



# SOUTH AFRICA'S 1<sup>ST</sup> BIENNIAL UPDATE REPORT

November 2014



**environmental affairs**

Department:  
Environmental Affairs  
**REPUBLIC OF SOUTH AFRICA**

**giz** Deutsche Gesellschaft  
für Internationale  
Zusammenarbeit (GIZ) GmbH

On behalf of:



of the Federal Republic of Germany





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Federal Ministry  
for the Environment, Nature Conservation,  
Building and Nuclear Safety

of the Federal Republic of Germany



## PREFACE

This report has been compiled for the Department of Environmental Affairs (DEA) in response to South Africa's obligation to provide a Biennial Update Report (BUR) to the United Nations Framework Convention on Climate Change (UNFCCC) before the end of 2014.

The report is prepared in accordance with the 'UNFCCC Biennial Update Reporting Guidelines for Parties not included in Annex I to the Convention' (FCCC/CP/2011/9/Add.1).

This report is published by the DEA, South Africa. An electronic version of the report will be available on the website of the DEA ([www.environment.gov.za](http://www.environment.gov.za)) once the review process is completed.

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## ACKNOWLEDGEMENTS

Many people and institutes were involved in the compilation of the BUR, and we greatly appreciate all the contributions from organisations and individuals who were involved in this compilation. Special thanks go to the Global Environmental Facility (GEF) and the Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, through its Climate Support Programme, for providing financial support for the preparation of the BUR.



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## MINISTERIAL FOREWORD

In 2014, South Africa celebrated twenty years of freedom and democracy. Over the last two decades we have been witness to a sustained process of transformation, with legislation and policy development, and the formation of new environmental guiding principles.

We have also begun taking strong and decisive action to address climate change, both domestically and internationally. In 2011, we proudly hosted and participated in the UNFCCC's seventeenth Conference of the Parties in Durban – a meeting with a final outcome that was both historic and precedent setting.

As a country, we are committed to contributing to the achievement of a climate-resilient society and low-carbon economy. Our Climate Change Response Policy, which was approved in 2011, articulates this vision. Guided by this Policy, we are currently developing a comprehensive suite of climate change measures which includes: defining desired emission reduction outcomes; promoting innovation and investment in renewable energy; encouraging energy efficiency; and creating a national system for greenhouse gas data collection. We are also set to put a price on carbon from 2016 onwards, which we see as an important step towards changing producer and consumer behaviour and, in so doing, addressing climate change.

Whilst we are extremely proud of the achievements we have made to date, we are aware of the challenges that lie ahead of us. As a developing country, our ability to adapt to

a changing climate is likely to be far slower than our developed counterparts. We are already seeing the devastating effects of varying weather patterns on our coastal provinces and droughts across the interior. We are also witnessing an increasing occurrence of diseases, loss of biodiversity and an increase in the number of displaced communities due to extreme weather events. We have initiated a process to develop our long term adaptation scenarios to respond by adapting to climate change within key climate-sensitive sectors. Through this process we will identify adaptation strategies to increase South Africa's resilience and reduce vulnerability.

As we approach our third decade of democratic governance, South Africa remains committed to working constructively domestically and internationally to respond to the global challenge of climate change. It is within this context, that I am pleased to present our First Biennial Update Report to the UNFCCC, which follows on from our 2011 Second National Communication.



Mrs B E E Molewa  
Minister of Environmental Affairs



## EXECUTIVE SUMMARY

The Republic of South Africa is submitting its First Biennial Update Report (BUR) under the United Nations Framework Convention on Climate Change (UNFCCC), which is due before the end of 2014. This report follows the Biennial Reporting Guidelines for Parties not included in Annex I to the Convention, and therefore comprises of the following seven chapters:

- I. National circumstances
- II. National greenhouse gas (GHG) inventory
- III. Mitigation actions and their effects
- IV. Financial resources, technology transfer, capacity building and technical support received
- V. Support received for the preparation of the BUR
- VI. Measurement, reporting and verification in South Africa
- VII. Additional information

Each of the chapters highlights a specific aspect of South Africa's response to climate change.

### ESI: NATIONAL CIRCUMSTANCES

South Africa is a culturally-diverse, developing country with a population of 53 million and 11 official languages. It has a diverse climate that ranges from a cool, wet climate in the Drakensberg region, through warm, sub-tropical in the north-east, a Mediterranean climate in the south west and a warm, dry, desert environment in the central west and north-west. On a regional level, the country is bordered by six countries, of which four are developing countries and two are least developed countries (LDCs). Since the advent of democracy in 1994, South Africa has taken a leadership role in Southern African Development Community (SADC). South Africa has the largest economy in the SADC and adverse climate change effects on the country will impact on the region as a whole.

South Africa is a contributor to global climate change, with GHG emissions resulting mainly from energy production and consumption. The energy intensity of the South African economy has resulted in an emissions profile that differs substantially from that of other developing countries at a similar stage of development. This is largely due to the significance of mining and minerals processing in the economy and the coal-intensive energy system.

As a result, South Africa has taken steps to formulate measures to mitigate and adapt to a changing climate. The transition to a low carbon economy is guided by the country's vision for 2030, as detailed in the 2011 National Development Plan and the National Climate Change Response White Paper. To achieve this vision, South Africa has outlined long term strategies for both: adapting to the effects of climate change, through adaptation policies; and reducing its carbon emissions to a sustainable level, through mitigation policies and measures. These mitigation policies and measures cover diverse measures, ranging from the development of a domestic carbon tax, to carbon budgeting, mandatory GHG reporting and energy efficiency initiatives. In terms of adaptation, South Africa has developed a Disaster Management Act to address the country's vulnerability to extreme climatic events such as fires, floods and extreme storms.

South Africa has prioritised research into climate change and offers funding (under its Global Change Research Programme (GCRP)) for work done to understand a changing planet. The South African Environmental Observation Network (SAEON), the African Observation Network (AEON), the Applied Centre for Climate and Earth Systems Science (ACCESS) and the South African National Space Agency (SANSA) are also collaborating to tackle challenges related to climate change.

## ES2: NATIONAL GREENHOUSE GAS INVENTORY

South Africa's most recent inventory covers the period between 2000 and 2010 and will be submitted to the UNFCCC in the first half of 2015. This inventory was calculated using the principles of the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories.

In 2010, South Africa's total GHG emissions including Forestry and Other Land Use (FOLU) were 518.2 million tonnes (Mt) carbon dioxide equivalent (CO<sub>2</sub>e). In 2010, South Africa's total GHG emissions excluding FOLU were 544.3 million tonnes (Mt) carbon dioxide equivalent (CO<sub>2</sub>e). Energy-related emissions (fossil fuel combustion, transport, and fugitive emissions) dominate South Africa's emissions profile, and contributed to 75.1% of the total emissions in 2010.

South Africa's total GHG emissions (including FOLU) increased by 21.9% between 2000 and 2010. Excluding FOLU, South Africa's net GHG emissions in 2010 increased by 21.1% compared with 2000 levels. Sectors with increasing emissions during the period 2000 to 2010 included Energy (up by 27%) and Waste (up by 59.3%). The sector showing decreasing emissions over the period were Agriculture, Forestry and Other Land Use (AFOLU) (down by 15.7%) and Industrial Processes and Product Use (IPPU) (down by 1.2%). The decrease in emissions in the IPPU sector was mainly due to the global economic recessions and the electricity crisis that occurred during that period, resulting in a decline in the demand for products.

The inventory results for the period between 2000 and 2010 (excluding FOLU) are illustrated in Figure ESI.

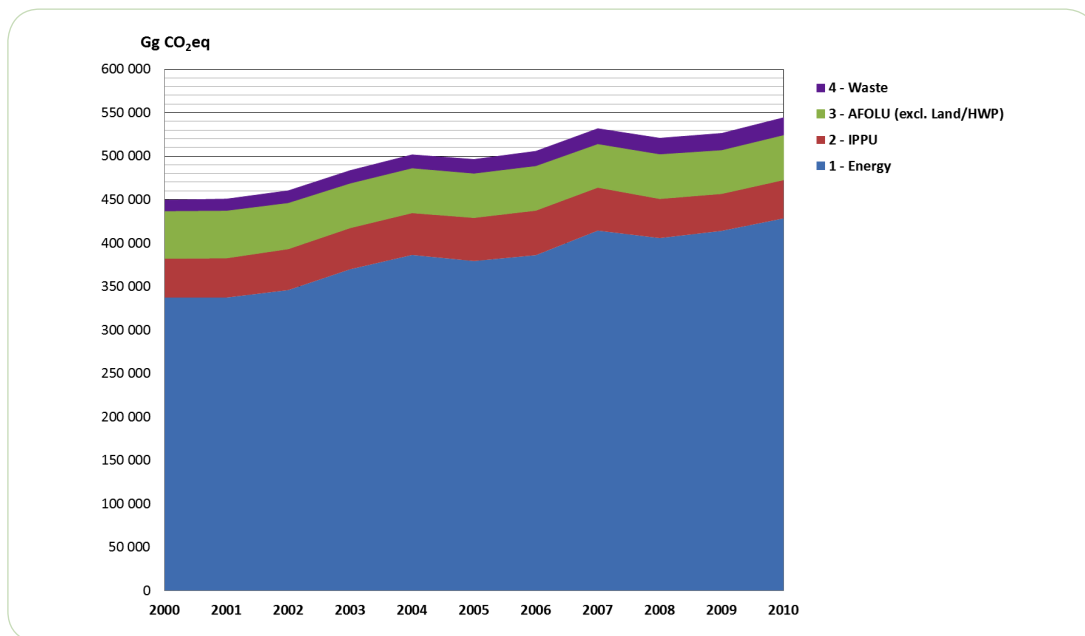


Figure ESI: Greenhouse gas inventory for South Africa for the period 2000 to 2010



South Africa is currently in the process of creating a national GHG inventory system that will manage and simplify its climate change obligations to the UNFCCC. This process will ensure that the country prepares and manages data collection and analysis, as well as all relevant information related to climate change, in the most consistent, transparent and accurate manner, for both internal and external reporting.

### ES3: MITIGATION ACTIONS AND THEIR EFFECTS

South Africa undertook to “reduce its GHG emissions by 34% below Business as Usual (BAU) before 2020, and by 42% below BAU by 2025. However, the extent to which this action can be implemented is dependent on the provision of financial resources, and the transfer of technology and capacity building support by developed countries”.

Chapter 3 of the BUR describes the major policies and mitigation measures that have been developed and implemented by all levels of government to meet South Africa’s emission reduction targets. In addition, mitigation efforts by the private sector are reported and their impacts analysed. The chapter also outlines the political context that underpins the country’s climate change response framework.

There are four key mitigation initiatives that are being led by the government in an effort to transition to a lower-carbon economy. These initiatives include Flagship Programmes, Mitigation Potential Analysis, Desired Emission Reduction Outcomes, and Carbon Tax. South Africa has established a set of domestic institutional arrangements to facilitate smooth implementation of these initiatives. The arrangements include an Inter-Governmental Committee on Climate Change (IGCCC), and a National Committee on Climate Change (NCCC).

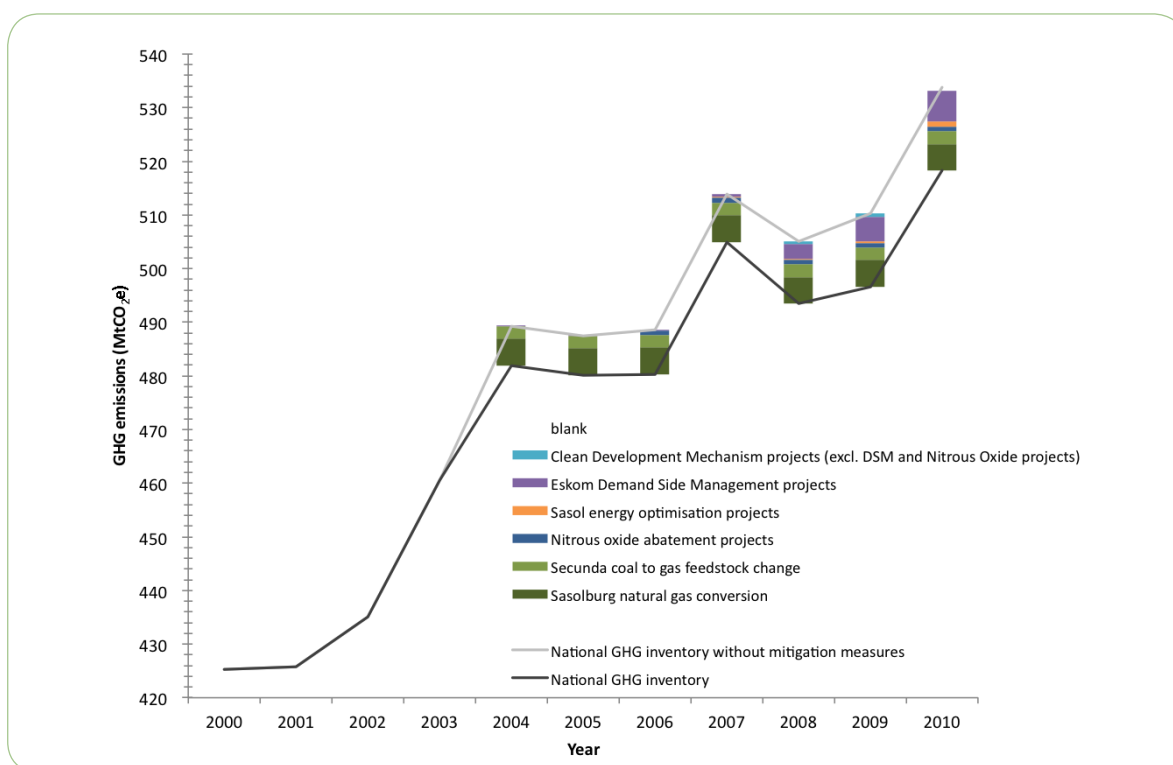


Figure ES2: Effect of South Africa’s mitigation initiatives on the country’s national greenhouse gas inventory (Promethium Carbon, 2014)

## ES4: FINANCIAL RESOURCES, TECHNOLOGY TRANSFER, CAPACITY BUILDING, AND TECHNICAL SUPPORT RECEIVED

South Africa is dedicated to mobilising internal and external resources to overcome the challenges in mitigating and adapting to climate change. This includes financial resources, technical cooperation and technology transfer at domestic, sub-regional, regional and international levels. Since 2000, South Africa has received (or has been earmarked to receive) a total of USD 1.2 billion in bilateral support for climate change-related activities. Over the same period, South Africa has also received (or has been earmarked to receive) a total of USD 837 million in multilateral support. The figures below present an analysis of South Africa's bilateral and multilateral support.

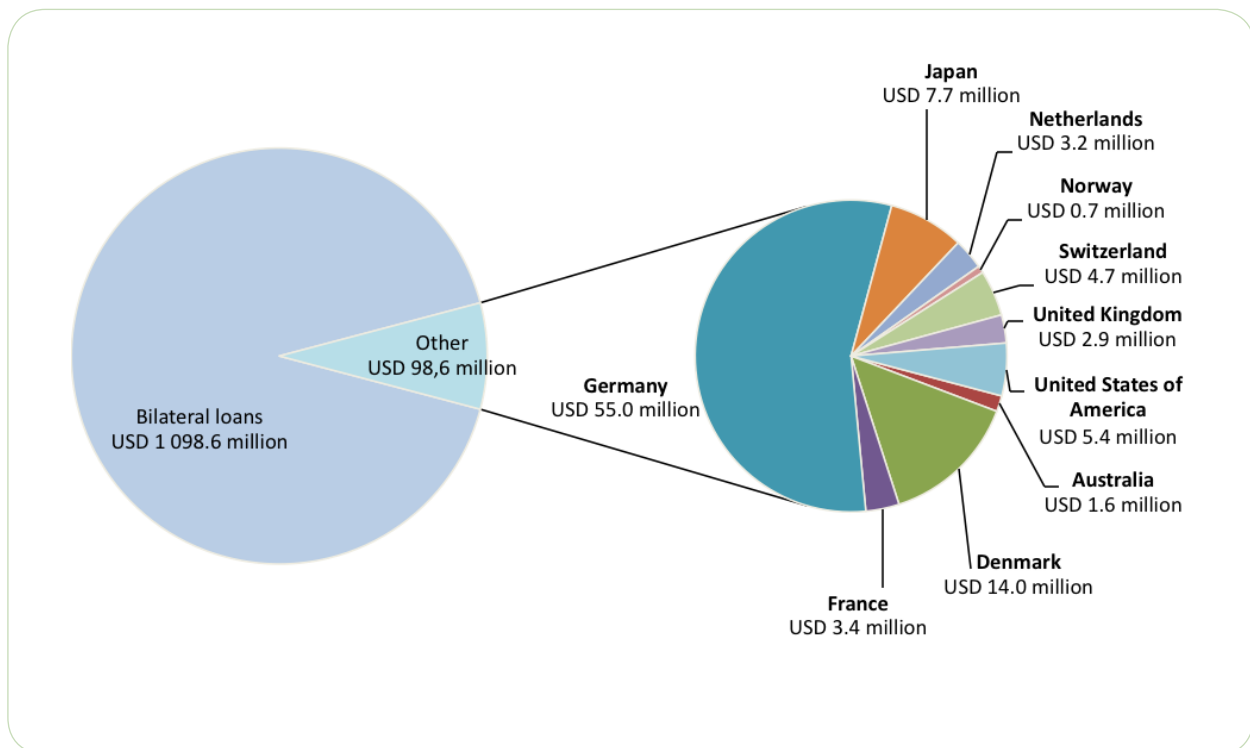


Figure ES3: South Africa's bilateral support

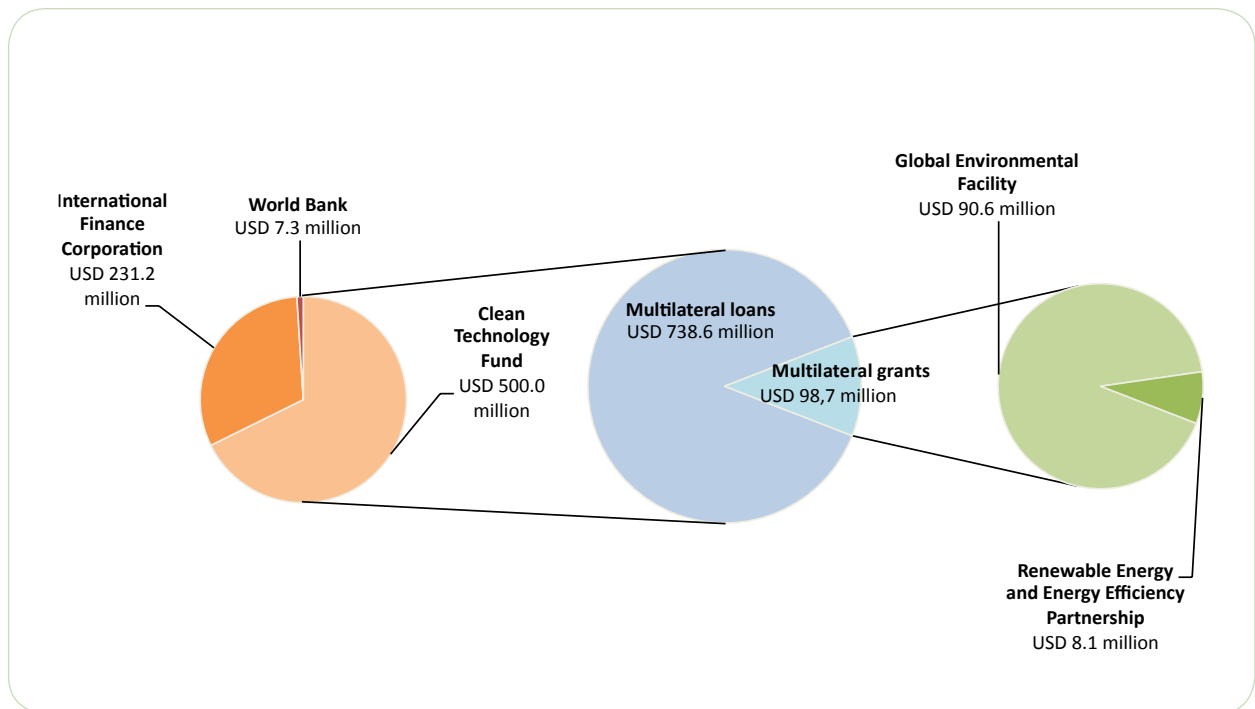


Figure ES4: South Africa's multilateral support

South Africa has commenced work on the design and implementation of a Climate Finance Co-ordination Mechanism to track the country's efforts in reducing GHG emissions, as well as the impact of the disbursed funds. This mechanism will also link the necessary resources with priority mitigation and adaptation programmes.

### ES5: SUPPORT RECEIVED FOR THE PREPARATION OF THE BUR

South Africa was one of six non-Annex I Parties that requested support from the Global Environmental Facility (GEF) for the preparation of its first Biennial Update Report. The government has further received funding from Gesellschaft für Internationale Zusammenarbeit (GIZ) for the compilation of the BUR and for conducting stakeholder consultation. South

Africa has worked with the Consultative Group of Experts (on National Communications from Parties not included in Annex I to the Convention (CGE)) to compile training materials for the BUR for developing countries.

### ES6: MEASUREMENT, REPORTING AND VERIFICATION IN SOUTH AFRICA

South Africa frames Measurement, Reporting and Verification (MRV) in terms of "Monitoring and Evaluation" (M&E). The "Monitoring" component of M&E is viewed to encompass MRV as a whole, whilst the "Evaluation" component provides continuous assessment and feedback on the "Monitoring" function. This M&E system aims to track the country's progress towards a lower-carbon and climate-resilient society.

The country has been working towards the development of an M&E system for more than five years. In 2009, South Africa developed a National Climate Change Response Database (NCCRD), which is a web-based database that contains information on the mitigation, adaptation and research projects that have been implemented in the country. The NCCRD now forms part of the broader climate change M&E system that South Africa is currently developing which

also tracks climate change adaptation responses. In 2014, South Africa will continue to progress the design of its M&E system through the development of a web-based database that records: GHG emissions; support received for climate change mitigation actions; and the costs and co-benefits of these mitigation actions. South Africa aims to pilot its climate change M&E system by the end of 2015.

## ES7: ADDITIONAL INFORMATION

South Africa has also undertaken a collection of additional work (over and above that reported in Chapters 1 – 6) to address climate change in the country, which includes:

Renewable Energy Independent Power Producer Procurement (REIPPP) Programme	The REIPPP Programme provides power purchase agreements for renewable energy technologies that generate electricity. These technologies include biomass, concentrated solar power, landfill gas, onshore wind, solar photovoltaic and small hydropower.
Long Term Adaptation Scenarios (LTAS)	The aim of the LTAS was to develop a consensus view of climate change trends and projections in the country. These projections were based on recent trends in climate, and synthesised a range of potential future climate conditions that could (plausibly) occur in South Africa.
Integrating Climate Change into Municipal Planning Through the 'Let's Respond Toolkit'	South Africa has developed a toolkit for integrating climate change risks and opportunities into municipal planning. This toolkit is known as the 'Let's Respond Toolkit', which was designed to assist local government with mainstreaming climate change issues into the planning process.
2050 Pathways Calculator	The 2050 Pathways calculator is an interactive, user-friendly tool that allows non-experts to develop their own combination of changes in different technologies in order to explore different energy and emission scenarios up to 2050. This is a useful tool to use to engage policy makers and the public on how the country's emissions could change over time.
National Atmospheric Emission Inventory System (NAEIS)	The NAEIS is a web-based reporting platform that provides the public with information on South Africa's emission profile.

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## ABBREVIATIONS

ACAD	Africa Carbon Asset Development
ACCESS	Applied Centre for Climate and Earth Systems Science
ACMP	Association of Cementitious Material Producers
ADA	Austrian Development Agency
AEON	African Observation Network
AFDB	African Development Bank
AFOLU	Agriculture, Forestry and Other Land Use
AgriSA	Agriculture South Africa
AIP	Africa Infrastructure Program
AIDS	Acquired Immunodeficiency Syndrome
ARC	Agriculture Research Council
BEE	Black Economic Empowerment
BMU	Bundesministerium für Umwelt (Federal Ministry for the Environment)
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (Federal Ministry for Economic Cooperation and Development)
BRICS	Five major emerging national economies: Brazil, Russia, India, China and South Africa
BRT	Bus Rapid Transport
BUR	Biennial Update Report
BUSA	Business Unity South Africa
CBA	Community Based Adaptation
CBAA	Community Based Adaptation in Africa
CBM	Coal Bed Methane
CCAA	Climate Change Adaptation in Africa
CCS	Carbon Capture Storage
CDI	Combined Index of Soil and Veld Degradation
CDM	Clean Development Mechanism
CEEPA	Centre for Environmental Economics and Policy in Africa
CEF	Central Energy Fund
CGE	Consultative Group of Experts
CH <sub>4</sub>	Methane
CNG	Compressed Natural Gas



CNRS	Centre for Scientific Research
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
CO <sub>2</sub> e	Carbon Dioxide equivalent
COP	Conference of the Parties
CPI	Consumer Price Index
CS	Country Specific
CSIR	Council for Scientific and Industrial Research
CSP	Concentrated Solar Power Plant
CSP	Climate Support Programme
DAAD	Deutscher Akademischer Austauschdienst (German Academic Exchange Service)
DAFF	Department of Agriculture, Forestry and Fisheries
DBSA	Development Bank of Southern Africa
DC	Direct Current
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DECC	Department of Energy and Climate Change
DEROs	Desired Emission Reduction Outcomes
DF	Default Factor
DFID	Department For International Development
DMR	Department of Mineral Resources
DoE	Department of Energy
DSM	Demand Side Management
DST	Department of Science and Technology
DTI	The Department of Trade and Industry
DWA	Department of Water Affairs
EEDSM	Energy Efficiency and Demand Side Management
EELN	Energy Efficiency Leadership Network
EEP	Energy and Environment Partnership
EETMS	Energy Efficiency Target Monitoring System
EF	Emission Factor

EIB	European Investment Bank
EMS	Energy Management Standards
EPWP	Expanded Public Works Programme
ERC	The Energy Research Centre
ESCOs	Energy Service Companies
ESO	Energy Systems Optimisation
FAO	Food and Agriculture Organization
FAPA	Ferro Alloys Producers Association
FFA	Forest Fire Association
FSA	Forestry South Africa
GCRP	Global Change Research Plan
GDP	Gross Domestic Product
GDRI	International Research Group
GEEF	Green Energy Efficiency Fund
GEF	Global Environment Facility
Gg	Gigagram
GHG	Greenhouse Gas
GIS	Geographic Information System
GIZ	Gesellschaft für Internationale Zusammenarbeit
GMT	Greenwich Mean Time
GS	Gold Standard
GTL	Gas-to-Liquid
GWh	Gigawatt hour
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons
HIV	Human Immunodeficiency Virus
HSRC	Human Sciences Research Council
IDC	Industrial Development Corporation
IDM	Integrated Demand Management
IEP	Integrated Energy Plan
IMCCC	Inter-Ministerial Committee on Climate Change



IGCCC	Inter-Governmental Committee on Climate Change
IFC	International Finance Corporation
IIASA	International Institute for Applied Systems Analysis
IPCC	Intergovernmental Panel on Climate Change
IPGP	Institut de Physique du Globe de Paris
IPPs	Independent Power Producers
IPPU	Industrial Process and Product Use
IPTN	Integrated Public Transport Network
IRP	Integrated Resource Plan for Electricity
ITS	Intelligent Transport System
LDC	Least Developed Country
LTAS	Long Term Adaptation Scenarios
LTMS	Long Term Mitigation Scenarios
M&E	Monitoring and Evaluation
MAPT	Measurement and Performance Tracking
MPA	Mitigation Potential Analysis
MRV	Measurement, Reporting and Verification
MW	Megawatt
MWh	Megawatt hour
N <sub>2</sub> O	Nitrous Oxide
NAEIS	National Atmospheric Emission Inventory System
NCCC	National Climate Change Committee
NCCRD	National Climate Response Database
NCCRP	National Climate Change Response Policy
NCPC	National Cleaner Production Centre
NEES	National Energy Efficiency Strategy
NERSA	National Energy Regulator of South Africa
NIBS	National Industrial Biofuels Strategy
NOAA-OGP	National Oceanic and Atmospheric Agency, Office of Global Programs
NOWCS	National Organic Waste Composting Strategy
NRCS	National Regulator for Compulsory Specifications

NRF	National Research Foundation
NT	National Treasury
ODA	Official Development Assistance
ODS	Ozone Depletion Substance
PFCs	Perfluorocarbons
PMR	Partnership for Market Readiness
POA	Programme of Activities
PRASA	Passenger Rail Agency of South Africa
PSEE	Private Sector Energy Efficiency
PWRs	Pressurised Water Reactors
QA	Quality Assurance
QC	Quality Control
REDISA	Recycling and Economic Development Initiative of South Africa
REIPPP	Renewable Energy Independent Power Producer Programme
REMT	Renewable Energy Market Transformation
SA	South Africa
SABS	South African Bureau of Standards
SABSSM	South Africa's national population-based HIV/AIDS behavioural risks, sero-status and media impact survey
SADC	Southern African Development Community
SAEON	South African Environmental Observation Network
SAGEN	South African-German Energy Programme
SAISI	South African Iron and Steel Institute
SAMI	South African Mineral Industry
SANBI	South African National Botanical Institute
SANEDI	South African National Energy Development Institute
SANERI	South African National Energy Research Institute
SANSA	South African National Space Agency
SAPP	Southern African Power Pool
SATREPS	Science and Technology Research Partnership for Sustainable Development
SAWS	South African Weather Service
SA-YSSP	Southern African Young Scientists Summer Programme





SDI	Soil Degradation Index
SF6	Sulphur Hexafluoride
SMEs	Small and Medium Enterprises
SO2	Sulphur Dioxide
SSN	South-South-North
StatsSA	Statistics South Africa
TB	Tuberculosis
TFESSD	Trust Fund for Environmentally and Socially Sustainable Development
TJ	Terajoule
TM	Tier Method
TNA	Technology Needs Assessment
TUT	Tshwane University of Technology
UFS	University of the Free State
UKZN	University of KwaZulu-Natal
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UP	University of Pretoria
USD	United States Dollar
USEPA	United States Environmental Protection Agency
VCS	Verified Carbon Standard
VDI	Veld (vegetation) Degradation Index
V-NAMA	Vertically-Integrated Nationally Appropriate Mitigation Action
VOCs	Volatile Organic Compounds
WB	World Bank
WEM	With Existing Measures
WOM	Without Measures
WRI	World Resource Institute
ZAR	South African Rand

# I. NATIONAL CIRCUMSTANCES


## I.1 INTRODUCTION

The Republic of South Africa (referred to as South Africa from here on) is situated at the southern tip of the African continent. The country became a democracy in 1994 and signed the United Nations Framework Convention on Climate Change (UNFCCC) in June 1993 and ratified it in August 1997. Regionally, the country is bordered by six countries, four of which are developing countries and two are least developed countries (LDCs). Since the advent of democracy, South Africa has taken a leadership role in the Southern African Development Community (SADC). Internationally, alliances include the country's relationships with: the other four major emerging national economies (Brazil, Russia, India, and China); the G-20; and the G8+5.

South Africa is also a signatory to a number of international environmental treaties, including the: Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, Antarctic Seals, Antarctic Treaty, Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Marine Dumping, Marine Life Conservation, Ozone Layer Protection, Ship Pollution, Wetlands, Whaling, Treaty on the Non-Proliferation of Nuclear Weapons, the Bacteriological (Biological) and Toxin Weapons Convention.

The main features of the country are summarised in the table below.

*Table 1: Main features of South Africa*

Feature	Detail
Form of state	A federal state, comprising a national government and nine provincial governments. South Africa is a multiparty, three tier democracy with National, Provincial and Local governance.
Legal system	Based on Roman-Dutch law and the 1996 Constitution, which came into force on 4 February 1997.
National legislature	Bicameral Parliament elected every five years, comprising a 400-seat National Assembly and a 90-seat National Council of Provinces.
Electoral system	List-system of proportional representation based on universal adult suffrage.
Head of state	The President is elected by the National Assembly. Under the Constitution, the President is permitted to serve a maximum of two five-year terms.
Language	Eleven official languages: Afrikaans; English; isiNdebele; isiXhosa; isiZulu; Sesotho sa Leboa; Sesotho; Setswana; siSwati; Tshivenda; and Xitsonga.
Population	52.3 million people (Statistics South Africa, 2013)
Currency	South African Rand (ZAR)
Time	Two hours ahead of GMT
Internet domain	.za
Capitals	Pretoria (administrative) Cape Town (legislative) Bloemfontein (judicial)
Flag	

South Africa has three levels of government (national, provincial and local). The autonomy of each of the levels of government is guaranteed by the Constitution. The economy is well developed, but suffers from high levels of inequality and is predominantly dependent on coal as an energy source, which translates into large GHG emissions.

The integration of climate change planning and action between the different levels of government is directed by the National Climate Change Response Policy (NCCRP) (Department of Environmental Affairs, 2011). The NCCRP prioritises mainstreaming of climate change considerations and responses into all relevant sectors. This includes the Industrial Policy Action Plan, Integrated Resource Plan for Electricity Generation, Integrated Energy Plan for the whole energy sector, Provincial Growth and Development Plans, and Integrated Development Plans.

On a political level, the country is taking a leadership role in the fight against climate change, with policies such as the National Development Plan and the National Climate Change Response Policy (NCCRP). The NCCRP plays a central role in formulating a mix of measures, ranging from the development of a domestic carbon tax, to carbon budgeting, carbon offsetting schemes, mandatory greenhouse gas (GHG) reporting and energy efficiency initiatives.

## 1.2 GEOGRAPHIC PROFILE

South Africa occupies the southern tip of Africa, its coastline stretching more than 2,500 km, from the desert border with Namibia (west coast) on the Atlantic Ocean, southwards around the tip of Africa, then northwards to the border with Mozambique on the Indian Ocean. South Africa shares borders with six countries: Namibia, Botswana, Zimbabwe and Mozambique to the north, Swaziland to the north-east and then Lesotho is landlocked within South Africa. The country ranges from subtropical regions in the north east to desert in the northwest, with much of these two areas being separated by escarpment. Most of the central area is 1,000 meters or more above sea level. The main geographical features of the country are the Drakensberg Mountains in the east, the Great Escarpment in the north east and the great Karoo in the centre. The central plateau extends from the Kalahari Desert in the west to the rolling grassland in the east and the semi-arid Karoo in the south.

South Africa is home to nine biomes (see figure below), all of which may be threatened due to climate change (SANBI, 2013). The country has limited forest cover.

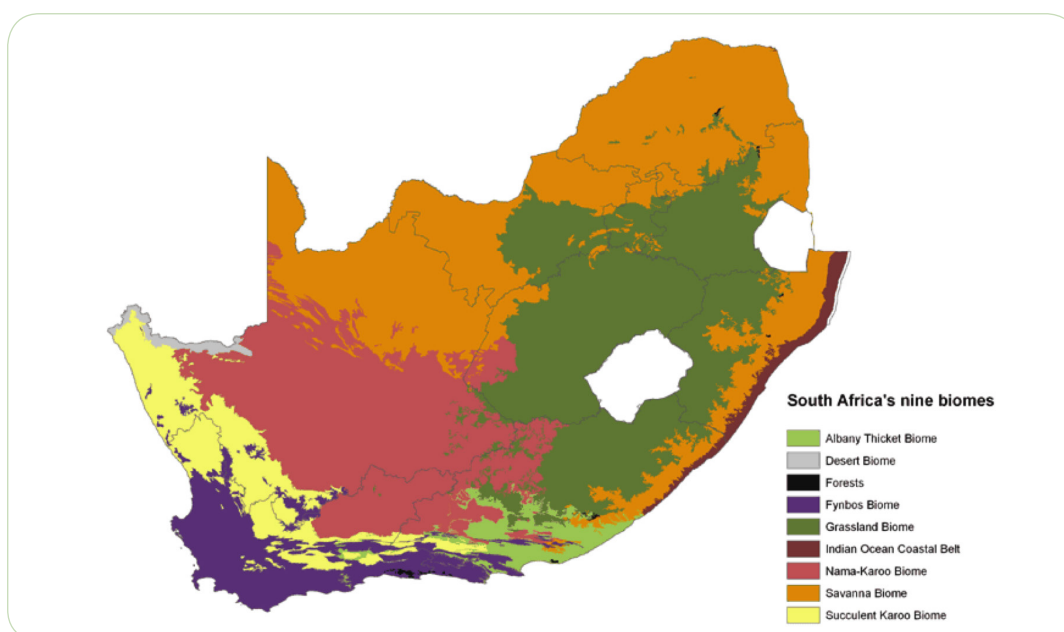


Figure 1: Biomes of South Africa (SANBI, 2013)

The main geographical features of South Africa are summarised in the table below:

*Table 2: Geographical information (Burger, 2011) (Central Intelligence Agency, 2013)*

Geographical feature	Details
Location	South Africa is situated at the southern tip of the African continent, latitudinally from 22° to 35° S and longitudinally from 17° to 33° E. The sub-Antarctic Prince Edward and Marion Islands (46°46'S, 37°51'E) are politically part of South Africa, and South Africa maintains a manned weather station on Gough Island (40°20'S, 10°0'W) that serves as an important remote weather station for South Africa.
Land area	The land area is 1,220,813 km <sup>2</sup> .
Coastline	2,798 km (from Namibia in the west, southwards to the Cape and then northwards to the border with Mozambique).
Borders	4,862 km.
Oceans	The Indian Ocean, located on the east and the Atlantic Ocean on the west confluence around the southern tip of South Africa.
Coastline	Even coastline with very few bays suitable as natural harbours.
Rivers	No navigational rivers. Most river mouths are unsuitable as harbours.
Relief	Coastal plains and interior plateau, separated by the 1,500 m high Roggeveld escarpment in the south-west and the 3,000 m high Drakensberg and Lesotho plateau in the east. The narrow coastal plateaus in the south and the west of the country are edged by coastal mountain ranges.
Climate	Semi-arid, with a sub-tropical region around 30°S, and a Mediterranean climate in the south west. Frequent gale force winds in the coastal region. Generally dry but diverse climate, ranging from a temperate Mediterranean-type climate in the south-west to a warm sub-tropical climate in the north-east, and a warm, dry, desert environment in the central west and north-west, where South Africa borders on the Namib Desert of Namibia and the Kgalagadi (Kalahari) Desert of Botswana respectively. The highlands of the Drakensberg Mountains (also home to the land-locked country of Lesotho), have a cool, wet climate relative to the rest of South Africa.
Rainfall	Average rainfall of 450 mm per year (global average 860 mm). 65% of the country receives less than 500 mm per year: 21% is arid, with less than 200 mm per year: Prolonged drought and severe floods are not uncommon.
Natural resources	Gold, chromium, antimony, coal, iron ore, manganese, nickel, phosphates, tin, rare earth elements, uranium, gem diamonds, platinum, copper, vanadium, salt, natural gas.
Agriculture	81.6% of total land area.
Arable land	12.1% of total land area.
Irrigated land	10.2% of arable land.

## 1.3 CLIMATE

### 1.3.1 Mean Conditions

South Africa has a diverse climate that ranges from a cool, wet climate in the Drakensberg region, to warm, sub-tropical in the north-east, a Mediterranean climate in the south west and a warm, dry, desert environment in the central west and north-west.

The country's climate is influenced by its long coastline and the cold Benguela current that sweeps northwards up the west coast and the warm Mozambique current that runs southwards down the east coast. The coastal region is susceptible to strong coastal winds.

Mean temperatures in South Africa are lower than in other regions on similar latitudes, due to its high elevation. Typical temperatures are daytime maximums in the high 20's (degree Celsius) in the central region going up to the high 30's in the north eastern low region and the arid north western region.

### 1.3.2 Areas Prone to Natural Disasters

South Africa is generally exposed to the following natural disasters: drought, flooding, extreme storms and fires. According to an Intergovernmental Panel on Climate Change (IPCC) Special Report (Intergovernmental Panel on Climate Change, 2012), there is "high confidence" that economic losses from weather-related and climate-related disasters (while variable)

have increased, and that these losses were greater in developing countries than in developed countries. Furthermore, more than 95% of deaths from natural disasters took place in developing countries (Intergovernmental Panel on Climate Change, 2012).

In order to address South Africa's vulnerability to these extreme climatic events, the country has developed a Disaster Management Act 2002 (The Presidency, 2002) which sets out a comprehensive approach to disaster management and identifies the role and responsibilities of key institutions and disaster management agencies.

#### 1.3.2.1 Floods and extreme storms

Historical data indicates that floods are responsible for a greater number of human fatalities and cause greater damage to assets than droughts. Increased flooding was experienced in South Africa between 2000 and 2009, which were often associated with intense concentrated rainfall events. The damage caused by these floods was estimated at R 4.7 billion, and they resulted in 140 deaths (Department of Rural Development and Land Reform, 2013), as taken from the Second National Communication (Department of Environmental Affairs, 2011).

The map below presents the flood risk in South Africa. The areas that are most at risk are Limpopo, the northern coast of KwaZulu-Natal, and central Eastern Cape.

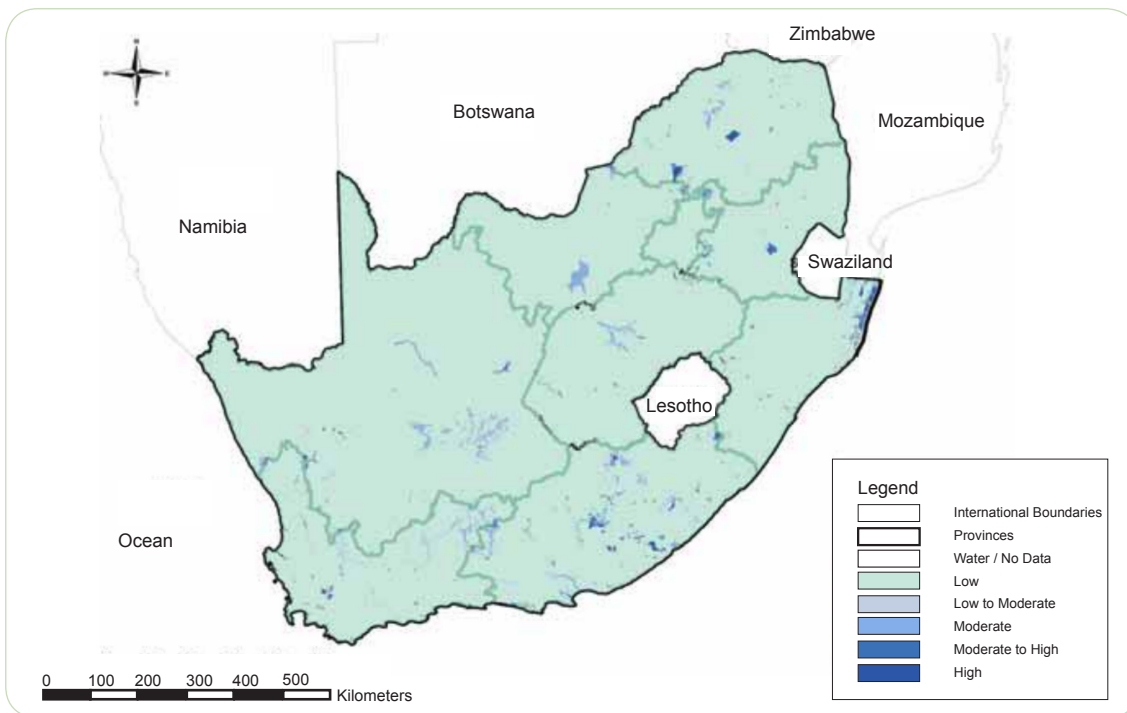


Figure 2: Flood risk in South Africa (Department of Science and Technology, 2010)

South Africa is prone to four different types of flooding:

**Riverine flooding:**

This type of flooding occurs seasonally - in summer in the northern parts of South Africa or in winter in the southern parts of South Africa – when rainfall causes river basins to fill with too much water, too quickly. Torrential rains from tropical cyclones can also produce river flooding, as was the case in 2000, when tropical cyclone Eline caused extensive flooding and subsequent damage throughout the Northern Province and Mpumalanga, and in parts of North-West Province and Gauteng (Department of Water Affairs and Forestry, 2013).



Figure 3: Tropical cyclone Eline caused flooding of the Limpopo River in 2000, displacing thousands of people (Photo: ARA-Sul 2000)

### Coastal floods:

Storms offshore of the South African coastline sometimes develop into intense low pressure systems, which can drive water inland and cause significant flooding. For example, in March 2007, an intense storm, coupled with the highest tide of the year, meant that the tide off the KwaZulu-Natal Coast, was 10.5m above mean sea level (generally, South African spring tides only reach about 1m above mean sea level) (Mather & Theron, 2011).

### Urban floods:

South Africa's urban development has created a number of areas that cannot absorb rainfall infiltration, resulting in increased run-off and flooding. Urbanisation increases runoff by two to six times of what would occur on natural terrain (Department of Provincial and Local Government, 2013).

### Flash floods:

Many areas in South Africa experience flash floods when an excessive amount of rain falls within a short period of time. Areas particularly affected by flash floods are Alexandra in Johannesburg and Cape Flats in Cape Town (Department of Provincial and Local Government, 2013), where the infrastructure has not been designed to cope with these extreme events.

Storms are associated with heavy precipitation, high winds, flash floods, and often with coastal and landslide damage. Each component has the ability to cause extensive damage. Storms, which are often difficult to dissociate from floods, are most often considered sudden events that can come in a number of forms, but which are commonly associated with severe thunderstorms and cold fronts. Storms have cost South Africa R395 million, and have resulted in six reported deaths between 2000 and 2009. It is expected that the frequency of intense storms is likely to increase, as a result of climate change (Department of Rural Development and Land Reform, 2013), as taken from the Second National Communication (Department of Environmental Affairs, 2011).

South Africa is exposed to the following health impacts resulting from increased floods and extreme storms due to climate change (Department of Environmental Affairs, 2013):

- Increased or decreased vector (e.g. mosquito) abundance (e.g. if breeding sites are washed away);
- Increased risk of respiratory and diarrhoeal diseases;
- Drowning;
- Injuries;
- Health effects associated with population displacement;
- Impacts on shelter and food supply.

In June 2014, the Department of Health approved the National Climate Change and Health Adaptation Plan. This Plan was subsequently launched on World Environmental Health Day in September 2014. The Plan aims to provide a broad framework for climate adaptation in the health sector.

The Plan concentrates on vulnerable groups, and urban and rural settlements. A set of core principles have been outlined in the Plan which includes, amongst others, prevention, community participation, intersectoral cooperation and collaboration, synergies between climate change adaptation and other public health initiatives, equity and evidence-based planning. This plan covers a five year period (2014 – 2019) and has defined:

- Nine health and environment potential risks in which human beings are directly and indirectly exposed to as a result of climate change; and
- Eleven key health actions/interventions.

#### 1.3.2.2 Fires

Wildfires (termed veld fires in South Africa, but known as bushfires or wild-fires elsewhere) are a natural phenomenon in many of South Africa's ecosystems. They cause damage and death in areas of human settlement and are particularly damaging to the forest plantation industry. In the period of 2008 – 2009, wildfires caused damage estimated at

R 1.75 billion, and resulted in 34 deaths (Department of Rural Development and Land Reform, 2013), as taken from the Second National Communication (Department of Environmental Affairs, 2011). This also impacted on the non-CO<sub>2</sub> GHG emissions from biomass burning during this period.

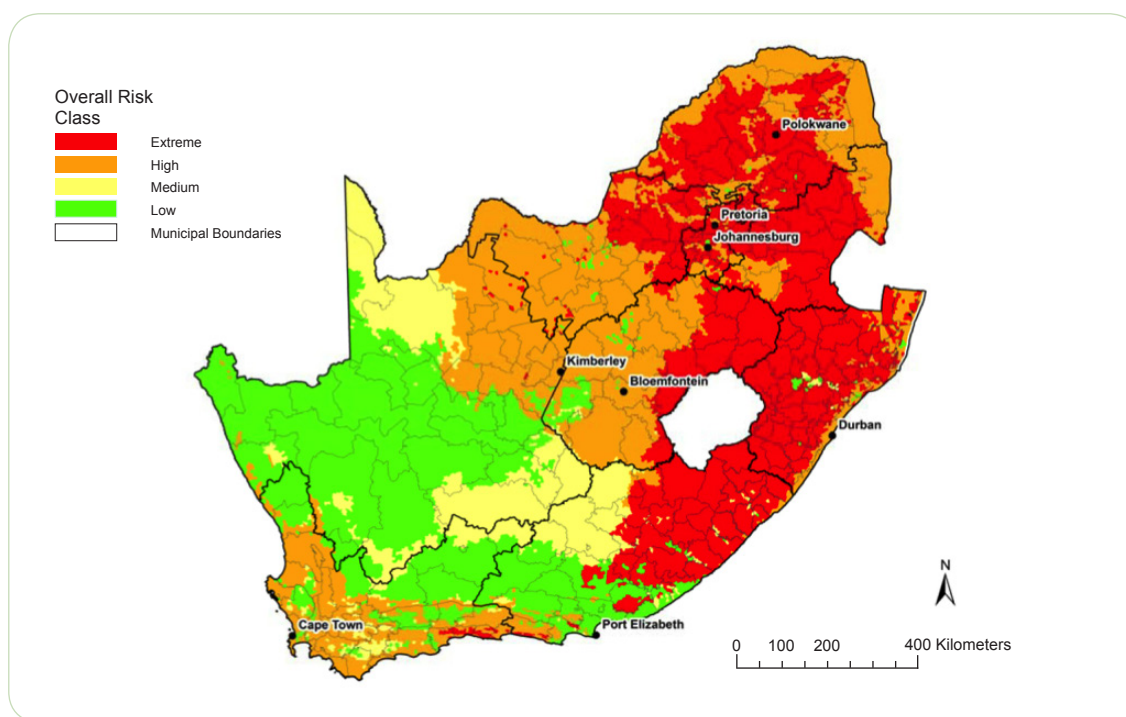


Figure 4: Overall assessment of veld fire risk levels in South Africa (CSIR, 2010)

South Africa is exposed to the following health impacts resulting from fires (Department of Environmental Affairs, 2013):

- Burns and smoke inhalation;
- Soil erosion and increased risk of landslides;
- Increased mortality and morbidity; and
- Increased risk of hospital and emergency admissions.

Fires directly impact the carbon balance of forests, through the emissions of carbon dioxide, volatile organic compounds (VOCs) and other greenhouse gases (GHG), which are formed during the combustion of vegetation and litter. Fires also increase radiative forcing, which changes global temperatures and precipitation, thereby exacerbating climate change.

### 1.3.2.3 Arid and Semi-Arid Areas

South Africa's median rainfall varies from below 200 mm per year to over 1000 mm per year. The western half of South Africa has a semi-arid climate with a median rainfall of below 400 mm per year. The cold Benguela current along the west coast contributes to the arid climate of this region (CSIR, 2010). As indicated in the figures below, the co-efficient of variation in annual rainfall increases as the median rainfall decreases. The western region, which has the lowest annual rainfall, is also the most vulnerable to variation in rainfall and therefore to the impacts of climate change.



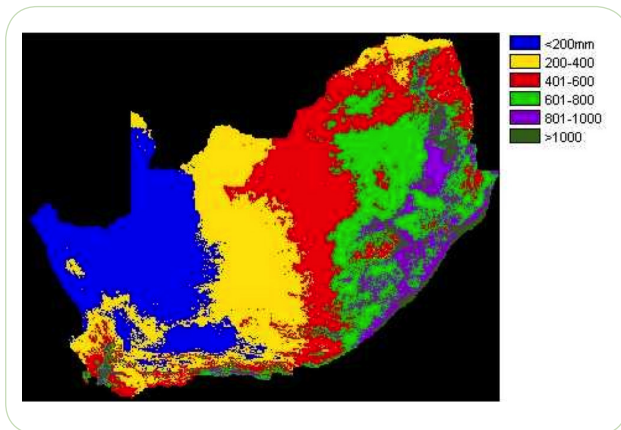


Figure 5: Rainfall in South Africa (Food and Agriculture Organization of the United Nations, 2006)

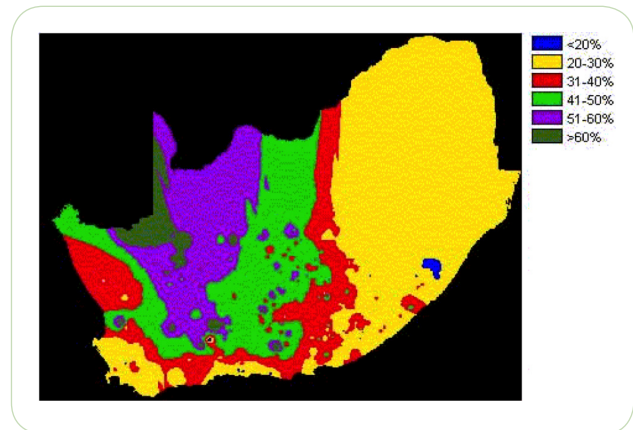


Figure 6: The coefficient of variation in annual rainfall for South Africa - derived from long-term rainfall records (50 years or more data) from 1015 stations (Food and Agriculture Organization of the United Nations, 2006)

Results from the Working Group I Report of the Fifth Assessment Report of the IPCC (Intergovernmental Panel on Climate Change (IPCC), Working Group I, 2013) show that Southern Africa will show both a decrease in average rainfall and an increase in rainfall variability, as indicated in the figures below. The dry western region of the country could show a reduction in average rainfall of as high as 30% by the middle of the century and 40% by the end of the century.

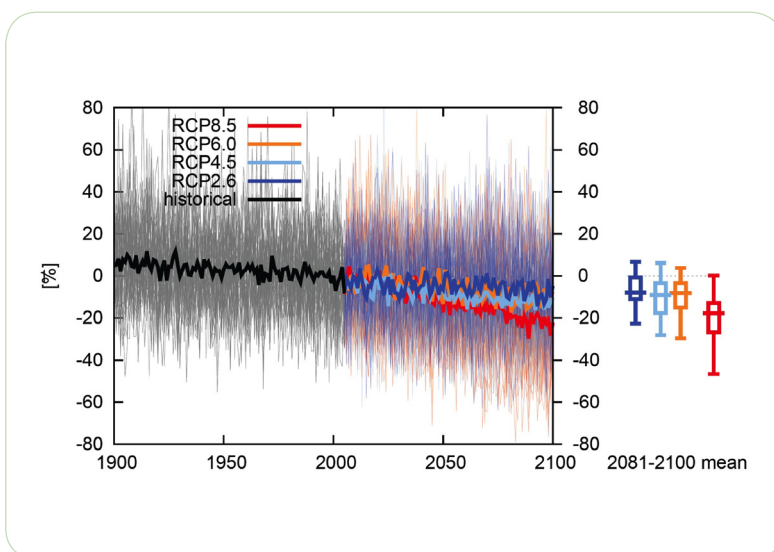


Figure 7: Precipitation change in Southern Africa, April – September (Intergovernmental Panel on Climate Change (IPCC), Working Group I, 2013)

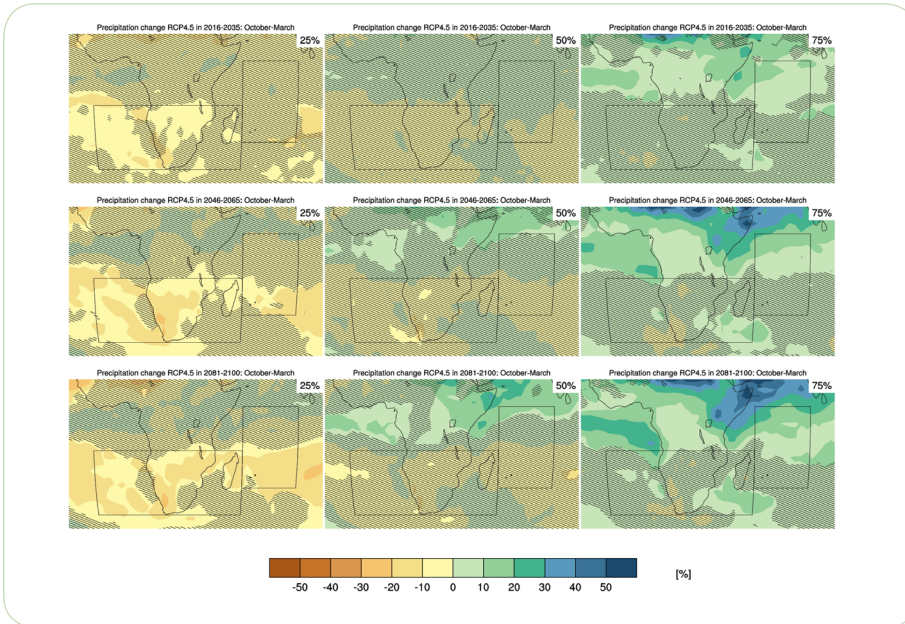


Figure 8: Precipitation change in Southern Africa (Intergovernmental Panel on Climate Change (IPCC), Working Group I, 2013)

South Africa's arid and semi-arid areas are very vulnerable to climate change impacts from both droughts and floods. The infrastructure in the region is vulnerable to severe floods and significant damage can occur as a result.



Figure 9: Flood in the Holgat River in the Northern Cape on 20 May 2006 before, during and after the bridge washed away. This area normally receives less than 200 mm of rain per year. (Photos: Johann Peyper)

### 1.3.3 Areas Liable to Drought and Desertification

#### 1.3.3.1 Drought

Drought in South Africa is defined as seasonal rainfall of 70% less than normal. Droughts are considered to be progressive or 'slow onset' disasters. They are a temporary feature, and are typically more widespread than localised. Droughts in the country caused damage estimated at R 1.15 billion between 2000 and 2009 (Department of Rural Development and Land Reform, 2013), as taken from the Second National Communication (Department of Environmental Affairs, 2011).

South Africa is exposed to the following health impacts from droughts due to climate change (Department of Environmental Affairs, 2013):

- Changes in the abundance of vectors (e.g. mosquito) that breed in dried-up river beds;
- Food shortages;
- Illness;
- Malnutrition;
- Increased risk of infection;
- Death (starvation); and
- Health impacts associated with population displacement.

#### 1.3.3.2 Degradation

It is estimated that more than 30% of the land in South Africa is severely or very severely degraded (United Nations Economic and Social Council, 2007). These rates and the extent of land degradation/desertification undermine and pose a serious threat to the livelihood of people living in these areas, and also reduce the provision of land resources.

Soil degradation/desertification costs South Africa nearly R2 billion per annum (National Botanical Institute, 2010). Significant costs are incurred because of erosion of arable land, which leads to siltation of dams and increased costs of water purification. The status of land degradation in South Africa is presented in terms of three indices: soil degradation index (SDI), veld (vegetation) degradation index (VDI) and combined index of soil and veld degradation (CDI). The soil and veld degradation indices are measures of the severity and rate of soil and vegetation degradation in the provinces. The combined degradation index is the sum of the provincial soil and veld degradation indices. A higher index implies a higher level of degradation. The comparative land degradation statistics for the nine provinces in South Africa are provided below.

Table 3: Comparative land degradation statistics for the 9 provinces in South Africa (National Botanical Institute, 2010)

Province	Area (km <sup>2</sup> )	SDI	VDI	CDI
Eastern Cape	168,966	200	116	316
Free State	129,825	48	86	134
Gauteng	18,178	113	31	143
KwaZulu-Natal	94,361	253	187	440
Mpumalanga	76,495	143	81	223
Northern Cape	372,889	92	140	232
Northern Province	129,462	255	189	444
North West	104,882	149	122	270
Western Cape	129,462	77	93	170

The figure below presents the combined degradation across South Africa (National Botanical Institute, 2010). The areas severely affected include the edges of the Southern Kalahari, the Drakensburg and the Karoo. It is worth noting that soil degradation also affects soil carbon. The impact of this on CO<sub>2</sub> emissions/sinks have not yet been accurately quantified in the national GHG inventory.

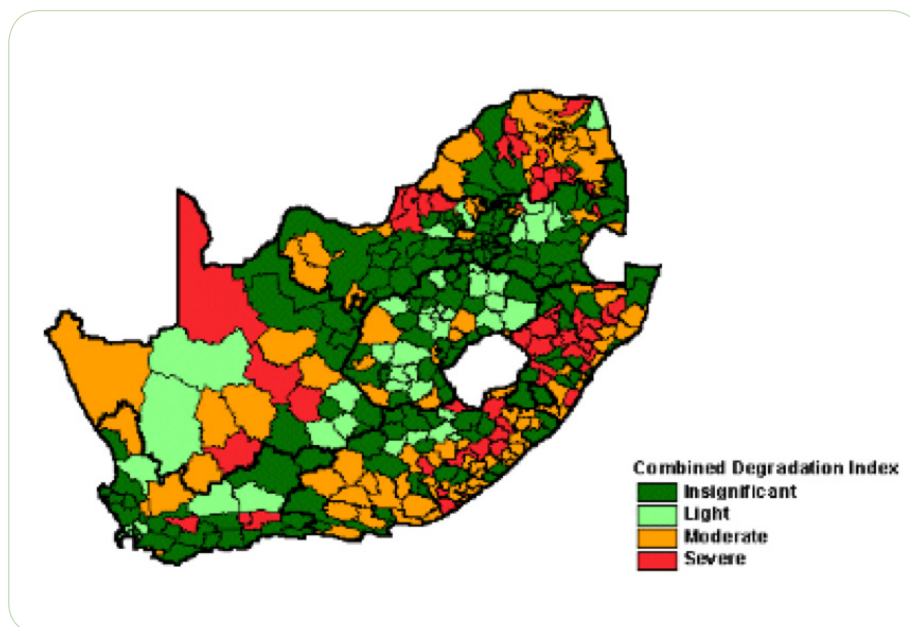


Figure 10: Combined degradation across South Africa (National Botanical Institute, 2010)

### 1.3.4 Areas with Ecosystems Vulnerable to Climate Change

The biomes in South Africa that are particularly vulnerable are:

- The Grassland biome, with large portions of the biome expected to be replaced by Savanna and potentially by forest vegetation;
- The Nama-Karoo biome, with Savanna and desert vegetation projected to expand into large portions of the current biome; and
- The Indian Ocean Coastal Belt biome, with large portions of the biome prone to replacement by the Savanna biome.

Several species in South Africa are also affected by climate change, namely:

- The Succulent Karoo biome 2,800 plant species face potential extinction, as their bio-climatically suitable habitat could be reduced by 80% with a global warming of 1.5-2.7°C above pre-industrial levels (Intergovernmental Panel on Climate Change, 2007);

- A loss of between 51% and 65% of the Fynbos biome area is projected by 2050, due to increased anthropogenic GHG emissions (Midgley, Hannah, Millar, Rutherford, & Powrie, 2002);
- Climate change may have the same impact as land-use change on the extinction of South Africa's endemic Protea species (found in the Fynbos biome) by 2020 (Intergovernmental Panel on Climate Change, 2007);
- The Mountain Wheatear (a small insectivorous bird native to South Africa) is projected to lose 51% of its bioclimatic range by 2050 (Intergovernmental Panel on Climate Change, 2007); and
- A 98% species range reduction is expected for 80% of grassland and animal species due to climate change (Intergovernmental Panel on Climate Change, 2007).

Climate change has been found to be one of the nine biggest threats to plant species in South Africa, as shown in the figure below.

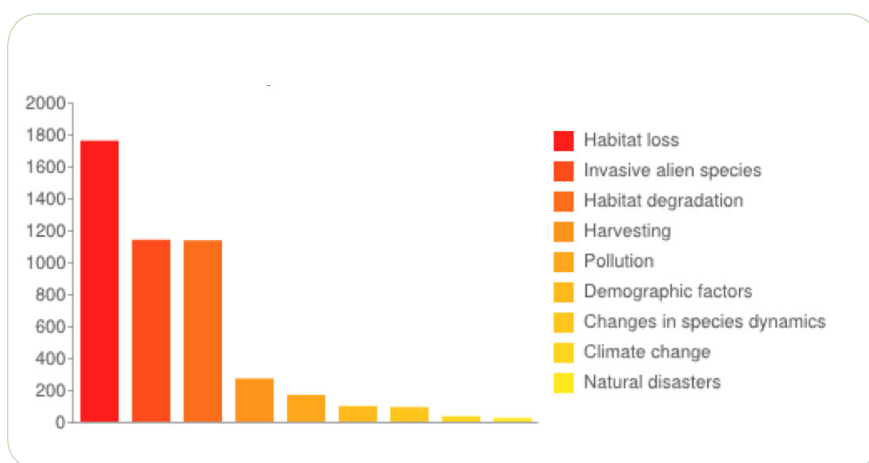


Figure 11: Major threats to plant species in SA (SANBI, 2013)

### 1.3.5 Global Change and Climate Projections

In 2013, the Department of Environmental Affairs completed the first phase of its Long Term Adaptation Scenarios (LTAS). The purpose of the LTAS is to respond to the South African National Climate Change Response Policy, by developing national and sub-national adaptation scenarios for South Africa under plausible future climate conditions and development pathways. The first phase covers climate change trends and projections for South Africa, key climate change impacts and identifies potential response options for primary sectors, such as water, agriculture and forestry, human health, marine fisheries and biodiversity. The second phase will use the information, data and models from the first phase to model and develop adaptation scenarios for future climate conditions.

In the first phase of work, the LTAS describes four broad climate scenarios at national scale, with different degrees of change and likelihood, which captures the results of global mitigation action.

The four broad climate scenarios are as follows:

- i. Warmer and wetter; with a greater frequency of extreme rainfall events;
- ii. Warmer and drier; with an increase in the frequency of drought events and a somewhat greater frequency of extreme rainfall events;
- iii. Hotter and wetter; with a substantially greater frequency of extreme rainfall events; and.
- iv. Hotter and drier; with a substantial increase in the frequency of drought events and a greater frequency of extreme rainfall events.

According to the work done in the development of the LTAS, under unmitigated emissions scenarios, climate change projections for South Africa up to 2050 and beyond include:

- The possibility of both drying and wetting trends in almost all parts of South Africa;
- Very significant warming - as much as 5-8 degree Celsius - over the interior of the country (warming would be reduced in coastal zones);
- A general pattern of drier conditions to the west and south of the country, and a risk of wetter conditions in the eastern areas of the country;
- Many of the projected changes are within the range of historical natural variability, and uncertainty in the projections is high; and
- Effective global mitigation is projected to reduce the risk of extreme warming trends, and to reduce the likelihood of extreme wetting and drying outcomes by at least mid-century.

### 1.4 POPULATION

South Africa is a culturally diverse country, where poverty is still pervasive and the inequality rate is high. Poverty is not a static condition – individuals, households or communities may be vulnerable to poverty as a result of shocks and crises (uncontrollable events that harm livelihoods and food security) and long-term trends (such as racial and gender discrimination, environmental degradation and macro-economic trends). Vulnerability to poverty is therefore characterised by an inability to devise an appropriate coping or management strategy in times of crisis. Climate change adds another layer of stress, either gradually in terms of accelerated ecosystem degradation or as specific drought or flood events. According to the IPCC's Fifth Assessment Report (Working Group II), 'climate-related hazards exacerbate other stressors, often with negative outcomes for livelihoods, especially for people living in poverty (high confidence)'.

The IPCC's Fifth Assessment Report (Working Group II) further states that 'climate-related hazards affect poor people's lives directly through impacts on livelihoods, reductions in crop yields, or destruction of homes and indirectly through, for example, increased food prices and food insecurity'.

South Africa's pyramid of the population (according to age and sex) is provided in the diagram below. Information is included by sex and age group (0-14 years, 15-64 years, 65 years and over). The age structure of a population affects a nation's key socio-economic issues. Countries with young populations (a high percentage under age 15) need to invest more in schools, while countries with older populations (a high percentage aged 65 and over) need to invest more in the health sector.

The age structure can also be used to help predict potential political issues. For example, the rapid growth of a young adult population unable to find employment can lead to unrest. In terms of climate change, the population diagram can support the identification of vulnerable age groups.

The population is distributed along the horizontal axis, with males shown on the left and females on the right. The male and female populations are broken down into 5-year age groups, represented as horizontal bars along the vertical axis, with the youngest age groups at the bottom and the oldest at the top. The shape of the population pyramid gradually evolves over time, based on fertility, mortality, and international migration trends.

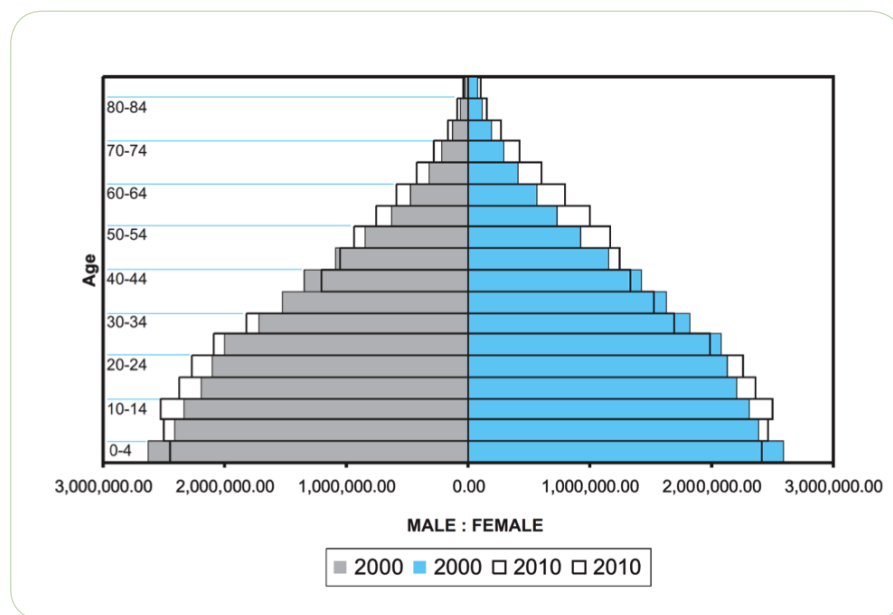


Figure 12: South Africa's population pyramid (2010 – 2030) (Dorrington, Bradshaw, & Budlender, 2002)

The three factors that affect population growth are fertility, mortality and migration. Currently international immigration is the main driving force behind South Africa's population growth (Turok, 2012). Fertility has declined from an average of 2.71% children per woman in 2002 to 2.34% children in 2013 (Statistics South Africa, 2013). According to (Go, Moyer, Rafa, & Schuneman, 2013) if the fertility rate continues to decline, South Africa's population is projected to increase to: 64.4 million by 2030 with relatively stable international migration; and 68.8 million with rapidly increasing migration.

Between 2002 and 2005 infant mortality increased; however, the availability of antiretroviral treatment from 2005 onwards partly influenced the decline in infant mortality. Infant mortality decreased from an estimated 63.5 live births per 1000 in 2002 to 41.7 per 1000 live births in 2013 (Statistics South Africa, 2013). According to Statistics South Africa, South Africa's

population (in 2013) was estimated to be 52.98 million. The annual population growth rate increased from approximately 1.30% in 2002-2003 to 1.34% in 2012-2013.

South Africa is one of the most urbanised countries in Africa, and nearly two-thirds of the total population live in urban areas (Turok, 2012). Economic opportunity is the main reason for rural-urban migration. The largest portion of the population resides in Gauteng Province. Approximately 12.7 million people (24.0%) live in Gauteng Province. The second largest portion of the population resides in KwaZulu-Natal, with approximately 10.5 million people (19.7%). Northern Cape has the smallest share of the population: approximately 1.16 million people (2.2%) reside in this province (Statistics South Africa, 2013). The table below shows the population density for the years 2001 and 2011 and the provincial share for the years 2011 and 2013.

**Table 4: South Africa's population density (Statistics South Africa, 2013)**

Province	Population Census, 2001	Population Census, 2011	Population Estimate, 2011	Population Estimate, 2011	Population Estimate, 2011
	Population	Density	Population	Density	Population
Gauteng	10 451 737	631.6	12 272 263	675.1	12,728,438
North West	3 271 948	30.7	3 509 953	33.4	3,597,589
Mpumalanga	3 643 319	47.6	4 039 939	52.8	4,127,970
Northern Cape	1 058 983	2.8	1 145 861	3.1	1,162,914
Western Cape	5 278 125	40.7	5 822 734	44.9	6,016,926
Eastern Cape	6 527 072	38.6	6 662 053	38.8	6,620,137
Kwa-Zulu Natal	10 259 685	108.	10 267 300	108.8	10,456,907
Limpopo	5 238 671	41.6	5 404 868	42.9	5,517,968
Free State	2 772 997	21.3	2 745 590	21.1	2,753,142



South Africa faces complex and pressing public health challenges that are exacerbated by adverse socio-economic conditions, including dense informal settlements that constrain effective service delivery. These health challenges are complicated by water-borne and chronic respiratory diseases. Potential health impacts from climate change may result from: direct exposure, such as floods, storms, drought and fire; or indirect exposure, such as worsening air pollution.

Understanding the population growth trend in the country is an important aspect, because population growth drives emissions growth. The table below indicates emissions per capita for the period of 2000-2010.

*Table 5: GHG emissions per capita (Department of Environmental Affairs, 2014) (Statistics South Africa, 2010)*

Year	GHG Emissions (including land)	GHG Emissions (excluding land)
	(tons CO <sub>2</sub> e per capita)	(tons CO <sub>2</sub> e per capita)
2000	9.6	10.2
2002	9.9	10.4
2004	10.9	11.3
2006	11.1	11.4
2008	11.2	11.4
2010	11.2	11.6

The table below presents other South African population indicators that relate to climate change.

*Table 6: Other relevant population indicators*

	Demographic Indicators	Values	Source	Climate change relevance
Growth	Estimated annual % population growth	1.58% (2013-2014), increased from 1.29% (2002-2003)	Statistics South Africa, 2014.	The South African population is still increasing and the total emissions are therefore expected to rise.
Human health	HIV prevalence as % among population aged 15-24 years	Baseline value estimated as 9.0% of the total population (14.1% of youth aged 15-24) in 2002. Estimated as 10.2% of the total population (8.7% of the youth aged 15-24%) in mid 2014.	Statistics South Africa, 2014.	The total number of persons living with HIV in South Africa increased from an estimated 4.09 million in 2002 to 5.51 million by 2014. For 2014 an estimated 10.2% of the total population is HIV positive. Approximately one-fifth of South African women (18.5%) in their reproductive ages are HIV positive.
Human health	Number of deaths due to malaria	A total of 1,315 deaths due to malaria recorded in South Africa between 2000 and 2012.	World Malaria Report 2013 and the Millennium Development Goals.	Malaria is endemic in only three provinces in South Africa. South Africa recorded a decrease of malaria case incidence of >75% between 2000 and 2012, due to insecticide spraying programmes, led to an achievement in the health related millennium development goal. An implementation plan for collaboration with the Democratic Republic of Congo around malaria control was developed. Technical skills were also shared with Mozambique and Swaziland through the Lubombo Spatial Development Initiative. Climate change is likely to affect transmission of vector-borne diseases such as malaria and yellow fever.
Education	Completion of matric (12 years of schooling)	More than 50% of South African youths do not hold a matric Certificate.	Household survey conducted by the Department of Education.	Awareness and effective communication for both mitigation and implementation of adaptation plans is required. Human health

## I.5 ECONOMY

South Africa is a significant industrial and economic power in Africa, has the largest economy in southern Africa and is classified by the World Bank as an upper-middle income country (Bhaktawar, 2013). The main features of the SA economy are shown in the table below.

*Table 7: Features of the South African Economy (Central Intelligence Agency, 2013)*

Feature	Detail
Gross Domestic Product (GDP)	USD 380 billion in 2012 (28th in the world)
GDP Growth	+2.6% in 2012
Per Capita GDP	USD 8,078 in 2011 (71st in the world)
GDP by sector	<p>Agriculture: 2.5%            Industry: 31.6%            Services: 65.9%</p> <p>South Africa has a well-developed mining, transport, energy, manufacturing, tourism, agriculture, commercial timber and pulp production, service sectors, and it is a net exporter of energy, food, telecommunications, and other services to neighbouring countries. The largest industries, as measured by their nominal value added in the fourth quarter of 2012, were as follows:</p> <p>Finance, real estate and business services: 21.1%            Wholesale, retail and motor trade, catering and accommodation industry: 17.8%            General government services: 16.9%            Manufacturing industry: 12.4%</p>
Consumer Price Index (CPI) Inflation	5% (2012)
Population below poverty line	32.3% in 2011 (roughly 16.3 million people) (Statistics South Africa, 2014)
Labour Force	17.89 million
Unemployment	25%
Exports	USD 101 billion
Main export partners	China: 14.5% United States: 7.9% Japan: 5.7% Germany: 5.5% India: 4.5% United Kingdom: 4.1%
Imports	USD 107 billion
Main import partners	China: 14.9% Germany: 10.1% United States: 7.3% Saudi Arabia: 7.2% India: 4.6% Japan: 4.5%
Public Debt	43.3% of GDP

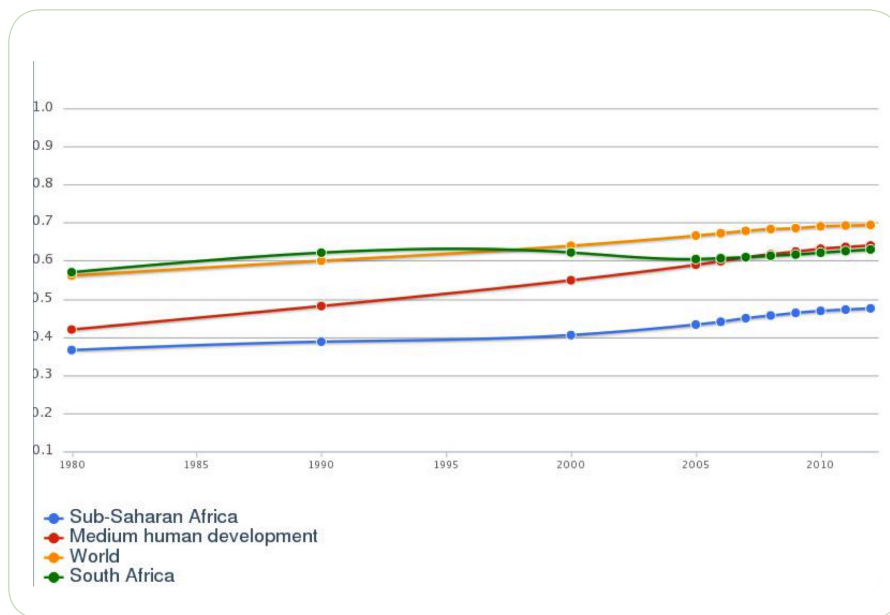
There are two structural elements of the South African economy which contribute significantly to the country's vulnerability to climate change. The first is the high levels of inequality in the economy and the second is the emission intensiveness of the commodities exported from the country.

In terms of the GDP growth rate in the period of 2000-2010, there has been a fluctuating trend in the country's growth. In 2008-2009 the country experienced a period of recession, which accounts for the reduction in GDP. Refer to the table below.

*Table 8: South Africa's GDP percentage growth*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
GDP % growth	4.2	2.7	3.7	2.9	4.6	5.3	5.6	5.6	3.8	-1.7	3.1

The development of the South African economy can be seen in the Human Development Index shown in the graph below.



*Figure 13: SA Human Development Index (United Nations Development Programme, 2013)*

The second area of vulnerability lies in the emission intensiveness of the country's export sector. South Africa has traditionally been a major supplier of mineral commodities to the world. The contribution the country makes to global supply is summarised below.

Table 9: SA share of world commodity production (Yager, 2010)

Commodity	Estimated share of world production
Platinum	77%
Kyanite	55%
Chromium	45%
Palladium	39%
Vermiculite	39%
Vanadium	38%
Zirconium	30%
Manganese	21%
Rutile	20%
Ilmenite	19%
Gold	11%
Fluorspar	6%
Aluminium	2%
Antimony	2%
Iron Ore	2%
Nickel	2%

South Africa's total energy consumption per unit of GDP is about 50% higher than the world's average. The high level is due to the importance of energy intensive industries and of coal in the energy supply system. Between 1990 and 2009, total energy intensity decreased at the slow rate of 0.4% per year. Energy intensity per GDP has decreased rapidly by 1% per year since 2000. During the period 1990-2009, CO<sub>2</sub> emissions per unit of GDP decreased at a faster pace than total energy intensity. Carbon dioxide emissions per unit of GDP decreased even faster between 2000 and 2009.

## 1.6 ENERGY

South Africa is a significant contributor to global climate change, with significant GHG emissions resulting from energy production and consumption. In 2009, South Africa had the 12th highest emissions level in the world. The energy intensity of the South African economy (largely due to the significance of mining and minerals processing in the economy and the coal-intensive energy system) has resulted in an emissions profile that differs considerably from that of other developing countries at a similar stage of development, as measured by the Human Development Index (Department of Environmental Affairs, 2011).

Since coal is the most emissions-intensive energy carrier, South Africa's economy is very carbon-intensive. Furthermore, many of the goods produced in South Africa are exported, which means that South Africa is exporting emission intensive goods to be consumed in other countries, as illustrated in the figure below.

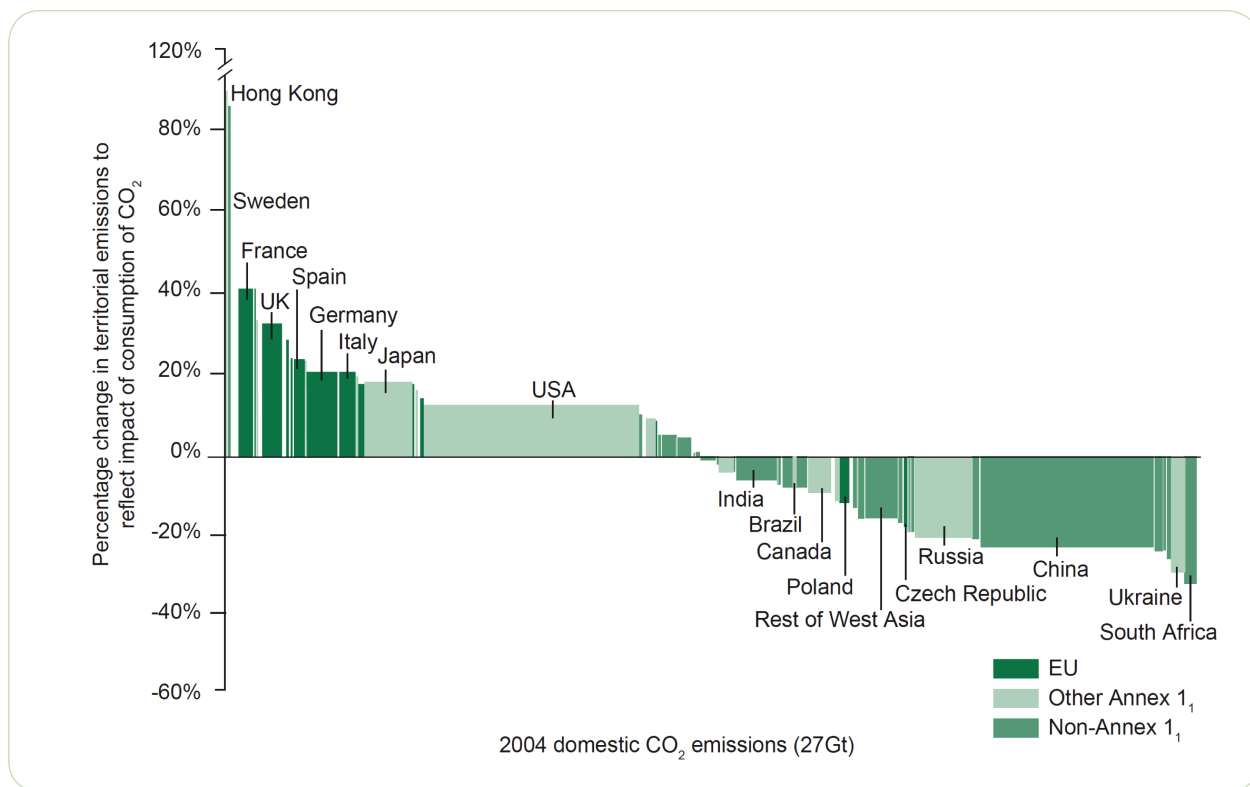


Figure 14: Consumption based versus production based emissions (House of Commons Energy and Climate Change, 2012)

Compared with other countries, South Africa has a relatively high level of GHG emissions per capita, as indicated in the figure below. This is predominantly due to the country's coal intensive electricity grid.

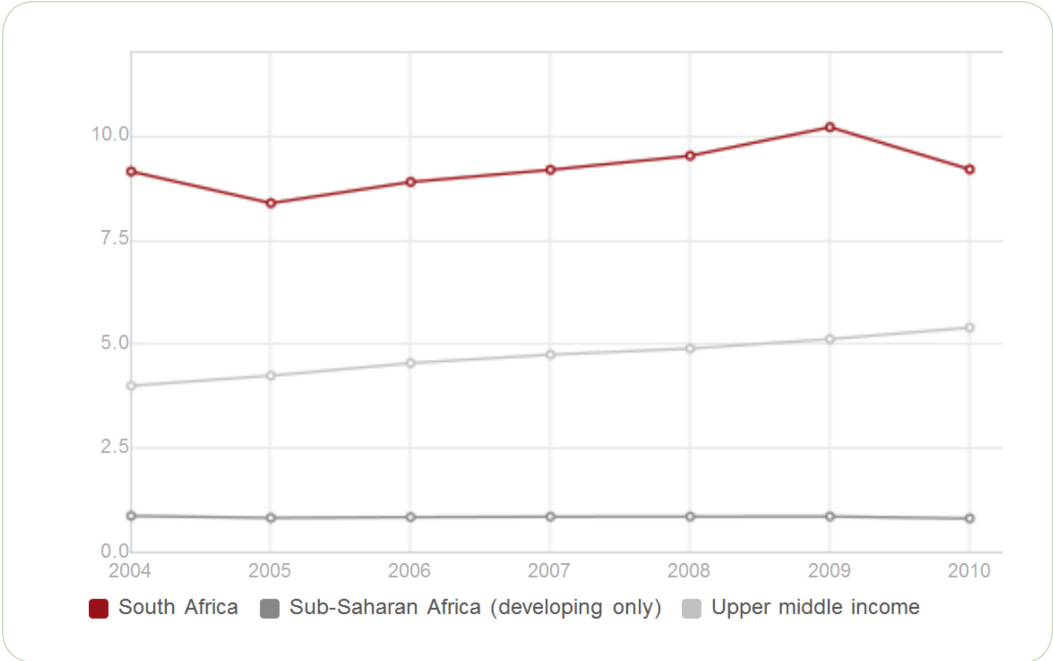


Figure 15: Per capita greenhouse gas emissions

The table below presents an overview of South Africa's energy sector:

*Table 10: Overview of South Africa's energy sector (Department of Energy, 2013)*

Energy source	Contribution to the country's energy mix	Additional Information
Coal	67%	South Africa ranks amongst the top 10 countries in terms of coal reserves and is currently the sixth largest coal producer in the world. Total coal production is equivalent to approximately 4% of the world's coal production. 90% of electricity in South Africa is generated from coal.
Crude oil	20%	South Africa's crude oil requirements are met by imports, mainly from the Middle East and Africa. Almost all crude oil is used in the production of liquid fuels, with a small percentage used for lubricants, bitumen, solvents and other petrochemicals. These liquid fuels are primarily used to meet the country's mobility needs.
Nuclear	5%	South Africa has one nuclear power station, Koeberg, situated about 30 km north-west of Cape Town. Koeberg has a capacity of 1 800 MW and consists of two 900 MW Pressurised Water Reactors (PWRs). South Africa has significant uranium resources and nuclear power generation has the potential to play a very significant role in efforts to reduce GHG emissions.
Natural gas	3%	Natural gas production in South Africa has historically taken place at the offshore Bredasdorp Basin to supply a Gas-to-Liquid (GTL) facility; however the available resources at this Basin are near depletion. At a national level, natural gas consumption currently exceeds production, with the majority of demand being met through imports from Mozambique. The gas infrastructure between Mozambique and South Africa consists of a high-pressure pipeline from Mozambique's Temane Pande gas fields to Secunda, where it links to a gas network. This network provides gas to industrial and commercial customers, primarily in the Gauteng region.
Renewable energy	5%	South Africa is well endowed with renewable energy resources, which have in the past remained largely untapped. South Africa generally receives sufficient sunlight to support a sustainable solar power industry. The Northern Cape has some of the world's best conditions for solar power; and much of South Africa's coastal region is suitable for wind power. Five hundred wind turbines have been installed at wind farms in South Africa and are used to generate Direct Current (DC) electricity.



The table below shows the total energy supply per capita for the period 2002-2009.

*Table 11: Total primary energy supply per capita for 2002-2009 (Department of Energy, 2009)*

Year	Total Primary Energy Supply (TJ)	Total Primary Energy Supply (TJ/capita)
2002	10 211 590	0.22
2004	8 952 891	0.19
2005	8 26 877	0.19
2006	8 914 923	0.18
2007	8 876 497	0.18
2008	8 124 576	0.16
2009	49 320 000	0.82

The table below shows the share of total energy demand across different sectors in 2010.

*Table 12: Proportion of current final energy demand within different sectors (Department of Energy, 2013)*

Sector	Proportion of final energy demand in 2010
Industry	37%
Transport	34%
Residential	11%
Mining	8%
Agriculture	3%
Commerce	7%

The figure below presents South Africa's projected energy demand for the entire economy by 2050. The demand projections indicate a substantial increase in the country's energy demand by 2050, increasing at an average annual rate of 2% to more than double 2010 levels.

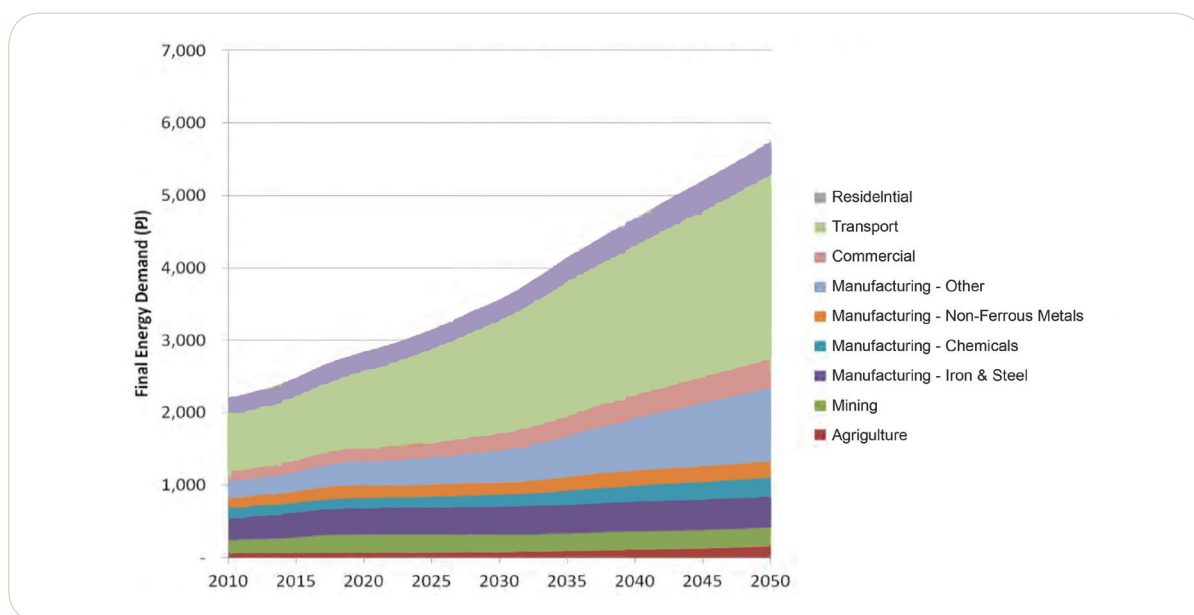


Figure 16: Projected energy demand for the South African economy by sector (Department of Energy, 2013)

The main opportunities for mitigation consist of energy efficiency, demand management and moving to a less emissions-intensive energy mix. Consequent economic benefits would be improved efficiency and competitiveness, as well as incentivising economic growth in sectors that have lower energy intensity.

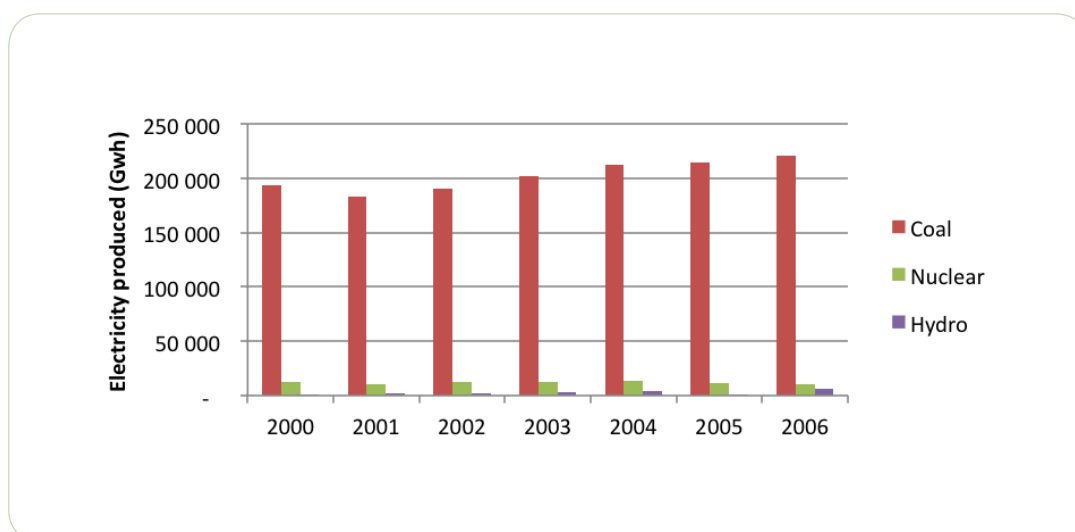


Figure 17: Electricity production by type of power plant (Department of Energy, 2009)

## 1.7 NATIONAL AND REGIONAL DEVELOPMENT PRIORITIES RELATED TO CLIMATE CHANGE

South Africa has taken major steps to mitigate climate change. These steps are informed by the country's commitment to a GHG emissions reduction. At an international level, on 6 December 2009, the President announced that South Africa will undertake to implement mitigation actions that will result in a 34% and a 42% deviation below its 'Business As Usual' emissions growth trajectory by 2020 and 2025, respectively. In accordance with Article 4.7 of the UNFCCC, the extent to which this outcome can be achieved depends on the extent to which developed countries meet their commitment to providing financial, capacity-building, technology development

and technology transfer support to developing countries. With financial, technology and capacity-building support, this level of effort will enable South Africa's GHG emissions to peak between 2020 and 2025, plateau for approximately a decade and decline in absolute terms thereafter. On a national level, South Africa's transition to a lower carbon economy is guided by the country's vision for 2030, as detailed in the 2011 National Development Plan and the National Climate Change Response White Paper, published in 2011. To achieve this vision, South Africa has outlined long term strategies for both adapting to the effects of climate change through adaptation policies and reducing its carbon emissions in line with its domestic targets. South Africa's climate change priorities, together with the national vision, are presented in the table below.

*Table 13: South Africa's 2030 vision for a transition to a lower carbon economy (National Planning Commission, 2011)*

2030 Vision	Priorities
Adaptation	<ul style="list-style-type: none"> <li>• Adequate support for the vulnerable.</li> <li>• Equitable disbursement of financial assistance.</li> <li>• Significant investment in new adaptive technologies and techniques in the water; biodiversity, fisheries, forestry and agricultural sectors.</li> <li>• Early warning systems for adverse weather; pest and disease occurrence.</li> <li>• Disaster relief preparedness.</li> <li>• Significant investment in conserving and resorting natural ecosystems to improve resilience.</li> </ul>
Mitigation	<ul style="list-style-type: none"> <li>• A commitment to undertake mitigation actions.</li> <li>• An appropriate mix of carbon pricing mechanisms.</li> <li>• An expanded renewable energy programme.</li> <li>• An advanced liquid and bio-fuels sector.</li> <li>• An effective mix of energy efficiency and demand management incentives.</li> <li>• Proactive local government climate change programmes in areas such as waste management and street lighting.</li> <li>• Regulation to promote green building and construction practices</li> <li>• Investment in efficient public transport systems.</li> <li>• A robust and transparent monitoring, reporting and verification system.</li> </ul>

Table 14: South Africa's climate change priorities (Department of Environmental Affairs, 2011)

National Climate Change Response White Paper	Priorities
Risk reduction and management	Near-term adaptation interventions that address immediate and observed threats to the economy, ecosystem services and the health and well-being of people. Research and develop short, medium and longer-term climate resilience, risk and vulnerability management policies and measures.
Mitigation actions with significant outcomes	Cost effective and beneficial mitigation policies to reduce the GHG emission trajectory, so that GHG emissions peak between 2020 and 2025, plateau for approximately a decade and begin declining in absolute terms thereafter.
Sectoral responses	Prioritise, in accordance with the provisions of this policy, the requirement for all key actors, organisations or participants in relevant sectors or sub-sectors to prepare, submit, implement, monitor and report on the implementation of detailed climate change response strategies and action plans that clearly articulate their roles, responsibilities, policies, measures, and interventions or actions to contribute to the achievement of the National Climate Change Response Objective in a measurable way.
Policy and regulatory alignment	Prioritise interventions already envisaged by national policies, legislation or strategies that have climate change co-benefits, particularly those that also contribute towards the national priorities of job creation and poverty alleviation or have other positive socio-economic benefits. Review existing national policies, legislation or strategies, with a view to optimising and maximising the climate change co-benefits of the interventions. Integrate into the relevant existing or new policies, legislation or strategies those climate change response interventions that stimulate new economic activities, as well as those that improve the efficiency and competitive advantage of existing activities.
Integrated planning	Mainstreaming of climate change considerations and responses into all relevant sectors, and national, provincial and local planning regimes.
Informed decision-making and planning	Prioritise research, systemic observation, knowledge generation, information management and early warning systems that increase our ability to measure and predict climate change and the implications of its adverse effects on the economy, society and the environment.
Technology research, development and innovation	Prioritise cooperation and the promotion of research, investment in and/or acquisition of adaptation, lower-carbon and energy-efficient technologies, practices and processes for employment by existing or new sectors or sub-sectors.
Facilitated behaviour change	Use of incentives and disincentives, including regulatory, economic and fiscal measures, to promote behaviour change towards a lower-carbon society and economy.
Behaviour change through choice	Prioritise education, training and public awareness programmes to build general public awareness of climate change, so as to empower all South Africans to make informed choices that contribute to an economy and society that is resilient to climate change.
Resource mobilisation	Prioritise the development of comprehensive resource and investment mobilisation strategies, capacity, mechanisms or instruments that support and enable implementation of climate change responses at the scale required.

On a regional level, local governments have either prepared, or are in the process of preparing, climate change response strategies and action plans. The priorities of five provinces are detailed in the table below. The other four provinces are in the process of preparing climate change response strategies and action plans.

Table 15: Provincial development priorities related to climate change

Province	Development priorities related to climate change
Gauteng	<p><b>Mitigation</b>            Energy efficiency in buildings            Compressed natural gas fuel for vehicles.            Cleaner production initiatives.            Renewable energy projects.            Reduction, recycling and reuse of waste material.            Agricultural practices that reduce methane emissions.</p> <p><b>Adaptation</b>            Climate resilient agriculture and agro-processing.            Food gardens in residential areas for subsistence consumption.            Conservation of natural resources and biodiversity areas.            Disaster risk planning and reduction.            Source: (Department of Agriculture and Rural Development: Gauteng Province, 2012)</p>
Western Cape	<p><b>Mitigation</b>            Energy efficiency.            Development of renewable and alternate sustainable energy resources.            Effective waste management strategies.            Cleaner fuel programmes for households and transport.</p> <p><b>Adaptation</b>            Effective land use and land care.            Protection, maintenance and enhancement of natural resources.            Source: (Department of Environmental Affairs: Western Cape, 2008)</p>
KwaZulu-Natal	<p><b>Mitigation</b>            Wave power to create renewable electricity, thereby displacing coal-based grid electricity.            Biodiesel production.            Energy efficiency in buildings.            Carbon capture and storage.            Source: (Department of Environmental Affairs: Province of KwaZulu Natal, 2013)</p>
Eastern Cape	<p><b>Mitigation</b>            Create an enabling environment for investment in, implementation and use of clean energy.            Reduction in organic waste to landfill.            Generation of renewable energy from waste.            Methane use or destruction.            Facilitate shift to low GHG modes of transport and transport systems.</p> <p><b>Adaptation</b>            Increased resilience of coastal infrastructure and resources to the effects of sea level rise, storm surges, flooding and increased sea temperatures (fisheries).            Improved response to the impact of extreme coastal events.            Effective water resources management and efficient waste use.            Reducing vulnerability to flooding events.            Societal adaptation to the human health impact of temperature increases associated with climate change.            Incorporating climate change acclimatisation and resilience into provincial food security programmes            Source: (Department of Economic Development and Environmental Affairs: Eastern Cape, 2011)</p>

## Limpopo

### Mitigation

Clean energy and energy efficiency.  
Sustainable waste management practices.  
Sustainable production and consumption.  
Non-motorised urban transport.

### Adaptation

Disaster risk reduction and management.  
Water management.  
Resource conservation and management.

Source: (Department of Economic Development, Environment and Tourism: Limpopo Province, 2013)

South Africa has prioritised research in the climate change field, with the following institutions actively participating:

- Department of Science and Technology offering funding (under the Global Change Research Programme (GCRP)) to address climate change challenges.
- The South African Environmental Observation Network (SAEON);
- The Applied Centre for Climate and Earth Systems Science (ACCESS);
- The South African National Space Agency (SANSA);
- The Agriculture Research Council (ARC);
- The South African National Biodiversity Institute (SANBI); and
- The South African Weather Service (SAWS).

Institutions that are focusing on emission reduction work in the country include:

- The Energy Research Centre (ERC);
- The Council for Scientific and Industrial Research (CSIR); and
- The South African National Energy Development Institute (SANEDI).

## 2. NATIONAL GREENHOUSE GAS INVENTORY

This chapter presents a summary of South Africa's national greenhouse gas (GHG) inventory for the 2010 calendar year, and also reports on emission trends between 2000 and 2010. South Africa's full national GHG inventory is to be published by the Department of Environmental Affairs – and subsequently submitted to the United Nations Framework Convention on Climate Change (UNFCCC) – at the end of 2014.

The 2010 GHG inventory was compiled in accordance with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, and covers the following sectors:

- Energy;
- Industrial Process and Product Use (IPPU);
- Agriculture, Forestry and Land Use (AFOLU); and
- Waste.

The inventory is reported here, in accordance with the "Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention", as contained in the Annex to decision 17/CP.8.

This inventory includes a breakdown of the country's 2010 anthropogenic GHG emissions by source, and removal by sinks, of all GHGs not controlled by the Montreal Protocol. The GHGs include: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>), and known exclusions are listed under the 'completeness of the national inventory'.

### 2.1 BACKGROUND AND CONTEXT

South Africa ratified the United Nations Framework Convention on Climate Change in August 1997. It was at this time that the Convention became binding, meaning that South Africa became obliged to adhere to all the obligations imposed on it.

As a result of being a party to the Convention, South Africa prepared its first GHG inventory in 1998 (using 1990 data). This inventory was then updated to include 1994 data, which was published in South Africa's Initial National Communication under the UNFCCC in October 2000.

South Africa published the 2000 national GHG inventory in its Second National Communication under the UNFCCC in November 2011.

The 2010 inventory reported on in this chapter is South Africa's fourth national GHG inventory.

### 2.2 INSTITUTIONAL ARRANGEMENTS FOR PREPARATION OF THE INVENTORY

The Department of Environmental Affairs (DEA) plays the lead role in climate change reporting in South Africa. The DEA is responsible for the coordination and management of all climate change-related information, such as:

- Mitigation;
- Adaptation; and
- Monitoring and Evaluation programmes (including compiling and updating national GHG inventories).

Within the DEA, the Chief Directorate for Climate Change Monitoring and Evaluation is responsible for the coordination and compilation of GHG emission inventories. The DEA cannot compile GHG emissions data in isolation, and relevant ministries, industries and agencies play a supportive role in terms of information provision across relevant sectors – this is detailed in the figure and subsections below. South Africa is currently developing a national monitoring and evaluation system to coordinate the inventory compilation process in a formal and sustainable manner.

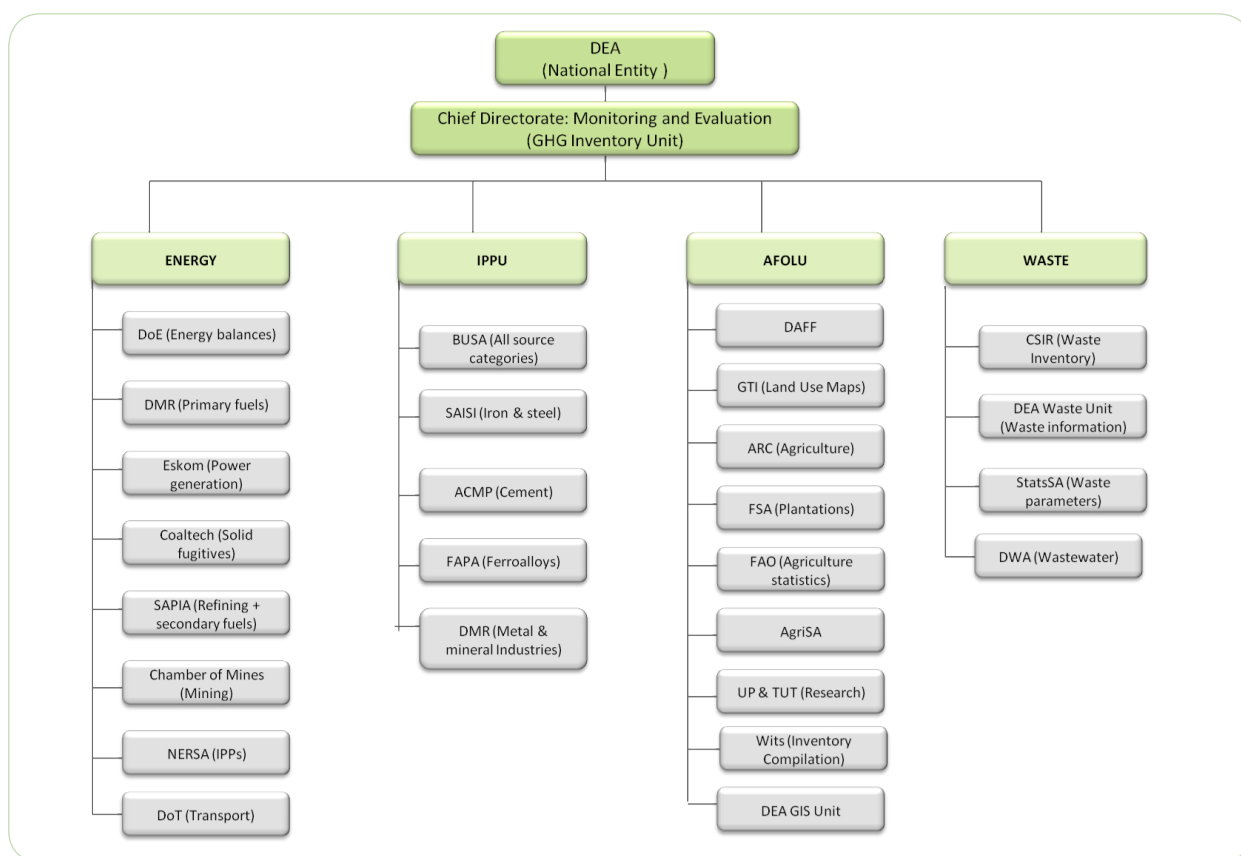


Figure 18: Institutional arrangements for preparation of the national GHG inventory



## 2.2.1 Institutional Arrangements in the Energy Sector

The table below presents the institutional arrangements in the energy sector:

*Table 16: Institutional arrangements in the energy sector*

Ministry / Agency	Role
Department of Energy (DoE)	The DEA utilises national energy balances published by the DoE to estimate energy emissions.
Department of Mineral Resources (DMR)	Provides energy related information in the form of the South African Mineral Industry (SAMI) report.
Eskom	Provides information on GHG information associated with electricity generation.
Coaltech	Provides information on fugitive emissions associated with solid fuels.
South African Petroleum Industry Association (SAPIA)	Provides information for estimating GHG emissions from petroleum refining.
Chamber of Mines	Provides information for estimating GHG emissions from mining activities.
National Energy Regulator of South Africa (NERSA)	Provides information for estimating GHG emissions from Independent Power Producers (IPPs).
Department of Transport	Provides information for estimating GHG emissions from the transport sector.

## 2.2.2 Institutional Arrangements in the IPPU Sector

The table below presents institutional arrangements in the Industrial Process and Product Use (IPPU) sector:

*Table 17: Institutional arrangements in the IPPU sector*

Ministry / Agency	Role
Business Unity South Africa (BUSAs) and Industry	Provides GHG information for the IPPU sector.
South African Iron and Steel Institute (SAISI)	Provides GHG information for the iron and steel industry.
Association of Cementitious Material Producers (ACMP)	Provides GHG information for the cement industry.
Ferro Alloys Producers Association (FAPA)	Provides activity data on ferroalloy production.
Department of Mineral Resources (DMR)	Provides industrial processes related information in the form of South African Mineral Industry (SAMI) reports.

### 2.2.3 Institutional Arrangements in the AFOLU Sector

The table below presents institutional arrangements in the AFOLU sector:

**Table 18: Institutional arrangements in the AFOLU sector**

Ministry / Agency	Role
GeoTerralImage	Provides maps for the forestry sector.
Agriculture Research Council (ARC)	Provides technical support when compiling GHG emissions for the agriculture.
Forestry South Africa (FSA)	Provides agriculture information for the forestry sector.
Agric South Africa (AgriSA)	Provides information for compiling GHG emissions from the agriculture sector.
University of Pretoria (UP) and Tshwane University of Technology (TUT)	Undertakes research related to the AFOLU sector.
Department of Agriculture, Forestry and Fisheries (DAFF)	Provides information on the AFOLU sector.
Department of Environmental Affairs (DEA) GIS Unit (Geographic Information System)	Provides an archiving system for forestry maps.

### 2.2.4 Institutional Arrangements in the Waste Sector

The table below presents institutional arrangements in the waste sector:

**Table 19: Institutional arrangements in the waste sector**

Ministry / Agency	Role
Council for Scientific Research (CSIR)	Provides technical support when compiling GHG emissions for the waste sector.
DEA Waste Unit	Provides information on the waste sector.
Statistics South Africa (StatsSA)	Provides statistical parameters that can be applied when estimating GHG emissions from the waste sector
Department of Water Affairs (DWA)	Provides information on the country's wastewater treatment works.



## 2.3 CALCULATION METHODOLOGY

South Africa's 2010 GHG inventory, which includes the GHG trends for a ten-year period (2000-2010), was compiled in accordance with the 2006 IPPC Guidelines for National Greenhouse Gas Inventories and the IPCC Good Practice Guidance (GPG). These guidelines classify GHG emissions into four categories: Energy; IPPU; Waste and AFOLU. The Global Warming Potentials (GWPs) – used for the quantification of GHG emissions in carbon dioxide equivalent – were sourced from the IPCC's Third Assessment Report. Emissions were calculated by multiplying the activity data by the appropriate and relevant emission factor. The reporting unit is a Gigagram of carbon dioxide equivalent (Gg CO<sub>2</sub>e). One Gigagram is equivalent to one thousand tonnes.

Activity data was gathered for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. Certain HFCs and PFCs have been reported in the IPPU sector. N<sub>2</sub>O and CO<sub>2</sub> emissions have also been estimated for the burning of biomass. The table below summarises the methods used to estimate South Africa's GHG emissions, where:

- TM = Tier method (where Tier 1 is a basic method, Tier 2 is an intermediate method, and Tier 3 is the most demanding method in terms of complexity and data requirements).
- EF = Emission factor.
- CS = Country specific emission factor.
- DF = Default emission factor.



Table 20: Methods used to estimate GHG emissions

GHG source and sink category	CO <sub>2</sub>		CH <sub>4</sub>		N <sub>2</sub> O		HFCs		PFCs		SF <sub>6</sub>	
	TM	EF	TM	EF	TM	EF	TM	EF	TM	EF	TM	EF
1. Energy												
A. Fuel combustion												
1. Energy industries	T1, T3	CS	T1, T3	DF	T1, T3	DF						
2. Manufacturing industries and construction	T1	DF	T1	DF	T1	DF						
3. Transport	T1	DF	T1	DF	T1	DF						
4. Other sectors	T1	DF	T1	DF	T1	DF						
5. Non-specified	T1	DF	T1	DF	T1	DF						
B. Fugitive emissions from fuels												
1. Solid fuels	T2		CS		T2		CS					
2. Oil and natural gas	T3		CS									
3. Other emissions from energy industry production	T3		CS		T3		CS					
2. Industrial processes												
A. Mineral products	T1	DF										
B. Chemical industry	T1, T3	DF, CS	T1	DF	T1	DF						
C. Metal industry	T2	CS	T1	DF					T1	DF		
D. Non-energy products from fuels and solvents	T1	DF										
F. Products used as substitutes for ODS							T1	DF				
3. AFOLU												
A. Livestock												
1. Enteric fermentation			T2	CS								
2. Manure management			T2	CS	T2	DF						
B. Land	T1, T2	CS, DF										
C. Aggregated sources and non-CO <sub>2</sub> emissions												
1. Emissions from biomass burning	T2	CS	T2	CS	T2	CS						
2. Liming	T1	DF										
3. Urea application	T1	DF										
4. Direct N <sub>2</sub> O from managed soils					T1	DF						
5. Indirect N <sub>2</sub> O from managed soils					T1	DF						
6. Indirect N <sub>2</sub> O from manure management					T1	DF						
4. Waste sector												
A. Solid waste disposal			T1	DF								
D. Wastewater treatment and discharge			T2, T1	CS, DF	T1	DF						

## 2.4 OVERALL GHG INVENTORY: 2000 – 2010

In 2010, South Africa emitted 518,239 GgCO<sub>2</sub>e (including Forestry and Other Land Use (FOLU)). Excluding the FOLU sector, South Africa emitted 544,314 GgCO<sub>2</sub>e in 2010. This emissions excluding FOLU are higher as the FOLU sector is a net carbon absorber/sink. The emission sources that contributed to more than 95% of the emissions include:

- Energy industries (solid fuels);
- Road transportation;
- Manufacturing and construction (solid fuels); and
- Energy industries (liquid fuels).

The largest contributor to South Africa's 2010 national inventory was the Energy Sector, which contributed 75.1% of the overall emissions in 2010. The Agriculture Sector was the second largest contributor to the national inventory, contributing to 9.5% of overall emissions. The Forestry and Land Use (FOLU), Industrial Processes and Product Use (IPPU), and Waste Sectors made up the remaining 15% of GHG emissions (3.6%, 8.1% and 3.7% respectively).

The breakdown of GHG emissions by sector between 2000 and 2010 is presented in the table below. Overall emissions (excluding FOLU) increased by 21.1% between 2000 and 2010.

*Table 21: Trends and levels in GHG emissions for 2000 and 2010 classified by sector (Department of Environmental Affairs, 2014)*

Sector	2000	2010	Percentage change between 2000 and 2010
	GgCO <sub>2</sub> eq		
Energy	337,382	428,368	27.0%
IPPU	44,907	44,351	-1.2%
AFOLU	30,497	25,714	-15.7%
Waste	12,437	19,806	59.3%
Total (FOLU)	425,219	518,239	21.1%

The figure below presents South Africa's emissions intensity between 2000 and 2010. The carbon intensity of the economy has dropped steadily over the decade. This is largely due to growth in the services and financial sectors and reduction and stagnation in the manufacturing and mining sectors respectively. Economic crisis and has had an impact on the carbon intensity of the national energy supply even though there is generally stagnation elsewhere in the time series due to an unchanged energy supply mix.

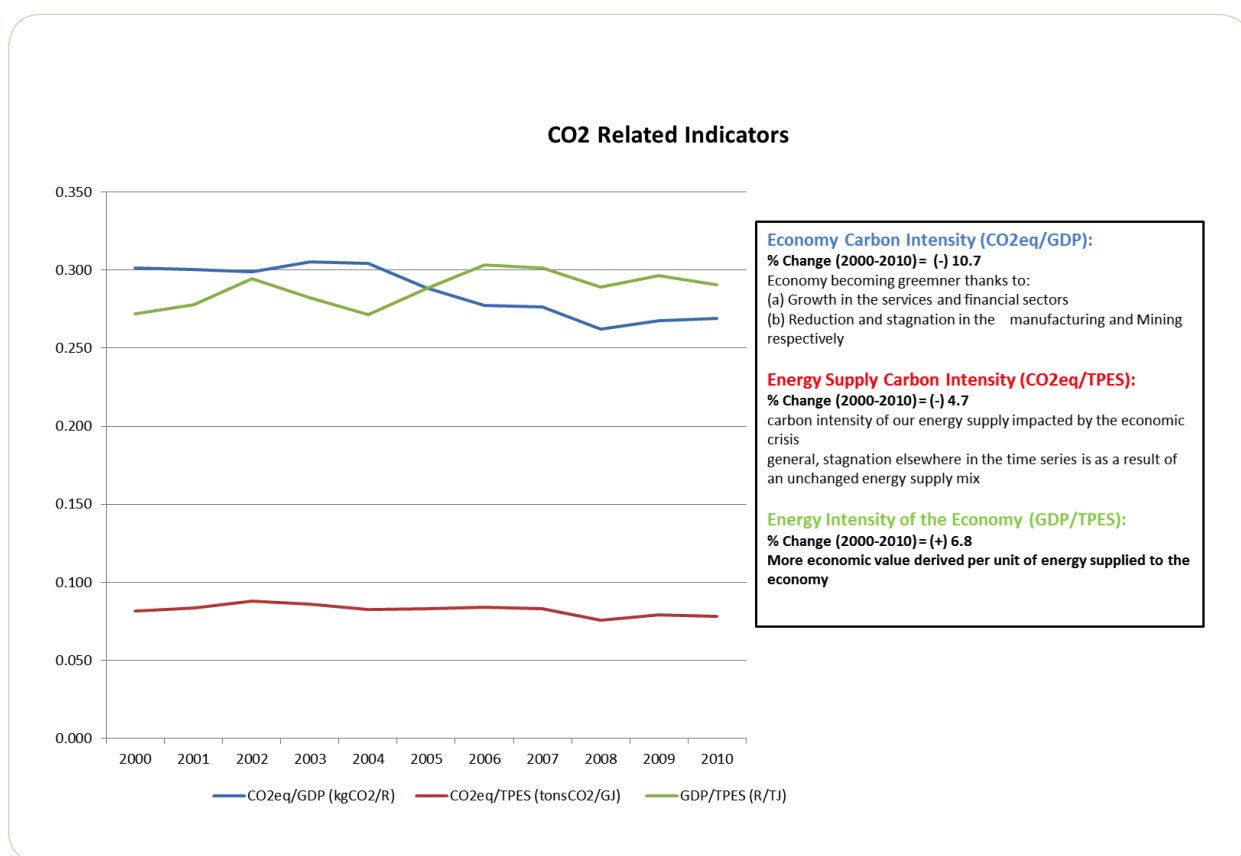


Figure 19: South Africa's emissions intensity between 2000 and 2010 (Department of Environmental Affairs, 2014)

## 2.5 GHG INVENTORY BY SECTOR: 2000 - 2010

The sections below present an analysis of South Africa's emissions between 2000 and 2010, classified by sector.

### 2.5.1 Energy Sector

South Africa's economy is predominantly driven by large-scale, energy-intensive minerals beneficiation and mining industries. The country is also heavily reliant on fossil fuels and coal accounts for almost 90% of the energy used in the generation of electricity (Department of Energy, 2013). As such, South Africa is ranked 16th in the world in terms of primary energy consumption, with the country's GDP being only 28th highest in the world.

South Africa's energy sector accounts for 15% of the country's GDP. Coal is the primary energy resource in the country, and the combustion of fossil fuels is the largest source of emissions in the energy sector – these emissions include CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>.

South Africa's emissions from the energy sector were estimated at 428,368 GgCO<sub>2</sub>e in 2010. The energy sector is divided into two categories:

i. Fuel combustion, which comprises:

- Energy industries;
- Manufacturing industries and construction;
- Transport;
- Other sectors; and
- Non-specified;

ii. Fugitive emissions from fuels, which comprises:

- Solid fuels;
- Oil and natural gas; and
- Other emissions from energy product

The majority of the emissions in the energy sector were from energy industries, which accounted for 62.5% of emissions in the energy sector in 2010. The transport sub-sector accounted for 11.1% of emissions, followed by manufacturing industries and the construction sub-sector (9.6%). A breakdown of emissions in the energy sector is presented in the figure below.

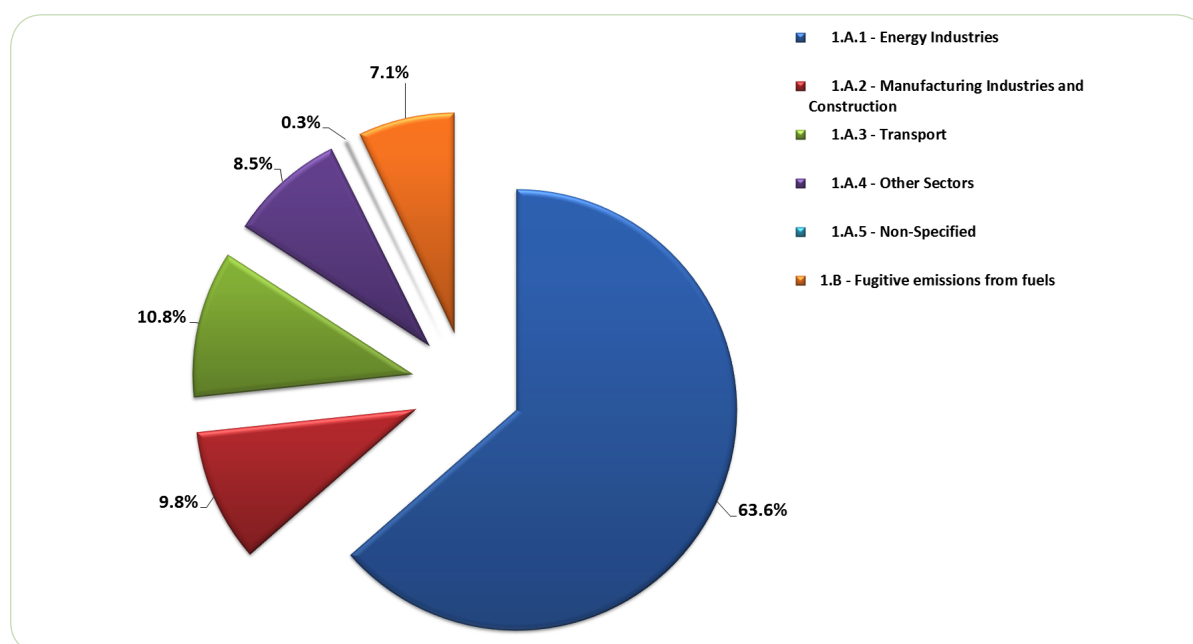


Figure 20: Breakdown of emissions in the energy sector in 2010 (Department of Environmental Affairs, 2014)

Since 2000, total GHG emissions in the energy sector have increased by 27%, whilst the country's GDP per capita more than doubled over the same period (The World Bank, 2013). The figure below presents the change in emissions in the energy sector between 2000 and 2010. The significant economic growth and development that occurred in South Africa between 2000 and 2004 (56% increase in GDP per capita over this period (The World Bank, 2013)) led to an increase in demand for electricity and fossil fuels.

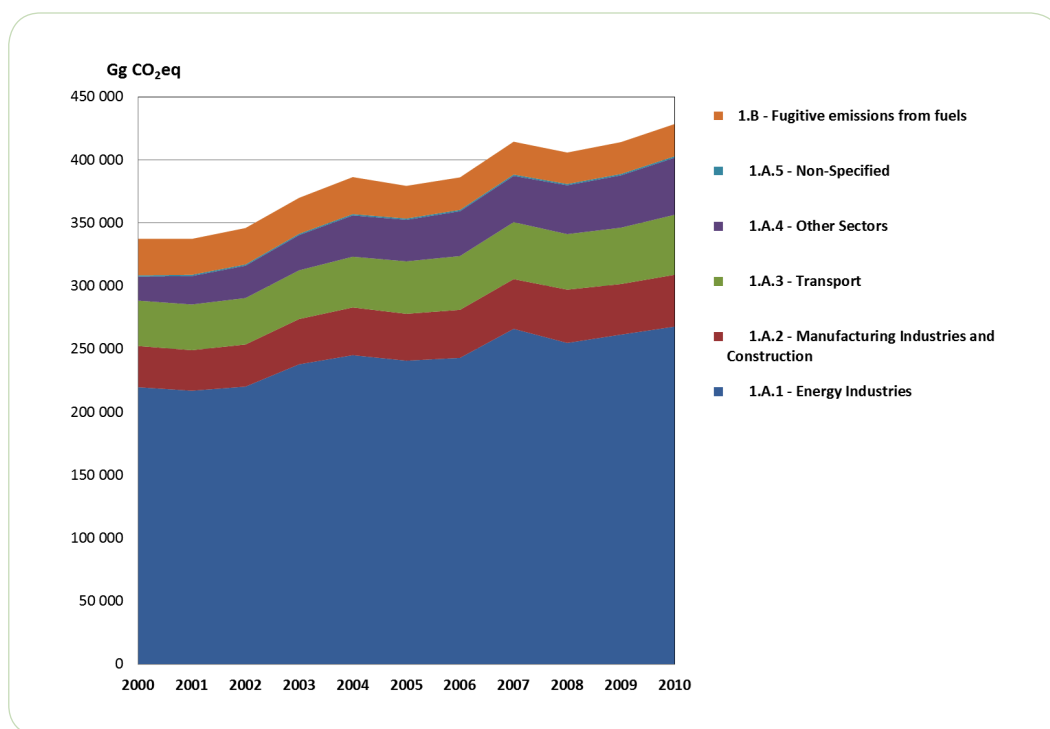


Figure 21: Energy sector emissions (2000 – 2010) (Department of Environmental Affairs, 2014)

### 2.5.2 Industrial Process and Product Use Sector

The Industrial Process and Product Use Sector (IPPU) sector includes GHG emissions from industrial processes, chemical product use, and the use of fossil fuels. GHGs are emitted during industrial processes as raw materials are chemically or physically transformed – these GHGs include CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, SF<sub>6</sub> and PFCs. Also included in the IPPU sector are GHG emissions associated with the production of refrigerators, foams and aerosol cans.

The main emissions sources in the IPPU sector can be attributed to: the production of metal (which accounts for 84.6% of the IPPU inventory); the manufacture of mineral products (mainly cement); and the manufacture of chemical products.

In 2010, GHG emissions by the IPPU sector were estimated at 44,351 GgCO<sub>2</sub>e, with an overall decrease of 1% from 2000 levels. However, during the ten year period between 2000 and 2010, emissions in the IPPU sector fluctuated significantly, as seen in the figure below. The fluctuation is especially attributable to changes in production in the metal industry.



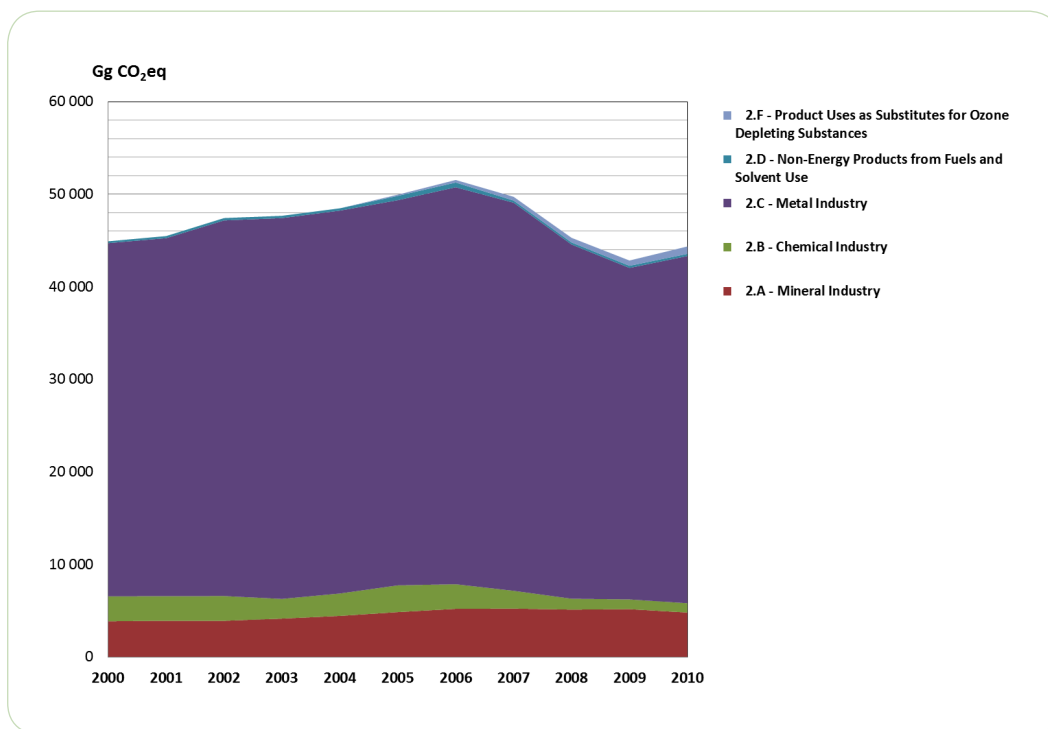


Figure 22: IPPU sector emissions (2000 – 2010) (Department of Environmental Affairs, 2014)

Economic growth between 2003 and 2006 led to an increased demand for products, resulting in a 10.3% increase in GHG emissions in the IPPU sector. The global economic recession and electricity crisis that occurred between 2006 and 2009 resulted in a decline of 17.9%. The emissions increase of 3.5% between 2009 and 2010 can be attributed to a recovery after the global recession and an increase in demand for commodities (mostly steel and cement) that resulted from hosting the 2010 FIFA World Cup.

### 2.5.3 Agriculture, Forestry and Other Land Use Sector

The AFOLU sector encompasses emissions from livestock (enteric fermentation and manure management), land (forests, crops, grasses, wetlands and settlements) and aggregate sources (biomass burning, liming, urea application and fertilisers). Emissions from this sector in 2010 were estimated at 25,714 GgCO<sub>2</sub>e, which was 15.7% lower than in 2000 (Department of Environmental Affairs, 2014). The main cause of this decrease can be attributed to reduced emissions from the livestock and non-CO<sub>2</sub> subsectors. The table below shows the emission trends for the AFOLU sector between 2000 and 2010.

Table 22: Trends in emissions and removals from the AFOLU sector (2000 – 2010) (Department of Environmental Affairs, 2014)

GHG	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	GgCO <sub>2</sub> e										
Livestock	31,119	31,169	29,402	28,796	28,802	29,087	28,637	27,950	28,650	28,146	28,986
Land	-18,493	-18,519	-17,751	-13,601	-10,260	-8,119	-17,865	-18,591	-19,518	-24,585	-19,871
Aggregate sources and non-CO <sub>2</sub> emissions sources on land	23,775	23,712	23,863	22,819	22,991	22,184	22,904	22,431	22,997	22,390	33,803
Harvested wood products	-5,786	-6,389	-7,338	-9,373	-9,419	-8,037	-7,538	-8,128	-5,025	-5,025	-6,205

#### 2.5.4 Waste Sector

In South Africa, emissions associated with the waste sector are either from solid waste disposal, or wastewater treatment and discharge. Industrial waste (in both source categories) is included, using default approximation methods. The total estimated GHG emissions from the waste sector increased by 59.8% from 11,748 GgCO<sub>2</sub>e in 2000 to 18,773 GgCO<sub>2</sub>e in 2010. Solid waste disposal contributed to 82.8% of the waste sector's emissions in 2010. The figure below shows the change in GHG emission in the waste sector between 2000 and 2010.

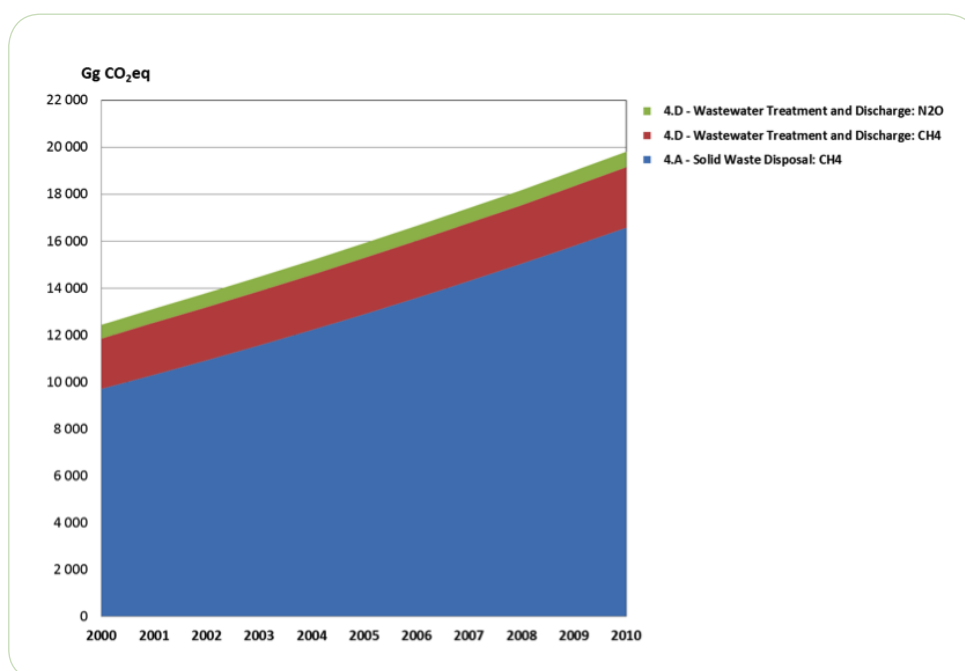


Figure 23: Waste sector emissions (2000 – 2010) (Department of Environmental Affairs, 2014)

## 2.6 NATIONAL CARBON SINKS ASSESSMENT

South Africa's Department of Environmental Affairs commissioned the National Carbon Sinks Assessment study in February 2013. This assessment identified current national carbon sinks related to afforestation, forest restoration, wetlands, agricultural practice, bio fuels, urban greening and all significant changes in land use. The main objectives of the study were to:

### 1. Understand the status and dynamics of the national carbon sinks:

For the first time in South Africa, the national terrestrial carbon stocks (i.e. below and above ground) have been mapped and estimates calculated. The impact of climate change and the increase in atmospheric carbon dioxide concentration on the carbon sinks and fluxes of selected ecosystems were also modelled.

### 2. Understand potential climate change mitigation opportunities

Interviews with a range of key stakeholders were conducted to understand the main issues that impact on carbon sinks and related ecosystems. Equally important, these stakeholders assisted in the identification of land based mitigation options, and shared challenges and experiences where possible.

### 3. Explore policy considerations as a result of the study

One hundred policies that impact on land cover, land use change and carbon stocks were reviewed.

The analyses of these policies:

- Identified the policies that impact negatively on carbon sinks and related ecosystems.
- Identified gaps in policies and opportunities for integration to achieve common goals.

South Africa's carbon sinks in 2010 are presented in the figure below:

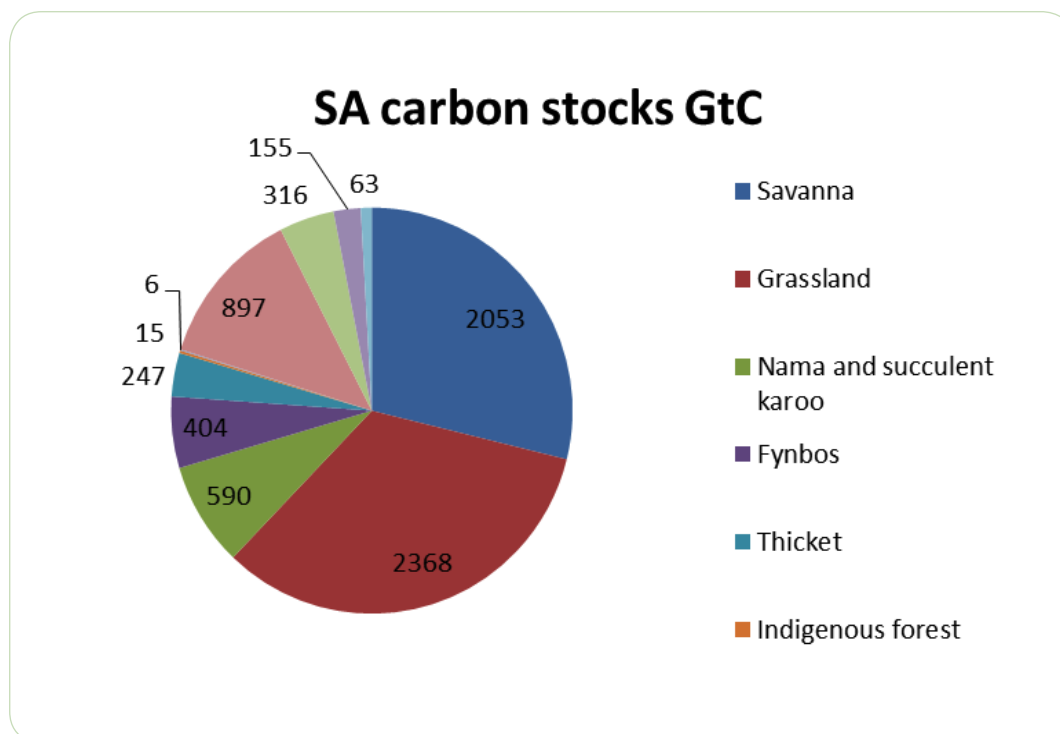


Figure 24: South Africa's carbon stocks in 2010 (in Gigatonnes of carbon)

### 3. MITIGATION ACTIONS AND THEIR EFFECTS

South Africa's approach to mitigation balances the country's contribution as a responsible global citizen, with the economic and social opportunities presented by the transition to a lower-carbon economy. The country's National Climate Change Response White Paper, published in October 2011, states that South Africa's mitigation actions shall:

1. Be needs-driven and customised: Mitigation approaches, policies, measures, programmes, interventions and actions shall meet the special needs and circumstances of those communities and people that are most vulnerable. These approaches shall also be specifically tailored to the specific actor, organisation, sector or sub-sector concerned;
2. Promote GHG-reducing technologies: Mitigation approaches shall promote the development, application, diffusion and transfer of GHG emission-reducing technologies, practices and processes;
3. Have significant outcomes: Mitigation approaches that are cost effective and provide substantial GHG emission reductions shall be prioritised; and
4. Be developmental: Mitigation actions that result in economic growth and job creation, or benefit public health and alleviate poverty, shall take precedence over those approaches with no co-benefits.

South Africa recognises that these mitigation actions need to simultaneously build and maintain the country's international competitiveness, as well as social, environmental and economic resilience to adverse effects of climate change.

#### 3.1 KEY ELEMENTS OF SOUTH AFRICA'S APPROACH TO MITIGATION

There are four key mitigation initiatives that are led by the government in an effort to transition to a low-carbon economy. These initiatives include Flagship Programmes, a Mitigation Potential Analysis, Desired Emission Reduction Outcomes, and a Carbon Tax, which are further discussed below. These measures are integrated and form part of a mix of measures that South Africa is implementing.

##### 3.1.1 Flagship Programmes

South Africa identified a suite of near-term priority Flagship Programmes to mitigate GHG emissions as well as the adverse effects of climate change. These programmes:

- Cover the major emitting sectors and key adaptation sectors;
- Have relatively well-known mitigation outcomes and implementation processes; and
- Are either very cost-effective with significant co-benefits, or have technology-development benefits.

A summary of the eight prioritised Flagship Programmes (as outlined in the National Climate Change Response White Paper, 2011) are presented below:

##### 1. The Climate Change Response Public Works Flagship Programme:

This Programme covers consolidation and expansion of the Expanded Public Works Programme and its sector components. These sector components include the Non-State Sector's Community Works Programme and the suite of Environment and Culture Sector programmes, such as Working for Water, Working for Wetlands, Working on Fire, and Working for Energy.

## 2. The Water Conservation and Demand Management Flagship Programme:

This Programme deals with accelerated implementation of the National Water Conservation and Water Demand Management Strategy in the industry, mining, power generation, agriculture, and water services sectors. It also includes the provision of rainwater harvesting tanks to rural and low-income settlements.

## 3. The Renewable Energy Flagship Programme:

This Programme covers the scale-up and deployment of renewable energy technologies, based on the country's Integrated Resource Plan (IRP) (Department of Energy, 2011).

## 4. The Energy Efficiency and Energy Demand Management Flagship Programme:

This Programme will develop and facilitate an energy efficiency programme in the industrial and residential sectors.

## 5. The Transport Flagship Programme:

This Programme will develop an enhanced public transport programme to promote lower-carbon mobility in five metropolitan and ten cities, and is to include a planned rail re-capitalisation programme. An Energy Efficient Vehicles Programme will also be created to improve the average efficiency of South Africa's vehicles by 2020.

## 6. The Waste Management Flagship Programme:

The aim of this programme is to use the information from the mitigation potential analysis for this sector, to identify key working areas, such as waste to energy. A pilot project has been planned and once implemented, it aims showcase that waste to energy can reduce GHG emissions and serve as a source of energy for a municipality.

## 7. The Carbon Capture and Sequestration Flagship Programme:

This Programme provides for the development of a Carbon Capture and Sequestration Demonstration Plant to store the process emissions from an existing high carbon emissions facility.

## 8. The Adaptation Research Flagship Programme:

This Programme provides for the design and roll-out of a national and regional research programme to scope sectoral adaptation requirements, strategies and costs.

The initiatives, policies and co-benefits that have resulted from the near-term priority Flagship Programmes are detailed in section 3.2.

### 3.1.2 Mitigation Potential Analysis

In January 2014, the Department of Environmental Affairs completed South Africa's Mitigation Potential Analysis (MPA). The purpose of the MPA was to:

- Identify mitigation options in South Africa's key economic sectors. The sectors considered were Energy, Industry, Transport, Waste, and Agriculture, Forestry and other Land Use (AFOLU); and
- Project national GHG emissions to 2050 under two different cases:

Case 1: A reference case 'without measures' (WOM), which projects emissions up to 2050, assuming that no mitigation measures have been implemented since 2000; and

Case 2: A reference case 'with existing measures' (WEM), which projects emissions up to 2050 and includes the impacts of climate change mitigation actions, policies and measures implemented to date.

The main outcomes of the MPA were:

- South Africa's mitigation potential (assuming 100% implementation of all identified mitigation options) is estimated at 100 MtCO<sub>2</sub>e in 2020, 340 MtCO<sub>2</sub>e in 2030, and 852 MtCO<sub>2</sub>e in 2050. This represents a reduction of reference case WEM emissions of 15%, 40% and 54% in 2020, 2030 and 2050, respectively;
- Under the WOM projection, South Africa's emissions are projected to reach 1,692 MtCO<sub>2</sub>e by 2050;

- Under the WEM projection, South Africa's emissions are projected to reach 1,593 MtCO<sub>2</sub>e by 2050;
- Mitigation opportunities exist in the following sectors:
  - Energy: renewable energy, carbon capture and storage, nuclear pressurised water reactors, and natural gas power;
  - Industry: energy efficiency, improved production processes, fuel switches, and GHG abatement technologies (such as the combustion and destruction of methane);
  - Transport: modal shifts, demand reduction measures, more efficient vehicle technologies, more efficient operations, and alternative low carbon fuels;
  - Waste: landfill gas recovery and utilisation, diversion of waste from landfills, and separation of recyclables, food and garden waste; and
  - AFOLU: livestock herd management, afforestation, reforestation, energy crops, and veld fire management.

### 3.1.3 Desired Emission Reduction Outcomes

South Africa first introduced the concept of Desired Emission Reduction Outcomes (DEROs) in its National Climate Change Response White Paper in 2011. Accordingly, the country will be defining DEROs for each significant sector, sub-sector of the economy, and at company level. These DEROs will be based on an in-depth assessment of the mitigation potential, best available mitigation options, and a full assessment of the costs and benefits. The economic sectors or sub-sectors for which DEROs have been established will be required to prepare and submit mitigation plans that set out how the sector intends to achieve these DEROs.

### 3.1.4 Carbon Tax

In May 2013, National Treasury released the country's Carbon Tax Policy Paper for public comment. This Paper followed on from the Carbon Tax Discussion Paper that was published in December 2010. The Carbon Tax Policy Paper outlined the broad aims of the proposed carbon tax, which are to:

1. Encourage a shift in production patterns towards low-carbon and more energy efficient technologies, by altering the relative prices of goods and services, based on their emissions intensity, and by encouraging the uptake of cost-effective, low-carbon alternatives;
2. Reduce the GHG emissions associated with the production of carbon-intensive products (such as steel, cement and aluminium); and
3. Create incentives for research, development and technology innovation in low-carbon alternatives, which will help to reduce the price gap between conventional, carbon-intensive technologies and low-carbon alternatives.

The proposed Carbon Tax Policy comprises the following key elements:

- A percentage-based threshold on actual (direct) emissions will be applied, below which the tax will not be payable during the first five years of implementation;
- Consideration will be given to sectors in which the potential for emissions reduction is limited due to either technical or structural reasons, such as process emissions;
- Graduated relief is given to trade-intensive sectors;
- Offsets can be used by businesses to reduce their carbon tax liability up to a limit. Variable offset limits are proposed, based on the mitigation potential of the sector; and

- The overall maximum tax-free threshold (including offsets and possible adjustments to the basic 60% tax-free threshold for carbon intensity) is limited to 90%, except for those sectors that are excluded during the first five-year period (agriculture, forestry, land use and waste).

In February 2014, the Minister of Finance confirmed that a carbon tax will be implemented in 2016. This will allow adequate time for the country to consult on draft legislation and to align the design of the carbon tax with the proposed DEROs. Carbon tax is viewed as only one component of the broad mix of measures that are being undertaken to address climate change.

### **3.2 KEY GOVERNMENT POLICIES AND MEASURES THAT IMPACT CLIMATE CHANGE MITIGATION**

This section covers the key government policies and measures that impact climate change mitigation, implemented since 2000. The tables below classify the policies and measures in terms of the four IPCC sector reporting categories: Energy; Industrial Processes and Product Use; Agriculture, Forestry and Land Use; and Waste. Additional tables that cover Adaptation and Financial Measures are also provided.



### 3.2.1 Energy Sector

Table 23: Energy sector mitigation actions taken

Mitigation Action	Name of Policy/ Instrument /Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Financial support measures for mitigation actions in the energy sector	Income Tax Act 58 of 1962; Section 12L and the National Energy Act 34 of 2008; and Section 19 read with the 'Regulation on the allowance for energy efficiency savings' (R729).	Tax rebates for the implementation of energy efficiency measures.	CO <sub>2</sub>	Economic	Existing measure	National Treasury, DoE, SANEDI, SANAS, SARS	Current (01 October 2013 to 31 December 2019).	Not available, but can be quantified.	<ul style="list-style-type: none"> <li>Reduce greenhouse gas emissions;</li> <li>Increase energy efficiency; and</li> <li>Job creation.</li> </ul>
Financial support measures for mitigation actions in the energy sector	Electricity levy	Subsidy to promote the installation of solar water heaters.	CO <sub>2</sub>	Economic	Existing measure	National Treasury, Department of Energy, Eskom	Current	Not available, but can be quantified.	<ul style="list-style-type: none"> <li>Reduce greenhouse gas emissions;</li> <li>Increase energy availability in the grid; and</li> <li>Job creation.</li> </ul>
Diversification of electricity generation sources	Integrated Resource Plan for electricity (IRP) 2010-2030	The IRP for electricity makes provision for an increased contribution from renewable and nuclear energy for electricity generation.	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Regulatory	Promulgated in March 2011. It was indicated at the time that the IRP should be a "living plan" which would be revised by the DoE every two years. The IRP is currently being updated.	DoE	2010 - 2030	Not available, but can be quantified.	<ul style="list-style-type: none"> <li>Energy security;</li> <li>Investment in renewable energy technology;</li> <li>Diversification of energy mix; and</li> <li>Job creation.</li> </ul>



Mitigation Action	Name of Policy/ Instrument /Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Diversification of electricity genera- tion sources	2003 White Paper on Renewable Energy	This policy document provides a range of measures designed to bring about integration of renewable energies into the mainstream energy economy. To achieve this aim, the government set a target of 10,000 GWh of renewable energy to add to the current energy mix by 2013. This is to be produced mainly from biomass, wind, solar and small-scale hydro. Following Cabinet approval of the White Paper, the DoE proceeded with the development of its renewable energy strategy.	CO <sub>2</sub>	Regulatory	Existing measure	DoE	Current The White Paper is currently under review by the DoE.	0.8	Add 1,667 MW renewable energy capacity; Impact GDP by R1,071 billion a year; Create additional government revenue of R299 million; Stimulate additional income that will flow to low-income households, by as much as R128 million; Create 20,000 new jobs; and Contribute to water savings of 16.5 million kilolitres, which translates into a R26.6 million saving
Diversification of electricity genera- tion sources	National Industrial Biofuels Strategy (NIBS), 2007	The aim of this strategy is to create a market for biologically produced fuels, so that they can be used as a blending component in petrol/diesel production. The Biofuels Industrial Strategy has adopted a short-term focus and aims to achieve 2% penetration of biofuels in the national liquid fuel supply, which is equivalent to 400 million litres per annum. In terms of regulation 6 of the Regulations regarding Mandatory Blending of biofuels with Petrol and Diesel, (Promulgated under Government notice R671 of 23 August 2012), Mr Ben Martins, in his capacity as the Minister of Energy, has determined that 1 October 2015 as the date on which the Regulations will come into effect.	CO <sub>2</sub>	Regulatory	Adopted	DoE	Current	Not available	Job creation; Sustainable development; and Black Economic Empowerment (BEE).

Mitigation Action	Name of Policy/ Instrument /Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Diversification of electricity generation sources	Renewable Energy Independent Power Producer Procurement (REIPPP) Programme	The Minister of Energy has determined that 3,725 megawatts (MW) is to be generated from renewable energy sources. This is required to ensure the continued uninterrupted supply of electricity. This 3,725 MW is in accordance with the capacity allocated to renewable energy generation in IRP 2010-2030. South Africa has already signed off a total of 64 projects to build about 3,916 MW in the first, second, and third stages of the clean energy drive. South Africa will buy an extra 1,456 MW of renewable energy from independent developers in the third stage of the renewable energy programme.	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Economic	Existing measure	DoE and NERSA	Current	Not available	<ul style="list-style-type: none"> <li>Socio-economic and environmentally sustainable growth.</li> </ul>
Diversification of electricity generation sources	Solar Water Heating Programme	This programme involves the installation of solar water heaters in low cost housing units. South Africa has also registered a solar water heating Programme of Activities under the Clean Development Mechanism.	CO <sub>2</sub>	Social	Existing measure	DoE	As per the National Development Plan, 5 million solar water heating units to be installed by 2019.	Not available, but can be quantified.	Socio-economic and environmentally sustainable growth.
Diversification of electricity generation sources	Solar Park and Concentrated Solar Power Plant (CSP)	The Solar Park and Concentrated Solar Power Plant will each add approximately 100MW of renewable electricity to the grid. South Africa has also registered a CSP Programme of Activities under the Clean Development Mechanism.	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Economic	Existing measure	DoE and Eskom	Current	Not available, but can be quantified.	Socio-economic and environmentally sustainable growth.

Mitigation Action	Name of Policy/ Instrument /Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Diversification of electricity generation sources	South African Wind Energy Programme (SAWEP)	The objective of SAWEP is to: install and operate 5.2 MW of electricity generated from the Darling Wind Farm National Demonstration Programme; and prepare for the development of an additional 45 MW of wind power from Independent Power Producers. South Africa has registered several wind Programme of Activities under the Clean Development Mechanism.	CO <sub>2</sub>	Economic	Existing measure	DoE	Current	Not available, but can be quantified.	<ul style="list-style-type: none"> <li>Develop capacity building and strengthened institutions;</li> <li>Promote commercial wind energy development;</li> <li>Develop long-term policy and implementation framework for wind energy; and</li> <li>Initiate green power funding.</li> </ul>
Diversification of electricity generation sources	The South African Coal Roadmap	The South African Coal Roadmap was developed to explore the short, medium and long-term activities and interventions needed to support the coal industry in South Africa.	CO <sub>2</sub>	Regulatory	Planned	SANEDI	Current	Not available	Socio-economic and environmentally sustainable growth.
Diversification of liquid fuel sources	Integrated Energy Plan (IEP)	The purpose and objectives of the IEP were established in the National Energy Act, 2008 (Act No. 34 of 2008). Integrated energy planning is undertaken to determine the best way to meet current and future energy service needs in the most efficient and socially beneficial manner. One of the key objectives of the DoE's policy is to diversify primary energy sources and reduce the country's dependency on coal.	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Economic	Existing measure	DoE	Current	Not available	Socio-economic and environmentally sustainable growth.

Mitigation Action	Name of Policy/ Instrument /Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Carbon capture and storage	The South African Centre for Carbon Capture and Storage	The South African Centre for Carbon Capture and Storage is responsible for the implementation of a roadmap for evaluating the potential for carbon capture and storage, as well as a testing and demonstration plant to store process emissions from an existing high carbon emission facility.	CO <sub>2</sub>	Economic	Planning	DoE in partnership with SANEDI	Commercial operation is expected in 2025	249	Reduce air pollution; Transfer and development of skills and expertise, and Job creation.
Energy efficiency	National Energy Efficiency Strategy (NEES)	The White Paper on Energy Policy (1998) gave a mandate to the DoE to pursue energy efficiency programmes. The NEES was approved by Cabinet and released in 2005 and is intended to support exploration of the potential for improved energy utilisation through reducing the country's energy intensity (thus reducing greenhouse gas emissions). The strategy outlines how an overall energy intensity reduction target of 12% could be reached by 2015 with the following sectoral energy efficiency improvement targets: Industry and mining (15%), Commercial and public buildings (15%), Residential (10%) and Transport (9%). South Africa has also registered several stand-alone energy efficiency projects under the Clean Development Mechanism.	CO <sub>2</sub>	Regulatory	Existing measure	DoE	Current The strategy was updated in its second review, but no changes were made to the targets. The DoE is currently establishing an Energy Efficiency target Monitoring System (EETMS), in order to progress with the targets set out in the strategy. This will also inform the post-2015 targets of the strategy.	Enhancing energy security by making better use of existing and new generation capacity; Improving South Africa's global competitiveness through reduced energy costs; Decoupling growth in energy consumption (and GHG emissions) from growth in GDP; and Improving global competitiveness which will, in turn, contribute to job creation.	

Mitigation Action	Name of Policy/ Instrument /Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Energy efficiency	Municipal Energy Efficiency and Demand Side Management (EEDSM)	The EEDSM programme provides grant funds that are disbursed to municipalities to implement energy efficient retrofits within the municipal infrastructure.	CO <sub>2</sub>	Economic	Existing measure	DoE	Current	0.5 (2004 up to the end of 2012)	<ul style="list-style-type: none"> <li>Reduce energy consumption</li> <li>Reduce air pollution;</li> <li>Reduce electricity bills;</li> <li>Transfer and development of skills and expertise; and</li> <li>Job creation.</li> </ul>
Energy efficiency	Appliance labelling regulations and/or standards	These standards are being developed to manage appliance performance and enforce energy efficiency labelling of domestic appliances.	CO <sub>2</sub>	Economic	Already identified, but not implemented.	Jointly implemented by the DoE and the dti, with support from SABS and NRCS. A voluntary appliance labelling programme for refrigerators was introduced in 2005/6.	Not available		<p>Job creation; and</p> <p>The environmental indicators that are reported on (per MWh grid electricity saved) include: water saving, coal ash avoided, and SO<sub>2</sub> emissions avoided.</p>
Energy efficiency	Integrated Demand Management Programme (IDM)	The IDM covers a range of funding and awareness programmes, which promote energy efficiency and load management.	CO <sub>2</sub>	Economic	Existing measure	Eskom	Current	The IDM has achieved estimated savings of 3,072 MW to date.	<p>Reduce energy consumption;</p> <p>Reduce air pollution;</p> <p>Reduce electricity bills;</p> <p>Transfer and development of skills and expertise; and</p> <p>Job creation.</p>

Mitigation Action	Name of Policy/ Instrument /Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Energy efficiency	National Cleaner Production Centre (NCPC)	The NCPC develops programmes that reduce pollution and improve resource efficiency in the private sector. The NCPC has identified programmes with a total potential saving of R65 million.	CO <sub>2</sub>	Economic	Existing measure	The dti	Current	Not available	<ul style="list-style-type: none"> <li>Reduce energy consumption;</li> <li>Reduce air pollution;</li> <li>Reduce electricity bills;</li> <li>Transfer and development of skills and expertise; and</li> <li>Job creation.</li> </ul>
Energy efficiency	Energy Efficiency Leadership Network (EELN)	The main objective of the EELN is to improve energy efficiency in the South African business sector. The EELN is also intended to support business's commitment to the Green Accord.	CO <sub>2</sub>	Economic	Existing measure	NBI, DoE and BUSA	Current, launched in December 2011.	Not available	<ul style="list-style-type: none"> <li>Reduce energy consumption;</li> <li>Reduce air pollution;</li> <li>Reduce electricity bills;</li> <li>Transfer and development of skills and expertise; and</li> <li>Job creation.</li> </ul>
Energy efficiency	Working for Energy Programme	The purpose of this programme is to develop and implement labour intensive energy related initiatives that will be closely aligned with the "Working for Water" programme. It will focus on interventions aimed at demand-side management and the provision of electricity from biomass-based resources.	CO <sub>2</sub>	Economic	Existing measure	DoE and SANEDI	Conceived in 2008/2009.	Not available.	<ul style="list-style-type: none"> <li>Reduce energy consumption;</li> <li>Reduce air pollution;</li> <li>Reduce electricity bills;</li> <li>Transfer and development of skills and expertise; and</li> <li>Job creation.</li> </ul>

Mitigation Action	Name of Policy/ Instrument /Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Energy efficiency	Private Sector Energy Efficiency Project	The NBI is implementing a Private Sector Energy Efficiency Project (PSEE) which aims to improve energy efficiency in commercial and industrial companies in South Africa, through the provision of various services that will assist companies in identifying and implementing energy saving measures.	CO <sub>2</sub>	Economic	Existing measure	DoE, NBI, DFID and the private sector	The project was launched in December 2013 and will run until March 2015.	Not available, but can be quantified.	<ul style="list-style-type: none"> <li>Energy savings;</li> <li>Energy intensity reduction;</li> <li>Implementation of projects that will result in the reduction of GHG emissions;</li> <li>Improved economic competitiveness through resource and process efficiency;</li> <li>Investment leveraged from the private and public sectors through capital investment in energy efficiency projects;</li> <li>Social benefits, such as job creation and skills development relating to energy efficiency;</li> <li>Increased awareness of energy efficiency.</li> </ul>
Coal bed methane reduction	Coal bed methane reduction (CBM)	CBM exploration is still in the early stages of development in Southern Africa. South Africa is planning to capture 25% of methane emissions from coal mines, starting in 2020, and reaching the goal by 2030.	CH <sub>4</sub>	Economic	Planning	DoE	2020 - 2030	61	<ul style="list-style-type: none"> <li>Reduce air pollution;</li> <li>Transfer and development of skills and expertise; and</li> <li>Job creation.</li> </ul>
Transport	Introduction of green cars to the Department of Environmental Affairs' vehicle fleet	The initiative involves the introduction of electric vehicles to the DEA's vehicle fleet. Fossil fuel vehicles will be phased out and replaced with zero-emission electric vehicles.	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Economic	Existing measure	DEA	2013 - 2016	Not available, but can be quantified.	<ul style="list-style-type: none"> <li>Reduce air pollution;</li> <li>Transfer and development of skills and expertise; and</li> <li>Job creation.</li> </ul>

Mitigation Action	Name of Policy/ Instrument /Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Transport	Standardised fuel economy and CO <sub>2</sub> emission testing and labelling system	This programme covers improved vehicle efficiency and promoting fuel efficiency awareness amongst buyers of new passenger vehicles.	CO <sub>2</sub>	Economic	Existing measure	South African Automotive Industry	2008	Not available.	<ul style="list-style-type: none"> <li>• Reduce air pollution;</li> <li>• Transfer and development of skills and expertise; and</li> <li>• Job creation.</li> </ul>
Transport	Passenger rail: modal shift from private vehicles to rail (PRASA), including the Gautrain	Passenger modal shifts are being explored by the Department of Transport. An Integrated Public Transport System reduces vehicle emissions.	CO <sub>2</sub>	Economic	Existing measure	DoT (Gauteng Province)	Current	Not available.	<ul style="list-style-type: none"> <li>• Reduce air pollution;</li> <li>• Transfer and development of skills and expertise; and</li> <li>• Job creation.</li> </ul>
Transport	Roadmap to Cleaner Fuel: The Clean Fuels 2 specification	South Africa must conform to the Clean Fuels 2 Stipulation by 2017. The aim of this programme is to decrease the content of aromatics (from 50% to 35%) and benzene (from 5% to 1%) in petrol. This is to ensure alignment with emission standards. The sulphur content of petrol will also be reduced from 500ppm to 10ppm.	CO <sub>2</sub>	Economic	Existing measure	DoT	Current	Not available.	<ul style="list-style-type: none"> <li>• Reduce air pollution;</li> <li>• Transfer and development of skills and expertise; and</li> <li>• Job creation.</li> </ul>
Transport	Integrated Public Transport Network (IPTN)	This programme covers the integration of urban public transport, including: Bus Rapid Transport, Metro Buses and Minibus Taxis. The programme includes dedicated lanes for public transport, an inner-city distribution system, integrated ticketing, and pedestrian and bicycle facilities.	CO <sub>2</sub>	Economic	Existing measure	DoT and City Metropolitan	2008	0.22 (shifting road freight to rail in 2011/2012)	<ul style="list-style-type: none"> <li>• Reduces highway congestion;</li> <li>• Saves commuter time; and;</li> <li>• Creates service, assembly and infrastructure jobs.</li> </ul>



Mitigation Action	Name of Policy/ Instrument /Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Transport	Bus Rapid Transport System (BRT) (a component of the public transport strategy)	The aim of the BRT is to quickly and safely transport people to all parts of the city, and to link different parts of the city in a network.	CO <sub>2</sub>	Economic	Existing measure	DoT and Local Governments	Current	Not available	<ul style="list-style-type: none"> <li>Reduces highway congestion;</li> <li>Saves commuter time; and;</li> <li>Creates service, assembly and infrastructure jobs.</li> </ul>
Transport	Intelligent Transport System (ITS)	The ITS covers urban traffic control, advanced traffic management, parking management and advanced public transport management.	CO <sub>2</sub>	Economic	Implemented/ existing measure	DoT and Local Governments	Current	Not available	<ul style="list-style-type: none"> <li>Job creation;</li> <li>Reduction in traffic accidents;</li> <li>Reduction in fuel consumption; and</li> <li>Reduction in travel time.</li> </ul>
Energy Efficiency in the petroleum refining, oil and natural gas sectors	South Africa's Greenhouse Gas Mitigation Potential Analysis	Mitigation measures applied by the Petroleum Refining sector and other energy industry sectors include: <ul style="list-style-type: none"> <li>Improved steam generating boiler efficiency;</li> <li>Improved process heater efficiency;</li> <li>Waste gas/heat recovery and utilization;</li> <li>Minimise flaring and utilize flare gas as fuel; and</li> <li>Improved process controls.</li> </ul>	CO <sub>2</sub> CH <sub>4</sub> N <sub>2</sub> O	Economic	Existing measures	Private sector (petrol refineries)	Current	4.9 (process related); 1.9 (fuel related); and 1.7 (electricity related) for 2000-2010.	<ul style="list-style-type: none"> <li>Improved on-site energy generation;</li> <li>Improved energy efficiency; and</li> <li>Energy security.</li> </ul>

Mitigation Action	Name of Policy/ Instrument /Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Methane capture in the coal mining and handling sector	South Africa's Greenhouse Gas Mitigation Potential Analysis	Mitigation measures for coal mining and handling sector include: <ul style="list-style-type: none"> <li>Methane destruction by flaring; and</li> <li>Methane capture and use for power and heat production.</li> </ul>	CH <sub>4</sub>	Economic	Existing measures at one mine (and potential for further roll-out)	Private sector	Current	Not available	<ul style="list-style-type: none"> <li>Reducing GHG emissions</li> <li>Replacing electricity previously drawn from the grid;</li> <li>Providing motive power for mine vehicles; and</li> <li>Replacing heat generated by coal- fired boilers and/or compressing gas to be piped off site for general use providing a source of natural gas.</li> </ul>
Renewable Energy	CDM project activities for renewable energy production, using wind, solar or hydro power	A number of CDM projects and programme of activities have been reg- istered for wind, solar and hydropower projects, but no CERs had been issued for these projects by 31 December 2012 (the end of the first commitment period of the Kyoto Protocol).	CO <sub>2</sub>	Economic	Implemented	Private sector	2000 - 2012	0	<ul style="list-style-type: none"> <li>Energy efficiency, and</li> <li>Energy security.</li> </ul>

### 3.2.2 Industrial Processes and Product Use Sector

**Table 24: Industrial processes and product use sector mitigation actions**

Mitigation Action	Name of Policy/ Instrument/ Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Fuel switching	Feedstock Fuel Switch - The Sasol Natural Gas Project	Some companies in South Africa have voluntarily made the decision to switch from a high carbon intensive to a low carbon fuel source. One of the largest fuel feedstock switches was completed by Sasol, a chemical and energy company in South Africa. Sasol replaced coal with natural gas as a feedstock for a liquid synfuels facility. This involved the commissioning of an 856km natural gas pipeline, from the Temane and Panda gas fields in Mozambique, to its synfuels facility in Secunda, South Africa.	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Economic	Existing measure, implemented in 2004.	Private sector	Current	7.43	<ul style="list-style-type: none"> <li>• Energy security; and</li> <li>• Improvement in working conditions at the facility implementing the fuel switch.</li> </ul>
Upgrades	Feed compressor upgrade	The upgrade of a feed compressor at the Sasol synfuels facility resulted in a direct electricity saving of 20MW.	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Economic	Implemented	Private sector	Current	0.18	<ul style="list-style-type: none"> <li>• Energy security.</li> </ul>

Mitigation Action	Name of Policy/ Instrument/ Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
New technology	Gas engines, heat recovery and new design	<p>Since 2009, Sasol has implemented a range of electricity saving projects:</p> <ul style="list-style-type: none"> <li>Wet sulphuric acid plant to produce 43 bar of steam, producing 9.1MW energy.</li> <li>Open cycle gas turbine to produce 200MW of electricity.</li> <li>Recovery of 290 tonnes of heat per hour from exhaust gas from an open cycle turbine, producing 68MW energy.</li> <li>Gas power plant to provide 140MW of electricity.</li> </ul>	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Economic	Implemented	Private sector	Current	3.17	<ul style="list-style-type: none"> <li>Energy security;</li> <li>Reduce air pollution; and</li> <li>Transfer and development of skills and expertise along with job creation.</li> </ul>
Nitrous oxide emission reduction	CDM nitrous oxide emission reduction	<p>To reduce nitrous oxide emissions in the explosive and fertiliser production process. Five South African nitrous oxide abatement projects have been registered under the Clean Development Mechanism. The UNFCCC issued 5,329,558 CERs collectively to these five projects up until 31 December 2012 (end of the first Kyoto commitment period).</p> <p>This initiative deals with the capture of PFCs at existing aluminium plants. The aim is to capture 100% of PFCs emitted from these plants by 2020.</p>	N <sub>2</sub> O	Economic	Implemented	Private sector	Current	5.33	<ul style="list-style-type: none"> <li>Reduce air pollution; and</li> <li>Transfer and development of skills and expertise along with job creation.</li> </ul>
Capture of PFC in aluminium plants	Long Term Mitigation Scenarios (LTMS)		PFCs	Economic	Planning	Not applicable	2011 - 2020	Not available.	Reduce air pollution; and Transfer and development of skills and expertise along with job creation.

Mitigation Action	Name of Policy/ Instrument/ Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Various GHG mitigation initiatives in the IPPU sector	South Africa's Greenhouse Gas Mitigation Potential Analysis	<p>Mitigation actions implemented by the IPPU sector between 2000-2010 include:</p> <ul style="list-style-type: none"> <li>Improved process, demand and energy management systems</li> <li>Improved energy monitoring and management systems;</li> <li>Revamp plants (increase capacity and energy efficiency);</li> <li>Energy-efficient boiler systems, kilns and utility systems (e.g. lighting, refrigeration, compressed air);</li> <li>Waste heat and/or gas energy recovery and utilization for co-generation;</li> <li>Implement best available production techniques;</li> <li>Replace semi-closed submerged arc furnaces with closed type;</li> <li>Improved electric motor system controls and variable speed drives;</li> <li>Improved heat exchanger efficiencies;</li> <li>Tail-gas energy recovery for combined heat and power (CHP) plant and minimize flaring;</li> <li>Use alternative fuels including biomass/residual wood waste; and</li> <li>Replace coal-fired partial oxidation process with natural gas-fired steam reforming product.</li> </ul>	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Economic	Implemented	Private sector	2000 - 2010	18.6 MtCO <sub>2</sub> e reduction in emissions for the IPPU sector from: 1.9 (process related), 1.1 (fuel related) and 16.4 (electricity related) for 2000-2010.	<ul style="list-style-type: none"> <li>Energy efficiency;</li> <li>Energy security; and</li> <li>Process improvements and cost abatements.</li> </ul>
Fuel switches, energy efficiency and biogas capture	CDM project activities for energy efficiency, fuel switch and biogas capture.	CDM projects at four industrial sites generated CERs through fuel switch, energy efficiency or biogas capture projects. The UNFCCC issued 973,967 CERs collectively to these four projects up until 31 December 2012.	CO <sub>2</sub> , CH <sub>4</sub>	Economic	Implemented	Private sector	2000 - 2012	0.94	<ul style="list-style-type: none"> <li>Energy efficiency; and</li> <li>Energy security.</li> </ul>

### 3.2.3 Agriculture, Forestry and Land Use Sector

Table 25: Agriculture, forestry and land use sector mitigation actions

Mitigation Action	Name of Policy/ Instrument/ Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Land use	Working on Fire - Firewise Programme	The objectives of this programme include enhanced human safety and the setup of high quality fire and land management customs to prevent harm to goods and life.	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Economic	Existing measure	Instigated by Government and executed by Forest Fire Association (FFA).	Current	Not available	<ul style="list-style-type: none"> <li>Improved resiliency of the ecosystem.</li> </ul>
Land use	Long Term Mitigation Scenarios (LTMS): Afforestation Projects	The rate of commercial afforestation is planned to increase from 2008 to 2030. This means that an additional 760,000 ha of commercial forests are to be planted by 2030.	CO <sub>2</sub>	Economic	Existing measure	DEA	Current: 2008 - 2030	Not available	<ul style="list-style-type: none"> <li>Maintained ecosystems;</li> <li>Water conservation;</li> <li>Preservation of biodiversity; and</li> <li>Job creation.</li> </ul>
Land use	Working on Land	The objective of this programme is to manage natural resources, in order to alleviate bush infringement/thickening as well as loss of top-soil. The first stage of the project is aimed at controlling bush encroachment – thinning teams have been put in place to control encroachment on about 1,526 ha of land.	CO <sub>2</sub>	Economic	Existing measure	DEA in partnership with the Land Care programme as well as other groups/institutions (municipalities, farmers, universities, schools, etc.)	April 2011 to March 2014	Not available	<ul style="list-style-type: none"> <li>Create new job opportunities; and</li> <li>Socio-economic benefits for local residents, which ultimately contributes to the Expanded Public Works Programme (EPWP).</li> </ul>

Mitigation Action	Name of Policy/ Instrument/ Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Agriculture	Long Term Mitigation Scenarios (LTMS); Enteric fermentation	This programme plans to reduce enteric fermentation from cattle, by transferring free-range cattle to feedlots and feeding them high-protein, highly-digestible food.	CO <sub>2</sub>	None	Planned	DEA	2003 - 2050	3.3	<ul style="list-style-type: none"> <li>Maintained ecosystems;</li> <li>Water conservation;</li> <li>Preservation of biodiversity; and</li> <li>Job creation.</li> </ul>
Agriculture	Long Term Mitigation Scenarios (LTMS); Reduced tillage	This programme aims to reduce tillage on croplands in order to reduce soil erosion.	CO <sub>2</sub>	None	Planned	DEA	2003 - 2050	100	<ul style="list-style-type: none"> <li>Saves labour and energy costs; and</li> <li>Benefits soil conservation.</li> </ul>

Table 26: Waste sector mitigation actions

Mitigation Action	Name of Policy/ Instrument/ Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government Agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Waste	Municipal Solid Waste Tariff Strategy	The Municipal Solid Waste Tariff Strategy was developed in 2011. The purpose of the tariff strategy is to provide a framework and guidance for municipalities in setting solid waste tariffs that align with the intentions of the National Waste Management Strategy.	CH <sub>4</sub>	Economic/ regulatory	Existing measure	DEA	Current	Not available	<ul style="list-style-type: none"> <li>Conserve space in existing landfills.</li> </ul>
Waste	Recycling and Economic Development Initiative of South Africa (REDISA)	The purpose of this initiative is to increase recycling, reuse of materials and energy recovery.	CO <sub>2</sub>	Economic	Existing measure	DEA	Current	Not available	<ul style="list-style-type: none"> <li>Conserve space in existing landfills;</li> <li>Reduce pollution and energy consumption associated with the manufacture of new materials; and</li> <li>The innovation and challenges (for example, the training and skills required for deconstruction) can help to attract and retain employees who are keen to develop new skills.</li> </ul>
Waste	National Organic Waste Composting Strategy (NOWCS)	This strategy has been developed to promote composting as a method of benefiting organic waste, and to divert organics from landfill disposal.	CO <sub>2</sub> , CH <sub>4</sub>	Economic	Existing measure	DEA	Current	Not available	<ul style="list-style-type: none"> <li>Reduce waste disposal costs.</li> </ul>
Waste	Biogas to energy projects (Durban, PetrosA, EnviroServe)	Most of the projects are CDM and the main objective is to produce energy from the methane in the landfills)	CH <sub>4</sub>	Economic	Existing Measure	Private sector & Government	Current	About 1 521 242 CERs issued to date	<ul style="list-style-type: none"> <li>Additional energy production leads to alleviation of pressure on the national grid.</li> </ul>



### 3.2.5 Financial Measures

Table 27: Financial measures sector mitigation actions

Mitigation Action	Name of Policy/ Instrument/ Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Carbon tax	Electricity levy	This is a levy on all electricity produced from non-renewable sources (which is more than 90% of South Africa's electricity). The revenue from the levy is for funding the repair of roads (particularly in Mpumalanga) that are damaged by coal trucks.	CO <sub>2</sub>	Economic	Existing measure	National Treasury	Current	Not available	<ul style="list-style-type: none"> <li>Transparent electricity pricing; and</li> <li>Improved roads.</li> </ul>
Carbon tax	Carbon dioxide vehicle emissions tax	A CO <sub>2</sub> emissions tax is applicable to new passenger motor vehicles. The main objective of this tax is to influence the composition of South Africa's vehicle fleet to become more energy efficient and environmentally friendly.	CO <sub>2</sub>	Economic	Existing measure, which was announced in 2009.	National Treasury	Current	Not available	<ul style="list-style-type: none"> <li>Reduce air pollution; and</li> <li>Facilitate the transition to a green economy.</li> </ul>
Carbon tax	Income Tax Act 58 of 1962; Section 12L and the National Energy Act 34 of 2008, Section 19 read with the 'Regulation on the allowance for energy efficiency savings' (R729).	Section 12L of the Income Tax Act provides for a tax incentive as a result of the implementation of efficiency initiatives. This came into effect on 1 November 2013.	CO <sub>2</sub>	Economic	Existing measure	SANEDI and SARs	Current (October 2013 – December 2019)	Not available, but can be quantified.	<ul style="list-style-type: none"> <li>Facilitate the transition to a green economy;</li> <li>Environmentally sustainable growth; and</li> <li>Job creation</li> </ul>

Mitigation Action	Name of Policy/ Instrument/ Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering government agency/ Actors	Time Horizon	Estimated emission reductions (MtCO <sub>2</sub> e)	Co-benefits
Carbon tax	Carbon Tax Policy	Carbon tax is to be implemented in order to allow businesses to internalise the negative effects of GHG emissions by adjusting the price of such services and environmental goods accordingly. Carbon taxes will encourage behavioural transformation amongst consumers and producers; in support of greener, cleaner, more efficient and lower-carbon emitting technologies.	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, SF <sub>6</sub> , PFCs.	Economic	Already identified, but not implemented.	National Treasury	2016 onwards	Not available	<ul style="list-style-type: none"> <li>Facilitate the transition to a green economy;</li> <li>Environmentally sustainable growth; and</li> <li>Job creation.</li> </ul>
Emissions trading	Emission trading scheme	Emission trading schemes allow for countries to meet their emission reduction obligations and for companies to offset their GHG emissions. Public and private companies in South Africa have registered Clean Development Mechanism (CDM) projects, Verified Carbon Standard (VCS) projects, and Gold Standard (GS) projects.	CO <sub>2</sub>	Economic	Existing measure	Designated National Authority under the Department of Energy	Current	18	<ul style="list-style-type: none"> <li>Foreign reserve earnings;</li> <li>Environmentally sustainable growth;</li> <li>Job creation.</li> </ul>

### 3.3 PRIVATE SECTOR MITIGATION INITIATIVES

South Africa's private sector mitigation initiatives have been predominantly geared toward energy efficiency, demand management and moving towards less carbon-intensive energy mix. This has resulted in the economic benefits of improved efficiency and competitiveness. The private sector has implemented mitigation initiatives often with incentives such as:

- International market mechanisms such as the Clean Development Mechanism (CDM) and Verified Carbon Standard (VCS). To date (November 2014), South

Africa has registered 59 stand-alone CDM projects and 34 Programmes of Activities (PoAs). South Africa has also registered 7 VCS projects – 3 of which being Grouped Projects; and

- Domestic support mechanisms such as Eskom's Demand Side Management (DSM) and Integrated Demand Management (IDM) programmes.

The graph below presents the effect of South Africa's private sector mitigation initiatives on the country's national GHG inventory. In 2010, these mitigation activities contributed to a 3% reduction in overall emissions.

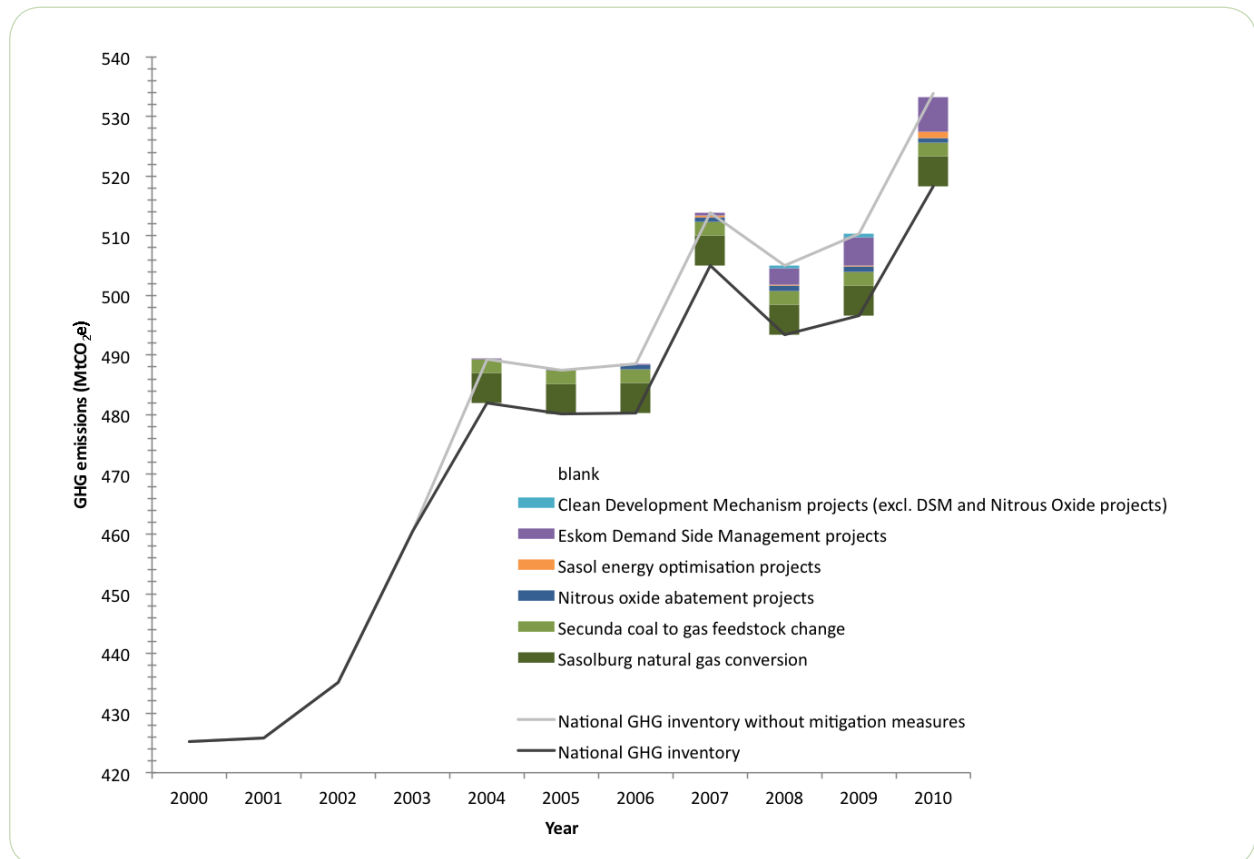


Figure 25: Effect of South Africa's mitigation initiatives on the country's national greenhouse gas inventory (Promethium Carbon, 2014)

### 3.4 DOMESTIC INSTITUTIONAL ARRANGEMENTS

South Africa has established a set of domestic institutional arrangements to facilitate smooth implementation of climate change mitigation policies and measures by the government. The three committees discussed below have been set up to drive the effort toward mainstream climate-resilient development.

#### 3.4.1 Inter-Ministerial Committee on Climate Change (IMCCC)

The Inter-Ministerial Committee on Climate Change (IMCCC) was set up in 2009 to coordinate and drive mitigation responses and measures across government departments. The IMCCC is chaired by South Africa's Minister of Environmental Affairs, and its Terms of Reference include:

- Directing the formulation of a national programme for climate change, and developing South Africa's final mandate for the UNFCCC; and
- Exercising oversight over all aspects of the implementation of climate policy. To this end, the IMCCC will oversee the implementation of the country's National Climate Change response Policy, and the implementation of climate change response policies and measures.

The technical, analytical and administrative capacity of the IMCCC is provided by a secretariat based at the Department of Environmental Affairs, which co-opts any required skills from other government departments or from outside the government.


#### 3.4.2 Inter-Governmental Committee on Climate Change (IGCCC)

The Inter-Governmental Committee on Climate Change (IGCCC) was established in 2008 to facilitate cooperative governance in the area of climate change. The IGCCC brings

together relevant national and provincial departments to exchange climate change information, and to assist with climate change policy development and implementation.

The Terms of Reference of the IGCCC include:

- Dealing with international and local policy matters, including:
  - Informing South Africa's climate change-related international negotiation positions, and the make-up of South African negotiating teams and delegations; and
  - Facilitating and co-ordinating the alignment of all policies, strategies, action plans, legislation, regulations, systems, implementation projects, and pilot projects that may have an impact on government's climate change policies and programmes;
- Dealing with implementation matters, including:
  - Acting as the de facto government steering committee for climate change-related projects that impact on, or require the active involvement of, more than one of the IGCCC members (e.g. the national GHG inventory, and the NCCRP development process);
  - Providing a platform for all IGCCC members to share information on their various climate change-related projects and initiatives (including, but not limited to, policy, strategies, action plans, legislation, regulations, systems, implementation projects, and pilot projects);
  - Facilitating and co-ordinating the efficient and effective implementation of various climate change-related projects and initiatives that impact on, or require the active involvement of, more than one of the IGCCC members; and
  - Monitoring and reporting progress on the implementation of various climate change-related



projects and initiatives that impact on, or require the active involvement of, more than one of the IGCCC members; and

- Dealing with information management matters, including:
  - Providing a platform for all IGCCC members to share information on forthcoming national, regional, and international climate change-related events (e.g. conferences, seminars, workshops, training opportunities, etc.); and
  - Acting as a reference group to ensure consistent, integrated, and coherent government messaging for climate change-related outreach and awareness-raising activities.

Finally, the IGCCC (together with South Africa's IMCCC) is responsible for development and oversight of the country's suite of near-term priority Flagship Programmes.

### 3.4.3 National Committee on Climate Change (NCCC)

The National Committee on Climate Change (NCCC) was set up to consult with stakeholders from key sectors that impact on (or are impacted by) climate change. The Committee advises on matters relating to national responsibilities with respect to climate change, and in particular in relation to the UNFCCC and the Kyoto Protocol. The NCCC acts as the official national platform for continuous stakeholder engagement on climate change within South Africa.





## 4. FINANCIAL RESOURCES, TECHNOLOGY TRANSFER, CAPACITY BUILDING, AND TECHNICAL SUPPORT RECEIVED

South Africa is committed to mobilising the resources that are necessary to overcome the challenges in mitigating and adapting to climate change. This includes financial resources, technical cooperation and technology transfer at domestic, sub-regional, regional, and international levels.

This chapter provides a reflection of how South Africa mobilised resources between 2000 and 2010. These resources have been mobilised from developed Annex II countries and multilateral agencies, with the South African government also playing an active role in channelling domestic financial resources towards climate change projects and research.

Whilst a transparent account of resource mobilisation is useful to support further cooperation and partnerships, perhaps a more important element of this chapter is the reflection on the support still required by South Africa to adequately respond to climate change. As such, this chapter highlights South Africa's needs in terms of financial support and non-monetised requirements for capacity building and technology transfer.

### 4.1 SUPPORT RECEIVED

#### 4.1.1 Financial support received

The financial support that South Africa has received for climate change mitigation/adaptation can be classified in terms of bilateral or multilateral support. Support is classified as 'bilateral' if it comes from one donor country. Support is classified as 'multilateral' if it comes from more than one country/entity, and is channelled through one donor agency. The bilateral and multilateral support that South Africa has received to assist with its climate change response is reported on in separate tables below.

The financial support received is reported on in both US Dollars (USD) and South African Rand (ZAR). The exchange rates applied are the 2010 rates released by the Presidency as part of the Development Indicators report. The funding is classified as either Official Development Assistance (ODA) or non-Official Development Assistance (non-ODA).

Table 28: Summary of bilateral financial support received/committed between 2000 and 2014 (National Treasury, unpublished)

Financial flows/ support	Donor	Amount	Amount	Type of funding						Principal focus		Co-financing (USD)	Specific purpose of funding	
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non-ODA			
Grant	Australia	2 19 941	1 500 000			X						X	-	Support for the development of a Southern African Development Community (SADC) Science and Technology Climate Change Implementation Plan.
Grant	Australia	2 19 941	1 500 000			X					X		-	Support for the development of a Southern African Development Community (SADC) Science and Technology Climate Change Action Plan and Training Programme.
Grant	Australia	1 193 255	8 138 000							X			-	Implementation of the MRV system for the AFOLU sector.
Grant	Denmark	1 1436 950	78 000 000							X		X	-	Support for renewable energy development, and mitigation and adaptation to climate change.
Grant	Denmark	2 611 437	17 810 000	X								X	-	Promote energy efficient technologies and lower resource usage in the low income housing sector in South Africa.
Grant	France	184 956	1 261 400			X						X	-	Research at the Carbon Capture Storage (CCS) Centre in South Africa.



Financial flows/ support	Donor	Amount	Amount	Type of funding						Principal focus	Co-financing (USD)	Specific purpose of funding	
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General				ODA
Grant	France	990 836	6 757 500				X				X		Technical assistance to support the Central Energy Fund (CEF) in identifying renewable energy and energy efficiency projects; develop a regulatory and institutional framework to promote energy efficiency; and develop investment programmes in the mining, industrial, cogeneration and bio fuels sector.
Loan	France	158 533 724	1 081 200 000	X							X		Credit line to facilitate banks' (IDC, Nedbank and ABSA) lending to the private sector for renewable energy or energy efficient technologies.
Grant	France	924 780	6 307 000				X				X		Technical assistance to support banks that participate in the credit facility to put in place renewable energy and energy efficiency strategies; enhance and disseminate market knowledge on energy efficiency projects; improve access to CDM credits; and support the establishment of a municipal energy management policy. This policy includes the installation of solar water heaters, electricity smart metering, various renewable energy projects (micro, sludge treatment, biogas), construction of a water pipeline (Western Aqueduct), and urban renovation.

Financial flows/ support	Donor	Amount	Amount	Type of funding							Co-financing (USD)	Specific purpose of funding	
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	Principal focus			
										ODA	Non-ODA		
Loan	France	132 111 437	901 000 000			X					X	-	Support the establishment of a municipal energy management policy. This policy includes the installation of solar water heaters, electricity smart metering, various renewable energy projects (micro, sludge treatment, biogas), construction of a water pipeline (Western Aqueduct), and urban renovation.
Grant	France	660 557	4 505 000				X				X	-	Strengthened multi-sectoral capacity of the eThekweni Energy Office; various missions and study visits by international experts, with a focus on energy efficiency topics (solar water heating, urban restructuring); and training and exchange of experiences.
Grant	France	660 557	4 505 000	X							X	-	Installation of a 100MW wind farm in the Northern Cape Province and a transmission line to connect to the national grid
Grant	Germany	33 556 305	228 854 000	X							X	-	Extension of basic rural electrification infrastructure to remote areas of the Eastern Cape Province by means of Solar-Home-Systems.
Grant	Germany	7 926 686	54 060 000	X							X	-	Improvement of municipal solid waste collection and final disposal with a strong focus on pre-treatment of municipal solid waste prior to discarding it, to reduce the volumes of waste to be transported and disposed of at landfills.

Financial flows/support	Donor	Amount	Amount	Type of funding	Co-financing (USD)	Specific purpose of funding						
							Amount	Principal focus				
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non-ODA	
Grant	Germany	6 605 572	45 050 000	X							X	Development of an environmentally friendly and energy efficient transport system.
Loan	Germany	162 497 067	1 108 230 000	X							X	Provide money to IDCs Green Energy Efficient Fund. This fund offers private sector companies, particularly small and medium sized enterprises, financing at below market interest rates to promote investment in renewable energies and energy efficiency
Grant	Germany	3 567 009	24 327 000	X							X	Provide money to IDCs Green Energy Efficient Fund. This fund offers private sector companies, particularly small and medium sized enterprises, financing at below market interest rates to promote investment in renewable energies and energy efficiency.
Loan	Germany	86 532 991	590 155 000	X							X	To promote the use of cleaner and environmentally friendly fuels in vehicles in South Africa. CNG will initially be used for public transport and the government fleet; it will then be expanded to private fleets.
Grant	Germany	3 302 786	22 525 000	X							X	To promote the use of cleaner and environmentally friendly fuels in vehicles in South Africa. CNG will initially be used for public transport and the government fleet; it will then be expanded to private fleets.

Financial flows/ support	Donor	Amount	Amount	Type of funding						Principal focus		Co-financing (USD)	Specific purpose of funding
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non-ODA		
Loan	Germany	25 101 730	1 711 900 000	X							X	-	The programme aims to contribute to an environmentally and climate friendly energy supply in the Southern African region through energy interconnections.
Loan	Germany	99 083 578	675 750 000	X							X	-	Programme aims to support the development of solar power in South Africa, and in particular concentrated solar power. Germany, along with EIB, AfDB, and WB, will support the construction and commissioning of a 100 MW CSP Power plant in Upington, Northern Cape. The project will be implemented by Eskom, on behalf of the South African government.
Loan	Germany	44 917 889	306 340 000	X							X	-	To broaden the roll-out of renewable energies and to create jobs in smaller and medium sized enterprises.
Loan	Germany	16 223 284	110 642 800			X					X	-	Increase investments in renewable energy and energy efficiency and improve framework conditions and capacity for enhanced investments in renewable energy and energy efficiency in South Africa.
Loan	Germany	9 247 801	63 070 000			X					X	-	Capacitate the South African workforce to meet the labour market demands of the South African green economy.

Financial flows/ support	Donor	Amount	Amount	Type of funding						Principal focus		Co-financing (USD)	Specific purpose of funding
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non-ODA		
Loan	Germany	16 117 595	109 922 000			X					X	-	Climate Support Programme (CSP), implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH with funding from the German Federal Environment Ministry (BMU), is strengthening South Africa's DEA and increasing its capacity to conduct analyses, develop policy and forge consensus on climate change issues.
Loan	Germany	3 414 552	23 287 246			X					X	-	Support the South African Department of Water and Environmental Affairs in the development of climate policy capacity, international climate change negotiations, analysis of emission reduction potential, implementation of sectoral policies, and adaptation activities.
Loan	Germany	4 198 303	28 632 429	X		X					X	-	Promote hybrid technology for buses.
Loan	Germany	3 963 343	27 030 000	X							X	-	Implement a pilot solar water heater PoA under the CDM framework.
Loan	Germany	39 633 431	270 300 000	X							X	-	Provide renewable energy in the Southern African Power Pool (SAPP).
Loan	Germany	8 058 798	54 961 000	X							X	-	Loan to support the South African Green Goal Programme for the energy efficient development of Buffalo City.
Loan	Germany	2 906 452	19 822 000	X							X	-	Grant to support the South African Green Goal Programme for the energy efficient development of Buffalo City.

Financial flows/ support	Donor	Amount	Amount	Amount	Type of funding							Co-financing (USD)	Specific purpose of funding	
					Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	Principal focus			
											ODA	Non-ODA		
Loan	Germany	26 422 287	180 200 000		X							X		Development of a new programme for renewable energy in South Africa.
Loan	Germany	18 495 601	126 140 000		X							X		Development of a new programme for energy efficiency in South Africa.
Loan	Germany	13 211 144	90 100 000		X							X		Development of a new programme for energy efficiency and renewable energy in South Africa.
Loan	Germany	1 981 672	13 515 000				X					X		Skills development for climate and environment businesses.
Grant	Japan	7 747 214	52 836 000				X					X		Provide funding for postgraduate students as part of the Science and Technology Research Partnership for Sustainable Development (SATREPS).
Grant	Netherlands	1 659 610	11 318 542		X						X			Provide funding for developing sustainable biomass chains for biogas projects (from residue waste); and provide funding for research into sustainable energy generation from oilseed crops - develop a CLIB - Certification system addressing indirect impacts of biofuel from various crops (certified sustainable energy from oilseed crops).
Grant	Netherlands	654 746	4 465 365			X					X			Piloting new technology for drinking water systems to reduce and prevent leakages.
Grant	Netherlands	36 654	249 982			X	X				X			Setting up of a cooperation structure on water management between South Africa and the Netherlands.

Financial flows/ support	Donor	Amount	Amount	Type of funding						Co-financing (USD)	Specific purpose of funding		
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General				
Grant	Netherlands	76 968	524 923		X						X	-	Sustainable water use in horticulture.
Grant	Netherlands	726 613	4 955 500	X	X						X	-	Funding for the programme 'Water for Food and Ecosystems in the Bavianskloof Mega Reserve'.
Grant	Norway	729 384	4 974 400			X					X	-	Assist South Africa to develop a national system for the sustainable compilation of national GHG emissions inventories; develop institutional arrangements; data collection templates; system procedures; and technical work instructions; review the national GHG inventory; and capacity building in energy efficiency monitoring and implementation.
Grant	Switzerland	2 045 455	13 950 000			X						-	Capacity building in energy efficiency monitoring and implementation.
Grant	Switzerland	2 642 229	18 020 000	X							X	3 500 000	Support industrial energy efficiency improvement in South Africa through sustainable transformation of industrial energy usage practices, and the development and implementation of Energy Management Standards (EMS).

Financial flows/ support	Donor	Amount	Amount	Type of funding							Principal focus		Co-financing (USD)	Specific purpose of funding
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non-ODA			
Grant	United Kingdom	2 649 707	18 071 000	X								X		Support industrial energy efficiency improvement in South Africa, through sustainable transformation of industrial energy usage practices, and the development and implementation of energy management standards (EMS).
Grant	United Kingdom	222 965	1 520 620		X							X		Implementation of a functional and sustainable MRV system for the AFOLU sector in South Africa.
Grant	United States of America	2 000 000	13 640 000			X						X		Capacity-building for adaptation to climate change, including SAQA level 2-4 course-work; and applied adaptation technologies in schools and communities.
Grant	United States of America	1 478 006	10 080 000			X	X					X		Regional research capacity for solar technology, including research and application of nanotechnology for renewable energy.
Grant	United States of America	1 900 293	12 960 000			X						X		Clean Energy Policy and Advisory Services - USAID's Africa Infrastructure Program (AIP) will provide support to develop policies related to the Integrated Renewable Plan, energy efficiency and demand side management, tariffs, independent power producers, electricity tariffs, and nuclear and renewable energy.



The figure below presents an analysis of the bilateral support that South Africa has received/ has been committed in order to develop its climate change response.

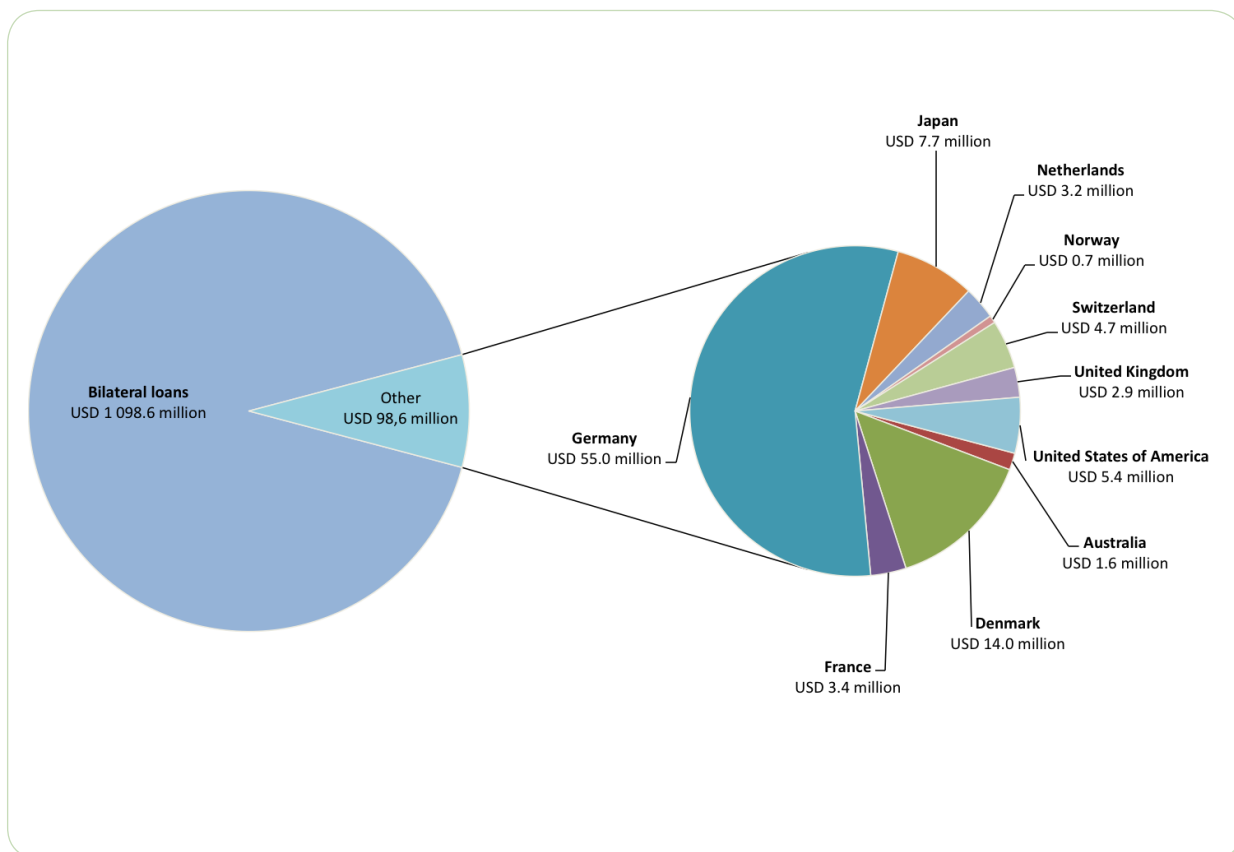


Figure 26: Analysis of committed/received bilateral support

Table 29: Summary of multilateral financial support committed/received between 2000 and 2014 (National Treasury, unpublished)

Financial flows/support	Donor	Amount (Total in USD)	Amount (Total in ZAR)	Type of funding					Principal focus of funding		Co-financing (USD)	Specific purpose of funding	
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA			Non-ODA
Loan	Clean Technology Fund	150 000 000	1 023 000 000	X							X	460 000 000	Support to municipalities and the private sector to deploy 500,000 solar water heaters; lines of credit to commercial banks; contingent financing to foster energy service companies (ESCOs); and financial incentives or risk products to market leaders. Partners include IFC, ADB, EIB and AFD.
Loan	Clean Technology Fund	250 000 000	1 705 000 000	X							X	350 000 000	100 MW-capacity Upington Concentrated Solar Power (CSP) plant. Partners include IBRD, ADB, EIB and KfW.
Loan	Clean Technology Fund	100 000 000	682 000 000	X							X	210 000 000	Western Cape Province Wind Energy Facility (Phase 1 100 MW wind farm) and investments in transmission capacity to connect Independent Power Producers to the grid. Partners include IBRD, ADB, EIB, AFD and KfW.

Financial flows/support	Donor	Amount (Total in USD)	Amount (Total in ZAR)	Type of funding						Principal focus of funding		Co-financing (USD)	Specific purpose of funding
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non-ODA		
Grant	Global Environmental Facility	25 710 000	175 342 200							X			Promote the demonstration, deployment, and transfer of innovative low-carbon technologies. Promote market transformation for energy efficiency in industry and the building sector. Promote investment in renewable energy technologies. Promote Energy efficient, low-carbon transport and urban systems. Promote Conservation and enhancement of carbon stocks through sustainable management of land use, land-use change, and forestry. Support enabling activities and capacity building under the Convention.
Grant	Global Environmental Facility	727 500	4 961 550	X								X	Deployment of solar water heaters (SWHs) in low income housing structures in peri-urban areas.
Grant	Global Environmental Facility	800 000	5 456 000	X								X	Pilot production and commercial dissemination of solar cookers.
Grant	Global Environmental Facility	2 000 000	13 640 000	X								X	Development of Phase I of the South African Wind Energy Programme (SAWEP).
Grant	Global Environmental Facility	230 000	1 568 600	X								X	Develop concentrated solar power in Africa.

Financial flows/support	Donor	Amount (Total in USD)	Amount (Total in ZAR)	Type of funding						Principal focus of funding		Co-financing (USD)	Specific purpose of funding
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non-ODA		
Grant	Global Environmental Facility	321 000	2 189 220			X						X	Enabling activities for the preparation of South Africa's initial National Communication to the UNFCCC.
Grant	Global Environmental Facility	6 000 000	40 920 000	X								X	Support the Renewable Energy Market Transformation (REMT) project, which aims to eliminate barriers to renewable energy development.
Grant	Global Environmental Facility	10 999 400	75 015 908	X								X	The objective of the project is to reduce GHGs from urban transportation in South African cities, through the promotion of a long-term modal shift to more efficient and less polluting forms of transport, and the adoption of sustainable low-GHG transport technologies.
Grant	Global Environmental Facility	6 000 000	40 920 000	X								X	Support market transformation through energy efficiency standards and labelling of appliances in South Africa.
Grant	Global Environmental Facility	3 275 000	22 335 500									X	Financing fuel cells for distributed generation appliances.
Grant	Global Environmental Facility	1 000 000	6 820 000	X								X	Greening the seventeenth Conference of the Parties in Durban
Grant	Global Environmental Facility	3 275 000	22 335 500	X								X	Sub-project 1st Group/Plug Power - under the Global Fuel Cells Financing Initiative for Distributed Generation Applications (Phase 1).
Grant	Global Environmental Facility	3 536 400	24 118 248		X							X	Reducing disaster risks from wildfire hazards associated with climate change.

Financial flows/support	Donor	Amount (Total in USD)	Amount (Total in ZAR)	Type of funding						Principal focus of funding		Co-financing (USD)	Specific purpose of funding
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non-ODA		
Grant	Global Environmental Facility	1 000 000	6 820 000	X							X	1 914 000	Reducing the carbon footprint of major sporting events, such as the FIFA 2010 World Cup. Implement a national greening programme in liaison with the 2010 FIFA Local Organising Committee.
Grant	Global Environmental Facility	3 554 250	24 239 985	X							X	27 700 000	Development of Phase 2 of the South African Wind Energy Programme (SAWEP).
Grant	Global Environmental Facility	5 776 480	39 395 594	X							X	27 600 000	Industrial energy efficiency improvement in South Africa, by mainstreaming the introduction of energy management systems (EMS) and energy systems optimisation (ESO).
Grant	Global Environmental Facility	350 000	2 387 000							X		150 000	Enabling South Africa to prepare its Third National Communication and First Biennial Update Report to the UNFCCC.
Grant	Global Environmental Facility	1 990 000	13 571 800								X	6 000 000	Funding small and medium enterprises (SMEs) in terms of clean technology innovations.
Grant	Global Environmental Facility	9 350 000	63 767 000	X							X	35 000 000	Energy efficient lighting initiative.
Grant	Global Environmental Facility	4 725 000	32 224 500		X						X	14 650 000	Enhancing climate change resilience in the Benguela current fisheries system.

Financial flows/support	Donor	Amount (Total in USD)	Amount (Total in ZAR)	Type of funding						Principal focus of funding		Co-financing (USD)	Specific purpose of funding	
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non-ODA			
Loan	International Finance Corporation	70 700 000	482 174 000	X								X		Amakhala Wind: Wind Power - Renewable Energy Generation.
Loan	International Finance Corporation	160 540 000	1 094 882 800	X								X		Abengoa CSP SA: Solar - Renewable Energy Generation (near Upington and Pofadder).
Grant	Renewable Energy and Energy Efficiency Partnership	333 108	2 271 797	X								X		Powering Water Supply in South Africa: Small hydro opportunities on existing infrastructure. This includes funding from Entura Hydro Tasmania and eThekweni Water and Sanitation.
Grant	Renewable Energy and Energy Efficiency Partnership	244 406	1 666 850						X			X		Expansion and scale-up of the climate change technology initiative, as part of the private financing advisory network in South Africa, Mozambique and Uganda. This includes funding from the CTI and USAID.
Grant	Renewable Energy and Energy Efficiency Partnership	107 010	729 810	X								X		Supporting South Africa's municipal Energy Efficiency Demand Side Management programme. This includes funding from municipalities and the DoE.

Financial flows/support	Donor	Amount (Total in USD)	Amount (Total in ZAR)	Type of funding						Principal focus of funding		Co-financing (USD)	Specific purpose of funding
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non-ODA		
Grant	Renewable Energy and Energy Efficiency Partnership	198 598	1 354 437	X							X	-	Local renewable energy initiatives: South - South cooperation between cities in India, Indonesia & South Africa. This includes funding from the City of Ekurhuleni and the City of Yogyakarta.
Grant	Renewable Energy and Energy Efficiency Partnership	227 469	1 551 342	X							X	-	Sustainable electricity provision at the municipal level. This includes funding from Evangelische Entwicklungsdienst (EED), City of Cape Town, Ethekwini Metro, Ekurhuleni Metro, and SALGA.
Grant	Renewable Energy and Energy Efficiency Partnership	396 270	2 702 559						X		X	-	Fund structuring for E+Co Clean Energy Funds for projects in China, South Africa, Indonesia, Ghana, Tanzania, Uganda, Vietnam, Cambodia, Thailand and Nepal. This includes funding from the GEEREF.
Grant	Renewable Energy and Energy Efficiency Partnership	340 000	2 318 800	X							X	-	Creating efficiencies in the municipal water system in Nelson Mandela Bay. This includes funding from SANED.
Grant	Renewable Energy and Energy Efficiency Partnership	140 488	958 128	X							X	-	Combined legislative and financial mechanisms for mass rollout of solar water heater mass rollout. This includes funding from the City of Cape Town and the City of Ekurhuleni.
Grant	Renewable Energy and Energy Efficiency Partnership	567 568	3 870 814	X							X	-	Lighting Africa 2010 Business Conference and Trade Show. This includes funding from the Netherlands and Conference and Trade Show fees.

Financial flows/ support	Donor	Amount (Total in USD)	Amount (Total in ZAR)	Type of funding						Principal focus of funding		Co-financing (USD)	Specific purpose of funding
				Mitigation	Adaptation	Capacity building	Technical support	Technology/ support	General	ODA	Non- ODA		
Grant	Renewable Energy and Energy Efficiency Partnership	328 229	2 238 522	X							X	-	Identifying corporate best practice in clean energy in emerging economies in China, Brazil, India and South Africa. This includes funding from PwC and Nathan Cummings Foundation.
Grant	Renewable Energy and Energy Efficiency Partnership	267 513	1 824 439	X							X	-	Breaking the risk barrier for institutional investment in clean energy in emerging markets (China, Brazil, Mexico, India, South Africa, Ethiopia, Tanzania, Uganda and Zambia). This includes funding from institutional investors and E+Co lawyers.
Grant	Renewable Energy and Energy Efficiency Partnership	143 243	976 917						X		X	-	Scale-up of Gold Standard expertise in emerging markets. This includes funding from the Gold Standard.
Grant	Renewable Energy and Energy Efficiency Partnership	155 338	1 059 405	X							X	-	Developing an Integrated Rural Energy Utility Roadmap. This includes funding from SERN, the Alternative Energy Development Board, and Pakistan.
Grant	Renewable Energy and Energy Efficiency Partnership	152 570	1 040 527	X							X	-	Developing a vehicle for Solar Water Heating Mass Implementation. This includes funding from the City of Tshwane, the City of Cape Town, Sol Plaatje Municipality, and SEED.



Financial flows/ support	Donor	Amount (Total in USD)	Amount (Total in ZAR)	Type of funding						Principal focus of funding		Co-financing (USD)	Specific purpose of funding
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non- ODA		
Grant	Renewable Energy and Energy Efficiency Partnership	229 730	1 566 759							X		X	Development of financial risk management instruments for supporting energy services in South Africa. This includes funding from UNEF.
Grant	Renewable Energy and Energy Efficiency Partnership	2 452 701	16 727 421	X								X	Development of marketplace competition for affordable non-fossil lighting in sub-Saharan Africa. This includes funding from the GEF, PPIAF, ESMAF, Good Energies, and the Government of Norway.

Financial flows/ support	Donor	Amount (Total in USD)	Amount (Total in ZAR)	Type of funding						Principal focus of funding		Co-financing (USD)	Specific purpose of funding
				Mitigation	Adaptation	Capacity building	Technical support	Technology support	General	ODA	Non-ODA		
Grant	Renewable Energy and Energy Efficiency Partnership	322 973	2 202 676							X	X	-	Development of International Energy Management Standards for integration into the ISO 9000. This includes funding from UNIDO.
Grant	Renewable Energy and Energy Efficiency Partnership	431 800	2 944 876							X	X	-	Improving electricity governance in Brazil and South Africa.
Grant	Renewable Energy and Energy Efficiency Partnership	168 919	1 152 028							X	X	-	Gold Standard local experts programme in India, China, Brazil and South Africa.
Grant	Renewable Energy and Energy Efficiency Partnership	340 000	2 318 800	X						X		-	Commercialisation of large scale solar water heating systems. This includes funding from Energyhouse Africa (TAS) E+Co Africa.
Grant	Renewable Energy and Energy Efficiency Partnership	129 365	882 269							X	X	-	Financing energy upgrades in South African low income homes.
Grant	Renewable Energy and Energy Efficiency Partnership	108 527	740 154							X	X	-	Promoting renewable energy and energy efficiency through city energy strategies. This includes funding from various municipalities
Grant	Renewable Energy and Energy Efficiency Partnership	262 768	1 792 078	X							X	-	Financial models for energy efficiency in water services across South Africa. This includes funding from USAID.

Financial flows/ support	Donor	Amount (Total in USD)	Amount (Total in ZAR)	Type of funding						Principal focus of funding		Co-financing (USD)	Specific purpose of funding
				Mitigation	Adaptation	Capacity building	Technical support	Technology/ support	General	ODA	Non- ODA		
Grant	United Nations Framework Convention on Climate Change	9 258	63 140							X	X	-	Assist South Africa in the collection of cropland management data for the purposes of accounting of GHG emissions from cropland management systems.
Loan	World Bank	440 000	3 000 800						X		X	264 000	Regulatory framework for IPPs.
Loan	World Bank	134 310	915 994						X		X	132 143	Promotion of improved biomass rocket stoves in South Africa
Loan	World Bank	400 000	2 728 000	X							X	-	South African cities energy efficiency and renewable energy program.
Loan	World Bank	364 250	2 484 185			X					X	-	Capacity building support to National Treasury PPP Unit: municipal desk.
Loan	World Bank	6 000 000	40 920 000			X					X	-	Renewable energy market transformation to establish policy and regulatory frameworks and build institutional capacity for renewable energy development in South Africa.

The figure below presents an analysis of the multilateral support that South Africa has received/has been committed in order to develop its climate change response.

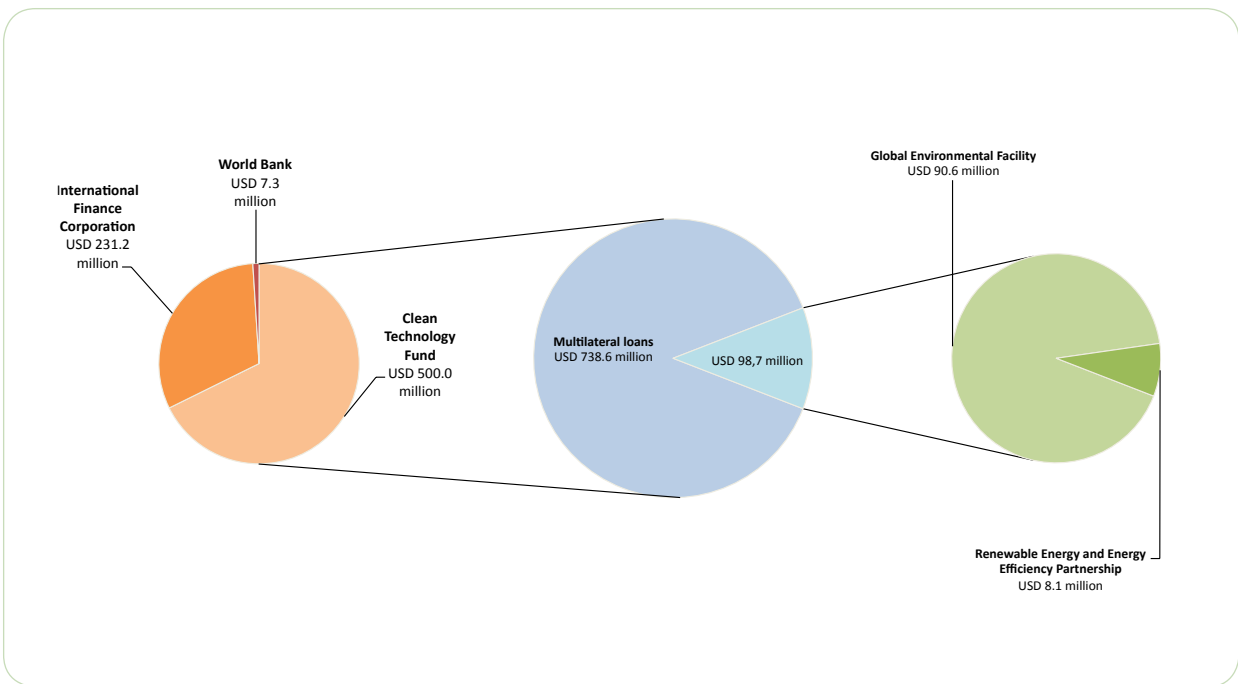


Figure 27: Analysis of committed/received multilateral support

#### 4.1.2 Domestic financial flows for climate change activities

Domestic funding for climate change-related activities was channelled through the Department of Trade and Industry (the dti), the DBSA, and the IDC.

*Table 30: Summary of domestic financial flows between 2000 and 2010*

Financial flows/support	Institution facilitating the transfer of support	Scheme	Amount (Total in USD)	Amount (Total in ZAR)	Type of funding						Specific purpose of funding	Outcome (Where Available)		
					Mitigation	Adaptation	Capacity building	Technical support	Technology support	General				
Grant	Department of Trade Industry (MCEP administered by Industrial Development Corporation)	Manufacturing Competitiveness Enhancement Programme (MCEP)	124 732 259	850 674 000	X								The MCEP provides financial incentives to encourage manufacturers to upgrade their production facilities by making use of green technology and resource efficiency improvement.	Green technology upgrades will lead to cleaner production and energy efficiency, and 27 projects funded.
Grant	Department of Environment (managed and implemented by Development Bank of Southern Africa)	Green Fund	48 505 132	330 805 000	X								The Green Fund provides financial support for the transition to a low carbon, resource efficient and climate resilient economy.	Not specified
Loan	Industrial Development Corporation	Green Energy Efficiency Fund	25 513 197	174 000 000	X								The IDC provides loans to stimulate energy efficiency and renewable energy investment in the commercial and industrial sectors.	For 17 projects to generate 750 MW of green energy.

### 4.1.3 Non-monetised capacity building and technology support received


**Table 31: Summary of non-monetised capacity building and technology support received**  
(Department of Environmental Affairs, unpublished)

Type of support	Activity	Focus	Timeframe	Donor
Capacity building	Non-Annexure I Inventory Software.	Mitigation	March 2014	United Nations Framework Convention on Climate Change (UNFCCC).
Capacity building	2006 IPCC Software.	Mitigation	2011 – 2014	United Nations Framework Convention on Climate Change (UNFCCC).
Capacity building	Addressing climate change in eastern and southern Africa with an agriculture and land use project.	Mitigation	2011-2014	United Nations Framework Convention on Climate Change (UNFCCC).
Capacity building	Building sustainable national inventory management systems.	Mitigation	2011-2014	United States Environmental Protection Agency (USEPA).
Capacity building	Training on the FAOSTAT database, which provides time-series and cross-sectional data relating to food and agriculture from over 200 countries.	Mitigation	December 2013	Food and Agriculture Organization of the United Nations (FAO).
Capacity building	The South African – French flagship: !khure Africa, is a scientific collaboration programme in the geosciences: Investigating the dynamic co-evolution of earth and life and their connection to tectonics and climate change. !Khure Africa incorporates a programme, made possible through visits and exchanges, to develop the analytical expertise of South African graduate students in France.	General	Ongoing	Institut de Physique du Globe de Paris' (IPGP), University of Paris Diderot. French National Centre for Scientific Research (CNRS) and International Research Group (GDRI) of CNR.
Capacity building	The Climate Support Programme (CSP): The CSP supports the South African Department of Environmental Affairs in terms of policy development and consensus building.	General	2009 - 2016	German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) (GIZ).
Capacity building	SA-Norway Programme: Collaboration between top researchers and research institutions in South Africa and Norway in terms of the environment, climate change and clean energy.	General	2012 - 2016	SA-Norway under the South African National Research Foundation (NRF).
Capacity building	The US Country Studies programme, together with the University of KwaZulu-Natal, evaluates the possible impacts of GHG-directed climate change on agriculture in South Africa. Possible maize production changes were measured by means of the CERES-maize model. The changes in crop yield, shifts in agricultural belts and changes in the life cycle of selected pests were also studied.	General	1998 - 2000	US Country Studies project and University of KwaZulu-Natal, Pietermaritzburg (UKZN).

Type of support	Activity	Focus	Timeframe	Donor
Capacity building	The Southern African Young Scientists Summer Programme (SA-YSSP): This programme was established for advanced doctoral candidates with research interests aligning with South Africa's Department of Science and Technology challenges and IIASA's existing research programmes regarding global environmental (energy and climate change), economic and social change.	General	2012 - Ongoing	Organised by the International Institute for Applied Systems Analysis (IIASA) [Luxemburg, Austria], the National Research Foundation (NRF), the Department of Science and Technology (DST) and the University of the Free State (UFS).
Capacity building	South African National Climate Change Conference: This conference represented a gathering of key researchers in climate change and eco-systems science. The National Climate Change Committee (NCCC) of South Africa organised a multi-stakeholder forum to guide the Department of Environmental Affairs and Tourism (DEAT) on issues related to climate change.	General	2005	The Royal Society, United Kingdom funded key international researchers to attend.
Capacity building	The Centre for Environmental Economics and Policy in Africa (CEEPA) and the University of Pretoria conducted a study of impacts and adaptation options to climate change. This study presented insight into the sensitivity of farm profits to climate variables in South Africa.	Adaptation	2006 - 2007	Major funding from the Global Environment Facility (GEF) and the World Bank's Trust Fund for Environmentally and Socially Sustainable Development (TFESSD). Complementary funding from CEEPA, Finland Trust Fund, and the National Oceanic and Atmospheric Agency, Office of Global Programs (NOAA-OGP).
Capacity building	Adaptation to climate change in South Africa and Ethiopia: This covered research to develop adaptation management plans for small scale farmers in semi-arid regions in South Africa and Ethiopia in altering climatic and policy conditions.	Adaptation	Not specified	The German Volkswagen Foundation.

Type of support	Activity	Focus	Timeframe	Donor
Capacity building	Climate Change Adaptation in Swartland: The aim of this programme was to raise the resilience of Swartland small scale farmers to climate change. This programme offers an array of activities and climate change readiness workshops. It is run through the Climate Change Adaptation in Africa (CCAA) programme.	Adaptation	Not specified	UK Government, Department for International Development (DIFD).
Capacity building	Community Based Adaptation in Africa (CBAA): This programme evaluates community based climate adaptation practices. The programme also examines and evaluates systems for adaptation projects.	Adaptation	Not specified	This project is being implemented with a range of international partners and funded by the CCAA.
Capacity building and technological development	Research initiatives under the 'Inkaba ye Africa Earth System Science': Research funding is provided for a variety of topics, including climate change and sustainable development. The three research classes are as follows: "The deep earth and the distant past are encapsulated in Heart of Africa"; "The causes and consequences of Africa separating from South America and Antarctica are studied in Margins of Africa"; and "Human habitat, resources and global change are included in Living Africa".	Adaptation	Ongoing	National Research Foundation (NRF), German Academic Exchange Service (DAAD) and third parties.
Capacity building and technical support	South-South-North (SSN) project: The objective is to improve poor communities' capability to adapt to the impact of both climate variability and climate change. SSN is at present developing a general methodology for recognising, designing and applying Community Based Adaptation (CBA) projects in LDCs and DCs.	Adaptation	1999 - 2008	The SSN Group core activities have been funded by the Dutch Foreign Ministry.
Technical support	African "green" projects: Developing a new carbon project, Africa Carbon Asset Development (ACAD), in the battle against climate change. It is a facility devoted to enhancing the African carbon market and will support continental projects through technical assistance, grants and privileged access to corporate economics and transactional assistance.	General	2009	The United Nations Environment Programme (UNEP), Standard Bank and the German Government's International Climate Initiative.





Type of support	Activity	Focus	Timeframe	Donor
Technical support	Africa Infrastructure programme: The establishment of South Africa's independent system and market operator legislation and the roll-out of the South Africa's Renewable Energy-Independent Power Producer.	Mitigation	Not specified	United States Agency for International Development (USAID).
Technical support	Cities Support Programme: Targeted at speeding up key infrastructure programmes in the field of public transport, human settlements as well as green infrastructure.	Mitigation	Not specified	Development Bank of Southern Africa (DBSA).
Technical support	World Bank Institute Large Cities Support Programme: <ul style="list-style-type: none"> <li>Carry out a review of environmental organisation techniques and approaches in order to design green cities in South Africa.</li> <li>Evaluation of on-going green cities initiatives in South Africa; develop a national level programme to incentivise local governments to advance environmental management and tackle mitigation and adaptation concerns;</li> <li>Develop a plan to encourage and build the capacity of climate resilient cities.</li> </ul>	Mitigation and adaptation	May - Sept 2011	World Bank Institute.
Technical support	Infrastructure Delivery Division: This programme supports government in speeding up delivery of excellent social and economic infrastructure and encouraging cost-effective, sustainable, integrated infrastructure planning and delivery.	Mitigation	Ongoing	Development Bank of Southern Africa (DBSA).

Type of support	Activity	Focus	Timeframe	Donor
Technical support	<p>Programmatic Carbon Credit Facility:</p> <p>Government departments have set up a programmatic Clean Development Mechanism (CDM) for subsidised housing in South Africa, which reduces greenhouse gas emissions through submissive design elements, energy-saving devices and the use of solar energy.</p>	Mitigation	Ongoing	Partnership between National Departments, the Development Bank of Southern Africa (DBSA) and the Carbon Market, along with the National Department of Housing, the Strategic Energy Fund (SANERF), and the National Housing Finance Corporation
Technical support	<p>Green Energy Efficiency Fund (GEEF):</p> <p>This Fund supports the implementation of energy efficiency and personal utilisation of renewable energy technologies. The Fund also supports South Africa's economic development and growth and facilitates access to international and local technical experts who will:</p> <ul style="list-style-type: none"> <li>• Perform energy evaluations and audits to recommend sustainable energy solutions.</li> <li>• Do economic evaluations of solutions.</li> <li>• Support the selection of suitable equipment and enhanced performance technologies.</li> </ul>	Mitigation	Ongoing	Industrial Development Corporation (IDC), German Cooperation and Development Ministry and KfW Bank.
Technology transfer	<p>Energy and Environment Partnership Programme (EEP) with Southern and Eastern Africa:</p> <p>This partnership encourages renewable energy, energy efficiency and clean-technology investments with Partner Countries. The partnership supplies sustainable energy services to the poor, which simultaneously combats climate change.</p>	Mitigation	2010 – Ongoing	The Ministry of Foreign Affairs of Finland (lead donor), UK Department for International Development (DFID) and the Austrian Development Agency (ADA).
Technology transfer	<p>The South African-German Energy Programme (SAGEN):</p> <p>Developing and realising initiatives to increase the country's energy efficiency and use of renewable energy.</p>	Mitigation	2011 - 2014	German Federal Ministry for Economic Cooperation and Development (BMZ) (GIZ).

## 4.2 SUPPORT NEEDS

### 4.2.1 Financial support needed

The table below presents a summary of the financial support that South Africa needs (or has requested) in order to develop its response to climate change.

The table classifies the support needed in terms of the sector or cross-cutting area, together with the outcome/purpose of the activity.

**Table 32: Summary of financial support needed (Department of Environmental Affairs, unpublished)**

Sector and activity	Reference to policies and measures	Amount needed (USD)	Amount needed (ZAR)	Outcomes/purpose	Specific type of support requested			Funding amount broken down by preferred type					
					General	Technology	Training	Loan	Grant	In-kind	Private	Carbon Market	
Multiphase sampling for the AFOLU sector	Long Term Mitigation Scenarios and Working on Land	746 628	5 092 000	Assessment of existing imagery; development of land use plot sampling strategy; classify imagery into land use classes; and scale up to full land-use characterisation and import into agriculture and land use tool.	X		X		X				
Development of country-specific emission factor for electricity generation sector	Carbon tax	439 883	3 000 000	Develop and verify country specific GHG emission factors for the stationary combustion of specified solid and liquid fuels in the electricity generation sector.	X		X		X				
Development of country specific emission factors for the transport sector	Carbon tax; the standardised fuel economy; and CO <sub>2</sub> Emission Testing and Labeling System	439 883	3 000 000	Develop and verify country-specific GHG emission factors for mobile combustion of liquid fuels in the transport sector.	X		X		X				
Waste activity data improvement project	Recycling and Economic Development Initiative of South Africa (REDISA)	1 173 021	8 000 000	Waste data source mapping; implementation of nation-wide data collection programme; development of waste emission factors; and national waste recovery assessment.	X		X		X				

Sector and activity	Reference to policies and measures	Amount needed (USD)	Amount needed (ZAR)	Outcomes/purpose	Specific type of support requested			Funding amount broken down by preferred type					
					General	Technology	Training	Loan	Grant	In-kind	Private	Carbon Market	
Demand-side apportionment of liquid fuels	Carbon tax	146 628	1 000 000	Updated information on the demand-side apportionment of liquid fuels for the period 2000-2013.	X		X		X				
Collection of ozone depleting substance (ODS) substitutes activity data	-	219 941	1 500 000	Collect facility specific activity data on the consumption of substitute ODS.	X		X		X				
Implementation of the Monitoring and Evaluation System	National Climate Change Response White Paper	586 510	4 000 000	Ensure that South Africa's Monitoring and Evaluation System is developed and functional.	X		X		X				
Development of GHG reporting guidelines	National Climate Change Response White Paper	219 941	1 500 000	Develop GHG reporting guidelines.	X		X		X				
Development of MRV guidelines for the M&E system	National Climate Change Response White Paper	293 255	2 000 000	Develop measurement, reporting and verification guidelines for the M&E system.	X		X		X				
Development of land use maps	Long Term Mitigation Scenarios and Working on Land	293 255	2 000 000	Develop maps showing land uses in South Africa.	X				X				
Development of a web-based GHG reporting system	National Climate Change Response White Paper	586 510	4 000 000	Ensure that South Africa's web-based GHG reporting system is developed and functional.	X				X				

Sector and activity	Reference to policies and measures	Amount needed (USD)	Amount needed (ZAR)	Specific type of support requested				Funding amount broken down by preferred type	
				General	Technology	Training	Loan	Grant	In-kind
Sustainable waste management and recycling	Recycling and Economic Development Initiative of South Africa (REDISA)	17 008 798	116 000 000	X			X	X	
Renewable energy, including off-grid and mini grid	Renewable Energy Independent Power Producer (REIPPP) Procurement Programme	22 727 273	155 000 000	X			X	X	
Biogas and bio-fuels	National Industrial Biofuels Strategy (NIBS)	19 061 584	130 000 000	X			X	X	
Payment for Environmental Services (PES) projects	-	1 099 707	7 500 000	X				X	
Rural energy, including off-grid and mini grid	-	146 628	1 000 000	X				X	
Renewable energy	Renewable Energy Independent Power Producer Programme (REIPPP)	6 671 554	45 500 000	X			X	X	
Sustainable water management	Working for Water	439 883	3 000 000	X			X		
Sustainable human settlements, the built environment and green buildings	-	4 252 199	29 000 000	X				X	

Sector and activity	Reference to policies and measures	Amount needed (USD)	Amount needed (ZAR)	Specific type of support requested				Funding amount broken down by preferred type	
				General	Technology	Training	Loan	Grant	In-kind
Energy efficiency	National Energy Efficiency Strategy (NEES)	26 539 589	181 000 000	X				X	
Sustainable transport	Intelligent Transport System (ITS)	20 527 859	140 000 000	X				X	
Rural adaptation projects and plans	Climate Change Awareness Campaign	403 226	2 750 000	X				X	
Biodiversity benefiting businesses, including sustainable farming	-	549 853	3 750 000	X			X	X	
Green Star SA: Community rating tool	-	366 569	2 500 000	X				X	
Green Star SA: Socio-economic category	-	261 730	1 785 000	X				X	
Bio-digestion demonstration centre	-	3 519 062	24 000 000	X				X	
Local government climate change adaptation: A municipal support project	-	645 161	4 400 000	X				X	
Embedding indigenous knowledge into sustainable management	-	879 765	6 000 000	X				X	
Integrated Energy, Environment, Empowerment-Cost Optimisation Methodology (IEECOTM) flagship programme	Near-term priority flagship programmes	366 569	2 500 000	X				X	

Sector and activity	Reference to policies and measures	Amount needed (USD)	Amount needed (ZAR)	Specific type of support requested				Funding amount broken down by preferred type	
				General	Technology	Training	Loan	Grant	In-kind
Open Collaborative Manufacturing (OCM)	-	205 279	1 400 000	X					
Engagement of top 500 organisations in sustainability	-	1 466 276	10 000 000	X					
Renewable centre of excellence	-	87 977	600 000	X					
Establishment of an environmental practitioners association	-	601 173	4 100 000	X					
Green economy skills and small, micro and medium enterprise (SMME) development through a green incubator initiative	-	1 319 648	9 000 000	X					
Electric vehicles technology platform	Introduction of green cars to the Department of Environmental Affairs' vehicle fleet	733 138	5 000 000	X					
Facilitating a national dialogue on the green economy	-	733 138	5 000 000	X					

#### 4.2.2 Non-monetised capacity building and technology support needed

The table below presents a summary of the non-monetised capacity building and technology support still needed in South Africa. The support will be used for bridging capacity constraints within Government and improving South Africa's mitigation potential through the installation of GHG-reducing technology.

*Table 33: Summary of non-monetised capacity building and technology support needed (Department of Environmental Affairs and outcomes of the Mitigation Potential Analysis report)*

Type of support	Activity	Focus	Timeframe	Donor
Capacity building	Development of GHG reporting guidelines.	Mitigation	2014 – 2015	Still required
Capacity building	Alignment of the GHG emissions inventory compilation process with the South African Standard Quality Assessment Framework of Statistics South Africa.	Mitigation	2014 – 2015	Still required
Capacity building	Alignment of GHG emissions accounting and methodologies for all spheres of government (national, provincial and local).	Mitigation	2014 – 2015	Still required
Capacity building	Partner to lead the Climate Change Adaptation Small Grants Project.	Mitigation	2014	Still required
Technology	Test the potential installation of combined cycle generation technologies/carbon capture and storage (CCS) systems at existing industrial facilities.	Mitigation	2010 – 2050	Still required
Technology	Use of biodiesel in open-pit mining mobile machinery.	Mitigation	2010 – 2050	Still required
Technology	Energy/waste recovery from furnaces and kilns.	Mitigation	2010 – 2050	Still required
Technology	Use of waste material (wood, paper, cardboard, textiles, plastics, rubber/tyres, industrial sludge, municipal sewage sludge, and animal meal and fats) as a fuel source in the industrial sector.	Mitigation	2010 – 2050	Still required
Technology	Improve the thermal design of new buildings (passive building).	Mitigation	2010 – 2050	Still required

Technology transfer is a key aspect of achieving the country's developmental goals. In 2007, the Department of Science and Technology (DST) completed a Technology Needs Assessment (TNA), which identified and assessed environmentally sound technologies that would reduce the impact of climate change and the rate of GHG emissions. The DST is currently working on an updated version of the TNA, which is due for publication in 2015.



### 4.3 TRACKING CLIMATE-RELATED FINANCIAL FLOWS

South Africa recognises that improved tracking of climate related financial flows is critical to creating a sustainable climate-architecture in the country and fostering transparency in the use of funds nationally and internationally. Since the publication of the National Climate Change Response White Paper, the DEA and National Treasury (NT) have commenced work on the design and implementation of a Climate Finance Co-ordination Mechanism. The aim of this mechanism is to:

- Track the country's efforts in reducing GHG emissions, as well as the impact of the disbursed funds;
- Secure the necessary resources for mitigation and adaptation priority programmes; and
- Match the resources to the identified priority programmes, including grants, concessionary debt and risk insurance products.

The DBSA, which has been appointed by the DEA to research the Mechanism, proposes the following structure for tracking the support.

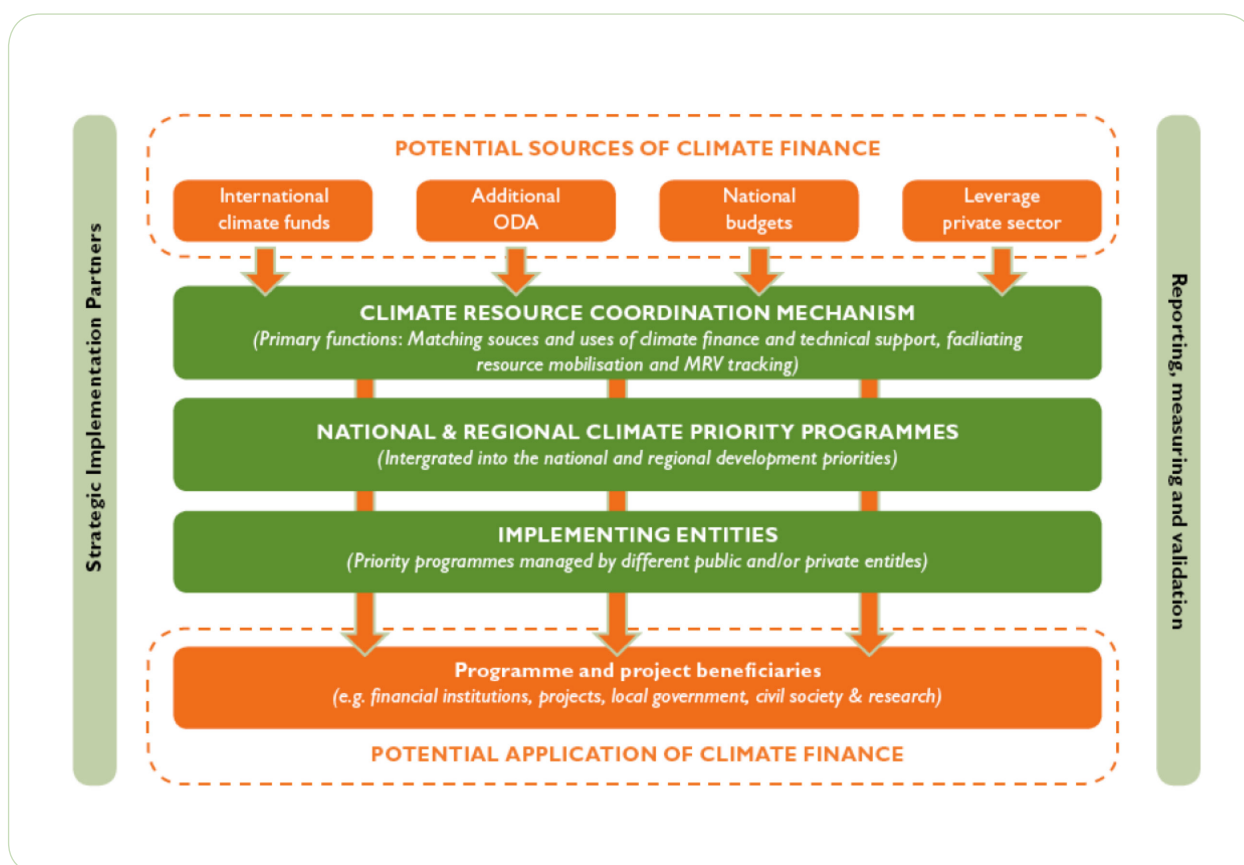


Figure 28: Climate finance coordination prototype for South Africa (Naidoo, 2011)

As illustrated in the figure above, the proposed structure increases the integration between sources of climate finance and technical support. It also bridges the gap between South Africa's national climate response programmes such as water, energy, and transport.

## 5. SUPPORT RECEIVED FOR PREPARATION OF THE BUR

South Africa was one of six non-Annex I Parties that requested support from the Global Environmental Facility (GEF) for the preparation of its first Biennial Update Report. In early 2013, the GEF approved a grant amount of USD 350,000, which is to be co-financed to the amount of USD 150,000.

The DEA is also applying to the GEF for a larger basket of funding that covers the preparation of South Africa's Third National Communication, as well as the first Biennial Update Report. The total grant amount being applied for is USD 3,815,850, which is to be co-financed by the South African Department of Environmental Affairs with an amount of USD 1,255,000.

The government has further received funding from Gesellschaft für Internationale Zusammenarbeit (GIZ) through the Climate Support Programme, a project funded by the German Federal Ministry for the Environment, Nature Conservation, Buildings, and Nuclear Safety (BMUB), through its International Climate Initiative. The majority of the USD 70,000 received from the GIZ will be used for funding the compilation of the BUR and for conducting stakeholder consultation sessions.

The capacity-building support that South Africa has received for the preparation of the BUR has come in the form of training. The Department of Environmental Affairs worked with the Consultative Group of Experts (on National Communications from Parties not included in Annex I to the Convention (CGE)) to compile training material for the BUR.

The Department of Environmental Affairs also attended an expert session in May 2013 to develop the training material. Further to this, a global training workshop was held in Bonn, Germany, between the 16th and the 18th of September 2013, which was also attended by the South African government.

South Africa has faced some barriers with regard to the compilation of the BUR. The main barrier related to timing. The country wanted to commence with preparation of its first BUR by 1 April 2013 and submit this to the UNFCCC by 31 December 2014. However, there is a disconnect between the timing of UNFCCC reporting requirements and GEF funding processes for such reporting. The funding earmarked for the BUR was delayed, which created a bottleneck in the system.

Another barrier faced during preparation of the BUR related to institutional arrangements that facilitate climate change related data collection. To date, ad-hoc institutional arrangements have been put in place in South Africa to collect once-off climate change data for collection projects, such as the GHG inventory, as and when required. Thus the time and effort spent in preparing the report is demanding, given the current structure and its minimal permanent employees. However, the DEA is working on implementing a monitoring and evaluation system that covers the data necessary for it to meet its reporting obligations.

The table below presents the milestones the South African government has to meet in order to submit the BUR to the UNFCCC at the end of 2014. Since parliamentary approval takes a significant portion of the time, the time available for report compilation is shortened.

*Table 34: Milestones to be met by government in order to submit the BUR in time*

Specific Task	Expected Date of Completion
Drafting terms of reference	Mid 2013
Appointment of service provider	October 2013
Compiling Biennial Update Report (BUR)	November 2013 - March 2014
Independent review of the report and stakeholder consultation sessions	June - October 2014
Writing the summary for policy makers and editing the BUR	June - October 2014
Institutional arrangements: Designing and developing the BUR national system for future writing of the BUR	October -December 2014
Parliamentary approval	November 2014
Submission of the report to the UNFCCC	End 2014

## 6. MEASUREMENT, REPORTING AND VERIFICATION IN SOUTH AFRICA

South Africa published the National Climate Change Response White Paper in October 2011. This Paper outlined the country's two objectives in terms of its response to climate change, i.e.:

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

The achievement of these objectives can be directly related to the successful implementation of a national Measurement, Reporting and Verification (MRV) system. This system will:

- Enhance the country's ability to track emissions, emission reductions and climate finance, which will, in turn, assist with informing climate change policies, mitigation goals, and support needs;
- Improve access to international financial, technological and capacity-building support.

This chapter will discuss the development, structure and approach to MRV in South Africa.

### 6.1 BACKGROUND AND CONTEXT

South Africa's National Climate Change Response White Paper frames MRV in terms of "Monitoring and Evaluation" (M&E).

The broad definition of 'monitoring' in the context of M&E in South Africa is:


*"Monitoring is a continuous function that aims to provide decision-makers and stakeholders with regular feedback and early indications of progress, or lack thereof, in the achievement of intended results and the attainment of goals and objectives."*

The broad definition of 'evaluation' in the context of M&E in South Africa is:

*"Evaluation is a time-bound exercise that systematically and objectively assesses the relevance, performance, challenges and successes of programmes and projects."*

In relation to climate change specifically, the "monitoring" component of M&E is viewed as encompassing MRV as a whole. Monitoring covers:

- M: The measurement of:
  - GHG emissions – both those emitted and those reduced or avoided through mitigation actions.
  - The support provided and received in terms of financing, technology or capacity building for these mitigation actions.
  - The cost and co-benefits of the mitigation actions.
- R: The reporting of:
  - Mitigation actions.
  - GHG inventories.
  - Emission projections.

- 
- V: The verification of:
    - Emissions reduced through mitigation actions.
    - GHG inventories.

The “evaluation” component of climate change M&E is to:

- Provide continuous assessment and feedback on the “monitoring” function; and
- Promote learning, improvement and knowledge-sharing through results and lessons learnt.



## 6.2 DEVELOPMENT OF M&E/MRV IN SOUTH AFRICA

South Africa has been working towards the development of an M&E/MRV system since 2009. The milestones in this development process are presented in the table below.

*Table 35: M&E development in South Africa*

December 2007	The concept of MRV is introduced in 2007 at the thirteenth Conference of the Parties (COP 13). The Bali Action Plan calls for enhanced action on mitigation of climate change, which includes the consideration of “measurable, reportable and verifiable” nationally appropriate mitigation actions. South Africa was an active participant at this conference.
March 2009	In the run up to the National Climate Change Response Policy Summit in March 2009 and COP15 in Copenhagen in December 2009, the Department of Environmental Affairs (DEA - through the Royal Danish Embassy) commissioned ERM to help them better understand what climate change response interventions were already taking place and what were planned in South Africa and what impact these were having and would have on emission levels. A National Climate Change Response Database (NCCRD) was developed.
December 2009	The NCCRD is showcased at the climate change summit (COP 15).
May 2010	South Africa (together with Germany and South Korea) launches the International Partnership on Mitigation and MRV. The overall aim of the Partnership is to support practical exchange on climate change mitigation-related activities and MRV practices, through capacity building and knowledge management between developing and developed countries.
2011	South Africa (the Energy Research Centre) participates in the WRI's Measurement and Performance Tracking (MAPT) project. The MAPT project aims to enhance national capacity in developing countries to measure GHG emissions and track performance toward low-carbon development goals, where needed.
October 2011	South Africa publishes its National Climate Change Response White Paper. The Paper states that the Department of Environmental Affairs will develop a Climate Change Response M&E system that evolves with international MRV requirements.
January 2012	South Africa begins structuring a system for M&E of climate change.
June 2012	South Africa hosts the first technical workshop for the International Partnership on Mitigation and MRV. This workshop analyses the existing UNFCCC framework for MRV, and identified options and requirements regarding the planning and implementation of MRV-systems in developing countries.
2012	<p>The Department of Environmental Affairs contracts entities to research MRV topics. The following reports are published:</p> <ul style="list-style-type: none"> <li>• ‘Measurement, Reporting and Verification (MRV) in South Africa’, written by Promethium Carbon. This study was published to assess and build South African MRV capabilities.</li> <li>• ‘A Draft Climate Change Response Monitoring and Evaluation System (Interim Report)’, published by Ricardo-AEA. This report proposes a structural design and operational architecture for a climate change response M&amp;E system for South Africa.</li> </ul> <p>The following studies are published through the WRI—ERC MAPT programme:</p> <ul style="list-style-type: none"> <li>• ‘South African approaches to measuring, reporting and verifying: a scoping report’, written by the Energy Research Centre. This report presents a mapping exercise of South African approaches to MRV;</li> <li>• ‘MRV across Multi-Level Governance: National, Provincial and Municipal Institutions in South Africa’. This study analyses how sub-national level governments in South Africa are engaging with measuring, reporting and verifying climate projects.</li> </ul>
2013	The DEA updates the NCCRD. This database covers most mitigation and adaptation actions in South Africa together with their respective emission reduction potentials. The Department of Environmental Affairs updates the national GHG Inventory (2000-2010) and compiles the first Biennial Update Report to be submitted the UNFCCC by the end of December 2014.



### 6.3 THE NATIONAL CLIMATE CHANGE RESPONSE DATABASE – THE FIRST STEP TOWARDS CLIMATE CHANGE M&E

As mentioned in the previous section, South Africa developed a National Climate Change Response Database (NCCRD) in 2009. The NCCRD is a web-based database that contains information on the mitigation, adaptation and research projects that have been implemented in the country. The aim of the database is to support government reporting on how well South Africa (as a whole) is achieving its emissions reduction goals; and it helps to devise new policies and strategies to achieve further reductions. The database also includes information about adaptation and research projects taking place in South Africa.

The purpose of the NCCRD is to:

- Use identified interventions as leverage for South African positions in international climate change negotiations;
- Allow for quick response to queries on significant South African interventions;

- Gauge the overall impacts of these interventions;
- Share knowledge and experiences;
- Replicate and up-scale successful initiatives;
- Avoid duplication of effort;
- Avoid “re-inventing the wheel”; and
- Provide a “one-stop-shop” for people who would like further information to inform their own interventions.

The NCCRD, which was dormant between 2010 and 2012, was scaled up in 2013, in response to new international reporting commitments for developing countries, and the desire to develop a national monitoring and evaluation system. This process also led to the formalisation of key data reporting structures, as indicated in the figure below.

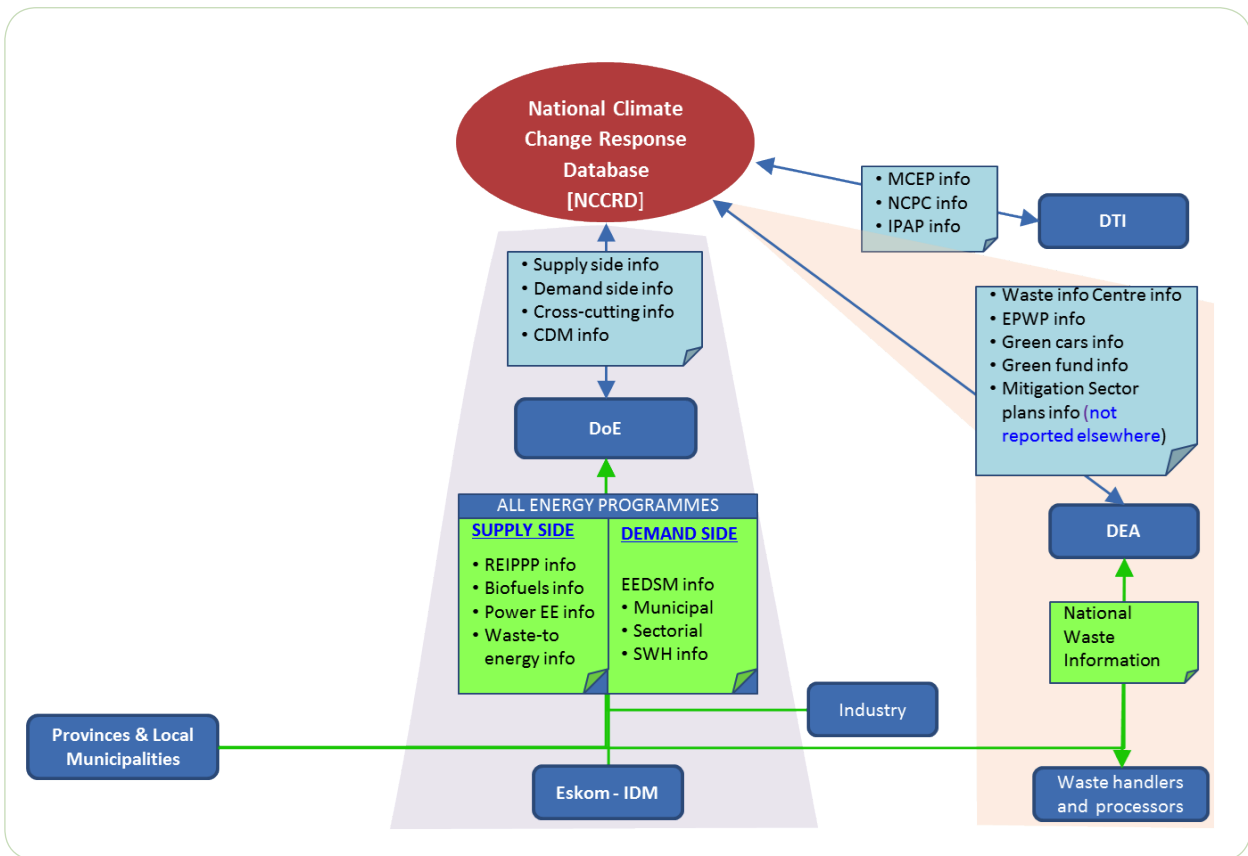


Figure 29: Information flows to the NCCRD (Department of Environmental Affairs, unpublished)

The NCCRD allows free user registration and voluntarily registration of a project and access to the information on the website. A comprehensive search facility allows registered users to obtain the available data relating to their specific projects and also navigate project locations using Google Earth. A range of reports can be drawn from the database, which summarise the number of projects by location and sector, as well as the estimated project emissions reductions. The figures below show an example of the information and reports that can be drawn from the NCCRD.



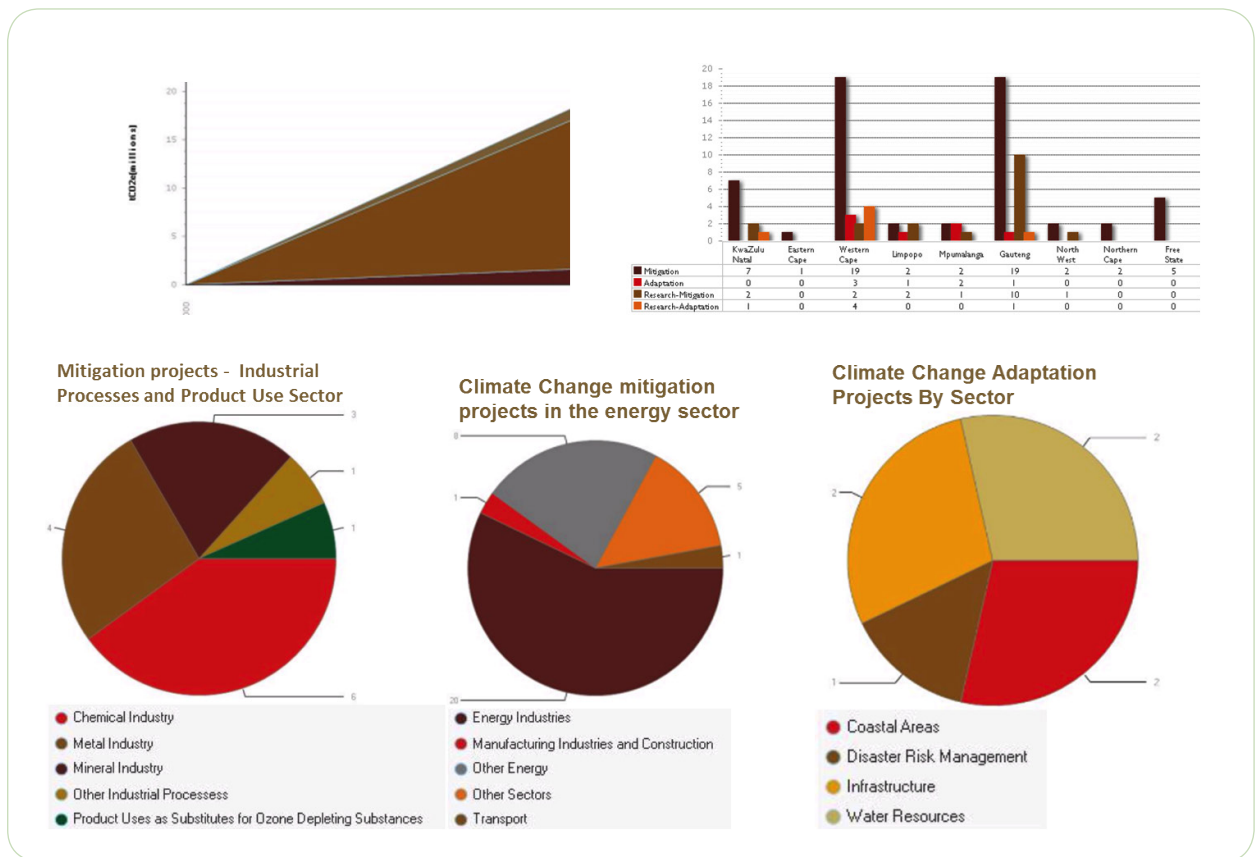
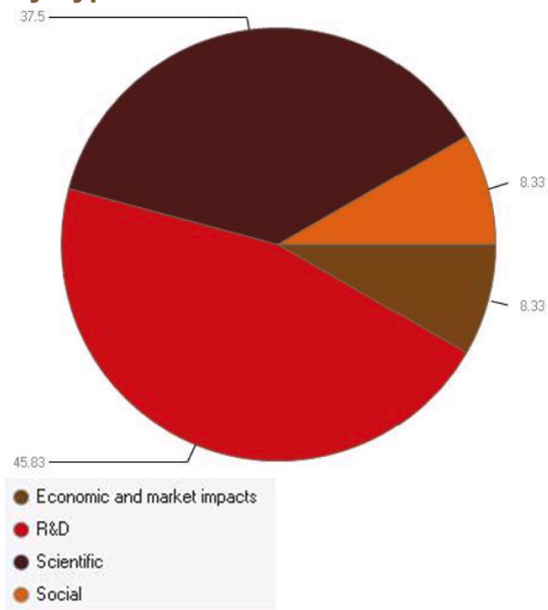


Figure 30: Mitigation and adaptation – output results for each sector from the NCCRD (Department of Environmental Affairs, unpublished)

### Climate Change Research Projects by Type



### Climate Change Research Projects by Target Audience

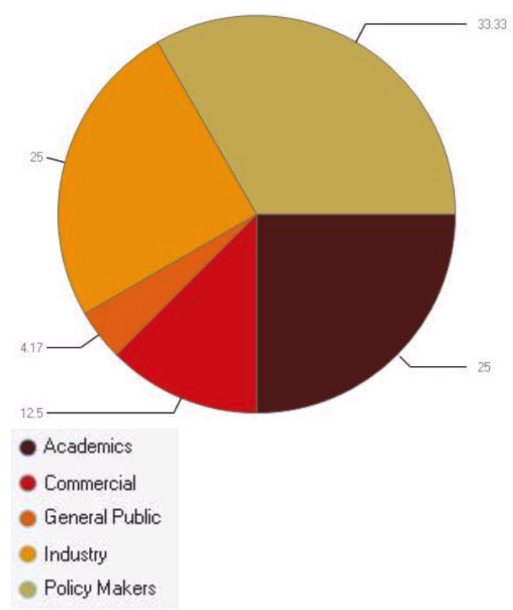


Figure 31: Climate change research – output results by type and target audience from the NCCRD (Department of Environmental Affairs, unpublished)

The table below provides a summary of the various climate change data custodians in the country, which provide data to the NCCRD.

*Table 36: Climate change data custodians (Department of Environmental Affairs, unpublished)*

Department of Energy (DoE)	The DoE's Energy Efficiency Target Monitoring System (EETMS) monitors the country's progress with regard to the implementation of the National Energy Efficiency Strategy. This includes both demand and supply side interventions with regard to energy efficiency. This data will be fed into the national climate change monitoring and evaluation system.
Department of Trade and Industry (dti)	The dti oversees the National Cleaner Production Centre (NCPC). The NCPC supports GHG abatement projects and keeps a database of this information. This data will be fed into the national climate change monitoring and evaluation system.
DEA	The Expanded Public Works Programme and the National Waste Information System, both of which are overseen by the DEA, have an existing monitoring and evaluation system. The information from these databases will be fed into the national climate change monitoring and evaluation system.

#### 6.4. SHIFTING FROM CLIMATE CHANGE MONITORING TO MONITORING AND EVALUATION

The NCCRD, despite its ability to capture response actions and boasting a well-defined national system, is merely a monitoring tool for South Africa to gauge how well it is responding to climate change. It does not necessarily assess the outcomes and associated impacts of the interventions that are being implemented. However, the National Climate Change Response Policy (2011) calls for the NCCRD to assess such outcomes and impacts. More specifically, it should be used as a tool to track the extent to which South Africa is making the transition towards a lower-carbon economy and climate-resilient society. As such, South Africa is developing a broader climate change M&E system, within which the NCCRD forms part.

This M&E system has an over-arching objective to track the transition towards a lower-carbon and climate-resilient South Africa:

- I. Tracking the transition to a climate-resilient society: This objective covers the tracking of:
  - Climate change risks and impacts;
  - Changes in vulnerability in the face of current and future climate risks; and
  - Adaptive capacity, which focuses on:
    - Mainstreaming climate change into policy and planning;
    - Progress on the implementation of climate change adaptation responses; and
    - The effectiveness of responses in reducing vulnerability and improving climate resilience.

2. Tracking the transition to a lower-carbon economy:

This objective covers the tracking of:

- GHG emissions (absolute, per-capita or emission intensities at national, sub-national, sectoral and institutional level);
- Response measures that mitigate future GHG emissions (implementation, landscape, costs, climate and sustainable development impacts); and
- The effectiveness of climate change response measures.

Other key objectives of South Africa's M&E system include the tracking of climate finance and the communication of climate-related information, both nationally and internationally. The figure below summarises the objectives of the M&E system.

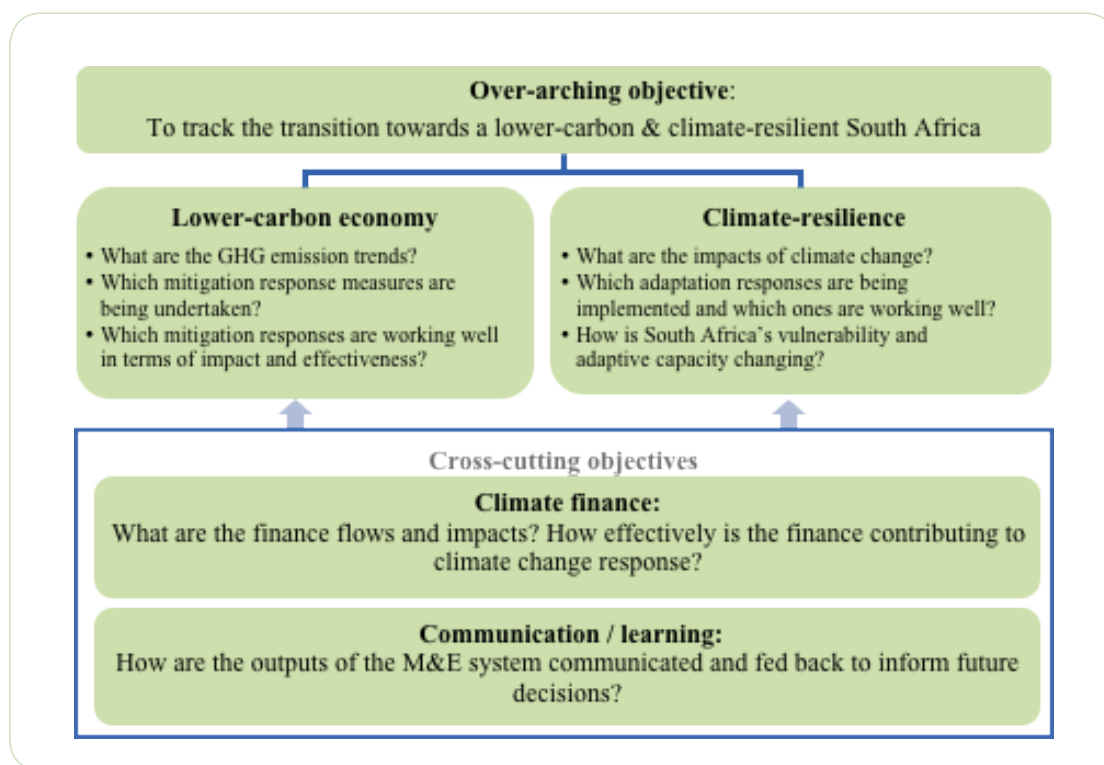


Figure 32: Objectives of South Africa's M&E system (Department of Environmental Affairs, unpublished)

One other key cross-cutting objective that can be observed in the figure above is to provide learning, so that the information gathered by the M&E system can be used to inform future policy decisions. This is crucial to ensuring that the M&E system is relevant. Learning takes on a particularly important dimension in the context of adaptation, as this is still an evolving realm of expertise and it is helpful to understand the mechanisms that define efficient and effective adaptation. Sharing experiences on what is working where and how is helpful, as it fosters wider stakeholder engagement and knowledge sharing and innovation.

## 6.5 OVERVIEW OF SOUTH AFRICA'S M&E SYSTEM

The Department of Environmental Affairs has established a monitoring and evaluation technical working group (M&E-TWG) in an effort to develop a climate change monitoring and evaluation system that: (a) addresses the broad national climate change monitoring and evaluation objectives (as captured in the NCCRP and within the National Development Plan (NDP)); and (b) is reflective of national circumstances.

The focus of the work of this technical group is to address technical issues related to the design and development of a monitoring and evaluation system. Key components of this work include:

- i. i. Mapping of existing monitoring and evaluation systems;
- ii. ii. Understanding existing flows of relevant data;
- iii. iii. Identifying types of data necessary to improve the quality of the monitoring and reporting system;
- iv. iv. Identifying the expertise necessary to undertake national monitoring and evaluation; and
- v. v. Guiding the work of consultants with regards to designing the M&E system.

The M&E-TWG comprise technical experts from:

- Government, including the Departments of Environmental Affairs, Energy, Transport, Economic Development, Mineral Resources, Presidency, Trade & Industry, Science & Technology, National Treasury, Public Enterprises, as well as Agriculture, Forestry & Fisheries, the Gauteng Province (Agriculture and Rural Development), and the South African Local Government Association.

- Civil society;
- Labour;
- Business;
- All provinces and metropolitans.
- State-owned research institutions, including the Council for Scientific and Industrial Research, the Agricultural Research Council, the South African National Energy Development Institute, Statistics South Africa, the South African Earth Observation Network, the South African Weather Service, and the South African National Accreditation System.

The Department of Environmental Affairs, whilst working closely with the M&E-TWG, designed the framework of the system, which is presented in the figure below. There are four main elements to this system, i.e.:

- Ex-ante appraisal of policies to determine what these policies are expected to achieve and deliver;
- On-going monitoring of the policies to track their implementation and effectiveness in reducing GHG emissions or adapting to climate change;
- Evaluation of the policies to assess the extent to which the policies are meeting their stated objectives; and
- Feeding this information back into the policy development cycle to inform existing policies and decisions on new policies.

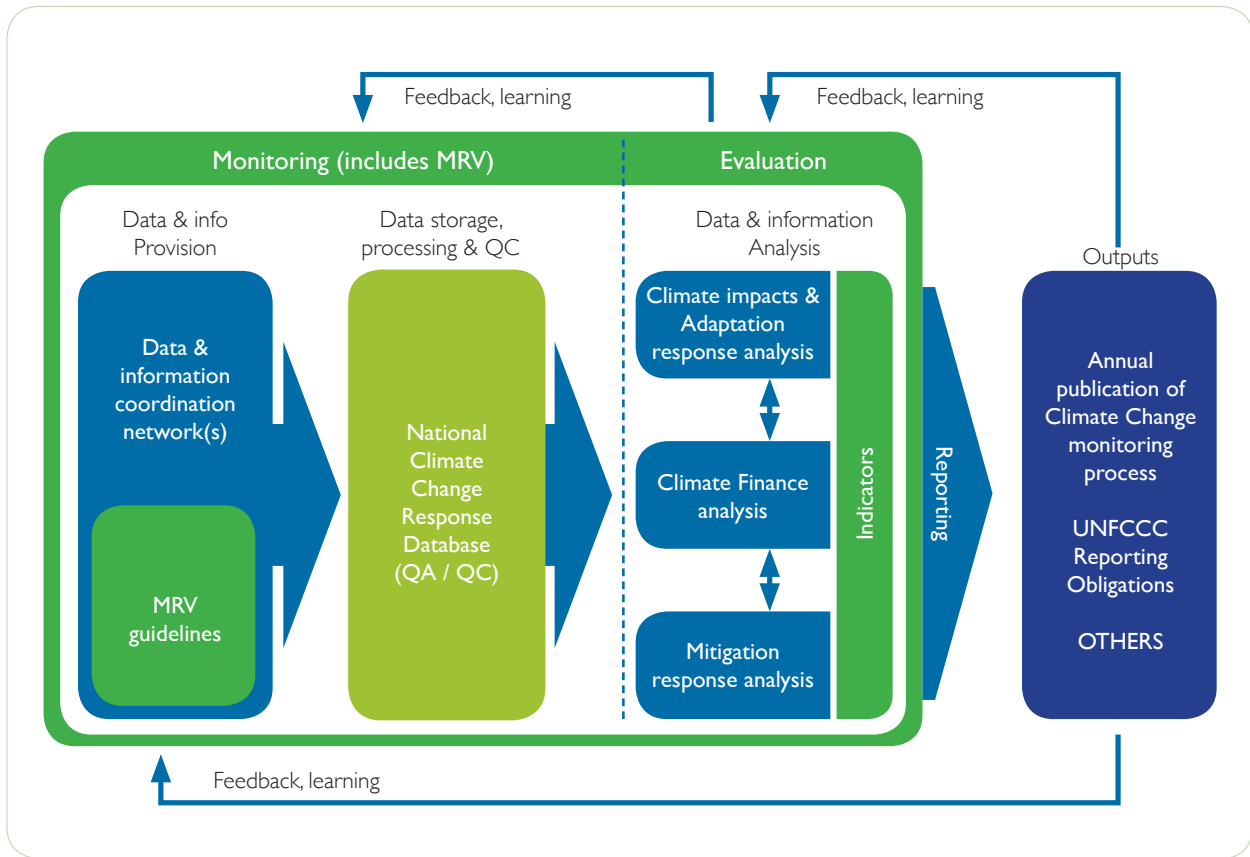



Figure 33: Proposed M&E structure (Department of Environmental Affairs, unpublished)



The proposed climate change M&E system will cover elements of both mitigation and adaptation. In terms of mitigation, the system will:

- Monitor and report GHG data;
- Quantitatively analyse the impact of mitigation measures against South Africa's emission trajectory range;
- Track the indicators defined in the DEROs and mitigation plans;
- Record the implementation status of DEROs and mitigation actions; and
- Record sustainable development benefits of the mitigation actions.

In terms of adaptation, the system will:

- Record and report on the implementation of adaptation activities, based on a set of defined adaptation indicators;
- Ensure that nation-wide climate change and atmosphere monitoring systems are maintained and enhanced where necessary;
- Ensure that climate change impacts are monitored at appropriate spatial density and frequency;
- Establish a monitoring system for gathering information and reporting progress on the implementation of adaptation actions; and
- Identify key role-players involved in monitoring and measuring these indicators, and describe how these role-players will share and report information on observed actions.

The system will also track the effectiveness and impact of the country's National Climate Change Response Flagship Programmes, as well as domestic and international support in terms of finance, technology and capacity-building.

## 6.6 NEXT STEPS

South Africa views the development of its M&E system as an opportunity to:

- i. Showcase its climate change actions;
- ii. Effectively co-ordinate and communicate with different stakeholders; and
- iii. Provide a platform for learning.

Implementation of this system will be done in three phases, as follows:

**Phase 1** will include the setting-up phase, with the key institutions and systems being put in place. It will primarily make use of existing monitoring systems and indicators, and the emphasis will be on large-scale, high-impact response programmes. Initial evaluation reports will be produced during Phase 1, although the full system may not be up and running at this stage.

**Phase 2** will seek to expand coverage of the system in terms of responses, such as more information on co-benefits. Phase 2 will also start to focus more on standardisation of reporting, by introducing guidance on MRV approaches, as well as ensuring that the results of the evaluation reports are starting to feedback into and influence policy development.

**Phase 3** involves the move to a fully-functional structure and design of the M&E system, in terms of coverage, accuracy, quality control, analysis and communication. The emphasis will be on influencing policy, funding decisions, etc.

This phased approach is summarised in the diagram below.

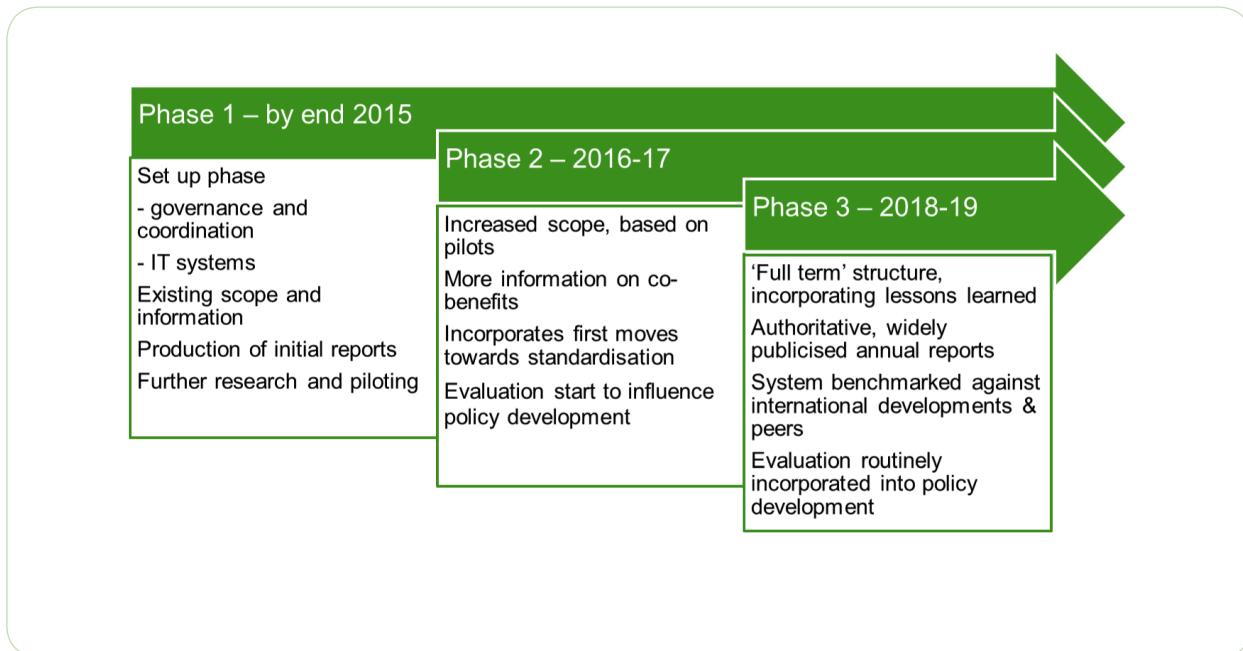


Figure 34: Phased approach to M&E development in South Africa (Department of Environmental Affairs, unpublished)

South Africa will undertake the following activities in 2014 in order to progress the design of its M&E system:

- Develop a web-based database for recording:
  - GHG emissions (both those emitted and those reduced or avoided through mitigation actions);
  - The support provided in terms of financing, technology or capacity building for these mitigation actions; and
  - The costs and co-benefits of the mitigation actions.
- Develop indicators to be monitored by the M&E system from sector plans and adaptation strategies;
- Describe the information/data required to analyse such indicators; and
- Design the institutional arrangements to support analysis of the indicators. The consolidated table of contents will be finalised and published in 2015.



## 7. ADDITIONAL INFORMATION

This chapter presents a collection of additional work (over and above that reported in Chapters 1 – 6) that has been undertaken to address a changing climate in South Africa.

### 7.1 RENEWABLE ENERGY INDEPENDENT POWER PRODUCER PROCUREMENT PROGRAMME

The Department of Energy has determined that 3,725MW of electricity will need to be generated from renewable energy sources to ensure the continued uninterrupted supply of electricity. Therefore, South Africa has designed the Renewable Energy Independent Power Producer (REIPP) Procurement Programme to contribute towards this target. The REIPP Procurement Programme has, to date, closed three windows for the submission of bids to generate power from renewable resources. The results of the bidding processes are summarised below.

*Table 37: REIPP Procurement Programme – Preferred Bidders in Bid Window 1 (submission date 4 November 2011)*

Technology	Number of Bids	Net Capacity (MW)	Total Energy Output over 20 years (MWh)	Associated emission reductions (tCO <sub>2</sub> e)
Biomass	-	-	-	-
CSP	2	150.0	9,966,799	9,926,932
Landfill gas	-	-	-	-
Onshore wind	8	634.0	38,877,129	38,721,621
Solar photovoltaic	18	631.5	26,735,973	26,629,029
Small hydro	-	-	-	-
Total	28	1,415.5	75,579,901	75,277,582

*Table 38: REIPP Procurement Programme – Preferred Bidders in Bid Window 2 (submission date 5 March 2012)*

Technology	Number of Bids	Net Capacity (MW)	Total Energy Output over 20 years (MWh)	Associated emission reductions (tCO <sub>2</sub> e)
Biomass	-	-	-	-
CSP	1	50.0	4,603,077	4,584,665
Landfill gas	-	-	-	-
Onshore wind	7	562.4	33,512,661	33,378,610
Solar photovoltaic	9	417.1	19,387,480	19,309,930
Small hydro	2	14.3	1,853,610	1,846,196
Total	19	1,043.8	59,356,828	59,119,401

**Table 39: REIPP Procurement Programme – Preferred Bidders in Bid Window 3 (submission date 29 October 2013)**

Technology	Number of Bids	Net Capacity (MW)	Total Energy Output over 20 years (MWh)	Associated emission reductions (tCO <sub>2</sub> e)
Biomass	1	16.5	2,587,200	2,576,851
CSP	2	200.0	14,330,664	14,273,341
Landfill gas	1	18.0	2,095,152	2,086,771
Onshore wind	7	787.1	55,909,527	55,685,889
Solar photovoltaic	6	435.0	18,896,126	18,820,542
Small hydro	-	-	-	-
Total	17	1 456.6	93,818,669	93,443,394

As of 31 March 2014, six projects (totalling 191.1 MW) have reached commercial operation from Bid Window 1. Four of these projects involve solar PV technology and two involve wind energy. These projects are:

1. Konkoonsies Solar PV in the Northern Cape (9.7 MW).
2. Kalkbult Soutpan Solar Park in the Northern Cape (72.5 MW).
3. Aries Solar Park in the Northern Cape (9.7 MW).
4. RustMo I Solar Park in the North West Province (6.9 MW).
5. Van Stadens Metro Wind in the Eastern Cape (27.0 MW).
6. Hopefield Wind Energy in the Western Cape (65.4 MW).

An additional 326.2 MW from six other projects from Bid Window 1 have reached an Early Operating Energy per MW (EOP/WM). This means that a certain portion of renewable energy is transmitted to the grid, whilst the project is still under construction. Four of these projects involve solar PV technology in the Northern Cape, with the remaining two

being onshore wind projects in each of the Eastern Cape and Western Cape. With regard to the Bid Window 2 projects, most are at the initial stages of construction is scheduled to be completed around 2016. However, eight of the nineteen will be commercially operational by the end of 2014.

## 7.2 ADAPTATION

### 7.2.1 Long Term Adaptation Scenarios

South Africa completed the first phase of the LTAS Flagship Research Programme in June 2013. The aim of the first phase was to develop a consensus view of climate change trends and projections in the country. These projections were based on recent trends in climate, and they synthesised a range of potential future climate conditions that could plausibly occur in South Africa. The climate projections were gathered into two main groups: unmitigated (unconstrained) and mitigated (constrained) future emission pathways.

The first phase summarised the impacts of climate change in South Africa's key sectors, and also identified the potential response options in the sectors:

Table 40: Impacts and potential responses to climate change in South Africa's key sectors

Sector	Projections and Key Impacts	Adaptation Responses and Priority Actions
Water	<ul style="list-style-type: none"> <li>• A higher frequency in flooding and drought extremes is expected, with the range of extremes exacerbated significantly under the unconstrained global emissions scenario.</li> <li>• Areas at highest risk of flooding and extreme runoff related events include KwaZulu-Natal, parts of southern Mpumalanga and the Eastern Cape.</li> <li>• Specific areas at risk of increased evaporation, decreased rainfall and decreased runoff include the south-west and western regions, and, to some extent, the central region and the extreme north-eastern parts of the country.</li> </ul>	<ul style="list-style-type: none"> <li>• Allow for flexible and robust infrastructure planning.</li> <li>• Prioritise and allocate resources to interventions that take cognisance of adaptation goals.</li> <li>• Assess the trade-offs between developmental aspirations and increased water usage.</li> <li>• Direct resources towards maintaining critical ecological infrastructure.</li> </ul>
Agriculture and Forestry	<ul style="list-style-type: none"> <li>• An increase in irrigation demand is projected: a 4-6% increase under the warmer/wetter climate scenario, and a 15-30% increase under the hotter/drier climate scenario.</li> <li>• There may be significant shifts in the optimum growing regions for many key crops, such as wheat, barley, maize, sorghum, soybeans and sugarcane, and in pasture/rangeland grasses.</li> <li>• Climate change-induced changes in plant and animal diseases and insect distribution would adversely affect both crop and livestock production, and animal health.</li> </ul>	<ul style="list-style-type: none"> <li>• Implement national-level strategies that relate to capacity building in key research areas.</li> <li>• Consider water resource allocation.</li> <li>• Implement local-level responses that are specific to agriculture production methods and local conditions.</li> <li>• Restore and rehabilitate ecosystems.</li> <li>• Minimise soil disturbance and maintain soil cover.</li> <li>• Maximise water storage.</li> <li>• Optimise yields through multi-cropping, and integrated crop and livestock production.</li> <li>• Minimise methane and nitrous oxide emissions.</li> </ul>
Human Health	<ul style="list-style-type: none"> <li>• Health risks in South Africa that climate change would aggravate over the next few decades include:</li> <li>• Heat stress.</li> <li>• Vector-borne diseases (such as malaria, dengue fever and yellow fever).</li> <li>• Communicable diseases (such as HIV/AIDS, TB and cholera)</li> <li>• Non-communicable diseases (such as cardio-vascular and respiratory diseases).</li> <li>• Hunger:</li> <li>• Malnutrition.</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct vulnerability assessments.</li> <li>• Reduce certain criteria pollutants.</li> <li>• Develop and strengthen existing public awareness campaigns.</li> <li>• Develop a spatial and temporal health data capture system.</li> <li>• Integrate food security and sound nutritional policies into all adaptation strategies moving forward.</li> </ul>

Sector	Projections and Key Impacts	Adaptation Responses and Priority Actions
Marine Fisheries	<ul style="list-style-type: none"> <li>Climate-related changes in wind, upwelling, sea surface temperature, productivity, oxygen levels, storm frequency, precipitation, freshwater flow and runoff patterns, may all have an impact on estuaries, and inshore and offshore ecosystems.</li> <li>Climate-related changes are likely to affect resource and habitat diversity, resource abundance, fish behaviour and physiology, resource catchability, fish size and fishing opportunities and success; this will, in turn, affect commercial and subsistence fishing livelihoods and recreational fisheries and their associated industries.</li> </ul>	<ul style="list-style-type: none"> <li>Robust stock assessments.</li> <li>Sustainable fishing levels and practices.</li> <li>Conduct experimental work on key species that are particularly vulnerable to climate change.</li> </ul>
Biodiversity	<ul style="list-style-type: none"> <li>A significant change and loss of South Africa's grasslands is expected.</li> <li>The Savanna biome is projected to expand, with its geographic range expected to partly replace grassland.</li> <li>Desert is projected to expand at the expense of other biomes.</li> <li>The expected invasion of woody plants (alien and indigenous) into the grassland biome has major implications for conservation and the delivery of ecosystem goods and services to people, notably water delivery from highland catchments and grazing, as well as ecosystem processes such as wildfire.</li> </ul>	<ul style="list-style-type: none"> <li>Stakeholder engagement.</li> <li>Integrate mitigation and adaptation responses.</li> <li>Make use of indigenous knowledge.</li> <li>Integrate vulnerability assessment data with spatial data</li> <li>Further research the rates of spreading of invasive plants and changes to fire regimes.</li> </ul>

The first phase of the LTAS concludes that South Africa could benefit significantly if the global CO<sub>2</sub> concentration in the atmosphere is stabilised at between 450 and 500ppm. However, even under effective international mitigation responses, South Africa is still vulnerable to the effects of a changing climate. These implications would largely be felt through the impacts on water resources (such as changes in water resource availability and a higher frequency of natural disasters

(flooding and drought)), with cross-sectoral effects on human settlements, disaster risk management and food security.

The second and third phases of the LTAS will build on the work completed in the first phase – a sub-national and national 'scenarioscape' will be developed, within which adaptation to climate change will occur. In addition, the process will assess the extent to which the regional and international context might influence the national adaptation response.

## 7.2.2 Adaptation Actions

The table below presents the climate change adaptation actions that South Africa has undertaken between 2000 and 2009.

**Table 41: GHG Adaptation actions taken between 2000 and 2010**

Mitigation Action	Name of Policy/ Instrument/ Strategy/ Plan	Primary Purpose	GHG	Type of Instrument	Status of Instrument	Administering Government Agency/Actors	Time Horizon	Estimated Emission Reductions (MtCO <sub>2</sub> e)	Co-benefits
Adaptation	Working for Water	The primary purpose of this programme is to clear invasive alien plants that compete for South Africa's water resources.	CO <sub>2</sub>	Economic	Existing measure	Department of Water Affairs	Current	Not available	<ul style="list-style-type: none"> <li>Drought resiliency of ecosystems;</li> <li>Enhances competitive advantage of natural vegetation; and</li> <li>Job creation.</li> </ul>
	Working on Fire	The primary purpose of this programme is to limit wildfire damage in plantation forests. This involves the combination of pro-active fuel reduction strategies at strategically created buffer strips in the landscape combined with reactive fire fighting at these locations, which has great potential to counter (to some extent) the potential increases in fire risk and severity.	CO <sub>2</sub>	Economic	Existing measure	Department of Agriculture, Forestry and Fisheries	Current	Not available	<ul style="list-style-type: none"> <li>Could play a significant role in landscape fire regimes in future;</li> <li>Reduce direct GHG emission from fire and enhances carbon stock capture in plant material;</li> <li>Job creation</li> </ul>
	Adaptation Research	The purpose of this programme is to research adaptation measures in South Africa. The programme covers research activities and provides bursaries.	CO <sub>2</sub>	Economic and social	Existing measure	Department of Environmental Affairs	Current	Not available	<ul style="list-style-type: none"> <li>Knowledge transfer.</li> </ul>
	Climate Change Awareness Campaign	This programme creates awareness of the causes and effects of climate change. The programme enables people, businesses, stakeholders to take action against climate change, as well as connecting different sectors (government, labour, business and civil society).	CO <sub>2</sub>	Economic and social	Existing measure	Department of Environmental Affairs	Current	Not available	<ul style="list-style-type: none"> <li>Knowledge sharing.</li> </ul>
	Climate Change Sector Plan for Agriculture, Forestry and Fisheries	The Plan is focused on the following (with regards to the South African agriculture sector): vulnerability assessments; mitigation and adaptation; response and recovery; communication; training and public awareness.	CO <sub>2</sub>	Social	Existing measure	Department of Agriculture, Forestry and Fisheries	Current	Not available	<ul style="list-style-type: none"> <li>Food and crop security.</li> </ul>

### 7.3 INTEGRATING CLIMATE CHANGE INTO MUNICIPAL PLANNING THROUGH THE ‘LET’S RESPOND TOOLKIT’

South Africa has developed a toolkit for integrating climate change risks and opportunities into municipal planning. Known as the ‘Let’s Respond Toolkit’, it was designed to assist local government with mainstreaming climate change issues into their planning process. The toolkit provides municipalities with the necessary steps and a set of tools with which to identify communities and sectors that are at risk because of climate change and to explore opportunities to increase their resilience. These steps are aligned with the country’s Integrated Development Process (IDP) and cover planning, analysis, strategy, projects, and integration/implementation, as illustrated in the figure below.

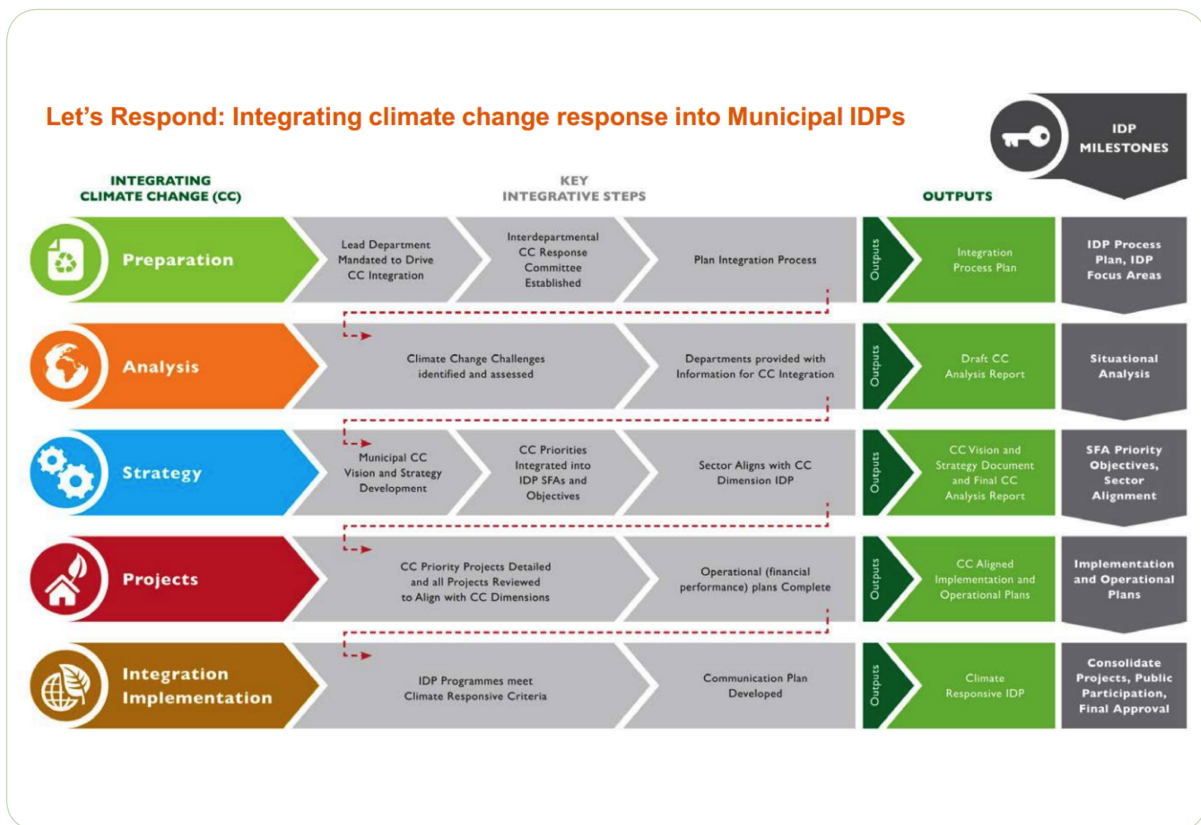


Figure 35: Process steps in the ‘Let’s Respond Toolkit’

The toolkit has been successfully piloted in the Namakwa District Municipality, which first developed a climate change vulnerability assessment, and is now developing four projects, including rainwater harvesting, solar geysers, recycling, and climate change awareness.

## 7.4 THE NATIONAL FLAGSHIPS PROGRAMME

South Africa has identified a suite of near-term priority Flagship Programmes to mitigate the adverse effects of climate change. These Flagship Programmes are a strategic set of measures that have been singled out as crucial stepping-stones to a low carbon, climate resilient economy and society. The Flagship Programmes share the following key features:

- Contribute to achieving existing commitments in terms of a lower carbon growth trajectory.
- Have significant potential to mitigate climate change and/or enhance climate resilience.
- Utilise, demonstrate and/or test a set of regulatory, fiscal and implementation mechanisms.
- Comprise inter-linked components, which are developed and implemented in a systematic and coordinated manner.

Whilst section 3.1.1 of this report provides the details of the eight Flagship Programmes, this section will highlight the progress made and the notable achievements of these Flagship Programmes:

1. Improved coordination of Flagship Programmes and consistent approach to monitoring and evaluation: An over-arching climate change framework is being developed to increase the levels of collaboration, collective action and mutual participation among the various stakeholders involved in both the conceptualisation and implementation of individual Flagship Programmes.
2. Enhanced vertical and horizontal integration: Through the Energy Efficiency and Energy Demand Management Flagship Programme, the Department of Environmental Affairs is facilitating the development and preparation of the Energy Efficiency and Demand Side Management and Vertically-Integrated Nationally Appropriate Mitiga-

tion Actions (V-NAMA) in public buildings at national, provincial and local government levels. The Energy Efficiency and Energy Demand Management Flagship Programme builds on the energy efficiency programmes in industry that were implemented by the Department of Energy, the experience of Eskom's Demand Side Management programme and the government building energy efficiency programme that is led by the Department of Public Works.

The Department of Environmental Affairs will continue to facilitate and support integrated implementation of green alternatives (such as the Flagship Programmes) that contribute to achieving the country's commitments in terms of a lower carbon growth trajectory and advancing the green economy pathway.

## 7.5 2050 PATHWAYS CALCULATOR

The Department of Environmental Affairs, in collaboration with the British High Commission and the United Kingdom's Department of Energy and Climate Change (DECC), has developed the 2050 Pathways Calculator for South Africa. The calculator was drawn from work conducted by the United Kingdom Government for its own 2050 Pathway Analysis.

The calculator is an interactive, user-friendly tool that allows non-experts to develop their own combination of changes in different technologies in order to explore different energy and emissions scenarios up to 2050. The heart of the calculator is a technical energy balancing model that brings together sectoral trajectories in different ways in order to construct possible pathways to 2050. The tool covers all sectors of the economy, and includes four trajectories for each of these, ranging from little or no effort to reduce GHG emissions or save energy (level 1) to extremely ambitious changes that push towards the physical or technical limits of what can be achieved (level 4).

Whilst the calculator will not be used as a decision making tool, it is a useful tool to:

- Determine how much the country can reduce its emissions whilst still meeting energy and other developmental needs;
- Explore energy choices and understand the associated GHG emissions;
- Engage policy makers and the public about how the country's emissions could change over time; and
- Educate learners about the impact of climate change.

The 2050 Pathways Calculator for South Africa can be accessed through this link:  
<http://2050.lateral.co.za:9292/>.

## 7.6 NATIONAL ATMOSPHERIC EMISSION INVENTORY SYSTEM (NAEIS)

Over the last ten years, South Africa has developed various national policies and initiatives to reduce air pollutants, including greenhouse gases. In order to measure the success of these policies and initiatives, it is necessary to keep a complete and accurate air emissions inventory for the country. Therefore the Department of Environmental Affairs established a National Atmospheric Emissions Inventory System (NAEIS), which was released for public use in October 2013. The NAEIS is a web-based reporting platform that provides the public with information on South Africa's emissions profile. According to draft regulations, any entity emitting more than 0.1 MtCO<sub>2</sub>e per annum is required to submit an emission report for inclusion in the database.

Emissions data for the NAEIS is collected using the following approach:

1. At the beginning of each annual emission inventory cycle, a national Air Quality Officer initiates a 'Master List', which lists all sources/entities that are required to prepare and submit emission reports;
2. The Master List is then automatically distributed to 287 local authorities (9 provinces, 8 metropolises, 44 districts, and 226 local municipalities). The local Air Quality Officer will only be able to see emission sources/entities within his/her own jurisdiction, and will update the local version on the Master List by adding/changing/inactivating sources and contacts, based on his/her local knowledge;
3. Where there are data gaps, the NAEIS will notify the source/entity about the mandatory reporting obligations; and
4. All emission reports are submitted before 31 March each year.

Although South Africa has yet to complete its first full reporting cycle using the NAEIS, the system promises to revolutionise South Africa's environmental data collection process. The NAEIS will provide support to the Department of Environmental Affairs by enhancing the country's air quality management and climate change monitoring, verification and reporting processes. The Department of Energy also plans to use the NAEIS to collect energy use data from manufacturing facilities; this will also be used by the Department of Environmental Affairs to evaluate energy efficiency and to promote clean manufacturing.

The NAEIS can be accessed through this link:  
<http://www.saaqis.org.za/Emissions3.aspx>



## 7.7 MONITORING AND EVALUATION IN THE AGRICULTURE, FORESTRY AND OTHER LAND USE SECTOR

Whilst Chapter 6 of the BUR provided an overview of the national M&E System, it is important to note that, as a component of this work, South Africa is also focusing on work in the AFOLU sector:

The AFOLU sector is of strategic national importance in addressing food security, water, health and land reform. As such, it is important to develop an M&E system for this sector to ensure effective implementation of integrated climate change programmes.

The AFOLU M&E system will monitor and evaluate:

- The effectiveness of mitigation and adaptation responses taking place on managed lands, which enhances the climate change resilience of communities and reduce emissions from that land
- The impacts of climate change on the agriculture and forestry sectors – with a focus on those impacts that affect the sources and sinks of GHG emissions; and
- Changes in land management that affect the sources and sinks of GHG emissions.

The AFOLU M&E system will also:

- Provide a platform for communication between authorities and different stakeholders, whose actions affect the sinks and sources of GHG emissions from the land sector;
- Track the needs, flows and impacts of national and international climate finance support for mitigation and adaptation activities; and
- Develop, monitor, report and verify key indicators for the AFOLU sector.

The AFOLU M&E system will form part of the pilot programme of the national M&E system at the end of 2015.

## 7.8 PARTNERSHIP FOR MARKET READINESS

South Africa tendered its expression of interest to the Partnership for Market Readiness (PMR) in 2011. The objective of the PMR is to provide a platform to build readiness capacity for new and innovative GHG mitigation mechanisms. These mechanisms include market-based tools such as emissions trading and scaled-up crediting mechanisms, NAMAs and carbon tax. The World Bank outlines the scope of PMR as a grant-based, capacity-building trust fund that provides funding and technical assistance to enhance readiness for market-based instruments that reduce GHG emissions. The PMR brings together developed and developing countries, as well as other key experts and stakeholders, in order to provide a platform for technical discussions about market instruments, South-South exchange, collective innovation for pilot efforts, and the scale-up of financial flows.

South Africa, through a joint effort by National Treasury and the Department of Environmental Affairs, presented an Organising Framework for scoping of PMR activities in May 2012. The Framework is aimed at refining the design features of the proposed carbon tax and offset mechanisms. A sum of USD 350,000 has been allocated to South Africa for further development of carbon tax, and also to develop its Market Readiness Proposal. The scope of work encompasses the following key components:

- Modelling work to support carbon tax implementation;
- Policy analysis and synthesis;
- Developing emissions intensity benchmarks for sectors; and
- Coordination and compilation of the findings into a draft MRP report.

The key pieces of work that South Africa has presented to the PMR are:

- Carbon tax;
- Stakeholder consultation;

- Overview of offset potentials and lessons learnt from the CDM; and
- Integrating carbon pricing and energy policies.

### **7.9 VERTICALLY-INTEGRATED NATIONALLY APPROPRIATE SET OF MITIGATION ACTIONS**

A vertically-integrated nationally appropriate set of mitigation actions (V-NAMA) focuses on the development of large scale, voluntary climate change mitigation actions across all levels of government (national, provincial and local). The Departments of Environmental Affairs, Energy and Public Works recently piloted an Energy Efficiency and Energy Demand Management (EEEDM) V-NAMA in the public building sector. A total of 80 buildings were selected for inclusion in the pilot; these were drawn from the building portfolios of national, provincial and local government. Four provinces were included in the pilot programme with representation from ten local government authorities.

A ten-step approach was applied then used as the reference framework for the development of the EEDMV-NAMA programme for public buildings. An assessment was undertaken to develop a baseline, in order to quantify the energy savings potential of energy efficiency measures with the public sector building stock, and also to gain an understanding of the nature and scope of existing energy efficiency programmes in South Africa. The outcome of this work then fed into the subsequent elements of the programme, including: final determination of the participants; the number and types and buildings to be included in the pilot programme; building selection criteria; and the specific interventions that were to form part of the programme. Determination of the above elements informed the detailed planning for the V-NAMA programme as well as the specific MRV approaches to be adopted within the programme. Once consolidated, the programme will form the core element of the final V-NAMA proposal to be submitted to the UNFCCC/NAMA facility for funding and support.

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