead to an associated decrease in water availability.
- In the eastern coastal regions it is anticipated that there will be a moderate increase in early winter, with moderate decreases in late winter rainfall.
- In the interior arid zones to the north-east, there are likely to be small increases in rainfall.
- Projections are in agreement of a general shorter rainfall season.

13.2.3 Changes in temperature

- Climate models have shown that there will be a minimum warming of 1°C by the late 2030s in comparison to the second half of the 20th century. Increases expected for 2050 are ~1.5°C at the coast and 2-3°C inland of the mountains.
- The warming trend increases from the south-west to the north-east.
- Warming is more pronounced in the spring and summer months.

13.2.4 Changing wind velocities

- Mild to moderate increased in wind velocity in summer, autumn, and spring
- Moderate to strong increases in wind velocity in winter

The changes in the above parameters can result in several impacts, both primary and secondary, which are summarized in the table below.

13.3 IMPACTS

The changes in the above parameters can result in several impacts, both primary and secondary, which are summarized in the **Table 13.3.1**.

Table 13.3.1 The impacts of climate change in the Western Cape

Change Climate variable	to	Possible Impacts	Affected sector and resource
Primary impacts			
Higher mean temperature		<ul style="list-style-type: none"> • Increased evaporation and decreased water balance • Increased severity of droughts • Increased prevalence and incidence of pests such as fruit fly • Increased demand for energy for cooling • Increased sea temperatures • Increased levels of ambient ozone 	<ul style="list-style-type: none"> • <i>Natural</i> • Water • Biodiversity • <i>Infrastructure / Economic</i> • Agriculture • Energy • Air quality • Tourism • <i>Health</i> • Health
Higher maximum temperatures, more hot days and heat waves		<ul style="list-style-type: none"> • Increased incidence of death and illness • Increased heat stress in livestock and wildlife • Increased susceptibility to crop burning • Increased wild fire danger • Increased threat to infrastructure (fires) 	<ul style="list-style-type: none"> • <i>Natural</i> • Water • Biodiversity • <i>Infrastructure / Economic</i> • Agriculture • Energy • <i>Health</i>

Change Climate variable	to	Possible Impacts	Affected sector and resource
		<ul style="list-style-type: none"> Increased cooling demand (electricity) and reduced energy supply reliability 	<ul style="list-style-type: none"> Health
Higher minimum temperatures, fewer cold days and frost days		<ul style="list-style-type: none"> Decreased risk of damage to crops Increased risk of damage to crops relying on cooling/chill units such as deciduous fruit Extended range and activity of disease vectors Reduced energy heating demand 	<ul style="list-style-type: none"> <i>Infrastructure /Economic</i> Agriculture Energy <i>Health</i> Health
Decrease in precipitation		<ul style="list-style-type: none"> Decreased runoff/stream-flow Decreased water quality Decreased water resources Decrease in shoulder seasons resulting in increased threat to fruit crops Increased fire danger Impacts on ecosystems Increase of energy consumption for irrigation and crop spraying systems 	<ul style="list-style-type: none"> <i>Natural</i> Water Biodiversity <i>Infrastructure / Economic</i> Agriculture <i>Health</i> Health
Secondary impacts			
Increased severity of drought		<ul style="list-style-type: none"> Decreased crop yields Increased damage to structure foundations caused by ground shrinkage Increased fire danger Reduced economic activity Decreased investment 	<ul style="list-style-type: none"> <i>Infrastructure / Economic</i> Agriculture Energy Tourism <i>Health</i> Health
Decrease in relative humidity		<ul style="list-style-type: none"> Increased wild fire danger Decreased comfort of living at high temperatures 	<ul style="list-style-type: none"> <i>Natural</i> Biodiversity <i>Infrastructure / Economic</i> Agriculture <i>Health</i>

Change Climate variable	to Possible Impacts	Affected sector and resource
		<ul style="list-style-type: none"> • Health
Increased intensity of extreme events (flooding, storms and fires)	<ul style="list-style-type: none"> • Increased risk to health and safety • Increased storm surge potential – coastal and riverine erosion and damage to infrastructure • Increased damage to coastal and riverine ecosystems • Increased soil erosion • Increased pressure on disaster relief efforts 	<ul style="list-style-type: none"> • <i>Natural</i> • Water • Biodiversity • <i>Infrastructure / Economic</i> • Agriculture • Energy • Tourism • <i>Health</i> • Health
Increased mean sea level	<ul style="list-style-type: none"> • Increased Salt water intrusion into aquifers and wetlands • Increased coastal flooding - in combination with storm surges. 	<ul style="list-style-type: none"> • <i>Natural</i> • Water • Biodiversity

It is evident from the above that the impacts of climate changes are complex and interrelated. A myriad of positive and negative feedback loops exist, complicating the quantification of risk to the different sectors.

13.4 A FOCUS ON THE VULNERABILITY OF WATER AND AGRICULTURE

The Western Cape is already experiencing significant water stress. The abstraction of groundwater as an additional resource from the Table Mountain Group Aquifers is currently being investigated and is approximated at 70 million m³/annum. The total resource is becoming increasingly vulnerable to climate variability and change ultimately affecting the quality and quantity of water supply. (Louw 2007) Agriculture (irrigation) is the major water user in the Western Cape (refer to **Figure 13.4.1**) except in the Berg WMA which supplies the metropolitan area of Cape Town. The Berg WMA is already in deficit and is expected to be the area to show the highest future population growth. Increasing demand is constantly putting pressure on resources, specifically the ecological health of the mainstream rivers (Barnes 2003 quoted in Louw 2007).

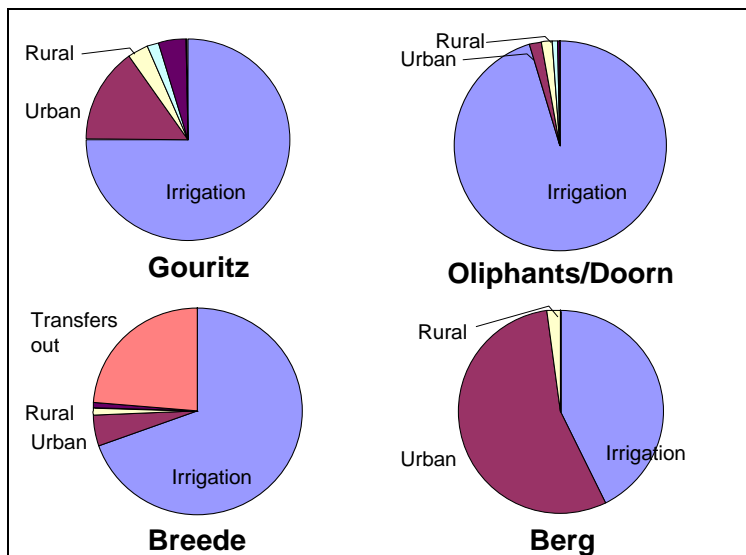


Figure 13.4.1 Water use by sector for the four Water Management Areas in the Western Cape (Midgley et al 2005)

The impact on the export fruit industry specifically, has emerged as a major threat. In an article published in the Cape Times on Wednesday, 23 February 2011, Peter Lukey (Department of Environmental Affairs, Acting Director: Climate Change) comments that “*global climate change could bring about the horror story of the end of the wine industry in the Western Cape*”. Wine is produced using specific cultivars of grapes. The cultivars are specific to climatic regions and geographic locations. Changes in climate will lead to “re-location” of cultivars and development of new cultivars and wines which may impact on existing reputations.

Cartwright (2002) (quoted in Louw 2007), investigated the impact of temperature increase on the production of Braeburn apples in the Western Cape. Compelling evidence was produced that the ability to produce for international markets will become restricted to high-lying areas of the Koue Bokkeveld, Ceres, Grabouw and Villiersdorp (all in the Cape Winelands District) within the next twenty years and limited to certain areas within the Koue Bokkeveld by 2050. This can be ascribed to the need of apple trees for satisfying the chilling requirements for economically viable production.

Although Cartwright’s study only assessed the impact of climate change on Braeburn apples, similar trends can be expected for other varieties. In general, the fruit industry is expected to be impacted upon more by extreme events (predicted to increase with climate change) than by changes in averages (pers. comm Wand 2006, quoted in Louw 2007). Heat waves normally contribute to 10% of all losses during an average year, but is said to rise to 50% should temperatures of higher than 35° Celsius occur during summer. Winters are already becoming too warm, and apple farming activities would have to move to higher altitudes. Due to its location on the southernmost tip of Africa, this is not an option for the Western Cape fruit industry. Water quality and quantity is also of importance to ensure quality fruit (pers. comm. Wand 2006). Fruit trees are sensitive to waterlogging, especially in spring and early summer. Should soil be saturated, extreme rainfall and flooding can have a major impact. The buffer capacity for withstanding drier conditions is said to be two to three years. Farmers in geographical (in terms of suitable climate conditions) marginal areas, such a Grabouw, and specifically those with substandard farming practices are expected to be affected most by an increase in temperature and changes in rainfall.

Eckert et al (1997) used a social accounting matrix to determine the fixed price multipliers of the Western Cape agricultural sector. These are shown per sector in **Table 13.4.1**. This table illustrates

the multiplier effect of demand for agricultural products. For example, R1.00 of additional demand for the horticultural sectors output increases the value added (provincial) by R1.40 requires R0.20 of imports and contributes R0.24 to revenue. The most important aspect in terms of this study is however the additional 92.8 number of person-years employment for the extra R1.0 million final demand.

Table 13.4.1 Fixed price multipliers for commodity and sector groupings (Louw et al 2001)

	Employment^a	Value added^b	Imports^b	Gov. revenue^b
All agriculture	82.8	1.29	0.21	0.26
Cereal	26.1	1.02	0.27	0.27
Other crops	70.8	1.36	0.19	0.25
Horticulture	92.8	1.40	0.20	0.24
Livestock	88.4	1.25	0.20	0.27
Agri-business	39.7	1.02	0.26	0.2
Non-agriculture	29.4	1.1	0.25	0.22

a Number of person-years employment created per R1 million rand final demand

b Rand value per additional R1 million final demand

The opposite is also true. Should the demand for a product decrease, or the industry is impacted upon by climate change, similar losses would be suffered. The salaries paid to the farm workers and those in the related industries are spent in the local towns, supporting many small businesses in the province. The threat of climate change to agriculture therefore also poses a huge risk not only to the related industries, but also those indirectly being supported by earnings in the sector. Eckert et al (1997) quoted in Louw and van Schalkwyk (2001) calculated that a 10 percent water restriction (read: 10% less water available) translates to a R100 to R200 million less expenditure in the rural areas – just in the Upper Berg River. This will certainly spill over to the rest of the economy.

In an attempt to quantify the impact on the economy, Louw (Louw DB quoted in Louw E 2007) and his colleagues firstly estimated the potential impacts of climate change scenarios on water supply in the Berg River Basin considering changes in runoff, evapo-transpiration and surface evaporation. These physical impacts were then translated into monetary terms (losses or gains) for different water users, both urban and agricultural. The model produced many results based on different scenarios, such as the implementation of efficient water markets, agricultural and urban water consumption, et cetera.

The relative and absolute damages attributable to climate change were much greater under the current water allocation regime than under an efficient water market regime. Under the low urban water demand scenario, damages ranged from R3 billion to R6 billion, depending on the climate scenario used. Under a high urban water demand scenario, damages increased to between R13 billion and R27 billion. For the efficient water market scenarios, the figures remained the same for low urban water demand but were reduced to R7 billion to R13 billion for the high demand scenario. In summary it can be said that climate change will have a severe impact on agriculture in the Berg River system (pers. comm. Louw DB 2006, quoted in Louw 2007). Not only will the demand for water from

both urban and agricultural sectors create immense competition in the water market, but the multiplier effect of agricultural losses poses a big threat to the local economy. (Louw 2007).

Agriculture systems do however have an inherent level of adaptive capacity to climate variability and change. This is evidenced through changes in land management practices as well as crop and cultivar choices. However, many aspects of agricultural life in the province are already found to be at (or close to) their thresholds. The agri-business units at highest risk will be:

- Those that are already under stress economically and/or biophysically as a result of land degradation, salination, and loss of biodiversity;
- Those at (or close to) the threshold of their climate tolerance;
- Emerging farmers who may have limited capacity, resources, and skills to adapt to and withstand economic pressures;
- Rural livelihoods that depend on agri-business-based economic activity for jobs;
- Commercial farmers who have made significant long term investments, for example in irrigation systems, processing facilities, and some cultivars; and
- Agri-business activity that is dependent on the export market, which is itself adapting to climate change.

Options and strategies to increase resilience and reduce the vulnerability of agriculture should include integrated land care management, research on pests and microbes that are particularly sensitive to climate change, research on cultivars that are capable of handling temperature increases and drought and more efficient irrigation for water conservation (DEA&DP, 2007).

13.5 THE DOMESTIC SECTOR

The most vulnerable are the poor living in marginalized areas who have a low adaptive capacity. Climate change impacts on sectors such as agriculture and tourism are likely to have an adverse effect on employment. Job losses in the agricultural sectors specifically, imply a likely migration to vulnerable urban areas, most likely informal settlements. These so-called climate-migrants would result in an even larger pressure on infrastructure and resources, such as the provision of sanitation services and access to clean water for domestic use. Another secondary impact would be the adverse effect on health, theoretically linked to poverty (Louw 2007). It should be noted that even some response to mitigate change can potentially further impact negatively on the poor unless carefully designed and implemented. Mitigation is very complex. All sectors and users are inter-linked through complex feedback mechanisms. The point is really that each mitigation measure must be thoroughly tested for its impacts on all sectors. 'Water conservancy for example is a noble idea, but not in a community where water related disease prevails it may not be a high priority. Therefore important to weigh up all the options and have a holistic view when implementing mitigation measures. I.e. Responding to climate change will have to focus on economic empowerment. (DEA&DP, 2007).

13.6 RESPONDING TO CLIMATE CHANGE

13.6.1 National Climate Change Strategy

It is clear that adaptation is a necessity. The cost of adaptation can be reduced by anticipation, analysis and planning. Adaptation, both anticipatory and reactive, varying according to location and sector, can potentially reduce impacts of climate change, enhance beneficial impacts and produce many immediate ancillary benefits. All damages, however, will not be prevented. The potential for adaptation is more limited for developing countries, which are projected to be more adversely affected. Adaptation can be reduced significantly when policies and measures also contribute to other goals of sustainable development. A number of formal strategic frameworks and interventions have been

established at international level. These include the United Nations Framework Convention on Climate Change, the United Nations Convention to Combat Desertification in Countries Experiencing Serious Droughts, the Ramsar Convention and the Montreal Protocol. (Louw 2007)

In South Africa, the National Climate Change Response Green Paper, 2010, published in Government Notice 1083 of 2010, serves as the South African Government’s vision for an effective climate change response and the long-term transition to a climate resilient and low-carbon economy and society. South Africa, taking into account equity and the common but differentiated responsibilities and respective capabilities of all nations as well as the inter-generational commitment of the Environmental Right contained in Section 24 of the country’s constitution, has the climate change response objective of:

- Making a fair contribution to the global effort to achieve the stabilization of greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system; and
- Effectively adapt to and manage unavoidable and potential damaging climate change impacts through interventions that build and sustain South Africa’s social, economic, and environmental resilience and emergency response capacity.

The achievement of South Africa's climate change response objectives is guided by the principles illustrated in **Figure 13.6.1**.

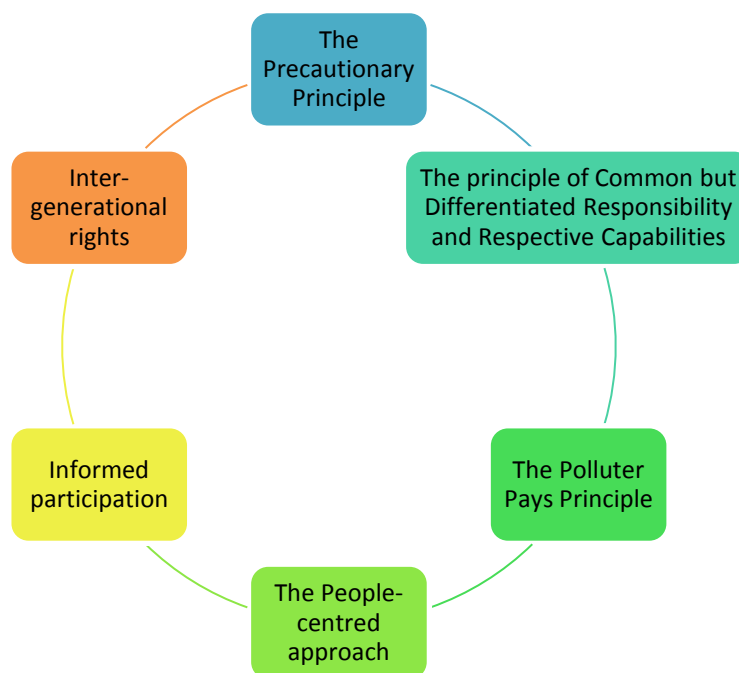


Figure 13.6.1 Principles for the achievement of South Africa’s climate change response objectives. (Source: DEA, 2010)

The achievement of South Africa’s climate change response objective will be brought about through the implementation of various approaches and actions for key climate change impacted and/or affected sectors. These are presented in **Table 13.6.1** and which have been ranked accordingly.

Table 13.6.1 Table of sectors ranked according to need for action. (Source: DEA, 2010)

First sectors: These are the sectors that in the short- to medium-term are broadly regarded as the key sectors requiring implementation of climate change adaptation responses	Water
	Agriculture
	Human health
Second sectors: These sectors are responsible for over 80% of South Africa's greenhouse gas emissions.	Energy
	Industry: <ul style="list-style-type: none"> • Commerce and manufacturing • Mining and mineral resources • Tourism
	Transport
Remaining sectors:	Disaster risk management*
	<ul style="list-style-type: none"> • Natural resources: <ul style="list-style-type: none"> • Terrestrial biodiversity • Marine biodiversity • Commercial forestry • Fisheries
	<ul style="list-style-type: none"> • Human society, livelihoods and services: <ul style="list-style-type: none"> • Urban areas • Rural areas • Coastal areas • Waste

*Although listed as an affected sector, disaster risk management should play a coordinating role in addressing climate change within the Disaster Risk context, as mandated by the Disaster Management Act (Act 57 Of 2002)

13.6.2 Western Cape Strategy Plan

The focus of the Western Cape's climate response strategy is firstly adaptation in order for development to be supported. Adaptation implies behavioral changes in response to the changed conditions, for example:

- Implementation of alternative farming practices (e.g. growing crops appropriate to the change in rainfall patterns and temperature)
- Appropriate measures in development planning (for example, building restrictions in the 1:50 year floodplain)
- Changing demand side¹ practices

¹ Demand-side management is the practice of controlling the use of resources (such as water) and utilities (such as electricity) by controlling the demand for these resources. This implies behavior changes by the consumer rather than the supplier.

Mitigation strategies imply radical changes in the use of technology and employing practices that actively reduce carbon emissions, such as:

- Innovative industrial processes;
- The use of cleaner fuels;
- The implementation of energy efficiency measures; and
- The enforcement of fuel-efficiency in vehicles.

Due to the long lead in time for these mitigation strategies to begin making a difference, a certain level of climate change is inevitable. We will therefore need to adapt and change our behavioural patterns in order to maintain economic stability and enjoy a measure of continued growth. The Western Cape Response Strategy and Action Plan is built on the prioritized programmes listed in **Table 13.6.2**.

Table 13.6.2 Prioritized programmes. (Source: DEA&DP, 2008, Provincial Government of the Western Cape, 2007)

An integrated water supply and infrastructure management programme that integrates climate impacts and risks – researching the cost benefit of irrigation, increasing water efficiency including through pricing strategies, establishing uninterrupted water conservancy targets, systems maintenance and repairs and establishing the ecological reserve.

An analysis of the financial and economic cost that an increase in the incidence of fires, floods, and drought will have on basic service delivery and particularly the cost of reinforced bulk infrastructure.

Planning and other developmental approval processes will need to be updated to reflect the climate change imperatives that might require amendments to rezoning processes and building control standards. Incentives and penalties need to be developed simultaneously with the legislative process to encourage and facilitate the introduction and formalization of mitigation and adaptation methodologies and technologies.

Establishing clear links between land stewardship, livelihoods and the economy – effective land use and land care; protection, maintenance and enhancement of natural resources; strengthening vulnerable communities and protecting livelihoods through targeted research; maintaining diversity in the economy; integrating climate risks into development planning.

Establishing a focused climate change research and weather information programme.

Reducing the province's carbon footprint – energy efficiency, development of renewable and alternate sustainable energy resources, effective waste management strategies and cleaner fuel programmes for households and transport.

13.6.3 Roles and Responsibilities

Climate adaptation and much of the mitigation efforts will take place at provincial and municipal levels, as such climate adaptation will need to be integrated into provincial development and spatial plans and IDPs at municipal level. In order to ensure that climate change considerations and the climate change response strategy outline in the National Climate Change Response Green Paper (2010) are fully mainstreamed into the work of government, all three spheres of government, all government departments, and all state owned enterprises must:

- By 2012, conduct a review of all policies, strategies, legislation, regulations, and plans falling within its jurisdiction or sphere of influence to ensure full alignment with the National Climate Change Response Policy.

- By 2014, ensure that all policies, strategies, legislation, regulations, and plans falling within its jurisdiction or sphere of influence are fully aligned with the National Climate Change Response Policy.

The following institutional arrangements are considered necessary for the implementation of the National Climate Change Response Policy:

- Executive national coordinator.
- A capacity for Research, Development, and Innovation coordination that should be aligned to the institutional arrangements of the national science and technology system championed by the Department of Science and Technology.
- A capacity for coordinating adaptation and mitigation actions.
- A system and capacity for measuring, reporting, and verifying climate change responses.
- A capacity for facilitating and promoting the use of carbon trading and off-set schemes.
- A means of monitoring and evaluating Government policies, strategies, and legislation to ensure alignment.

In ensuring proper coordination on climate change issues, **Figure 13.6.2** illustrates the cooperative structures and mechanisms that will be utilized.

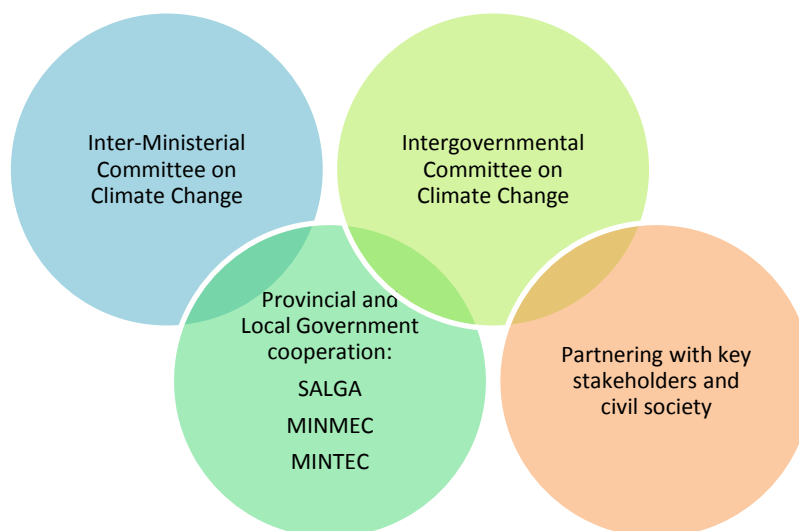


Figure 13.6.2 Cooperatives structure and mechanisms required for coordination on climate change issues. (Source: DEA, 2010)

In line with government's local and international undertakings and South Africa's change response objective, South Africa's climate change mitigation interventions are informed by, and will be monitored and measured against the following peak, plateau and decline emission trajectory, where:

- South Africa's greenhouse gas emissions peak in 2020 to 2025 at 34% and 42% respectively below a business as usual baseline.
- South Africa's greenhouse gas emissions plateau from peak in 2020 to 2035 and begin declining in absolute terms from plateau levels from 2036 onwards.

13.7 PROBLEM AREA SYNTHESIS

The problems that are likely to be created by climate change are summarised below.

13.7.1 Impact on Water Resources

- The expected decrease in rainfall, particularly in the south-western part of the province, will result in reduced runoff into rivers and reduced recharge of aquifers. This will lead to a reduction in the yield of surface water and groundwater supply systems and general water shortages. Increased temperatures and evaporation rates will contribute to this yield reduction in surface water schemes.
- The lower rainfall levels, increased temperatures and evaporation rates will lead to an increase in the water requirement for irrigation as well as urban garden watering, which will exacerbate the water shortages. This increase in irrigation will also result in an increase in energy consumption.
- The frequency and severity of droughts will increase. Consequently, water resources will have to be managed more carefully, and it is likely that water restrictions will be applied more frequently.
- Increased salt water intrusion into estuaries and coastal aquifers, and raised groundwater tables near the coast.
- Long term monitoring of the onset of climate change needs to be combined with long term water resource planning to take into account the potential reduction in yield that may occur due to climate change. Planning horizons of 10 years and more are necessary to enable the relevant authorities to respond timeously to ensure adequate water availability. Such long term monitoring needs to be integrated with the day to day management of the water resource so that it happens as a matter of routine.

13.7.2 Vulnerability of Agriculture

- A number of potential impacts of climate change apply to agriculture, namely decreased rainfall, increased temperatures, increased evaporation rates and loss of the required low temperatures for certain crops. This results in reduced soil and water quality, increased risk of extreme events (drought, flood, hail, frost), and increases in weeds, pests and disease. The overall effect of these factors is the reduction in animal and crop yield and quality. The reduction in output from agriculture has serious negative impacts on the economy, particularly in the rural areas which rely heavily on agriculture.
- The agricultural sector, particularly the wine and deciduous fruit industries are particularly at risk due to climate change. Therefore early and on-going adaptation to the changing climatic conditions is required, which reinforces the need for monitoring the onset of climate change mentioned in the previous section.

13.7.3 Health Impacts

Human health is likely to be negatively affected directly and indirectly by increasing temperatures, the frequency of heat waves, and changing rainfall patterns. Higher temperatures will increase the quantities and spreading of disease.

13.7.4 Other Impact

- Increasing temperature and heat waves will increase the demands for energy in summer for cooling.
- Extreme weather events, such as flooding and bushfires, may result in an increase in damage to infrastructure.

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