



**Western Cape
Government**

Environmental Affairs &
Development Planning



WESTERN CAPE CLIMATE CHANGE RESPONSE STRATEGY 2ND BIENNIAL MONITORING & EVALUATION REPORT 2017/18

Progress in preparing for climate change

March 2018

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ABOUT THIS REPORT

This is the second report highlighting the implementation efforts relating to the focus areas outlined within the Western Cape Climate Change Response Strategy 2014 (WCCCRS). The document aims to:

- i) coordinate and bring sources of existing information and inputs from stakeholders together to achieve this purpose;
- ii) identify gaps and emerging areas of development, planning and implementation;
- iii) raise awareness of the urgency of responding to climate change in the Western Cape and our collective response in this critical societal and economic challenge, as well as eliciting further opportunities for partnerships and upscaling;
- iv) plot trends where these are available and survey-able, and identify emerging risks, gaps and opportunities; and
- v) provide an opportunity to influence strategic cross-sectoral economic and development planning in both the public and private sector of the Western Cape.

The document is not intended to be a report that tracks climate change hazards and risks (i.e. trends in temperature, rainfall etc.). Many of the impacts of climate change on sectors are discussed in the WCCCRS, and any information and updates on impacts, and trends will be provided in the next update of the Strategy planned for 2019/20 and/or in specific in-depth sector climate change strategies such as the 'Smart Agriculture for Climate Resilience – SmartAgri' Response Framework (2016). This report is also not intended to be a source of primary/newly collected data, unless they are ones that are already being tracked. At this stage we may not be able to track whether each of our efforts is the exact 'right response' to each climate related challenge, as many of these evaluations will not be possible with the current data availability, human resource base, knowledge and uncertainty with regards to some climate stimuli. The report will include information on these where they are obtainable and forthcoming from partners, and where rational conclusions and discussions can be derived.

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THE FUTURE OF THIS REPORT

This is the second iteration of a multi-sectoral climate change response stocktake for the Western Cape. It is anticipated that it will highlight recommendations and opportunities for strengthening our climate change response thereby creating that low carbon and resilient province.

This report, along with additional national commitments to international climate change agreement decisions reached post-United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP) 21 Paris Agreement Global Stocktake, will assist in providing further clarity and a way forward on more informed targets both on reducing our emissions and on increasing our resilience.

Future iterations of this report will likely include an agreed set of proportional targets (based on national and international commitments) for both mitigation and adaptation. If, however, this is not adequate, a set of ambitious provincial targets under the PSG4 Climate Change Response Work Group will be adopted (linked to the Subnational Global Climate Leadership MOU 'Under2 MOU', of which Western Cape Government is a signatory).

As the WCCCRS 2014 is a strategy that covers activities of all stakeholders of the Western Cape, its scope is broad and thus reporting on its implementation equally as broad. Contact the coordinating team if you:

- i) wish to contribute to the report in future iterations,
- ii) have identified an indicator or data set that your organisation owns;
- iii) have identified an area / topic that should be covered in the next iteration of the Climate Change Response Strategy; or
- iv) would like to showcase innovative climate response projects and initiatives.

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1

INTRODUCTION

The science on climate change is unequivocal – it is happening, it is anthropogenic in origin and it is happening in a ‘worst case scenario’ as global and local responses are proving to be inadequate. Indeed, since the first of these M&E reports was published in 2016, the Western Cape has experienced a considerable onset of several climate-related disasters, the drought being the most far reaching and economically and socially devastating. Although the outlook is one that is potentially dismal, climate change also presents us with the most unprecedented opportunity of our time to leapfrog our development practices to be more just, equitable, innovative and sustainable – and to develop a ‘New Climate Economy’. As climate related disasters are experienced in the Western Cape, the time is now to translate reactive, short term, largely expensive disaster responses, into proactive long term planning that will prove to be cost-effective in the long term.

Broadly, the scientific consensus is that sub-Saharan Africa, given its geographic location straddling the equator, will experience the greatest negative effects of global warming of any region. For South Africa, under the current emissions trajectory, this is projected to be an average increase above the 20th century average of 1.5°C around the coast, to 3°C in the interior, by 2050, with a doubling of these figures to 3°C and 6°C by the end of the century. As a result, coastal regions like the Western Cape are likely to see significant in-migration from the interior of the country (as well as from further north on the continent).

Globally, 2015 was the hottest year recorded since modern records began, with 14 of the hottest 15 years recorded all occurring in this century. The global average temperature increase has already reached 1°C as of December 2015¹ and 2017 was the hottest year without an El Niño influence by a large margin, and was hotter than 2015 which was a year influenced by El Niño². Furthermore, globally, 90% of all disasters are now climate-related³, and since the first UNFCCC COP in 1995 over 600,000 lives have been lost and 4.1 billion people injured, left homeless or in need of emergency assistance as a result of weather-related

¹ https://www.theguardian.com/science/2016/mar/14/february-breaks-global-temperature-records-by-shocking-amount?CMP=share_btn_tw

² <https://www.theguardian.com/environment/climate-consensus-97-per-cent/2018/jan/02/2017-was-the-hottest-year-on-record-without-an-el-niño-thanks-to-global-warming>

³ http://www.un.org/apps/news/story.asp?NewsID=53418#.VuK5_P197IX

disasters⁴. The 2014-2018 drought in the Western Cape has been described as once-in-a-millennium drought, Tuesday March 3rd 2015 was the highest temperature recorded in the last 100 years in Cape Town at 42°C, and this coincided with severe fires. The fire season for 2015/16 has broken previous records⁵.

In recognition of the urgent need to rapidly reduce greenhouse gas (GHG) emissions and adapt to climate changes already being experienced, the Western Cape Government (WCG) recognises the necessity to contribute to global efforts to reduce its GHG emissions, particularly with a longer-term view to reducing climate change impacts to 1.5°C globally as agreed at the UNFCCC COP21 in the Paris Agreement in December 2015. On an international level, in November 2017 the WCG committed to responding to climate change as a regional government by joining 'The Climate Group – States and Regions Alliance', an international non-profit network of like-minded regional governments determined to contribute to the international response to climate change in order to keep the global average temperature increase below 2°C. As part of this, in April 2017 the WCG signed the Subnational Global Climate Leadership MOU 'Under2MOU', a commitment to contribute to reducing global GHG emissions to net-zero by 2050.

Equally significant, the WCG also recognises the need to adapt to the impacts of the unavoidable climate changes already occurring and those in the longer term, particular as it is the most disaster prone province in South Africa⁶. Historical methods of dealing with climate hazards will not be sufficient to cope with the frequency and magnitude of anticipated climate change impacts.

Climate change will reconfigure economic competitiveness regionally and globally, but can also provide the catalyst for investment into climate adaptation that increase economic competitiveness of the Western Cape. 'Assessment of Economic Risks and Opportunities of Climate Change Resilience in the Western Cape' undertaken by the Western Cape Government's DEA&DP Climate Change Directorate in 2017-18 provides the following (amongst others) astounding findings from modelling and analyses: i) By investing in improved climate resilience, the **Western Cape Economy could be 33% better-off in 2040 than if the province does not adapt to the impacts of climate change** (Failure to invest could result in contraction of economy by 17%; whilst effective investment in climate resilience could boost provincial GDP by 15% above the no-adaptation baseline); ii) Employment levels could increase by as much as 12.% by 2040, if the province leads in adapting to climate change; iii) regional exports from the Western Cape could increase by 6.4% by 2040 with enhanced climate resilience; and iv) A more climate resilient province will result in a lower cost of living and better quality of life for the Western Cape's people (through impacts on CPI – Consumer Price Index).

Planning, preparedness, and innovation are therefore required to maximise the province's adaptive capacity to this global and local threat. Taking action now will limit damages, possible loss of life, and economic costs over the coming decades and, if strategically and urgently considered, will add to the Western Cape's global competitive edge into the future. The 'Assessment of Economic Risks and Opportunities of Climate Change Resilience in the Western Cape' as mentioned above makes the case that trade-offs in terms of provincial short term priorities may have to be made, however, and it is imperative that these are explicit rather than realising unintended consequences as a result of disastrous events. We have an imminent window of opportunity that presents us with exciting and innovative growth paths for the Western Cape.

The Stern Review completed in 2006 estimated that the percentage of global governments' Gross Domestic Product (GDP) being consumed by recovering from climate related disasters could increase to between 5% and 20% by 2100, although these figures may be even greater in the current context.

⁴ CRED. 2015. The Human Cost of Weather Related Disasters (1995 -2015).

⁵ Tony Marshall, CapeNature, Pers. Communication.

⁶ RADAR Western Cape. 2010. Risk and Development Annual Review.

As stated in the 2015/16 M&E report: “against the backdrop of the socio-economic challenges facing the country and the province, such increased disaster recovery costs pose a significant risk to the achievement of the Western Cape’s growth and development goals (including those related to job creation)” – this statement is ever more true and current given the state of climate related disasters in the province and the economic costs of responding.

Short, medium and long term adaptation interventions specifically, and thoughtfully, designed to ensure that the Western Cape does not compromise its growth and development strategy are, therefore, critical to ensuring reduced vulnerability to the impacts of climate variability and climate change across the province.



2

GLOBAL CONTEXT

Since the development of the WCCCRS, the global context on climate change has reached several catalytic turning points. Of pivotal importance, nations reached a global agreement at the United Nations Framework Convention on Climate Change (UNFCCC) – 21st Conference of the Parties (COP21), ‘the Paris Agreement’, on 12 December 2015. The key commitment by all nations is holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. This will require all nations to provide targets towards contributing to these emissions reductions. Governments agreed on the need for global emissions to peak as soon as possible, recognizing that this will take longer for developing countries; and to undertake rapid reductions thereafter in accordance with the best available science. The global community has also established a global goal on adaptation - on enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response across all sectors in the context of the temperature goal. There is thus important work which will need to be undertaken nationally, provincially and locally to ensure that our targets are appropriate to ensure proportionate contributions and adaptation responses. The South African Nationally Determined Contribution (NDC) spells out how this progress will be achieved in South Africa (see section below). Despite the USA’s stated intent to withdraw from the Paris Agreement by 2020 a separate coalition of American cities, states and businesses, called the United States Climate Alliance and representing more than 50% of the US economy, committed to continue working to achieve the Paris Agreement. The overall international response to the USA’s withdrawal has been a reaffirmation of commitment to the Paris Agreement and overall UNFCCC goals.

Significant progress has also been made in shaping a post-2015 development agenda, and the Sustainable Development Goals (SDGs, which includes 17 goals) were agreed upon in 2015 to replace the Millennium Development Goals. Among the SDGs, the responsibility for the climate goal is handed over to the UNFCCC. This is the only body subject to binding targets for the SDGs. The SDGs themselves are not binding; it is up to the individual governments to decide how to implement them. The main goal of the climate objectives

(to keep the rise in global average temperature below 2°C at the very least, and preferably below 1.5°C) and the main goals of the SDGs (including poverty eradication by 2030) should, however, be central to all development measures and cannot be compromised. In addition to the SDGs, advancement was made in 2015 that speaks directly to the economic and social impacts of climate change. The United Nations International Strategy for Disaster Reduction (UNISDR) facilitated the process of developing the Sendai Framework for disaster risk reduction (replaces the Hyogo Framework) which has strong cross linkages with climate change adaptation and resilience. The strong link to disaster risk is pivotal as is identified by the World Economic Forum in their latest annual report⁷ on the top global risks – **Failure of climate change mitigation and adaptation** is included in the top 5 global risks, both in terms of likelihood as well as impact. In addition, the top 10 risks for both categories include **extreme weather events; natural disasters; large-scale involuntary migration; water crises; food crises; biodiversity loss and ecosystem collapse; and spread of infectious diseases** – all risks associated with climate change. Since 2011, every annual global risk report has listed climate change within the top 5 global risks.

⁷ World Economic Forum (2018). The Global Risks Report 2018, 13th Edition. Downloaded from: http://www3.weforum.org/docs/WEF_GRR18_Report.pdf.



3

SOUTH AFRICAN CONTEXT

The National Climate Change Response White Paper (NCCRWP 2011) presents the South African Government's vision for an effective climate change response and a long-term, just transition to a climate-resilient and lower-carbon economy and society. South Africa's response to climate change has two objectives:

1. Effectively manage inevitable climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity; and
2. Make a fair contribution to the global efforts to stabilise GHG concentrations in the atmosphere at a level that avoids dangerous anthropogenic interferences with the climate system within a timeframe that enables economic, social and environmental development to proceed in a sustainable manner.

The National Climate Change Response Policy highlighted eight near-term Priority Flagship Programmes that are being undertaken; these have since been expanded to ten Flagship programmes⁸:

1. The Climate Change Response Public Works Flagship Programmes;
2. The Water Conservation and Water Demand Management Flagship Programme;
3. The Energy Efficiency and Energy Demand Management Flagship Programme;
4. Low Carbon, Climate Resilient Transport Systems Flagship Programme;
5. The Renewable Energy Flagship Programme;
6. The Waste Management Flagship Programme;
7. The Carbon Capture and Storage Flagship Programme; and

⁸ DEA (2016). South Africa's 2nd Annual Climate Change Report. Downloaded from: https://www.environment.gov.za/sites/default/files/reports/southafrica_secondnational_climatechange_report2017.pdf

8. The Adaptation Research Flagship Programme.
9. The Agriculture, Food Systems and Food Security Flagship Programme
10. The Low Carbon, Climate Resilient Built Environment, Communities and Settlements Flagship Programme

Further at the national level, South Africa has developed a 'flagship research project', on Long-term Adaptation Scenarios (LTAS, DEA 2014). The Long Term Adaptation Scenarios (LTAS) are designed to provide a consistent framework for adaptation planning for the country, as well as identify as early as possible where significant trade-offs may need to be made in terms of both national and sub-national development targets, for example, over competing water use. The LTAS brief on Water states unequivocally that 'Climate change impacts on South Africa are likely to be felt primarily via effects on water resources; significant trade-offs are likely to occur between developmental aspirations...with significant social, economic and ecological consequences through restricting the range of viable national development pathways'. The LTAS series of reports produced since the development of the WCCCRS are a critical resource for guiding downscaled action at the provincial level and useful resource for all sectors to utilise.

Currently the DEA is in the process of developing a National Adaptation Strategy (NAS) to guide South Africa's implementation of climate change adaptation actions. It will identify strategic interventions and implementation priorities for various sectors, put in place adaptation planning guidelines for the country, and introduce a national vulnerability assessment framework. At the time of writing the strategy has gone through two rounds of public consultation and is expected to be finalised in 2018.

As part of the national Climate Change Mitigation System, the DEA has developed Sector Emissions Targets [SETs, previously known as Desired Emission Reduction Outcomes (DEROs)] as one of the key elements for the implementation of South Africa's long-term climate mitigation goal. SETs are intended to serve as a strategic point of departure for the implementation of policies and measures intended to meet South Africa's long-term climate mitigation goals – a roadmap to a low-carbon future, and are not intended to play a regulatory role in themselves. The Carbon Tax Bill (draft 2018 to be implemented in 2019) as well as the declaration of Greenhouse gas emissions as priority pollutants under the National Environmental Management: Air Quality Management Act (Act 39 of 2004), will also strongly support the mitigation agenda in South Africa by putting requirements in place on industry and other sectors to reduce their emissions and report on these reductions.

The national Department of Environmental Affairs (DEA), as custodians for international climate change reporting obligations, is responsible for the design and publication of the National Climate Change Response Monitoring and Evaluation System Framework, which was completed in 2015⁹. As part of this the DEA published the National Greenhouse Gas Emission Reporting Regulations in 2017, which function as a single national reporting system for greenhouse gas emissions. This feeds into the National Greenhouse Gas Inventory, South Africa's national communications to the UNFCCC and informs the implementation of legislation and policy. The DEA is in the process of compiling and submitting South Africa's Third National Communication to the UNFCCC, which communicates the country's actions to implement our commitments under the convention. Part of the intention of this reporting exercise within WCG is to contribute to the national M&E, and assess the degree to which this is feasible in various themes. The DEA published South Africa's 2nd Annual Climate Change Report in 2016.

National government is in the process of developing a Climate Change Bill, which is intended to become the primary legal instrument regulating and supporting climate change response in South Africa. The Bill is due to be gazetted for public comment in 2018.

⁹ DEA (2017). South Africa's 2nd Annual Climate Change Report. Pretoria: Department of Environmental Affairs.



4

WESTERN CAPE CONTEXT

The Western Cape Climate Change Response Strategy¹⁰ (WCCCRS) was approved by the Western Cape Cabinet in 2014. The Strategy is developed as a coordinated climate change response; it aims to guide the implementation of innovative projects and the search for opportunities that combine a low carbon development trajectory with increased climate resilience, enhancement of ecosystems and the services they provide, and economic stability and growth. The WCCCRS, which is aligned to the NCCRWP (2014), also acknowledges the important role that sub-national governments play in responding to climate change, since adaptation and mitigation actions necessary to tackle climate change are, or will be, implemented at this level of governance. Subnational governments are also addressing the issues of climate change and the economic difficulties many of them are facing, by turning these challenges into an opportunity. The WCCCRS document highlights nine focus areas:

- Energy efficiency;
- Renewable energy;
- Built environment – critical infrastructure, disaster management, integrated waste management, human settlements;
- Sustainable transport;
- Water security and efficiency;
- Biodiversity and ecosystem goods and services;
- Coastal and estuary management;
- Food security; and
- Healthy communities.

¹⁰ https://www.westerncape.gov.za/text/2015/march/western_cape_climate_change_response_strategy_2014.pdf

Building on the WCCCRS, in August 2014, the Western Cape Climate Change Response Implementation Framework was released. This discussed each focus area in greater detail in order to identify impact potential / benefit for the priority programmes and to discuss the opportunities for and barriers to the implementation of the priority programmes identified in the strategy document. The impact potential / benefits were then used to finalise a basket set of indicators that could be used in the development of this M&E report. The WCCCRS will be updated in the 2018/19 financial year for finalisation in 2019/20.

On an international level, in November 2017 the WCG committed to fighting climate change as a regional government by joining the Climate Group – States and Regions Alliance, an international non-profit network of like-minded regional governments determined to contribute to the international response to climate change in order to keep the global average temperature increase below 2°C. As part of this, in April 2017 the WCG signed the Subnational Global Climate Leadership MOU 'Under2MOU', a commitment to contribute to reducing global GHG emissions to net-zero by 2050.

In February 2017 the Western Cape Cabinet Bosberaad reached a resolution that identified climate change and water availability as enterprise level risks that need to be addressed by all Departments in the WCG. In response to this all Departments have been tasked to include climate change response in their annual performance plans (APPs), starting in 2018 and becoming more integrated over the next two years until all APPs clearly outline the Departmental response to climate change risks.



5

REPORT OBJECTIVES & PRINCIPLES

The overarching objectives of this report, which will be published every two years, over time will be to track the transition to a low carbon and climate resilient Western Cape through the implementation of the WCCCRS.

This will include:

- Providing a clear picture of the various response measures included in climate change mitigation and adaptation programmes;
- Providing an assessment of the effectiveness of these response measures, where feasible;
- Moving towards a consistent approach to these assessments to allow for greater comparability, where feasible;
- Increasing co-ordination of climate change response measures and M&E;
- Demonstrating the impact of response measures over time;
- Increasing transparency on finance flows relating to climate responses; and
- Increasing awareness of observed and projected climate impacts.

As climate change impacts all sectors, this is a highly ambitious, complex and yet critically important piece of work for all economic sectors, public and private sector implementers, and communities alike. It is complex, not least because of the uncertainty of the exact climate change impacts we will experience, but due to the plethora of activities required to respond by a multitude of different actors. Many organisations and stakeholders are grappling globally with the scope and extent of climate change responses required and the way in which to track and monitor them.

The WCCCRS was developed in a manner that would focus in on specific programmes of work, and thus whilst covering most of the key sectors of the economy and governmental functions at provincial

and local level, the degree of focus of each is not extensive, but rather specific and focused on priority programmes. These focus areas have been selected based on the urgency of action required. In many cases, work in these focus areas is already being implemented by WCG departments, local authorities, the business sector, non-governmental organisations (NGOs) and other key stakeholder groups. The focus areas will include both the scaling up of existing climate change initiatives and the development of required new initiatives. There is thus opportunity to additionally shift the scope and to adaptively manage our climate change response as new and emerging priorities surface and our knowledge base improves. The focus areas will be reviewed every five years to assess the relevance of those selected for the last period and to address priorities for that period. If necessary, the focus areas may be adjusted to a sectoral approach in order to mainstream climate change into all programmes.

The authors have thus taken a pragmatic approach to initiating this reporting platform with this second iteration biennial report. It thus takes the WCCCRS 2014 as impetus, along with the first biennial report, in responding to and reporting on progress being made in the identified focus areas. Some additional information is also provided that may sit outside of these focus areas, along with some data and discussion of underlying vulnerability. Each section has some follow up recommendations for future analysis, action and focus. It thus aims to build a robust platform upon which we can all collectively build our knowledge base.



6

CROSS CUTTING CLIMATE CHANGE RESPONSES

INSTITUTIONAL ARRANGEMENTS & GOVERNANCE

The current Provincial Strategic Plan 2014-2019 sets out the Western Cape Government's vision and strategic priorities, and together with the five Strategic Goals, will contribute to continuous improvement in the lives of its citizens. These are:

1. **Strategic Goal One:** Creating Opportunities for Growth and Jobs;
2. **Strategic Goal Two:** Improving Education Outcomes and Opportunities for Youth Development;
3. **Strategic Goal Three:** Increasing Wellness, Safety and Tackling Social Ills;
4. **Strategic Goal Four:** Enabling a Resilient, Sustainable, Quality and Inclusive Living Environment; and
5. **Strategic Goal Five:** Embedding Good Governance and Integrated Service Delivery through Partnerships and Spatial Alignment.

The Strategic Plan will be reviewed for the 2020 – 2024 period and the Strategic goals and programmes will be updated to address the current challenges being experienced in the province.

In 2017 the Provincial Cabinet escalated both climate change and water security as enterprise level risks for Western Cape Government. These risks will require all departments to include climate change (and water security) responses in their Annual Performance Plans; responses will address how climate change will impact on sector department's operations, and what actions are being implemented to achieve improved resilience and decrease carbon emissions. Many actions have been driven by the drought currently being experienced in the Western Cape, but other challenges linked to climate change also need to be addressed.

The PSG4 Climate Change Response Work Group and Climate Change Response Forum continue to meet on a quarterly basis to discuss transversal climate change concerns impacting on the Western Cape Government and the Western Cape as a whole.

The Climate Change Response Work Group and Forum focus on 3 programmes:

- Western Cape Climate Change Response Implementation - the programme will track implementation of the WCCCRS focus areas and associated priority programmes;
- Climate Change Partnerships, Opportunities and Co-operation - partnerships with key stakeholders are paramount to maximise effective implementation of climate change response programmes; and
- Ecological Infrastructure for Resilience Programme - this programme will address areas of ecosystem resilience as it pertains to climate change.

POLICY ALIGNMENT

Responding to climate change is a transversal priority for the Western Cape Government and requires responses and accountability within all departments. Furthermore, it requires the implementation of key overarching strategic directions for economic growth, investment, and social upliftment, which are informed by climate impacts and threats. One of the critical aspects of the Western Cape Climate Change Response Strategy is that the implementation is the responsibility across the whole of provincial government and all associated stakeholders. It must thus be carried out, at the most strategic level, by mainstreaming the key priorities directly into sectors policies and plans, and overarching strategies that will require critical analysis of policy trade-offs. The expected benefits of mainstreaming climate change adaptation and mitigation into development activities include avoided policy conflicts; reduced risks and vulnerability; greater efficiency compared to managing climate change separately, and; the potential of leveraging much larger financial flows in sectors affected by climate risks than the amounts available for financing climate change separately. Lastly it will allow for a defensible response on the part of provincial government to stakeholders and citizens that the best contemporary science has been utilised systematically in our decision- and policy-making, reducing the future potential for negative legal and accountability responses.

Over the last few years, a number of key WCG strategies and policies have been developed that have or need to incorporate climate change considerations. A policy alignment exercise was undertaken to assess the level of climate change integration into WCG policy. This policy alignment exercise served as a high level analysis in terms of policies' alignment / misalignment with the key components of the WCCCRS. It also provided the WCG with initial guidance/recommendations on next steps required to undertake further complex modelling and scenario and systems analysis of different policy decisions under a changing climate.

Policies reviewed in the first phase of the exercise include the Provincial Spatial Development Framework (2014), Green Economy Strategy Framework (2013), Western Cape Infrastructure Framework (2013), Provincial Land Transport Framework (which was being revised at the time), the Western Cape Sustainable Water Management Plan (2012), and HealthCare 2030 Plan (2014). The final set of policies included the Integrated Waste Management Plan (2010)¹¹, the Provincial Strategic Plan (2014) and the Disaster Management Framework (2010).

¹¹ This review fed into the updated Integrated Waste Management Plan (2017)

MUNICIPAL SUPPORT

Municipalities play a vital role in addressing the country's social, economic and environmental needs. Local government is tasked with the provision of services in a sustainable and equitable manner which includes climate change resilience, resource efficiency, the facilitation of social and economic development and the promotion of a safe and healthy environment for all. Climate change and climate variability already have a direct impact on the ability of municipalities to meet these objectives.

Extended dry seasons, increasing temperatures, extreme storms (including hail) and sea level rise, are resulting in impacts such as: drought, crop loss/failure, livestock death, damage to infrastructure, runaway fires, vector-borne disease, loss of livelihoods and damage to household assets.

In response to an uncertain future and immediate development needs, municipalities should align climate responses with existing climate and development challenges and deepen existing response capacity as well as:

- Develop links with research institutions and community bodies to improve the flow of information, in particular early warning systems, for extreme events;
- Incorporate climate change information into sector planning and plan for a wide range of longer term changes in average conditions;
- Improve cross-sector integration of management and development planning. As mitigation and adaptation efforts fall under the responsibility of a range of departments, some form of institutional coordination is important; and
- Move hard and faster on core development objectives, which will provide immediate benefits and long-term climate response benefits.

Climate change impacts all sectors and integrating climate change into existing policies and plans is considered the most effective way of mainstreaming the required climate change response. This approach builds increasing flexibility into planning decisions and helps to avoid "lock-in" systems or infrastructure not suitable to future climate conditions.

The Climate Change Municipal Support Programme within WCG: DEA&DP was initiated in 2012 from an expressed need by municipalities for support on climate change and led to a programme to support municipalities in the development of Climate Change Response Frameworks and Plans. As the first Province in South Africa to roll out such a programme the Western Cape has been at the forefront of learning and modifying this programme as it has developed to create best practices for the country. The Climate Change Municipal Support Programme forms part of the larger WCG: Municipal Support Programme as well as the national Department of Environmental Affairs Mitigation and Adaptation Climate Change Municipal Support Programme, which focussed on the Western Cape during the 2017/18 financial year. WCG is also monitoring and evaluating the progress of municipalities in responding to climate change. In assessing this, an annual Integrated Development Plan (IDP) assessment of all local and district IDPs is undertaken utilising a Climate Change IDP Assessment Framework. This framework was developed to assess the integration of all climate change responses in municipal IDPs and sector plans.

The municipal IDPs are then scored according to one of the following categories, as shown in Figure 1:

- Non-performance: climate change is not included, or only briefly mentioned in the text of the document;
- Compliance performance: specific climate change response programmes/projects are included in the IDP; or
- Optimum performance: specific climate change response programmes / projects with budget and capacity are included in the IDP.

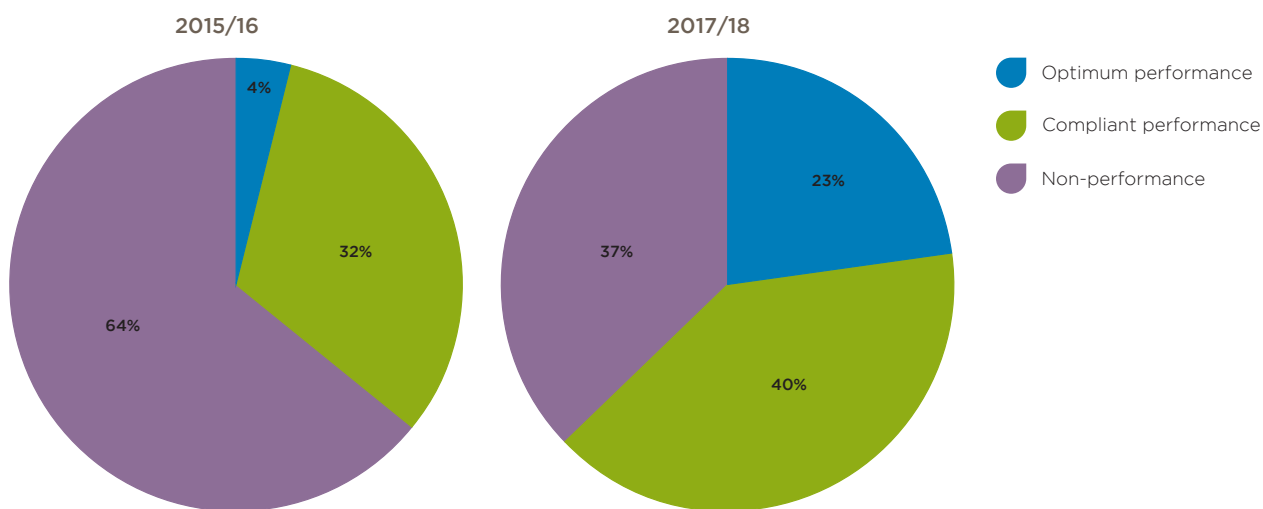


Figure 1. Climate Change IDP Assessment results for the 2015/16 IDP review and the 2017/18 IDP review (based on the Climate Change IDP Assessment Framework)

The figure above shows that there has been a significant improvement in the integration of climate change and climate change responses in municipal IDPs. In 2016 the Climate Change Directorate developed a municipal specific Climate Change Advisory based on the final update of the 3rd generation IDPs, in order to enhance climate change integration into the development of the 4th generation IDPs (2017 – 2022). There has been tremendous support for the advisories evidenced by the fact that Climate Change advisories content have been captured into the latest draft IDPs.

The WCG Greenest Municipality Competition also contains a comprehensive assessment of climate change response – questions are designed to not only provide a platform for competing in the competition, but also as a mechanism to upscale local government responses on climate change integration into planning. Eleven local and four district municipalities completed the Climate Change element of the 2017 Greenest Municipality Competition.

CLIMATE CHANGE FINANCE

One of the primary constraining factors to transitioning to a low carbon and climate resilient Western Cape is finance; an issue that is complex, requires trust among parties and is politically sensitive. In developing countries, climate change investment needs are significant. Direct government funding is generally scarce and the billions of dollars committed by industrialised countries remain inadequate to the magnitude of the challenge of stabilising a steep trajectory of greenhouse gases and responding to the associated impacts¹².

In the 2009 Copenhagen Accord, developed countries pledged to raise US\$ 30 billion by 2012, increasing to US\$ 100 billion per year by 2020, to support climate change projects in developing countries. These commitments were reiterated in the Cancun decision (2010), the Durban Platform in 2011 and the Paris Agreement in 2015. The current annual finance goal is set to continue until 2025 when a new collective goal will be set.

South Africa is committed to mobilising the resources that are necessary to overcome the challenges in mitigating and adapting to climate change¹³. Under the United Nations Framework Convention on Climate Change (UNFCCC), there are climate finance channels and instruments available for accessing funds.

¹² OECD (2015), "Climate finance in 2013-14 and the USD 100 billion goal", a report by the Organisation for Economic Co-operation and Development (OECD) in collaboration with Climate Policy Initiative.

¹³ South Africa's First Biennial Update Report, 2014.

Theoretically, South Africa as a developing country has access to this finance. An assessment of country case studies highlighted that a mixture of four broad categories of funding sources were utilised to finance Climate Change Response projects: International Climate Funds; Bilateral and Multilateral Development Assistance; Domestic Public sector; and Private Sector Financing.

The bilateral loans and grants received / committed per donor country between 2000-2014 are presented below. A total amount of US\$ 20,975 billion was received by South Africa, of which 68% were received in the form of loans from Germany, 19% as loans from France, while the remaining 13.1% was grant funding received from various donor parties.

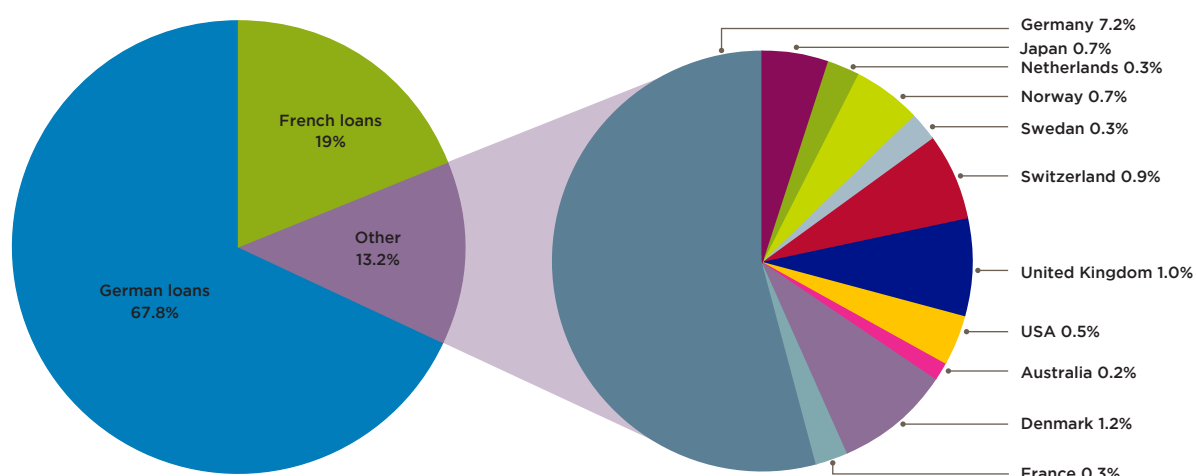


Figure 2. Indication of the bilateral and multilateral support South Africa has received / or that which has been committed by bilateral lenders to develop its climate change response, in USD14 [information is divided into Loans, and Other (i.e. Bilateral donor/grant funding)]

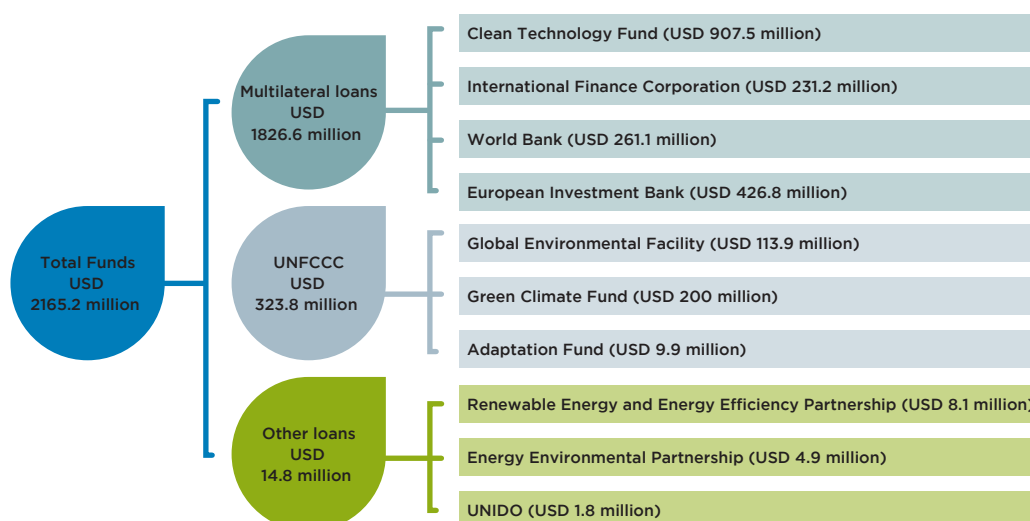


Figure 3. Indication of the committed and received bilateral and multilateral support SA to develop its climate change response¹⁵ (information divided into Loans (IFC, World Bank and Clean Technology Fund), and Grants (i.e. GEF and REEEP))

¹⁴ South Africa's First Biennial Update Report, 2014.

¹⁵ South Africa's First Biennial Update Report, 2014.

The multilateral support South Africa received between 2000 – 2014 was US\$ 2 165.2 million; the money was received via multilateral loans, UNFCCC financial mechanisms and other international loans. From the total received financial support US\$ 1 826.6 million was received through multilateral loans, of which the biggest proportion came from Clean Technology Fund (49.7%), followed by the European Investment Bank (23.4%) and other funds were channelled through the World Bank (14.3%) and International Finance Corporation (12.7%). The UNFCCC funding has contributed US\$ 323.8 million through the Global Environment Facility (35%), the Green Climate Fund (65%) and the Adaptation Fund (3%). SA also received other loans from Renewable Energy and Energy Efficiency Partnership (REEEP), UNIDO and the Energy Environment Partnership (EEP)

Subnational governments have been able to access some sources of funding with varying degrees of success; indicating that municipalities and provincial government departments are willing to engage in climate change response projects. These sources include international multilateral and bilateral grants; municipal own revenue; intergovernmental grants to both municipalities and provinces; and concessionary loans for very large infrastructure projects. However, the ability of smaller municipalities to access or raise finance is limited, and the ability of all municipalities to upscale and replicate projects is challenging¹⁶. Figure 4 provides an indication of where funding opportunities for climate change response projects in the Western Cape originates, as self-reported in 91 projects in the Western Cape Climate Change Response Projects Database (CCRPD; as of March 2018).

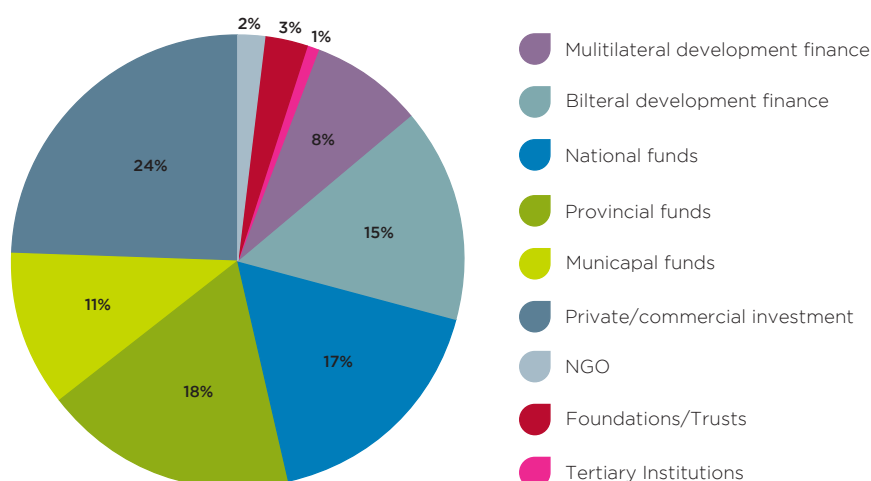


Figure 4. Frequency breakdown of funding sources for self-reported Western Cape based climate change response projects (91 projects, 2011 – 2018). Note that this is not a representation of total funding amounts¹⁷

Figure 5 gives an indication of the percentage of projects reported on in the CCRPD which fall into the various focus areas defined in the WCCCRS. It is clear from the figures that the bulk of the focus of finance is on emissions reductions, with very limited focus on resilience and climate change adaptation. This may seem particularly concerning for infrastructure, the built environment, food security, water and human settlements where the largest financial risks lie, and where the greatest losses are already being observed. However, the adaptation part of the database is not as robust as the energy part of the database and in this current iteration such conclusions may not yet be fully warranted. The general consensus is that more funding is still being allocated towards mitigation than adaptation, but the database is not a full reflection of the actual numbers. Massive upscaling of adaptation finance is however required, and for integration of climate change risks into all development planning and infrastructure investments.

¹⁶ Increasing Investment in Climate Change Related Projects at the Sub National Level- report, 2013.

¹⁷ It is important to note that this figure only indicates the direct source; in some cases the ultimate source may be different from the one reported. For instance, a project may report that their funding originated from a national government entity, which may in turn have received the funds from a multinational funding source.

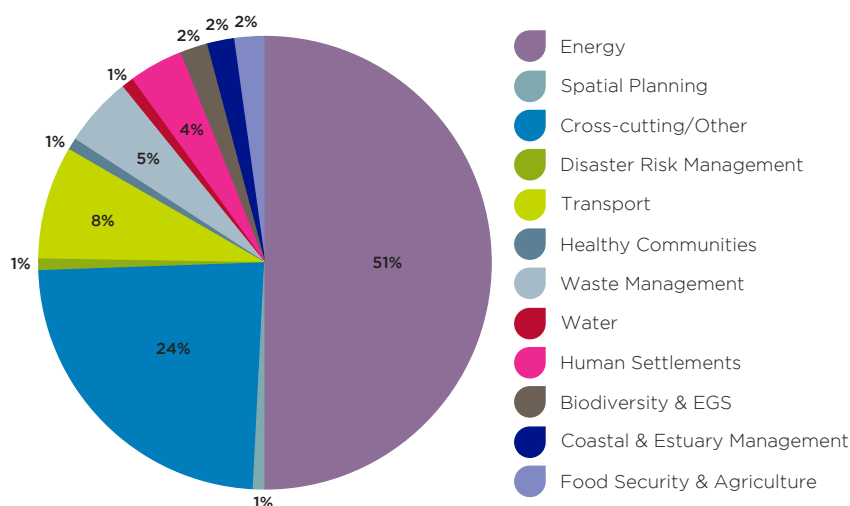


Figure 5. Frequency breakdown of how often Western Cape based climate change response projects fall into particular WCCCRS focus areas (all projects, 2011 – 2015)

OPPORTUNITIES, GAPS AND RECOMMENDATIONS

- Absence of a simple and effective mechanism to raise adequate finance for climate change response projects. The global climate finance architecture is complex and in the process of continuous reform; thus accessing International Climate Finance requires a high level of capacity and expertise to prepare and package the projects according to rigorous and unfamiliar requirements.
- Capacity challenges and drafting of project concepts/ bankable proposals.
- Lack of support for feasible provincial and local government climate change projects e.g. from private financiers.
- Challenges relating to upfront costs and long pay back periods of implementing technology changes.
- Accuracy of projected returns to finance investment in climate change response projects linked to new or alternative technology.
- Developing indicators for tracking climate finance flows in the Western Cape and mechanisms for collecting data on the finance flows.



7

CLIMATE RISK MANAGEMENT

The current priority areas for addressing climate change related disaster management is through a move towards climate risk management in the Western Cape and includes the initial focus on:

1. Consideration and incorporation of climate change into disaster management plans across the province.

Since the development of the WCCCRS, a new Disaster Management Amendment Act (Act no. 16 of 2015) has been promulgated which provides the legal mandate for all tiers of government to include climate change adaptation into all disaster management plans. In addition, multiple high impact disasters have occurred in the Western Cape in 2016-2018, and as such the integration of climate change into disaster risk management is a highly evolving, relevant and urgent programme area. Climate related disasters in the Western Cape are getting larger in extent and magnitude, and the economic and social impacts are growing as disasters impact larger areas, last for longer (causing permanent impacts on agriculture), urban-wildland interfaces¹⁸ are being surpassed by events such as fires impacting on infrastructure, homes, businesses and livelihoods.

¹⁸ Urban-wildland interfaces refer to the zones of transition between unoccupied land (wild or farm) and human development. These areas are typically getting larger in the Western Cape as urban and semi-urban (nature estates etc.) creep into natural and farm areas. These are high risk areas to manage particularly in terms of fire.

Table 1. Climate Risk Management Indicators for the WCCCRS

HIGH LEVEL CATEGORY	INDICATOR	2015/16	2017/18
SPATIAL RISK AND VULNERABILITY ASSESSMENT FOR CLIMATE CHANGE	Provincial Spatial Climate Change Risk and Vulnerability Assessment.	Provincial Risk profile is under development and will include climate change. A specific spatially explicit climate change R&V assessment has not yet been undertaken.	Provincial Risk Profile complete, and includes climate change narrative. Original 2008 Climate Change Risk and Vulnerability Assessment (part of the first provincial strategy) – updated by DEA/CSAG/ACDI in 2017 specifically for the climate risk management and health sections ¹⁹ . A feasibility assessment for a spatially explicit Climate Change Spatial Risk and Vulnerability Assessment has been completed in 2018.
	Number of Municipal Climate Change Risk and Vulnerability assessments	Varying degrees of Risk and Vulnerability (R&V) assessment exist for municipalities on some climate change related risks (specifically flooding), however, the degree to which these systematically cover the full range of climate change risks is currently not fully assessed.	No update

Table 2. Additional High Level Climate Risk Management Indicators

HIGH LEVEL CATEGORY	INDICATOR	2015/16	2017/18
ECONOMIC COSTS OF DISASTERS	Losses from climate related disasters in the Western Cape between 2003 – 2014	2003 – 2014: R 5 billion (2003 – 2008 ²⁰ and 2003-2014 ²¹ data was utilised) (floods and storms)	No comprehensive update from these sources R4 billion to R6 billion ²² : Cape Town storm & Knysna fires property damage (single event - June 2017)
	Losses from the El Niño and climate change driven drought of 2015-2018 and associated fires in the Western Cape ²³	+/- R2 – 4 billion (Projected impact on Agriculture: loss of 5-10% of normal production) ²⁴	Drought has continued into 2017/18 ²⁵ : R5.9 Billion in losses in the 2017/18 Agricultural season ²⁵ R14 Billion in losses in total to Agriculture ²⁶ 20% Reduction in average Agricultural production ²⁵ >30 000 seasonal Agri-workers will not have a normal income or any income at all ²⁵ Avian flu outbreak 2017: R800 million in production losses ²⁷

The Western Cape is the most disaster prone province in South Africa²¹, and is particularly prone to the effects of climate-related hazards, which pose a significant risk to the Western Cape's economy, ecosystems and population. At the time of writing of the first 2015/16 M&E report, direct damages from extreme climate events over a 10-year period were in the vicinity of R5 billion, and the drought at that point had resulted in estimated R4 billion in losses. Since 2015 the drought has persisted and the Agriculture sector alone in the Western Cape is tallying up to R14 Billion in losses. Other sector loss estimates (such as Agriculture, Industry, Building, Film, etc.) have yet to be calculated. The single Fire/Storm event of June 2017, particularly in relation to the fires in the Garden Route (Knysna/George area), resulted in up to R6 Billion in losses. These disaster-related damages place a significant financial burden on service delivery and the economy, without taking into account the indirect costs of social, environmental and other disruptive impacts that typically characterise such events. National disaster response funding is substantially inadequate to respond, (although the new declaration of a national disaster may shift this ability somewhat), and is not able to provide for the private sector and the public at large who have all

¹⁹ The original component of the first Western Cape Climate Change Strategy contained a section on Risk and Vulnerability for the province. This was updated through a DEA funded project in 2017 with support of CSAG and ACDI, funded by GIZ. The update drew strongly on key national documents namely the National Adaptation Strategy, the Third National Communication to the UNFCCC, and the LTAS programme documents (from 2013/14). This study recommended that a spatial risk and vulnerability assessment would likely be required for the province.

²⁰ These events are described by RADAR in their 2010 Risk and Development Annual Review (<https://www.westerncape.gov.za/text/2013/July/radar-eng.pdf>). The costs are direct damage costs sustained and reported primarily by public sector entities, and are likely and underestimate of total costs from a range of storms and cut-off low pressure systems.

²¹ <http://www.riskreductionafrica.org/wp-content/uploads/2014/09/OFF-THE-RADAR-SYNTHESIS-REPORT.pdf> (this data was utilised, and non-cut off low pressure systems from the 2010 report added to this figure of R4.9 billion to reach a total of R 5 billion).

²² <http://citypress.news24.com/Personal-Finance/knysna-fires-lessons-for-our-home-insurance-20170801>

²³ Losses are currently challenging to calculate, with only the Agriculture sector putting out reliable figures, later analysis will likely provide significantly higher numbers across the full breadth of economic sectors, and livelihoods.

²⁴ MEC Alan Winde, Cape Argus 4 February 2016.

²⁵ <https://www.fin24.com/Economy/drought-impact-on-w-cape-economy-worse-than-anticipated-minister-20180301>

²⁶ <https://www.businesslive.co.za/bd/economy/2018-02-05-farmers-lose-r14bn-as-cape-drought-bites/>

²⁷ <https://citizen.co.za/news/south-africa/1674873/bird-flu-costs-the-western-cape-an-estimated-r800m-in-production-losses/>

contributed and re-budgeted in order to respond to the crisis. The impacts associated with the future climate projections for the region will result in an increasing economic burden, particularly if climate vulnerability is not reduced across the province.

Already a significant portion of the ecological infrastructure which should buffer against climate-related hazards, such as coastal barrier dunes, wetlands, mountain catchments and flood plains is compromised (see Biodiversity and Ecosystem Goods and Services), and continues to be through reactive responses even in a drought period. Increasing magnitude and frequency of extreme events, temperature increases, altered rainfall patterns and changes in evaporation rates, etc. will further compromise the ability of the natural environment to buffer human settlements and infrastructure against the impacts of climate hazards.

The possibility of increased disaster risk is considered to be one of the most concerning and potentially costly impacts of climate change in South Africa and globally. Understanding these risks and identifying key areas of concern is critical for developing suitable and sustainable adaptation policies and scenarios. A consistent message from the Long Term Adaptation Scenarios analysis of drought-related risks over the medium and long term is that there will be increased water supply limitations in the Western Cape. The LTAS also indicated there will be an increase in amount of rainfall in the southern Cape likely resulting in high flood risk. Linking the potential increased flooding risk with the location of current key infrastructure shows the potential for 'high' or 'very high' impacts on the current flood design standards for more than 30% of bridges (road and rail), 19% of dams and 29% of ESKOM transmission line crossings across the country by mid-century²⁸.

2015-2018 DROUGHT: LINKING DISASTER RESPONSE AND LONG TERM CLIMATE CHANGE ADAPTATION

Many disaster events are not being attributed to a changing climate, even though we have already seen a global average increase of 1 Degree Celsius²⁹. Furthermore, 90% of all disasters globally are now climate related, and the latest science points to the attribution of climate change being a driver behind many extreme weather events³⁰. We need to formally recognise the economic costs and risks of climate related disasters as ones that will increase in magnitude and frequency.

As an example the El Niño phenomenon of 2016-17, which is a naturally occurring one, was the worst on record, because it was occurring on top of an already 1 degree of warming. The oceans are much warmer than ever before and as a result the severity of the impacts of the 2015/16 El Niño has been substantial globally, including in South Africa, and the Western Cape. El Niño events can result in either more severe flooding or drought. The current drought in the Western Cape has been classified as a potentially once-in-a-millennium event by some climate scientist³¹.

In response to the El Niño and climate change driven drought, the cumulative totals of the impact of the drought are still being calculated on an ongoing basis. Initial reports in 2015/16 stated losses to the agricultural sector alone of R4-6 billion rand. This has since been added to with ongoing drought impacts of R14 Billion in the Agriculture sector. In addition, the single storm and related fires in Knysna in June 2017 caused R4 – 6 billion losses in damage; the avian influenza outbreak (associated with the drought) caused losses of R800 million to the poultry sector. Over 30,000 seasonal jobs in agriculture have been lost. Many of the costs are still being determined. The responses in reactive disaster funding have been but a fraction of the economic cost: R1 billion in 2017; and close to another half a billion rand has been requested from national disaster management funds in 2018³². The situation is a clear indicator of the economic cost of failure to adapt to climate change. Proactive planning and adaptive measures, rather than reactive measures are likely to be less costly.

²⁸ Long Term Adaptation Scenarios Research Flagship Program, Technical Report No 3.

²⁹ This is already 2/3rds of what is considered the safe limits of warming that human communities and systems can withstand – this is seen as 1.5°C of warming globally, and we have already surpassed the mark of 1°C of warming.

³⁰ National Academies of Sciences, Engineering and Medicine. 2016. Attribution of extreme Weather Events in the Context of Climate Change. Washington, DC: the National Academies Press. Doi: 10.17226/21852.

³¹ <http://www.csag.uct.ac.za/2017/08/28/how-severe-is-this-drought-really/>.

³² Personal communication, Western Cape Disaster Management Center.

In addition to water supply challenges, the accelerating impacts on inflation and to the cost of basic food staples is a key consideration in responding to the current drought. Based on January 2016's preliminary retail prices, the cost of the staple basket increased by approximately 19% from January 2015 to the corresponding month in 2016 and a further increase of 10% in quarter 1 of 2016 was expected³³. The cost of the staple food basket increased in total by 22% from April 2015 to April 2016³⁴. Food prices have increased by a further 2.8% between September 2016 and the same month in 2017³⁵.

A similar drought situation was experienced in South Africa in 1992/3 (although the drought of 2015-2018 is seen to be worse). In 1992/1993, undoubtedly one of the most widespread droughts of the last 45 years (until 2015-2018), maize had to be imported to South Africa (as well as the rest of southern Africa). The knock-on effect of crop failure could be seen in the population drift from rural areas into the cities, farm labour lay-offs and farm closures as well as an increasing indebtedness in the agricultural sector (WeatherSA)³⁶. According to the Reserve Bank (Pretorius and Smal 1992) the loss of GDP during the 1992 drought was approximately 1.8 percent, representing US\$500 million which is a substantial impact from a sector playing a relatively small role in the economy (Mniki, 2009:34)³⁶. The drought of 2015-18 has substantially far surpassed these impacts. Disasters, particularly drought, have a direct impact on the most vulnerable communities across the country. We can take the current disaster situation as a warning for the future and a timely reminder that the early climate change adapters will be the economic winners of the future.

To respond to disasters, and climate related disasters specifically, the South African national policy framework provides a robust basis from which to develop our responses. South Africa's legislation and policy instruments for disaster risk reduction, which includes early warning systems (EWSs) are one of the best in Africa, having adopted a proactive rather than a reactive approach³⁶. Both the Disaster Management Act (DMA) (RSA, 2002) and the National Disaster Management Framework (NDMF) (RSA, 23 2005) guide Disaster Risk Reduction Management (DRR-M) implementation in the country, with the National Disaster Management Centre being the lead institution for DRR-M. The newly promulgated Disaster Management Amendment Act (Act no. 16 of 2015) specifically refers to climate change adaptation, ecosystem-based adaptation and community based adaptation measures and investments being required by all tiers of government (National entities, provincial entities, and local entities). There is a strong risk reduction mandate contained in the National Disaster Management Act, and this should be included in provincial and district disaster management planning. This provides an opportunity to align infrastructure risk reduction measures with the provincial and district infrastructure frameworks and plans. The Act places the onus for rehabilitation and reconstruction of infrastructure on the organ of state responsible for maintaining such infrastructure (7.7.14 of National Disaster Management Framework).

The National Disaster Management Centre (NDMC) promotes integration and coordination with a special emphasis on prevention and mitigation. It works with National, Provincial and Municipal organs of state, statutory functionaries, other role players and communities. The NDMC currently resides within the Department of Provincial and Local Government. The Western Cape Disaster Management Advisory Forum is the key coordination forum for the province and meets quarterly, as well as an ad hoc basis as required in relation to disaster protocol. The WCG: DEA&DP Climate Change Directorate feeds into this forum in order to integrate and synergise on climate change and disaster management plans, programmes and activities. All District Municipalities in the Western Cape have Disaster Management Advisory Forums.

³³ Bureau for Food and Agricultural Policy: Policy brief on the 2015/2016 drought.

³⁴ Bureau for Food and Agricultural Policy Baseline Agricultural Outlook 2017 - 2026 (2017).

³⁵ <https://businesstech.co.za/news/lifestyle/207697/food-prices-in-south-africa-2017-vs-2016/>.

³⁶ Long Term Adaptation Scenarios Research Flagship Program, Technical Report No 2.

Table 3. Recent Western Cape Disaster Management Tools

ENHANCED DISASTER MANAGEMENT TOOLS	
Early Warning Database and Early Warning Systems	COMPLETE
GIS and web-based Decision Support Tool to guide district disaster management planning	COMPLETE
Provincial disaster risk and vulnerability assessment (2002)	COMPLETE
Provincial Risk Profile	COMPLETE
Flood Hazard Index Tool	COMPLETE

Western Cape Disaster Management (WCDM) ensures the maintenance of an early warning database that includes all the critical role-players within disaster management. The unit also disseminates warnings to all relevant stakeholders. This ensures that all the necessary line functions and department are kept abreast of all impending hazards. WCDM has a well maintained Geographic Information System and Web-based decision support tool which includes a large number of climate related hazard information. Most recently this has included a consolidation of all flood related data for the Western Cape; a roll out of the Decision Support Tool to all municipalities in the Western Cape; and general maintenance and update of the datasets in its central data repository. A preliminary disaster risk and vulnerability assessment was undertaken in 2002 and forms the baseline for any subsequent disaster risk assessments by the Province. While these assessments take climate related hazards into account, the assessments fall short of a comprehensive assessment of climate change projections, the consequences for infrastructure and spatial planning, and need for disaster risk reduction measures.

MUNICIPAL RESPONSES

WCDM works closely with municipalities to strengthen the link between development and prevailing disaster risk including climate change. WCDM is in the process of ensuring all fourth generation IDPs include a dedicated disaster management chapter. Furthermore, in the past financial year updated risk profiles (of all disaster related risks including climate change) have been undertaken. This has assisted in high level planning and spatial mapping of the most prevalent hazards. Only two local municipalities updated risk profiles remain to be done in the 2018/19 financial year. This has assisted in high level planning and spatial mapping of the most prevalent hazards.

All Municipalities in the Western Cape have overarching Disaster Management Plans which cover climate change related risks to varying degrees. As these are updated they are becoming more uniform in approach. Now that the new Disaster Management Amendment Act (DMAA) provides more provisions for climate change adaptation specifically, this area of work is likely to evolve substantially in the near future. In addition to Disaster Management Plans various municipalities have specific plans for some climate related hazards and could be utilised in future to further enhance planning³⁷.

OPPORTUNITIES, GAPS AND RECOMMENDATIONS

- Assess the lessons learnt from the current drought period, and analyse ways forward to shift from 'reactive disaster response' to 'long term climate change adaptation' decision making.
- Further refine requirements for appropriate climate change risk and vulnerability assessments in relation to ongoing disaster interventions, and as per the new Disaster Management Amendment Act provisions.
- Related to the above point, clearly determine which municipalities adequately include climate change in current Risk and Vulnerability Assessments in the province. In addition, to improve the spatial understanding of these risks and vulnerabilities in relation to climate change.

³⁷ Information taken from the most recent Western Cape Disaster Management quarterly report – Q3 2015/16.

- Develop a coordinated reporting mechanism for the financial costs of climate related disasters in order to enhance analysis of the increasing economic and social impact across the province.
- Whilst many plans, policies and systems are in place for disaster management, the capacity at local and district level is limited, and it is highlighted that in a changing climate with an increasing intensity, severity and frequency of many climate-related disasters that urgent attention to funding centres, and human resources must be elevated. Disaster management is a severely underfunded public service globally, particularly in fiscally constrained environments such as in South Africa, and particularly at the local level this is a concern.
- Financing risk reduction remains a significant barrier to implementing identified climate risk reduction actions. Disaster damaged critical infrastructure is often just replaced in its previous form due to constraints such as lack of finance, Environmental Impact Assessment (EIA) demands, lack of specialist studies the lack of appetite to do things differently and the need to quickly resolve the problem. Long lead times in transferring the Municipal Infrastructure Grant (MIG) results in the delay in the release of funds (between when a disaster occurs and when funds are released)³⁸. This is due to the conditions that need to be met before funding can be channelled from the national budget to the Department of Cooperative Governance and eventually to the MIG fund. One project has been initiated to investigate a mechanism to overcome these obstacles – the Feasibility Assessment for a Municipal Risk Pooling Facility is being assessed in the Western Cape (This is a multi-partner collaboration funded by the IDRC).

³⁸ Long Term Adaptation Scenarios Research Flagship Program, Technical Report No 2.



8

WATER

The current WCCCRS priority areas for addressing water security in the Western Cape in a changing climate include:

1. Invasive alien vegetation clearing;
2. Prioritisation, valuation, mapping, protection, and restoration of ecological infrastructure in catchments;
3. Effective utilisation of irrigation water;
4. Resource nexus decision support; and
5. Develop ecosystem goods and services (EGS) investment opportunities.

The current WCCCRS covers the following in this focus area, which is in addition to that coordinated under the Western Cape Sustainable Water Management Plan (WCSWMP) and activities of the Department of Water and Sanitation (DWS):

1. Invasive alien vegetation clearing;
2. Effective utilisation of irrigation water; and
3. Ecosystems goods and services and ecological infrastructure (these are further covered in Biodiversity and Ecosystem Goods and Services).

Given the current drought in the Western Cape, and the fact that the WCSWMP has been recently updated, it is likely that some of the focus areas of this chapter of the WCCCRS will change in the imminent future.

Table 4. Water Indicators for the WCCCRS

HIGH LEVEL CATEGORY	INDICATOR	2015/16	2016/17	2017/18
MORE CROP PER DROP	Number of hectares registered for the FruitLook* Tool for broad scale management [indicating increasing water efficiency]	89 623 ha ³⁹		123 100 ha ⁴⁰
ALIEN CLEARING	Number of hectares of IAP cleared per annum through Working for Water projects in Western Cape (represents 95% of the clearing activity in the province)	85 244 Ha (2015/16) [Initial Ha Cleared = 14865.2 Follow-Up Ha Cleared = 70378.83]	138 694 Ha [predominantly follow-up work]	114 407 Ha [mostly follow-up; data up to end of January 2018]

*Fruitlook is discussed in additional detail in the food security, and invasive alien clearing sections of this report.

Table 5. Additional High Level Water Related Indicators

HIGH LEVEL CATEGORY	INDICATOR	2015/16	2017/18
WATER	Total water supply versus total water demand [for the Western Cape Water Supply System, which supplies CCT and regions downstream of the Berg River]	Supply: 596,000,000 m ³ Demand: 508,100,000m ³ [2013 data] ⁴¹	Supply: 596,000,000m ³ Demand: 547,260,000m ³ [2014 data] ⁴³
BLUE DROP SCORE	Average Blue Drop score for the Western Cape	89% ⁴⁴	No update
GREEN DROP SCORE	Average Green Drop score for the Western Cape	84.5% ⁴⁵	No update
HOUSEHOLD SANITATION	% households with access to sanitation	94.8% ⁴⁶ [2013 data]	94.6% ⁴³ [2014 data]

The Long Term Adaptation Scenarios for South Africa - brief on Water, states unequivocally that 'Climate change impacts on South Africa are likely to be felt primarily via effects on water resources; significant trade-offs are likely to occur between developmental aspirations ...with significant social, economic and ecological consequences through restricting the range of viable national development pathways'. The updated State of Environment Outlook Report (SOEOR 2018; see Annex 3) for the Western Cape indicates a general baseline decline in water quantity and quality. Many areas in the Western Cape have poor environmental water quality, water resources are generally over-abstracted and ecosystems are heavily degraded and invaded by alien plants. The current drought has highlighted how vulnerable many of our towns are in terms of water provision, and not enough is known about the sustainability of groundwater resources. In most cases, climate change will increase pressure on water resources through increased temperature and associated evaporation, likely reductions in rainfall, drying, and related increases in extreme weather events which will negatively impact critical infrastructure systems. Blue drop, green drop and access to sanitation scores indicate that very small proportions of the Western Cape have underlying vulnerability related to access to potable water and adequate sanitation at the time that these reports were produced, however, these can easily decline with eroding infrastructure (Table 5).

³⁹ 89 823 ha (45 963 ha for 2015/16 and 43 860ha historic) is registered for broad scale management utilising the tool as of 30 April 2016. Of this 41 023 ha is registered for farm scale management. The area for which FruitLook data can be obtained on a weekly basis is 170 000 ha. Data obtained from WC DoA.

⁴⁰ 123 100 ha (75 422 ha for 2017/18 and 47 679 ha historic) is registered for broad scale management utilising the tool as of 15 February 2018. Of this, 71 636 ha is registered for farm scale management (running season: 41 755; historical seasons: 29 881). The area for which FruitLook fruit crop data can be obtained on a weekly basis is 200 000 ha (2018). Data obtained from the FruitLook Progress Report 2018.

⁴¹ Western Cape Government Green Economy Report 2014.

⁴² Adjusted water use figure that refers to the actual domestic use plus the current capped volume for agriculture.

⁴³ Western Cape Government Green Economy Report 2016 [2014 data].

⁴⁴ Briefing notes on the 2014 Blue Drop Report (Annexure C).

⁴⁵ Western Cape Government Green Economy Report 2014 [2013 data].

⁴⁶ Western Cape Government Green Economy Report 2014 [2013 data].

WATER SUPPLY

From Table 6 below it can be determined that even as far back as 2005 there were insufficient water resources available to meet the demands for the Province. All Water Management Areas (WMAs), except the Breede, were recorded with a negative water balance as a result of overutilization⁴⁷. This often correlates with the ecological condition of the fresh water systems being degraded. As a result, the WMA's are severely stressed and vulnerable to any major changes in rainfall e.g. from drought and long term climate change, as has been keenly felt during the previous three drought years. Figure 6 gives an indication of the water uses per WMA in the Western Cape.

Table 6. A comparison of the overall water resource supply and consumption between 2000 and 2005, per Water Management Area⁴⁸

WMAs	YEAR: 2000 (MILLION M ³ PER ANNUM)			YEAR: 2005 (MILLION M ³ PER ANNUM)		
	WATER SUPPLY	WATER USE	BALANCE	WATER SUPPLY	WATER USE	BALANCE
BERG	676	704	-28	709	745	-36
BREEDE	865	828	37	1090	1071	19
GOURITZ	275	339	-64	351	415	-64
OLIFANTS / DOORN	338	373	-35	372	406	-34
PROVINCIAL TOTAL			-90			-115

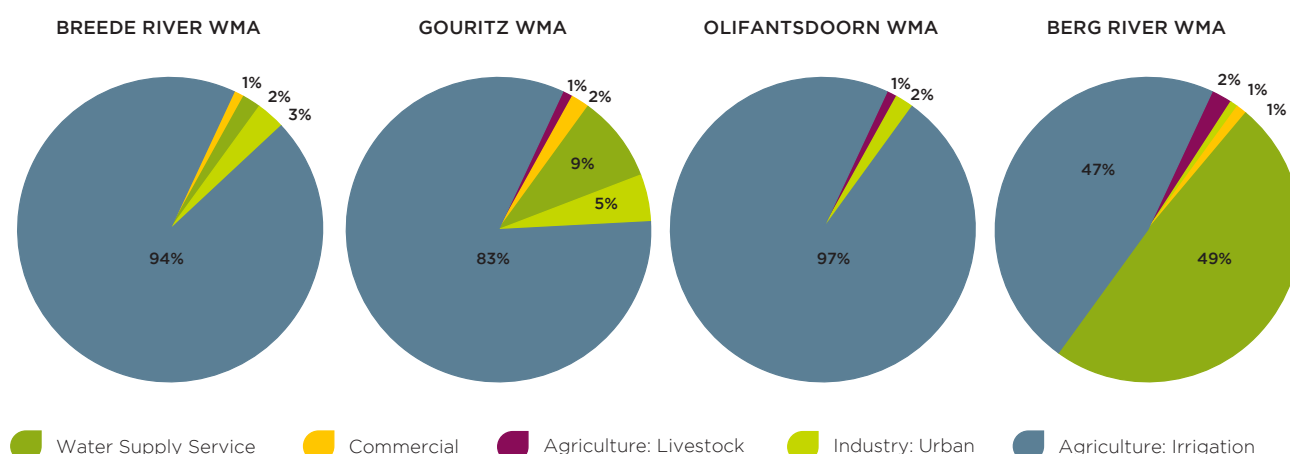


Figure 6. Registered water use per WMA – Western Cape Areas⁴⁹

It is the responsibility of the Department of Water and Sanitation (DWS) to respond to expected growth initiatives to provide guidance on water sources and supply. Constitutionally, DWS is also responsible for bulk water planning with ensuring that the necessary water is available when it is required. Distribution of the water resource at the local level is the responsibility of the municipality. Municipalities and particularly the City of Cape Town (as one of the largest water users in the province) thus have a key role in water management.

In early 2005, the then Department of Water Affairs and Forestry (DWAF), as the custodian of the country's water resources, in partnership with the City of Cape Town (CCT), commissioned the Western Cape Reconciliation Strategy Study to facilitate the reconciliation of predicted future water requirements with supply available from the Western Cape Water Supply System (WCWSS) for a 25-year planning horizon.

⁴⁷ Western Cape State of Environment Outlook Report 2013.

⁴⁸ Annual Report on the Western Cape Sustainable Water Resource Management Plan 2014/15.

⁴⁹ GreenCape Water Market Intelligence Report, 2015.

The Strategy is used as a decision-support framework for making timeous and informed recommendations on those interventions that should be implemented to meet the future water requirements. The Planning scenario used in this study, however, does not include climate change as the uncertainty of the impacts on rainfall is deemed too high for planning in the short term.

Currently the WCWSS Reconciliation Strategy identifies the following key targets⁵⁰:

1. CCT must reduce water losses to less than 15% of total average demand;
2. Ensure on-going effective management and implementation of integrated water resources planning (WRP);
3. Mobilise resourcing according to the Water Conservation / Water Demand Management (WC/ WDM) Strategy;
4. CCT must by 2020, reduce and maintain non-revenue water (NRW) to below 20% of the total average annual water requirement and within accepted international benchmarks; and
5. Reduce projected potable requirement to an average growth rate of no more than 2% per annum for the next 10 years and conserve Cape Town's available water resources.

The latest WCWSS status report indicates that goal one was achieved in the 2013-2014 financial year, as water losses were contained below the 15% target. However, NRW was measured as 21.8% in the same financial year⁵¹.

2015 – 2018 WESTERN CAPE DROUGHT

Over the last four years the Western Cape has experienced an increasingly devastating drought, which has been classified as a potentially once-in-a-millennium event by some climate scientists⁵². While it is hard to determine exactly to what degree climate change might have contributed to such an extreme event, it is accepted that climate change will increase the frequency of extreme events such as drought, floods and storm surges, and the already-measured increase in average temperature of 1°C in the Western Cape undoubtedly contributed to the overall severity of the drought. We can therefore no longer look to the past climate as an accurate predictor of the future climate, which combined with population growth means that we must prepare for a much more water-constrained environment. Winter rainfall was already hard to predict accurately, but recent experience shows that our weather prediction models will become even more unreliable in future unless they take climate change into account.

MUNICIPAL RESPONSES/ANNUAL TRENDS IN NRW LOSSES

The latest status report indicates that goal one was achieved in the 2013-2014 financial year, as water losses were contained below the 15% target. However, NRW was measured as 21.8% in this financial year⁵¹. In response to the 2014-2018 drought the CCT has implemented a water demand management campaign that resulted in the reduction of average daily usage from 1.2 billion litres a day in February 2015 to 515 million litres a day in February 2018⁵³ – this represents a reduction in water use of just over 50% in three years, a feat unmatched by any other city in the world. This most likely prevented the realisation of a “Day Zero” scenario in the summer of 2018. Additionally, the CCT is in the process of implementing a fast-tracked schedule of water augmentation to increase bulk water supply, including groundwater abstraction, desalination and water re-use. Attempts by the CCT to decouple water use from population/economic growth through water demand management in the years leading up to the drought enjoyed a large amount of success (despite population increases the CCT saw negative growth of its water requirements for three years until 2013/14), but whether this trend can be maintained into the future is questionable.

⁵⁰ GreenCape Water Market Intelligence Report, 2015.

⁵¹ DWS, 2016. Support to the Continuation of the Water Reconciliation Strategy for the Western Cape Water Supply System: Status Report April 2016. Prepared by Umvoto Africa (Pty) Ltd in association with WorleyParsons RSA on behalf of the Directorate: National Water Resource Planning.

⁵² <http://www.csag.uct.ac.za/2017/08/28/how-severe-is-this-drought-really/>.

⁵³ Cape Argus, 7 March 2018. City's water savings hailed as 'global first'.

At the Municipal level, municipalities have Municipal Water Service Development Strategies and Plans which include mechanisms such as water metering, by-laws and stepped tariff structure. As these get updated they might include increasing consideration of climate change. Currently many are dealing with increasing conservation and demand side management of water which is a key priority for all water users. Protection of water resources from pollution is also an effort to protect our dwindling resource, but NRW⁵⁴ losses constitute significant losses even before reaching the consumer. The DWS, through bilateral engagements (among other) with local municipalities, have affected a monitoring system to determine which municipalities are adversely affected by such losses. Of the municipalities who submitted their water balance information (including the City of Cape Town), 9 out of 23 municipalities and 9 out of 24 managed to decrease the value of their NRW between 2013 and 2014, and between 2014 and 2015, respectively⁵⁵. It is clear that the most benefit from reduction in NRW will come from efforts in the metropolitan area and as a result this is a major focus for many institutions engaged in water security planning.

The WCG: DEA&DP: Pollution and Chemicals Management Directorate have recently updated the Western Cape Sustainable Water Management Plan (2017/18), and in the process reprioritised areas of action. Relevant reprioritised actions focus on including climate change considerations in estuary management plans, the development of a water sensitive urban design strategy and assistance to provincial departments on implementing this with regard to climate change adaptation, and reviewing the school curriculum to address water scarcity and climate change resilience, as well as various actions to improve water resilience in the province.

WATER PROVISION AS AN ECOSYSTEM SERVICE

The water sector is critical for climate change adaptation. DWS through the National Water Act has recognised the importance of the maintenance of ecosystem functioning and the ecological infrastructure and an ecological reserve is actively set aside for this purpose; the protection of important areas is recognised through the development of Water Resource Quality Objectives, which considers the identification of National Freshwater Ecosystem Priority Areas - NFEPAs⁵⁶. A primary concern for managing water into the future is to protect the very sources of where it is produced, and thus to maintain ecosystems – rivers and wetlands – and their surrounding water catchments. Freshwater Ecosystem Priority Areas (FEPAs) describe the “strategic spatial priorities for conserving freshwater ecosystems and supporting sustainable use of water resources”⁵⁶ and are one of the emerging tools for protecting freshwater ecosystems. The maintenance of supportive ecological infrastructure such as wetlands and healthy riparian zones is highly dependent on sound land management which is supported by Agriculture under the Conservation of Agricultural Resources Act (CARA) regulations and should also be built into Area Wide Planning Processes and the establishment of River Management Maintenance Plans, as set out in the National Environmental Management Act (NEMA) regulations. These issues further emerged out of the SmartAgri project as priority climate change response priorities (see Food Security). The Sustainable Water Management Plan has enabled a review, update and publication of new guidelines for the development of River Maintenance Management Plans which includes consideration to be made to improvements in ecological infrastructure as a form of preventative maintenance.

In the Western Cape, irrigation to support agriculture is the major water use in the four currently designated water management areas (WMAs), as shown in Table 6. In the Berg WMA however, water supply service to the metropolitan area of Cape Town also represents a major source of consumption⁵⁷. As a result of the importance of the Berg River in the province, a number of strategic projects have been initiated under the ‘Berg River Improvement Plan (BRIP)’ (Box 2). One of the key project priorities in the BRIP project is rehabilitation of river banks cleared of invasive alien vegetation. In addition, numerous other partner organisations are conducting invasive alien clearing in priority catchment areas throughout the province. The data on this will over time be reported on as an indicator of expenditure on ecosystem maintenance for water security.

⁵⁴ Non-revenue water includes free basic water and water to communities that do not pay for the water. Water losses are included under non-revenue water but it is a subset of this category.

⁵⁵ Annual Report on the Western Cape Sustainable Water Resource Management Plan 2016/17

⁵⁶ Nel, J.L., Driver, A. and Swartz, E. 2011. National Biodiversity Assessment 2011: Freshwater component. CSIR Report, CSIR Natural Resources and the Environment, Stellenbosch, South Africa

⁵⁷ GreenCape Water Market Intelligence Report, 2015.

BERG RIVER IMPROVEMENT PLAN⁵⁸

The Berg River contributes significantly to agriculture in the Western Cape. The value of the market based on agricultural surveys in **the Berg River area and linked to market sales figures is over R3 billion (with over 80% destined for export)**. It is essential that the water quality in the Berg River comply with the appropriate standard - this is important for maintaining the rand value of both the local and export market. As part of implementing the Water Plan, a Berg River Improvement Plan was endorsed by the Western Cape Government during January 2013. Under this plan, short and long-term actions are currently being implemented and integrated across the various departments of the Western Cape Government towards a common outcome, viz. a Water Stewardship Programme for the Berg River that facilitates the recognition of the Berg River for its value for ecosystem services, and its natural resource state as it relates to water quality and quantity returns, while promoting sustainable growth and development in a green economy. Improvements are prioritised into a series of tasks which include riparian zone rehabilitation, bioremediation, water quality monitoring and associated economic analysis. These efforts have been further enriched through river stewardship and successful propagation at the on-site nursery. Since the initiation of the active riparian rehabilitation programme in 2013, just over half a million plants of local species have been utilised for the Berg and Upper Breede River Catchments, leading to a total of over 40ha of riparian land being rehabilitated.

Although there was an intention by national government to establish Catchment Management Agencies (CMAs) to oversee the maintenance of catchments, the current development is to follow on from the development of the National Water and Sanitation Masterplan, through which the organisational structure and oversight authority of CMAs is to be streamlined. The current uncertainty could have implications for climate change adaptation management, but these are unknown at this stage. At the moment, the Breede-Gouritz CMA (BGCMA) functions as a formally established CMA.

OPPORTUNITIES, GAPS AND RECOMMENDATIONS

- The WCWSS Reconciliation Strategy needs to be urgently reviewed as the current planning scenarios that are being used for future planning do not include climate change as a factor in the future water supply projections.
- Review the Specifications of the Regional Bulk Infrastructure Grant (RBIG), Municipal Infrastructure Grant (MIG), Accelerated Community Infrastructure Programmes (ACIP) and other similar funds and allocations to determine their climate responsive state (and link to any other ongoing such initiatives).
- Protection of Strategic Water Source Areas (SWSAs) (previously termed High Water Yield Areas - these areas which are mostly in the mountains, cover 8% of the countries surface area but produce 50% of the water) should be a strategic climate protection priority for the Western Cape and CapeNature. SWSAs should be evaluated to ensure they receive appropriate protection in terms of supportive zoning in SDFs (Spatial Development Frameworks).
- It is recommended that ground water monitoring needs to become a growing priority in the Western Cape.
- Whilst coordination of clearing and rehabilitation has become more streamlined and effective in recent years, further cooperation between IAP clearing authorities and rehabilitation programmes for wetlands and rivers will be beneficial in a changing climate. Currently there is no centralised reporting mechanism and spatial capturing of initiatives.
- Continued focus on the way in which we manage our water systems, and increased emphasis on Water Sensitive Urban Design.

⁵⁸ Annual Report on the Western Cape Sustainable Water Resource Management Plan 2014/15.



9

FOOD SECURITY

The current WCCCRS priority areas for addressing food security and an economically sustainable agricultural industry in the Western Cape in a changing climate include:

1. Farming practices that are in harmony with nature, i.e. 'conservation farming';
2. Climate smart agriculture;
3. Agricultural water technologies that reduce consumption and increase efficiency (see Water);
4. Research on climate resilient and alternative crops and livestock applicable to the Western Cape;
5. Addressing climate vulnerability through the Municipal Support Programme; and
6. Assessing food security in the context of the resource nexus.

These priority areas will be updated and refined, along with M&E reporting in the next iteration of the M&E based on the revision of the WCCCRS in 2018.

Table 7. Food Security Indicators for the WCCCRS

HIGH LEVEL CATEGORY	INDICATOR	2015/16	2016/17
SECTOR CLIMATE CHANGE STRATEGY	'Smart Agriculture for Climate Resilience' Strategy [SmartAgri] developed and implemented.	Strategy and Implementation Framework published May 2016 and implemented from 2016/17 financial year.	Implementation continued in 2017/18 financial year
MORE CROP PER DROP	Number of hectares users utilise by the FruitLook Tool [indicating increasing water efficiency]	2014/15: 15 608 ha ⁵⁹	2015/16: 25 672 ha ⁶⁰ 2016/17: 35 000 ha ⁶¹ 2017/18: 71 636 ha ⁶²
CLIMATE SCIENCE BACKED DECISION-MAKING	Identification of historical climate trends and projections for future climate in the WC.	SmartAgri Status Quo Assessment report 2014	No update ⁶³
SMARTAGRI RESEARCH AGENDA	Identification of key research areas for stimulating and facilitating shift to climate smart agriculture	Developed under SmartAgri project, sent to Cape Higher Education Consortium (CHEC).	Research focus areas implemented in research agendas of various research institutions

Table 8. Additional High Level Food Security Indicators

HIGH LEVEL CATEGORY	INDICATOR	2013	2014	2015	2016
LAND	Agricultural land improved through conservation measures annually	29 076 ha ⁶⁴	18 036 ha ⁶⁴	7 342 ha ⁶⁴	12 918 ha ⁶⁵
HOUSEHOLD FOOD SECURITY	% households with measure of food insecurity	22.70% ⁶⁶	25.5% ⁶⁴	24% ⁶⁷	22.3% ⁶⁸

The improvement of agricultural land through conservation measures depends on the availability of funding and the degree of degradation per financial year⁶⁹. These factors influenced the decrease displayed in Table 8 for the total agriculture land area improved, from 29 076 ha (2013) to 12 918 ha (2016). Other influencing factors include, impact on service delivery and performance due to increased capacity demands as a result of natural and manmade disasters, increased environmental resource degradation due to increased demands by all sectors, the inability to implement succession planning due to skills shortages⁷⁰.

The agricultural sector is an important backbone of the economy of the Western Cape; it is further pivotal for food security. By nature, the sector is highly sensitive to climatic changes, with the Western Cape already having experienced gradual warming of approximately 1°C over the last five decades. The region is expected to be particularly hard hit by the combination of warming and additional stress on already constrained water supplies; a scenario that does not bode well for the sector that is also the single largest user of water in the province. The consequences of the current drought (2015-2018) include severely decreased water allocations of between 60% and 86% for the agriculture sector. Climate projections for the Western Cape indicates continued warming of the region and an increase in the frequency and magnitude of extreme weather events such as the drought. Apart from planning for post disaster mitigation and recovery, it is also necessary to have a pro-active approach towards climate related disasters. Without an adequate and timeous response, climate change could further constrain the future development and sustainability of the agricultural sector and threaten economic growth, livelihoods and food security.

⁵⁹ Smart Agri Case Study: FruitLook (2016): <http://www.greenagri.org.za/assets/documents-/SmartAgri/Case-Studies/1.-Case-Study-FruitLook-FINAL.pdf>

⁶⁰ Fruitlook Newsletter, January 2017

⁶¹ Fruitlook for Efficient Farming, September 2017

⁶² Fruitlook Summary Report 2017/18

⁶³ Current project implementation is based on historical climate trends and projections for future climate in the WC as identified in the SmartAgri Status Quo Assessment report 2016. No updated data is available for the agriculture sector.

⁶⁴ Western Cape Government Green Economy Report 2016 [2014 Data]

⁶⁵ Western Cape Department of Agriculture, Annual Performance Plan, 2017-2018

⁶⁶ Western Cape Government Green Economy Report 2016 [2013 Data]

⁶⁷ StatsSA General Household survey, 2015

⁶⁸ StatsSA General Household survey, 2016

⁶⁹ Communication with Francis Steyn, March 2018. Western Cape Department of Agriculture

⁷⁰ Western Cape Department of Agriculture, Annual Performance Plan, 2017-2018

Farmland constitutes 89% of the total land in the province, and generates approximately R39 billion gross production value. The Western Cape has the highest market value of agricultural assets in South Africa at R44 billion and also the largest farming debt at R9.6 billion⁷¹. The Agriculture sector of the Western Cape contributes R4.436 billion to the province's economy with the total output value of the sector at R41.443 billion⁷². The province contributes 45% of national agricultural exports and steady increases in exports of wine, fruit and livestock products contributes positively to economic growth and rural incomes. In 2016, the Western Cape exports consisted of 50.7% agricultural products⁷³ and is predicted to contract by between 13% – 20% during the 2018 season as a result of the drought and associated decreased quality or grading of fruit⁷⁴. The agricultural sector employs approximately 180 000⁷⁵ people in the Western Cape and has strong forward linkages to the manufacturing sector in the form of food and beverage processing. The sector however suffered a loss of 32 047 jobs over the period 2015 -2017⁷⁶. There are also strong backward linkages to input suppliers such as feed, equipment, fertiliser and packaging companies. These industries contribute significantly to employment in the province. It is estimated that the production sector contributes 71.6% to employment in the agri-processing value chain.

In addition to the climate change threats to agriculture, there are additional underlying vulnerabilities as highlighted in the SOEOR 2018 (Annex 3) which indicate a general declining environment (including water, ecosystems and land transformation) which render the agriculture sector even more vulnerable to climate change. Various baseline activities are underway such as LandCare programmes to improve the quality of agricultural land. Almost all the adaptive responses which are already being implemented in the province are driven primarily by non-climatic drivers, particularly economic drivers (both on-farm and consumer-driven), and in some instances the need for greater ecological and social sustainability⁷⁷. Farmers and agri-businesses adopt new ways of doing things only where it makes economic sense and/or the market demands it. However, future climate resilience is often acknowledged as a co-benefit. Good examples of 'no-regrets' approaches providing multiple benefits are Conservation Agriculture and the FruitLook Project. Interventions are required that additionally respond directly to climate change threats on top of business as usual responses, which is where the SmartAgri Plan has been pivotal in redirecting the whole sector. Increased drought resilience has been observed on farms practising sustainable agriculture and applying principles according to the SmartAgri Plan.

CONSERVATION AGRICULTURE CASE STUDY OF EFFECTIVENESS IN 2015-18 DROUGHT⁷⁸

In 2002, full conservation agriculture principles were implemented on three conservation agriculture trial sites of the Western Cape Government: Agriculture (WCG: DoA). The farms are located in Moreesburg (Langgewens Research Farm), Riviersonderend (Tygerhoek Research Farm) and in Riversdale. Commercial yields to supply enough food and ensuring a farmer's profitability depends on the efficiency of the amount of water received above 110mm. During the 2017 season, several areas in the Swartland for example received less than 100mm of rain, producing either very low yields or no harvest. During the 2017 season, rainfall and wheat yields for the production season at these trial sites were 157mm (wheat: 2.45 t/ha), 147mm (wheat: 2.8 t/ha) and 126mm (wheat: 1.8 t/ha) respectively. The wheat yields were produced with an excess of the 110 mm rainfall threshold. During the three driest years for the agriculture sector, 2003, 2015 and 2017, the average wheat yields at these production sites were 1 t/ha, 2.1 t/ha and 2.4 t/ha respectively.

Water resource management along the Breede River was addressed through a joint initiative between WCG: DEA&DP, WCG: DoA Cape Winelands LandCare team, land owners along the Breede River banks and the Breede-Gouritz Catchment Management Agency (BGCMA). Implementation actions for improved management of water resources along the river banks include clearing the riverbanks of invasive plants,

⁷¹ SmartAgri Status Quo [based on 2007 data]. An update of this research has not been done since 2007.

⁷² Quantec: Data supplied by the Western Cape Department of Agriculture (2016 Data)

⁷³ Pienaar Louw, Western Cape Department of Agriculture

⁷⁴ Drought Policy brief 2018, Western Cape Agriculture. Compiled by the Western Cape Department of Agriculture and the Bureau for Food and Agricultural Policy

⁷⁵ Quarterly Labour Force Survey, Quarter 4, 2017. StatsSA

⁷⁶ Drought Policy brief 2018, Western Cape Agriculture. Compiled by the Western Cape Department of Agriculture and the Bureau for Food and Agricultural Policy

⁷⁷ SmartAgri Status Quo Summary report.

⁷⁸ SmartAgri Newsletter, December 2017

and rehabilitating the river's watercourses. This approach ensures the "restoration of natural ecosystems including riparian buffers and wetlands" which is a SmartAgri solution. After clearing 1000 ha of invasive plants along the Breede River banks, observations from farmers involved in the project include, increased water availability in the Breede River than the previous year (2016). As a result of the removal of trees, farmers noted that the air flows more freely through the vineyards which has reduced frost.

Globally, greenhouse gas (GHG) emissions from agriculture, forestry and other land use are steadily increasing. They now stand at just under a quarter of global emissions, and future emissions may further increase by up to 30% by 2050⁷⁹. Therefore, in the agricultural sector there is potential for mitigation through an enhancement of GHG removals and emission reductions through management of land and livestock and demand-side management.

Despite the high global emissions, the agricultural sector accounts for only 2% of energy consumption in the province. The National Greenhouse Gas (GHG) Inventory (2000-2012)⁸⁰ attributes 6.2% of national GHG emissions to the Agriculture, Forestry and Other Land-use sector, a decrease from 10.6% of national emissions in 2010. The agriculture sector of the Western Cape accounts for 4%⁸¹ of the province's total energy-related emissions in 2015/16 even though we have not completed a full GHG inventory for the province.

In the Western Cape, the agricultural system has proven its resilience to climate variability in the past. Recent disruptions and climate-related disasters such as the 2009 drought and the 2015 – 2018 drought has impacted sector stability and resilience. Similar systems in other parts of the world such as Spain and South Western Australia have recently had significant negative impacts on agriculture as a result of a changing climate.

To respond to climate change in the Agriculture sector the Western Cape has developed an innovative climate change resilience strategy called "SmartAgri", see Box 4. The SmartAgri plan and its proposed actions has changed the service delivery environment of all the programmes of the WCG: DoA and is not only providing a roadmap for climate change support to the Agriculture Department, but has assisted the sector to become climate change resilient. This strategy builds on all the existing initiatives that are contributing to resilience and low carbon management of systems, such as LandCare, FruitLook, Conservation Farming, the Climate Resilience Project and Green Economy initiatives. Climate Smart Agriculture takes a systems approach to securing sustainability and resilience by addressing both adaptation and mitigation in agriculture while providing economic, ecological and social benefits.

Additional supporting policies and initiatives also aim to enhance climate responses to a certain degree, such as through the WC Green Economy Strategy Framework (2013).

SMARTAGRI

SmartAgri – 'Smart Agriculture for Climate Resilience' is a sector climate change response plan developed in partnership between the WCG: DoA and WCG: DEA&DP. The launch of the SmartAgri plan announced the end of a 20-month long project and a plan of proposed action to lead the agricultural sector to being more climate change resilient.

SmartAgri continues to play a major role in the agricultural sector in emerging and existing projects and platforms as the increasing devastation of the drought (2015 - 2018) continues to impact the sector. Since its launch, the SmartAgri plan has been communicated and work shopped with various stakeholders in the agricultural sector. The plan has landed in strategic discussions and decision making of various organisations and commodities and has undoubtedly contributed to make stakeholders more climate change ready and resilient and increase their ability to take decisions bases on science based information and knowledge.

⁷⁹ SmartAgri Status Quo, 2016

⁸⁰ Department of Environmental Affairs, 2017. South Africa's 2nd Annual Climate Change Report. Pretoria: Department of Environmental Affairs

⁸¹ Western Cape Energy Consumption and CO₂ Emissions Database Reports (2015/16 Data)

The Drought Dialogue hosted by the WCG: DoA in mid-2016 built on the SmartAgri plan and aimed to address and discuss the drought, lessons learnt and ways to mitigate future drought conditions and thereby increase the resilience of the sector. The multi stakeholder dialogue identified 32 high-priority, actionable interventions for the WCG: DoA to strengthen the response to current and future droughts. Within these priorities, five areas were highlighted for immediate action. The five priority areas are closely aligned with the SmartAgri Plan and is outlined below:

- Bridging finance to keep farmers on farms
- Optimise water usage (surface and ground water)
- More accurate predictions of droughts and disasters
- Develop a social security net to support mostly rural communities and agri-workers adversely affected by drought
- Revisit water management and policies currently hampering new infrastructure

An action plan for the five priorities has been developed under the guidance of the Rural and Agricultural Sector Support Committee, in partnership with Agri Western Cape and the African Farmers Association of South Africa. Initially known as the Drought Committee, the Rural and Agricultural Sector Support Committee was expanded to include industries and other stakeholders as a result of the escalated impacts of the drought. SmartAgri is represented on the committee and provides insight into the alignment between knowledge and action on climate change, and the current response to the drought in the agricultural sector. A key output for the committee was the Drought Fact Sheet 2017 for the agriculture sector. Tasked to the SmartAgri team, the document focusses on the cross-cutting aspects of the Western Cape drought which includes scientific information on climatology and hydrology, the impacts on crops and livestock, social welfare, jobs and the overall food system.

PROMOTING CLIMATE SMART AGRICULTURE

Climate Smart Agriculture is one of the primary responses initially being pursued and is also highlighted as a priority in SmartAgri. This approach includes improved soil management techniques, minimising carbon release and maximising carbon sequestration; rehabilitation of ecological infrastructure will also enhance sequestration. Climate Smart Agriculture further focusses on climate adaptation by building farmers' climate resilience, as well as improving livelihoods through poverty reduction. Programmes such as LandCare and ongoing extension support services will continue to promote Climate Smart Agriculture practices.

Through the LandCare initiatives, farmers have and will continue to receive support through extension, awareness campaigns and capacity building exercises as well as with the removal of alien vegetation. In this way the agricultural sector will continue to save water, re-establish natural vegetation in the river riparian zones, improve land use through conservation measures and update farm plans for sustainable farming purposes.

The Climate Resilience Project (CRP) is an initiative from the WCG: DoA to link GreenCape activities to the outcomes of the SmartAgri project. The project was launched during 2017 in collaboration with the Farmer Support and Development Programme and is specifically focused on building climate resilience in small holder farmers through agricultural extension as part of the SmartAgri Priority Project 6 - Climate Smart Agricultural Extension.

The Water Research Commission (WRC) runs various projects in South Africa's water sector in collaboration with academic institutes and other partners. The WCG: DoA has high interests in the outcome of these projects, specifically the outcomes of one of the key strategic areas of the WRC which focusses on Water Utilisation in Agriculture. The projects under this theme are closely related to the concept of Climate Smart Agriculture, a component of the SmartAgri plan. The two projects are "Enabling participation of

emerging farmers in water resources management” and “Water footprint as a sustainability indicator for table and wine grape production”, which is currently still in progress.

Programmes such as FruitLook additionally support farmers’ ability to increase water-use efficiency without compromising production. The programme is an example of the leading role that has been played by the sector in climate change adaptation. The FruitLook programme has had a substantial uptake by many farmers to improve their water efficiency and the tool now covers 123 100⁸² hectares (an increase from 15,468 in 2015). The FruitLook programme has been extended to cover all irrigation areas in the province, to assist farmers to optimise the reduced water allocations during the drought. The tool has been proven to help farmers in improving their water management, create increased awareness of crop development and detecting growth issues⁸². Information and technical support will also be provided to dry land grain and rooibos tea farmers to assist them to change from conventional farming to conservation farming practices with the objective of increasing soil fertility and retaining moisture in the soil. The current drought situation has emphasised the importance of the optimal utilisation of the current limited water resources. The Programme: Sustainable Resource Management of the Agriculture department will provide relevant information to irrigators to assist them to increase their water use efficiency to produce more crops with less water.

PROMOTING FOOD SECURITY AT THE MUNICIPAL LEVEL

Urban and peri-urban agriculture is part of the overall food system, although participation rates by poor households in Cape Town (5% in 2007) and in the province (2%) are very low. However, the Philippi Horticultural Area of Cape Town makes a very important contribution to the supply of fresh vegetables to the city’s supermarkets. Other urban production areas such as the Joostenbergvlakte contribute to the chicken and pork supply. More recently a Food Security and Nutrition Strategy for the Province was commissioned and particularly prioritises urban food security issues.

As seen in Table 8, food insecurity in the Western Cape is variable over time and will be important to continue monitoring in relation to climate change impacts.

RESEARCH ON CLIMATE RESILIENT AND ALTERNATIVE CROPS AND LIVESTOCK APPLICABLE TO THE WESTERN CAPE

The Western Cape can draw on its very strong research and knowledge base on natural resources to devise strategies that strengthen the linkages with agriculture and its productive potential into the future. This will require a targeted focus on better understanding and monitoring such linkages, and improved collaboration between the agriculture, water and biodiversity sectors. The private sector has taken the lead in providing research support, with some areas of research covered by WCG: DoA. An extensive spectrum of research gaps and priorities has systematically been identified through the development of the SmartAgri project and the current list has been shared through the Cape Higher Education Consortium (CHEC). The list will also be shared with other research organisations and commodity groups to incorporate into their respective research programmes.

The challenges associated with climate change and the consequences of the current drought has created a continuously high demand for research and technology development services to assist farmers in sustaining their production against a set of climate challenges. The focus on climate smart research, including minimum or zero tillage for soil conservation, crop rotation for higher production, increased crop cover to prevent evaporation (these are the three pillars of conservation agriculture), judicious fertiliser use, alternative farming practises and possible new and alternative crops for the Western Cape, has intensified. Conservation agriculture in the small grain and potato industry will also be advocated and promoted in focussed technology transfer efforts. The focus on soil health will be intensified. “Soil reform”, and not only land reform, will ensure a sustainable agricultural sector with soil being the most important medium to physically support sustainable crop production and subsequently animal production⁸³.

⁸² Fruitlook Summary Report 2017/18 (2017/18 Data)

⁸³ SmartAgri Update, March 2018

OPPORTUNITIES, GAPS AND RECOMMENDATIONS

- The current potential to respond is hampered by the limited availability and additionally the loss of institutional and human capacity (and institutional memory) in critical areas in government. Research capacity and expertise at municipal decision-making level is limited and collaboration and co-operation is lacking.
- This review has found that, although the agricultural value chain is known to be extremely important in the Western Cape, limited work has been done to assess the impacts of climate change across the value chain. Growth opportunities in the value chain should be well assessed against climate change risks and impacts, including the question of limiting resources (water, energy) required for these activities.
- Focus should be on promotion of carbon sequestration through land-based interventions such as restoration of rangelands, reducing degradation of soils and land cover and promoting conservation agriculture (with partners).
- Continue to promote reduction of energy consumption and switch to renewable and energy efficiency where feasible.
- Transition from measuring carbon footprints to reducing them with appropriate policy support.
- Increased collaboration between agriculture and health with regards to occupational climate change risks of agricultural workers.
- A more integrated approach between agriculture and food security is needed.
- The following have been identified through the SmartAgri project as priority programmes, and these are likely to be an immediate focus, and there will be continued drive for programme development and funding related to these:
 - Conservation Agriculture for all commodities and farming systems
 - Restored ecological infrastructure for increased landscape productivity, socio-ecological resilience and soil carbon sequestration
 - Collaborative integrated catchment management for water yield and quality and job creation
 - Climate-smart energy case studies are needed to inspire the transition to low-carbon agriculture
 - Climate-proofing the growth of agri-processing in the Western Cape
 - Integrated knowledge system for climate-smart agricultural extension



10

ENERGY

The Energy Chapter covers the Renewable Energy, as well as the Energy Efficiency and Demand Side Management focus areas that are discussed in the Western Cape Climate Change Response Strategy, 2014. Transport has a strong link to the energy chapter, particularly in terms of the emissions associated with the use of transport fuels, such as petrol and diesel. The role of transport as part of the total energy and emissions profile is discussed here, but the detail around responses for that sector are addressed in the Sustainable Transport chapter.

The current priority areas for addressing energy efficiency and renewable energy in the Western Cape in a changing climate include:

1. Implementation of building energy efficiency programmes and awareness raising, including improved energy efficiency of WCGs own building stock;
2. Promotion and rollout of solar water heaters (both low and high pressure systems);
4. Development of the renewable energy economy in the Western Cape, in terms of both the appropriate placement of utility scale renewable energy generation as well as manufacturing opportunities; and
5. Development of opportunities around small-scale embedded generation.

Table 9. Energy Indicators for the WCCCRS

HIGH LEVEL CATEGORY	INDICATOR	2012/13	2015/16
GHG EMISSIONS	GHG emissions associated with the energy sector	2012: 36 345 753 tCO ₂ e ⁸⁴	2015: 38 901 581 tCO ₂ e ⁸⁵
ENERGY CONSUMPTION IN THE WESTERN CAPE	Energy Consumption (total)	2012: 276 333 250 GJ ⁸⁴	2015: 299 401 470 GJ
	Sector Breakdown		
	Industry	85 383 982 GJ	87 530 766 GJ
	Transport	146 296 370 GJ	161 817 293 GJ
	Agriculture	6 968 221 GJ	5 092 440 GJ
	Commercial	10 921 301 GJ	14 430 141 GJ
	Local Government	2 111 886 GJ	1 561 059 GJ
	Residential	24 652 305 GJ	28 969 771 GJ
SOLAR WATER HEATERS (SWHS)	Number of SWHS installed in the Western Cape	14 889 HP SWH ⁸⁶	No new data available
RENEWABLE ENERGY	Total energy produced from Renewable sources by independent power producers	421.82 MW ⁸⁷	606 MW ⁸⁸
	Annual values of renewable energy projects financed by national and international funding sources	R 8.024 billion ⁸⁷	R 3.74 billion ⁸⁸
SMALL SCALE EMBEDDED GENERATION	Number of Western Cape municipalities that have implemented SSEG tariffs	4	13 municipalities have approved tariffs, but 19 allow SSEG

GHG EMISSIONS ASSOCIATED WITH THE ENERGY SECTOR

South Africa is the 35th largest economy in the world⁸⁹ but the 15th largest carbon dioxide emitter. This is mainly because the energy intensive economy is largely dependent on carbon-based fuels and the majority of our electricity is generated by coal power stations. As the world takes steps to cost the negative effects of carbon in the global economy, South Africa is likely to face challenges (and opportunities) in reducing emissions.

The National GHG Inventory during 2000 – 2010 attributes 78.9% of national GHG emissions to the energy sector⁹⁰; this has risen to 82.6% in 2012 which is an increase of just under 4% (DEA, 2017⁹¹). The proportional breakdown for the Western Cape is not available.

The WCG has to date concluded three energy consumption and CO₂ emissions data collection exercises in order to understand and track the emissions profile for the energy sector in the Western Cape. These were undertaken in 2012 (based on 2009 data), in 2015 (based on 2012 data) and in 2017 (based on 2015/16 data).

Table 10 highlights the key indicators for the energy sector emissions profile.

When comparing the consumption and emission figures below (Table 10), it shows that although there was a decrease in energy consumption and association emissions between 2009 and 2012/13, there was an increase for 2015/16, with the 2015/16 consumption figure also being slightly higher than in 2009.

Although there is evidence of behaviour change interventions as a response to the rising cost of electricity and the associated increased uptake of energy efficiency and renewable energy interventions for residential, commercial and industrial users, the consumption of energy and associated emissions has risen.

⁸⁴ Western Cape Energy Consumption and CO₂ emissions database report (2015).

⁸⁵ Western Cape Energy Consumption and CO₂ emissions database report (2018).

⁸⁶ GreenCape Market Intelligence Report 2014.

⁸⁷ Green Economy indicator report 2015.

⁸⁸ Green Economy indicator report 2018.

⁸⁹ <http://statisticstimes.com/economy/countries-by-projected-gdp.php>

⁹⁰ The National GHG Inventory emissions proportions are: Energy (82.6%), Waste (4.2%), IPPU (7.2%) and AFOLU (6.0%) – making up 95% of total GHG emissions for the country.

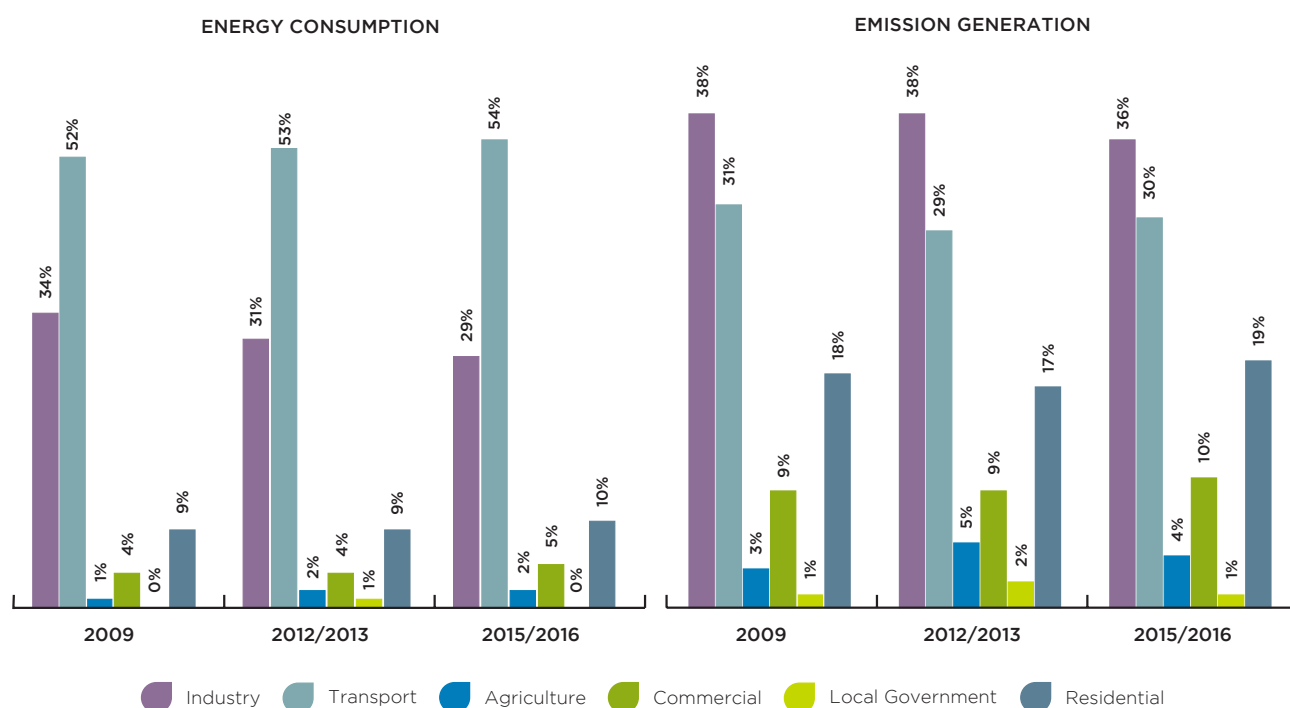
⁹¹ Department of Environmental Affairs, 2017. South Africa's 2nd Annual Climate Change Report. Pretoria: Department of Environmental Affairs

Table 10. Sustainable energy indicators for the Western Cape

KEY SUSTAINABLE ENERGY INDICATOR	UNIT OF MEASURE	PROVINCIAL VALUE (2009)	PROVINCIAL VALUE 2012/13	PROVINCIAL VALUE 2015/16
TOTAL ENERGY CONSUMPTION	GJ	292 342 004	276 333 250	299 401 470
TOTAL ENERGY RELATED GHG EMISSIONS	tCO ₂ e	38 532 296	36 345 753	38 901 581
ENERGY CONSUMPTION PER CAPITA	GJ/capita	64	46	48
GHG EMISSIONS PER CAPITA	tCO ₂ e/capita	8	6	6
ENERGY PER GDP (R' MILL)	GJ/GDP	1 428	679	792
GHG EMISSIONS PER GDP (R' MILL)	tCO ₂ e/GDP	178	89	103

Figure 7 below shows the energy consumption and CO₂ emissions by sector for 2009, 2012/13 and 2015/16. The largest proportion of the energy consumed in the province is the transport sector with 54%, followed by industry at 29% for 2015/16. Across the province the residential sector is only responsible for 10% of energy consumption. This highlights that most of the energy efficiency activities should take place in the industrial and transport sectors, although many of the interventions for the residential and commercial sectors are generally considered to be “low-hanging fruit.”

It is industry, however, and not the transport sector, that contributes the most to the provincial emissions profile at 36%, as it draws from coal-derived electricity as well as fairly large amounts of direct coal consumption. This is followed by the transport sector at 30%.

Figure 7. Energy consumption and CO₂ emissions by sector for 2009, 2012/13 and 2015/16

Electricity, diesel, petrol and coal dominate the mix of fuel consumed in the province, with some shifts in the proportional contribution⁹², with coal consumption decreasing from 22% in 2009 to 17% in 2015/16 and the proportional consumption of petrol and diesel increasing (there was a significant increase in the consumption of diesel between 2009 and 2015/16). However, there was a slight decrease of 1% in the consumption of Jet Fuel. There were no changes in consumption of other fuels such as Paraffin, LPG, HFO and aviation gas between 2009 and 2015/2016.

⁹² This refers to the percentage breakdown of the fuel when compared to the other fuels.

The 2009, 2012/13 and 2015/16 emission proportional breakdown are very similar, showing no significant changes between sectors except the increase of emissions from diesel - 8% in 2009 to 14% in 2015/16. Electricity is responsible for most of the emissions at 60% (up from 55% in 2009). This is followed by the liquid fuels, predominantly linked to the transport sector (petrol and diesel). Electricity is the largest producer of emissions in the Western Cape due to the coal-based electricity linked to the national grid.

Electricity's contribution to emissions should decrease over time with the increase in renewable energy's contribution to the national energy mix. This trend should also manifest in primary coal for industry purposes and liquid fuels for transport as efficiency interventions in these sectors increase. This clearly highlights the sectors that need to be targeted in order to reduce emissions in the Western Cape.

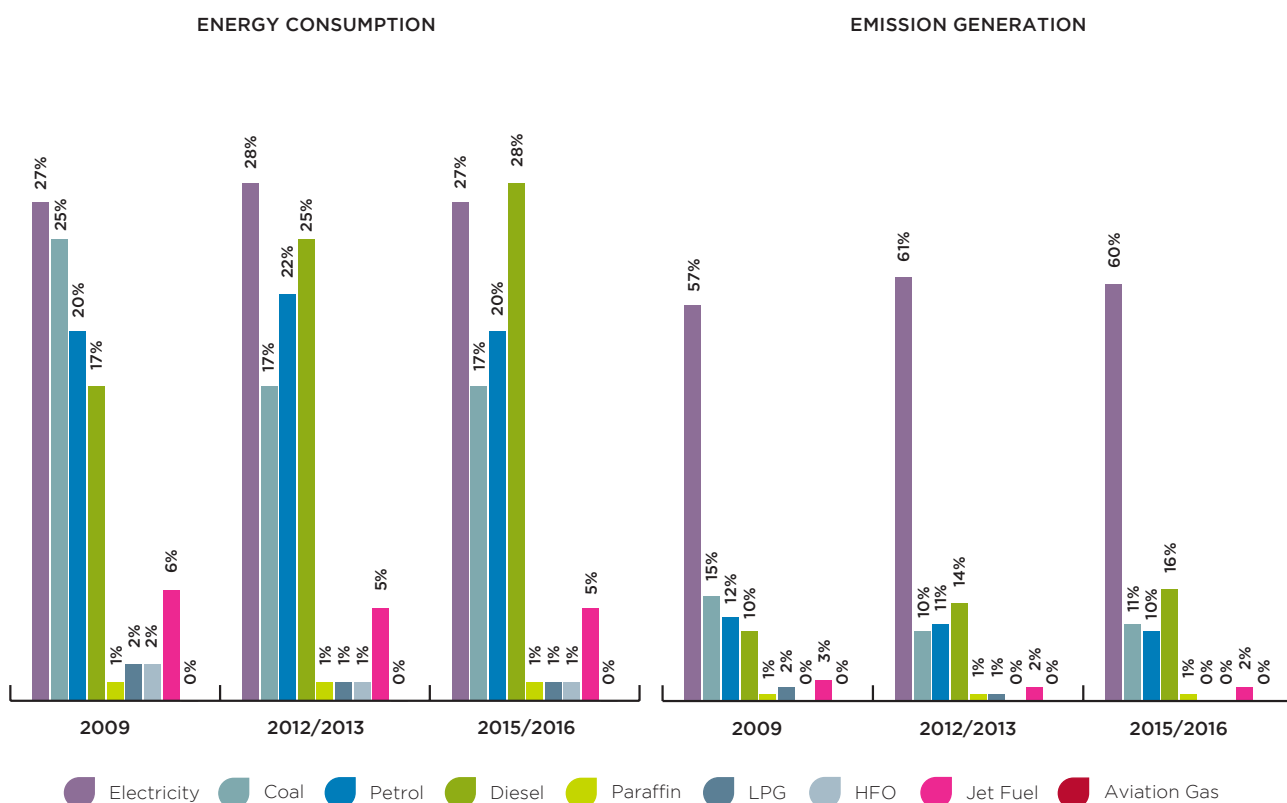


Figure 8. Energy consumption and CO₂ emissions by fuel for 2009, 2012/13 and 2015/2016

ENERGY EFFICIENCY

This indicator in the Western Cape is strongly focussed on public buildings. The WCG annual property efficiency report has been developed to review the WCG office estate. This report includes a chapter on the environmental performance of buildings, with a focus on energy and water management. As part of the modernisation of the WCG office space, there has been a focus on energy efficiency interventions as well as making use of metering technology in order to measure the consumption and potential savings realised as part of the interventions put in place.

Table 11. Key performance data for WCG buildings (energy and water consumption)

TECHNOLOGY	ALL WCG OFFICES			CBD CAPE TOWN OFFICES			NON CBD CAPE TOWN OFFICES			PRIVATE SECTOR AVERAGE		
	2014/15	2015/16	2016/17	2014/15	2015/16	2016/17	2014/15	2015/16	2016/17	2014/15	2015/16	2016/17
WESTERN CAPE PORTFOLIO: NET AREA (M²)	206 524	206 975	212 466	147 834	145 285	149 740	61 690	61 690	62 726	-	-	-
ACCOMMODATED OFFICE STAFF	8 642	8 658	10 034	6 336	6 440	7 804	2 306	2 218	2 230	-	-	-
COST PER FTE	56 148	58 169	72 808	58 031	58 517	75 878	50 206	57 157	70 079	31 418	31 418	47 152
M²/ FTE (M²)	24.3	23.9	26.6	23.3	22.6	20.9	26.8	27.8	31.3	14.7	14.7	20.6
ENERGY CONSUMED PER FTE (KWH)	4 319	3 817	2 854	4 682	4 419	3 817	3 321	2 066	1 997	4 556	4 375	2 490
WATER CONSUMED PER FTE	20.3	26.1	27.2	16.3	20.9	25.4	31.1	39.7	28.8	32	29.7	25.3

CASE STUDY - ENERGY REDUCTION THROUGH BEHAVIOUR CHANGE

In late 2012, the Western Cape Government engaged ideas42 and the University of Cape Town to collaborate a multi-year initiative known as “Changing Behaviour in the Western Cape”. The goal of this initiative was to apply behavioural economics to policy challenges in a variety of areas, ranging from health to education to road safety, by designing and testing behaviourally informed solution to policy issues in each domain. One of the areas of focus for the initiative was climate change, where the partnership focused on the issue of energy use within government – a key part of the Western Cape Government’s “2Wise2Waste” program which encourages environmentally-friendly behaviour by WCG employees.

The aim of this project has been the reduction of energy consumption in Western Cape Government buildings by installing energy meters on each floor of 4 Dorp Street and thereafter using emails as behavioural nudges to incentivise energy savings, saving the Western Cape Government money and contributing to the WCG’s response to mitigation climate change.

Data was collected using floor-level meters (which were installed for the purpose of this project) to create an e-mail campaign involving several key behaviourally informed components including: floor-level competitions, assigning responsibility to key staff targeted information, and timely reminders to address energy consumption in the building. Several ‘packages’ or combinations of these interventions were then tested.

The research showed that a significant reduction in energy consumption of 13.5% was achieved. These are some of the largest reductions in energy use to have been demonstrated using behavioural nudges alone. It is especially noteworthy that these occurred in an office setting with no monetary incentives. Preliminary costing estimates suggest that the costs of the basic infrastructure (meters) for this project would be recovered from reductions in electricity bills in approximately 2 years.

WCG: DEPARTMENT OF HEALTH CASE STUDY

Regular monitoring and reporting of utilities consumption data across the Western Cape hospitals has created valuable and effective data resources to drive future efficiency improvements in the Province’s hospitals and clinics. The initiatives and project was set up by Western Cape Government: Health to understand and monitor the efficiency of utilities consumption for 52 hospital sites with a total area of 1.3 million m². The project has already secured savings and improvements at several sites.

Energy and water consumption represent two very significant resource requirements of the hospital estate and initiatives to understand and reduce wastage can have significant economic and environmental impacts. Around R225 million was spent on utilities across the hospital estate during 2013/14. The monitoring system implemented by WCG: Health recorded data from utilities accounts on a database to equip engineers with insights into performance to prompt further analytical studies. The data resource has facilitated like for like comparison across the estate with internal benchmarking enabling WCG: Health to determine benchmarks and targets for electricity and water consumption. The latter have been included in the WCG: Health Annual Performance Plan where performance is now monitored by the Departmental Monitoring and Evaluation Committee.

The information gathered confirms and pinpoints increases in usage, quickly identifies where wastage is evident and has helped to quantify the impact on consumption of “green” building design in the health sector. At a provincial level the data has highlighted that regional hospitals consume around 5% more energy per m³ than district hospitals but provide just 15% more hospital space per bed.

By using this data and tracking performance, WCG: Health aims to achieve savings in the short term of R7 million per annum. However, the potential for further savings through behavioural change and viable engineering interventions is estimated to be in the order of R30 million per annum.

The initiative clearly demonstrates the value which access to accurate and timely performance has delivered. The information enabled pro-active management of utilities across the hospitals delivering savings, efficiency improvements, and improved healthcare facilities.

MUNICIPAL ENERGY EFFICIENCY

Municipalities also play a key role in implementing energy efficiency through optimising their own operations and encouraging their consumers to implement energy efficiency interventions. The Department of Energy's (DoE) Energy Efficiency Demand Side Management (EEDSM) fund [through the Division of Revenue Act (DORA)] allows municipalities to access funds to retrofit building lighting, street lights and traffic lights. In 2016/17, nine Western Cape municipalities accessed EEDSM funding and ten municipalities would have accessed EEDSM funding by the end of 2020.

Table 12. Energy Efficiency and Demand Side Management Grant for Western Cape municipalities in 2014/15 to 2019/20 (Division of Revenue Bill, 2017).

MUNICIPALITY	ALLOCATION (R'000)	ALLOCATION (R'000)	ALLOCATION (R'000)	ALLOCATION (R'000)	ALLOCATION (R'000)	ALLOCATION (R'000)
	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
CITY OF CAPE TOWN	10 000	12 000	15 000	10 000	20 000	10 000
SWARTLAND	10 000					
KANNALAND	4 000					
HESSEQUA	4 000					
MOSSEL BAY	4 000					
BEAUFORT WEST	4 000	8 000	3 000	6 000	5 024	5 065
STELLENBOSCH		6 000	10 000	10 000	10 000	12 000
OUDTSHOORN		3 000	3 000	4 000		
LAINGSBURG		3 000	3 000	5 000		
GEORGE				7 000	10 000	10 000
TOTAL	18 000	32 000	34 000	42 000	45 054	37 065

The City of Cape Town Energy Efficiency programme covering own operations has resulted in savings of more than R110 million over the past five years. Between 2010 and 2016, the City has saved almost 80 GWh of electricity and 79 000 tons of associated carbon through its municipal operations energy efficiency programme. This is the equivalent of the power needed to operate all of Cape Town's street lights for a whole year. City-wide energy efficiency is central to the City of Cape Town's Energy 2040 goals, which aim for the overall reduction of 37% in carbon emissions; approximately 21% of which can be achieved through energy efficiency alone⁹³. The City also runs an Electricity Savings Campaign, which includes a Solar Water Heater accreditation programme and an Energy Efficiency Forum for the commercial sector.

Other energy efficiency interventions by municipalities include building retrofits, with a particular focus on air conditioning and lighting as well as the use of solar water heaters and solar PV on municipal buildings. For more information, please refer to the Western Cape Energy Consumption and CO₂ emissions database report (2018).

⁹³ <http://www.capetown.gov.za/Media-and-news/City%20of%20Cape%20Town%20targets%20green%20procurement>

SOLAR WATER HEATERS

The national target for installing solar water heaters (SWH), particularly in terms of the low pressure systems had not been met due to delays in finalising the implementing contract with Eskom as well as in finalising the local content verification outcomes projected by the South African Bureau of Standards. The Solar Water Heaters Programme will now be managed by the Department of Energy.

Spending of R 1.2 billion over the medium term (5 years)⁹⁴ on 131 146 SWH is projected. The budget for SWH service providers is included in the Clean Energy Programme, a sub-programme of the Energy Efficiency Programme, and is expected to grow at an average annual rate of 49.8% between 2014-19⁹⁵. The high growth rate can be attributed to slow spending at the inception of the project resulting in the low base in 2015/16. Associated spending on agency and support services in the Clean Energy Programme is expected to grow at an average annual rate of 46.9% over the period.

The City of Cape Town successfully launched its solar water heating accreditation and marketing programme towards the end of 2013. The programme targets the installation of approximately 150 000 SWH. The City has identified the key barrier to uptake of HP SWH as lack of financing and lack of credibility amongst the installers. The City's Residential Solar Water Heater Programme helps residents by carefully vetting solar water heater service providers and accrediting those meeting rigorous standards for their competence, quality of products used, quality of installation, customer service, maintenance and other aspects of their business.

The Energy Security Game Changer's energy efficiency lever supports the City of Cape Town's 2040 energy goal of a large-scale uptake of solar water heaters and heat pumps. Anecdotal evidence raised by the Game Changer questioned the degree to which the energy efficiency standards for buildings was being complied with. A research project was undertaken in the City of Cape Town to determine the level of compliance with SANS10400-XA Energy Efficiency Standard for Water Heating and to understand the barriers to compliance with the regulations. A sample of 400 approved residential building plans, approved between April 2014 and December 2015 was assessed. The results of the survey showed relatively good compliance with the regulations although there is a strong need for further changes need to be made to forms and templates in order to ensure compliance with the regulations. A pilot programme has been implemented in Drakenstein, Saldanha Bay and Stellenbosch, where the checking of compliance will be incorporated into the occupation certificate check and the results shared with the Energy Security Game Changer on a monthly basis.

RENEWABLE ENERGY IN THE WESTERN CAPE

The Western Cape has attracted 606 MW (9%) of the total national REIPPPP procured capacity of 6.4 GW. The electrical energy that will become available from the investments in all the bid windows will equate to roughly 8% of the Western Cape's own energy needs. The Western Cape accounts for 0.6 GW (Table 13 below) of nationally procured capacity through 14 projects [Onshore Wind (8), PV (5) and Biomass (1)]; 0.5 GW (15% of national total) electrical energy capacity is operational, with more than 2554 GWh electricity generated since inception to the end of June 2017, thereby off-setting 2.6 million ton CO₂ emissions. Western Cape renewable energy projects from BW1 to 4, 1S2 and 2S2 will save a gross Eskom grid equivalent of 1.8 million tonnes CO₂ emissions per annum.

⁹⁴ Department of Energy Annual Performance Plan 2016/17

⁹⁵ Department of Energy Annual Performance Plan 2016/17

Table 13: Number and capacity of projects in Bid Window 1-4 of the REIPPPP in the Western Cape.

TECHNOLOGY	BW 1		BW 2		BW 3		BW 4		ALL	
	No. of Projects	Capacity MW	No. of Projects	Capacity MW	No. of Projects	Capacity MW	No. of Projects	Capacity MW	No. of Projects	Capacity MW
ONSHORE WIND	4	102.4	2	226.32	0	0	2	139.66	8	468.38
PV	2	41	2	17.7	1	75	0	0	5	133.7
BIOMASS	1	5	0	0	0		0	0	1	5
TOTAL	7	148.4	4	244.02	1	75	2	139.6	14	607.08

The Western Cape has attracted 14% of the total wind capacity procured in BW1 to BW4, 1S2 and 2S2 under the REIPPPP in South Africa, contributing 0.47GW of the national total 3.37 GW wind power. Of the 14 renewable energy IPPs in the province, wind has the dominant share with 8 IPPs or 77% of total provincial capacity. This is followed by 5 solar PV IPPs contributing 134MW or 22% and 1 biomass IPP at 5MW or 1% of total provincial capacity.

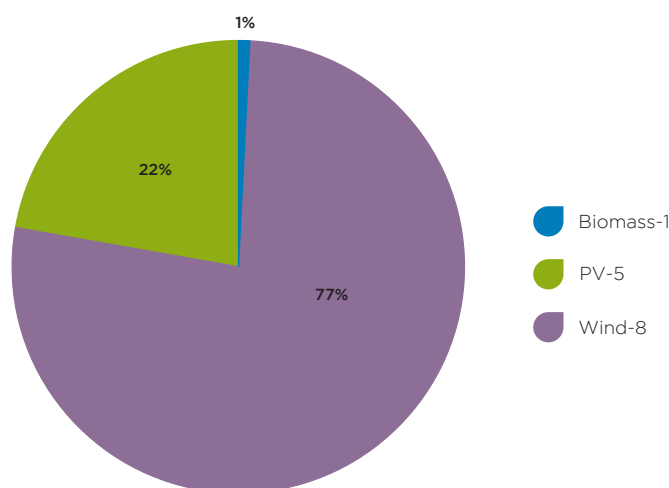


Figure 9. REIPPPP projects in the Western Cape by technology

REIPPPP EMPLOYMENT IN THE WESTERN CAPE

Similar to the rest of the country, employment creation remains a top priority in the Western Cape as well. IPP investments in BW1 to BW4, 1S2 and 2S2 within the province have contributed new employment opportunities for South African citizens estimated to be 11 067 job years over the construction and projected operational life of the plants.

Approximately 10% of the total jobs created for SA citizens under the REIPPPP, in BW1 to BW4, 1S2 and 2S2 (114 266 job years) will be located in the Western Cape.

Notably, 782 (32%) of these new employment opportunities have been retained within local communities (In the province) associated with the respective IPP plants. To date, the opportunities during construction for local community members have significantly exceeded expectations, achieving 167% of what is planned across all 7 BWs.

During the construction phase (2-4 years), the number of people employed on site typically spikes, and then tapers off to a lower and steadier employment number over the extended 20-year operational life of a project. Although lower in numbers, these opportunities are both sustainable and in environmentally friendly firms, thereby contributing to the national objective of creating 'green' jobs, and will accrue over 20 years. At this early stage, 472 job years have already been created by the IPPs that commenced operations.

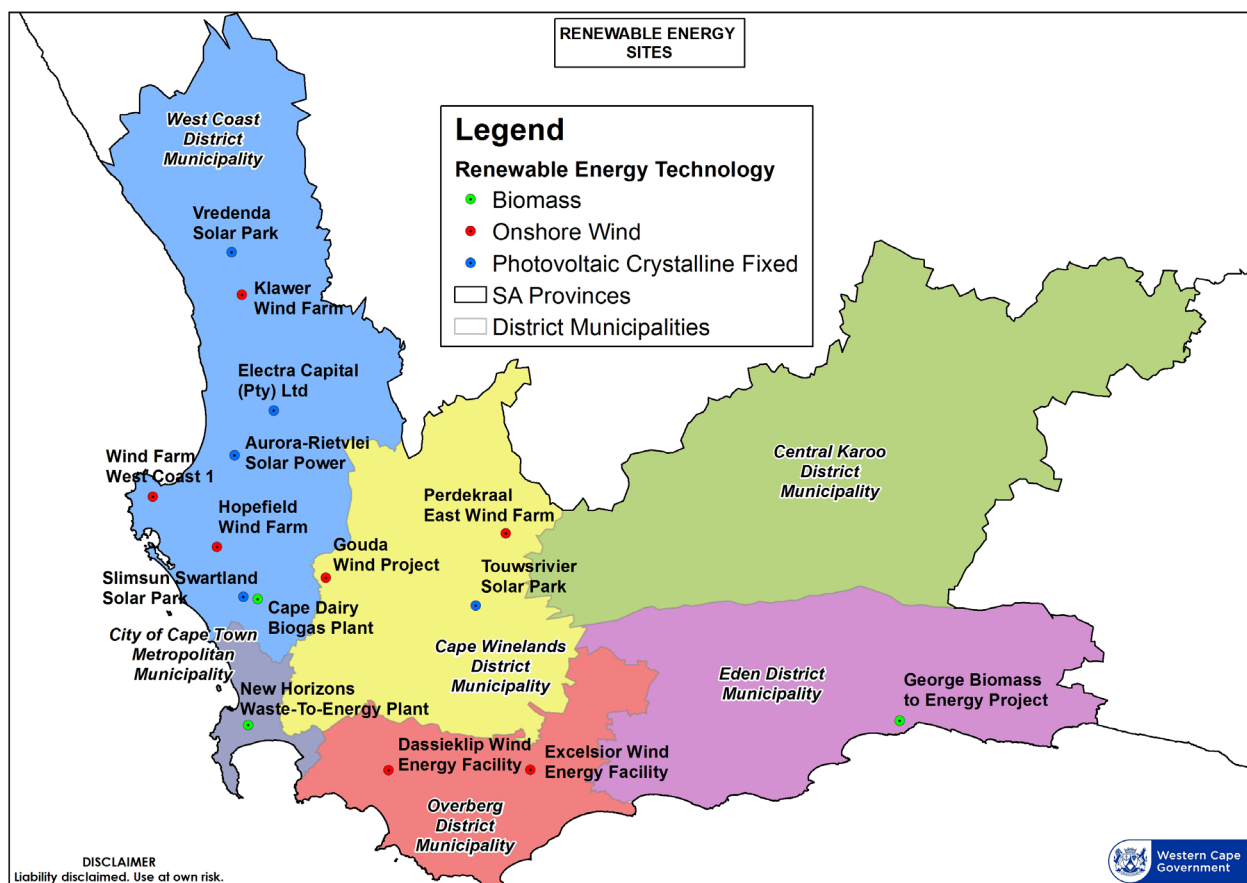


Figure 10. The location of the IPP projects within the province

RENEWABLE ENERGY IN WESTERN CAPE GOVERNMENT BUILDINGS

As part of the Provincial Strategic Plan the Western Cape is engaged in the Energy Efficiency in Government Buildings initiative that has the ambitious target of reducing energy consumption in office buildings by 30% (net of photovoltaic solar generated) by 2020. So far, four provincial government buildings have solar PV systems installed namely:

Table 14. Solar PV installed on Western Cape Government Buildings

ENERGY EFFICIENCY IN WESTERN CAPE GOVERNMENT BUILDINGS (SOLAR PV SYSTEMS)							
BUILDING	OCCUPIERS	CAPITAL COST (R/MILLION)	ESTIMATED ELECTRICITY SAVINGS	AVERAGE SAVINGS AS OF 31 AUGUST 2017 (WINTER MONTHS)	PAYBACK PERIOD IN YEARS	NUMBER OF 315WP PV PANELS	INSTALLED CAPACITY
9 DORP STREET PROJECT	Department of Transport and Public Works	R1,25	R10 643 p/m	R8 991 p/m	8,2	164	51,66 kWp
27 WALE STREET PROJECT	Department of Human Settlements	R0.53	R3 198 p/m	R2 645 p/m	12,5	51	16,07 kWp
LIBRARY BUILDING PROJECT, ALFRED STREET	Department of Cultural Affairs and Sport (Library Services)	R1,76	R10 125 p/m	R7 308 p/m	10,8	240	75,60 kWp
VANGATE SHARED SERVICES CENTRE PROJECT, ATHLONE	Cape Nature (Department of Environmental Affairs and Development Planning) Department of Transport and Public Works (Operator Licensing and Permits)	R2,32	R17 882 p/m	R12 988 p/m	8,6	345	108,68 kWp
		R5.86 Total	R10 462 p/m Average	R7 983 p/m Average	10.025 Average	800 Total	252.01 kWp Total

SMALL-SCALE EMBEDDED GENERATION

Ensuring that the enabling environment for the uptake of small scale embedded generation is in place has been a core focus of the Energy Security Game Changer's Rooftop Solar PV Lever. In order to create a safe and conducive environment for the growth of the SSEG market, the Western Cape Government has been working closely with GreenCape to develop and promote the necessary guidelines, by-laws and tariffs, based on the pioneering work done by the City of Cape Town. Of the 25 local and metropolitan municipalities in the Western Cape, ranging from the smallest (Laingsburg) to the largest metro (the City of Cape Town) the following has developed over the past year in terms of allowing SSEG, SSEG feed-in, the existence of approved SSEG tariffs and SSEG rules, regulations and policies.

With the support and guidance of GreenCape and the Energy Security Game Changer (Table 15):

- 19 municipalities allow SSEG to be installed within the municipal boundaries⁹⁶;
- 12 municipalities allow SSEG to feed into the grid;
- 13 municipalities have SSEG tariffs approved by NERSA; and
- 13 municipalities have SSEG rules & regulations in place.

Table 15. The number of Western Cape municipalities with SSEG regulations and tariffs.

MUNICIPALITY	ALLOW SSEG	SSEG TARIFFS	MUNICIPALITY HAVE A FORMAL APPLICATION PROCESS	SSEG POLICIES
BEAUFORT WEST	Yes	Yes	No	Council Resolution signed
BERGRIVIER	Yes	No	No	In progress
BREEDE VALLEY	Yes	Yes	Yes	Yes
CAPE AGULHAS	Yes	No	Yes	Yes
CEDERBERG	Yes	Yes	No	In progress

CONTINUE

⁹⁶ Five of these 19 do not allow the installations to feed electricity back onto the grid.

MUNICIPALITY	ALLOW SSEG	SSEG TARIFFS	MUNICIPALITY HAVE A FORMAL APPLICATION PROCESS	SSEG POLICIES
CITY OF CAPE TOWN	Yes	Yes	Yes	Yes
DRAKENSTEIN	Yes	Yes	Yes	Yes
GEORGE	Yes	Yes	Yes	Yes
LAINGSBURG	Yes	Council Resolution signed	No	Council Resolution signed
LANGEBERG	Yes	Yes	Yes	Yes
MOSSEL BAY	Yes	Yes	Yes	Yes
OUUDTSHOORN	Yes	Yes	Yes	Yes
OVERSTRAND	Yes	Yes	Yes	Yes
PRINCE ALBERT	Yes	Council Resolution signed	No	Council Resolution signed
SALDANA BAY	Yes	In progress	Yes	Yes
STELLENBOSCH	Yes	Yes	Yes	Yes
SWARTLAND	Yes	Yes	Yes	Yes
THEEWATERSKLOOF	Yes	Yes	Yes	Yes
WITZENBERG	Yes	In progress	Yes	Interim policy

EDEN DISTRICT MUNICIPALITY HEAD-OFFICE GOES SOLAR

Parking lot rooftop PV plant.

Eden District Municipality (Eden DM), officially launched the construction works of a Photovoltaic (PV) Plant at its main building in York Street, George in 2017. The erecting of the 476 solar panels, is foreseen to be an effective way in which the Municipality can save costs in the long run and reduce its carbon footprint, by generating energy to supply its main building, including its 24/7 Disaster Management Centre, with electricity.

Situated in the employee parking area, behind the building, the plant will have a capacity of 150 kW in peak time (11:00 to 14:00). The existing shade cloth parking structures were replaced with more robust structures onto which the solar panels will be mounted. The parking area will still be utilised by the employees.

The PV plant will also operate during an event of power failure. The diesel standby generator that belongs to the Municipality, automatically activates should the power fail. In this case, the generator will only supply power to the extent that the PV plant is not able to supply.

The overall capital cost of the plant is R3.8 million and it is expected that it will pay for itself in 5 to 8 years. The plant has a design life of 20 years, but it is expected that a significant quantity of energy will be supplied well beyond this time.

OTHER WESTERN CAPE GOVERNMENT RESPONSES

The Energy Security Game Changer

The security of energy supply is recognised as having a significant role in the development and resilience of modern economies. Energy security not only relies on the reliability of installed generation, transmission and distribution infrastructure, but increasingly also on the diversity of the energy mix of the region.

The WCG and CCT have identified the availability of quality, reliable and clean energy as a key strategic imperative in supporting continued economic and social development in the province. To this end, the Energy Security Game Changer seeks to ensure the long term energy security through the availability of reliable diverse and low carbon energy to support economic and social growth in the Western Cape by 2020.

Four strategies form the basis of the Energy Security Game Changer:

1. Enhanced uptake of rooftop PV: increase the contribution of rooftop PV to Western Cape electricity supply to 228 MW by 2020;
2. Reduced energy consumption in both public and private buildings: 30% reduction in energy consumption in provincial government buildings by 2020;
3. Enhanced load management: optimally manage the electricity grid in order to reduce peak demand;
4. The rollout of Independent Power Producers and Liquid Natural Gas: increases diversity of electricity supply in the Western Cape through IPPs by 2020.

The Energy Security Game Changer is a joint effort by the Western Cape Government, the City of Cape Town and the five largest non-metro municipalities (Stellenbosch, George, Drakenstein, Saldanha Bay and Mossel Bay), but also with increasing participation of other Western Cape municipalities. Successful implementation depends critically on the continuous engagement and co-operation of multiple stakeholders within both government and the private sector.

RENEWABLE ENERGY TRAINING PROGRAMME

The WCG: DEA&DP is currently running the Renewable Energy Training programme for its second financial year. The project is facilitated by Ithemba Labantu Lutheran Community Centre who was awarded the training contract. The training includes 4 months of theory and 2 months of practical training in the areas of installation of PV panels and associated electrical skills and basic plumbing. Fourteen beneficiaries have graduated from the first round in May 2016 and the 2016/17 funding makes provision to accommodate 10 more beneficiaries. Industry role players were requested to provide recipients with experiential training to ensure employability. After completing the course, recipients are awarded a certificate of competency. The programme responds to the need for upskilling and building capacity for people to enter the renewable energy industry. It therefore contributes to the WCG Energy Security Changer, job creation, entrepreneurship and local economic development.

OPPORTUNITIES, GAPS AND RECOMMENDATIONS

- Facilitating the implementation of the mitigation measures highlighted in the Western Cape Climate Change Mitigation Scenarios for the energy sector report across the sectors.
- Energy consumption is characterised by diversity. There are some highly energy efficient office buildings within the estate but investigation into the performance of the least efficient will undoubtedly uncover significant scope for improvement.
- Inadequate access to data translates into poor transparency and as a hurdle to identifying issues and successfully managing local improvements to consumption. The reliability and access to energy and water consumption data is variable.
- Systems need to be set up to accurately calculate the savings realised through private sector energy efficiency and renewable energy interventions.
- The municipal revenue model needs to be reviewed, as currently a large proportion of municipal revenue comes from electricity sales; this causes a strong disincentive for municipalities to encourage energy efficiency and SSEG. Despite the fact that this issue has been identified so far nothing has been done to address it.



11

WASTE MINIMISATION AND MANAGEMENT

The current priorities for addressing waste minimisation and management in the Western Cape include:

1. Development of waste characterisation profiles for municipalities in the Western Cape;
2. Promotion of the waste economy and identification of opportunities to reduce waste going to landfill; and
3. Development of waste-to-energy generation opportunities for both municipal and private (industrial and commercial) waste systems.

Table 16. Waste Indicators for the WCCRS

HIGH LEVEL CATEGORY	INDICATOR	2012	2014	2015 ⁹⁷	2016 ⁹⁷	2017 ⁹⁷
GHG EMISSIONS	GHG emissions associated with the waste sector	2 348 249 tCO ₂ e (2009)	Data not available	Data not available	Data not available	Data not available ⁹⁸
MUNICIPAL WASTE GENERATION	Municipal solid waste generated annually	3 807 765 tonnes (2012)	Data not available	2 922 788 tonnes	4 067 982 tonnes	3 602 979 tonnes
WASTE DIVERTED FROM LANDFILL	% waste diverted from landfill annually	9% (2012)	39%	38.06%	16.33%	50%

GHG EMISSIONS ASSOCIATED WITH THE WASTE SECTOR

The National Greenhouse Gas (GHG) Inventory⁹⁹ (2000-2012) attributes 4.2% of national GHG emissions to the waste sector¹⁰⁰. This is a decrease of 0.8% compared to the total waste emissions of 5% reported in the GHG Inventory (2000-2010).

⁹⁷ WCG: DEA&DP Directorate: Waste Management

⁹⁸ Extensive work is underway in terms of waste characterisation, there is however currently not sufficient information available to provide an estimate of the waste-related emissions. (Waste-related emissions not available for 2015 - 2017)

⁹⁹ The National GHG Inventory emissions proportions are: Energy (82.6%), The Industrial Processes and Product Use sector (7.2%) (IPPU, the Agriculture, Forestry and other Land use sector (AFOL U) (6.0%) and the Waste sector (4.2%) - making up 100% of total GHG emissions for the country.

¹⁰⁰ International studies have, however, shown that this figure could be as high as 10% in some countries.

Although a complete GHG Inventory will include emissions associated with energy, waste, industrial process and product use and agriculture, forestry and other land use (AFOLU), the Western Cape Energy Consumption & CO₂ emissions database report completed in 2018 only gives an indication of the energy emissions. Due to the difficulties in accessing the data for the other sectors, only the energy related emissions have been updated regularly to date.

MUNICIPAL WASTE GENERATION

Waste generation is a direct result of population and economic growth, increased standard of living and urbanisation. These factors determine the amount of goods manufactured, consumed and eventually the total waste that end up in landfills. In addition to the indirect GHG emissions from the manufacturing of products, the disposal of waste also produces greenhouse gasses. Changing material consumption patterns and prioritising waste management that reduces waste going to landfill will play a role in reducing the GHG emissions associated with the waste sector.

As seen in Table 16, the province generated 2 922 189 tons of waste for 2015, a decrease from the 3 807 765 tonnes generated in 2012 but a significant increase experienced in 2016 (4 067 982.20 tons) compared to both 2012 (3 807 765 tonnes) and 2015 (2 922 189.60 tons). This sharp increase in waste generated between 2015 -2016 is predominantly due to the quality of waste information reporting from municipalities, rather than a true indication of the total waste generated during this period. The quality of waste information is important in waste management planning as this guides waste minimisation initiatives and implementation.

To address the quality of waste information from municipalities, training was provided on using the online waste reporting platform, the Integrated Pollutant and Waste Information System (IPWIS). WCG: DEA&DP also developed the Waste Calculator which has assisted municipalities to document their waste data. Various training sessions have been conducted with municipalities on the use of the waste calculator and the IPWIS tool, which has increased reporting of waste information.

WASTE DIVERSION RATES

The percentage of waste diverted from landfill has increased significantly from 2012 (9%) to 2017 (50%). A sharp decrease is however displayed between 2015 (38.06%) and 2016 (16.33%). The significant drop in the diversion rate during this period can be attributed to incorrect and inconclusive reporting due to inaccurate and missing data from the reports submitted in 2016¹⁰¹.

The increase in the diversion rate from 16.33 (2016) to 50% (2017) is due to improved quality of reporting as a result of increased capacity of municipalities to use the waste calculator and the IPWIS tool. The roll out of various waste minimization activities has contributed immensely to the total waste diverted from landfills. These initiatives are discussed in more detail under Figure 12.

The WCG: DEA&DP completed its Western Cape Integrated Waste Management Plan 2017-2022 (WC IWMP) during 2017 to fulfil the implementation of the National Environmental Management: Waste Act (Act 59 of 2008). The WC IWMP 2017 replaces the 2011 version of the document and aims to guide and improve current and future integrated waste management practises in the province over the short- (2017-2022), medium- (2022-2027) and long- (2027-2032) term. The IWMP prioritises a healthy and sustainable environment and aligns key themes from national and provincial strategies to inform its implementation framework. The IWMP incorporates strategies such as the National Development Plan (2030), the WC Climate Change Response Strategy (2014), the Provincial Strategic Plan (2014 - 2019) and the WCG: DEA&DP Strategic Five-Year Plan (2015 - 2020). These policies identify key actions towards a sustainable and resilient environment and a low carbon society.

¹⁰¹ Annual State of Waste Management Report, Western Cape 2016; Chantal Dryden, WCG: DEA&DP: Waste Management Planning Sub Directorate

The WC IWMP has four strategic goals which informs the implementation plan. Each goal has detailed descriptions with individual objectives, indicators and activities. Goal 3, in particular has strong links to the climate change programme.

Goal 3 of the IWMP focus on achieving a low carbon economy and climate resilient world through the effective and efficient utilisation of resources. The planned activities under this goal contributes to reduced greenhouse gas emissions from the waste sector and include, the development of a municipal Construction & Demolition waste management guideline, the development of a guideline on green waste and engagement with and provide support to “waste-preneurs” in Eden District Municipality. The remaining goals addresses behavioural change, improved integrated waste management planning and compliance.

The National Environmental Management: Waste Act (Act No. 59 of 2008) (NEMWA) promotes integrated waste management through the internationally accepted Waste Management Hierarchy (Figure 11). The Western Cape Integrated Waste Management Plan (2017) is based on this waste hierarchy which sets out the relative value and priority of different methods of waste management with waste avoidance and minimisation as the first option that needs to be applied by all sectors of society.

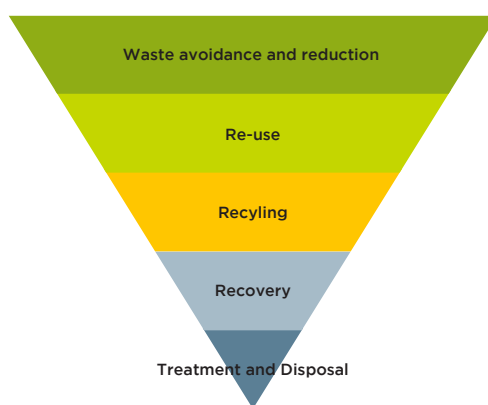


Figure 11. The Waste Management Hierarchy

OPPORTUNITIES TO REDUCE WASTE GOING TO LANDFILL

WCG: DEA&DP is prioritising the diversion of green waste from landfill as an option with significant benefits for reducing waste to landfills and reducing the methane emissions from organic waste. In March 2018, the department finalised and published a Guideline for the Management of Green Waste¹⁰² in the Western Cape. The guideline addresses green waste generated within municipalities, in the forestry and agricultural sectors as well as the clearing of alien vegetation programmes. The guideline includes effective strategies and action plans for the management of green waste, available technologies for the beneficiation potential of green waste, and addressing the challenges faced by municipalities and industries in green waste management. The guideline is a result of a status quo analysis that was completed to understand the current green waste management practises in the province. Workshops to familiarise municipalities with the guideline have been held during 2017, in Worcester, the Eden district and in the City of Cape Town with various municipalities attending in each location.

¹⁰² Green Waste is defined as a subsection of organic waste which refers to organic biodegradable materials such as grass cuttings, leaves, soil, branches, and other woody waste generated from gardens and parks, trimmings from forestry and agriculture, and from the clearing of alien vegetation (Gregg Adams, WCG: DEA&DP: Waste Policy & Minimisation)

Strategies to divert organic waste from landfills also include a provincial policy that is currently being developed that will impose a 50% ban of organic waste in 2022 and a full ban of organics to landfill by 2027. This impending ban will stimulate the beneficiation of organics and the growth of the waste economy. The WCG: DEA&DP Waste directorate developed the Western Cape Waste Awareness Strategy which was published in March 2018.

The strategy aims to identify initiatives that will empower and support municipalities, industries and the public in contributing to the waste management hierarchy and thereby play a large role in influencing behavioural change towards waste minimisation in the Western Cape. Activities suggested by the strategy to enhance and promote waste minimisation falls under the themes of anti-litter, waste minimisation and creating jobs in waste. These activities include signage, brochures, community awareness programs and public place and special events recycling.

Sixty-one percent of municipalities¹⁰³ in the Western Cape have embarked on diverse waste minimisation initiatives that falls within the categories of waste avoidance, reduction and recycling. These initiatives include separation at source programmes, capacity building and awareness workshops, job creation programmes and buy-back and swop-shops projects¹⁰⁴. The latter are community focussed projects and encourage the community to be more actively involved in recycling as they receive direct benefits.

As part of an awareness campaign to educate the public, Stellenbosch municipality has launched a quarterly news publication “Utter Rubbish¹⁰⁵”. The publication aims to inform the public of waste related issues such as waste disposal and a specific focus on waste recycling.

With the aim to assist municipalities to further decrease the amount of waste going to landfills in their districts, WCG: DEA&DP implemented a Waste minimization training programme during 2016 in the Cederberg, Overstrand, Saldanha, Drakenstein, Laingsburg and Beaufort West Municipalities. The department also drafted a guideline for the 2016/17 financial year which focussed on waste characterisation methodology and included guidance on topics such as diverting waste from landfill sites and waste minimisation through recovery, reuse and recycling¹⁰⁶. The various waste minimisation initiatives implemented contributes to the total waste being diverted from landfills. As seen in Figure 12 below, the total waste being diverted from landfills increased from 16% in 2016 to 50% in 2017.

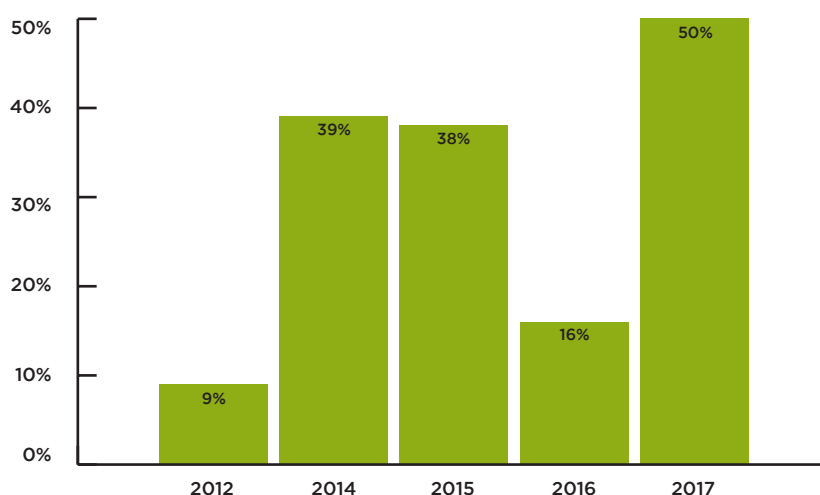


Figure 12. Waste diversion rate (%) 2012 - 2017¹⁰⁷

¹⁰³ The percentage is based on the response from 23 local municipalities and 3 district municipalities.

¹⁰⁴ Annual State of Waste Management Report Western Cape, 2016

¹⁰⁵ The latest Utter Rubbish publication is available from Utter Rubbish, June 2017. Utter Rubbish publications is available on the Stellenbosch Municipality website

¹⁰⁶ Annual State of Waste Management Report, Western Cape 2016

¹⁰⁷ Waste diversion rate for 2013 is not available.

Municipalities started with a consistent record keeping process which helped with finalising data for reporting purposes. The WCG: DEA&DP Waste Directorate has implemented a waste data auditing process during 2017/18 which will continue into 2018/19. This has contributed to increasing the accuracy and quality of waste data recorded and submitted. The increasing quality of the waste information has and will continue to assist municipalities in planning and will be a valuable asset in drafting their IWMP's. Accurate and consistent reporting improves the quality of waste information submitted for provincial and national reporting. This enables that a more accurate and correct waste emissions picture can be created.

PROMOTION OF A WESTERN CAPE WASTE ECONOMY

Waste has increasingly been receiving more attention due to its economic contribution and potential as well as waste-to-energy generation opportunities. In addition to the waste streams that is currently contributing to the economy, GreenCape has identified a total of 13 waste streams that can be explored though economic opportunities¹⁰⁸. Tapping into the full economic potential of waste recycling would increase the waste from landfill diversion rate, impact the total GHG gas emissions produced, create job opportunities and secure investment in the province and the specific municipal areas. Creating an enabling environment for this growth remains a challenge but can be addressed through municipal partnerships with private enterprises, the creation of markets for waste products and the inclusion of waste pickers in formal plans¹⁰⁹.

SUPPORT PROGRAMME FOR SMALL, VERY SMALL AND MICRO ENTERPRISES IN THE WESTERN CAPE

Recognising the important contribution from small businesses in the waste minimization landscape, the Western Cape government embarked on a support programme for Small, Medium and Micro-sized Enterprises (SMME's) during 2016/17. The programme contributes to reducing emissions from the waste sector through creating an enabling environment for SMME's to play a long-term role in reducing the total waste going to landfills through waste minimization and recycling.

The pilot programme focussed on 15 active entrepreneurs in the waste industry located in local municipalities outside of the City of Cape Town. The local municipalities included Grabouw, Piketberg, Worcester, Riviersonderend and Villiersdorp. The pilot programme focussed on the capacity development of SMME's in the province and creating an enabling environment for SMME's that supports their role in the Green Economy of the province.

The majority of these enterprises lack formal entrepreneurial training, skills and compliance information. This affects their capacity to tender for municipal and private contracts and thus decreases exposure to wider market opportunities. As a result, these enterprises are vulnerable to stagnant growth or going out of business.

The programme consisted of a training programme for the entrepreneurs and a full business diagnostic. Other aspects of the programme include:

- Capacitate businesses with current compliance and waste minimisation requirements
- Register businesses on supplier database
- Assist business with tax registration
- Accessibility to resources and markets

¹⁰⁸ GreenCape Waste MIR 2017

¹⁰⁹ Western Cape Government Provincial Treasury: Provincial Economic Review and Outlook 2017

The training programme includes:

- Business mentorship
- Entrepreneurial skills training
- Financial management
- Marketing

The programme have been extended to 10 small and micro waste enterprises in the Eden District Municipality for the 2017/18 financial year and will continue to play a role in waste diversion in the Western Cape.

MUNICIPAL AND PRIVATE WASTE-TO-ENERGY GENERATION OPPORTUNITIES

The environmental thresholds for waste-to-energy projects triggering environmental authorisations are small and require multiple environmental authorisations. Twelve waste-to-energy facilities, which include anaerobic digesters, biogas, biomass fuel combustion and pyrolysis, have been licensed in the Western Cape, of which a number are in the agricultural sector. During 2017, the New Horizons Energy plant was opened in Athlone, Cape Town. The plant, emphasised as the first of its kind in Africa, is able to process municipal solid waste, wet trade waste and pure organic waste into energy and recycled by-products.

Local municipalities Stellenbosch and Drakenstein located in the Cape Winelands district, are currently investigating the feasibility of waste-to-energy facilities. Stellenbosch municipality has undertaken a feasibility study into a waste-to-energy facility, while Drakenstein municipality has entered into a Public Private Partnership agreement with Interwaste to develop a waste-to-energy facility for the region. A concern for the proposed waste-to-energy facility in Drakenstein municipality is insufficient waste totals generated to make the facility financially viable¹¹⁰.

Details on the City of Cape Town's waste to energy projects can be found in Box 9. Waste to energy projects are being investigated as part of the City's Integrated Waste Management Strategy.

METHANE

Waste disposal facilities are one of the largest anthropogenic sources of methane (CH₄). Landfill methane is produced when organic materials are decomposed by bacteria under anaerobic conditions. Methane production varies greatly at each facility depending on site-specific characteristics such as waste quantities, composition, moisture content, landfill design, operating practices and climate. Unless captured first by a gas recovery system, methane generated by the disposal facility is emitted when it migrates through the landfill cover. During this process, the soil oxides approximately 10% of the methane generated and the remaining 90% is emitted. Methane is a powerful GHG with approximately 72 times as much global warming potential than CO₂ over a 20-year period.

Due to the significant production of methane from waste disposal facilities, it has become imperative to minimize the production of this gas from these facilities as methane is also a health and safety concern at waste facilities. In order to minimise the total methane produced at waste facilities, WCG: DEA&DP started a landfill gas monitoring project. The project includes a component of preliminary methane specific determination and aims to produce baseline data for landfill gas at waste disposal facilities. The results of the landfill gas monitoring are compiled in a Landfill Gas Report and communicated to the relevant municipalities.

Among the facilities tested during 2017 through the preliminary methane specific determination component of the landfill gas monitoring project during, the Gwaing waste facility recorded the highest levels of methane (17.5% with a follow-up of 15%,) with the majority of facilities producing no measurable levels of methane gas.

¹¹⁰ Western Cape Integrated Waste Development Plan 2017 – 2022

The high increase in methane levels at the Gwaing Waste facility in the Eden district, can be associated with the significant increase in waste generated in the district between 2016 and 2017 as seen in Table 20. The relevant municipalities were alerted to these significant levels, and the Department requested that relevant mitigation measures be put in place to manage the high levels of methane gas.

The information is assisting municipalities to implement mitigation measures or conduct additional studies on the methane levels at their facilities. The impact of the measures implemented can be seen from the difference in the monitoring results between 2016 and 2017.

The City of Cape Town's Department of Solid Waste Management launched a landfill gas flaring project at the Coastal Park and Bellville South landfills in March 2018. The gas extraction and flaring system reduces greenhouse gas emissions. In addition, the methane from the waste facility will be converted to energy that will be used for electricity generation. This will further reduce the emissions produced at the facility.

The project was implemented via the United Nations-approved Clean Development Mechanism (CDM), which is a mechanism of the Kyoto Protocol. The mechanism allows developing countries to implement approved carbon offsetting projects which developed countries may invest in by purchasing "carbon credits". The City plans to develop a similar system at the Vissershok South landfill.¹¹¹

WASTE CHARACTERISATION PROFILES FOR MUNICIPALITIES IN THE WESTERN CAPE

The characterisation of waste is not only a key requirement for successful waste planning, but for understanding the GHG potential from this sector. The characteristics for the Western Cape waste streams are shown in Figure 13.

Waste characterisation training sessions have been done in various local municipalities including Breede Valley, Mossel Bay, Matzikamma and Drakenstein municipality. Waste characterisation studies have also been undertaken in municipalities and include the local municipalities of Elim, Beaufort West and Cape Agulhas municipality.¹¹²

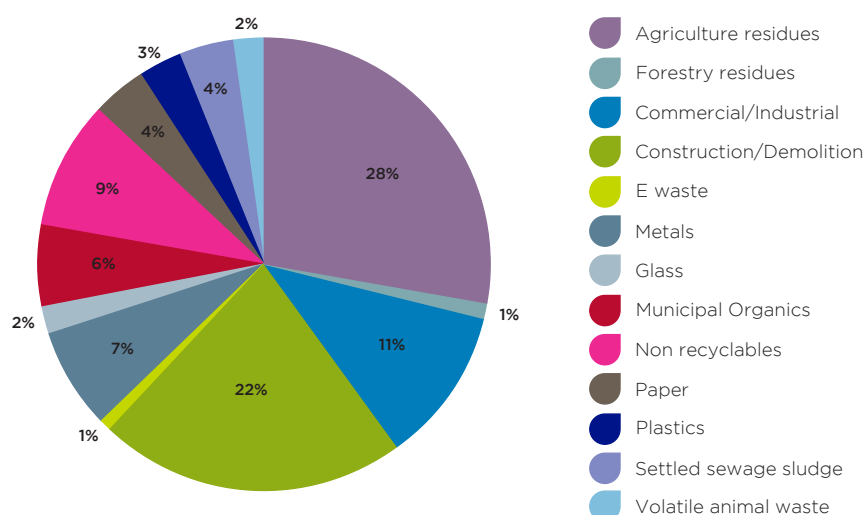


Figure 13. Waste stream analysis for the Western Cape (2016)¹¹³

¹¹¹ <https://www.timeslive.co.za/news/sci-tech/2018-03-02-cape-town-dump-produces-first-gas-with-electricity-in-the-pipeline/>. Accessed on 12 March 2018

¹¹² WCG: DEA&DP Waste Directorate, 2018

¹¹³ WCG: DEA&DP Waste Directorate, 2018

Table 17. Estimated waste generation in Western Cape District Municipalities (2015 - 2017) ¹¹⁴

METRO AND DISTRICT	ESTIMATED MASS (T) OF WC WASTE GENERATION (2010) ¹¹⁵	ESTIMATED MASS (T) OF WC WASTE GENERATION (2015)	ESTIMATED MASS (T) OF WC WASTE GENERATION (2016)	ESTIMATED MASS (T) OF WC WASTE GENERATION (2017)
CCT	2 670 836	2 176 701.15	3 088 448.25	2 801 306.50
WEST COAST DISTRICT	190 004	153 054.38	180 334.69	208 586.55
CAPE WINELANDS DISTRICT	453 505	430 896.16	574 773.98	184 459.42
OVERBERG DISTRICT	151 618	110 157.19	131 033.94	142 742.35
EDEN DISTRICT	302 745	46 398.95	89 993.16	260 811.62
CENTRAL KAROO DISTRICT	38 066	5 579.77	3 943.53	5 914.79
TOTAL	3 807 765	2922787.60	4 067 982.20	3 602 979.23

Table 17 displays the estimated waste generated in the Western Cape District Municipalities during the period 2015 – 2017. Cape Winelands experienced the largest decrease (39 0314.56 tons) in total waste generated between 2016 (574 773.98 tons) and 2017 (184 459.42 tons). Eden experienced the largest increase (170 818.46 tons) in the total waste generated between 2016 (89 993.16 tons) and 2017 (260 811.62 tons).

THE WESTERN CAPE INDUSTRIAL SYMBIOSIS PROGRAMME (WISP)

The Western Cape Industrial Symbiosis Programme (WISP) is a free facilitation service that connects companies so that they can identify and realise the business opportunities enabled by sharing unused or residual resources (materials, energy, water, assets, logistics and expertise). WISP uses various tools to engage with companies including Business Opportunity workshops, individual company meetings and site visits, as well as awareness raising at industry events. These methods allow WISP to build a network of companies and identify underutilised resources which could lead to business opportunities for member companies.

The City of Cape Town has funded the programme since the 2016/17 financial year, initially co-funding with the Western Cape Government Department of Economic Development. The City of Cape Town will be the sole funder for the financial year 2017/18).

Playing a major role in diverting waste from landfill, the programme has to date diverted 27 800 tons of waste from landfills which amounts to 82 300 tonnes of greenhouse gas emissions saved. This is equivalent to a total emission saving from the electricity generated by 11 (2.2MW) wind turbines in South Africa. More information on the achievements of WISP can be seen in Table 18 below. There has been consistent growth since the implementation of the WISP programme in 2013. The largest growth is seen between Year 2 (2014/15) and Year 3 (2015/16), with an increase of 1018 tonnes of waste diverted from landfills during this period. A further increase of 953 tonnes of waste was diverted from landfills during Year 3 (2015/16) and Year 4 (2016/17).

¹¹⁴ WCG: DEA&DP Waste Directorate, 2018

¹¹⁵ WCCCRS Biennial Monitoring & Evaluation Report 2015/16

Table 18. Aggregated list of verified outcomes of WISP

KEY PERFORMANCE INDICATORS		YEAR 1 (2013/14)	YEAR 2 (2014/15)	YEAR 3 (2015/16)	YEAR 4 (2016/17)	CUMULATIVE TO DATE (2013 - 2018)	ESTIMATED 5-YEAR IMPACT
WASTE DIVERSION (TONNES)		59	339	1 357	2 310	27 800	7 900
ADDITIONAL REVENUE (R MILLION)		2.90	1.28	1.47	6.0	25.3	18.2
COST SAVINGS (R MILLION)		2.70	2.30	3.14	4.0	18.7	15.4
PRIVATE INVESTMENT			100 000	-	-	640 000	-
FOSSIL GHG SAVINGS (TONNES (CO ₂ E))		1 100	1 500	2 800	4 644	82 300	12 600
JOBS CREATED	PERMANENT	4	6	2	25	25	80
	INDUCED	0	1	3	81	121	
	TEMPORARY	11	0	3			25
	INDIRECT	0	2	3	0	20	

OPPORTUNITIES, GAPS AND RECOMMENDATIONS

- There is a strong move towards considering waste as part of the circular economy, where resources and materials can be re-used and recycled, returned back to the economy and used again to create a closed-loop production system. To realise the potential of these so-called secondary raw materials, we have to remove the existing barriers to the trade, improve the waste management practices and guarantee high quality standards.
- There is a need to understand the role that solid waste plays in the GHG emission profiles for the Western Cape. Although this is a small proportion in comparison to the energy sector, there are a number of opportunities for this sector and every contribution that is made can add to emissions reductions.



12

SUSTAINABLE TRANSPORT

The current priorities for addressing sustainable transport in the Western Cape, include:

1. Promotion of public and non-motorised transport, including the development of appropriate infrastructure;
2. Investigation of opportunities for alternative transport fuels, including biofuels;
3. Awareness raising and behaviour change programmes and transport models; and
4. Government vehicle fleet efficiency programmes.

Table 19. Sustainable transport Indicators for the WCCCRS

HIGH LEVEL INDICATORS	INDICATOR	2012/13	2015/16
GHG EMISSIONS	GHG emissions associated with the transport sector	10 455 847 tCO ₂ e ¹¹⁶	11 574 860 tCO ₂ e ¹¹⁷
PUBLIC TRANSPORT	% of commuters who use public transport as main model of transport	46% (2013) ¹¹⁸	No updated data available
NON-MOTORISED TRANSPORT	% of commuters who use non-motorised transport (NMT) as main model of transport	19% (2013) ¹¹⁹	No updated data available
INTEGRATED PUBLIC TRANSPORT NETWORK	No of municipalities with Integrated Public Transport Networks (IPTNs)	2 (Cape Town and George)	2 (No new IPTNs)

GHG EMISSIONS ASSOCIATED WITH THE TRANSPORT SECTOR

Although transportation is a key sector in the Western Cape economy, the sector is currently extremely inefficient from a cost, energy, emissions and lifestyle perspective. The harmful effect that transport has on the environment as well as its socio-economic inadequacies, are of great concern. Herein lies a great opportunity as the sector has huge potential for reducing GHG emissions, given that it is responsible for

¹¹⁶ Western Cape Energy Consumption and CO₂ emissions database (2012/13) (WCG: DEA&DP, 2013).

¹¹⁷ Western Cape Energy Consumption and CO₂ emissions database (2015/16) (WCG: DEA&DP, 2018).

¹¹⁸ Update of the Western Cape 2016/17 – 2020/21 Provincial Land Transport Framework (WCG: TPW, 2016).

¹¹⁹ Update of the Western Cape 2016/17 – 2020/21 Provincial Land Transport Framework (WCG: TPW, 2016).

54% of the energy consumption in the Western Cape¹²⁰. Requirements for diminished GHG emissions and improved air quality, coupled with potential limitation on the supply of fuel, are the drivers promoting an energy-efficient transport system.

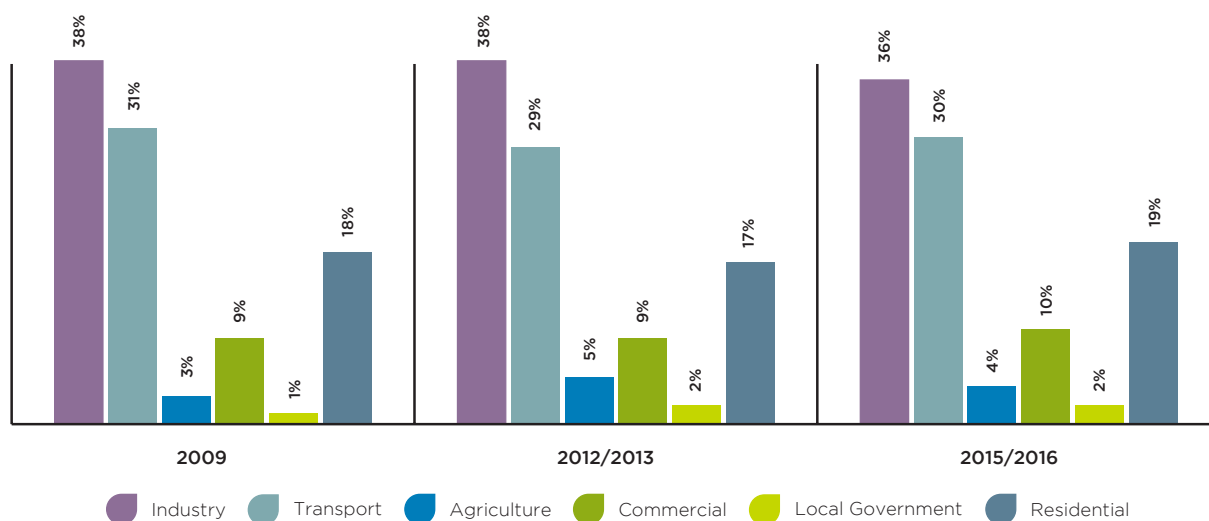


Figure 14. Emissions by Sector for the Western Cape (CO₂e)

The transport sector is responsible for 30% of Western Cape energy related GHG emissions. National roads traversing a district cadastral boundaries have a profound effect on energy consumption in the area, as can be seen for Central Karoo district in Table 20, where 83% of energy consumed in the district is by the Transport Sector¹²¹. This is as a result of the intensive use of the N1 and N12 national roads that run through this district, which includes freight activities. The land transport sector is also responsible for more than 50% of energy consumption in the Overberg and Eden districts. A national road runs through these districts, which increases liquid fuel use that is outside the management control of local municipalities.

Table 20. Energy consumption and emissions per district for the transport sector

	CITY OF CAPE TOWN	CAPE WINELANDS	OVERBERG	EDEN	CENTRAL KAROO	WEST COAST
TRANSPORT SECTOR CARBON EMISSIONS AS% OF DISTRICT TOTAL	37%	16%	19%	39%	56%	10%
TRANSPORT SECTOR ENERGY CONSUMED AS% OF DISTRICT TOTAL	68%	38%	44%	68%	83%	12%

¹²⁰ Western Cape Energy Consumption and CO₂ emissions database (2015/16) (WCG: DEA&DP, 2018)

¹²¹ The energy data for transport fuels as collected for the Western Cape Energy Consumption and CO₂ emissions database is based on fuel sales in a particular magisterial district (then converted into municipal boundaries). This, therefore, doesn't give an accurate reflection of the fuel consumption in the area, and in some areas this may skew the fuel use picture for a particular area, such as Central Karoo.

Figure 15 presents the proportional consumption of energy by the transport sector across the City of Cape Town and the five districts in the Western Cape and highlights the City of Cape Town as the largest consumer of energy in the transport sector. Seventy-two percent of energy consumed by the transport sector takes place in the City of Cape Town. This is strongly linked to the majority of Western Cape's population residing and working in the City of Cape Town as well as the economic contribution of the region.

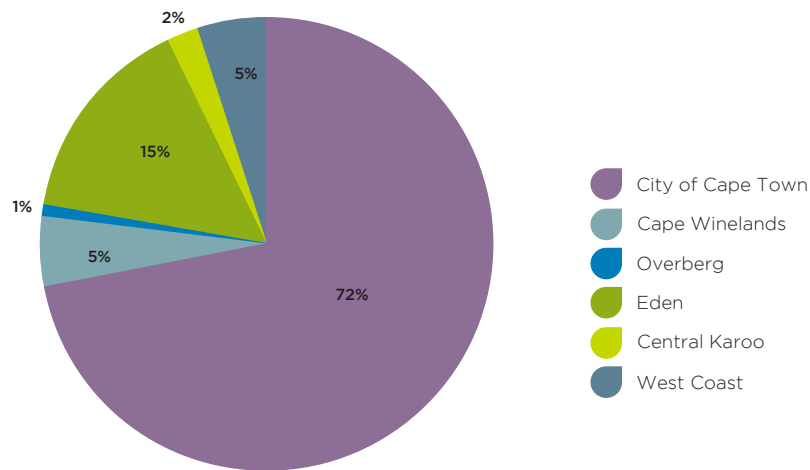


Figure 15. Percentage of provincial land transport energy used per district

PROMOTION OF PUBLIC AND NON-MOTORISED TRANSPORT

A strategic goal of the Province is to enhance mobility and access in municipalities through the development, implementation and management of incremental public and non-motorised transport networks – Integrated Public Transport Networks (IPTN) – especially in priority non-Metro areas of the Western Cape, incorporating both the principles of the Provincial Public Transport Institutional Framework (PPTIF) and the lessons learnt through the George IPTN process.

Support for non-motorised transport (NMT) is a key strategy for the Province. It is however the role of local and district municipalities to identify projects for consideration in planning and funding processes. Non-motorised transport route facilities have been constructed in a number of urban and rural locations in the Province, some serving specific users (such as scholars) or purposes (such as access to public transport) and others providing for general mobility in urban and rural areas.

As is the case nationally, the largest modal shift in Western Cape's passenger transport during the last decade has been the decline in the share of NMT from 42% in 2003 to 19% in 2013 and the increase in the share of minibus taxis (10% - 26%) and private cars (from 32% - 37%) between 2003 and 2013.

Table 21. Modal Split by transport mode in districts

	CITY OF CAPE TOWN	CAPE WINELANDS	OVERBERG	WEST COAST	EDEN	CENTRAL KAROO	TOTAL
TRAIN (2013)	14%	5%	1%	2%	1%	2%	11%
BUS (2013)	18%	2%	4%	4%	5%	5%	7%
BRT (2013)	1%	0%	0%	0%	0%	0%	0%
MINIBUS TAXI (2013)	26%	21%	14%	24%	35%	35%	26%
CAR (2013)	37%	45%	47%	43%	26%	26%	37%
NMT (2013)	14%	27%	34%	27%	33%	33%	19%
PASSENGER MODAL SPLIT (NOT INCL. NMT) [PRIV:PUB 2003]	54:46	58:42	59:41	58:42	67:33	68:32	55:45
PASSENGER MODAL SPLIT (NOT INCL. NMT) [PRIV:PUB 2013]	43:57	63:28	71:29	59:41	39:61	49:51	46:54

From Table 21 it is evident that private cars have become the dominant mode in most districts in 2013 apart from the Overberg, Central Karoo and Eden where NMT still plays a dominant role. Minibus taxis is a leading contributor in passenger transport in Eden district and increased its share substantially in all districts as well as the CCT. Motorised passenger transport in the Western Cape has shifted from private to public transport since 2003. According to the National Household Travel Survey (2013), 54% of the daily motorised transport trips across the Western Cape were via public transport mode (mainly minibus taxi) in 2013 as opposed to 45% in 2003. In the Cape Winelands and Overberg districts, private cars dominate as the main mode of motorised transport.

To date two municipalities have implemented Integrated Public Transport Networks in the form of MyCiTi in the City of Cape Town and GoGeorge in George. MyCiTi is a bus rapid transit service with a feeder network which forms part of a greater Integrated Public Transport driven economic development strategy of the City of Cape Town that started in 2010. From Atlantis in the north to Hout Bay in the south, and from Mitchells Plain and Khayelitsha in the east to Sea Point in the west, there are currently 46 MyCiTi interconnected routes, serving close to 50 stations and over 350 stops.

The George Integrated Public Transport Network, also known as GoGeorge, is an integrated public transport network that aims to provide a quality public transport service that is reliable, affordable, safe, convenient and accessible that continues to an improved quality of life. GoGeorge currently has 15 routes around the George, with a plan to have 28 routes with more than 700 scheduled stops once fully implemented and operational. Eventually the entire George municipal area will be serviced with a network of routes that will ensure that the majority of the urban population of George will be within a 5-10 minute walk from a bus route. In future, routes will be developed to serve the rural farming areas and link to the neighbouring towns of Knysna, Mossel Bay and Oudtshoorn.

A primary objective of the province is to increase the role of NMT as a key transport mode, and together with the integration between NMT and public transport, is seen as vitally important. NMT should act as the feeder system to public transport, and the ease and convenience with which NMT users can access the public transport system will promote and enhance the utilisation of both modes at the same time. With increasingly high traffic congestion levels in the main cities and towns, effective and efficient public transport systems are being implemented in a structured way.

INVESTIGATION OF OPPORTUNITIES FOR ALTERNATIVE TRANSPORT FUELS, INCLUDING BIOFUELS AND ELECTRIC VEHICLES

Biogas

The United Nations Industrial Development Organisation (UNIDO) has appointed GreenCape to conduct a study to determine the success conditions for biogas projects in the South African context. This study is part of a larger UNIDO waste-to-energy project executed under the auspices of the Department of Environmental Affairs and co-financed by the Global Environment Facility (GEF). The project objective is to promote market-based adoption of integrated biogas technology in small, medium and micro-sized enterprises (SMMEs) in South Africa. Other components of the project include:

- Capacity Building
- Policy and Regulatory Framework review and development; and
- Technology Demonstration

GreenCape's study aims to identify the current success conditions for viable private sector biogas projects that use anaerobic digestion methods and includes an assessment of the technical, legal and financial factors that affect viability. One of the revenue streams for a biogas project that has shown to be most viable is the direct sales of biogas and/or CNG as an alternative fuel replacement for fossil fuels in heat applications or transportation.

Electric Vehicles

There has been a lot of movement around electric vehicles both internationally and in South Africa over the last few years. Electric vehicles will not realise a reduction in the number of vehicles on the road, but may realise some level of transport related emissions reduction. In most cases the vehicles will still be charged through the national electricity grid, which is predominantly based on coal-powered electricity generation, which has a very high carbon potential. The emissions reduction of electric vehicles will therefore not be significant if this route is followed. If the vehicles are charged or the charge is offset through a renewable energy source, this will realise greater emissions savings. The lifecycle emissions associated with the vehicle manufacture and operations will need to be considered.

The Energy Security Game Changer has established a Work Group to investigate electric vehicles in the Western Cape context and are working with the City of Cape Town and GreenCape on taking this work forward. The three areas of work that the Work Group will focus on include: electric vehicles and renewable energy, maximising the benefits of electric vehicles for the South African economy and facilitating the rapid uptake of electric vehicles through regulation and infrastructure rollout.

Electric vehicles in South Africa account for less than 1% of vehicles on the road. This is indicative of a market that is still in its infancy but holds prospects should the right enabler be put in place to support its emergence and growth.

A number of opportunities and barriers have already been identified. These include:

1. Local manufacturing of EV components

Local manufacturing of internal combustion engine (ICE) vehicles is a sector that makes a significant contribution to South Africa's GDP. It is also the sector that holds great potential for employment. There is an opportunity to locally manufacture some of the EV components, but this is not without barriers. With the EV market still in its infancy, Original Equipment Manufacturers have seen no justification to locally manufacture EVs at this stage as therefore is little to no demand. There is however a manufacturing opportunity for motorised vehicles up to L class (i.e. vehicles up to 850kg) and charging infrastructure.

2. Skills support

One of the critical challenges facing the automotive industry is capacity limitations due to a lack/ shortage of qualified skilled labour. A transition towards electric vehicles would require an investment into skills training. Closely linked to this is ensuring that the transition to electric mobility happens with minimal job losses.

3. Charging infrastructure

To date, there are approximately 100 charging stations spread across South Africa with the bulk of the stations located in the Gauteng province. Unlike ICE vehicles that are oil dependent and subject to volatile fuel prices, EVs being powered by energy that is entirely local presents a value to the economy and contribute to energy security. The barrier in this space is the slow pace of infrastructure roll out, particularly fast charging stations, as well as the lack of charging infrastructure standards that industry can adhere to across the board. This is to ensure that the infrastructure is compatible to any vehicle brand.

4. Viable application of EV technology

There are strong reasons to suggest that the best business case for introducing electric mobility is on public transport. Some of the reasons include:

- EVs on public transport platforms makes the technology universally accessible / inclusive (i.e. across all income groups, removing the notion that EVs are only for the elite)
- It gives a city or municipality the ability to move more people with less fuel (i.e. energy efficiency)
- They can help to reduce emissions associated with transport

This is an opportunity that municipalities and public transport providers can tap into.

AWARENESS RAISING AND BEHAVIOUR CHANGE PROGRAMMES AND TRANSPORT MODELS

There are numerous ad hoc programmes underway to promote behaviour change around transport and to raise awareness about alternative transport modes, particularly to encourage commuters to shift to public transport.

The uptake of ride-sharing and carpooling apps, to a lesser extent, has had some impact on the transport sector, with these considered to be disruptive technologies in the transport space. Anecdotal evidence shows that people are giving up their private vehicles in favour of the ridesharing apps, but the negative impact of the technology has been felt. This includes strong opposition from the convention metered taxi industry. It is not yet clear what impact this technology has had on energy consumption and associated emissions for road transport.

GOVERNMENT VEHICLE FLEET EFFICIENCY PROGRAMMES

The Transport Flagship Programme under the National Climate Change Response White Paper includes a Government Vehicle Efficiency Programme that will improve the efficiency of the government vehicle fleet by 2020. It encourages new efficient-vehicle technologies such as electric vehicles, by setting procurement objectives for acquiring such vehicles.

Sixty-one staff members from the Department of Environmental Affairs and Development Planning undertook SMART Driver training, which was developed by the City of Cape Town in 2016 and 2017. The training included a series of interactive presentations and an assessment covering both the theory and practice of Smart Driving. The SMART Driver training focussed on identifying the opportunities to improve driver skills and reduce fuel use, which reduces transport related emissions as well as maintenance costs.

OPPORTUNITIES, GAPS AND RECOMMENDATIONS

- There is a need to undertake a comprehensive and robust science-based climate change response strategy for the transport sector in the province, in order to fully understand and plan for the shift to a low carbon transport system as well as the impact that climate change is and will have on transport infrastructure and planning.
- A better understanding of the uptake of alternative fuels / new vehicle technologies is required in order to understand the mitigation potential for the transport sector. A lot of activities are taking place in the shift to more efficient public transport systems, but there are a number of opportunities for private vehicles and freight in taking this work forward.
- Energy futures modelling undertaken in the CCT showed that the single biggest mitigation intervention for transport, particularly in the short term, would be increasing vehicle occupancy numbers. A better understanding of the interventions that will cause people to make this change is required in order to understand how to roll out a programme to encourage higher vehicle occupancies.
- An assessment of the mitigation measures identified for passenger and freight transport in the Western Cape Climate Change Mitigation Scenarios for the Energy Sector report is required. This can assist in identifying key activities that should be implemented in the short and medium term in order to reduce transport related emissions in the Western Cape.
- A better understanding of the freight sector is required to fully understand its role in the transport sector and its potential for mitigation of GHGs.
- In order to improve the sustainability of the province's transport system the province needs to facilitate a progressive model shift from road to rail and from private to public transport, in order to achieve sustainable mobility.



13

HUMAN SETTLEMENTS

The current WCCCRS priority areas for addressing Human Settlements in a changing climate include:

1. Mainstreaming climate change into human settlement developments;
2. Implementation of energy efficiency interventions in low income houses and communities; and
3. Improving the resilience and adaptive capacity of informal settlements.

Table 22. Human Settlements Indicators for the WCCCRS

HIGH LEVEL CATEGORY	INDICATOR	2015/16	2016/17	2017/18
HUMAN SETTLEMENTS	Percentage of state-subsidised houses built in province that makes use of climate-resilient technologies in the designs (2015/16)	17.4% ¹²²	16.8% ¹²³	5.4% ¹²⁴ (estimate)
HUMAN SETTLEMENTS	Number of state-subsidised houses built in the Province that comply with the updated ¹²⁵ National Norms and Standards for the Construction of Stand Alone Residential Dwellings and Engineering Services (based on the requirements of SANS 10400 XA)	11 604 units ¹²²	11 283 units ¹²³	11 094 units ¹²² (estimate)

In South Africa generally, and the Western Cape in particular, the provision of low-income housing has driven the spatial expansion of towns and cities. The imperative of responding rapidly to housing needs has led the State and developers to search for low cost land, most of which is situated on the periphery of urban areas, for the development of subsidised housing projects. While these projects have substantially increased housing availability, there have been a number of negative aspects that have implications for climate change planning.

¹²² Department of Human Settlements Annual Performance Plan, 2018/19.

¹²³ Calculated based on data in the Department of Human Settlements Annual Performance Plan, 2018/19.

¹²⁴ Calculated based on estimated data in the Department of Human Settlements Annual Performance Plan, 2018/19.

¹²⁵ As of December 2013.

Firstly, evidence indicates that the programme has been unable to keep pace with demand. According to the 2016 Household Survey¹²⁶, 16.5% of households in the Western Cape still reside in informal settlements (down from 18.2% in 2011), of which the vast majority are in urban areas. These informal settlements are vulnerable to floods and fires, exacerbated by their location in flood- or ponding-prone areas and on sand dunes, as well as inferior building materials and/or poorly designed infrastructure. Secondly, most housing projects that are constructed are far from services and amenities. Infrastructure and service delivery to these areas bears large costs for the state, the households, and the environment. These areas tend to be homogeneous (i.e. only low income housing), lacking diversity and resilience.

The impact which human settlement development has on the environment and resource use, coupled with the scale at which delivery is taking place, creates an opportunity and imperative to consider climate change. These considerations are relevant for all existing and planned low income and informal settlements and should aim to improve the resilience, adaptive capacity, and resource dependency of settlements and the urban areas.

MAINSTREAMING CLIMATE CHANGE INTO HUMAN SETTLEMENT DEVELOPMENTS

The Western Cape Government: Human Settlements (WCG: HS) is in the process of developing various policies aimed at making service delivery more sustainable in the long term, focussing not only on financial sustainability, but also on social as well as environmental sustainability. These policies are increasingly explicitly including climate change response, as the current context prescribes it of any sustainable plan. It speaks to all three facets of sustainability:

- Financial losses related to maintaining and servicing settlements under a changing climate and especially during climate-related disaster events;
- the increased social sustainability that climate-proofed settlements offer residents; and
- the climate impacts of human settlement development and operations (e.g. the emissions from building and operating these settlements).

A variety of relevant policies and programmes have recently been developed, or are in development by the WCG, which will assist in setting the platform for a transitioning human settlements sector. These are captured in Table 23.

Table 23. Human settlement policies and programmes relevant to climate change response.

POLICY, PLAN OR PROGRAMME	DESCRIPTION
WESTERN CAPE LAND USE PLANNING ACT 2014 (ACT NO. 3 OF 2014).	Replaces the Land Use Planning Ordinance, and is aligned with National Government's SPLUMA Regulations. It introduces a new order for land use planning and attempts to ensure the effective integration of planning activities across the provincial and municipal governments. LUPA promotes the principles of densification and ensures that sustainability criteria are met.
WESTERN CAPE INFORMAL SETTLEMENT STRATEGIC FRAMEWORK (ISSF).	Focuses on i) how the current informal settlement upgrades can be enhanced; ii) what needs to be done differently and iii) what resources and expertise are required to shift from historical outdated planning methodologies to innovative, alternative and sustainable interventions for informal settlements. The 2030 vision incorporates climate resilience, stating that informal neighbourhoods will be "able to withstand natural shocks and stresses, such as flooding and climate change". Guiding principles include "Plan for climate change, sustainability and resource efficiency"
MAKING BETTER CHOICES: GREEN PROCUREMENT IN STATE-SUBSIDISED HUMAN SETTLEMENTS (2017)	Assists municipalities in, amongst others, i) following procurement processes for the development of housing that result in reduced levels of embodied carbon, ii) the development and housing that minimises exposure to environmental risks and hazards. This should result in developments that have a decreased climate risk. The WCG: HS is in the process of developing an Implementation Programme for this policy.
PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK (PSDF) (2014).	The PSDF includes climate change as an issue to be addressed under the PSDF principle of Sustainability and Resilience , and also identifies it as one of the major future risk challenges the province will face. Various PSDF focus areas are linked to mitigation and adaptation.
FEASIBILITY STUDY FOR ALTERNATIVE AND SUSTAINABLE INFRASTRUCTURE AND SERVICES FOR SETTLEMENTS (2015).	An investigation of the feasibility of alternative sustainable technologies currently on the market in settlement development. The outcomes indicated that in the long term it was financially more sustainable for municipalities to invest in more sustainable settlements using some of these alternative technologies instead of following a "business-as-usual" approach to settlement development.

CONTINUE

¹²⁶ StatsSA: Community Survey 2016 – Provinces at a glance (Report 03-01-03).

POLICY, PLAN OR PROGRAMME	DESCRIPTION
PSDF SPECIALIST STUDY ON THE MUNICIPAL FINANCIAL SUSTAINABILITY OF CURRENT SPATIAL GROWTH PATTERNS (2013).	The results from this study show that it is more financially sustainable for municipalities to pursue compact growth. A follow-up study was done using Mossel Bay Municipality as a case study (see below).
MOSSSEL BAY GROWTH OPTIONS STUDY (2015) ¹²⁷ .	This study included the non-financial impact of different growth footprints on biodiversity, ecosystem services, cultural landscape and agriculture, as well as social facilities and passenger transport; for all factors investigated the results indicate that compact growth is more sustainable than sprawling growth.
LIVING CAPE: A WESTERN CAPE HUMAN SETTLEMENTS FRAMEWORK	This is an overall guide to human settlement development in the Western Cape in the short, medium and long term (up to 2040), and will combat urban fragmentation and sprawl as well as promoting more integrated and sustainable settlement development.
GREEN BOOK (IN DEVELOPMENT)	Similar to the Red Book, the Green Book is being developed to provide planning guidelines for adapting South African settlements to climate change. The target audience is primarily planners at a municipal level involved in spatial planning and land use management. Other disciplines such as disaster risk managers, engineers and environmentalists will also benefit from the guidelines.
DOHS WATER CRISIS RESPONSE POLICY GUIDELINES	In order to combat the impact of the drought and to build resilience the DoHS now requires all successful bidders for Departmentally managed and contracted projects to submit a Water Demand Management Plan for approval, which focusses on interventions to make water use in settlements more sustainable. These include Technical Interventions relating to norms and standards and contractor activities, and Behavioural and Administrative Interventions which include consumer education activities, rain-water harvesting, contract management activities and other recommendations.

In terms of incorporating alternative technologies into human settlement development, the WCG: HS is investigating and encouraging projects that will yield higher quality and more resource efficient settlements.

STATE-SUBSIDISED HOUSES THAT MAKES USE OF CLIMATE-RESILIENT TECHNOLOGIES IN THE DESIGNS

The number of state-subsidised houses built in the province that makes use of climate-resilient technologies in the designs (refer to Table 22) is measured under the WCG: HS strategic departmental goal of promoting innovation and the better living concept. This will be achieved by increasing sustainable resource use through exploring innovative technologies in construction, energy, water and sanitation, and promoting the use of alternatives to achieve the most energy and cost effective development. Table 24 gives the targets for this indicator for the next three financial years. In order to facilitate the implementation of alternative and climate-smart technologies in human settlements, government officials from the Western Cape Department of Human Settlements are receiving training on how to use the Green Building Council of South Africa's **Excellence in Design for Greater Efficiencies** (EDGE) tool. This tool can be used to assess the cost impact on a housing project of including various climate-smart techniques and technologies in terms of reduction of energy consumption, water use, and embodied energy/carbon. The tool also specifically incorporates South African conditions with regard to climate, building regulations and utility costs¹²⁸.

Table 24. Housing targets set by the WCG: HS for the construction of state-subsidised houses built in the Province that comply with the updated National Norms and Standards for the Construction of Stand Alone Residential Dwellings and Engineering Services (based on the requirements of SANS 10400 XA), as well as construction of houses using innovative technology initiatives in construction, energy, water, and sanitation¹²⁹

FINANCIAL YEAR	TARGET NUMBER OF HOUSES CONSTRUCTED AS PER UPDATED NATIONAL NORMS AND STANDARDS	TARGET NUMBER OF HOUSES CONSTRUCTED WITH INNOVATIVE TECHNOLOGY INITIATIVES
2015/16	10 240	3240
2016/17	11 134	600
2017/18	11 094	600
2018/19	9 467	600
2019/20	9 500	600
2020/21	9 500	600

¹²⁷ WCG: DEA&DP. 2015. Mossel Bay Growth Options Study: A study on the municipal financial and non-financial impacts of sprawling vs. compact growth options. Final Report.

¹²⁸ <https://www.gbcsa.org.za/residential-tools/edge/>.

¹²⁹ DoHS Annual Performance Plans, 2015/16, 2016/17, 2017/18 & 2018/19

SANS 10400 XA FOR LOW-COST HOUSING

The national norms and standards for the construction of stand-alone residential dwellings and engineering services have been updated, based on SANS 10400 XA- Energy usage in buildings. As it was judged too expensive for government to implement these standards fully in low-income housing and still deliver housing at an acceptable rate, some concessions have been made, and the National Norms and Standards for the Construction of Stand Alone Residential Dwellings and Engineering Services have been adjusted to include some requirements from the SANS 10400 XA standard. For the standard 40m² house this includes an increased thermal performance over the previous standards (including ceilings, insulation, plastering, reduced window size, etc.), and is accompanied by increased housing subsidy quantum to cover the additional costs.

According to the new standards, all houses in the Western Cape built from 2015/16 onwards are compliant (see Table 22). The targets set by the WCG: HS for the next three years for this indicator are given in Table 25.

Table 25. Housing targets set by the WCG: HS for the construction of houses complying with the updated National Norms and Standards for the Construction of Stand Alone Residential Dwellings and Engineering Services¹³⁰

FINANCIAL YEAR	NUMBER OF HOUSES CONSTRUCTED
2018/19	9 467
2019/2020	9 500
2020/21	9 500

OPPORTUNITIES, GAPS AND RECOMMENDATIONS

- One of the current gaps is that the current human settlement legislation does not explicitly consider climate change in its rollout; however, the development of resources such as the Green Book may help to fill this gap.
- A clearer understanding is required of risk to the sector and what climate resilience means for human settlements.
- With increased rates of urbanization and correlated increases in inequality, the role of human settlements will need to recognise the importance of the Food-Energy-Water nexus, and how to integrate the management of this nexus for improved liveability – noting that improved liveability improves equal access to opportunity to address inequality.



14

BIODIVERSITY AND ECOSYSTEM GOODS AND SERVICES

The current WCCCRS priority areas for addressing biodiversity and ecosystem goods and services in the Western Cape in a changing climate include:

1. Prioritisation, valuation, mapping, protection, and restoration of ecological infrastructure;
2. Landscape initiatives / biodiversity corridors and identification of requirements for climate change adaptation corridors;
3. Biodiversity stewardship; and
4. Mainstreaming of conservation planning into decision making.

Table 26. Biodiversity and Ecosystem Goods and Services Indicators for the WCCCRS

HIGH LEVEL CATEGORY	INDICATOR	2015/16	2017/18
BIODIVERSITY; ECOSYSTEM GOODS AND SERVICES	Percentage of the Climate Change Corridors (CCCs) that fall within conserved areas	2015: Less than 1% ¹³¹	1.07% ¹³²
ECOSYSTEM GOODS AND SERVICES	Number of Ecosystem Goods and Services (EGS) mapped and utilised in planning tools	10 ¹³³	These tools have been incorporated into the Western Cape Biodiversity Spatial Plan Handbook. As part of the "cost surface" calculations, a layer of features important for CC adaptation of biodiversity was utilised.
BIODIVERSITY	Integration of biodiversity priorities in municipal Spatial Development Frameworks (SDFs)	Not adequately integrated: 34% Adequately integrated: 34% Excellent integrated: 31% ¹³⁴	Not adequate: 10% Adequate: 0% Excellent: 90% ¹³⁵
ECOSYSTEM GOODS AND SERVICES	Number of wetlands rehabilitated per year	2013/14: 20 2014/15: 29 2015/16: 25 ¹³⁶	2016/17: 32 2017/18: 34 ¹³⁶

¹³¹ CapeNature, 2015. CNC Reserves. Western Cape Nature Conservation Board; CapeNature 2015. Stewardship Sites - 2015 (Signed and Declared). Western Cape Nature Conservation Board; SANBI 2010. Formal Protected Areas. SANParks.

¹³² CapeNature, 2017. CNC Reserves. Western Cape Nature Conservation Board; CapeNature 2017. Stewardship Sites - 2017 (Signed and Declared). Western Cape Nature Conservation Board; SANBI 2011. Formal Protected Areas. SANParks.

¹³³ Genevieve Pence, CapeNature, pers. Communication.

¹³⁴ Albert Ackhurst, Biodiversity Sub-Directorate, DEA&DP, March 2016, pers. Communication.

¹³⁵ Tracy Sampson, Biodiversity Sub-Directorate, DEA&DP, July 2017, pers. Communication.

¹³⁶ Heidi Nieuwoudt, SANBI, pers. communication.

Table 27. Additional High level Biodiversity and EGS Indicators

HIGH LEVEL CATEGORY	INDICATOR	2015/16	2017/18
ECONOMIC LOSS FROM ECOSYSTEM DEGRADATION	Estimated economic potential lost from ecosystem degradation per annum in the Western Cape	R4.5 billion ¹³⁷	No update
BIODIVERSITY	Percentage of the Western Cape's land that is under conservation management by CapeNature	2014/15: 6.81% ¹³⁸	2015/16: 6.91% ¹³⁹ 2016/17: 7.45% ¹⁴⁰
ECOSYSTEM GOODS AND SERVICES	Percentage of wetland area in the Western Cape that falls within formally protected areas	2015/16: 8.8% ¹⁴¹	2017/18: 9.9% ¹⁴²

Climate change is one of the most important direct drivers of biodiversity loss and ecosystem service changes worldwide, and it may become the dominant direct driver of these changes by the end of the 21st century¹⁴³. South Africa's biomes are expected to be impacted by climate change, as the current climate which influence conditions within the biomes are likely to shift¹⁴⁴.

For the Western Cape, in addition to habitat loss and direct impacts (such as increase in average temperature, increase in the frequency of extreme weather events, etc.), climate change is anticipated to further threaten the natural ecosystems of the province. Already, the economic losses resulting from general ecosystem degradation have been calculated to amount to R4.5 billion per annum¹⁴⁵, a figure that is likely to worsen given the future impacts from climate change. Within this century, the climate is likely to become warmer and drier, with less winter rainfall and more irregular and intense rainfall events¹⁴⁶. This will have various consequences for the province's economy, ecological integrity and livelihoods including:

- i) reduced water quantity and quality through negative impacts on rivers, wetlands and estuaries (see Water);
- ii) detrimental effects on biodiversity, including significant species losses in the Cape Floristic Region;
- iii) increased fire and flooding danger and frequency (see Climate Risk Management);
- iv) increased danger to coastal towns due to sea level rise;
- v) threats to livelihoods, especially of the poor who are most vulnerable; and
- vi) impacts on economic sectors such as fishing, forestry, agriculture, insurance, banking, tourism, infrastructure and construction¹⁴⁷.

Given that intact biodiversity and functional ecosystem goods and services increase resilience to climate change, it is vitally important that our environment and biodiversity remain protected to decrease the impacts of climate change on human settlements, infrastructure and services, in the Western Cape. This would also prevent some of the climate change-associated costs that could otherwise lead to potentially crippling economic impacts in the province.

The 2018 State of Environment Outlook Report for the Western Cape (SOEOR) found that overall biodiversity and ecosystem health was declining, due to the continuing loss of biodiversity and general decline of the quality of our ecosystems (the biodiversity indicators tracked in the SOEOR can be viewed in Annex 3). Table 27 gives an overview of some high level biodiversity and ecosystem goods

¹³⁷ WCG 2014. Western Cape Eco-Invest Project. Phase I: A Preliminary Assessment of Priorities and Opportunities for Mobilising Private Sector Investment in the Western Cape's Natural Capital.

¹³⁸ CapeNature Annual Report 2014/15.

¹³⁹ CapeNature Annual Report 2015/16.

¹⁴⁰ CapeNature Annual Report 2016/17.

¹⁴¹ CapeNature, 2015. CNC Reserves. Western Cape Nature Conservation Board; CapeNature 2015. Stewardship Sites - 2015 (Signed and Declared). Western Cape Nature Conservation Board; SANBI, 2011. NFEPA_Wetlands. CSIR. Note that this dataset does not include estuaries.

¹⁴² CapeNature, 2017. CNC Reserves. Western Cape Nature Conservation Board; CapeNature 2017. Stewardship Sites - 2017 (Signed and Declared). Western Cape Nature Conservation Board; SANBI, 2011. NFEPA_Wetlands. CSIR (includes 2016 updates; note that this dataset does not include estuaries).

¹⁴³ Millennium Ecosystem Assessment, 2005. Ecosystems and Human Well-being: Biodiversity Synthesis. World Resources Institute, Washington, DC.

¹⁴⁴ Driver A., Sink, K.J., Nel, J.N., Holness, S., Van Niekerk, L., Daniels, F., Jonas, Z., Majiedt, P.A., Harris, L. & Maze, K. 2012. National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria.

¹⁴⁵ WCG 2014. Western Cape Eco-Invest Project. Phase I: A Preliminary Assessment of Priorities and Opportunities for Mobilising Private Sector Investment in the Western Cape's Natural Capital.

¹⁴⁶ Midgley, G. F., Chapman, R. A., Hewitson, B., Johnston, P., de Wit, M., Ziervogel, G., Mukheibir, P., van Niekerk, L., Tadross, M., van Wilgen, B.W., Kgope, B., Morant, P. D., Theron, A., Scholes, R. J. and Forsyth, G. G. 2005. A Status Quo, Vulnerability and Adaptation Assessment of the Physical and Socio-economic Effects of Climate Change in the Western Cape. Report to the Western Cape Government, Cape Town, South Africa. CSIR Report No. ENV-S-C 2005-073, Stellenbosch.

¹⁴⁷ Western Cape Protected Area Expansion Strategy: 2015 - 2020. 2015. Compiled by Maree, K.S., Pence, G.Q.K. and Purnell, K. 2015. Unpublished report. Produced by CapeNature. Cape Town, South Africa.

and services indicators relating to climate change, which are discussed further below. The Western Cape State of Biodiversity report 2017 was recently published by CapeNature and highlighted the following in relation to climate change: i) land use change is still threatening biodiversity areas particularly Critical Biodiversity Areas; ii) the impacts of climate change on biodiversity are still largely unknown; iii) disasters such as fires and drought are impacting on conservation budgets negatively; and iv) Cape Nature has the ability to increase the weather monitoring system (and has done so through addition of several new weather stations).

A number of programmes that address the identified threats to biodiversity and EGS from climate change are underway in the WCG. In 2009, twenty-eight Climate Change Corridors were identified in the Western Cape through an exercise undertaken with the support of the Table Mountain Fund (TMF¹⁴⁸). These corridors were taken into account when designing the Province's Protected Area Expansion Strategy (2015)¹⁴⁹. Expansion of the Protected Area Estate should therefore improve the protection of the climate change corridors and refugia. Landscape level initiatives are aiming to improve protection and land management in these corridors so that they maintain function. Relevant initiatives include:

1. Biosphere Reserves – represented by the Western Cape Biospheres Forum¹⁵⁰.
2. Landscape Initiatives coordinated or supported by CapeNature and represented at the CAPE Implementation Committee¹⁵¹.

WESTERN CAPE LAND THAT IS UNDER CONSERVATION MANAGEMENT BY CAPENATURE

Whilst there is a declining state of biodiversity, much is being done to attempt to turn the tide on this. One of the ways this is being done is through increasing the conservation estate¹⁵², as well as restoring and rehabilitating key ecosystems [including wetlands (covered later in this section) and rivers (see focus area 5)]. In the last few years there has been an increase in the percentage of land in the Western Cape that is conservation management (Figure 16) in line with targets set by CapeNature.

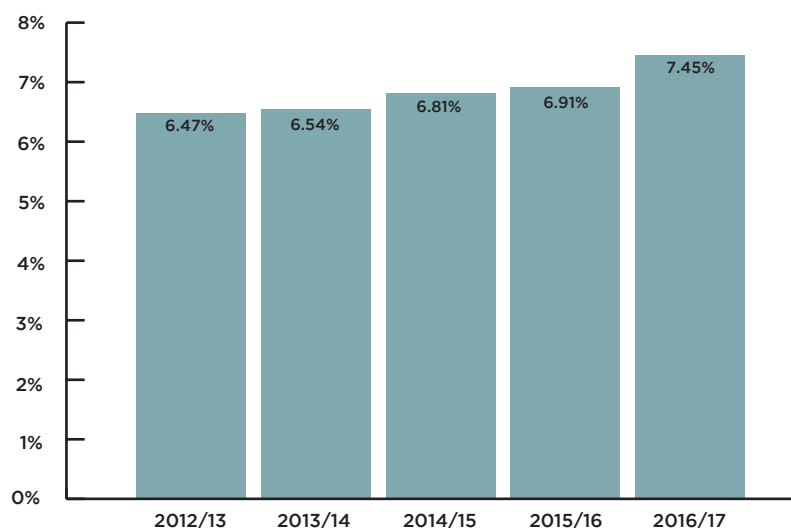


Figure 16. Percentage of land in the Western Cape that is under conservation management by CapeNature (CapeNature Annual Reports: 2012/13; 2013/14; 2014/15; 2015/16; 2016/17)

¹⁴⁸ Pence, G.Q.K. 2009. Climate Adaptation Scenarios for the Cape Floristic Region: Technical Report.

¹⁴⁹ CapeNature. 2015. Western Cape Protected Area Expansion Strategy: The 2015 - 2020 strategy to expand the Protected Area network of the Western Cape Province. Unpublished Internal Report, CapeNature. Cape Town.

¹⁵⁰ Which represents the four biosphere reserves: Gouritz Cluster, Cape Winelands, Kogelberg, and Cape West Coast.

¹⁵¹ Includes the Agulhas Biodiversity Initiative (ABI), The Greater Cederberg Biodiversity Corridor (GCBC), Upper Breede Collaborative Extension Group (UBCEG), Garden Route, and Addo-to-Eden Corridor.

¹⁵² The conservation estate referred to in CapeNature's strategic documents. This is defined as all sites declared by Government Gazette and/or formal agreement under NEM:PAA, (new state land and contract nature reserves, as well as contractual agreements, but not voluntary stewardship sites)

WETLAND AREA IN THE WESTERN CAPE THAT FALLS WITHIN FORMALLY PROTECTED AREAS

When comparing the formal conservation estate in the Western Cape (as defined by CapeNature) with a list of areas in the Western Cape classified as natural wetlands (obtained from Working for Wetlands), it can be seen that of the 262 837 ha of wetland area identified in the Western Cape, 26 118 ha (approximately 9.9%) falls within formally protected areas, up from 8.8% in 2015/16. Wetlands provide many important ecosystem goods and services such as water purification, flood attenuation, groundwater recharge and provision of habitats to key species.

CLIMATE CHANGE CORRIDORS THAT FALL WITHIN CONSERVED AREAS

The corridors were designed to target unprotected landscapes that still support intact connections between protected areas. To measure whether the conservation status of these targeted areas are increasing, the corridors were compared with the most up to date information on areas conserved by CapeNature and SANParks. Currently less than 1% of the corridor areas are formally protected¹⁵³; however additional portions that don't currently enjoy formal protection do fall within areas that are protected by virtue of their inaccessibility (e.g. mountainous areas) or conservation importance to other sectors (e.g. strategic water source areas). Despite this, it is vitally important to formalise the protection of these "informally" protected areas, as well as affording protection to the currently unprotected portions of those corridors.

A complimentary approach to the conservation strategies being followed by the WCG is to adopt spatial planning tools to take the importance of biodiversity and ecosystem goods and services into account during planning and development. Therefore, in addition to the Protected Area Expansion Strategy, the DEA&DP and CapeNature have recently finalised, in 2017, the Western Cape Spatial Biodiversity Plan¹⁴⁹. This plan prioritizes areas for action and includes climate adaptation corridors and critical ecological infrastructure such as Strategic Water Source Areas and wetlands which increase climate change resilience.

ECOSYSTEM GOODS AND SERVICES (EGS) MAPPED AND UTILISED IN PLANNING TOOLS

As part of the abovementioned Spatial Biodiversity and Ecological Infrastructure Plan, CapeNature uses a set of biodiversity planning tools in terms of ecological infrastructure (through which EGS flows). Since EGS are rarely included directly in planning tools, these types of tools were used as a proxy indicator for planning tools that include EGS. These tools are:

1. Important water source areas [combination of Strategic Water Source Areas and High Yield Catchments, as per the National Freshwater Ecosystem Priority Areas (NFEPA)];
2. High groundwater recharge areas (NFEPA);
3. Climate change adaptation corridors;
4. Upland-lowland interfaces;
5. Estuarine functional areas;
6. Wetland clusters (NFEPA);
7. Ecosystem-based adaptation areas [as per the National Biodiversity Assessment (NBA 2011);
8. Riparian functional areas; and
9. Coastal corridors, which include: Fore dunes (specific value/service of providing physical buffering against sea storm surges).

¹⁵³ Protected areas used in this analysis include areas that fall within CapeNature's conservation estate [CapeNature 2015. CNC Reserves. Western Cape Nature Conservation Board; CapeNature 2015. Stewardship Sites - 2015 (Signed and Declared). Western Cape Nature Conservation Board], as well as national nature reserves (SANBI 2010. Formal Protected Areas. SANParks).

These tools have now been incorporated into the Western Cape Biodiversity Spatial Plan, which has a handbook to support decision-makers. The Biodiversity Spatial Plan as well as the Provincial Biodiversity Strategy and Action Plan will be used by WCG: DEA&DP and CapeNature when commenting on development applications or environmental impact assessments (EIAs), and will be incorporated in spatial development tools through the classification of specific areas of high ecological importance.

INTEGRATION OF BIODIVERSITY PRIORITIES IN MUNICIPAL SPATIAL DEVELOPMENT FRAMEWORKS (SDFS)

An additional planning tool is the integration of biodiversity and ecosystem priorities into municipal SDFs. SDFs are included in IDPs, and DEA&DP regularly assesses these documents to ensure that they include the necessary biodiversity planning and considerations. Figure 17 illustrates the DEA&DP assessment outcomes for the 29 Local Municipalities¹⁵⁴. The assessment on how well municipalities integrate biodiversity priorities in the SDF is done on approximately a five-year interval by the Biodiversity component of DEA&DP, which matches the SDF review cycle. The integration of biodiversity into SDFs is improving with time.

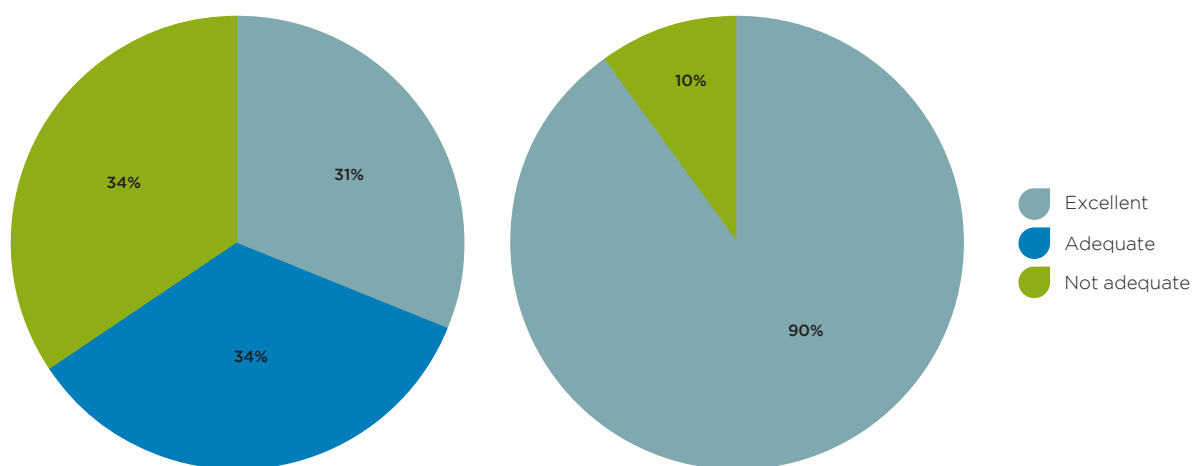


Figure 17. Degree to which biodiversity priorities were integrated into Western Cape municipal Spatial Development Frameworks^{155,156}

Following on from the publication of the National Biodiversity Strategy and Action Plan (NBSAP) the WCG finalised a Provincial Biodiversity Strategy and Action Plan¹⁴⁹ (PBSAP) in 2017, which is a high level long term plan that will govern biodiversity management in the Western Cape. The PBSAP has seven core strategic objectives, of which the first two speak strongly to climate change and Ecosystem-based Adaptation: i) conservation and effective management of biodiversity contributes to a resilient and inclusive Western Cape economy; i) partner sectors contribute to achieving biodiversity conservation targets through mainstreaming biodiversity into policies, strategies, plans, practices and projects.

The PBSAP therefore aims to protect the diversity of ecosystems, habitats, populations, species and genetic diversity. Once in implementation the PBSAP indicators will be reported on, and this will be followed by an implementation plan.

The Eco-Invest project (a biodiversity economy strategy and programme which falls under the PBSAP) is linked to reducing the risks of fire and floods as well as water supply stress. This is being done through investing in natural capital to restore degraded ecosystems, allowing these ecosystems to return to delivering ecosystem goods and services such as flood water attenuation, which will increase the Western Cape's natural systems' resilience to climate change impacts.

¹⁵⁴ The City of Cape Town was excluded from this analysis.

¹⁵⁵ Municipal SDFs were assessed for a series of biodiversity-related considerations, for each of which a score was awarded. These scores were converted to an average overall score between 0 and 5, with 5 representing perfect inclusion of biodiversity-related considerations, and 0 representing no inclusion of biodiversity-related considerations. Municipalities who on average scored below 3 was deemed to be "not adequate", between 3 and 4 was deemed to be "adequate", and those that scored above 4 were deemed to be "excellent".

¹⁵⁶ Albert Ackhurst, Biodiversity Sub-Directorate, DEA&DP, March 2016 & November 2017, pers. Communication.

WETLAND REHABILITATION

The Eco-Invest project advocates, inter alia, investing in maintaining and restoring ecosystem services such as wetlands. In the Western Cape wetland rehabilitation is often done by the Working for Wetlands programme, and Table 28 gives an indication of how many wetlands were rehabilitated in the Western Cape over the last three financial years by this programme¹⁵⁷.

Table 28. Number of wetlands rehabilitated in the Western Cape, 2013 – 2018¹⁵⁸

YEAR	NUMBER OF WETLANDS REHABILITATED
2013/14	20
2014/15	29
2015/16	25
2016/17	32
2017/18	34

Climate change response that relates to improving the ability of biodiversity and EGS to lend our society the resilience to respond to climate change has been quite well addressed in the Western Cape to date. What needs further maturing is the use of ecosystems and biodiversity as buffers and in providing resilience to built infrastructure, towns, settlements, and to agriculture and key resources (water, food, energy, transport etc.).

OPPORTUNITIES, GAPS AND RECOMMENDATIONS

- Better data sharing is needed between government entities such as WCG: DEA&DP, SANBI and CapeNature, as well as between government and the private sector, to facilitate the tracking of biodiversity and EGS-related indicators.
- Due to the wide range of stakeholders and entities involved in alien clearing, finding comprehensive information on the numbers/hectares of aliens cleared is problematic. Alien invasives are covered in this report under the water section.
- Informally protected areas are hard to track, as the data is often patchy or outdated.
- There is a need to set fact-based climate change targets for this focus area.
- The data indicates that only very small areas of the climate change corridors are protected – there is therefore a big need to expand the conservation estate within these corridors.
- Local community stewardship over corridors and unprotected areas should be promoted.

¹⁵⁷ It should be noted that there are other programmes that focus on wetlands in the Western Cape; in this case Working for Wetlands numbers are readily available.

¹⁵⁸ H. Nieuwoudt, SANBI, pers. Communication.



15

COASTAL AND ESTUARY MANAGEMENT

The current WCCCRS priority areas for addressing biodiversity and ecosystem goods and services in the Western Cape in a changing climate include:

1. Establishment of coastal risk overlays and coastal management lines;
2. Research best practice regarding responding to repeated coastal inundation in high risk areas;
3. Protecting and rehabilitating existing dune fields as coastal buffers / ecological infrastructure;
4. Monitor possible linkages between climate change and fisheries industry; and
5. Ensure Estuary Management Plans take cognisance of climate change.

Table 29. Biodiversity and Ecosystem Goods and Services Indicators for the WCCCRS

HIGH LEVEL CATEGORY	INDICATOR	DATA	2015/16	2017/18
COASTAL MANAGEMENT	Number of Coastal municipalities using coastal management lines and coastal risk overlays in development planning ¹⁵⁹ (out of 14 coastal municipalities)	Coastal management lines determined	9	14
		Coastal risk overlays determined	9	14
		Coastal management lines and coastal risk overlays endorsed by MEC	0	0
		Coastal Management lines and coastal risk overlays incorporated into municipal zoning schemes	1	1
ESTUARY MANAGEMENT	Number of Estuary Management Plans that adequately include climate change risks and responses (out of 16 existing plans) ¹⁶⁰	Climate change not mentioned at all	3	All EMPs are in the process of being updated; the National Estuary Management Protocol prescribes the inclusion of climate change considerations as a minimum requirement for EMPs
		Climate change mentioned briefly	4	
		Potential impacts of climate change on estuary discussed	5	
		Management actions in response to climate change identified (excluding research and monitoring)	4	

¹⁵⁹ Zain Jumat, WCG: DEA&DP: Coastal Management Sub-Directorate.

¹⁶⁰ WCG: DEA&DP: Climate Change Directorate.

Table 30. Additional High Level Coastal & Estuary Indicators

HIGH LEVEL CATEGORY	INDICATOR	2015/16			2017/18			
ESTUARY MANAGEMENT	Present Ecological State of estuaries	SOURCE: NBA (2011) ¹⁶¹		% ESTUARIES (N = 53)	SOURCE: TURNER (2017) ¹⁶²		% ESTUARIES (N = 56)	% ESTUARINE HABITAT (20 500 HA)
		Unmodified, natural modifications	A	9	Unmodified, natural	A	5.4	0.0
						A/B	10.7	3.5
		Largely natural with few modifications	B	30	Largely natural with few modifications	B	14.3	0.5
						B/C	8.9	24.5
		Moderately modified	C	21	Moderately modified	C	17.9	61.3
						C/D	5.4	6.1
		Largely modified	D	21	Largely modified	D	16.1	3.6
						D/E	5.4	0.0
		Seriously modified	E	15	Highly degraded	E	14.3	0.4
		Critically/Extremely modified	F	4	Extremely degraded	F	1.8	0.0
COASTAL MANAGEMENT	% of Western Cape coastline protected by Marine Protected Areas (MPAs)	21.2% (2015) ¹⁶³			21.2% (2018) ¹⁶⁴			

Climate change will likely lead to increased frequencies of disasters in coastal areas, which will lead to major economic losses; for example, Cartwright (2008)¹⁶⁵ estimated that storm surges enhanced by sea level rise could cost the City of Cape Town between R5 billion to R20 billion in the next 25 years¹⁶⁶.

According to the South African Risk & Vulnerability Atlas (CSIR 2018) the primary risks associated with climate change in the marine environment include:

- Changes in local physical processes, e.g. upwelling or the formation of the Agulhas Current rings
- Altered freshwater inflow, e.g. changes in rainfall patterns
- Altered water properties, caused by increased seawater temperature, increased UV radiation, ocean acidification, increased sediment suspension, etc.
- Habitat destruction, e.g. estuaries and beaches due to sea level rise, increased intensity of storms and ocean acidification
- Damage to the man-made environment due to an increased intensity of coastal storms, sea level rise, and coastal flooding

As a result of these impacts it is therefore important that climate change, and particularly the above-mentioned effects, be integrated into ocean and coastal spatial planning. As part of the National Coastal Management Programme (NCMP 2014) the DEA is in the process of developing conditions of use for the coastal zone, including a national coastal risk and vulnerability assessment. These conditions of use will provide guidance for mitigation and adaptation to climate change in the coastal zone (DEA: Oceans and Coasts, in progress)¹⁶⁷.

¹⁶¹ Van Niekerk, L. and Turpie, J.K. (eds) 2012. South African National Biodiversity Assessment 2011: Technical Report. Volume 3: Estuary Component. CSIR Report Number CSIR/NRE/ECOS/ER/2011/0045/B. Council for Scientific and Industrial Research, Stellenbosch.

¹⁶² Van Niekerk, L. 2017. Estuaries. In: Turner, A.A. (ed.). Western Cape Province State of Biodiversity 2017. CapeNature Scientific Services, Stellenbosch. ISBN: 978-0-621-45962-3.

¹⁶³ WCG: DEA&DP: Spatial Information Management.

¹⁶⁴ WCG: DEA&DP: Spatial Information Management.

¹⁶⁵ Cartwright, A., Brundrit, G. B. and Fairhurst, L. (2008). Global climate change and adaptation – A sea-level rise risk assessment. Phase four: Adaptation and risk mitigation measures for the City of Cape Town. Prepared for the City of Cape Town by LaquaR Consultants CC, 42 pp.

¹⁶⁶ Umvoto Africa. (2010). Sea Level Rise and Flood Risk Assessment for a Select Disaster Prone Area Along the Western Cape Coast. Phase 1 Report: Eden District Municipality Sea Level Rise and Flood Risk Literature Review. Prepared by Umvoto Africa (Pty) Ltd for the Provincial Government of the Western Cape Department of Environmental Affairs and Development Planning: Strategic Environmental Management (May 2010).

¹⁶⁷ National Coastal Management Programme (2014).

The NCMP identified nine key priorities for coastal management in South Africa, of which priority one is “Effective planning for coastal vulnerability to global change (including climate change)”. The programme also indicates that national government is in the process of preparing a coastal hazard zone index and demarcate coastal hazard zones (including impacts from climate change); however, to date this has not yet been finalised.

South Africa’s primary piece of legislation dealing with the coast is the National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008) as amended. The act aims to provide integrated management of South Africa’s coastline and ensuring the sustainable use of the coast’s natural resources, while discouraging inappropriate development.

The importance of correctly managing our coastal areas, as well as the economic opportunities that the coast offers, is enjoying increasing attention, as evidenced by the recent focus by national government on the coastal economy in the form of Phase 1 of Operation Phakisa, undertaken by the Presidency and DEA in 2014.

The WCG is responding to the need for responsible coastal and estuary management in several ways. The 2018 State of the Environment Outlook Report (SOEOR) includes a chapter on oceans and coasts, which concludes that the quality of South Africa’s oceans and coasts are continuing to decline due to environmental impacts such as increased development in the coastal zone and deteriorating estuarine health (see Annex 3 for a summary of the SOEOR indicators). The WCG: DEA&DP Directorate: Coastal Management is in the process of developing a State of the Coast report, which is due to be completed in 2018, and will give a more detailed overview of the state of the Western Cape coast.

Although climate change is not often mentioned as a direct threat to estuaries, there are in fact many climate change impacts which may affect estuaries significantly. These include reduced/increased freshwater flow, sea level rise, increased storm activity and decreased rainfall. It is predicted that estuaries on the western and southern coast of South Africa will experience a reduced freshwater inflow of between 11 and 84% in future¹⁶⁸. These changes may result in reductions in estuarine nursery habitat, or cause changes in how often mouths open¹⁶⁹. Longer periods of drought and intense flooding events will also affect salinity levels and ecological functioning of estuaries.

STATE OF ESTUARIES

As healthy estuaries are more resilient to the effects of climate change, the state of estuaries is considered to be an important indicator that we can use to track our climate change adaptation response. The Western Cape State of Biodiversity was published in 2017, and included an update to the estuary information published in the National Biodiversity Assessment (2011). Figure 18 gives an overview of the current state of Western Cape estuaries as compared to the previous assessment in 2011.

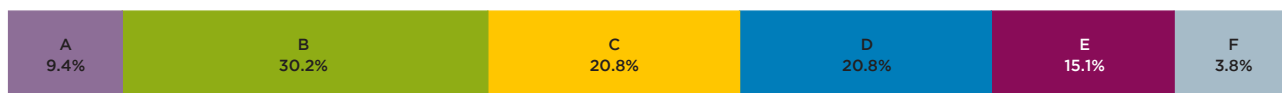
Table 31. Schematic illustration of the relationship between loss of ecosystem condition and functionality

CONDITION	≥90%	76-90%	61-75%	41-60%	21-40%	≤20%
CATEGORY	A Natural	B Largely natural with few changes	C Moderately modified	D Largely modified	E Highly degraded	F Extremely degraded
STATE	Excellent	Good	Fair		Poor	
FUNCTIONALITY	Retain process & pattern (representation)		Loss of process or pattern		No process & pattern	

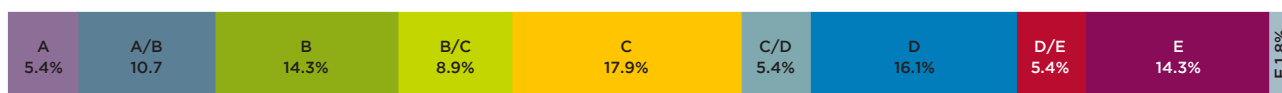
¹⁶⁸ CSIR (2018). South African Risk and Vulnerability Atlas, 2nd ed.

¹⁶⁹ Department of Environmental Affairs. 2013. Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa. Climate Change Implications for Marine Fisheries in South Africa. Pretoria, South Africa.

2011: % of estuaries that fall within each state (n=53):



2017: % of estuaries that fall within each state (n=56):



2017: % of total estuarine habitat assessed (20 500 ha) that fall within each state:

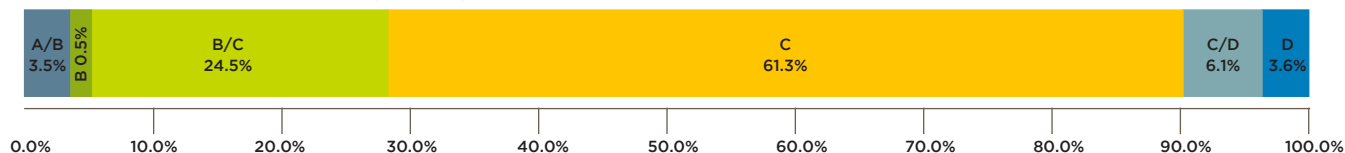


Figure 18. Percentage of the Western Cape estuaries classified under the various ecological rating categories (NBA 2011 & Turner 2017¹⁷⁰). Read in conjunction with Table 31.

SEA LEVEL RISE AND STORM SURGES

Increased sea storm surges due to more extreme weather coupled with sea level rise in particular have a great potential to impact our coastal developments. This has been felt in the City of Cape Town in the last few years, with some coastal businesses and infrastructure being inundated on a regular basis, causing repeated damage. High intensity storms and high water events also have the potential to impact on estuarine, inshore and offshore fisheries¹⁷¹. The City of Cape Town monitors a combination of environmental conditions that together could lead to damage to infrastructure (such as swell direction and height, wind speed and direction, etc.). This dataset is then used to inform decision-making when development applications are received in areas potentially at risk from damage from environmental processes.

In 2010, the WCG commissioned sea level rise studies for all the coastal Districts in the province, which included a review of sea level rise science and literature for South Africa and the Western Cape, a sea level rise and flood inundation Geographic Information System (GIS) model, as well as a sea level rise and flooding hazard risk assessment for the coastline. The South African coastline has experienced an increase in sea level of 1.2mm per year over the last thirty years, and areas in the Western Cape that have been identified as being vulnerable to sea level rise include northern False Bay, Table Bay, Saldanha Bay, the Southern Cape coast and Mossel Bay to Nature's Valley¹⁶⁸.

COASTAL MANAGEMENT LINES AND COASTAL RISK OVERLAYS IN COASTAL MUNICIPAL DEVELOPMENT PLANNING

In 2011, the WCG: DEA&DP commissioned a series of studies to determine coastal setback / management lines for all District Municipalities in the Western Cape. As seen in Table 32, all of the coastal municipalities in the Western Cape now have draft coastal management lines and coastal risk overlays (14 municipalities in total). So far none of these have been adopted by the MEC for Local Government, Environmental Affairs and Development Planning; however, the process for adoption has been initiated. Until the draft coastal management lines and coastal risk overlays have been adopted the municipalities may use them to inform their development decisions, but they are not necessarily compelled to do so.

¹⁷⁰ Turner, A.A. (ed.) 2017. Western Cape Province State of Biodiversity 2017. CapeNature Scientific Services, Stellenbosch. ISBN: 978-0-621-45962-3.

¹⁷¹ Department of Environmental Affairs. 2013. Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa. Summary for Policy-Makers. Pretoria, South Africa.

Table 32. Progress and approval status of coastal management lines and coastal risk overlays in the Western Cape
(Data source: Coastal Management Component, WCG: DEA&DP).

COASTAL MANAGEMENT LINES DETERMINED	COASTAL RISK OVERLAYS DETERMINED	COASTAL MANAGEMENT LINES AND COASTAL RISK OVERLAYS ADOPTED BY MEC	COASTAL MANAGEMENT LINES AND COASTAL RISK OVERLAYS INCORPORATED INTO MUNICIPAL ZONING SCHEMES
City of Cape Town West Coast District Matzikama Cederberg Bergrivier Saldanha Bay Swartland Overberg District Overstrand Cape Agulhas Swellendam Eden District Hessequa Mossel Bay George Knysna Bitou	City of Cape Town (for specifically identified areas) West Coast District Matzikama Cederberg Bergrivier Saldanha Bay Swartland Overberg District Overstrand Cape Agulhas Swellendam Eden District Hessequa Mossel Bay George Knysna Bitou	None	City of Cape Town – coastal urban edge included in SDF ¹⁷²

The Western Cape (WC) Coastal Management Programme (2016) guides coastal management in the province. The Programme also focuses on growing the blue¹⁷³ and green economy through unlocking the economic potential of our coastal assets. It directly contributes to enabling a resilient, sustainable, quality and inclusive living environment through improved coastal spatial and development planning, access, protection and Local Government support.

Of the nine Priority Areas of the plan, Priority Area 4 focusses on “**climate change, dynamic coastal processes and building resilient communities**”, with the goal of promoting resilience to the effects of dynamic coastal processes, environmental hazards and natural disasters. Some of the planned outputs of this priority area includes a coastal vulnerability analysis for the Western Cape, a Western Cape Coastal Regional Plan (with responses to increase coastal resilience), and a Provincial Coastal Protocol for assessment and response for coastal vulnerability, risk and damage.

The Programme also has a priority area dedicated to Estuary Management. This focusses on the requirements of the National Estuarine Management Protocol, with the goal of co-ordinating and integrating estuarine management to optimise the ecological, social and economic value of these systems on an equitable and sustainable basis. It has led to the development of a Provincial Estuarine Management Framework and Implementation Strategy as part of a dedicated Provincial Estuarine Management Programme. Among other outcomes, this will see 33 EMPs and 10 mouth management plans which include climate change considerations approved in the near future.

INCLUSION OF CLIMATE CHANGE RISKS AND RESPONSES IN ESTUARY MANAGEMENT PLANS

Of the 56 estuaries in the province, 16 currently have draft Estuary Management Plans (EMPs) that are awaiting final approval (these are being implemented in the interim). These EMPs were originally developed by the Cape Action for People and the Environment (C.A.P.E) programme, and will be updated as part of the above-mentioned Provincial Estuarine Management Framework and Implementation Strategy. Twenty-five draft EMPs from all over the country were reviewed by DEA in terms of the National Estuarine Management Protocol, which included the 16 draft C.A.P.E. EMPs. This resulted in a review report¹⁷⁴ which indicated the alignment of the draft EMPs with the National Estuarine Management Protocol, as well as

¹⁷² Although the CCT has a version of a CML (i.e. the coastal urban edge), they have not incorporated risk overlays into the municipal zoning scheme.

¹⁷³ In this context the blue economy refers to the development of South Africa's marine resources.

¹⁷⁴ Department of Environmental Affairs (2014) National Estuarine Management Protocol. Review of Existing Estuarine Management Plans 2007-2014. Cape Town.

suitability for approval for each of the reviewed draft EMPs, as well as various recommendations for changes and additions. One of the general findings of the review was that most of the draft EMPs did not address climate change or sea level rise. The degree of consideration of climate change and sea level rise in the C.A.P.E. draft EMPs is given in Figure 19. As of March 2018 these estuary management plans are still in the process of being finalised based on the recommendations of the DEA review; they will then undergo a process for approval.

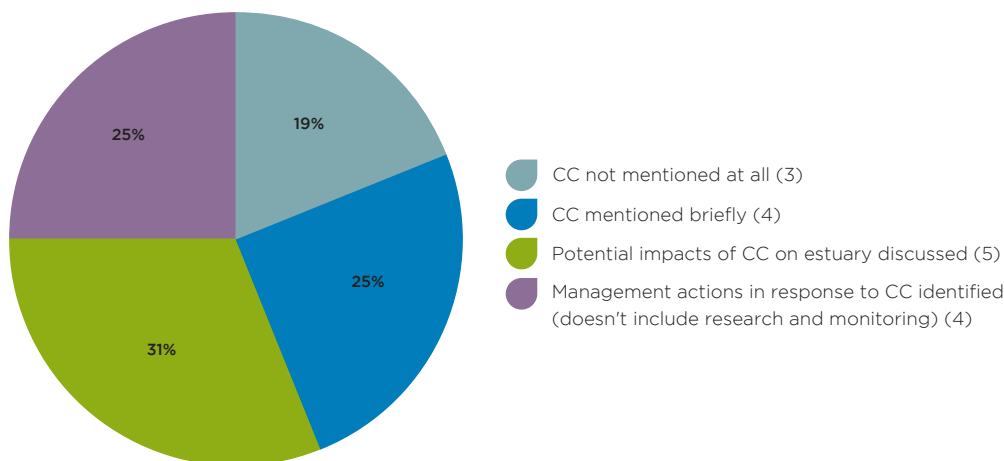


Figure 19. Degree of inclusion of climate change (CC) and sea level rise issues in Western Cape Estuary Management Plans (note that many of these plans are still in draft form awaiting final approval)

Both the Western Cape Protected Area Expansion Strategy (PAES 2016) as well as the WC Coastal Management Programme supports the expansion of Marine Protected Areas (MPAs) in the Western Cape as part of Operation Phakisa¹⁷⁵, with the expansion and effective management of a system of coastal protected areas being one of the goals of Priority Area 6 (Natural and cultural resource management) of the WC Coastal Management Programme.

WESTERN CAPE MARINE PROTECTED AREAS

As of 2018, 369 km (or 21.2%) of the Western Cape's 1 742 km coastline is protected by MPAs¹⁶⁴. This includes the coastline of islands that fall within MPAs, but excludes some Marine Nature Reserves that still need to be added¹⁷⁶. Although there haven't been large changes to these areas in the last 7 years, they are soon set to increase given the goals of Operation Phakisa as well as the planned MPA expansion outputs from the WC Protected Area Expansion Strategy, with additional draft MPAs published for public comment in February 2016 by DEA.

An area of emerging need of work is the fisheries sector, as climate change is likely to affect the productivity and diversity of South Africa's fisheries. This could result in significant adverse impacts on subsistence fishing livelihoods as well as commercial and recreational industries; this is worsened by the fact that our fish stocks are overexploited, which increases their vulnerability to climate change. Already shifts have been noticed in the spatial distribution of some marine species in our waters. By reducing overfishing, habitat degradation, pollution and other anthropogenic factors, we can improve our fisheries management to make the sector more sustainable and more adaptable to climate change¹⁶⁹. Monitoring of these areas is essential to achieve this, and the WCG: DEA&DP has been engaging with national Department of Agriculture, Forestry and Fisheries (DAFF) on the development of their fisheries climate change adaptation plan.

¹⁷⁵ A national government initiative to fast track the implementation of solutions on critical development issues.

¹⁷⁶ H.F. Verwoerd Marine Reserve (Betty's Bay), Millers Point Nature Reserve (Simon's Town), Knysna National Lake Area and marine reserves that for part of national parks (West Coast National Park, Wilderness National Park and Tsitsikamma National Park).

OPPORTUNITIES, GAPS AND RECOMMENDATIONS

- Case studies and cost benefit analyses on optimal approaches to coastal protection should be developed for the Western Cape.
- Fact-based climate change targets for this focus area need to be set out.
- A better understanding of the fisheries sector and the impact of climate change on the sector in the Western Cape is required.
- Monitoring and evaluation standards are currently included in the draft EMPs, but implementation is still struggling. The state of each estuary should be monitored on a regular basis; one possibility for achieving this could be the expansion of the National Estuarine Monitoring Programme, which includes water quality monitoring.



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HEALTHY COMMUNITIES

The current WCCCRS covers the following in this focus area of Healthy Communities:

1. Monitoring health trends in relation to climate trends, including the linkages between human health and climate change in the Western Cape context.

[Infrastructure and energy efficiency in public buildings, which includes hospitals and clinics is covered under the Energy section]

There is currently no indicator for tracking climate change and health research in the Western Cape context, because the area of research is particularly new, and because, until recently, there has yet to be a concerted effort to analyse the broader research that might be underway. In 2017 the WCG Climate Change Directorate put out a call through the Cape Higher Education Consortium (CHEC) to have a literature review conducted of climate change impacts on health in the Western Cape. The literature review will be complete in April 2018. Initial findings indicate that a key concern is climate change will increase the current burden of disease. There are however still many unknowns, and suggested areas of research include: mental health, urban health, allergies and respiratory health, water and food-borne diseases, injuries, infectious disease, chronic disease, malnutrition, reproductive health and cancer (specifically related to sun and air pollution).

Table 33. Health Indicators for the WCCCRS

HIGH LEVEL CATEGORY	INDICATOR	2015/16	2017/18
PROVINCIAL HOSPITALS UPTAKE OF GREENING	Number of provincial hospitals that have joined the Global Green and Healthy Hospitals Network (GGHNN)	2015: 6 (out of 52)	2018: 8 ¹⁷⁷

¹⁷⁷ <https://www.greenhospitals.net/members/?lang=en>. [Mitchells Plain Hospital, Khayelitsha Hospital, Valkenberg Hospital, Victoria Hospital, Groote Schuur Hospital, Worcester Hospital, George Hospital, Mowbray Maternity Hospital]

Table 34. Additional High Level Health Indicators

HIGH LEVEL CATEGORY	INDICATOR	2012	2015/16	2017/18
HOUSEHOLD FOOD SECURITY	% households with measure of food insecurity	21.3% ¹⁷⁸	2013: 22.70% ¹⁷⁹	2014: 25.5% ¹⁸⁰
HOUSEHOLD SANITATION	% households with access to sanitation	95.6% ¹⁷⁸	2013: 94.8% ¹⁷⁹	2014: 94.6% ¹⁸⁰

The Health sector is increasingly gaining more prominence in dialogues and research on the impacts of climate change globally. This includes a variety of concerning trends including inter alia: i) the links between climate change and potential outbreaks of diseases such as Ebola Virus Disease (EVD), and Zika Virus most recently; ii) link between climate change and malnutrition; iii) increasing incidence and occurrence of disease such as Cholera related both to changing climate and decline in infrastructure and ability to cope with increasing urban populations; and iv) the unknown psychological impacts of climate change on human mental wellbeing.

The Western Cape does have in a number of instances progressive performing health statistics. For example: i) life expectancy at birth is 66 years, 68 years for women and 64 years for men, which is above the figures for the country as a whole; ii) the infant mortality rate is 17 compared to 27 nationally; and iii) the maternity mortality ratio is 59 as compared to 269 for South Africa^{181,182}. However, the Western Cape does already have large vulnerable communities with a high underlying disease burden (i.e. HIV/AIDS¹⁸³ (7.8% in age 15 -49 years - 2012) and Tuberculosis (the highest in the country with 703 cases per 100,000)¹⁸⁴. Climate related hazards such as extreme events characterised by floods and high winds, heat waves and cold snaps will result in impacts such as heat stress, an increase in incidence of communicable diseases, and potential range expansion of disease vectors.

The biggest impact is likely to be on the poor, environmental migrants, vulnerable children, the frail and the elderly.

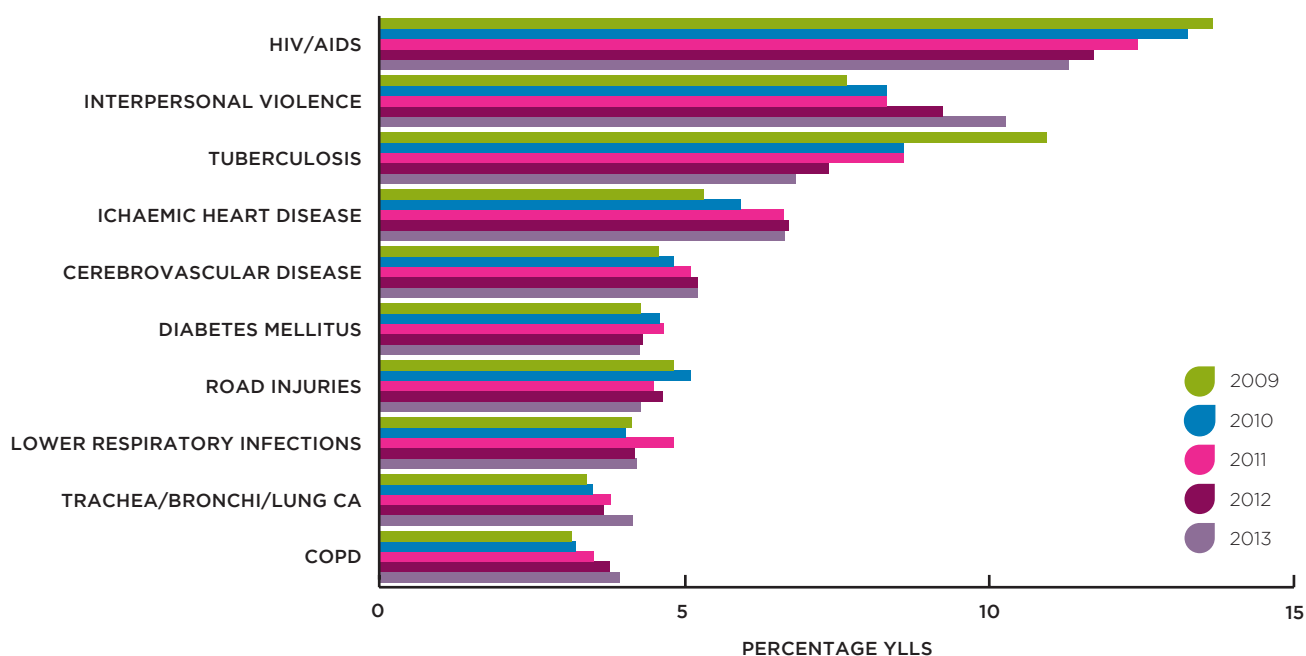


Figure 20. Leading causes of premature mortality [Years of Life Lost (YLL)] for all persons, Western Cape 2009– 2013¹⁸⁵

¹⁷⁸ Western Cape Government Green Economy Report 2014.

¹⁷⁹ Western Cape Government Green Economy Report 2015.

¹⁸⁰ Western Cape Government Green Economy Report 2016.

¹⁸¹ Western Cape Department of Health, Annual Report 2016/17.

¹⁸² Both of these statistics have improved for the Western Cape, whilst the national updated numbers have not been provided here in this version of the report.

¹⁸³ The Western Cape Mortality Profile for 2012 shows that HIV and TB remain the leading single causes of premature mortality in the Province; however, premature mortality due to HIV shows a decrease in 2012 compared to 2011, a trend noted in the previous annual report. Premature mortality due to some (e.g. cerebrovascular disease) but not all (e.g. not in ischaemic heart disease or diabetes mellitus) chronic diseases continued to increase from 2011 to 2012, after having increased the previous year. [From WCG: Health AR 2014/15]

¹⁸⁴ Western Cape Department of Health, Annual Report 2014/15.

¹⁸⁵ Morden E, Groenewald P, Zinyakatira N, Neethling I, Msemburi W, Daniels J, Vismer M, Coetzee D, Bradshaw D, Evans J. Western Cape Mortality Profile 2013. Cape Town: South African Medical Research Council, 2016. ISBN: 978-0-621-44356-1

A large contributing factor to increased resilience in health and the ability to cope with climate impacts is related to the underlying vulnerability and state of health services infrastructure, community infrastructure such as clean water and sanitation and access to facilities, health and medical staff. The baseline resilience of the Western Cape is relatively high compared to the rest of South Africa; although with increasing population sizes particularly in lower income groups do result in an ongoing backlog of service delivery. The recent ongoing drought of 2015-2018 has also indicated that large scale climate related events can and are likely to overcome general resilience, and create health risks as a result of limited and decreasing water supplies, and associated sanitation levels.

The current focus on health care, emergency health response and preparedness in the Western Cape to climate change risks is still in a research and preparation phase. There is currently a low awareness of impacts of climate change on inter alia: infectious diseases, violence and injury, mental health, chronic diseases, malnutrition, women's and reproductive health, child health, and occupational health. This includes impacts such as heat stress, and extreme events directly on human health and well-being (including psychological impacts). Furthermore, to date there is limited preparation and planning in place to knock-on impacts via specific vector pathways.

Nationally in South Africa, there is a National Climate Change and Health Adaptation Plan 2012 -2016 which has started to guide the needs and responses of the health sector. Other key strategic research policy focused initiatives in South Africa have also contributed to the evidence base for health, such as the focus on 'Climate Change and Human Health' in Phase 1 of the national Long Term Adaptation Scenarios. This key piece of work has also identified that monitoring of health trends in relation to climate trends is the critical action required across the country. Within the Western Cape, the HealthCare 2030 Strategy guides the Health sector of the Western Cape (See Box 12). There is currently no climate change response plan in place for Health in the Western Cape (this would ideally include specific hazard response plans: such as heatwaves, cold snaps, severe storms, flooding etc.). However, there is a Climate Change Adaptation Plan of Action (CAPA) for the health sector in the City of Cape Town which was drafted in September 2011, following a series of workshops and interviews with key informants across the City (City of Cape Town 2011). The WCG: Department of Health has recently become a member of the Global Green and Healthy Hospitals Network (GGHHN) and is a signatory to the Kolkata Call to Action.

THE WC HEALTHCARE 2030 STRATEGY

The health service needs to be in a state of readiness to address the public health consequences of climate change. This will include improved surveillance and disease outbreak management capacity, better disaster management and rescue responsiveness in collaboration with other departments and strengthened emergency services within health.

The department will put in place tools to measure its own contribution to GHG emissions, set targets and implement cost-effective mitigation measures to systematically reduce its GHG contributions. This will include a range of interventions from better infrastructure design to more environmentally friendly operational policies such as the Green Procurement Policy of the WCG. The four focus mitigation areas are currently water usage, electricity consumption, waste management and distances travelled.

The department has created a climate change committee, convened by a senior manager, to systematically start to address both the mitigation and adaptation aspects. Work is currently in its infancy. Disaster preparedness in the department is being systematically supported by the emergency medical services. The committee will also be the liaison point for engaging with other sectors and spheres of government in this regard.

Khayelitsha and Lentegeur hospitals have been identified as flagship projects as part of the Premier's 100% Green campaign. Local initiatives by institutions in the department are being encouraged and the expertise, technical knowledge and research within the Higher Education Institutions (HEIs) are being harnessed by the department.

Various coordinating initiatives are underway and in development, for example, there is a National Climate Change & Health Steering Committee. Institutionally the WCG: Health established a Western Cape Climate Change and Health Committee. It includes both internal and external stakeholders and includes ongoing guidance and consistent support from the WCG: DEA&DP Climate Change Directorate. The committee focuses on both climate change mitigation and adaptation issues related to health, with an increasing focus towards adaptation and resilience. Key collaborations and partnerships are critical for health and climate change, such as enhancing partnerships with national structures, such as the Epidemiology and Surveillance Directorate under the WCG: Health to monitor these trends in the Western Cape.

Whilst the research required on climate change and health impacts in the Western Cape is in its nascent stages, there are some research projects and programmes underway that will continue to provide a sound basis upon which to build our knowledge.

OPPORTUNITIES, GAPS AND RECOMMENDATIONS

- Develop a Climate Change Response Plan for the Health sector in the Western Cape aligned with the national responses.
- Future iterations of the WCCCRS and Implementation Plan will enhance the health focus, and in synergy with this more sophisticated groups of indicators might be tracked. Indicators may need to be linked cross-sectorally, e.g. days of absenteeism from schools may provide data for diseases, but this will require tight coordination across multiple levels.
- Collaborate across sectors for specific groups of vulnerable people who will be impacted by specific climate change impacts. For example, for occupational health of agriworkers who work outdoors may require specific plans for coping with heat waves, as has been identified in the Agriculture response strategy.
- Co-ordinate integrated plans and health surveillance with the Western Cape Disaster Management Centre.
- Continue to partner with research organisations and entities to undertake critical research and surveillance and monitoring as identified in the Health Climate Change Response Plan. This could include a range of specific interlinked data collection activities at different levels (from clinic to provincial hospital). It should include the development of burden of disease indicators in order to monitor the impact of climate change and should also enhance systems developed to report on the impact of climate related extreme events on health.

ANNEX 1: LIST OF CONTRIBUTING STAKEHOLDERS TO THIS REPORT

WESTERN CAPE GOVERNMENT: DEPARTMENT OF ENVIRONMENTAL AFFAIRS & DEVELOPMENT PLANNING:

Waste Management

Eddie Hanekom; August Hoon; Lance Mcbain-Charles, Belinda Langenhoven; Marius Venter, Yonela Makabeni; Chantal Dryden; Robyn Britten; Dean Gilbert

Biodiversity

Albert Ackhurst

Coastal Management

Mellisa Naiker; Nyanisa Tshaya; Caren George

Coastal Impact Management

leptieshaam Bekko

Pollution & Chemicals Management

Wilna Kloppers; Jason Mingo; Cathy War

Communication Services

Rudolf van Jaarsveldt; Shereen Pearson

WESTERN CAPE GOVERNMENT: LOCAL GOVERNMENT

Risk Reduction Planning

Nabeel Rylands

WESTERN CAPE GOVERNMENT: HEALTH

Infrastructure Planning

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WESTERN CAPE GOVERNMENT: AGRICULTURE

Ilse Trautmann; Louw Pienaar; Caren Jarman; Ruben Goudriaan; Alwyn Lubbe

WESTERN CAPE GOVERNMENT: ECONOMIC DEVELOPMENT AND TOURISM

Hildegard Fast; Cabral Wicht; Ajay Tikram

GREENCAPE

Jack Radmore; Sarah O'Carroll

CAPENATURE

Pierre de Villiers; Marienne de Villiers, Ruida Stanvliet, Genevieve Pence, Jenifer Gouza

CITY OF CAPE TOWN

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UNIVERSITY OF CAPE TOWN

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ANNEX 2: ACTUAL OBSERVED CLIMATE IMPACTS

Table A1: Recent observed trends in the Western Cape

CLIMATE VARIABLE	OBSERVED TRENDS	OUTLOOK AND COMMENTS
TEMPERATURE	General trend of rising temperatures, including both minimum and maximum temperatures. Increasing temperatures is resulting in a trend in increased evapotranspiration (this in particular can drive a shift in state to droughts, and severe impacts on agriculture). Increased temperatures and increased evapotranspiration result in dry soils and vegetation which becomes more fire-prone – March 3 rd 2015 was the highest temperature ever recorded (in 100 years) in Cape Town at 42°C. This coincided with severe fires.	There has been a decrease in the number of very cold days which creates the cold (or chill) units required for deciduous fruit cultivars to grow.
PRECIPITATION (RAIN, SNOW)	Reduction in rain days in autumn and summer especially on the Southern Coast. Evidence of a trend in increasing severity of rainfall events (i.e. more rain falls in a shorter time). Winter rainfall season starting later each year. Anecdotal information of reduction of winter snow in Karoo – may result in decreased groundwater recharge. Current status unknown.	Responding to this trend requires increased flood preparedness plans in winter, as well as increased standard requirements for storm water flows in infrastructure.
WIND	Wind velocity expected to increase, with stronger South Easters.	Potential impacts on tourism: e.g. Table Mountain cable car operations, Robben island ferry operations, Beach usability etc.
SEA LEVEL RISE	Sea level has been rising at the same rate as global trends. See discussion on 'sea storm surges' below.	There is global concern that previous estimates of the rates of sea level rise may have been too optimistic, and that decision makers need to be aware that worst case scenarios in this century may be possible.
OCEAN TEMPERATURE	The Agulhas current has warmed by 1.5°C since 1980. The impact of global warming and sea-level rise has already brought changes in the distributional range of fish and other marine species. Climate change is also responsible for shifts in the distribution of the West Coast rock lobster. However, the full understanding of these changes is complex and cannot necessarily all be attributed to a changing climate ¹⁸⁶ .	Impacts of shifting marine resources have implications for social and economic fabric of coastal communities.
OCEAN ACIDIFICATION ¹⁸⁷	Ocean acidification would have severe impacts on most ocean life. Currently the ocean has already acidified by 0.1 pH points as a global average (this varies from region to region).	Current impacts not well described.
EXTREME EVENTS (THESE CAN RESULT AND BE RELATED TO ONE OR MORE OF THE ABOVE CLIMATE VARIABLES)¹⁸⁸ Between 2003 and 2014 direct damage related to climate events in the Western Cape amounted to approximately R5 billion; particularly from floods and droughts (Eden District and Central Karoo droughts of 2009/10 and floods of 2011 etc.). Between 2015 and 2018 the Western Cape Drought have led to financial losses of approximately R14 billion in the agricultural sector alone, and the Cape Town storm and Knysna fires of 2018 inflicted damage of R4-6 billion.		
FLOODS / DROUGHTS	Numerous flood and drought events have occurred in the Western Cape in the past decades with increasing frequency. It is difficult to determine if these are all attributable to a changing climate, but this is likely given similar trends globally.	See "Extreme Events" above.
SEA STORM SURGES (BIG STORM EVENTS)	In the past 15 years, various big storm events have caused infrastructure damage along the Western Cape coastline. Studies reflect sea level has risen on the Western Cape coastline in accordance with global trends. Most impacts are due to inappropriate coastal development.	Coastal municipalities potentially have a big role to play here. Insurance companies are starting to withdraw from some vulnerable coastal areas.
FIRE	Observed increased fire incidences ¹⁸⁹ and potential increase in extent and severity of fires. Notable extreme fire events were the 2015 fire season, occurred in record breaking hot temperatures, as well as the massive Knysna fire in 2017. The economic implications are hard to quantify, but are estimated to be massive.	Number and intensity of fires seem to be increasing. Disaster funds for fires will need to increase as well, but more importantly proactive protection of ecosystems and water is the required long term response. It is challenging to differentiate how much of the increase in fires and intensity is climate change related, but global trends indicate climate change has a role to play.
HAIL	There is anecdotal evidence that more hail storms are occurring in new areas of the Western Cape, causing economic losses to agriculture (SmartAgri Status Quo Report).	The increased likelihood of hail storms is not well understood.

¹⁸⁶ SAEON. 2011 Observations in Environmental Change in South Africa.

¹⁸⁷ As the ocean absorbs CO₂, its PH changes.

¹⁸⁸ Current disaster funding approaches are not sufficient for responding to climate change. These funds are generally reactive, and disaster funding is often utilised to rebuild the exact same infrastructure in the exact same places. In order to respond effectively and responsibly to climate change all departments need to integrate climate change into infrastructure build and planning, and to utilise standards appropriate for a changed climate regime

¹⁸⁹ <http://www.iol.co.za/news/south-africa/western-cape/cape-fire-insurance-firms-brace-for-claims-1.1827557#.VfnA8RGeDGc>

ANNEX 3: STATE OF ENVIRONMENT OUTLOOK INDICATORS (2018)

The State of Environment Outlook Report (2018) outlook indicator table is given below. This gives a general overview of the state of the environment in the Western Cape, and compliments the indicators covered in this document.

Arrows indicate the direction of the trend of the “state” of a sector – downward arrows indicate that the state of the sector in general is declining, upward arrow indicate that it is improving, etc.

Table A2: Summary of environmental indicators reported on in the State of Environment Outlook Report (2018)

INDICATOR	KEY QUANTIFICATIONS	TARGET	TREND	
LAND: INSUFFICIENT DATA BUT APPEARS TO BE DECLINING				
LAND COVER	65.2% natural 33.5% transformed (16.8% degraded, 15.1% agriculture, 0.9% urban, 0.6% plantations)	Protect natural land cover Prevent further land transformation	DECLINING	
LAND CAPABILITY	No high value agricultural soils - vulnerable agriculture requiring high inputs	Sustainable agricultural practices that enhance the value of existing agricultural soils	INSUFFICIENT HISTORICAL DATA	
LAND TRANSFORMATION	Decrease in cultivation by 3.5% 16.2% more degradation	Prevent further degradation	DECLINING	
BIODIVERSITY AND ECOSYSTEM HEALTH: DECLINING				
ECOSYSTEM THREAT STATUS	Increase in threat status for some vegetation types due to habitat loss	Maintain or decrease the threat status	DECLINING	
ECOSYSTEM PROTECTION LEVEL	43 ecosystems well protected (up by 8) 21 moderately protected (up by 12) 56 poorly protected (down by 20) 43 not protected (up by 15) Additional 24 214.5 ha protected	Increase protection category of all ecosystems Increase total extent of areas formally protected	IMPROVING	
BIODIVERSITY PRIORITY AREAS	Loss of 19 270ha of CBAs72	No loss of CBAs and increase in CBAs secured in protected areas	DECLINING	
HABITAT DEGRADATION	16.2% increase in degraded land between 2009 and 2014.	Reduction in the extent of degraded land	DECLINING	
SPECIES THREAT STATUS (SPECIES)	50 species have higher IUCN Red List threatened status (mainly in Critically Endangered and Endangered categories) 58 species have improved in IUCN Red List threatened status	Reduction in the Red List status of species	DECLINING	
ALIEN INVASIVE SPECIES	Lack of appropriate comparable data	Reduction in density and distribution of alien invasive species	INSUFFICIENT DATA	
INLAND WATER: DECLINING				
WATER AVAILABILITY	Western Cape declared a disaster area due to severe drought. 12% of towns have inadequate yield 27% of towns exceed water supply allocation 12% expect a deficit in 0 – 5 years 49% expect a deficit in > 5 years Insufficient water supply in WCWSS by 2018	No unsustainable abstraction Adequate water supply for all towns	DECLINING	
WATER QUALITY FITNESS FOR USE	Fitness for use at river monitoring stations: 13% ideal 30% acceptable or tolerable 57% intolerable 26 stations have extremely high levels of microbial contamination	No intolerable water quality No stations with extremely high levels of microbial contamination	DECLINING	

INDICATOR	KEY QUANTIFICATIONS	TARGET	TREND	
FRESHWATER ECOSYSTEM HEALTH	Ecological state of rivers (PES): 21% unmodified, natural 28% largely natural 17% moderately modified 26% largely modified 6% seriously modified 1% critically or extremely modified	No freshwater systems seriously or critically modified	DECLINING	
OCEANS AND COASTS: DECLINING				
COASTAL WATER QUALITY	Increase in Blue Flag Beaches from 18 to 31 indicative of good coastal water quality.	Coastal water quality compliant with relevant standards	IMPROVING	
ESTUARY HEALTH	4% of estuarine areas in good or excellent condition 95% of estuarine areas in fair condition 1% of estuarine areas in poor or non-functional condition.	No non-functional estuaries No decline in estuary health	HIGH CONCERN	
CONSERVATION AREAS	9 MPAs Persistent challenges Increased recognition of management functions	Increase in extent and good management of MPAs	DATA NOT COMPARABLE	
MARINE AREA THREATS	No change to critically endangered and endangered marine habitats	No increase in threat status	HIGH CONCERN	
TRANSFORMATION OF THREATENED ECOSYSTEMS IN COASTAL BELT	Loss of 2000 ha of threatened ecosystem in the coast belt between 1990 and 2014	No loss of threatened ecosystems in the coastal belt	DECLINING	
BUILDINGS IN HIGH RISK COASTAL AREAS	40% increase in number of buildings in high risk coastal zone between 2006 and 2013	No increase in number of buildings in high risk coastal zones	DECLINING	
HUMAN SETTLEMENTS: STABLE				
HOUSING	16.6% of households in informal dwellings (18.2% in 2011) Housing backlog: 529 181 (409 827 in 2011)	Increasing% of population with access to formal housing Shift from providing houses to providing sustainable human settlements Shift from State as provider to State as enabler of housing provision	DECLINING	
ACCESS TO BASIC SERVICES	Piped water: 96.5% in 2016 (99.1% in 2011) Electricity: 96.5% in 2016 (93.6% in 2011) Sanitation: 94.6% in 2016 (90.5% in 2011) Refuse removal: increased from 91.7% in 2011 – exact% not available	Basic services to all households	IMPROVING	
ACCESS TO TRANSPORTATION	Better transport infrastructure than much of SA Cost constraints and dearth of bus routes persist Some still walking long distances Poor transport service for low-income communities in rural areas	Access to affordable public transport for all communities	NO CHANGE	
OPEN SPACE PROVISION	Challenges to open space provision Lack of updated data on existing open space status	Access to open spaces for urban and rural population	INSUFFICIENT DATA	
AIR QUALITY: STABLE WITH SLIGHT IMPROVEMENT				
ATMOSPHERIC POLLUTANTS	Particulate Matter (PM10) – below SA NAAQS and indicates a steady decline.	Comply with the NAAQS, with steadily declining emission rates and ambient concentrations across the province.	IMPROVING	
	Nitrogen Dioxides (NO2) – below SA NAAQS; however, no visible trend Sulphur dioxide (SO2) – below SA NAAQS with key hotspot areas. Greenhouse gases (GHG) – increase in levels but stable per capita.		NO CHANGE	

INDICATOR	KEY QUANTIFICATIONS	TARGET	TREND	
AIR QUALITY MANAGEMENT AT DISTRICT LEVEL	Increased commitment to air quality related matters – complaints registers, AQMP updates, AQ Forums, By-Laws, Air Quality Officer appointments); and Increased number of monitoring stations.	Continual commitment to air quality issues in the Province	IMPROVING	
KEY ATMOSPHERIC POLLUTANTS PER DISTRICT	City of Cape Town: improving All other districts: No change		NO CHANGE	
CLIMATE CHANGE: DECLINING				
PROJECTED CHANGES TO CLIMATE VARIABLES	Rising (minimum and maximum) temperatures Reduction in rain days; increasing intensity of rainfall events. Winter rainfall season starting later each year Sea level rise aligned with global trends	Under 2°C increase in regional temperatures	DECLINING	
EXTREME WEATHER EVENTS	Increasingly frequent floods and droughts Increased fire incidence, extent and severity More sectoral policy responses to climate change related extreme weather events	Limit/mitigate the change in impact, frequency and intensity of extreme weather events	DECLINING	
EMISSIONS PROFILE	Marginal increase in absolute GHG emissions and GHG emissions per GDP GHG emissions per capita unchanged	2 metric tons of CO ₂ -equivalent per capita by 2050	NO CHANGE	
ENERGY: STABLE				
ENERGY SUPPLY	Increasing number and diversity of power plants. More renewable energy Small scale embedded generation in 15 municipalities	Increased energy generation from renewable sources Decreased dependence on coal	IMPROVING	
ENERGY USE	Total energy use increased by ~ 8% between 2013 and 2016 54% used by transport (35% in 2004 and 52% in 2009) Mostly coal based electricity and liquid fuels CCT consumes 57% (59% in 2013), West Coast 21% (20% in 2013))	Decrease in energy use Decreased reliance on coal based electricity and liquid fuels	DECLINING	
ENERGY INTENSITY	48 GJ/capita energy consumption (increase from 46 GJ/capita in 2013) 6t CO ₂ e/capita (no change from 2013) Increase in intensity per unit of GDP	Decrease in GJ/capita energy consumption Decrease in tonnes of CO ₂ e /capita Decrease in energy intensity per GDP	DECLINING	
DOMESTIC ENERGY USE	97.18% Households electrified (up from 93.4% in 2011) Decreasing% of households using electricity (rather than solar PV) for heating	100% of households electrified Increase in households using solar PV Fewer households using biomass	IMPROVING	
ENERGY SECURITY	6.82% of households reporting interruption to electricity supply 30% of which lasted longer than 12 hours	Fewer power outages Decrease in duration of interruptions Decreased reliance on Eskom for electricity	INSUFFICIENT HISTORICAL DATA	
WASTE MANAGEMENT: CONCERN				
WASTE GENERATION	% increase in waste generated far exceeded population and economic growth rate.	Waste generation rates in line with, or below population and economic growth rates.	DECLINING	
	Implementation of alternative waste management projects has improved waste diversion rates.		IMPROVING	
WASTE CHARACTERISATION	IPWIS implementation allows for improved reporting of waste generation rates. Low reporting compliance in many municipalities hinders understanding of waste streams.	Reliable data regarding waste (general and hazardous).	IMPROVING	

INDICATOR	KEY QUANTIFICATIONS	TARGET	TREND	
WASTE MANAGEMENT FACILITIES	Fewer operational WMFs in 2017 vs 2006. Closure of unlicensed facilities and consolidation of existing operational facilities. All municipalities except CKDM have plans for regional facilities.	Sufficient integrated waste management infrastructure to deal with projected waste volumes. Increase in compliance of WMFs.	IMPROVING	
	Majority of the WMFs have less than 5 years of operational capacity remaining. 11% of WMFs require small changes to operation and management 27% of WMFs partially compliant, requiring improvements 61% had poor compliance, requiring major improvements.		CONCERN	
WASTE COLLECTION SERVICES	Increased% of households receiving weekly municipal waste removal services Room for improvement in rural areas	Waste collection services for all communities.	IMPROVING	

ANNEX 4: ACRONYMS

ACIP	Accelerated Community Infrastructure Programmes
AFOLU	Agriculture, Forestry and Other Land Use
APM	All Possible Measures
APP	Annual Performance Plan
BGCMA	Breede-Gourtiz Catchment Management Agency
BRIP	Berg River Improvement Plan
BW	Bid Window
C.A.P.E.	Cape Action for People and the Environment
CAPA	Climate Change Adaptation Plan of Action
CARA	Conservation of Agricultural Resources Act
CBD	Central Business District
CBG	Compressed Biogas
CCGT	Combined Cycle Gas Turbine
CCR	Climate Change Response
CCRPD	Climate Change Response Projects Database
CCT	City of Cape Town
CDM	Clean Development Mechanism
CH₄	Methane
CHEC	Cape Higher Education Consortium
CMA	Catchment Management Agency
CNG	Compressed Natural Gas
CO₂	Carbon dioxide
COPD	Chronic obstructive pulmonary disease
COP	Conference of Parties
CPUT	Cape Peninsula University of Technology
CRP	Climate Resilience Project
CSIR	Council for Scientific and Industrial Research
CSP	Concentrated Solar Power
DAFF	Department of Agriculture, Forestry and Fisheries
DBSA	Development Bank of South Africa
DDR-M	Disaster Risk Reduction Management
DEA	Department of Environmental Affairs
DERO	Desired Emission Reduction Outcomes
DM	District Municipality
DMA	Disaster Management Act
DMAA	Disaster Management Amendment Act
DOE	Department of Energy
DORA	Division of Revenue Act
DRR - M	Disaster Risk Reduction Management
DWAF	Department of Water and Forestry
DWS	Department of Water and Sanitation
EE	Energy Efficiency
EEDSM	Energy Efficiency Demand Side Management
EGS	Ecosystem Goods and Services

EIA	Environmental Impact Assessment
EMP	Estuary Management Plan
EMU	Electric Multiple Unit
EnMS	Energy Management Systems
ESO	Energy systems optimisation
EV	Electric Vehicle
EVD	Ebola Virus Disease
EWS	Early Warning Systems
FEPA	Freshwater Ecosystem Priority Areas
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GEF	Global Environment Facility
GGHHN	Global Green and Healthy Hospitals Network
GHG	Greenhouse Gas
GIPTN	George Integrated Public Transport Network
GIS	Geographic Information Systems
GJ	Gigajoules
GW	Gigawatt
GWh	Gigawatt hour
HEI	Higher education institutions
HFO	Heavy Fuel Oil
HP	High pressure
HVAC	Heating, Ventilation, Air Conditioning
IAP	Invasive Alien Plants
ICE	Internal Combustion Engine
IDP	Integrated Development Plan
IDRC	International Development Research Centre
IEE	Industrial Energy Efficiency
IFC	International Finance Corporation
INDC	Intended Nationally Determined Contribution
IPP	Independent Power Producer
IPPU	Industrial processes and product use
IPTN	Integrated Public Transport Network
ISSP	Informal Settlement Support Plan
IWMP	Integrate Waste Management Plan
kWh	Kilowatt hour
LPG	Liquefied petroleum gas
LTAS	Long Term Adaptation Scenarios
M&E	Monitoring and Evaluation
MDB	Multilateral Development Banks
MEC	Member of Executive Council
MIG	Municipal Infrastructure Grant
MOU	Memorandum of Understanding
MPA	Marine Protected Areas
MW	Megawatt
NAS	National Adaptation Strategy
NBA	National Biodiversity Assessment

NBI	National Business Initiative
NCCRWP	National Climate Change Response White Paper
NCMP	National Coastal Management Programme
NCPC-SA	National Cleaner Production Centre – South Africa
NDMC	National Disaster Management Centre
NDMF	National Disaster Management Framework
NERSA	National Energy Regulator South Africa
NFEPA	National Freshwater Ecosystem Priority Areas
NGO	Non-Governmental Organisation
NMT	Non-motorised transport
NRW	Non-revenue Water
PAES	Protected Area Expansion Strategy
PBSAP	Provincial Biodiversity Strategy and Action Plan
PM10	Particulate matter
PPTIF	Provincial Public Transport Institutional Framework
PSDF	Provincial Spatial Development Framework
PSEE	Public Sector Energy Efficiency Programme
PSG4	Provincial Strategic Goal 4
PSP	Provincial Strategic Plan
PV	photovoltaic
R&V	Risk and Vulnerability
RBIG	Regional Bulk Infrastructure Grant
RE	Renewable energy
REDZ	Renewable Energy Development Zones
REEEP	Renewable Energy and Energy Efficiency Partnership
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RMMP	River Maintenance and Management Plan
SEA	Strategic Environmental Assessment
SET	Sector Emissions Target
SALGA	South African Local Government Association
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SAQA	South African Qualifications Authority
SDF	Spatial Development Framework
SDG	Sustainable Development Goal
SIPs	Strategic Infrastructure Programmes
SME	Small Medium Enterprises
SMME	Small, Medium and Micro-sized Enterprises
SO₂	Sulphur dioxide
SOEOR	State of Environment Outlook Report
SPLUMA	Spatial Planning and Land Use Management Act
SSEG	Small-scale embedded generation
SWH	Solar water heaters
SWSA	Strategic Water Source Areas
SU	Stellenbosch University
tCO₂e	Tonnes Carbon Dioxide equivalent
TMF	Table Mountain Fund

UCT	University of Cape Town
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organisation
UNISDR	United Nations International Strategy for Disaster Reduction
US\$	United States Dollar
UWC	University of Western Cape
VOC	Volatile Organic Compounds
VSD	Variable Speed Drives
WC	Western Cape
WCCCARF	Western Cape Climate Change Agriculture Response Framework
WCCCRS	Western Cape Climate Change Response Strategy
WCDM	Western Cape Disaster Management
WCG	Western Cape Government
WCG: DEA&DP	Western Cape Government: Department of Environmental Affairs and Development Planning
WCG: HS	Western Cape Government: Human Settlements
WCHSF	Western Cape Human Settlements Framework
WCSWMP	Western Cape Sustainable Water Management Plan
WC/WDM	Water Conservation / Water Demand Management
WCWSS	Western Cape Water Supply System
WMA	Water Management Area
Wp	Watt peak
WRC	Water Research Commission
WRP	Water Resources Planning
YLL	Years of Life Lost

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