

SOUTH AFRICA'S 3RD CLIMATE CHANGE REPORT

2017



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SOUTH AFRICA'S 3RD CLIMATE CHANGE REPORT 2017

FOREWORD

DR BOMO EDNA MOLEWA MINISTER OF ENVIRONMENTAL AFFAIRS

S outh Africa has warmed significantly over the past eight decades, with parts of the country having warmed at twice the global rate of warming. We are reminded repeatedly of the effects of climate change, with the occurrence of unprecedented extreme weather events, ranging from severe storms, floods and drought. This reality has become even more evident with the declaration of the current drought crisis across the country, as a national disaster. Drastic warming of more than 4 - 6 °C is projected for South Africa over the next few decades, making climate change one of the most important developmental risks to South Africa; with economic, social and ecological dimensions. Climate change will adversely affect the poorest and vulnerable.

Effective climate change responses, offer opportunities to foster a new kind of economic development that is sustainable and that will improve the distribution of resultant economic gains. South Africa's transition to a low carbon and climate resilient economy and society requires immediate and accelerated action and investment to enable a timely and effective transition. The participation of all stakeholders is essential to achieve South Africa's climate change objectives as set out in the National Climate Change Response Policy. Cooperation by all countries and other stakeholders, including finance, technology and capacity-building support, is essential to ensure low carbon development as a basis for protecting global climate for our present and future generations and building climate resilience.

Extensive work has been done to translate the National Climate Change Response Policy into practical action, including the introduction of a Climate Change Act. The proposed legislation places a legal obligation on every organ of state to coordinate and harmonise their various policies, plans, programmes and decisions; providing legislative and coordination guidance for all spheres of government and organs of state. The Climate Change Bill has been gazetted for public comment.

The Department of Environmental Affairs, other key national government departments and implementation partners intensified their efforts towards the development, implementation and scaling-up of climate action in their respective sectors, through the Climate Change Flagship Programmes. The Climate Change Flagship Programmes are strategic measures implemented by the South African Government to trigger a large-scale transition to a low carbon economy and a more climate resilient South Africa. They are government led programmes that signal climate change investment priorities and provide the certainty needed to stimulate the investment required for transitioning to a low carbon and climate resilient society. The Climate Change Flagship Programmes place government at the forefront of increasing the use, visibility and recognition of climate change response technologies and services while at the same time, facilitating their rapid diffusion.



South Africa recognises global efforts against climate change and applauds the Paris Agreement as a hardwon achievement by the international community. In this regard, South Africa has ratified the Paris Agreement on Climate Change and submitted its instrument of ratification to the Depository under the United Nations Secretary-General in New York. The Paris Agreement brings a transformative impetus to the global response to climate change in the context of poverty eradication and sustainable development, whilst reflecting equity and common but differentiated responsibilities and respective capabilities. We have submitted South Africa's nationally determined contribution (NDC) under the Paris Agreement, covering mitigation, adaptation and support. Measurement and monitoring of climate change responses is critical to ensuring their effective implementation. To this end, South Africa has established the Climate Change Response Monitoring and Evaluation System and we have published two Climate Change reports as a key output of this mechanism.

Adaptation is an issue that requires an urgent national and global response. South Africa is confronted by a reality that compels us to invest far more seriously in the national adaptation response. South Africa has played a critical role in providing leadership in tracking adaptation and contributing to the enhanced global transparency framework of the Paris Agreement. Consistent and accurate information and communications on adaptation are crucial as a basis for understanding impacts, progress and enabling climate action. South Africa's 3rd Climate Change Report details national efforts to clearly understand and track progress towards the national adaptation goal and input into the adaptation component of South Africa's NDC, through the Desired Adaptation Outcomes Framework.

Climate vulnerability and risk is exacerbated by poverty and unemployment and will likely increase social and economic inequality in years to come. Equally, climate change adaptation and mitigation offer opportunities to foster a new kind of economic development that is sustainable and that will improve the distribution of resultant economic gains. Accordingly, ambitious, decisive and strong leadership is critical for the urgent and effective implementation of far-reaching action that is required to mitigate and manage climate change. Now is the time to act for the greater good and future generations.

The Department of Environmental Affairs is therefore pleased to present this 3rd Climate Change Report as a basis for inspiring and informing progressively bolder and transformative climate action.

Thank you.

DR B E E MOLEWA, MP Minister of Environmental Affairs

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EXECUTIVE SUMMARY

Abbreviations and acronyms

A-NDC	Adaptation Nationally Determined Contributions
AF	Adaptation Fund
CBIT	Capacity Building Initiative for Transparency
C02	Carbon Dioxide
COSATU	Congress of South African Trade Unions
CSIR	Council for Scientific and Industrial Research
DAO	Desired Adaptation Outcome
DEA	Department of Environmental Affairs
DHS	Department of Human Settlements
DOE	Department of Energy
DOH	Department of Health
DPW	Department of Public Works
DST	Department of Trade and Industry
GCF	Green Climate Fund
GDARD	Gauteng Department of Agriculture and Rural Development
GEF	Global Environment Facility
GHG	Greenhouse Gas
GHGIP	Greenhouse Gas Improvement Programme
GIZ	Gesellschaft für Internationale Zusammenarbeit
HFC	Hydrofluorocarbon
ICA	International Consultation and Analysis
LTAS	Long Term Adaptation Scenarios
M&E	Monitoring and Evaluation
Mt	Megatonne
NCCRD	National Climate Change Response Database
NCCRP	National Climate Change Response Policy
NDMC	National Disaster Management Centre
NDC	Nationally Determined Contribution
NDP	National Development Plan: Vision for 2030
NRF	National Research Foundation
SAEON	South African Earth Observation Network
SADC	Southern African Development Community
SALGA	South African Local Government Association
SANA	Situational Analysis and Needs Assessment
SANBI	South African National Biodiversity Institute
SARVA	South African Risk and Vulnerability Atlas
SAWS	South African Weather Services
SDG	Sustainable Development Goal
SOCCO	Southern Ocean Carbon & Climate Observatory
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
VrESM	Variable-resolution Earth System Model

1. INTRODUCTION

Climate change is a sobering reality for South Africa. The country has experienced significant warming since 1931, with rates of warming that exceed the global rate. Climate risk and vulnerability in South Africa is influenced by a range of socio-economic factors such as poverty and unemployment, and service delivery. Extreme warming of up to 6°C is predicted for South Africa over the next few decades, making climate change the defining context for South Africa's development.

South Africa's climate change response landscape is growing and advancing. South Africa is taking noteworthy steps to respond to climate change risks and impacts and to provide regional leadership in this regard. A variety of stakeholders have done extensive work to translate the National Climate Change Response Policy into practical action with tangible social, economic and environmental benefits.

This 3rd Climate Change Report reflects on the progress made in responding to climate change, profiles ongoing efforts to this end as a basis for triggering even more ambitious climate action and chronicles key advances in the tracking of South Africa's transition towards a climate resilient society and a low carbon economy.

Thus, the objectives of South Africa's 3rd Climate Change Report are to:

- Apprise South Africans and other interested audiences of the collective and inclusive efforts of different role players in implementing South Africa's national climate change response and the impacts of these various climate change response measures.
- Provide a platform for action that contributes to South Africa's climate change response objectives and to recognise those leading this work.
- Improve and expand the understanding of the impact, effectiveness and gaps in South Africa's climate change actions, thus improving the ability of role players in all sectors of society to implement and replicate successful climate action.

2. WHY IS CLIMATE CHANGE IMPORTANT TO SOUTH AFRICA?

A key feature of the projected climate change futures of South Africa is that temperatures are set to increase drastically over the next six decades. In addition to changes in rainfall intensity, magnitude and seasonality, there is a higher likelihood of extreme events and sea level rise. Climate change impacts on water in South Africa will exacerbate existing water-related challenges. The South African agricultural sector is one of the most critical economic sectors in terms of potential impacts of climate change. Agriculture is impacted directly by changes in precipitation, temperature and evaporation with secondary impacts of increased disaster risk and health issues. Climate change is likely to increase existing vulnerabilities to disaster. South Africa's history and resulting urban form has resulted in a high level of vulnerability to disaster. Different human settlement types and locations have varying vulnerabilities and capacities, and will experience the hazards associated with the present and future climate changes to an unequal extent, with informal settlements and their populations being the most exposed. South Africa exhibits multiple risks that contribute to the overall burden of disease (namely, the quadruple burden of disease consisting of high incidences of HIV/AIDS and TB, maternal and child mortality, violence and injuries and non-communicable diseases (NCDs)), which currently puts stress on the health sector. **Table 1** provides a summary of the vulnerability of key socio-economic sectors in South Africa to climate change.

CEOTOD	SENSITIVITY ANALYSIS	EXI	POSURE ANAL	ADAPTATION PRIORITIES		
SECTOR	Current stresses to systems	Climatic driver	Impacts	Area	Actions required to cope	
		↓ rainfall	Reduction in yields	KwaZulu-Natal, Mpumalanga, Western Cape		
Agriculture and forestry	Land use and changeWater stressInvasive alien plants	∆ rain distribution	Δ rain distribution broduction		Climate Smart AgricultureConservation Agriculture	
		↑ heat waves	Pressure on water resources	National		
Coastal zone	 Direct wave impacts Coastal flooding/inundation Erosion and under-scouring Land use change 	 Intrusion of saltwater Loss/changes to coastal wetlands Higher (ground) water levels and limited soil drainage Flooding of low-lying areas and erosion 			 Land use planning, designation of risk areas or development free zones Construction of dykes, bank protection, sea walls Beach nourishment, dune protection 	
Health	 Quadruple burden of disease Poor housing, infrastructure and service delivery Change in distribution of diseases Catastrophic events may affect the health of the population. 	 A changing clir on the health s There is a lack between climai quantitative lin mortality) 	nate can have a ector of understandir te and health in k between high	 Cross-sectoral cooperation and collaboration Tailored adaptation strategies to regions or communities based upon their risks and vulnerability Measuring/monitoring the effects of climate change on health will be very important. 		
Terrestrial ecosystems	 Habitat fragmentation Land use change Invasive alien plants	↑ temperature and extremes Δ in rainfall and distribution Changes in fire	Changes acros through altera species distrib ecosystems fu	ss the biomes tion of habitats, bution, and nctioning.	 Land use planning and management Ecosystem-based adaptation Mainstreaming of stewardship programmes Monitoring and evaluation 	
Urban and rural settlements	• Deficit in infrastructure and provision of services	 Different human settlement types and locations having varying vulnerabilities and capacities Informal settlements and their population are most exposed 		 Different human settlement types and locations having varying vulnerabilities and capacities Informal settlements and their population are most exposed 		 Disaster risk management Implementation of no-regret measures Water sensitive design and ecological infrastructure
	 High water demand: current water usage already exceeds reliable yield 	↓ rainfall	Increase in demand from agriculture, power generation, settlements		National water policies, plans and funds mainstream slimate	
Water resources	• High levels of variability in rainfall, resulting in frequent floods and droughts	↑ intense rainfall	Increased erosion and sedimentation of dams and rivers		 Monitoring and information need to be appropriately designed Infrastructure development, operation and maintenance Groundwater protection 	
	 Deteriorating water quality in river systems, water storage reservoirs and groundwater 	↑ temperature	 Increased evaporation loss from dams Effect on biological and microbiological processes 			

Table 1: Summary of the vulnerability of key socio-economic sectors in South Africa to climate change

3. ENABLING A JUST TRANSITION TO A LOW CARBON AND CLIMATE RESILIENT ECONOMY

The participation of all stakeholders from industry, business, labour and civil society, is essential to achieve the objectives set out in the National Climate Change Response Policy (NCCRP) (DEA 2011). To this end, the Department of Environmental Affairs (DEA), the South African Local Government Association (SALGA), provinces and the Gesellschaft für Internationale Zusammenarbeit (GIZ) have implemented the Local Government Support Programme, aimed at strengthening local government capacity to respond to climate change and to ensure that climate change considerations are integrated into municipal planning and service delivery. The DEA conducted Situational Analysis and Needs Assessments (SANAs) to assess the capacity and processes in provinces to respond to climate change in line with requirements in the National Development Plan: Vision for 2030 (NDP), the NCCRP and South Africa's Nationally Determined Contribution (NDC) under the Paris Climate Agreement (DEA 2015).

Labour perspectives on challenges, gaps and opportunities that will have to be addressed and strengthened to create an enabling environment for transitioning are key to advancing the overall national climate change response. Trade unions have been engaged in climate change talks with government for some time coining the phrase 'just transition', recognising that the transition should consider potential job losses and opportunities for reskilling workers to take advantage of opportunities resulting from the shift towards new forms of production. As part of civil society efforts aimed at 'democratising climate change knowledge', a reference group comprising the various affiliates of the Confederation South African Trade Unions (COSATU), of environmental rights organisations and academia was established in 2012 to better capacitate the unions about the threat of climate change. In addition to this, a booklet on climate change titled A Just Transition to a Low Carbon and Climate Resilient Economy was published in 2013 in English, Sesotho and isiZulu, for ordinary citizens. Efforts are underway to publish an Afrikaans version of the booklet.

One of the biggest challenges labour organisations experience is that climate change is not a core function of the work of trade unions, even though workers are acutely vulnerable to its impacts. As a result of this, few unions have taken up climate change issues and many do not participate in the various governmental climate forums. There is, thus, a critical need for all social partners to work together on programmes and projects aimed at educating our people. South Africa has taken significant strides forward in recent years to coordinate its climate change research efforts in support of formulating its climate change adaptation strategies. An important milestone was the completion of Phases I and II of the DEA's Long Term Adaptation Scenarios (LTAS) project focusing on analysing the risks and vulnerabilities that climate change poses to South Africa, and identifying broad response options and research needs for key sectors. The analysis of significant climate change risks and vulnerabilities for key sectors undertaken in Phases I and II of the LTAS has since been reviewed and updated based on the most comprehensive set of regional projections of future climate change over South Africa obtained to date. The fine-scale projections of future climate change used in this analysis have also been significantly extended over the last two years and used as a baseline to describe the projected climate futures over southern Africa. Both sets of work are detailed in South Africa's Third National Communication under the United Nations Framework Convention on Climate Change (UNFCCC) (DEA, 2018).

The Southern Ocean, which is the ocean south of Africa beyond 40°S and extending all the way to the ice edge at about 70°S, is the largest carbon and climate mitigation system on the planet. This ocean accounts for 50% of the total oceanic uptake of anthropogenic CO₂ and 75% of the excess heat generated by rising CO₂ levels. South Africa's comparative geographical advantage make it an ideal platform to build, transform and project global South African climate science. The Southern Ocean Carbon & Climate Observatory (SOCCO) Programme is a Council for Scientific and Industrial Research (CSIR)-led multiinstitutional South African initiative supported by the Department of Science and Technology (DST) and the National Research Foundation (NRF). It aims to understand the link between climate and the carbon cycle in the Southern Ocean and how those feedbacks will influence decadal and centennial evolution of our regional and global climate. SOCCO is now in Phase III and its achievements of the past six years include the development of ocean modelling capability in South Africa, which is being used to develop the Variable-resolution Earth System Model (VrESM), the first African-based Earth System Model and Africa's only global climate change projection contribution to Assessment Report Six (AR6) of the Intergovernmental Panel on Climate Change (IPCC). The VrESM modelling capability will enable more reliable projections of future climate change over South Africa and the Southern African Development Community (SADC) region.

4. IMPLEMENTING THE NATIONAL CLIMATE CHANGE MONITORING AND EVALUATION SYSTEM

Transparency and reporting on progress in responding to climate change, enabled by the National Climate Change Monitoring and Evaluation (M&E) System, are key to the effective implementation of South Africa's Climate Change Response Policy and the achievement of South Africa's NDP Vision for 2030. Furthermore, climate change transparency is at the heart of the Paris Agreement and as such South Africa, along with other countries will need to enhance reporting on climate actions and their effects, among other things (DEA 2016: 16).

South Africa's climate change transparency priorities and key themes have been identified and defined. These priorities and themes inform South Africa's domestic and international reporting obligations and are being integrated into the web-based platform of the Climate Change M&E System (**Figure A**).

MONITORING AND EVALUATION PRIORITIES AND THEMES

National circumstances, development priorities and institutional arrangements	Historical GHG emission trends	Implementation progress of actions and quantification of impacts of climate actions		
Socio-economic scenarios, climate projections and GHG emissions projection	Risk and vulnerability profiles, and adaptation/mitigation actions	Finance flows		

FIGURE A: South Africa's climate change monitoring and evaluation priorities and themes

The Desired Adaptation Outcomes (DAOs) for monitoring and evaluating climate resilience have been updated and now comprise nine DAOs with cross-cutting and cross-sectoral relevance. These DAOs describe, in a general sense, a desired state that will enhance South Africa's transition towards climate resilience and fall into two distinct groups. Six of the nine DAOs describe the processes, resources and capacities required to enable effective climate change adaptation and the remaining DAOs describe the key impacts of adaptation interventions and associated measures.

A pragmatic approach has been developed to monitor and evaluate the progress being made in achieving individual DAOs using traffic light colours as a scoring system to summarise progress, for example:

Legal frameworks, plans/strategies, policies, programmes and projects not informed by risk and vulnerability profiles.

Legal frameworks, plans/strategies, policies, programmes and projects informed by risk and vulnerability profiles.

Implementation of legal frameworks, plans/strategies, policies, programmes and projects informed by risk and vulnerability profiles AND contributing to reducing vulnerability and enhancing capacity to respond to climate change impacts

Responsibility for delivering individual DAOs rests with a range of stakeholders operating at different spatial scales. The DAOs have been customised for different stakeholders including: business, sector departments, provincial and municipal government through stakeholder consultations. The DAOs have been aligned with various international environmental and climate change adaptation related agreements to which South Africa is a signatory or participant, shown in **Figure B** below.



FIGURE B: International climate change adaptation-related agreements to which the DAOs are aligned

A web-based prototype of the Climate Change M&E System has since been developed, in partnership with the South African Earth Observation Network (SAEON). The prototype consists of adaptation, mitigation and monitoring and evaluation components. It aggregates information from the South African Risk and Vulnerability Atlas (SARVA), National Climate Change Response Database (NCCRD), and a growing list of contributing relevant systems. Consultations will be undertaken with a range of stakeholders to review and refine the prototype.

The DEA is developing a series of sector specific mitigation M&E guidelines to enable various stakeholders to quantify emissions reductions and other sustainable development indicators, programmes and projects to support implementation of the M&E system. The guidelines are comprehensive in their scope and provide proven working examples applied to mitigation measures, technologies and processes prioritised in various climate change policy and strategy documents.

The 2nd Climate Change Annual Report reported on the National Greenhouse Gas (GHG) Emission Reporting Regulations that took effect on 3 April 2017. The regulations seek to introduce a single national reporting system for the transparent reporting of GHG emissions and will be used to update and maintain the National GHG Inventory (DEA 2016). The registration of reporting companies was, however, done manually as the online system has not yet been modified to meet the registration and reporting requirements. Work to enable online registration and reporting by companies is being undertaken through a project led by National Treasury, in collaboration with the DEA and the Department of Energy. Technical guidelines have also been developed to support the implementation of the National GHG Emission Reporting Regulations.

As part of the Climate Change M&E System, South Africa is implementing a National GHG Inventory System to provide detailed, complete, accurate and up-to-date GHG Inventories. The initial version of the system has been completed and is currently being piloted. The system aims to strengthen the institutional arrangements around national inventories and to enable the sharing of experience on technical guidelines, data collection and archiving, documentation of methods, quality assurance and quality control, uncertainty analysis, reporting and tools. Planned activities on developing the system include a review of the National GHG Inventory System taking into account the recommendations of the International Consultation and Analysis (ICA) as well as the pilot testing of the system.

South Africa is also implementing a GHG Improvement Programme (GHGIP) which comprises a series of sectorspecific projects aimed at improving the quality and accuracy of the National GHG Inventory. Current work has focused on hydrofluorocarbon (HFC) consumption, application and production in South Africa and development of emission factors or GHG modelling for the ferroalloys, transport and waste sectors.

5. TRACKING SOUTH AFRICA'S TRANSITION TO A CLIMATE RESILIENT ECONOMY AND SOCIETY

Noteworthy progress has been achieved in adaptation M&E responses, working closely with government departments, state-owned entities and non-governmental organisations that are pioneering work in this area. Much of this adaptation M&E work over the past year has focused on planning and regulatory frameworks, actions underpinning effective climate change adaptation and ongoing M&E, and the extent to which accurate climate information informs adaptation planning and disaster risk reduction.

As indicated earlier, South Africa's approach to adaptation M&E incorporates the adaptation goals in the country's Nationally Determined Contribution (A-NDC) and links the national adaptation response with other international environmental agreements that require reporting on adaptation as shown in **Table 2**.

Desired Adaptation Outcomes (DAOs)	Alignment of DAOs with international agreement goals, targets, and indicators
G1: Robust/integrated plans, policies and actions for effective delivery of climate change adaptation, together with monitoring, evaluation and review over the short, medium and longer-term.	 A-NDC goal 1: Develop a National Adaptation Strategy (NAS), and begin operationalisation (2020 to 2030). A-NDC goal 2: Consider climate in national development, subnational and sector policy. A-NDC goal 4: Develop an early warning, vulnerability and adaptation monitoring system for vulnerable sectors and geographic areas (2020 to 2030). Sustainable Development Goals (SDG) indicator 13.1.2: Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030. SDG indicator 13.2.1: Number of countries that have communicated the establishment or operationalisation of an integrated policy/ strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience. Sendai target 5: Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.
G3: Accurate climate information (e.g. historical trend data, seasonal predictions, future projections, and early warning of extreme weather and other climate- related events) provided by existing and new monitoring and forecasting facilities/ networks (including their maintenance and enhancement) to inform adaptation planning and disaster risk reduction.	 Temperature goal under Paris Agreement: Hold global temperature increase below 2 °C above pre-industrial levels while pursuing 1.5 °C target. A-NDC goal 4: Develop an early warning, vulnerability and adaptation monitoring system. SDG indicator 13.3.1: Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. Sendai target 7: Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

TABLE 2: Alignment of DAOs with international agreement goals, targets, and indicators

The NCCRP requires vulnerable sectors to develop adaptation plans and monitor their responses to climate change impacts (DEA 2011).

Department of Health (DoH)

The DoH has developed the National Climate Change and Health Adaptation Plan 2014-19 (Department of Health 2012). The Plan requires both strengthening the monitoring and surveillance of public health systems to detect climate change and health trends, and assessing the readiness of the emergency medical services and health facilities to respond to climate change casualties and other health impacts.

The DoH has developed draft climate change adaptation indicators for the health sector. These indicators, most of which are already being monitored by the Department of Health for other purposes, are awaiting high-level

approval. A Health Information System Programme / District Health Information System is in place. The Health Information System Programme is supporting various public health programmes within the Department of Health. The analysis of identified climate-sensitive diseases is reported and discussed monthly by the multi-stakeholder National Outbreak Response Team. The analyses of climate change indicators related to environmental health are also reported and discussed at quarterly inter-provincial environmental health meetings, in which provincial and municipal health professionals are represented. There is a need to strengthen the role of provincial, district and municipal health departments when the National Climate Change and Health Adaptation Plan is implemented.

The Department of Human Settlements (DHS)

The DHS is required to prepare an Environmental Implementation Plan. The most-recent plan is for the period 2014/15–2019/20 (DHS 2015). A baseline study assessment for the future impact evaluation of informal settlements targeted for upgrading has been implemented (DHS, 2016). The findings indicated that informal settlements experience multiple deprivation and high levels of risk and vulnerability. National norms and standards for the construction of stand-alone residences are in place (DHS, 2009a). Guidelines on environmentally sound low-cost housing have been developed focusing on environmental sustainability and energy efficiency, such as the South African National Standard (SANS) 10400XA.

The DHS scope of monitoring, extends to provincial departments of human settlement and local government. The DHS also works with the Department of Science and Technology (DST) and with other public and private sector institutions to monitor specific sector-related indicators.

Information is analysed and packaged to inform policy and decision-making through a number of mechanisms including:

- Annual compliance report of the Environmental Implementation Plan
- Annual reports for the Department of Human Settlements and its related entities
- UN-HABITAT country reporting framework
- Evaluations (baseline studies, impact evaluations, rapid appraisals)
- Human settlements index reporting

A DHS web-based Monitoring, Evaluation and Impact Assessment (MEIA) system is currently under development.

National Disaster Management Centre (NDMC)

The NDMC was established under the Disaster Management Act, 2002 (Act No. 57 of 2002) to promote an integrated and coordinated system for disaster management, with special emphasis on prevention and mitigation by organs of state and other key role players. Section 21 of the Disaster Management Act requires the establishment of mechanisms for monitoring, measuring and evaluating disaster management plans, prevention efforts, mitigation, response and recovery by organs of state and other key role players.

Much work has been carried out by the National Disaster Management Centre in recent years on monitoring and evaluation including:

- Development of a disaster and fire services monitoring and evaluation framework.
- Development of national, provincial and municipal indicators.
- Development and piloting of reporting tools.
- Development of a database template for declared disasters defining data fields and primary data.
- Capacity building of monitoring and evaluation functionaries, in partnership with the National School of Government.

Climate Information, Adaptation Planning and Disaster Risk Reduction

South Africa's weather and climate is highly variable in both space and time. This variability of weather and climate needs to be taken into consideration in adaptation planning. Such an approach will require robust observations, the analysis of these observations, and regular monitoring and evaluation of climate and climate impact trends and should be integral to the preparation of strategic climate change adaptation reports.

Both seasonal predictions and longer-term climate projections and outlooks need to be incorporated into decision-making. A 'rotating climate-sensitive route' should be implemented to facilitate adaptation planning

processes. The approach comprises four rolling actions, namely: improvement of observational networks, climate data analysis, development of climate outlooks and an understanding of how climate is affecting climate-sensitive operations.

South African Weather Services (SAWS) is a public entity of the DEA that focuses on forecasting, research and development, climate services, air quality services, authority in aviation, training, and technical services. SAWS is the only organisation in South Africa that can issue warnings and alerts of severe weather hazards. SAWS hosts a large archive of observed data that are available to the climate change adaptation community and regularly issues short-term weather forecasts, seasonal predictions and climate change projections. SAWS has recently developed a comprehensive Climate Change Reference Atlas (SAWS 2017) which contains a wide range of climate change projection maps for South Africa. SAWS data and projections were used to generate a historical-to-future near-surface temperature and rainfall profile to inform the Climate Change Response Strategy for Gauteng's City Regions (GDARD, 2018).

Adaptation monitoring in grassroots communities: Adaptation monitoring in grassroots communities focused on the work of GenderCCSA – Women for Climate Justice, an international organisation working for gender and climate justice. GenderCCSA has been working with grassroots communities, particularly women's groups and smallholder farmers, in rural, urban and peri-urban communities in six provinces. Adaptation M&E in this sector focused on three keys aspects:

- methods and approaches to engage communities in climate change adaptation
- indicators used to monitor and evaluate the progress and impact of projects
- lessons learned

6. SOUTH AFRICA'S TRANSITION TO A LOW CARBON ECONOMY AND SOCIETY

The NCCRP identifies the national GHG inventory as one of the tools used to compare current emissions profiles against the benchmark national GHG emission trajectory range. GHG emissions have grown, on average, at an annual rate of 7 MtCO_{2e} from 434 MtCO₂e in 2000 to 518 MtCO₂e in 2012.

Although GHG emissions have been growing over time, analysis of the impact of mitigation actions shows that the GHG reductions trend is growing steadily over time as more programmes that mitigate climate change are being implemented. An estimated running total (from 2000) of 315.7 $MtCO_2e$ emissions had been prevented from entering the atmosphere through the mitigation actions implemented. Energy efficiency has been the largest contributor to climate change mitigation in the country, accounting for 83%, 83% and 80% of emission reductions in 2010, 2012 and 2014 respectively, and 82% overall.

Individual response measures contributing to the overall national transition are covered in more detail in section 7 of this report dealing with the Climate Change Flagship Programmes.

7. NATIONAL CLIMATE CHANGE FLAGSHIP PROGRAMMES

South Africa already has a well-developed base for mitigating climate change and building climate resilience through the Climate Change Near-Term Priority Flagship Programmes operationalised by the NCCRP. These are implementation programmes which include both the scaling-up of existing climate change initiatives and new initiatives that are ready to come on-stream by 2020.

The story of the Flagship Programmes is one of progressively intensified, bold and capable climate action. The scale and urgency of climate action has grown, enabled by a boldness of vision, collaborative and collective action, and the creation of opportunities and leveraging resources. The vision and mission of the Climate Change Flagship Programmes is shown in **Box 1** (DEA, 2017).

Box 1: The Vision and Mission of the Climate Change Flagship Programmes

Vision: Accelerated implementation of high impact, large-scale catalytic climate action

Mission: To champion implementation of climate action beyond pilot initiatives

The DEA is currently working on scaling-up the implementation of eight Climate Change Response Flagship Programmes by 2020, in collaboration with lead national departments and other spheres of government, government institutions, the private sector and civil society. There are currently ten Climate Change Flagship Programmes, building on the initial set of 8 programmes, described in the NCCRP (DEA 2011: 31–33).

Figure C provides an overview of how the Climate Change Flagship Programmes deliver large scale catalytic climate action.



FIGURE C: Implementing South Africa's Nationally Determined Contribution – Delivering climate action at scale through the Climate Change Flagship Programmes (DEA, 2017)

Key developments in the implementation of the Climate Change Flagship Programmes since 2011, are shown in **Figure D**.



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The priority work packages for the Climate Change Flagship Programmes in 2016 and 2017, included the existing set of Flagship Programmes first described in 2011, as well as new Flagship Programmes that have been established since the publication of the NCCRP. Table 3 provides an overview of the primary focus areas for the 2017 priority work packages.

TABLE 3: Core focus areas for t	he Climate Chan	ge Flagship Pr	ogrammes priority	v work packa	ues for 2016 and 2017
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Climate Change Flagship Programme	2016 and 2017 priority work package	Core focus	Lead implementing departments
Energy Efficiency and Energy Demand Management Flagship Programme	Energy Efficiency in Public Infrastructure and Buildings Programme	 Market development and expansion Leveraging private sector investment 	 Department of Energy Department of Public Works
Waste Management Flagship Programme	Diversion of Municipal Solid Waste from Landfill	 Demonstration scale implementation and development of implementation blueprints 	• Department of Environmental Affairs
Waste Management Flagship Programme	Wastewater Biogas Generation for Electricity	 Strengthening the regulatory framework Demonstration scale implementation and development of implementation blueprints 	 Department of Water and Sanitation Department of Energy
Transport Flagship Programme	Sustainable Urban Transport Nationally Appropriate Mitigation Action (NAMA)	Strengthening the regulatory frameworkDedicated implementation support	• Department of Transport
Renewable Energy Flagship Programme	Small-scale Embedded Energy Generation	 Strengthening the regulatory framework Support of systematic implementation 	• Department of Energy
Renewable Energy Flagship Programme	Hydrogen and Fuel Cell Technologies and Energy Storage	 Market development Demonstration scale implementation and development of implementation blueprints 	 Department of Science and Technology
Agriculture, Food Systems and Food Security Flagship Programme	Agriculture, Food Systems and Food Security Flagship Programme	 Strengthening the regulatory framework Demonstration scale implementation of integrated approaches and new systems 	 Department of Agriculture, Forestry and Fisheries
Low Carbon, Climate Resilient Built Environment, Communities and Human Settlements Flagship Programme	Low Carbon, Climate Resilient Built Environment, Communities and Human Settlements Flagship Programme	 Strengthening the regulatory framework Demonstration scale implementation of integrated approaches and new systems 	 Department of Human Settlements Green Building Council South Africa

The NDCs are at the heart of the Paris Agreement, as reflected in Articles 3 and 4.2 of the Agreement, and are the main avenue for national action and the achievement of long-term goals of the UNFCCC's international climate change response framework. The Climate Change Flagship Programmes allow for robust country-level programming to transition South Africa to a low carbon economy and a climate resilient society at scale by consolidating and extending existing climate change response implementation measures as the base for South Africa's NDC and the Green Climate Fund country programme.

The Climate Change Flagship Programmes provide investment efficiency and coordination for lead implementing departments, the DEA and international donors/partners by focusing attention on climate change priorities, concentrating and leveraging resources at the most catalytic points of the implementation value thus compounding the benefits of existing resources.

8. INTERNATIONAL CLIMATE CHANGE REGULATORY FRAMEWORK AND NEGOTIATIONS

Climate change is a global challenge requiring both international and domestic solutions. South Africa is an active participant and regional leader in the global climate change response, implemented through the UNFCCC. A major shift towards parity between mitigation and adaptation is a key outcome of recent global climate change negotiations.

The 'big-ticket' issues identified by South Africa in the international arena include mitigation, adaptation, means of implementation (finance, technology and capacity building) and transparency. Accordingly, related to mitigation the focus is the issue of accounting respective to NDCs. Regarding adaptation the focus is on communicating adaptation needs and costs but also recognising adaptation efforts of developing countries. In terms of finance the focus is on the adaptation fund serving the Paris Agreement, while transparency will seek to address transparency of reporting and support.

Climate Finance: The fundamental issue is that climate finance should be new, additional and predictable. The developing trend related to climate finance is the increasing emphasis on and requirement for co-financing. Other emerging concepts include the institutionalisation of climate finance assessments in developing countries and the reporting on and positioning of long-term finance. Part of the existing plans that can facilitate progress towards such an objective is to make use of the NDCs as one of the immediate vehicles.

Guidance for Accounting for Parties' Nationally Determined Contributions: Parties are obliged to report on progress on their GHG inventories and progress on implementation; in addition, they are expected to communicate their NDCs every five years. Parties will have to accept that NDCs are nationally determined and yet they will have to account internationally and set up systems to achieve this.

Recognition of Adaptation Efforts of Developing Country Parties: The premise for this is that many developing countries have expressed adaptation needs in their NDCs. They also draw from their own resources/fiscus in order to address climate change impacts. This, therefore, requires recognition of investments of developing countries as part of their contribution/spend in dealing with climate change impacts on such issues as adaptation infrastructure. Further, methodologies for assessing adaptation needs with a view to assisting developing country Parties then become an integral part of this exercise and they are further linked to the adequacy and effectiveness of adaptation. **Transparency:** Reporting is one of the foundational blocs of the UN climate change regime. All Parties to the Paris Agreement will report under its enhanced transparency framework for action and support, with expected flexibilities for developing countries.

Capacity Building Initiative for Transparency (CBIT): CBIT is meant to strengthen the institutional and technical capacities of developing countries to meet the enhanced transparency requirements of the Paris Agreement. South Africa is in the process of getting its CBIT proposal approved.

These big-ticket items are a package that will usher us into the new era (post 2020) – their importance carries the same weight both pre-2020 and post-2020.

9. CLIMATE FINANCE

The multilateral financial architecture for climate change is a complex and evolving network of international, bilateral, and regional funds that provide financial resources to developing countries to support the transition towards low emissions and climate resilient development. Each fund has a unique combination of thematic areas and mandates, and each has its own set of information requirements and eligibility criteria.

Issues of climate finance are addressed in a number of the provisions of the UNFCCC, the Kyoto Protocol and the Paris Agreement. Developed countries are to provide new and additional financial resources to meet the 'agreed full costs' incurred by developing countries in supplying national communications.

They are also to finance the 'agreed full incremental costs' to developing countries of implementing certain measures.

The key multilateral climate funds are listed below:

- The Green Climate Fund (GCF) was established to support projects, programmes and policies in developing country Parties and is intended to be the main fund for global climate finance.
- The Global Environment Facility (GEF) is the largest independent financial organisation in the environment sector that finances both government and non-government entities for the implementation of projects related to climate change.
- The Adaptation Fund (AF) is a multilateral fund under the UNFCCC and its Kyoto Protocol. The fund was established in 2001 to finance concrete adaptation projects and programmes and became operational in 2009.

One of the unique features of these dedicated climate funds is the ability of countries to nominate and access financial resources directly through national entities. South Africa has a number of entities accredited to the multilateral climate funds as shown in Table 4 below.

TABLE 4: South Africa's direct access entities

Fund	Entity	Status
	South African National Biodiversity (SANBI) National Implementing Entity for projects no greater than US\$50 million	Accredited
GREEN	Development Bank of Southern Africa for projects greater than US\$250 million	Accredited
FUND Green Climate Fund (GCF)	Land Bank of South Africa	Undergoing Accreditation
Global Environment Facility (GEF)	Development Bank of Southern Africa	Accredited
ADAPTATION FUND Adaptation Fund (AF)	SANBI National Implementing Entity for projects no greater than US\$50 million	Accredited

Closely related to whether financial resources are provided from public or other sources is the nature of the resources provided. Understanding the implications of different sources of, and means for, providing finance (grants, loans, and market-based instruments) is important for developing countries when assessing whether financial resources will meet various requirements such as whether they are new and additional or adequate to meet the needs of developing countries and ensure the effective implementation of the Convention.

Climate finance from developed to developing countries amounted to US\$25.4 billion in 2013 and US\$26.6 billion in 2014, an increase of about 50% from public finance reported through the same channels in 2011–12. Table 5 provides an overview of South Africa's climate finance portfolio.

Sources	Grants (US\$)	Loans (US\$)	Co-financing (US\$)*
GEF	78,244,375	15,000,000	402,841,552
GCF	380,000	Not Applicable	Not Applicable
AF	9,937,737	Not Applicable	Not Applicable
CTF †		442,5000,000	2,706,800,000*
Bilateral	69,531,441	Not Applicable	Not Applicable
TOTAL	158,093,553	457,500,000	3,109,641,552*

TABLE 5: South Africa's climate finance portfolio

* Estimated; † Clean Technology Fund

The NCCRP envisages the Climate Change Flagship Programmes as the crucial mechanism to direct and anchor immediate ambitious and practical action at an economy-wide scale and to stimulate the investment required to firmly entrench the transition to low emissions and resilient development. The current expanded set of Climate Change Flagship Programmes forms the foundation for South Africa's Green Climate Fund Strategic Framework developed to enable a coherent engagement with the GCF and to ensure that South Africa's GCF investments are aligned to the national climate change response priorities. The Climate Change Flagship Programmes currently constitute the vast majority of South Africa's GCF country programme at over 95% of South Africa's GCF proposal pipeline.

10. CONCLUSION

South Africa is likely already committed to relatively large and rapid increases in temperature. Further climate change poses a serious risk to South Africa's development and efforts to address poverty and inequality.

South Africa's climate change response landscape is growing and advancing on all fronts, drawing on the action and leadership of actors in all sectors of society including civil society organisations, labour, the business, research and scientific institutions and all spheres of government. A significant amount of work has been done to raise the awareness of different stakeholder groups on climate changerelated risks. However, the current impacts of climate change signal the need to prioritise and fast-track the implementation of these response plans.

Considerable effort has been invested and commendable progress achieved, in the course of the past seven years, in implementing the NCCRP through the practical implementation of the Climate Change Flagship Programmes. These cover all key areas of South Africa's climate change response, with the exception of disaster risk reduction and disaster management. Energy efficiency has been the largest contributor to climate change mitigation in the country, accounting for approximately 82% of GHG emission reductions since 2010. The Energy Efficiency and Demand Management Flagship Programme is one of the most important and mature scaling-up efforts in the national portfolio of Climate Change Flagship Programmes, implemented under the leadership of the Department of Energy, in collaboration with the Department of Public Works, the DEA, the National Business Initiative and the Carbon Trust.

The Waste Management Flagship Programme has enjoyed similar success, focusing on diverting food and organic waste from landfills and implementing alternative waste management technologies. Given the impact of the national drought and the vulnerability of the agricultural sector, current efforts on scaling up the Water Conservation and Demand Management Flagship Programme, led by the Department of Water and Sanitation through the development of the National Rainwater Harvesting Strategy are particularly important; as is the implementation of climate resilient agriculture through the Agriculture, Food Systems and Food Security Flagship Programme, led by the Department of Agriculture, Forestry and Fisheries.

The multilateral financial architecture for climate change is complex and evolving. Understanding the implications of different sources and means for providing finances, is important for developing countries when assessing whether financial resources will meet various requirements. The DEA has established dedicated advisory, technical, climate finance, coordination and implementation and climate change M&E capacity in the Climate Change Flagship Programmes. They will work with the relevant lead national departments and other key implementation partners collaborating with the DEA, to prepare and operationalise detailed business plans for financing and implementing South Africa's NDC.

Transparency and reporting of progress in responding to climate change are key to the effective implementation of South Africa's Climate Change Response Policy. The regulatory framework for mitigating climate change has been enhanced significantly with the promulgation of the National GHG Emission Reporting Regulations that took effect on 3 April 2017.

Other key developments in improving South Africa's climate change M&E capability are the continued refinement and strengthening of the DAOs Framework, working with a very broad range of stakeholders, and alignment with key international environmental and climate change adaptation related agreements to which South Africa is a signatory. The web-based platform of the Climate Change M&E System is operational enabling the System to inform South Africa's domestic and international reporting obligations and facilitating South Africa's ability to manage the increasing transparency requirements at the heart of the Paris Agreement.

South Africa's climate change response is part of a broader global effort to mitigate and manage the effects of global warming, embedded within the UNFCCC and associated international mechanisms. On the international front it is in the interest of developing countries to maintain the spirit of the Paris Agreement, for its ultimate test lies in the elements contained under article 2 of the Agreement. This speaks to the enhanced collective efforts to limit the increase in global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre industrial levels.



INTRODUCTION

INTRODUCTION

LEAD AUTHORS: Tsepang Makholela, Department of Environmental Affairs (DEA) Reitumetse Molotsoane, DEA

Abbreviations and acronyms

DEA	Department of Environmental Affairs
M&E	Monitoring and Evaluation
NCCRP	National Climate Change Response Policy
UNFCCC	United Nations Framework Convention on Climate Change

1.1. NATIONAL CONTEXT

Climate change is a stark reality for South Africa. This reality has become even more evident with the declaration of the current drought crisis across the country as a national disaster (RSA 2018). South Africa has experienced significant warming since 1931, with rates of warming that exceed the global rate. Extreme warming of up to 6 °C is predicted for South Africa over the next few decades, making climate change the defining context for South Africa's development.

South Africa's climate change response landscape is growing and advancing. South Africa is taking noteworthy steps to respond to climate change risks and impacts and to provide regional leadership in this regard. South Africa's implementation ability and experience has grown tremendously over the past years, as national and global efforts to manage and respond to climate change intensify. A variety of stakeholders are active in translating the National Climate Change Response Policy (NCCRP) (DEA 2011) into concrete climate action with tangible social, economic and environmental benefits.

This 3rd Climate Change Report reflects on the progress made in the implementation of this climate action profiling ongoing efforts to respond to climate change and quantifying the impacts of these actions, as a basis for triggering more ambitious climate action.

1.2. OBJECTIVES AND TARGET AUDIENCE OF THE CLIMATE CHANGE REPORT

The NCCRP commits South Africa to tracking, evaluating and reporting on the progress made in the implementation of the national climate change response. To this end the Department of Environmental Affairs (DEA) finalised the National Climate Change Response Monitoring and Evaluation System Framework (MESF) in 2015, to inform the tracking of South Africa's transition towards a climate resilient society and lower carbon economy as mandated by the NCCRP and is implementing the system.

This Climate Change Report chronicles the progress made in South Africa's climate change response and key advances in tracking South Africa's transition towards a climate resilient society and a low carbon economy.

Thus, the objectives of South Africa's 3rd Climate Change Report are:

- To apprise South Africans and other interested audiences of the collective and inclusive efforts of different role players in implementing South Africa's national climate change response and the impacts of these various climate response measures.
- To provide a platform for action that contributes to South Africa's climate change response objectives and to recognise those leading this work.
- To improve and expand the understanding of the impact, effectiveness and gaps in South Africa's climate change actions, improving the ability of role players in all sectors of society to implement and replicate successful climate action.



1.3. STRUCTURE OF SOUTH AFRICA'S 3RD CLIMATE CHANGE REPORT

The 3rd Climate Change Report is divided into four broad sections that detail different aspects of the national climate change landscape and linkages to the broader global climate change response:

- The national context and impetus for climate action in South Africa and an inclusive approach to climate action integrating key role players from all sectors of society.
- Implementation of the National Climate Change Monitoring and Evaluation System and progress in monitoring adaptation and mitigation actions.
- Implementation of concrete climate change programmes and projects through the Climate Change Flagship Programmes.
- The international climate change regulatory framework and support mechanisms.

The report seeks to provide readers with an understanding of the enormity of the climate change challenge, the risks it poses to South Africa's development and the scale of action required to respond effectively. The report presents current and projected climate change scenarios for South Africa and the associated impacts.

The NCCRP repeatedly acknowledges the importance of an inclusive and just transition to a low carbon and resilient economy and society. This report profiles the various stakeholders, including civil society and labour organisations and different spheres of government, driving the national climate change response and provides insight into their perspectives on the challenges and key enablers for a just and effective climate change response. The subsequent chapters focus on the implementation of the National Climate Change M&E System and tracking of adaptation and mitigation actions. The Climate Change M&E System is key to ensuring that decision makers in all sectors of society are able to understand climate-related challenges and to identify opportunities as a basis for effective implementation of climate change responses.

The tremendous growth in South Africa's implementation capability is presented and discussed in the Climate Change Flagships chapter of this report. This chapter chronicles and celebrates the journey of the Climate Change Flagship Programmes, which anchor the practical implementation of the NCCRP through a number of national scale programmes and projects. It presents key progress made in implementing these programmes over the past year and the strategic leadership and vision provided by these programmes up to 2030.

South Africa's climate change response is part of a broader global effort to mitigate and manage the effects of global warming, embedded within the United Nations Framework Convention on Climate Change (UNFCCC) and associated international mechanisms. The final chapters of this report cover what South Africa considers to be 'big-ticket' items as informed by the positions and decisions that South Africa has advanced and influenced through the UNFCCC negotiations and Paris Agreement.

South Africa's efforts to trigger economy-wide investment for scaled-up climate action through the Climate Change Flagship Programmes, using international finance mechanisms such as the Global Environment Facility, the Nationally Appropriate Mitigation Action (NAMA) Facility and the Green Climate Fund, are included in the final chapters of the report.



WHY IS CLIMATE CHANGE IMPORTANT TO SOUTH AFRICA ?

WHY IS CLIMATE CHANGE IMPORTANT TO SOUTH AFRICA?

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LEAD AUTHORS: François Engelbrecht

Abbreviations and acronyms

CCAM	Conformal Cubic Atmospheric Model
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
NCD	Non-Communicable Disease

Global warming could translate into an increase in temperature by as much as 6 °C for many parts of the African continent, with sub-Saharan Africa a region identified as being most vulnerable to drought and climate change-induced impacts (IPCC 2014). Climate change will also likely increase the frequency and magnitude of many extreme weather events. the most comprehensive set of regional projections of future climate change over South Africa obtained to date, detailed in South Africa's Third National Communication under the UNFCCC, indicate that the country is likely already committed to relatively large (compared to the global average) increases in temperatures, even under high-mitigation futures (DEA, 2018, 12). Such increases will also be associated with drastic increases in the number of heat-wave days and very hot days (here defined as days when the maximum temperature exceeds 35 °C), with potentially devastating impacts on agriculture, water security, biodiversity and human health (Kovats & Hajat 2008), energy demand (Isaac & van Vuuren 2009) and agriculture (Schlenker 2010).

Climate risk and vulnerability in South Africa is influenced by a range of socio-economic factors such as governance, poverty, inequality, unemployment and service delivery. Climate change will likely increase poverty and inequality as a whole, since those that rely on the natural resource base for their livelihoods are more at risk.

South Africa has warmed significantly over the period 1931–2015, warming at a rate of 2 °C/century, or even higher. The greatest warming has been observed in the west over the Western and Northern Cape, and in the north-eastern provinces of Limpopo and Mpumalanga, extending southwards to the coastal

areas of KwaZulu-Natal. Moreover, increases have not been observed only in the annual and seasonal averages of minimum and maximum temperature, but also in their extremes. The Western and Northern Cape, Gauteng, Limpopo, and eastern KwaZulu-Natal, in particular, have experienced warming at a rate that is more than twice the global rate of warming.

There is strong evidence of statistically significant increases in rainfall occurring over the southern interior regions over the period 1921–2015, extending from the western interior of the Eastern Cape and eastern interior of the Western Cape northwards into the central interior region of the Northern Cape. Extreme daily rainfall events have also increased over these areas, with these increases also extending northwards into North West Province, the Free State and Gauteng. Over Limpopo there is strong evidence of statistically significant decreases in annual rainfall totals.

A key feature of the projected climate change futures of South Africa is that temperatures are set to increase drastically over the next six decades. Drastic warming of more than 4 °C is projected for the whole of southern African from 2080, with the exception of the southern and eastern coastal regions of South Africa. Warming of more than 6 °C is likely over the western, central and northern parts of the country during the same period (Figure 1).

The changing African climate is likely to have a range of impacts across the continent, including impacts on energy demand (in terms of achieving human comfort within buildings and factories), agriculture (for example, reductions of yield in the maize crop under higher temperatures and reduced soil moisture), livestock production (for example, higher cattle mortality as a result of oppressive temperatures), water security (through reduced rainfall and enhanced evapotranspiration) (for example, Engelbrecht et al. 2015; Garland et al. 2015; Thornton et al. 2011) and infrastructure (mostly through the occurrence of more large-scale floods in particular regions).

South Africa is most likely to experience climate change impacts primarily affecting water resources (DWA 2013). Due to South Africa's arid to semi-arid



FIGURE 1: Conformal Cubic Atmospheric Model (CCAM) dynamically downscaled projected changes in annual mean temperature (°C), under RCP 8.5 for the 2081-2099 period (DEA, 2018)

climate, less than 9% of annual rainfall ends up in rivers and only about 5% recharges groundwater aquifers (DEA 2014). As a result, South Africa is classified as a water-stressed country which makes the country even more vulnerable to expected climate change impacts.

Climate change impacts on water in South Africa could exacerbate existing water-related challenges such as access to potable water. Projected impacts are due to changes in rainfall and evaporation rates, further influenced by climate drivers such as wind speed and air temperature as well as soils, geology, land cover and topography across water catchments. A key impact of climate change will be changes in water runoff. Under a wetter future climate scenario, increased runoff would result in increased flooding, human health risks, ecosystem disturbances and aesthetic impacts. However, under drier future climate scenarios there would be reduced surface water availability. Reduced water availability would most likely create significant trade-offs in terms of the allocation of water resources between agricultural and urbanindustrial water use (DEA 2013). In addition to water impacts, climate change will also impact sanitation. In 2013, municipalities increased the supply of sewerage and sanitation services by 6.2%, raising the number of consumer units with access to sanitation facilities from 9.4 million in 2012 to almost 10 million in 2013 (StatsSA 2013). Increased flooding and storms, however, could result in damage to infrastructure and potable water supplies.

The South African agricultural sector is highly diverse in terms of its activities and socioeconomic context. The sector is considered to be one of the most critical economic sectors in terms of potential impacts of climate change in South Africa. Agriculture is impacted directly by changes in precipitation, temperature and evaporation and through secondary impacts including disaster risk and health issues. The most significant climate change risks and vulnerabilities to agriculture in South Africa include increasing temperatures and more variable precipitation that are likely to have significant impact on a wide variety of crops and forestry products. The climate change risks to marine and fishery resources include rises in temperature, rainfall, and sea level, coastal storms and the acidification of estuaries. This may diminish fish stocks, alter markets, and influence tourism in the marine environment.

In terms of disaster risk management, climate change is likely to increase existing vulnerabilities to disaster risk. South Africa's history and resulting urban form has caused a high level of vulnerability to disaster that must be addressed. South Africa exhibits multiple risks that contribute to the overall burden of disease (namely, the quadruple burden of disease consisting of high incidences of HIV/AIDS and TB, maternal and child mortality, violence and injuries and non-communicable diseases (NCDs)), which currently puts stress on the health sector. The challenging burden of disease in South Africa may make people more vulnerable to the health impacts from climate change (for example, through pre-existing conditions). This may make the sector as a whole more vulnerable to climate change due to the additional stress a changing climate may put on the system. There are recognised impacts to human-heath from climate change including heat stress, increased vector-borne diseases, food insecurity, hunger and malnutrition. However, the combined effects of biophysical and socio-economic drivers of human health and disease and the required ability to manage and respond to these challenges are uncertain. South Africa does have health policies in place, but more action is needed to implement these.

Different human settlement types and locations having varying vulnerabilities and capacities, and will experience the hazards associated with the present and future climate changes to an unequal extent. Areas with higher vulnerability and lower coping capacity will have increased risk from exposure to climate related hazards, with informal settlements and their populations being the most exposed. Projected climate changes are likely to compound the impacts felt by the most exposed populations and therefore building adaptive capacity in these areas should be a priority. Deficits in infrastructure and provision of services in some areas act as barriers to adaptation and increase vulnerability to climate change. This can be compounded by a lack of resources, unclear regulations and unexpected consequences resulting from previous maladaptation or poor development practices.

Threats to terrestrial ecosystems due to climate variability and change include rising average temperatures, more temperature extremes, changes in rainfall intensity, magnitude and seasonality, a higher likelihood of extreme events such as droughts, floods, heat waves, shifts in seasonal rainfall and sea level rise, among others.

Table 1 provides a summary of the vulnerabilityof key socio-economic sectors in South Africa toclimate change.

ADAPTATION PRIORITIES	Actions required to cope	 Climate-smart agriculture Conservation agriculture 			 Land use planning Designation of flood areas or high-risk areas and development-free zones Construction of dykes, groynes, bank protection, sea walls Beach nourishment and dune protection 	 Cross-sectoral cooperation and collaboration Tailored adaptation strategies to regions or communities based upon their risks and vulnerability Measuring/monitoring the effects of climate change on health will be very important. This will assist us to develop data and information on vulnerability as we go. The data could inform future plans. 	 Land-use planning Land management Ecosystem-based adaptation Mainstreaming of stewardship programmes Monitoring and evaluation 	 Disaster risk management Mainstreaming of no-regret interventions Principles of water-sensitive urban design and ecological infrastructure 	 National water policies, plans and funds to mainstream climate-change adaptation 	 Monitoring and information needs to be appropriately designed Infrastructure development, operation and 	 Broundwater protection by preventing degradation and exploitation
: ANALYSIS	Geographical areas	KwaZulu-Natal, Mpumalanga, Western Cape	All 9 provinces	All 9 provinces	etlands d limited soil drainage resultant erosion of beaches and	rriad impacts on the health sector g of the linkages between climate the quantitative link between high	es 1 alteration of existing habitats, bution and changing ecosystems veen biomes, and with increase	 Different human settlement types and locations having varying vulnerabilities and capacities will experience the hazards Informal settlements and their population being the most exposed 	er demand from agriculture, power :lements	on and sedimentation of dams and	aporation loss from dams ical and microbiological processes
EXPOSURE	Potential consequences	Reduction in yields	Impact crop production	Increased pressure on water resources	aastline: Itwater nges to coastal we Jwater levels and v-lying areas and r	 A changing climate can have my There is a lack of understanding and health in South Africa (e.g., temperatures and mortality) 	 Rising and extreme temperature Decrease/increase in rainfall Changes in fire Changes across biomes through seasonal rainfall, species distribunctioning Threats vary in importance betwore time and levels of GHGs 		Increase in wate generation, sett	Increased erosio rivers	Increased evAffect biolog
	Change in climatic driver	🕇 rainfall	Δ rain distribution	† heat waves	 Provinces with a c Intrusion of sa Loss of or cha Loss of or cha Higher [groun Flooding of lov bluffs 				↓ rainfall	†intense rainfall	† temperature
SENSITIVITY ANALYSIS	Current stresses	 Land use and change Water stress 	 Invasive alien plants 		 Direct wave impacts, coastal flooding and inundation, and erosion and under-scouring Land use change 	 Quadruple burden of disease in SA and people from neighbouring countries Poor housing, infrastructure and service delivery Poor housing, infrastructure and service delivery Change in geographical distribution of diseases e.g. Malaria could spread southward; new diseases might develop. Water supply, agriculture, catastrophic events may have short- and long-term effects on health. It is essential to include these factors and their health impacts in the sensitivity analysis. 	 Habitat fragmentation Land-use change Invasive alien plants 	Deficit in infrastructure and provision of services	 High water demand: current water usage already exceeds reliable yield 	 High levels of variability in rainfall from year to year, resulting in frequent floods and droughts Deterioration water quality in river systems, reservoirs and 	groundwater resources
	SECTOR	Agriculture and Forestry			Coastal zone	Health	Terrestrial ecosystems	Urban and rural settlements	Water resources		

TABLE 1: Summary of the vulnerability of key socio-economic sectors in South Africa to climate change

CHAPTER REFERENCES

- DEA, 2013: Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa. Climate Change Implications for the Water Sector in South Africa, Pretoria, South Africa.
- DEA, 2014: Climate Change and the Water Sector. Climate and Impacts Factsheet Series. Long-Term Adaptation Scenarios Flagship Research Programme.
- DEA, 2018: South Africa's Third National Communication under the United Nations Framework Convention on Climate Change, Pretoria, South Africa.
- Department of Water Affairs (DWA), 2013: National Water Resource Strategy: Water for an Equitable and Sustainable Future. June 2013.
- Engelbrecht, F., Adegoke, J., Bopape, M-J., Naidoo, M., Garland, R., Thatcher, M., McGregor, J., Katzfey, J., Werner, M., Ichoku, C and Gatebe, C., 2015: Projections of rapidly rising surface temperatures over Africa under low mitigation. Environmental Research Letters, 10, (8).
- Garland, R. M., Matooane, M., Engelbrecht, F. A., Bopape, M-J. M., Landman, W. A., Naidoo, M., van der Merwe, J. and Wright, C. Y., 2015: Regional Projections of Extreme Apparent Temperature Days in Africa and the Related Potential Risk to Human Health, International Journal of Environmental Research and Public Health, 12, (10).
- Gauteng Department of Agriculture and Rural Development (GDARD), 2018. Gauteng region Over-Arching Climate Change Response Strategy fourth draft. Pretoria: GDARD.

- IPCC (2014) Summary for policymakers. In: Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field C.B., Barros V.R., Dokken D.J., Mach K.J., Mastrandrea M.D., Bilir T.E., Chatterjee M., Ebi Y.L., Estrada Y.O., Genova R.C., Girma B., Kissel E.S., Levy A.N., MacCracken S., Mastrandrea P.R., White L.L. (eds)]. Cambridge University Press, Cambridge, UK and New York, USA. pp 1–32.
- Isaac, M. and Van Vuuren, D.P., 2009. Modeling Global Residential Sector Energy Demand for Heating and Air Conditioning in the Context of Climate Change. Energy Policy, 37(2), pp.507-521
- Kovats, R. S. and Hajat, S., 2008: Heat Stress and Public Health. A Critical Review. Annual Review of Public Health, 29.
- South African Weather Service, 2017. A Climate Change Reference Atlas. Pretoria: South African Weather Service. Accessed 04 December 2018 at: http://www.weathersa. co.za/images/SAWS_CC_REFERENCE_ATLAS_PAGES.pdf
- Schlenker, W. and Lobell, D.B., 2010: Robust Negative Impacts of Climate Change on African Agriculture. Environmental Research Letters 5(1):014010.
- Statistics South Africa, 2013. Non-Financial Census of Municipalities for the Year Ended 30 June 2013. Statistical release P9115. Pretoria: Stats SA. Accessed 05 November 2018 at: http://www.statssa.gov.za/publications/P9115/ P9115June2013.pdf
- Thornton, P. K., Jones, P. G., Ericksen, P. J. and Challinor, A. J., 2011: Agriculture and Food Systems In Sub-Saharan Africa in a 4 °C+ World. Philosophical Transaction of the Royal Society A., 369, 117–36.



ENABLING A JUST TRANSITION TO A LOW-CARBON AND CLIMATE-RESILIENT ECONOMY

ENABLING A JUST TRANSITION TO A LOW-CARBON AND CLIMATE-RESILIENT ECONOMY

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A-NDC	Adaptation Nationally Determined Contributions
AR6	Assessment Report
CMIP5	Coupled Model Intercomparison Project Phase 5
CO ₂	Carbon dioxide
COSATU	Congress of South African Trade Unions
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DST	Department of Trade and Industry
EAP	Environmental Action Plan
EIA	Environmental Impact Assessment
FEDUSA	Federation of Unions of South Africa
GIZ	Gesellschaft für Internationale Zusammenarbeit
IDP	Integrated Development Plans
LTAS	Long Term Adaptation Scenarios
LGCCSP	Local Government Climate Change Support Programme
M&E	Monitoring and Evaluation

Abbreviations and acronyms

NACTU	National Council of Trade Unions
NCCRP	National Climate Change Response Policy
NDC	Nationally Determined Contribution
NDP	National Development Plan
NEDLAC	National Economic Development and Labour Council
NGO	Non-Governmental Organisation
NRF	National Research Foundation
SADC	Southern African Development Community
SALGA	South African Local Government Association
SANA	Situational Analysis and Needs Assessment
SOCCO	Southern Ocean Carbon & Climate Observatory
UNFCCC	United Nations Framework Convention on Climate Change
VrESM	Variable Resolution Earth Systems Model
WCCCR	Western Cape Climate Change Response
WCG	Western Cape Government

3.1. INTRODUCTION

The participation of all stakeholders from industry, business, labour and civil society, is essential to achieve the objectives set out in the NCCRP (DEA 2011). This section acknowledges and focuses on the role of key stakeholder groups, in enabling South Africa's transition to a low carbon and climate resilient economy.

The Department of Environmental Affairs (DEA), South African Local Government Association (SALGA), provinces and the Gesellschaft für Internationale Zusammenarbeit (GIZ) have implemented the Local Government Support Programme, aimed at strengthening local government capacity to respond to climate change and to ensure that climate change considerations are integrated into municipal planning and service delivery. Key outcomes of this work are presented in this chapter.

The impacts of climate change will disproportionately affect the poor and most vulnerable groups, and South Africa's ability to meet its development and economic growth goals, including job creation and poverty reduction. Labour perspectives on challenges, gaps and opportunities that will have to be addressed and strengthened to create an enabling environment for transitioning are included and discussed below.

3.2. LABOUR

The NCCRP recognises the importance of civil society to the success of a national climate change response effort. The NCCRP calls for civil society to express its needs and to critically evaluate, comment on and respond to the initiatives of government and the private sector.

Trade unions have been engaged in climate change talks with government for some time coining the phrase 'just transition' in advocating a shift away from the forms of production that have caused the environmental degradation witnessed today. The transition advocated takes into account workers currently employed in key GHG emitting sectors of the economy, recognising that the transition should make allowances for potential job losses and opportunities for reskilling workers to take advantage of opportunities as a result of the shift towards new forms of production.

The Congress of South African Trade Unions (COSATU) resolved at its 2009 Congress that 'climate change is one of the greatest threats to our planet and our people'. It noted that, 'it is the working class, the poor and developing countries that will be adversely affected by climate change.' The Congress also noted that 'the working class and its organizations' needed to take up the issue of climate change seriously to ensure equitable access to the economy and means of production (as quoted in COSATU 2011, 1). The

2009 Congress resolution also committed COSATU to increase its research capacity on climate change.

COSATU's Growth Path towards Full Employment published by the federation in 2010 (COSATU 2010) presents a strong argument for a growth path that promotes redistribution and which creates decent work. The document puts forward six policy pillars for the achievement of redistribution and decent jobs. One of these pillars is environmental sustainability, which is fleshed out in chapter 17 of the document under the heading 'Green Jobs and the Environment'.

COSATU's position on climate change is outlined in the organisation's Policy Framework on Climate Change, 2011 which was adopted by the Central Executive Committee. The framework indicates that climate change is part of a larger economic and ecological crisis which represents a serious challenge for the working class in general and the trade union movement in particular. It is a challenge that has a gender dimension in that working-class women, as the administrators and labourers of households, are bearing the brunt of the impacts of climate change (COSATU 2011).

The framework outlines the organisation's position on climate change and elaborates on the organisation's key principles, a few of which are shown in **Figure 2** below:



FIGURE 2: COSATU framework on climate change key principles
COSATU has since undertaken a drive to capacitate itself, its members and the various affiliates on climate change and how the sectors that the federation organises in are contributing towards climate change, and has done research and capacity building for their officials and members. As a result, a reference group comprising environmental rights NGOs, academia and the various affiliates of COSATU was established in 2012 to better capacitate the unions about the threat of climate change. In addition to this, as part of 'democratising climate change knowledge', an accessible booklet on climate change titled A Just Transition to a Low Carbon and Climate Resilient Economy, was published in 2013, in English, Sesotho and isiZulu. Efforts are underway to publish an Afrikaans version of the booklet. The booklet lays out the causes, socio-economic impact, international politics and solutions to climate change, in addition to identifying specific measures that the organisation's affiliates can implement (COSATU 2013).

Further, climate change workshops, funded by the Green Fund, were convened to capacitate provincial officials across the three main federations, COSATU, the Federation of Unions of South Africa (FEDUSA) and the National Council of Trade Unions (NACTU).

The workshops aimed to capacitate labour union officials to understand what climate change is and how the sectors are contributing to climate change. More basic education on climate change, implemented by government, together with civil society and labour was identified as a key action.

One of the biggest challenges experienced by labour organisations, is that climate change is not a core function of the work of trade unions, even though workers are acutely vulnerable to its impacts. As a result of this few unions have taken up the issue of climate change and many do not participate in the various governmental climate forums. There is, thus, a critical need for all social partners to work together on programmes and projects aimed at educating our people.

3.3. PROVINCES AND LOCAL GOVERNMENT

3.3.1 Provincial situational analysis and needs assessment

Achieving climate change resilient development requires both horizontal and vertical integration of climate change into government planning, and needs to involve all three spheres of government in playing important roles in addressing climate change (DEA 2011). The NDP and the NCCRP require each province to develop a climate response strategy, which assesses provincial climate risks and impacts and identifies response options at provincial level based on risk and vulnerability assessments. Furthermore, South Africa's Nationally Determined Contribution (NDC) (RSA, 2015) under the Paris Agreement emphasises the need to take up climate considerations at subnational level. The DEA, SALGA, Provinces and the technical partner, GIZ, assisted provinces and local municipalities to strengthen local government capacity to respond to climate change. The DEA conducted Situational Analysis and Needs Assessments (SANAs) to assess the capacity and processes in provinces to respond to climate change in line with requirements in the NDP, NCCRP and NDC (DEA, 2017b).

Figure 3 provides an update of the institutional capacity and arrangements since the publication of the 1st Climate Change Report.



Province	Climate change strategy and mainstreaming	Institutional capacity	Institutional arrangements
Eastern Cape	Review of the existing vulnerability assessment and response strategy finalised.	Climate change function embedded under planning and coordination.	Dedicated climate change forum established
Free State	Climate Change Response Strategy developed and implementation plans for key sectors being developed	Climate Change Coordinating Committee formed but needs proper management for meaningful sectoral contributions	Bimonthly Environmental Management Committee to assess EIAs and integrate climate change requirements for EAPs compliance documents
Gauteng	Gauteng Climate Change Adaptation Strategy is being reviewed	Climate change unit established within the Directorate: Environmental Policy; Planning and Coordination	Provincial Climate Change Forum launched in 2015
KwaZulu-Natal	Review of the Climate Risk and Vulnerability Assessment report and response strategy finalised.	Climate change function embedded under planning and coordination	KwaZulu-Natal Climate Change and Sustainability Council and Technical Task team in place
Limpopo	Limpopo Climate Change Response Strategy 2016-2020 developed and approved	Climate Change embedded within the Sub-directorate: Air Quality Management.	Provincial Climate Change Working Group launched in 2016
Mpumalanga	Vulnerability Assessment report and Climate change Adaptation Response Strategy finalised	2 officials seconded at sub- component level responsible for climate change.	Provincial Climate Change Forum launched in 2016
North West	Provincial Climate Risk and Vulnerability Assessment and adaptation response strategies with implementation plan finalised.	Climate change function embedded under planning and coordination	No dedicated climate change forum
Northern Cape	Provincial Climate Change Response Strategy developed	 A seconded official at a sub-component level responsible for climate change. Air quality officials assisting with climate change 	Climate change forum established
Western Cape	 First sectoral provincial climate change response strategy: SmartAgri – Western Cape Climate Change Response (WCCCR) Framework and Implementation Plan for the Agricultural Sector 2016. Release of the first WCCCR Strategy Biennial monitoring and evaluation report on progress on implementation of the strategy 	Climate Change Directorate established	 Climate Change Response Work Group established for internal staff only and the Climate Change Response Forum re-established for broader stakeholders WCG Energy Efficiency Forum of the Energy Game Changer

FIGURE 3: Update on provincial policy and planning, institutional capacity and institutional arrangements since the 1st Climate Change Report

3.3.2. Local Government Climate Change Support Programme

The NDP and the NCCRP also require that climate change considerations and constraints should be integrated into municipal development planning tools such as Integrated Development Plans (IDPs), and municipal service delivery programmes. Both policies also recognise the role that local government plays in building climate resilience through planning human settlements and urban development, the provision of municipal infrastructure and services, water and energy demand management and local disaster response amongst other things.

The Local Government Climate Change Support Programme (LGCCSP) was initiated as part of rolling out the Let's Respond toolkit which was published and adopted in 2012, initially focusing on climate change adaptation. The programme has since been expanded to incorporate other aspects of responding to climate change.

A considerable amount of work was done to conduct workshops on climate change (mitigation, adaptation and M&E), assessing vulnerability, the development of response plans and integration into the IDP and cross cutting issues in municipalities in Gauteng, Free State and Northern Cape.

The workshop focus areas are detailed below in **Figure 4**.

Climate change	Climate change	Monitoring and	Cross-cutting
adaptation	mitigation	evaluation	themes
 Introduction to the concept of climate change adaptation. National Approach to the concept (plans, reports, tools etc.). Role of municipalities and their response to climate change adaptation. Assessing vulnerability Identifying adaptation options Selecting adaptation options Implementation 	 Introduction to the concept of climate change mitigation. National approach to the concept of climate change mitigation. Developing greenhouse gas inventories. Selection of priority mitigation interventions. 	 Introduction to the concept of climate change monitoring and evaluation. National approach to both mitigation and adaptation M&E. Translation of monitoring and evaluation at the local level. 	 The role of local government support in district municipalities. The role of SALGA in climate change response. Lessons sharing through case studies.

FIGURE 4: Focus areas of the Expanded Local Government Support Programme workshops

Figure 5 below shows provinces, districts and local municipalities that received climate change awareness training, support on undertaking vulnerability assessments and development of response plans as well as training on mainstreaming climate change into municipal IDPs as detailed in the progress report on the rolling out of the Let's Respond Toolkit (DEA, 2017a).



FIGURE 5: Local Government Support Programme activities in provinces and municipalities for the 2016/17 financial year

3.4. DEFINING SOUTH AFRICA'S CLIMATE CHANGE ADAPTATION RESEARCH AGENDA

South Africa has in recent years taken significant strides forward to coordinate its climate change research efforts in support of the formulation of its climate change adaptation strategies. An important milestone was the completion of Phases I and II of the DEA's Long Term Adaptation Scenarios (LTAS) project. This multi-year, multi-institutional and multidisciplinary research effort greatly furthered the analysis of the risks and vulnerabilities that climate change poses to South Africa, with a clear emphasis on the need to undertake impacts assessments, and identify broad response options and research needs for key sectors, namely water, agriculture and forestry, human health, marine fisheries, biodiversity, human settlement (coastal, rural and urban), and disaster risk reduction.

The LTAS analysed climate trends over the last five decades and climate projections for 2030, 2050 and 2100. Climate projections derived from a range of

modelling approaches and scenarios were simplified into four fundamental climate future scenarios to describe South Africa's climate to the end of this century, namely warmer/wetter, warmer/drier, hotter/ wetter, hotter/drier. These broad, consensus climate futures provide a framework within which users of climate information can position a wide range of specific climate change and impact projections with results depending on a range of emission scenarios, global climate models and downscaling techniques.

This in turn, was based on the most comprehensive set of regional projections of future climate change over South Africa obtained to date. From this foundation, South Africa in 2016 became one of the first countries worldwide to formulate its Nationally Determined Contributions on Adaptation (A-NDC) under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC).

The LTAS outputs (Phases I & II) further facilitated policy and regulatory alignment through the review and integration of interventions into the relevant existing or new policies that contribute towards

the national priorities of job creation and poverty alleviation or that have other positive socioeconomic benefits, as well as overall climate change adaptation support for national, provincial and local government through use of climate information in decision making, coordination, awareness and training.

The analysis of significant climate change risks and vulnerabilities for key sectors undertaken in Phases I and II of the LTAS has since been reviewed and updated based on the most comprehensive set of regional projections of future climate change over South Africa obtained to date. The review covered the following sectors: agriculture and forestry, water resources, forestry, terrestrial ecosystems, coastal zone, health, urban and rural settlements, and disaster risk management. The fine-scale projections of future climate change used in this analysis have also been significantly extended over the last two years and used as a baseline to describe the projected climate futures over southern Africa. Both sets of work are detailed in South Africa's Third National Communication under the UNFCCC (DEA, 2018).

The DEA has commissioned work to further define South Africa's climate research agenda to inform the LTAS III. The Climate Change Flagship Programmes are discussed in more detail in subsequent chapters of this report.

3.5. SOUTH AFRICA'S OCEAN-CLIMATE RESEARCH PARTNERSHIP

3.5.1. The Southern Ocean's Critical Role in the Global Carbon Cycle and Climate Change

The Southern Ocean, which is the ocean south of Africa beyond 40 °S and extending all the way to the ice edge at about 70 °S, is the largest, coldest and stormiest part of the global ocean – but this is why it is also the climate fly-wheel of the planet – right at our door-step. Its impact is felt through winter rains or drought in the Western Cape and the winter snow falls in Lesotho that supply water to Gauteng via the Lesotho Highlands Water Scheme. In fact, South Africa's winter rainfall region is projected to become systematically and significantly drier because of the poleward shift in the westerly winds above the Southern Ocean under climate change (**Figure 6**).

The weakening of the westerly winds over South Africa (blue shades) may be directly linked to the poleward displacement of cold fronts and drastic reductions in winter rainfall over the south-western Cape in South Africa. The Southern Annular Mode, which refers to the oscillations in atmospheric pressure above the Southern Ocean, has also been linked to the decadal variability in summer rainfall over South Africa.



FIGURE 6: CSIR climate model projections of the poleward shift in the westerly winds over the Southern Ocean under a low mitigation (high CO, emissions) future (Source: Engelbrecht et al. 2015)

On a global scale the Southern Ocean accounts for 50% of the total ocean uptake of anthropogenic CO, and for 75% of the excess heat generated by rising CO₂, and supplies nutrients that support 75% of global ocean productivity outside the Southern Ocean. Presently, the Southern Ocean is the largest carbon and climate mitigation system on the planet but we do not really understand how it works and how sensitive it is to climate change. It is clear that climate-linked small changes to these large influences could have long-term consequences that we would like to predict, particularly if there are unexpected feedbacks and tipping points to regional and global climate. These challenges combined with South Africa's comparative geographical advantage make it an ideal platform to build, transform and project global South African climate science.

3.5.2. The Southern Ocean Carbon & Climate Observatory and Variable-resolution Earth System Model

The Southern Ocean Carbon & Climate Observatory (SOCCO) programme is a CSIR-led multi-institutional South African initiative supported by the Department of Science and Technology (DST) and the National Research Foundation (NRF). It aims to understand the link between climate and the carbon cycle in the Southern Ocean and how those feedbacks will influence decadal and centennial evolution of our regional and global climate.

Biases (systematic errors) in climate and earth systems models are emerging as observations start to provide improved constraints to the way models reflect the most important variability such as the seasonal cycle. These biases provide a strong basis to focus the research that is needed to understand the geophysics and biogeochemistry that will lead to significantly improved 21st century climate change projections. As a consequence, the CSIR is the only institution that is pursuing Earth System Science and Earth System Model development through a Southern Ocean lens, and with a focus on improving the reliability of climate change projections over Africa. Towards this end, the CSIR has developed the first African-based Earth System Model, the Variable-resolution Earth System Model (VrESM). This model relies on the SOCCO programme to develop a world-leading capability to simulate the role of the Southern Ocean in the African and global climate system.

SOCCO is now in its Phase III and its achievements of the past 6 years include:

- Identification and explanation of some of the carbon biases in the Southern Ocean in Coupled Model Intercomparison Project Phase 5 (CMIP5) models used in developing the VrESM, thus contributing to making the VrESM a world leading Earth System Model in terms of representing Southern Hemisphere climate.
- Addressing one of the global challenges of resolving interannual variability of CO2 fluxes in the Southern Ocean.
- Developing global leadership in the biological carbon pump that will be translated into the parameters of a new VrESM model.
- SOCCO is becoming a global leader in understanding, through pioneering robotics observation and modelling, the role that fine scale dynamics play in shaping the phasing and the magnitudes of the seasonal cycle and its internal variability.
- Increased technical capacity in ocean science and sensor engineering in South Africa has been achieved in collaboration with tertiary institutions.
- Developing ocean modelling capability in South Africa, which is being used to collaborate with our colleagues at CSIR to develop a VrESM, which is the first African-based Earth System Model and Africa's only global climate change projection contribution to Assessment Report Six (AR6) of the Intergovernmental Panel on Climate Change (IPCC). The CSIR-VrESM will be the model used to inform long term risk and impacts of climate on rainfall, food security, health, fisheries and marine safety in Southern Africa and globally;
- The SOCCO and VrESM research programmes at the CSIR have also induced an extensive human capacity building programme in the Earth System Sciences, with tens of young scientists pursuing their post-graduate research as part of these programmes.

SOCCO and VrESM at CSIR, South Africa's Ocean-Climate Research Partnership, has brought the new dawn for African climate science opening the path towards enhanced national, continental and global impact in terms of climate research and pro-active adaptation policy making and decision making.

3.6. IMPROVING THE RELIABILITY OF CLIMATE CHANGE PROJECTIONS OVER AFRICA

Against this background of excellence in climate science and climate change policy making in South Africa the CSIR's SOCCO and VrESM research programmes are aiming to achieve enhanced national, continental and global impact. Through the SOCCO programme the CSIR and South Africa are well-positioned to increasingly perform world-leading research on the critical issue of how climate change may impact on the Southern Ocean carbon cycle, and thus on the rate of global warming. Moreover, it is the Southern Ocean and Antarctica that likely holds the key towards more skilful seasonal predictions of winter rainfall for South Africa – a critical issue for the country to resolve given the current water crisis in the Western Cape and parts of the Eastern Cape.

The VrESM modelling capability will enable more reliable projections of future climate change over South Africa and the SADC region. VrESM is the first climate model that is able to simulate the detailed coupled processes between the Agulhas current and

Benguela upwelling system and regional climate, enabling the first comprehensive analysis of climate change impacts on fisheries, coastal communities and coastal infrastructure. The model is also capable of simulating how the southern African land-surface may respond to climate change, with implications for the production of crops and livelihoods. It is through linking with the SOCCO programme, moreover, that the VrESM research programme will turn South African excellence in the climate sciences into a global capability serving the entire continent. With its focus on the Southern Ocean and Africa, an African country will, for the first time, be contributing projections of future global climate change to an Assessment Report of the IPCC. This will be a testimony to South Africa's commitment to excellence in climate science, pro-active adaptation policy making and commitment to the Paris Agreement. Moreover, as a result of South Africa's initiative, together with Brazil and India (which are developing similar Earth System Models), the developing world will for the first time have a voice in the global debate on global climate change projection.

CHAPTER REFERENCES

- Congress of South African Trade Unions (COSATU), 2009. Accessed 21 August 2018 at: http://www.cosatu.org.za/ docs/resolutions/2009/part1.pdf
- COSATU, 2010. A Growth Path Towards Full Employment: http://www.cosatu.org.za/show.php?ID=3952
- COSATU, 2011. COSATU Policy Framework on Climate Change: Adopted by the COSATU Executive Committee, August 2011. Accessed 21 August 2018 at: http://www. cosatu.org.za/docs/policy/2011/pol1119.html
- COSATU, 2013. A just transition to a low-carbon and climate resilient economy: COSATU policy on climate change: a call to action. Accessed 21 August 2018 at: http://www.sagreenfund.org.za/wordpress/wp-content/ uploads/2017/05/Naledi_A-just-transition-to-a-climateresilient-economy.pdf
- COSATU, 2018. Extracted directly from the COSATU website on 28 May 2018 http://www.cosatu.org.za/show. php?ID=5679
- Department of Environmental Affairs (DEA), 2011 National Climate Change Response Policy (NCCRP). Accessed 21 August 2018 at: https://www.environment.gov.za/sites/ default/files/legislations/national_climatechange_response_ whitepaper.pdf
- Republic of South Africa (RSA), 2015. South Africa's Nationally Determined Contribution. Accessed 21 August 2018 at: http://www4.unfccc.int/ndcregistry/pages/Party. aspx?party=ZAF

- Department of Environmental Affairs, 2017a. Local Government Climate Change Support Programme: 2016/17 Progress Report on the Rolling Out of the Let's Respond Toolkit.
- Department of Environmental Affairs, 2017b. Provincial Climate Change Adaptation Situational Analysis and Needs Assessment (SANAs) Implementation Update Report.
- Department of Health, 2012. National Climate Change and Health Adaptation Plan, 2012. Pretoria: Department of Health.
- Engelbrecht F., Ndarana T., Landman W., Van der Merwe J., Ngwana I. and Muthige M., 2015. Radiative forcing of southern African climate variability and change. WRC Report K5/2163. Water Research Commission, Pretoria. 53 pp.
- NUMSA and Transform RSA Granted an Interdict to Prevent Eskom IPP Contracts! 13 March 2018. Accessed at: https:// www.numsa.org.za/article/numsa-and-transform-rsagranted-an-interdict-to-prevent-eskom-ipp-contracts/
- National Planning Commission, 2011. National Development Plan 2030: Vision for 2030. Pretoria: NPC. Accessed 1 August 2018 at: https://www.gov.za/sites/default/files/devplan_2.pdf
- Republic of South Africa (RSA), 2015. South Africa's Nationally Determined Contribution. Accessed 21 August 2018 at: http://www4.unfccc.int/ndcregistry/pages/Party. aspx?party=ZAF



IMPLEMENTING THE NATIONAL CLIMATE CHANGE MONITORING AND EVALUATION SYSTEM

IMPLEMENTING THE NATIONAL CLIMATE CHANGE MONITORING AND EVALUATION SYSTEM

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Abbreviations and acronyms

Agriculture, Forestry and Other Land Use	NCCRP	National Climate Change Response Policy
Adaptation Nationally Determined Contribution	NDC	National Determined Contributions
Adaptation Nationally Determined Contribution	NDP	National Development Plan: Vision for 2030
Community Based Organisation	NGO	Non-Governmental Organisation
Conference of the Parties	QA/QC	Quality Assurance/Quality Control
Desired Adaptation Outcomes	PPD	Peak Plateau Decline
Department of Environmental Affairs	SAD	System Architecture and Design
Gross Domestic Product	CAFON	South African Environmental Observation
Greenhouse Gas	SAEUN	Network
Greenhouse Gas Improvement Programme	SARVA	South African Risk and Vulnerability Atlas
Human Development Index	SDG	Sustainable Development Goal
International Consultation and Analysis	SMS	Short Message Service
Intergovernmental Panel on Climate Change	UN	United Nations
Industrial Processes and Product Use		United Nations Convention to Combat
Monitoring and Evaluation	UNCED	Desertification
Measuring, Reporting and Verification	LINECCC	United Nations Convention on Climate Change
National Atmospheric Emissions information		officed Nations Convention on Climate Change
System		United Nations Office for Disaster Risk
National Adaptation Strategy	ontobit	Reduction
National Business Initiative	WRI	World Resources Institute
	Agriculture, Forestry and Other Land UseAdaptation Nationally Determined ContributionCommunity Based OrganisationConference of the PartiesDesired Adaptation OutcomesDepartment of Environmental AffairsGross Domestic ProductGreenhouse GasGreenhouse Gas Improvement ProgrammeHuman Development IndexInternational Consultation and AnalysisIntergovernmental Panel on Climate ChangeIndustrial Processes and Product UseMonitoring and EvaluationMeasuring, Reporting and VerificationNational Adaptation StrategyNational Business Initiative	Agriculture, Forestry and Other Land UseNCCRPAdaptation Nationally Determined ContributionNDCNDPNDPCommunity Based OrganisationNGOConference of the PartiesQA/QCDesired Adaptation OutcomesPPDDepartment of Environmental AffairsSADGross Domestic ProductSAEONGreenhouse GasSARVAHuman Development IndexSDGInternational Consultation and AnalysisSMSIntergovernmental Panel on Climate ChangeUNMonitoring and EvaluationUNCCDMational Atmospheric Emissions information SystemUNFCCCNational Adaptation StrategyWRI

4.1. NATIONAL APPROACH TO CHANGE MONITORING AND EVALUATION

4.1 1 National Climate Change Monitoring and Evaluation Themes and Indicators

Transparency and reporting of progress in responding to climate change, enabled by the National Climate Change M&E System, are key to the effective implementation of South Africa's Climate Change Response Policy (NCCRP) and the achievement of South Africa's NDP Vision for 2030. Furthermore, Climate change transparency is at the heart of the Paris Agreement and as such South Africa, along with other countries will need to enhance reporting on climate actions and their effects, among other things (DEA, 2017). The global climate change regulatory framework and Paris Agreement is discussed in more detail in Chapter 8 of this report.

South Africa's climate change transparency priorities and key themes have been identified, and are detailed in **Figure 7** below. These priorities and themes inform South Africa's domestic and international reporting obligations and are being integrated into the web-based platform.

MONITORING AND EVALUATION PRIORITIES AND THEMES

INSTITUTIONAL ARRANGEMENTS	NATIONAL CIRCUMSTANCES	HISTORICAL TRENDS	PROJECTIONS/ SCENARIO
 Climate change champions and funding for businesses, sectors, provinces and municipalities - OPERATIONAL Climate change champions and funding for businesses, sectors, provinces and municipalities - STRATEGIC Inclusion of climate change in business, sectoral, provincial and municipal/ committees at operational level Inclusion of climate change in business, sectoral, provincial and municipal/ committees at strategic level Institutional arrangements 	 National and regional development priorities, objectives & circumstances (including basis for addressing climate change and its adverse impacts) Emissions per capita (including & excluding land) over time Change over time in proportion of population in each age group Economic features (GDP, GDP change by industry, growth, exports, energy intensity, energy demand forecasts) Human Development Index (HDI) over time (compared to world) 	 Historical emissions (National, provincial) GHG emissions by gases GHG projections Net GHG emissions disaggregated by sub-sector GHG emissions time series by sector Distribution of gross and net emissions by sector (including and excluding AFOLU) Trends and levels of GHG emissions 	 Socio-economic scenarios Climate projections GHG emissions projections/ scenarios Provincial projections/ scenarios Municipal projections/ scenarios

ADAPTATION AND MITIGATION ACTIONS

- Plans, strategies, legal frameworks, bylaws, licenses
- Climate change priorities in policies and plans
- Research & systematic observations
- Technology transfer & development
- Adaptation and mitigation actions without quantified effects
- Education, training and public awareness
- Risk and vulnerability profiles

QUANTIFICATION OF IMPACTS OF CLIMATE ACTIONS

- Implementation progress of actions whose effects have been estimated
- Evidence of reactive action to reduce climate change impacts
- Evidence of proactive action to reduce climate change impacts
- Emissions reductions from annualised mitigation actions
- Sustainable development benefits of key climate actions
- Guidelines for assessing adaptation and mitigation actions
- Tracking GHG emissions reductions against PPD*/NDC
- Tracking adaptation actions against NDC adaptation

* Peak, Plateau and Decline (PPD) scenario

FIGURE 7: South Africa's climate change monitoring and evaluation priorities and themes

• Bilateral loans

Grants received

Multilateral loans

• Domestic financial flows

4.1.2 The Adaptation Outcomes Framework

The development of the Desired Adaptation Outcomes (DAOs) for monitoring and evaluating climate resilience was discussed in the first and second annual climate change reports (DEA 2016; DEA 2017). The set of cross-cutting adaptation outcomes has been updated and now comprises nine DAOs with cross-cutting, cross-sectoral relevance (**Table 2**).

TABLE 2: Relationship between desired adaptation outcomes and obligations under international climate change adaptation	-
related agreements	

Generic Desired Adaptation Outcomes (DAOs)		International agreement goals, targets, objectives and indicators achieved by reporting under each adaptation outcome		
G1	Robust/integrated plans, policies and actions for effective delivery of climate change adaptation, together with monitoring, evaluation and review over the short, medium and longer- term.	 A-NDC goal 1: Develop a National Adaptation Strategy (NAS), and begin operationalisation as part of implementing the National Climate Change Response Policy for the period 2020 to 2025 and for the period 2025 to 2030. A-NDC goal 2: Take into account climate considerations in national development, subnational and sector policy frameworks for the period 2020 to 2030. A-NDC goal 4: Develop an early warning, vulnerability and adaptation monitoring system for key climate vulnerable sectors and geographic areas for the period 2020 to 2030, and reporting in terms of the NAS with rolling five-year implementation periods (RSA 2015, 3–5). Sustainable Development Goal (SDG) indicator 13.1.1 under target 13.1.2: Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030). SDG indicator 13.2.1 under target 13.2: Number of countries that have communicated the establishment or operationalisation of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other) (UN 2018, 14). Sendai target 5: Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020. 		
62	Appropriate resources (including current and past financial investments), capacity and processes (human, legal and regulatory) and support mechanisms (institutional and governance structures) to facilitate climate change adaptation.	 Financial goal under Paris Agreement: Direct global finance flows (including private finance) towards low greenhouse gas and climate resilient investment (UNFCCC 2015a). A-NDC goal 3: Build the necessary institutional capacity for climate change response planning and implementation for the period 2020 to 2030. A-NDC goal 6: Communication of past investments in adaptation for education and awareness as well as for international recognition. SDG indicator 13.1.1 under target 13.1: Number of countries with national and local disaster risk reduction strategies. United Nations Convention to Combat Desertification (UNCCD) strategic objective (S0) 5: To mobilize substantial and additional financial and non-financial resources to support the implementation of the Convention by building effective partnerships at global and national level (progress indicators: Strategic Objective S0 5-1 Trends in international bilateral and multilateral official development assistance: S0 5-2 Trends in domestic public resources; S0 5-3 Trends in number of co-financing partners: S0 5-4 Resources mobilized from innovative sources of finance, including from the private sector) (UNCCD 2017: 9). Sendai target 6: Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030 (UNISDR 2015). 		
G3	Accurate climate information (e.g. historical trend data, seasonal predictions, future projections, and early warning of extreme weather and other climate-related events) provided by existing and new monitoring and forecasting facilities/networks (including their maintenance and enhancement) to inform adaptation planning and disaster risk reduction.	 Temperature goal under Paris Agreement: Hold global temperature increase below 2°C above pre-industrial levels while pursuing 1.5°C target (UNFCCC 2015a). A-NDC goal 4: Develop an early warning, vulnerability and adaptation monitoring system for key climate vulnerable sectors and geographic areas for the period 2020 to 2030, and reporting in terms of the NAS with rolling five-year implementation periods. SDG indicator 13.3.1 under target 13.1: Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. Sendai target 7: Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030. 		

Generic Desired Adaptation Outcomes (DAOs)		International agreement goals, targets, objectives and indicators achieved by reporting under each adaptation outcome		
G4	Capacity development, education and awareness programmes (formal and informal) for climate change adaptation (e.g. informed by adaptation research and with tools to utilise data/outputs).	 A-NDC goal 3: Build the necessary institutional capacity for climate change response planning and implementation for the period 2020 to 2030. A-NDC goal 6: Communication of past investments in adaptation for education and awareness as well as for international recognition. SDG indicator 13.3.1 under target 13.1: Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. SDG indicator 13.3.2 under target 13.3: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions. Sendai target 6: Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030. 		
G5	New and adapted technologies/ knowledge and other cost-effective measures (e.g. nature-based solutions) used in climate change adaptation.	 A-NDC goal 6: Communication of past investments in adaptation for education and awareness as well as for international recognition. SDG indicator 13.3.2 under target 13.3: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions. Sendai target 6: Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030. 		
G6	Climate change risks, impacts and vulnerabilities identified and addressed.	 A-NDC goal 5: Development of a vulnerability assessment and adaptation needs framework by 2020 to support a continuous presentation of adaptation needs. SDG indicator 13.1.2 under target 13.1: Number of deaths, missing persons and persons affected by disaster per 100,000 people. Sendai target 1: Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020 and 2030 compared to 2005-2015. Sendai target 2: Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020 and 2030 compared to 2005-2015. Sendai target 3: Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030. 		
G7	Systems, infrastructure, communities and sectors less vulnerable to climate change impacts (e.g. through effectiveness of adaptation interventions/response measures).	 Global adaptation goal under Paris Agreement: Enhancing adaptive capacity, strengthening resilience/reducing vulnerability to climate change. Temperature goal under Paris Agreement: Hold global temperature increase below 2 C above pre-industrial levels while pursuing 1.5 C target. UNCCD strategic objective 1: To improve the condition of affected ecosystems (progress indicators: S0 1-1 Trends in land cover; S0 1-2 Trends in land productivity or functioning of the land; S0 1-3 Trends in carbon stocks above and below ground). UNCCD strategic objective 2: To improve the living conditions of affected populations 		
G8	Non-climate pressures and threats to human and natural systems reduced (particularly where these compound climate change impacts).	 (progress indicators: S0 2-1 Trends in population living below the relative poverty line and/or income inequality in affected areas; S0 2-2 Trends in access to safe drinking water in affected areas). UNCCD strategic objective 3: To mitigate, adapt to, and manage the effects of drought in order to enhance resilience of vulnerable populations and ecosystems (progress to be monitored through qualitative information). UNCCD strategic objective 4: To generate global environmental benefits through effective implementation of the UNCCD (progress indicators: S0 4-1 Trends in carbon stocks above) 		
G9	Secure food, water and energy supplies for all citizens (within the context of sustainable development).	 and below ground; SO 4-2 Trends in abundance and distribution of selected species). UN Habitat New Urban Agenda strategic result under the focus area on urban planning and design: City, regional and national authorities have implemented policies, plans and designs through a participatory process including all different actors, such as civil society and poor people, for more compact, better integrated and connected cities that foster equitable sustainable urban development and are resilient to climate change (UN Habitat 2013). Sendai target 4: Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030. 		

These DAOs describe, in a general sense, a desired state that will enhance South Africa's transition towards climate resilience and fall into two distinct groups. Six of the nine DAOs (G1–G6) describe the 'inputs' (namely processes, resources and capacities) that need to be in place to enable effective climate change adaptation; and three DAOs (G7–G9) describe the key 'impacts' of adaptation interventions and associated measures (for example, reductions in vulnerability of human and natural systems).

Consultations have been undertaken with key sectoral and provincial stakeholders to gain ownership and acceptance of the DAOs concept, to fine-tune the DAOs, to consider the data needed to track progress towards their achievement, and to identify potential data sources.

4.1.2.1 International climate change adaptation-related agreements

South Africa is subject to a number of international environmental agreements, some of which require reporting on climate change adaptation, as outlined in **Figure 8** below.



FIGURE 8: International climate change adaptation-related agreements to which the DAOs are aligned

a. The Paris Agreement and NDC Adaptation goals

The central aim of the Paris Agreement (UNFCCC 2015a) is the long-term goal of holding global average temperature increase to well below 2 °C, and pursuing efforts to limit this to 1.5 °C above pre-industrial levels. The Paris Agreement also requires countries to effectively implement their national climate change commitments and to increase their 'ambition' over time. Achieving these goals requires finance, with the Agreement aiming to make all financial flows consistent with a pathway towards low-emissions, climate-resilient development.

The Agreement highlights the importance of monitoring, evaluation and learning from adaptation practice (Article 7, para 9d). To understand progress towards achieving climate resilient development, it requires all countries to provide information on climate change impacts and adaptation. It also stipulates a 'global stock take', which will include a review of adaptation effectiveness and progress made towards the global adaptation goal (enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change).

South Africa's NDC (RSA 2015) under Article 4.4 and the provisions of Article 12 of the Paris Agreement (UNFCCC 2015a) sets out how national commitments for adaptation will be met over the period 2020 to 2030 (RSA, 2015). The Nationally Determined Contribution will address adaptation through six goals (A-NDC goals). The relationship between the A-NDC goals and generic DAOs s is shown in Table 2, above.

b. Sustainable Development Goals targets and indicators

The 2030 Agenda on Sustainable Development (adopted by UN member states in 2015) consists of 17 goals, 169 targets and 231 indicators (UN, 2015). The targets are defined as aspirational and global, with each government setting its own national targets guided by the global 'ambition' but taking into account national circumstances. Goal 13 'climate action' (take urgent action to combat climate change and its impacts) comprises five targets, three of which are of particular relevance to adaptation in South Africa. The relationship between the SDG targets and indicators and generic DAOs is shown in Table 2, above.

c. United Nations Convention to Combat Desertification impacts and indicators

The UN Convention to Combat Desertification (UNCCD) adopted a 10-year strategy in 2007 for the period 2008–2018 (UNCCD, 2008). Four 'strategic objectives' were identified to guide actions and a number of 'expected impacts' capture the intended long-term effects of these objectives. At UNCCD COP13 (2017), countries agreed a new Strategic Framework to address land degradation, which currently affects over a third of the world's land resources. The new UNCCD 2018–2030 Strategic Framework (UNCCD 2017) is the most comprehensive global commitment to achieve Land Degradation Neutrality. Actions will be guided by five strategic objectives, the expected impacts of which will be monitored by a set of indicators. Parties may also wish to report on progress towards expected impacts for strategic objectives 1-3 by using nationally-relevant quantitative indicators or qualitative information, as appropriate. The relationship between the UNCCD strategic objectives and progress indicators for 2018–2030 and generic DAOs is shown in Table 2, above.

d. UN HABITAT New Urban Agenda focus areas and strategic results

In the strategic plan 2014–2019 for the UN Human Settlements Programme (UN Habitat 2013), which is focused on cities in the developing world, UN Habitat cites seven 'focus areas'. Focus area 2: Urban planning and design recognises that cities are facing increasing challenges associated with the impacts of climate change and that the pressure to adapt to these impacts is mounting (UN Habitat III 2018). The relationship between the focus area and its strategic result and the generic DAOs is shown in Table 2, above.

e. Sendai targets Sendai Framework for Disaster Risk Reduction

The Sendai Framework for Disaster Risk Reduction 2015–2030 (UNISDR 2015) outlines seven clear targets and four priorities for action to reduce existing and prevent new disaster risks. It aims to achieve a substantial reduction in disaster risk and loss of life, livelihoods and health, and of the cultural, economic, environmental, physical and social assets of people, businesses, communities and countries over a 15-year period. The United Nations Office for Disaster Risk Reduction (UNISDR) is tasked with the implementation, follow-up and review of the Sendai Framework. The relationship between the Sendai targets and generic DAOs is shown in Table 2, above.

4.1.3. Monitoring and evaluation

A simple pragmatic approach has been developed to monitor and evaluate the progress being made in achieving individual DAOs. The approach uses traffic light colours as a scoring system to summarise progress, for example:

- Legal frameworks, plans/strategies, policies, programmes and projects **not informed** by risk and vulnerability profiles.
- Legal frameworks, plans/strategies, policies, programmes and projects **informed by** risk and vulnerability profiles.

Implementation of legal frameworks, plans/strategies, policies, programmes and projects **informed by risk and vulnerability profiles AND contributing** to reducing vulnerability and enhancing capacity to respond to climate change impacts

Responsibility for delivering individual DAOs will rest with a range of stakeholders operating at different spatial scales (namely, national and/or provincial and/or municipal). Whilst some stakeholder groups may have systems and indicators in place to monitor their activities (NBI 2017), others will not. This approach will enable all stakeholders to gather basic data and information, from which a cumulative 'score' of progress can be derived. Stakeholder groups will be informed of specific data/information needs and of the time period for which these are required. The data/ information collected from individual groups will be aggregated to provide a total 'indication' of progress for that DAO. A summary of progress for the specified time period will then be presented graphically. Table 3 illustrates the approach by providing a 'hypothetical' summary of progress towards a sub-set of generic DAOs.

TABLE 3: Hypothetical summary of progress towards a sub-set of generic DAOs

DAOs	Summary of progress (for a specified time period)		
G1			
G6			
G7			
G8			

By comparing progress summaries for successive reporting periods, the effectiveness of adaptation interventions in addressing adaptation priorities and, therefore, delivering climate resilience can be determined.

Data/information needs to monitor and evaluate progress and understand effectiveness of DAOs

Reliable and readily available data and/or information are required to enable progress in achieving individual DAOs to be accurately and repeatedly monitored over time and to understand their effectiveness in reducing vulnerability and enhancing resilience to climate change. The DAOs have been customised for different stakeholders including: business, sector departments, provincial and municipal government. Stakeholder consultations were carried out to identify the data/information (including any existing indicators) needed for their monitoring and evaluation; these are summarised in Table 4.

TABLE 4: Information needed to monitor and evaluate progress and understand effectiveness of generic DAOS s customised to be business-, sector-, province- and municipality-specific

Monitoring	Evaluation
DAO 1. Climate change adaptation fully integrated for effective de including governmental, sectoral/multi-sectoral, and NGO/CBO p	elivery into business, provincial and municipal planning processes, Planning [G1].
 Number of business, sectoral, provincial and municipal legal frameworks, plans/strategies, policies, programmes and projects that incorporate climate change adaptation. Examples: Spatial development frameworks/environmental management frameworks; Growth and development strategies; Disaster management plans; Conservation plans; Food and energy security strategies; Coastal management programmes; Agricultural plans and strategies; Integrated development plans and associated sector plans as prescribed in Municipal Systems and Structures Act; Water catchment strategies; Integrated waste management plans; Alien invasive strategies; Environmental impact assessments; International agreements on water allocation; Business plans; Land capability plans; Greening and green economy strategies; Forest protection strategies; Water management strategies; Education. Economic, tourism plans, human settlements/rural development plans; Licensing/permitting/authorisation procedures and by-laws; and, 	 Legal frameworks, plans/strategies, policies, programmes and projects not informed by existing risk and vulnerability profiles that include climate risks and impacts. Legal frameworks, plans/strategies, policies, programmes and projects informed by risk and vulnerability profiles that include climate risks and impacts. Implementation of legal frameworks, plans/strategies, policies, programmes and projects - informed by risk and vulnerability profiles that include climate risks and impacts. Implementation of legal frameworks, plans/strategies, policies, programmes and projects - informed by risk and vulnerability profiles that include climate risks and impacts - to reduce vulnerability in risk and vulnerability profiles and enhance capacity to respond to climate change impacts.

Monitoring	Evaluation
DAO 2. Appropriate resources, capacities, processes and mechani provinces and municipalities [G2].	sms for facilitating climate change adaptation in businesses,
 i. Dedicated climate change champions/nodes/units and funding for businesses, sectors, provinces and municipalities (metropolitan, district and local); ii. Climate change training programmes; iii. Inclusion of climate change agendas in business, sectoral, provincial and municipal forums/committees (e.g. Climate Change Sustainability Councils, Municipal Climate Change Task Teams, Disaster Management Advisory Forums, Ward Councillor meetings, Provincial Cluster meetings, Board- level oversight); and iv. Implementation of forum/committee climate change action plans) dedicated budget/funding (including monetary incentives). 	 No dedicated political/administrative champions, capacity, structure (i.e. organogram with climate change key performance indicators or Board-level oversight of climate change) or funding (including monetary incentives); no inclusion of climate change items in existing administrative and political forums/committees in businesses, sectors, provinces and municipalities. Political/administrative champions designated but with no capacity, structure (i.e. organogram) or funding; inclusion of climate change items only by request in existing administrative and political forums/committees. Political/administrative champions designated, and capacity, structure (i.e. organogram/Board-level oversight) and dedicated funding; climate change standing item in administrative and political provincial, municipal and sector forum/committee agendas.
DAO 3. Accurate climate information (e.g. historical trend data, sea weather and other climate-related events) provided by existing an their maintenance and enhancement) to inform adaptation plannin municipalities [G3]	asonal predictions, future projections, and early warning of extreme d new monitoring and forecasting facilities/networks (including 1g and disaster risk reduction in businesses, provinces and
 i. Historical climate trends; ii. Fine-scale projections, forecasts (seasonal to inter-annual and intra-seasonal variability) and early warning systems for provincial and municipal use; iii. Dissemination and communication platforms for weather and climate-related events (e.g. SMS and media); (iv) utilisation of data/information products by end-users; and iv. Maintenance and enhancements of monitoring and forecasting facilities/networks. 	 No dissemination and utilisation of weather and climate-related information. Lack of monitoring and forecasting facilities/networks. Dissemination but no utilisation of weather and climate-related information. Monitoring facilities/networks exist but are not well-maintained or enhanced. Dissemination and utilisation of weather and climate-related information at provincial, municipal and community levels. Monitoring facilities/networks exist and are maintained and enhanced.
DAO 4. Capacity development programmes in businesses, province research [G4]	es and municipalities informed by locally-specific adaptation
 Number of capacity development programmes (including students, staff, researchers and institutions) addressing climate change adaptation; Coverage of adaptation research and training being undertaken and financed; Uptake of research outcomes and human capacity trained in adaptation; Collaboration and partnerships between sectors, businesses, provinces, municipalities and researchers; and Incorporation of climate change issues into school curriculum. 	 No capacity building programmes (including research), collaboration and partnerships to address climate change adaptation and no incorporation into school curriculum. Attendance of capacity building programmes but no utilisation, collaboration and partnerships to address climate change adaptation and no incorporation into school curriculum. Capacity building programmes (including research and utilisation), collaboration and partnerships to address climate change adaptation, incorporation into school curriculum.
DAO 5. Development and implementation of new technologies, res provinces and municipalities [G5]	earch and knowledge on climate change adaptation for businesses,
 New technologies, research and knowledge adopted; ii. Indigenous knowledge systems; iii. Technology needs assessments; iv. Technology transfer and access (national and global); v. Web-based tools on technologies and technology transfer opportunities; and 	 Lack of awareness/understanding of newly developed technologies, research and knowledge leading to poor or no application. Awareness/ understanding of technologies, research and knowledge but no implementation and utilisation. Evidence of implementation and utilisation of technologies

- vi. Other adaptation challenges and opportunities on technologies, research and knowledge.
- Evidence of implementation and utilisation of technologies and knowledge (e.g. 100 households now have rainwater harvesting devices and have received training on how to use and maintain them).

IMPLEMENTING THE NATIONAL CLIMATE CHANGE MONITORING AND EVALUATION SYSTEM

Monitoring	Evaluation		
DAO 6. Climate change risks, impacts and vulnerabilities identified municipalities [G6]	d and addressed in businesses, sectors, provinces and		
Details of sectoral, business, provincial and municipal risk profiles and vulnerability assessments and measures/actions to address the identified risks, impacts and vulnerabilities in businesses, sectors, provinces and municipalities.	 No risk and vulnerability profiles. Risk and vulnerability profiles identified. Risks, impacts and vulnerabilities addressed in policies, plans and actions. 		
DAO 7. Systems, infrastructure, communities and sectors in busin change impacts [G7]	esses, provinces and municipalities less vulnerable to climate		
Evidence of reduced risk/vulnerability as a result of addressing the identified risk/vulnerability.	 Lack of behavioural/system/infrastructure change/ modification as a result of addressing identified risks (including climate risk) and vulnerabilities to reduce climate change impacts. Evidence of reactive behavioural/system/infrastructure change/modification as a result of addressing identified risks (including climate risk) and vulnerabilities to reduce climate change impacts. Evidence of proactive behavioural/system/infrastructure change/modification as a result of addressing identified risks (including climate risk) and vulnerabilities to reduce climate change/modification as a result of addressing identified risks (including climate risk) and vulnerabilities to reduce climate change impacts. 		
DAO 8. Reduction in non-climate pressures and threats in businesses, provinces and municipalities [G8]			
Land use and land use change, population demographics, pollution, water quality and siltation of dams, protection and enhancement of natural resources and other environmental assets, service delivery protests, non-maintenance of infrastructure, and socio-economic status/factors.	Findings from surveys and datasets (e.g. green/blue drop status, community satisfaction surveys, StatsSA census of socio-economic indicators etc.) will be used for this purpose.		
DAO 9. Secure food, water and energy production and supplies in businesses, provinces and municipalities [G9]			

Climate smart agricultural practices, conservation agriculture practices, and water conservation and demand practices.

- No climate resilient measures/actions implemented to ensure secure food, water and energy.
- Climate resilient measures/actions implemented to ensure secure food, water and energy.
- Evidence of secure food, water and energy in communities as a result of implementing climate-resilient measures.

Nine generic DAOs have been developed, each of which describes, in a general sense, a desired state that will enhance South Africa's transition towards climate resilience. These DAOs s fall into two distinct groups: six DAOs describe the 'inputs' that need to be in place to enable effective climate change adaptation; and three DAOs describe the key 'impacts' of adaptation interventions and associated measures.

Clearly defined synergies exist between the generic DAOs and the adaptation commitments – goals, targets, impacts and indicators – in a number of key international agreements. A simple approach to monitoring and evaluating the progress being made in achieving individual DAOs has been proposed. this approach should make reporting on climate change adaptation, both through DAOs and corresponding national and international adaptation commitments, more relevant to the ongoing, planned and future adaptation work in 'at risk' sectors and across national, provincial and municipal levels of government.

4.2. ACHIEVEMENTS OF THE NATIONAL CLIMATE CHANGE MONITORING AND EVALUATION SYSTEM

4.2.1. The Climate Change Monitoring and Evaluation System Web-based Platform

A considerable amount of work has been achieved since the second annual report. The country is developing a web-based platform for the M&E system and climate Change Information System to understand the country's progress in the transition to low-carbon and climate-resilient society and economy. The first step in the establishment of this web-based platform included a series of documents, including a detailed design document and further guidance on how the system would to be set up. The five outputs from this work are shown in **Figure 9**.

Domestic systems	International systems	User requirements	System design document	System phasing
review report	review report	specification		plan
 Reviews existing systems in the country containing data relevant to climate change monitoring and evaluation. Proposes how this data can be collated, disseminated and reused in the proposed system. 	 Reviews existing international M&E and MRV systems that track climate change mitigation, adaptation actions and climate finance. Describes how these systems have been developed and operated, and then recommends how South Africa's system can be developed and implemented. 	Specifies user requirements for the proposed system, including data presentation and interfaces, analytical needs, linkages with other systems, reports to be produced.	Outlines a design for the proposed system, including information flows, process flows, interface design, actors, user access, reporting structure, cross-system interfaces and QA/QC.	 Defines a high-level phasing plan for the development and evolution of the system. Gives a breakdown of the components of each of the phases and the motivation for their inclusion in a particular phase.

FIGURE 9: Building South Africa's Climate Change Monitoring and Evaluation System

A web-based prototype has since been developed, in partnership with South African Earth Observation Network (SAEON). The prototype consists of adaptation, mitigation and monitoring and evaluation components. It aggregates information from the South African Risk and Vulnerability Atlas (SARVA), National Climate Change Response Database (NCCRD), and a growing list of contributing relevant systems. Consultations will be undertaken with a range of stakeholders to review and refine the prototype.

4.2.2. The Climate Change Monitoring and Evaluation System Visualisation Platform

The themes and priorities in mentioned earlier in this chapter will be used to present the outputs as infographics. The work on infographics is developed under the partnership between the Department of Environmental Affairs (DEA) and the World Resources Institute (WRI). The infographics platform will present and visualise information, data or knowledge on national climate change response actions, in an informative, engaging and inspiring manner for various audience groups both nationally and internationally. The primary objective is the presentation of climate information in a more visual and easier to explore format for use by various user groups. It will also serve as a communication tool for understanding and providing insight on South Africa's climate action and priorities. **Figure 10** below provides an overview of the tool outputs.



The Climate Change Flagship Programmes are strategic measures implemented by the South African government to trigger a large-scale transition to a low-carbon economy and create a more climate-resilient South Africa. They signal climate change investment priorities and provide the certainty needed to stimulate further investment.



FIGURE 10: A screenshot of South Africa's Infographics draft climate action portal

4.2.3. The National Greenhouse Gas Emission Reporting Regulations and Technical Guidelines

South Africa's 2nd Annual Climate Change Report reported on the National GHG Emission Reporting Regulations that took effect on 3 April 2017. The regulations seek to introduce a single national reporting system for the transparent reporting of GHG emissions and will be used to update and maintain the National GHG Inventory (DEA, 2017). The National GHG Emission Reporting Regulations fall under the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004). The regulations provide for mandatory reporting of GHG emissions by entities (companies and installations) that emit more than 0.1 Mt of GHGs annually, or that consume electricity which results in more than 0.1 Mt of emissions from the electricity sector. The regulations require emitting entities to register on the National Atmospheric Emissions and activity data for all their facilities for the preceding calendar year. The registration of reporting companies was done manually as the NAEIS is not yet able to meet the registration and reporting requirements. Modifying the NAEIS to meet the requirements of the National GHG Emissions Reporting Regulations is being undertaken through a project led by National Treasury and involving the DEA and the

Department of Energy. The regulations classify entities conducting controlled activities into two categories: category A data providers are private companies that emit GHG emissions and are liable for reporting under the regulations; category B data providers are mainly public institutions which will submit activity data and GHG emissions data upon request by the DEA. A total of 154 category A data providers with over 1,435 facilities have registered with the DEA as of April 2018.

The Technical Guideline describes the reporting methodology as specified in the National Environmental Management: Air Quality Act, 2004: National GHG Emission Reporting Regulations. The purpose of these technical guidelines is to provide guidance to reporting companies on methodologies to apply when quantifying GHG emissions from activities listed for reporting under the GHG Reporting Regulations. These technical guidelines embody the latest methods for estimating emissions and are based on the 2006 IPCC Guidelines for compilation of national GHG inventories, providing additional guidance and commentary to assist data providers in estimating GHG emissions for reporting in the NAEIS. The technical guidelines support the process to update and maintain a National GHG Inventory for South Africa.

A series of consultations were held with the industry to develop this guidance which is now at an advanced stage of development to support entities under the GHG Reporting Regulations.

4.2.4. The National GHG Inventory Management System

South Africa is implementing a national GHG inventory system to provide detailed, complete, accurate and up-to-date GHG Inventory. The system is intended to achieve the following key outcomes:

- a. Strengthening the institutional arrangements around national inventories, including legal matters.
- b. Sharing experience on technical guidelines, data collection and archiving, documentation of methods, quality assurance and quality control, uncertainty analysis, reporting and tools.

The national GHG inventory management system is made up of two sub-systems:

- a. A web-based reporting system and the mapping of data flows for all the relevant sectors.
- b. The process governance which includes the institutional arrangements and the setting up of the National Inventory Unit within the DEA.

There have been major achievements since the 2nd Climate Change Report. The initial version of the system has been completed and is currently being piloted. Other major key system development milestones are shown in **Figure 11** below.



FIGURE 11: National GHG Inventory management system development milestones

The next planned activities on the system development will include the review of the National GHG System to improve the GHG inventory taking into account the outcomes of the International Consultation and Analysis (ICA) recommendations as well as the pilot testing of the system in order to move towards full operationalisation of the system.

4.2.5. The Greenhouse Gas Improvement Programme

The Green House Gas Improvement Programme (GHGIP) refers to a series of sector-specific projects aimed at improving the quality and accuracy of the National GHG Inventory. The programme entails developing country specific emission factors for different sectors and sub-sectors in order to improve calculation of greenhouse gas emissions and reduce uncertainty. A majority of projects are donor funded with clear objectives and targets primarily focusing on the improvement of estimation methodologies, activity data and development of country-specific emission factors. The sectors covered in the GHGIP are the Energy Sector, Industrial Processes and Product Use (IPPU) and Agriculture, Forestry and Other Land Use (AFOLU). Table 5 below shows progress in achieving the various projects implemented under the programme.

TABLE 5: Greenhouse Gas Improvement Programme projects update

Projects	Purpose	Progress
GHG Improvement – HFC Survey	Survey on HFC consumption, application and production in South Africa.	Completed
GHG Improvement – Ferroalloys	Development of a country-specific CO ₂ emission factor for the estimation of GHG emissions for ferroalloy production, specifically ferrochrome (FeCr) in the metal industry	Completed
GHG Improvement – Road Transport Modelling study	Development a country-specific CO ₂ emission factor for the estimation of GHG emissions for ferroalloy production, specifically ferrochrome (FeCr) in the metal industry	In progress
GHG Improvement – Road Transport Emission Factor (EF) study	Development of country-specific Road Transport emission factors for CO_2 , CH_4 and N_2O [CO_2 – based on carbon content of petrol and diesel] [$CH4$ - measure EF by vehicle type [N_2O – vehicle type with and without catalytic converter].	In progress

4.2.6. Climate Change M&E Guidelines

The DEA is developing a series of sector-specific mitigation M&E guidelines to enable various stakeholders to quantify emissions reductions and other sustainable development indicators, programmes and projects to support implementation of the M&E system. The guidelines are comprehensive in their scope and provide working examples applied to mitigation measures, technologies and processes prioritised in various climate change policy and strategy documents. The guidelines will be applied by various users to understand the effects of policies, programmes and strategies on GHG reductions and on sustainable development outcomes in the various sectors and to inform policy design and implementation. A summary of the individual sector guidelines is shown in Table 6 below.

Title	Purpose	Partners
Volume 1 : Policies, Strategies And Laws	Provides overall accounting approach for estimating GHG and Non-GHG effects of policies and actions, without providing calculation formulas and data requirements.	WORLD RESOURCES INSTITUTE
Volume 2: Energy & Transport Sector	Provides detailed equations and data requirements for assessing M&E system indicators in the Energy and Transport sectors, including GHG effects.	FROM THE AMERICAN PEOPLE
Volume 3: Waste Sector	Provides detailed equations and data requirements for assessing M&E system indicators in the Waste sector, including GHG effects.	Not Applicable
Volume 4: Industrial Processes and Product Use Sector (IPPU) Volume 5: Transport Sector	Provides detailed equations and data requirements for assessing M&E system indicators in the IPPU sector, including GHG effects.	
Volume 5 : Agriculture, Forestry and Other Land Use (AFOLU) sectors	Provides detailed equations and data requirements for assessing M&E system indicators in the AFOLU sector, including GHG effects.	Australian Government

TABLE 6: Scope and supporting partners for the development of the mitigation M&E sector guidelines

The M&E guidelines have already been applied to the Public Transport Policy and National Waste Management Strategy.

CHAPTER REFERENCES

- Department of Environmental Affairs (DEA), 2011. National Climate Change Response White Paper. Accessed on 9 March 2018 at: https://www.environment.gov.za/sites/default/files/legislations/national_climatechange_response_whitepaper.pdf.
- Department of Environmental Affairs (DEA), 2016. South Africa's First Climate Change Annual Report 2015. Accessed 1 March 2018 at: https://www.environment.gov.za/otherdocuments/reports/southafricas_firstnational_climatechange.
- Department of Environmental Affairs (DEA), 2017. South Africa's Second Climate Change Annual Report 2016. Accessed 1 March 2018 at: https://www.environment.gov.za/otherdocuments/reports/southafricas_secondnational_climatechange.
- National Business Initiative (NBI), 2017. A New Climate of Risk: How South African Businesses Are Adapting to Climate Change.
- Republic of South Africa (RSA), 2015. South Africa's Intended Nationally Determined Contribution. Accessed on 1 March 2018 at: http://www4.unfccc.int/ndcregistry/PublishedDocuments/South%20Africa%20First/South%20Africa.pdf.
- United Nation (UN), 2015. Sendai Framework for Disaster Risk Reduction 2015-2030. Accessed 1 March 2018 at: https://www. unisdr.org/we/inform/publications/43291.
- United Nations Convention to Combat Desertification (UNCCD), 2008. The 10-Year Strategic Plan And Framework To Enhance The Implementation Of The Convention [to Combat Desertification]. Accessed 9 March 2018 at: https://www2. unccd.int/sites/default/files/sessions/documents/ICCD_CRIC7_2/2eng.pdf
- United Nations Habitat (UN), 2013. Strategic Plan 2014–2019 of the United Nations Human Settlements Programme. Accessed 1 March 2018 at: https://unhabitat.org/un-habitats-strategic-plan-2014-2019/.
- United Nations Framework Convention on Climate Change (UNFCCC), 2015a. Paris Agreement. Accessed 1 March 2018 at: https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf.
- United Nations (UN), 2015b. Sustainable Development Goals. Accessed 1 March 2018 at: http://www.un.org/ sustainabledevelopment/development-agenda/.
- United Nations (UN), 2017. The Future Strategic Framework of the Convention [to Combat Desertification]. Accessed 26 March 2018 at: https://www2.unccd.int/sites/default/files/inline-files/ICCD_COP%2813%29_L.18-1716078E_1.pdf.
- UN Habitat III 2018. United Nations Conference on Housing and Sustainable Urban Development (Habitat III) Quito, 17–20 October 2016, A/CONF.226/4*. Accessed 21 August 2018 at: http://nua.unhabitat.org/uploads/ DraftOutcomeDocumentofHabitatIII_en.pdf



TRACKING SOUTH AFRICA'S TRANSITION TO A CLIMATE RESILIENT ECONOMY AND SOCIETY

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Abbreviations and acronyms

A-NDC	Adaptation Nationally Determined Contribution
DA0s	Desired Adaptation Outcomes
DEA	Department of Environmental Affairs
DHS	Department of Human Settlements
DOJ	Department of Justice
DoH	Department of Health
DST	Department of Science and Technology
GDARD	Gauteng Department of Agriculture and Rural Development
GIZ	Gesellschaft für Internationale Zusammenarbeit
M&E	Monitoring and Evaluation
MEIA	Monitoring, Evaluation and Impact Assessment
NCCRP	National Climate Change Response Policy
NDC	National Determined Contributions
NDMC	National Disaster Management Centre
NDP	National Development Plan: Vision for 2030
NGO	Non-Governmental Organisation
NRF	National Research Foundation
PV	Photovoltaic
SACN	South African Cities Network
SAWS	South African Weather Services
UN	United Nations
UNDP	United Nations Development Programme
UNISDR	United Nations Office for Disaster Risk Reduction
WHO	World Health Organization

5.1. PROGRESS IN MONITORING ADAPTATION ACTIONS AND SUPPORTING THE POLICY ENVIRONMENT

Noteworthy progress has been achieved in adaptation M&E responses, working closely with government departments, state-owned entities and non-governmental organisations that are pioneering work in this area. This chapter provides an update on monitoring and evaluation of climate resilience since the publication of South Africa's first and second climate change reports (DEA 2016; DEA 2017). It considers the progress made in monitoring and evaluating adaptation responses, as required in the National Climate Change Response Policy (NCCRP) (DEA 2012) and the adaptation goals in the country's Nationally Determined Contribution (A-NDC) (RSA 2015) under the Paris Agreement (UNFCCC 2015). In addition, it outlines links with other international environmental agreements that require reporting on adaptation.

Much of this adaptation M&E work over the past year has focused on two aspects of building climate resilience:

- a. Planning and regulatory frameworks and actions underpinning effective climate change adaptation and ongoing M&E (DAO G1)
- b. The extent to which accurate climate information informs adaptation planning and disaster risk reduction ((DAO G3)

This work was presented at a workshop hosted by the Department of Environmental Affairs (DEA) and GIZ.

5.2. PLANNING AND REGULATORY FRAMEWORKS AND ACTIONS UNDERPINNING EFFECTIVE CLIMATE CHANGE ADAPTATION

5.2.1. Department of Health

Supporting policy environment at national and international levels

The NCCRP requires sectors (including the health sector) to develop adaptation plans and monitor their responses to climate change impacts (DEA, 2012). The National Climate Change and Health Adaptation Plan 2014-19 (DoH 2014) requires the following:

- Strengthening the monitoring and surveillance of public health systems to detect climate change and health trends.
- Assessing the readiness of the emergency medical services and health facilities to respond to climate change casualties and other health impacts.

The Paris Agreement highlights the importance of monitoring, evaluation and learning from adaptation practice (UN 2015, Article 7, para 9d). Understanding progress towards achieving climate resilient development requires all countries to provide information on climate change impacts and adaptation. The United Nations Development Programme (UNDP) is providing support to the implementation of Sustainable Development Goal 3 (promote good health and well-being by improving access to quality health care) and Goal 13 (reduce impacts of climate change, includes health impacts) (UNDP 2017). The World Health Organisation's (WHO) new Regional Strategy for the Management of Environmental Determinants of Human Health in the African Region 2017–2021 requires member countries to develop climate change adaptation plans, to mainstream climate change into health programmes, and to conduct surveillance of climate-sensitive diseases (WHO 2017). In addition, the Adopted Joint Statement on Climate Change and Health (African Ministers of Health and Environment) emphasises the need to implement an essential public health package to enhance climate change resilience in the health sector (WHO 2010).

Monitoring and Evaluation

The Department of Health (DoH) has developed draft climate change adaptation indicators for the health sector with the following objectives (DoH 2014):

- To identify and understand disease thresholds and monitor disease trends in different provinces, in order to ensure informed decision-making and timely intervention measures.
- To identify populations at risk from climate change health impacts.
- To establish health data that can be used for future assessment of human health vulnerability to climate change.
- To institute effective intervention and prevention measures to ensure stability and resilience to climate change health impacts.
- To monitor and evaluate the effectiveness of health response measures, and policies and programmes to improve public health.
- To assess the health care system's readiness to deal with casualties from climate change disasters.

These indicators, most of which are already being monitored by the DoH for other purposes, are awaiting high-level approval, and are summarised in **Table 7** below:

Health climate-sensitive disease indicators	Health care system readiness assessment indicators
Child under 5 years severe acute malnutrition incidence	11. Mental illness case load
Child under 5 years diarrhoea with dehydration incidence	12. Emergency medical services P1* urban response under 15 minutes rate
School learner underweight rate	13. Emergency medical services P1 rural response under 40 minutes rate
Notifiable medical condition environmental health investigation rate	14. School learner screening coverage
Cholera cases reported	15.Number of functional ward-based primary health care outreach teams
Malaria cases reported	16. Number of primary health care facilities in 52 districts that qualify as ideal clinics
Yellow Fever cases reported Dengue Fever cases reported West Nile Virus cases reported Rift Valley Fever cases reported	Number of hospitals that comply fully with national core standards

TABLE 7: Department of Health – draft climate change adaptation indicators

* P1 priority 1

Monitoring is being conducted by the following:

- Health Information System Programme District Health Information System
- Malaria Directorate
- Communicable Disease Directorate
- Surveillance Directorate
- National Institute of Communicable Diseases
- Environmental Health Directorate
- Hospital services
- Primary health care
- Monitoring and Evaluation Unit District Health Information System indicators and strategic indicators (compliant hospitals, functional ward-based primary health care outreach teams, qualifying ideal clinics, mental illness screening case load)
- Provinces, districts and municipalities

Target audiences for the resulting data and/or information include:

- Public health programme managers
- Heath policy-makers
- Policy implementers in provinces, districts and municipalities
- Health research institutions
- Health academic institutions
- Interested and affected government institutions
- Interested and affected non-governmental organisations
- Interested and affected community members.

Raw data and dedicated reports should be available from the Department of Health and provincial, district and municipal health department websites. The Department of Health, for example, intends to publish an indicators analysis report once its indicator set has been approved. Access to information will be based on the provisions of relevant legislation (Access to Information Act, 2000, as amended; National Health Act, 2003, as amended). Additional information should be available from Statistics South Africa and the World Health Organization.

Assessment of effectiveness of responses and lessons learnt

The Health Information System Programme is supporting various public health programmes within the Department of Health. These include the development and analysis of District Health Information System indicators, for which training has been given to data managers in provinces and municipalities. Strategic health care indicators (for example state of readiness indicators) are planned to monitor progress and report on achievements annually. These are reviewed monthly/quarterly, with challenges identified and action plans developed where nonachievement has been recorded. The analysis of identified climate-sensitive diseases is reported and discussed monthly by the multi-stakeholder National Outbreak Response Team, wherein various internal public health programmes, the National Institute of Communicable Diseases, and the World Health Organization (WHO) Regional Office are represented. The analysis of climate change indicators related to environmental health are also reported and discussed at guarterly inter-provincial environmental health meetings, in which provincial and municipal environmental health professionals are represented.

Continuous stakeholder involvement, including high-level management commitment, is important in the development and implementation of adaptation plans. Access to data and information remains a key challenge. There is a need for moreeffective data gathering on key conditions that are related to climate change (for example respiratory conditions, heat stress and heat stroke) and to develop dedicated guidance and action plans.

A health vulnerability assessment is an important first step in the development of an action plan; this should help establish adaptation measures to address the vulnerabilities identified. There is also a need to strengthen the role of provincial, district and municipal health departments when the National Climate Change and Health Adaptation Plan is reviewed. Momentum is growing with the development of adaptation plans, although human health impacts and adaption measures are often absent.

5.2.2. Department of Human Settlements

Supporting policy environment, guidelines and baseline studies

Figure 12 provides a summary of the relevant supporting policy framework, guidelines and studies for climate change in the context of Human Settlements.



FIGURE 12: Overview of the supporting policy framework, guidelines and studies for climate change in the context of human settlements

- **Constitution of Republic of South Africa:** Section 26 of the Constitution of the Republic of South Africa (DOJ 1996) states that everyone has the right to adequate housing, that the state must take reasonable legislative and other measures, with its available resources, to achieve the progressive realisation of this right, and that no one maybe evicted from their home, or have their home demolished, without an order of court made after considering all the relevant circumstances. No legislation may permit arbitrary evictions.
- UN-HABITAT Agenda: In 1996 the South African government committed to the Habitat Agenda for sustainable human settlement. It offers, within a framework of goals, principles and commitments, a positive vision of sustainable human settlements where all have adequate shelter, a healthy and safe environment, basic services, and productive and freely chosen employment.
- The Housing Act, 1997 (Act No. 107 of 1997: The Housing Act (DHS 1997) expands on the provisions of the Constitution by prescribing general principles for housing development and defining the housing development functions of national, provincial and local governments.
- National Environmental Management Act, 1998 (Act No. 107 of 1998): Section 11 of the National Environmental Management Act requires that the national and provincial departments 'exercising functions which may affect the environment', in terms of Schedule 1 of the Act, 'must prepare an environmental implementation plan' and monitor the implementation on a regular basis. (DEA 1998).

The Department of Human Settlements (DHS) is listed in Schedule 1 and is, therefore, required to prepare an Environmental Implementation Plan. The plan has to be reviewed at least every four years. The mostrecent plan is for the period 2014/15–2019/20 (DHS 2015).

A baseline study assessment for the future impact evaluation of informal settlements targeted for upgrading has been implemented (DHS 2016). This study collected data to: (i) strengthen the implementation and improve the performance of the Upgrading of Informal Settlements Programme; (ii) determine the nature and sustainability of the programme's outcomes; and (iii) determine measurable impacts on beneficiaries and communities in the programme. The findings indicate that informal settlements are places of multiple deprivation. Key development indicators on health, safety, income and unemployment revealed poor levels of health and nutrition, high unemployment and underemployment levels, as well as high levels of risk and vulnerability.

National norms and standards for the construction of stand-alone residential units are in place. In terms of the definitions in the Introduction to the Housing Act, 1997, 'housing development' equates to 'the establishment and maintenance of habitable, stable and sustainable public and private residential environments to ensure viable households and communities in areas allowing convenient access to economic opportunities, and to health, educational and social amenities in which all citizens and permanent residents of the Republic will, on a progressive basis, have access to:

a. Permanent residential structures with secure tenure, ensuring internal and external privacy and providing adequate protection against the elements; and b. Potable water, adequate sanitary facilities and domestic energy supply.' (DHS 1977, 4)

Against this background, revised national norms and standards were introduced (DHS 2009a), including prescripts regarding the housing typologies to be financed through future housing programmes.

Guidelines on environmentally sound low-cost housing have been developed: Environmental issues are inherently linked with the quality of life. Settlements are often strongly influenced by and can themselves influence resources in the environment. Environmentally sound settlements (DHS, 2009b) are characterised by good air quality, energy and water efficiency, and planting that provides green 'lungs' and, where possible, food security. These guidelines relate to two major aspects in the development of environmentally sound low-cost housing: energy efficiency and water efficiency.

Energy efficient housing can be enhanced by thermally efficient design considerations, such as:

- Orientation houses in South Africa should face north
- Plan and layout houses should be as close to a square shape as possible
- Ceilings use insulating materials that maximise thermal efficiency
- Floors use materials that absorb heat
- Windows use large north-facing windows to maximise solar heating

Water efficient design considerations include:

- Layout of plumbing systems
- Size of water pipes
- Type of plumbing fittings
- Optimum water supply pressure.

Monitoring and Evaluation

The recommendations in the Environmental Implementation Plan (DHS 2015) include output indicators for use in monitoring compliance, actions and outcomes. These are summarised in **Table 8** below.

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Compliance	Output indicators	Actions/outcomes
Encourage environmentally sustainable land use development	Urban infill and densification actively encouraged Measures to make well-located land available for low cost housing introduced	 Urbanisation: ratios of urban populations to entire population; annual population growth statistics Number of new title deeds registered in terms of national housing programme Densification: average residential densities as per municipal standards; numbers of medium density houses developed by province in terms of national housing programme
Promote integrated development planning	Housing developments linked with other sector requirements ensured	 Citizen involvement in settlement development planning Funding for integrated planning: level of public investment in informal settlement upgrading
Spatial planning for development of sustainable human settlements		Number of projects approved in accordance with approved spatial planning framework
Address needs and priorities of people in informal settlements	National budget increased to provide for basic services in informal settlements	Security of tenureAccess to basic services
Promote environmentally sound low-cost housing	 Water and energy-efficient housing constructed Tree planting promoted in low-cost housing projects 	 Water consumption Energy consumption Cost of water Cost of energy Household affordability of energy resources

The indicators are monitored by the national DHS, which also monitors compliance of provincial departments of human settlement and local government in relation to the Environmental Implementation Plan.

The Department also works with other public and private sector institutions to monitor specific sectorrelated indicators, such as:

- Department of Science and Technology (DST): monitoring climate change indicators in urban areas by the Council for Scientific and Industrial Research.
- South African Cities Network (SACN): providing advice on emerging issues around human settlements to the Minister, on a number of issues, including provisions of the UN-HABITAT New Urban Agenda and securing funding for research.
- Statistics South Africa: tracking a number of indicators on a regular basis, including basic services, populations, household surveys, incomes, and so on.
- DEA providing monitoring data on waste management and climate change.

The bulk of this work is nationally driven, but with a special focus on urban areas where population densities are at their highest. A number of pilot studies are focused on major urban centres: Johannesburg (Gauteng Province); Cape Town (Western Cape Province); and Durban (KwaZulu-Natal Province). Information is analysed and packaged to inform policy and decision-making through the following mechanisms:

- Annual compliance report for the Environmental Implementation Plan
- UN-HABITAT country reporting framework
- Evaluations (baseline studies; impact evaluations; rapid appraisals)
- Annual reports for the Department of Human Settlements and its related entities
- Human settlements index reporting
- Information will flow into a web-based Monitoring, Evaluation and Impact Assessment (MEIA) system, which is currently under development.

The target audiences for the resulting data and/or information are cited in the Department's 'intergovernmental framework', which includes the following:

- Provinces and local government departments
- Metropolitan municipalities (priority audience requiring data to inform policy decisions to address challenges of in-migration and demands for basic services and energy resources in these centres of growth)
- Entities of the Department
- Other public sector institutions
- Built environment research community.

Assessments of effectiveness of responses and lessons learned

The effectiveness of responses is assessed through various reporting, evaluation and peer review mechanisms (for example, Medium-Term Strategic Framework Reporting, Outcome 8 Reporting' Human Settlements Index).

The lessons learned are packaged under: (i) Programme and policy design; and (ii) Programme implementation. The lessons learned from programme and policy design include:

- Build a comprehensive database of all settlements (set terms for monitoring and evaluation framework and implementation/ impact evaluations).
- Develop a new set of technical guidelines on planning, implementation and management for different types of urban settlement.
- Define norms and standards for different phases of upgrading-service quality/levels, shared facility ratios, timelines for phases, urban management arrangements, and so on.

The key challenges that need to be addressed on programme implementation include the following:

- Resolving misalignment of planning instruments that hinder upgrading of settlements (fix security of tenure).
- Strengthening institutional mechanisms for funding and implementation.
- Improving the structuring of intergovernmental relations in upgrading programmes.
- Building the delivery and management skills at province and municipal levels.

5.2.3. National Disaster Management Centre

Supporting policy

The National Disaster Management Centre was established under the Disaster Management Act, 2002 (Act No. 57 of 2002) as an institution within the public service (NDMC 2002). The objective of the Centre is to promote an integrated and coordinated system for disaster management, with special emphasis on prevention and mitigation by national, provincial and municipal organs of state and other role players involved in disaster management and communities.

The implementation and operationalisation of the Disaster Management Act is enabled by the Disaster Management Framework (NDMC, 2005), which provides for a coherent, transparent and inclusive policy on disaster management. It introduces four key performance areas and enablers that are geared towards effective implementation.

Disaster management is defined in the Act as a continuous and integrated multi-sectoral, multi-disciplinary process of planning and implementation of measures aimed at:

- Preventing or reducing the risk of disasters
- Mitigating the severity or consequences of disasters
- Emergency preparedness
- Rapid and effective response to disasters
- Post-disaster recovery and rehabilitation

The Centre also has responsibilities under the Fire Brigade Services Act, 1987 (Act No. 99 of 1987) (State President's Office 1987), which provides for the 'establishment, maintenance, employment, co-ordination and standardization of fire brigade services; and for matters connected therewith.' (State President's Office, 1987).

Monitoring and Evaluation

Section 21 of the Disaster Management Act requires the establishment of mechanisms for monitoring, measuring and evaluating disaster management plans, prevention efforts, mitigation, response and recovery by organs of state and other key role players involved in disaster management. All member states must monitor and report progress on the implementation of the Sendai Framework 2015–2030 to the United Nations Office for Disaster Risk Reduction (UNISDR, 2015). The expected outcome of the framework is 'substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries' (UNISDR 2015, 12).

The National Disaster Management Centre, housed in the Department of Cooperative Governance and Traditional Affairs, (COGTA) has developed a disaster and fire services monitoring and evaluation framework with the following objectives:

- Promote a culture of continuous learning and improvement within the National Disaster Management Centre
- Coordinate and standardise processes and procedures for monitoring and evaluation
- Facilitate accountability across the three spheres of government
- Facilitate the utilisation of reliable, timely and relevant information to all relevant stakeholders

- Disseminate best practice findings for improved project and programme performance
- Strengthen evaluation capacity
- Build the capacity and capability of the disaster management monitoring and evaluation practitioners (COGTA 2014, 9–10).

The key benefits of the monitoring and evaluation framework include:

- Contributing 'to a more-efficient use of data and resources when it ensures, for example, that indicators and sampling methods are comparable over time and by reducing duplication of efforts'.
- Ensuring that the National Disaster Management Centre and other relevant stakeholders move from 'opinion-based policy' towards 'evidence-based policy' or 'evidenceinfluenced policy'.
- Providing comprehensive and integrated strategic monitoring and evaluation direction across disaster and fire services management to determine, on an on-going basis, how best to maximise the value of prevention, reduction, response and intervention. (COGTA 2014, 7–9)

Monitoring and evaluation are based on indicators for each key performance area and enabler, as shown in **Figure 13**.



FIGURE 13: Indicators for each key performance area and enabler

Much work has been carried out by the National Disaster Management Centre in recent years on monitoring and evaluation; as shown in **Table 9**.

Period	National Disaster Management Centre M&E focus
2012/2013	 Functions of disaster management monitoring and evaluation units developed. Readiness assessment conducted within the National Disaster Management Centre and Provincial Disaster Management Centres on the capacity and capability to establish a monitoring and evaluation system.
2013/2014	 Development of the Disaster Management Framework. Development of a Monitoring and Evaluation Implementation Plan 2014-2019. Development of national, provincial and municipal indicators. Development of reporting tools and timeframes.
2014/2015	 Piloting of indicators and reporting tools in KwaZulu-Natal, Mpumalanga and Western Cape Provinces. Identification of provincial monitoring and evaluation coordinators. Capacity building of monitoring and evaluation functionaries, in partnership with the National School of Government (two workshops held). Development of database template for declared disasters – defining data fields and primary data.
2015/2016	 Quarterly reporting institutionalised in all provinces and feedback provided. Provincial templates developed and data collected on all declared disasters from 2010 to 2015. Capacity building of provincial monitoring and evaluation coordinators, with customised training provided by the National School of Government.
2016/2017	 Data validation and triangulation. Concept note on conducting implementation evaluation. Further capacity building of provincial monitoring and evaluation coordinators, with customised training provided by the National School of Government.

TABLE 9: National Disaster Management Centre monitoring and evaluation efforts since 2012

Lessons learned

The development and institutionalisation of the Disaster Management Framework relies on the establishment of monitoring and evaluation units across all spheres of government. The effectiveness and efficiency of a disaster management monitoring and evaluation system needs adequate resources in terms of human capital and funding. Monitoring and evaluation within disaster management is currently seen as an 'add-on' rather than an essential tool. There is limited use of available information in planning, decision-making and policy development/change.

There is also a tendency to report on outcomes for compliance reasons, rather than to analyse progress against key indicators and identify ways of doing things better. Feedback sessions, workshops and knowledge exchange platforms provide valuable opportunities for learning. There is a need to develop a culture of evidence-based information (namely, to move away from opinion-based to evidence-based policy). Disaster risk reduction is key to a more proactive approach to building resilient communities by influencing spatial planning, infrastructure and economic development.

5.3. CLIMATE INFORMATION, ADAPTATION PLANNING AND DISASTER RISK REDUCTION

5.3.1. Climate variability, information and readiness

South Africa's weather and climate is highly variable in both space and time. Such variability of weather and climate needs to be taken into consideration in adaptation planning, since the weather or climate in a specific area or location is likely to differ significantly from the generalised projected assumptions made in many strategic climate change adaptation reports.

There are a number of important points to consider in this regard:

- Generalised climate change assumptions do not provide the best basis for adaptation planning or the best way of achieving climate resilience in a specific area or location.
- Observational records provide important information about weather and climate variability and extremes in a specific area or location and can help in understanding historical trends.
- Indicators of climate change and climate impacts should be used to identify exposure and sensitivity to change in a specific area or location and then when preparing adaptation action plans.

Such an approach will require robust observations, the analysis of these observations, and regular monitoring and evaluation of climate and climate impact trends and should be integral to the preparation of strategic climate change adaptation reports.

Despite the awareness-raising work by the DEA, South Africans still need to be better informed about climate variability and to be more prepared to adapt to change.

Incorporating observations and outlooks into decision-making

Analyses of historical observations can provide a lot of information on prevailing climatic conditions in specific areas or locations. Such analyses can also play an important role in adaptation planning, particularly where frequencies of occurrence of climatic variables (average and extreme conditions) are known. These observations can be aligned with seasonal predictions and longerterm climate projections to provide a plausible assessment of possible future climate impacts in a specific area or location (**Figure 14**).

Following a 'climate-sensitive route'

Historical observations suggest that South Africa's climate is changing relatively slowly. For example, monitoring of near-surface temperatures has shown an average increase of 0.17 °C per decade. However, with a maximum increase of 5 °C projected by 2100, temperatures could rise by up to 0.5 °C per decade. Alongside gradual changes in climate come changes in climatic extremes, which also need to be monitored.

Observational evidence of gradual and extreme changes in climate, together with future projections, should be factored into adaptation planning processes. The concept of a 'rotating climate-sensitive route' should help facilitate this approach (**Figure 15**).

5.3.2. The South African Weather Service

Supporting policy environment

The South African Weather Service (SAWS) is a public entity of the Department of Environmental Affairs and was created under the South African Weather Service Act, 2001 (Act No. 8 of 2001) (DEA, 2001). It provides services to government and the South African public, both commercially and for the public good – the latter services are financially supported by the Department of Environmental Affairs.

To fulfil its vision to create a 'WeatherSMART' nation, SAWS has an organisational structure that ensures the delivery of quality products and services, including: forecasting, research and development, climate services, air quality services, authority in aviation, training, and technical services. SAWS is the only organisation in South Africa that can issue warnings and alerts of severe weather hazards.

Monitoring and evaluation: SAWS, as well as other institutions, hosts a large archive of observed data that are available to the climate change adaptation community. In addition, SAWS regularly issues short-term weather forecasts, seasonal predictions and climate change projections (all defined as weather and climate outlooks). The following examples show how these data have been used.

Climate change projections: SAWS has recently developed a comprehensive Climate Change Reference Atlas (http://www.weathersa.co.za/ climate/climate-change-reference-atlas), which contains a wide range of climate change projection maps for South Africa. These include near-surface temperature and rainfall projections generated from nine global climate models. Although these maps cover the entire country, provincial maps can also be generated.



FIGURE 14: An analysis of the historical frequency of occurrence of a climatic variable (left) contains a lot of information about its possible future propagation. With this as a basis, seasonal predictions and climate change projections can be added to inform the process of adaptation planning.



FIGURE 15: The concept of a 'rotating climate-sensitive route' should help facilitate adaptation planning processes

Contribution to Gauteng Climate Change Response Strategy

SAWS data and projections were used to generate a historical-to-future near-surface temperature and rainfall profile to inform the Climate Change Response Strategy for Gauteng's City Regions (GDARD, 2018).

As a historical reference, annual rainfall totals and average monthly rainfall for Gauteng Province are depicted in **Figure 16** and **Figure 17** respectively.



FIGURE 16: Annual total rainfall for Gauteng Province from 1900 to 2017 (blue histogram). Average rainfall of 701mm is indicated by the red line



FIGURE 17: Monthly average rainfall for Gauteng Province from 1900 to 2017

The rainfall record, which extends from 1900, was obtained from the SAWS provincial rainfall database. Gauteng received on average, 701mm of rain per year. The rainfall displays a seasonal cycle of wetter austral summer rainfall, peaking at 128mm in January, and drier austral winter rainfall, with minimums of 7mm in June and July.

As a contribution to Gauteng Province's Climate Change Response Strategy, two Representative Concentration Pathways for greenhouse gases were considered: CO_2 concentrations of approximately 560 ppm and 950 ppm by 2100. Historical (1976–2005) and projected (2006–2095) simulations using nine Global Climate Models were analysed (**Table 10**).
TABLE 10: Projections from nine global climate models were used for downscaling to a finer spatial resolution (0.4°	х
0.4°) using a regional climate model	

Model name	Institute/country	Resolution
CanESM2m	CCCMa (Canada)	2.8° x 2.8°
CNRM-CM5	CNRM-CERFACS(France)	1.4° x 1.4°
CSIRO-Mk3	CSIRO-QCCCE (Australia)	1.9° x 1.9°
IPSL-CM5A-MR	IPSL (France)	1.9° x 3.8°
MICR05	AORI-NIES-JAMSTEC (Japan)	1.4° x 1.4°
HadGEM2-ES	Hadley Centre (UK)	1.8° x 1.2°
MPI-ESM-LR	MPI-M (Germany)	1.9° x 1.9°
NorESMI-M	NCC (Norway)	1.9° x 2.5°
GFDL-ESM2M	GFDL (USA)	2.0° x 2.5°

However, the spatial resolution was relatively coarse, especially when producing provincial-scale projections. To address this limitation, the results were downscaled to a finer spatial resolution using a Regional Climate Model. Annual temperature and rainfall projections for the time periods 2036–2065 (centred at 2050) and 2066–2095 (centred at 2080) for both Representative Concentration Pathways are depicted in **Figure 18**. Temperature projections of between +1.5 °C and +3 °C are indicated for the 560 ppm pathway and of between +2 °C and +5 °C are indicated for the 950 ppm pathway. Rainfall projections are variable, although a drying trend in annual rainfall totals is visible from the 2050s towards the 2080s.



FIGURE 18: Annual mean near-surface temperature change and annual total rainfall change projected for 2036–2065 and 2066–2095 under representative concentration pathways (RCP) of 560 ppm (RCP 4.5) and 950 ppm (RCP 8.5)

TRACKING SOUTH AFRICA'S TRANSITION TO A CLIMATE RESILIENT ECONOMY AND SOCIETY

Lessons learned

The Department of Environmental Affairs has contributed significantly to making South Africans aware of the risks posed by global warming (increased temperatures) and climate change (changes in climate variability and extremes). However, strategic climate change adaptation reports often refer to model projections as the only basis for adaptation action, without any reference to observations and the importance of monitoring and evaluation. These reports then provide guidelines on how to adapt to these generalised conditions, with little or no consideration being given to observed weather and climate trends in the areas of interest.

5.4. ADAPTATION MONITORING IN GRASSROOTS COMMUNITIES

GenderCCSA – Women for Climate Justice is part of an international network of women, gender activists and experts from all world regions working for gender and climate justice. GenderCCSA has been working with grassroots communities, particularly women's groups and smallholder farmers, in rural, urban and peri-urban communities in North-West, Limpopo, Western Cape, Eastern Cape, KwaZulu-Natal and Gauteng Provinces, as well as in Mozambique and Zimbabwe. Projects include training and building capacity on climate change adaptation to enhance the livelihoods of communities, whilst addressing the challenges of water, health, energy and food security.

5.4.1. Methodologies and approaches for engagements at grassroots level

GenderCCSA employs the following methods and approaches to engage communities in climate change adaptation:

- Using participatory methods that provide opportunities for various perspectives and give people a greater say in the planning, design and implementation of projects. For example, working with both men and women, separately and together, giving them the opportunity to speak out about their impacts and needs.
- Identifying and actively reaching out to specific stakeholders or the general public. Relevant stakeholders include social groups, organisations and individuals who are affected by the respective decision or affect its implementation.
- Conducting basic community-based baseline assessments before a project's implementation to see where the communities are at and identify areas that could be prioritised.

- Establishing local Project Steering Committees, comprising representatives of the communities, the technical team and the implementing organisations, to ensure flow of information, joint decision-making, reflection and identifying pilot areas for the project's implementation.
- Using 'learn and build' methodologies, where solutions and technologies are being embedded within communities by training and transferring skills to the grassroots. Service providers are mandated to work with communities while they are installing technologies so that knowledge and information can be passed on, thereby enabling them to maintain and assist in rolling out the technology.
- Identifying 'local champions' to become the lead participants and play an important role in training other community members and ensuring the successful implementation of activities. They also serve as contact points for their communities and for liaison with project steering committees.
- Training of 'local champions' in various pilot project sites to ensure reference points for easy access by all project beneficiaries and interested parties. These sites will act as demonstrations for the benefit of other beneficiaries. Training activities, together with the logistical support of fieldworkers, will always be organised through and with the assistance of the local champions. Grouping of the beneficiaries will be arranged according to project sites.

5.4.2. Example of project indicators

A range of indicators are being used to monitor and evaluate the progress and impact of projects, examples include:

- Number of beneficiaries adopting and integrating climate change adaptation strategies in food production, year by year.
- Percentage increase in crop yields during the project.
- Income generated from sale of produce or amount of money saved, and so on.
- Number of women and men in communities trained in the use and management of natural resources.
- Number of households with improved access to water compared to baseline figures by end of action.
- Number of households able to access energy through solar PV or bio-digester technology by the end of action.

- Number of women and men able to make and use soil compost to input into community gardens and own gardens by end of action.
- Number of community gardens established and fully equipped.
- Number of beneficiaries exposed to information on climate change adaptation from the action.
- Number of policy-makers from government and research institutions exposed to information from this action through oral and written presentations.

5.4.3. Documentation of experiences and lessons learned

The documentation of experiences and lessons is achieved through:

- Focus group discussions with a mixture of beneficiaries and other members of community working groups, including various stakeholders.
- Field visits to evaluate project implementation sites.
- Interviews with direct and indirect project beneficiaries to document their experiences in case studies that are shared with various stakeholders and policy-makers.

Key lessons learned include:

- Projects need to overtly recognise that life in a community is ongoing.
- There is a lot of indigenous knowledge amongst community members and many are already adapting to the impacts of climate change.
- Government policies and programmes often do not trickle down to the grassroots and to local governments/municipalities.
- There is a lack of information about funding for disaster relief and climate change adaptation.

CHAPTER REFERENCES

- Department of Cooperative Governance and Traditional Affairs (COGTA), 2014. Disaster Management Monitoring and Evaluation Framework. Pretoria: National Disaster Management Centre. Accessed 23 August 2018 at: http://www.ndmc.gov.za/Frameworks/ Disaster%20Management%20Monitoring%20and%20 Evaluation%20Framework.pdf
- Department of Environmental Affairs (DEA), 1998. National Environmental Management Act (Act No. 107 of 1998).

Department of Environmental Affairs (DEA), 2001. South African Weather Service Act No. 8 of 2001. Accessed on 28th March 2018 at: https://www.environment. gov.za/sites/default/files/legislations/sawsa8of2001_ aviationmeteorologicalservices_gn37343.pdf.

Department of Environmental Affairs (DEA), 2012. National Climate Change Response White Paper. Accessed on 9 March 2018 at: https://www.environment.gov.za/ sites/default/files/legislations/national_climatechange_ response_whitepaper.pdf.

- Department of Environmental Affairs (DEA), 2016. South Africa's First Climate Change Annual Report - 2015. Accessed 1 March 2018 at: https://www.environment. gov.za/otherdocuments/reports/southafricas_ firstnational_climatechange.
- Department of Environmental Affairs (DEA), 2017. South Africa's Second Climate Change Annual Report - 2016. Accessed 1 March 2018 at: https://www.environment. gov.za/otherdocuments/reports/southafricas_ secondnational_climatechange.
- Department of Health (DoH), 2014. National Climate Change and Health Adaptation Plan 2014-19.
- Department of Human Settlements (DHS), 1997. Housing Act, 1997 (Act No. 107, 1997).
- Department of Human Settlements (DHS), 2009a. Norms and standards for the construction of stand- alone residential dwellings and engineering services.
- Department of Human Settlements, 2009b. National Housing Code Technical and General Guidelines Part 3.
- Department of Human Settlements (DHS), 2015. Gazetted Environmental Implementation Plan, Notice 880 of 2015.
- Department of Human Settlements (DHS), 2016. A Baseline Assessment for Future Impact Evaluation of Informal Settlements Targeted for Upgrading.
- Department of Justice, 1996. The Constitution of the Republic of South Africa 1996 (Act No. 108 of 1996). Accessed 28th March 2018 at: http://www.justice.gov. za/legislation/constitution/SAConstitution-web-eng.pdf
- Gauteng Department of Agriculture and Rural Development (GDARD), 2018. Gauteng region Over-Arching Climate Change Response Strategy fourth draft.
- National Business Initiative (NBI), 2017. A New Climate of Risk: How South African Businesses Are Adapting To Climate Change.
- National Disaster Management Centre (NDMC), 2002. Disaster Management Act 2002 (Act No. 57 of 2002).
- National Disaster Management Centre (NDMC), 2005. National Disaster Management Framework.

- Republic of South Africa (RSA), 2015. South Africa's Intended Nationally Determined Contribution. Accessed on 1 March 2018 at: http://www4.unfccc.int/ ndcregistry/PublishedDocuments/South%20Africa%20 First/South%20Africa.pdf.
- State President's Office, 1987. Fire Brigade Services Act, 1987 (Act No. 99 of 1987). Government Gazette Vol. 268, No 11006, 23 October 1987. Cape Town: State President's Office. Accessed 7 December 2018 at: https://www.gov.za/sites/default/files/Act%2099%20 of%201987.pdf
- UN Habitat 2013. Strategic Plan 2014–2019 of the United Nations Human Settlements Programme. Accessed 1 March 2018 at: https://unhabitat.org/un-habitatsstrategic-plan-2014-2019/.
- United Nation (UN), 2015. Sendai Framework for Disaster Risk Reduction 2015-2030. Accessed 1 March 2018 at: https://www.unisdr.org/we/inform/publications/43291.
- United Nation Office for Disaster Risk Reduction (UNISDR), 2015. Sendai Framework for Disaster Risk Reduction 2015–2030. Accessed 1 March 2018 at https://www.unisdr.org/files/43291_ sendaiframeworkfordrren.pdf.
- United Nations (UN) 2018. Global Indicator Framework for the Sustainable Development Goals and Targets of the 2030 Agenda for Sustainable Development. Accessed 23 August 2018 at: https://unstats.un.org/sdgs/ indicators/Global%20Indicator%20Framework%20 after%20refinement_Eng.pdf
- United Nations (UN), 2008. The 10-year Strategic Plan and Framework to Enhance the Implementation of the Convention [to Combat Desertification]. Accessed 9 March 2018 at: https://www2.unccd.int/sites/default/ files/sessions/documents/ICCD_CRIC7_2/2eng.pdf
- United Nations (UN), 2015. Sustainable Development Goals. Accessed 1 March 2018 at: http://www.un.org/ sustainabledevelopment/development-agenda/.
- United Nations Convention to Combat Desertification (UNCCD), 2017. The Future Strategic Framework of the Convention [to Combat Desertification]. Accessed 26 March 2018 at: https://www2.unccd.int/sites/ default/files/inline-files/ICCD_COP%2813%29_L.18-1716078E_1.pdf.
- United Nations Development Programme (UNDP), 2017. UNDP support to implementation of Sustainable Development Goal 3. Accessed 23 August 2013 at: http://www.undp.org/content/dam/undp/library/ Sustainable%20Development/SDG-3%20Health.pdf
- United Nations Framework Convention on Climate Change (UNFCCC), 2015. Paris Agreement. Accessed 1 March 2018 at: https://unfccc.int/files/essential_ background/convention/application/pdf/english_paris_ agreement.pdf.
- World Health Organisation (WHO), 2017. Regional Strategy for the Management of Environmental Determinants of Human Health in the African Region 2017–2021. Victoria Falls, Republic of Zimbabwe.
- World Health Organisation, 2010. Ministers Launch Pioneering Initiatives to Tackle Health and Environment Issues in Africa. Accessed 1 March 2018 at: http://31.3.96.8/fr/centre-des-medias/communiquesde-presse/item/2583-ministers-launch-pioneeringinitiatives-to-tackle-health-and-environment-issues-inafrica.html



SOUTH AFRICA'S TRANSITION TO A LOW CARBON ECONOMY AND SOCIETY

CHAPTER 6

SOUTH AFRICA'S TRANSITION TO A LOW CARBON ECONOMY AND SOCIETY

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Abbreviations and acronyms

AFOLU	Agriculture, Forestry and Other Land Use
BRT	Bus Rapid Transit
CNG	Compressed Natural Gas
CO ₂	Carbon Dioxide
DST	Department of Science and Technology
FOLU	Forestry and Other Land Use
Gg	Gigagram
GHG	Greenhouse Gas
GIZ	Gesellschaft für Internationale Zusammenarbeit
IPAP	Industrial Policy Action Plan
IPCC	Intergovernmental Panel on Climate Change

IPPU	Industrial Processes and Product Use
M&E	Monitoring and Evaluation
MRV	Measuring, Reporting and Verification
Mt	Mega tonnes
NCCRP	National Climate Change Response Policy
NCPC	National Cleaner Production Centre
NDC	Nationally Determined Contributions
NDP	National Development Plan: Vision for 2030
UNFCCC	United Nations Framework Convention on Climate Change

6.1. OVERVIEW

This section focuses on South Africa's overall transition towards a low carbon economy and society and looks at national progress towards the national greenhouse gas (GHG) emissions trajectory as communicated in South Africa's Nationally Determined Contribution (NDC) (RSA, 2015). Individual response measures contributing to the overall national transition – the Climate Change Flagship Programmes – are covered in more detail in Chapter 7 of this report.

National level indicators for GHG emissions and M&E of mitigation actions are based on the National Development Plan: Vision for 2030 (NDP) vision of a lower carbon economy depicted in **Figure 19**.



6.2. PROGRESS TOWARDS THE NATIONAL GHG EMISSIONS TRAJECTORY

The National Climate Change Response Policy (NCCRP) identifies the national GHG inventory as one of the tools used to compare the current emissions profile against the benchmark national GHG emission trajectory range (DEA, 2012). An accurate GHG inventory supports various activities and programmes within the country related to natural resource management, climate change planning, and economic development.

Figure 20 provides an overview of the complimentary components comprising the measuring, reporting and verification (MRV) of GHG emissions.



FIGURE 20: Overview of complimentary components comprising the MRV of GHG emissions

The GHG inventory and/or its emission estimation methodologies have proved extremely useful in other climate change mitigation policy response areas such as setting up carbon budgets, international reporting obligations, carbon tax, and broader climate change monitoring and evaluation.

South Africa has published several national GHG inventory reports, detailing national GHG emissions for the period spanning 2000 – 2012.





During this period, GHG emissions have grown, on average, at an annual rate of 7 $MtCO_2e$, from 434 $MtCO_2e$ in 2000 to 518 $MtCO_2e$ in 2012 (**Table 11** and **Figure 22**).

SOUTH AFRICA'S TRANSITION TO A LOW CARBON ECONOMY AND SOCIETY

Sector	NAT	Change between			
Sector	2000	2010	2011	2012	2000 and 2012 (%)
Energy	342,592	435,117	415,843	428,112	25.0%
IPPU	33,563	35,463	38,888	37,129	10.6%
AFOLU (incl. FOLU)	45,860	38,456	38,376	31,128	-32.1%
Waste	12,288	20,354	21,151	21,928	78.5%
TOTAL	434,304	529,391	514,257	518,297	19.3%

TABLE 11: National GHG emissions for the period spanning 2000-2012

The energy sector accounts for the largest proportion of national GHG emissions, contributing 82.6% to the national GHG inventory in 2012. The Industrial Processes and Product Use (IPPU) sector, the Agriculture, Forestry and other Land use sector (AFOLU) and the Waste sector contributed 7.2%, 6.0% and 4.2% respectively to total GHG emissions in 2012.





By 2010, an estimated running total (from 2000) of 315.7 MtCO₂e emissions had been prevented from entering the atmosphere through the mitigation actions included in the analysis. The results show that the GHG reductions trend is growing steadily over time as more programmes that mitigate climate change are been implemented. In 2011, 2012, 2013 and 2014 the annual emission reductions from these mitigation programmes were estimated at 66.7 MtCO2e/yr, 69.3 MtCO2e/yr, 70.0 MtCO2e/yr and 71.7 MtCO2e/yr respectively, bringing the total cumulative emission reductions since 2000 to 451.7 MtCO2e by 2012 and to 593.4 Mt MtCO2e by 2014.

Energy efficiency has been the largest contributor to climate change mitigation in the country, accounting for approximately 82% of GHG emission reductions since 2010. **Figure 23** below shows the GHG inventory compared to the national GHG emissions trajectory and mitigation NDC target.



FIGURE 23: A comparison of South Africa's GHG Inventory relative to the National GHG emissions trajectory and mitigation NDC

Table 12 presents a summary of the key mitigation assessment for individual or groups of response measures undertaken in the country between 2000 and 2012 or 2017.

	CLIMATE CHANGE GHG EMISSION REDUCTIONS (MTC) RESPONSE MEASURES FLAGSHIP	NS (MTC02E)				
THEMATIC AREA	ATIC AREA RESPONSE MEASURES FLAGSHIP PROGRAMME		2015	2016	2017	Cumulative (2000–2017)
Renewable Energy, Energy	gy Efficiency and Lower Carbon Fuels					
	Industrial Policy Action Plan (IPAP) – National Cleaner Production Centre (NCPC) industry efficiency projects	PAP) – entre ects Energy efficiency		1,4	3	6,1
	Eskom – integrated demand side management programme	and energy demand management	Programme concluded in 2014			62
	12L – Income Tax Act		0,2	0,0	1,5	7,4
	SASOL energy efficiency projects	Not applicable	1,3	1,3	1,3	9,8
Energy efficiency	Municipal Energy Efficiency Programme (now integrated into the Energy Efficiency in Public Infrastructure and Buildings Programme)	Energy efficiency and energy demand management	0,1	0,1	0,1	0,9
	Certified Green Buildings (Commercial)	Low carbon, climate resilient built environment, communities and human settlements	No data	No data	45	45
	Other energy efficiency programmes	E (// ·	41	43	45	707
	Industrial and residential energy efficiency (energy efficiency target monitoring system)	Energy efficiency and energy demand management	No data	No data	No data	653
Utility coole power	Renewable Energy Independent Power Producers Programme	Renewable energy	3,3	3,3	4,9	14
generation	ESKOM Open Cycle Gas Turbines	Energy efficiency and energy demand management	0,2	0,2	0,2	1,7
	SASOL gas turbines	No	1,2	1,3	1,4	10
	Tongaat Hulett co-generation	No	0,0	0,1	0,0	0,3
Non-utility power	SASOL coal-to-gas switch	No	7,4	7,4	7,4	103
generation	Compressed Natural Gas (CNG) industry fuel switch	No	0,008	0,008	0,008	0,03
	Clean Development Mechanism (excluding energy efficiency)	Renewable energy	4,9	4,9	4,9	41
Low Carbon Transport						
Public transport – urban Bus Rapid	Rea Vaya Bus Rapid Transport (BRT) system		0,01	0,01	0,01	0,05
Iransport (BRI)	MyCity BRT system		0,03	0,03	0,03	0,20
Public transport – taxis	Taxi recapitalisation	Transport	0,3	0,3	0,3	2,0
	CNG vehicle fuel switch		0,003	NBI0,003	0,003	0,01
Passenger and freight	Passenger rail		0.0	0.0	0.0	0.0
	Iransnet freight road-to-rail		0,7	4,0	4,0	10
Waste management	D					
	Biogas projects (municipal and private sector)		0,1	0,1	0,1	0,8
Waste management	Composting projects (private sector)	Waste management	0,2	0,2	0,2	1,5
	Municipal landfill gas projects		0,6	0,7	0,7	5,4
Total Cumulative GHG Fm	nission Reductions (2000–2017) (MtCO2e)		0,01	0,01	0,01	844

TABLE 12: Cumulative mitigation achieved by major response measures since 2000

CHAPTER REFERENCES

- Department of Environmental Affairs (DEA), 2012. National Climate Change Response White Paper. Accessed on 9 March 2018 at: https://www.environment.gov.za/sites/default/files/legislations/national_climatechange_response_whitepaper. pdf.
- Department of Environmental Affairs (DEA), 2016a. South Africa's First Climate Change Annual Report 2015. Accessed 1 March 2018 at: https://www.environment.gov.za/otherdocuments/reports/southafricas_firstnational_climatechange.
- Department of Environmental Affairs (DEA), 2016b. GHG National Inventory Report: South Africa 2000-2012. Draft for public comment. Accessed 31 October 2017 at: https://www.environment.gov.za/sites/default/files/reports/ nationalinventoryreport2000-2012_draftforpubliccomment.pdf
- Department of Environmental Affairs (DEA), 2017. South Africa's Second Climate Change Annual Report 2016. Accessed 1 March 2018 at: https://www.environment.gov.za/otherdocuments/reports/southafricas_secondnational_climatechange.
- Republic of South Africa (RSA), 2015. South Africa's Intended Nationally Determined Contribution. Accessed on 1 March 2018 at: http://www4.unfccc.int/ndcregistry/PublishedDocuments/South%20Africa%20First/South%20Africa.pdf.



NATIONAL CLIMATE CHANGE FLAGSHIP PROGRAMMES

Abbreviations and acronyms

APAP	Agriculture Policy Action Plan
BMU	German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
BRT	Bus Rapid Transport
CAPEX	Capital Expenditure
CCS	Carbon Capture and Storage
CGS	Council for Geosciences
CH4	Methane
CNG	Compressed Natural Gas
C02	Carbon Dioxide
CSA	Climate Smart Agriculture
DAFF	Department of Agriculture, Forestry and Fisheries
DBE	Department of Basic Education
DMW	Diversion of Municipal Waste from Landfill
DOE	Department of Energy
DMR	Department of Mineral Resources
DPME	Department of Planning Monitoring & Evaluation
DPW	Department of Public Works
DoT	Department of Transport
DST	Department of Science and Technology
DWS	Department of Water and Sanitation
ECCS	Energy and Climate Change Strategy for Public Building Sector: 2015 – 2050
EE	Energy Efficiency
EEDSM	Energy Efficiency and Demand Side Management
EEPIBP	Energy Efficiency in Public Infrastructure and Buildings Programme
EEPS0	Energy Efficiency Project Support Office
ESCo	Energy Service Companies
EV	Electric Vehicle
FY	Financial Year
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GIZ	Gesellschaft für Internationale Zusammenarbeit
GTS	Green Transport Strategy
FA0	Food and Agriculture Organization
IARC	International Agency for Research on Cancer
IDC	Industrial Development Corporation
IGCCC	Intergovernmental Committee on Climate Change
IGDP	Integrated Growth and Development Policy for Agriculture, Forestry and Fisheries

IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
kt	Kilotonne
kWh	Kilowatt
HFC	hydrogen fuel cell
HySA	Hydrogen South Africa
LTAS	Long Term Adaptation Scenarios Climate Change Flagship Programme
LOHC	liquid organic hydrogen carriers
M&E	Monitoring and Evaluation
MPA	Mitigation Potential Analysis
MRV	Measurement, Reporting and Verification
MSW	Municipal Solid Waste
Mt	Megatonne
MW	Megawatt
MTSF	Medium Term Strategic Framework
NAMA	Nationally Appropriate Mitigation Action
NBI	National Business Initiative
NCCRP	National Climate Change Response Policy
NCPC	National Cleaner Production Centre
NDC	Nationally Determined Contribution
NEES	National Energy Efficiency Strategy
N20	Nitrous Oxide
OPEX	Operating Expenditure
PASA	Petroleum Agency of South Africa
PCSP	Pilot Carbon Storage Project
PDA	Provincial Department of Agriculture
PTAS	Project Technical Advisory Services
PRASA	Passenger Rail Agency of South Africa
PV	Photovoltaic
R&D	Research and Development
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RWH	Rainwater Harvesting
SANS	South African National Standard
SANEDI	South African National Energy Development Institute
SAP0	South African Post Office
SMME	Small, Medium and Micro Enterprise
UNEP	United Nations Environment Programme
UNFCCC	United Nations Convention on Climate Change
WC/WDM	Water Conservation and Water Demand Management

CHAPTER 7

NATIONAL CLIMATE CHANGE FLAGSHIP PROGRAMMES

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7.1. OVERVIEW

Immediate and intensified climate action offers South Africa, the region and other countries globally both a compelling opportunity and clear pathway towards the shared aim of a more prosperous, inclusive, and equitable future (National Planning Commission (NPC), 2011). South Africa already has a well-developed base for mitigating climate change and building climate resilience, however, the current level and speed of action is insufficient to mitigate national GHG emissions and enhance climate change resilience on the scale required.

The NCCRP identifies a set of Climate Change Near-Term Priority Flagship Programmes, which are frontrunners or 'game-changers' in South Africa's climate action in key sectors (DEA, 2012). These programmes are South Africa's response to implementing climate action at scale and provide the greatest opportunity for attracting, mobilising and leveraging investment from both the private and public sectors towards South Africa's Nationally Determined Contribution (NDC).

The Climate Change Flagship Programmes respond to key challenges facing South Africa and other countries as global efforts to address climate change intensify. **Figure 24** below depicts these challenges.



FIGURE 24: Responding to the challenges of implementing transformative large-scale climate action through the Climate Change Flagship Programmes

The NCCRP identifies the Climate Change Flagship Programmes as the foundation for the next phase in South Africa's transition to a low-carbon and climate-resilient economy and society – thereby enabling Vision 2030 of the NDP. The Climate Change Flagship Programmes respond to the challenges of implementing national scale climate action in three ways, as shown in **Figure 25**.

Igniting climate action at a national scale	Demonstrating climate action at a national scale	Attracting resources at a national scale
Igniting national-scale action at the speed required to respond to climate change, namely limiting GHG emissions and/or enabling adaptation to the impacts of unavoidable climate change with the necessary urgency.	Demonstrating that the course of actions needed to respond to climate change effectively and efficiently is not only possible, but highly beneficial unlocking and realising significant social, economic and environmental benefits.	Attracting resources at the scale required to enable meaningful transformation, namely transformation at the scale that effectively limits atmospheric GHG emissions and/or enables adaptation to the impacts of unavoidable climate change.

FIGURE 25: How Climate Change Flagship Programmes respond to key challenges facing South Africa and other countries as global efforts to address climate change

As a signatory to the UNFCCC, South Africa has affirmed its commitment to the Paris Agreement by ratifying it in November 2016. In doing so it has undertaken to make a fair contribution to the global effort to stabilise greenhouse gas emissions and to manage inevitable climate change impacts through interventions that build and sustain South Africa's economic, social and environmental resilience. **Figure 26** provides an overview of how the Climate Change Flagship Programmes are positioned within South Africa's Climate Change Response.



FIGURE 26: Positioning the Climate Change Flagship Programmes in South Africa's Climate Change Response

South Africa's has risen to the challenge of climate change and the Climate Change Flagship Programmes bear testimony to this fact. In the past seven years, considerable effort has been invested and commendable progress achieved in implementing the NCCRP through the practical implementation of the Climate Change Flagship Programmes.

This 3rd Climate Change Report aims to provide an update on the progress made in implementing the Climate Change Flagship Programmes. The Report covers the development of business and investment plans for scaling-up climate action and provides insight into the support and needs required for further climate action to meet South Africa's climate action goals.

This section also seeks to communicate and reinforce the NCCRP vision for Climate Change Flagship Programmes. One of consolidating and extending the national climate change response as a critical part of South Africa's NDC and outlining the vision for Climate Change Flagship Programmes going forward.

Figure 27 summarises the objectives of the Chapter on Climate Change Flagship Programmes.



FIGURE 27: Purpose of the Climate Change Flagship Programmes

Additionally, this section provides a much-needed opportunity to record and document the growth and evolution of the national climate change response through the lens of the Climate Change Flagship Programmes. The approach, sequence of events and processes adopted to scale up climate action through the Climate Change Flagship Programmes, as well as the corresponding success factors and lessons are shared with a broader audience beyond the immediate programme team – providing inspiration and guidance.

7.2. ACHIEVING CLIMATE ACTION AT SCALE THROUGH THE CLIMATE CHANGE FLAGSHIP PROGRAMMES

7.2.1. The Vision and Mission of the Climate Change Flagship Programmes

The Climate Change Flagship programmes are implementation programmes that advance South Africa's climate change response efforts. The programmes include both the scaling-up of existing climate change initiatives and new initiatives that are ready to come on-stream by 2020. The vision and mission of the Climate Change Flagship Programmes is shown in **Box 2** (DEA, 2017).

Box 2: Vision and mission of the Climate Change Flagship programmes

VISION: Accelerated implementation of high impact, large-scale catalytic climate action MISSION: To champion implementation of climate action beyond pilot initiatives

The specific objectives and pillars of the DEA's approach to support, facilitate and scale-up implementation of climate action are listed in **Table 13** below, responding to the vision and mission of the Climate Change Flagship programmes.

TABLE 13: objectives and pillars of the approach to support and facilitate scaled-up implementation of climate action through the Climate Change Flagship Programmes

Objective	Sub-objectives and key activities
Objective 1: Envisioning and programming South Africa's NDC into tangible implementation programmes	 This objective clarifies the exact manner in which South Africa's NDC will be achieved, focusing on the implementation of concrete GHG emissions reduction or climate resilience building measures at all geographic scales. It includes the following elements: a. Communicating the NDC implementation and investment mandate of the Climate Change Flagship Programmes. b. Recognising and operationalising the Climate Change Flagship Programmes Steering Committee as the NDC Implementation and Investment platform to consolidate and coordinate South Africa's climate change implementation programmes.
Objective 2: Continuous delivery of implementation- and investment- ready climate action (pipeline development and the acceleration of implementation readiness)	 c. Building a pipeline of catalytic climate action (conceptualisation, scoping studies): Active identification, analysis and assessment of opportunities to enhance the impact, effectiveness and scale of climate action (new/enhanced implementation, funding and governance models). Building partnerships to enable the implementation of transformative action at scale. d. Accelerating implementation readiness by demonstrating the business case for investing in the full-scale implementation (pre-feasibility, pilots, feasibility, implementation readiness and mobilising investment): Governance mechanism to coordinate implementation preparation (managing the pipeline). Development, implementation and preparation of opportunities. Marketing and profiling of the value proposition of identified implementation opportunities. Commissioning of projects and programmes. Building and enhancing the enabling environment for programme preparation and implementation: Consistently providing/enhancing access to technical and advisory services for programme development and implementation partners. Providing/enhancing/facilitating consistent access to climate finance/funding throughout all points of the implementation to transformative and large-scale climate action (technical and funding). f. Enhancing and enabling the integration of mechanisms for scaling-up into existing or new systems and mechanisms (climate change mainstreaming). Scaling-up system processes and structures integrated with national planning and governance mechanisms (Medium Term Strategic Framework (MTSF), provincial planning, IDPs, NDC planning/reporting etc.). Using conditional grants/other fiscal instruments to mainstream climate change. Alignment/integration with the national evaluation system processes.

7.2.2. The approach to scaling up the Climate Change Flagship Programmes

Scaling-up the Climate Change Flagship Programmes has taken many forms, based on the maturity and complexity of the targeted work packages as shown in **Table 14**. A variety of scaling up mechanisms are being applied in conjunction with one another, in order to anchor implementation more deeply and to hasten implementation as far as possible. In all cases, the acceleration of climate action has meant expanding, adapting and sustaining the successful projects, programmes, or policies in different ways over time (Hartmann & Linn 2007).

Approach	Description	Mechanism for scaling up	Flagship Programme
Quantitative	Growth or expansion and/ or replication of existing measures.	 Replication Adaptation	 Waste Management (Solid Waste Management)
Deepening/ Functional	Increasing the coherence and comprehensive coverage of the programme components to increase the depth of impact.	 New dimensions, types of activities and programme areas Adding incentives or tools to reinforce existing components 	 Energy Efficiency and Demand Management Waste Management (wastewater)
ldea or innovation	Spreading an idea among individuals or organisations within a certain area or system (geographic, organisational, and professional).	CommunicationMarketingDissemination	 Low Carbon, Climate Resilient Built Environment, Communities and Settlements
Technology or skill	Increasing the number of people or places that use or apply a technology, practice or approach.	MarketingDistributionTraining	 Renewable Energy Agriculture, Food Systems and Food Security Transport
Policy	Moving towards institutional and structural changes – institutionalisation (mainstreaming). Ensuring that ideas expressed as policy are transformed into behaviour throughout a place.	• Implementation	 Energy Efficiency and Demand Management Transport Water Conservation and Demand Management

TABLE 14: Approaches to scaling up the Climate Change Flagship Programmes

The Climate Change Flagship Programmes provide investment efficiency and coordination for lead implementing departments, the DEA and international donors/partners by focusing attention on climate change priorities, concentrating and leveraging resources at the most catalytic points of implementation value thus compounding the benefits of existing resources. **Figure 28** provides an overview of how the Climate Change Flagship Programmes deliver large scale catalytic climate action.





Figure 29 details the series of steps and milestones for guiding and coordinating the development and scaling-up of the Climate Change Flagship Programmes to achieve the accelerated implementation of high impact, large-scale catalytic climate action.



FIGURE 29: Approach to scaling up the Climate Change Flagship Programmes (DEA 2017)

7.3. THE CLIMATE CHANGE FLAGSHIP PROGRAMMES JOURNEY

The Climate Change Flagship Programmes anchor and celebrate South Africa's achievements in the tangible implementation of the NCCRP. This section chronicles and celebrates the journey of the Climate Change Flagship Programmes highlighting the progress made in implementing them over the past year and the continued leadership, strategic guidance and vision they will provide to 2030 (**Figure 30**).



FIGURE 30: The success and leadership of the Climate Change Flagship programmes

The DEA is currently working on the scaled-up implementation of eight Climate Change Response Flagship Programmes by 2020, in collaboration with lead national departments and other spheres of government, government institutions, the private sector and civil society. There are currently ten Climate Change Flagship Programmes (as shown in Figure 28), building on the initial set of eight programmes, described in Section 8 of the NCCRP. Seven of the expanded list of Climate Change Response Flagship Programmes, shown in Figure 28, have been prioritised for implementation up to 2020. Key developments in the implementation of the Climate Change Flagship Flagship Programmes since in 2011, are shown in **Figure 31**.



FIGURE 31: Milestones in implementing the Climate Change Flagship Programmes since publication of the NCCRP in 2011

FLAGSHIP PROGRAMMES

7.3.1. Expanding the Climate Change Flagship Programmes

The story of the Climate Change Flagship Programmes is one of progressively intensified, bold and capable climate action. The scale and urgency of climate action has grown, enabled by a boldness of vision, collaborative and collective action, and the creation of opportunities and leveraging resources. South Africa's implementation capability has grown tremendously, characterised by maturing systems and processes and a more informed workforce better able to build strong coordinated climate change response progress.

The first phase of implementation focused on defining the scope and boundaries of individual Climate Change Flagship Programmes at operational level. In most cases, the NCCRP only provided a high-level description of the programme, broadly outlining the key components and indicating the key role-players involved in its implementation.

The initial set of Climate Change Flagship Programmes, as at December 2015, had thirtynine distinct components. Each programme was disaggregated into sub-programmes and projects that were typically implemented at provincial and municipal levels.

Figure 32 gives an overview of the initial set of eight Climate Change Priority Flagship Programmes, and the associated sub-programmes and projects.

FIGURE 32: Overview of the initial set of Near-term Priority Flagship Programmes (DEA 2015)



The Climate Change Response Public Works Flagship Programme



The Water Conservation and Demand Management Flagship Programme



The Renewable Energy Flagship Programme



The Energy Efficiency and Energy Demand Management Flagship Programme



The Transport Flagship Programme

The Waste Management Flagship Programme The Carbon Capture and Sequestration Flagship Programme



Long-term Adaptation Scenarios Flagship Research Programme (DEA)

Working for Water							
Working for Wetlands	Pe	ople and Parks	Working for Fish	neries			
Working for Land	Greeni	ng and Open Space	Comprehensive Ag	ricultural			
Working on Fire	Wo	rking on Waste	Support Progra	mme	 SoilCare, Veld Conservation 	care, WaterCare, JuniorCare	
Working for Energy	Work	king for the Coast	LandCare				
Working for Ecosystems							
Development and implementation	of Water			1			
Conservation and Demand Manage WDM) strategies	ment (WC/	National Rainwa	ater Harvesting				
War On Leaks		WC/WDM target sett municij	ing for metropolitan palities				
Accelerated Community		No Drop As	ssessment				
Infrastructure		and Certificatio	in Flogramme				
Renewable Energy Independent	t Power	• Large-s	cale REIPPPP (projects	ightarrow 5MW) and	small projects REI	PPPP (projects \rightarrow 1 \leftarrow 5 MW)	
Producer Procurement Programme	e (REIPPPP)	• Social n	rogramme (fully subsid	isod SWH for	low-cost housing)		
National Solar Water Heating Pro	ogramme	Subsidis Insurance	sed voluntary geyser rep ce programme (subsidis	placement sc sed replacem	heme (private and c ient of failed geysers	ommercial buildings) s with SWH)	
skom renewable energy projects		• Sere wir	nd farm facility (100 MW	/)			
Off-grid household electrification		EstablisHydro/p	hment of concentrated umped storage hydro p	solar power rojects (Ingul	plants (Upington 10 a Scheme)	0 MW plant)	
			focilitation and issued	opt prove t		technology	
Green industries developm	ient	Market Local m	anufacturing and indus	try upgrading	n renewable energy g incentives	technology manufacturing	
Strategic environmental assessment for RE resources and RE development zones		Renewa Nationa	 Establishing local renewable energy manufacturing capacity Renewable energy manufacturing local content requirements and sector designation National building regulations to accommodate renewable energy technologies 				
		• Green e	conomy renewable ener	rqy investme	nts		
Green Accord		 Reduction of fossil-fuel open fire cooking and heating Promotion of localisation, youth employment, cooperatives and skills development 					
Integrated Demand Management P	Programme	• Renewa	ble energy sector finand	cing			
		• Industri	al Energy Efficiency Imp	provement Pr	oject		
Industrial Energy Efficient	су	Energy Green E	nergy Efficiency Fund (I	DC)			
Residential Energy Efficiency Pro	ogramme	Nationa	l Housing Codes – envir	onmentally e	fficient housing		
				, , ,			
Government Building Energy Ef Programme	ficiency	Municip Nationa	al energy efficiency and l framework for green b	l demand ma puildings and	nagement green building cons	struction standards	
Biofuels		• Building	g energy performance la	abelling			
	· · · · · · · · · · · · · · · · · · ·	• Biofuels	industrial strategy and	biofuels mai	ndatory blending reg	gulations	
Energy Efficiency Labelling Sta	ndards	• Rea Va	va (Johanneshura)	• GOIDurba	n (Durban)	Buffalo City Rapid	
Integrated Rapid Public Transport	Networks	A re Yei My Citi	ng (Tshwane)	Libhongo Mandelal	Lethu (Nelson	Transport	
		Town)		Harambee	e (Ekurhuleni)	Mangaung Rapid Transport	
Promote fuel efficiency meas	sures	Rusten Transp	ort	 Go George Mbombela 	a Rapid Transport	 Polokwane Rapid Transport 	
Non-motorised transport netw	works						
Taxi recapitalisation program	nme	 Mass bio Dedicate Pedestri 	ed cycling infrastructure an walkway infrastructure	e e developmer ure developm	nt nent		
Integrated urban planning and trar planning	nsportation	• Passen	ier rail infrastructure p	roiects			
Transport modal shifts		Gautrair Transne	t freight rail recapitalisa	ation program	nme		
		Landfill	gas-to-energy projects	c			
Solid waste managemen	ıt	Diversio	in or waste norm tanuntt	.5			

Phase 1: Climate modelling, sector-based	 Analysis of climate change trends and projections Development of a consensus view of scenarios (short to long-term) Scoping of impacts, adaptation options and future research on key sectors 	
impacts and adaptation scoping		
Phase 2: Development of adaptation scenarios for future climate conditions	 Review of climate change vulnerabilities and potential adaptation Assessment of climate change vulnerabilities and options for integrated regional adaptation Modelling economic implications of climate futures on national water and food security 	
	Final adaptation scenarios	

Pilot storage and capture projects

Figure 33 below shows the list of South Africa's Climate Change Flagship Programmes and investment priority areas, including new Climate Change Flagship Programmes in bold text.

Climate change priority investment areas	Corresponding climate change flagship programme
Social protection systems and public works programmes	The Climate Change Response Public Works Flagship Programme
Water conservation and water demand management	The Water Conservation and Demand Management Flagship Programme
Disaster risk reduction and management	Currently No Recognised Climate Change Flagship Programme
Health	Currently No Recognised Climate Change Flagship Programme
Renewable energy	The Renewable Energy Flagship Programme
Waste management	The Waste Management Flagship Programme
Carbon capture and storage	The Carbon Capture and Storage Flagship Programme
Energy efficiency and energy demand management	The Energy Efficiency and Energy Demand Management Flagship Programme
Agriculture, food systems and food security	The Agriculture, Food Systems and Food Security Flagship Programme
Land, biodiversity and ecosystems	The Climate Change Response Public Works Flagship Programme
Low carbon, climate resilient transport systems	The Transport Flagship Programme
Low carbon climate resilient spatial development	Currently No Recognised Climate Change Flagship Programme
Low carbon, climate resilient built environment, communities and settlements	Low Carbon, Climate Resilient Built Environment, Communities and Settlements Flagship Programme

FIGURE 33: South Africa's climate change priority investment areas and corresponding expanded Climate Change Flagship Programmes (DEA, 2016)

The second phase of the Climate Change Flagship Programmes, focused on deepening the impact of and consolidating existing programmes. The third phase has focused on expanding the initial set of Flagship Programme activities to incorporate increasingly ambitious and innovative elements and to recognise the importance of adaptation measures in the national climate change response. In January 2016, national departments were invited to nominate existing and new climate-relevant programmes and projects, to be recognised as Climate Change Flagship Programmes.

The call for new Climate Change Flagship Programmes was intended to foster ownership and commitment to implementing the Climate Change Flagship Programmes by the lead departments, and to ensure the inclusion of climate change impacts as a key success metric in the implementation of national programmes. As part of fostering cooperative governance and strengthening institutional linkages the DEA has invited implementing departments and other key partners to formerly collaborate on scaling up new and existing Climate Change Flagship Programmes. The seven Climate Change Flagship programmes shown in **Figure 34**, are prioritised for further development and scaling up between now and 2030.



FIGURE 34: Prioritised Climate Change Flagship Programmes to 2030

The development of a disaster risk reduction and management Climate Change Flagship Programme is also proposed towards 2019.

As indicated in previous Climate Change Reports, the expanded list of the Climate Change Flagship Programmes and investment priority areas elevates climate action through which both adaptation and mitigation benefits can be realised and amplified. This approach prioritises the adoption of a systems approach, integrating and coordinating climate action at scales of implementation, led by all three spheres of government, the private sector and civil society actors.

These areas of work were prioritised based on the following:

- 1. The extent to which the sector is considered as key social and economic infrastructure fundamental to economic growth and social development.
- 2. The extent to which the sector is vulnerable to climate change or can mitigate climate change.
- 3. The extent to which climate change impacts/benefits on the sector are pervasive and will impact on other sectors.
- 4. The institutional readiness of the key implementation partners.

The work on the Climate Change Flagship Programmes, undertaken by the DEA and the Climate Change Flagship Programmes unit in particular, aims to ensure that the Climate Change Flagship Programmes realise their strategic goal of catalysing climate action at scale to achieve South Africa's climate change and NDC objectives.

Figure 35 provides a breakdown of specific components of each of the prioritised Climate Change Flagship Programmes to 2030. The priority work packages include pre-existing Climate Change Flagship Programmes (first described in 2011 and shown in **Figure 32**), as well as new Flagship Programmes established since the publication of the NCCRP. Specific work packages are profiled in detail in **Figure 35** below.

NATIONAL CLIMATE CHANGE FLAGSHIP PROGRAMMES

FIGURE 35: Climate change priority areas and current Flagship Programme work packages 2017

Agriculture, Food Systems and Food Security Flagship Programme

Development of integrated climate smart agriculture (CSA) and implementation

(Department of Agriculture, Forestry and Fisheries)

Training of extension practitioners on climate-smart agricultural practices (Department of Agriculture, Forestry and Fisheries)

Refurbishment of Irrigation schemes integrating water conservation and water demand management (Land Bank)

Development and Piloting of Climate Resilient Agriculture Fund (Land Bank)

Leveraging conditional grants for CSA mainstreaming (Department of Agriculture, Forestry and Fisheries)

CSA Insurance, Risk Reduction and Risk Management (Land Bank)

Development of an integrated National CSA Financing Framework (Department of Agriculture, Forestry and Fisheries)

CSA Green Climate Fund (GCF) Proposal (Department of Agriculture, Forestry and Fisheries) Water Conservation and Water Demand Management Flagship Programme

National rainwater harvesting strategy and implementation

(Department of Water and Sanitation)

Public sector rainwater harvesting (Department of Water and Sanitation) and Department of Public Works)

Water recycling (Department of Water and Sanitation)

Integrated wastewater treatment and infrastructure to protect water resources (Department of Water and Sanitation)

Renewable energy based desalination (Transnet, Municipalities, Department of Water and Sanitation)

Low Carbon, Climate Resilient Built Environment, Communities and Human Settlements Flagship Programme

Residential green buildings and certification awareness strategy and campaign (Green Building Council South Africa)

Implementation framework for low carbon, climate resilient built environment, communities and human settlements

Department of Public Works Green Building Programme Management Office and implementation of public sector greening

Greening of the Higher Education and Training Sector Programme and GCF proposal

Green building MRV framework and pilot (Green Building Council South Africa)

Public sector green building / human settlements planning and management capacity building (other spheres of government)

Energy Efficiency and Demand Management Flagship Programme

Energy Efficiency in Public Infrastructure and Buildings (Department of Energy and Department of Public Works)

Public and Private Sector Energy Efficiency Programme and GCF Proposal

(Department of Energy and Department of Public Works)

Energy Efficiency SME Funding and Credit lines (National Business Initiative (NBI) and

Carbon Trust)

Industrial Energy Efficiency Programme (Department of Trade and Industry: National Cleaner Production Centre)

Residential Energy Efficiency and Renewable Energy Programme (Department of Human Settlements)

Renewable Energy Flagship Programme

Implementation of Integrated hydrogen and fuel cell technologies, energy storage and renewable energy (Department of Science and Technology; Department of Energy)

Public Sector RE Programme (Department of Public Works and Passenger Rail Agency of South Africa (PRASA)

Transnet PV Programme (real estate) (Transnet)

Wayside Energy Storage Programme (Transnet and PRASA)

Public Sector RE Procurement (CSIR)

Embedded Generation Registration and Tracking System Development (National Energy Regulator of South Africa)

Integrated RE GCF Proposal and Programme Development (Department of Energy)

Establishment of inter-governmental co-ordination mechanism for embedded generation (Department of Energy)

Embedded RE knowledge products (information web portal/resources) and capacity building (Department of Energy)

Enhancing grid management and capacity at local government level (Department of Energy)

Enhancing grid performance through appropriate refurbishment and maintenance of distribution level grids (Department of Energy)

Embedded RE funding (revenue and tariff modelling, market-based incentives and credit lines) (Department of Energy)

Distribution-scale renewable energy generation market development (Department of Energy) Transport Flagship Programme

National programme for sustainable urban mobility (Department of Transport)

Finalisation of the Green Transport Strategy (Department of Transport)

Financing Sustainable Mobility and Green Procurement (Department of Transport)

Fuel Economy Standards/Dialogues (Department of Transport)

Alternative fuels and low carbon mobility

(Department of Transport and Department of Trade and Industry)

Parking and congestion management congestion pilots (Department of Transport and Municipalities)

System for monitoring, reporting and evaluation for urban mobility (Department of Transport and Municipalities)

Waste Management Flagship Programme

Diversion of Solid Waste from Landfills – Prefeasibility and implementation preparation: Phases 1 and 2 (DEA; municipalities)

Diversion of solid waste from landfills GCF proposal (DEA; municipalities)

Technical and capacity-building (DEA; municipalities)

Biogas generation and combined heat-power (wastewater treatment) (Department of Water and Sanitation and Department of Energy)

7.3.2. Case Studies of the Climate Change Priority Areas and Current Flagship Programmes Work Packages 2017

The Energy Efficiency and Demand Management Flagship Programme: Energy efficiency in public infrastructure and buildings

The Energy Efficiency and Demand Management Flagship Programme (EE Flagship Programme) continues to be a central feature of the national climate change response given the pivotal role of energy in South Africa's economic growth, the intensity of energy consumption as a function of economic activity combined with a widespread inefficient use of energy and the carbon intensity of electricity generation. Improving energy efficiency is a strategic priority in both the National Development Plan 2030 and South Africa's Nationally Determined Contribution (NDC) under the UN Framework on Climate Change. The EE Flagship Programme is informed by the National Energy Efficiency Strategy (NEES), initially published in 2005 (Department of Minerals and Energy (DME), 2005). The NEES has undergone two reviews, in 2008 and 2012. The draft post 2015 National Energy Efficiency Strategy was gazetted for public comment in December 2016, and is being finalised.

The EE Flagship Programme includes the most important and mature scaling-up effort of the Near-term Priority Flagship Programmes to date, the Energy Efficiency in Public Infrastructure and Buildings Programme (EEPIBP). The lead departments, the Department of Energy (DOE), the Department of Public Works (DPW) and DEA have built on the extensive national investment and experience in energy efficiency garnered over more than a decade. Thus, the EEPIBP consolidates and extends work undertaken by a range of implementers and organises these various measures into a cohesive programme within a single integrated national energy efficiency and climate change framework.

The vast majority of South Africa's public buildings portfolio is energy inefficient with inadequate consideration of energy efficiency evident in all stages of the building life-cycle (**Figure 36**).



FIGURE 36: Drivers of energy inefficiency in public buildings¹

¹ Based on actual consumption data from a sample of buildings (across the four use-types and six climatic zones). The data were gathered from ongoing initiatives such as municipal EEDSM (energy efficiency and demand side management) initiatives, building-specific electricity bills and walk-through audits (DOE, 2015).

The public sector building portfolio is, without doubt, the largest component of South Africa's real estate market, both in terms of overall size and value (a variety of estimates in the property market place the value of the sector at R250–R500 billion) (DOE, 2015).

The Department of Public Works (DPW) alone, has an asset register of 90,500 buildings, while municipalities own several thousand buildings (DOE, 2015). This makes the three spheres of government jointly comparable to the largest listed real estate company in South Africa.

The public sector building stock is expected to grow exponentially from around 52 million m² in 2015 to around 180 million m² by 2050, with an associated increase in energy consumption and consequently GHG emissions from about 12 million tonnes/year to 23 million tonnes/year (Figure 37). This would be almost a doubling in overall emissions per annum resulting in a cumulative total of 580 million tonnes CO₂ by 2050 (DOE, 2015).





Energy efficiency reductions in the construction and operation of buildings, offers one of the single most significant opportunities to mitigate climate change (DEAT, 2009). The operations phase of buildings in a modern economy accounts for an average of 40% of overall energy consumption and associated GHG emissions, placing the built environment at the heart of South Africa's climate change mitigation focus. Given South Africa's moderate climatic conditions as well as readily available and viable intervention technologies now in the market, an aggressive energy efficiency campaign within public sector buildings would achieve a significant component of the national GHG emission reduction aims. This is the need to which the EEPIBP responds.

The EEPIBP forms part of an overarching sector-wide Nationally Appropriate Mitigation Action (NAMA), vertically integrating energy efficiency measures in the public sector buildings portfolio across all three spheres of government. The EEPIBP was first introduced as a key component of the EE Flagship Programme in South Africa's 1st Annual Climate Change Report. Given the strategic importance of this work in the public sector built environment the EEPIBP is discussed at some length in this section.

The EEPBP is developed by the DoE, DPW, DEA, the National Business Initiative (NBI), the Carbon Trust and the Gesellschaft für Internationale Zusammenarbeit (GIZ) on behalf of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMU).² The DoE is the lead national government authority for the EEPIBP.

² The EEBIP is supported by the BMU International Climate Initiative (IKI) through the Vertically Integrated Nationally Appropriate Mitigation Actions (V-NAMA) Programme and the Climate Support Programme. Both programmes are implemented by GIZ on behalf of the German Federal Government.

The EEPIBP aims to reduce GHG emissions in South Africa by catalysing an energy efficiency transformation within the public sector. The programme aims to enhance the energy performance of the existing public building stock (pre-2014) to a level similar to or better than the levels prescribed for new buildings under the South African Bureau of Standards (SABS) SANS 10400-XA, energy usage in buildings standard.

The envisaged outcomes of the EEPIBP are twofold:

- Municipalities, provinces and national government have undertaken interventions in energy efficiency and related GHG mitigation in public buildings, using services provided by Energy Service Companies (ESCos), which are leveraged by private finance.
- South Africa has established an effective incentives and support mechanism for energy efficiency in public buildings providing simplified access for municipalities, provinces and national government to information, funding and capacity building

The EEPBIP focuses on the procurement potential of the public sector, to stimulate the growth of the Energy Service Company (ESCo) market, by enhancing financial services and creating a critical mass of project opportunities in the market. In this way the EEPIBP will have the effect of stimulating transformation of the energy efficiency market in South Africa.

A range of mitigation options is available and, can be readily applied to the public buildings portfolio as both stand-alone and combined measures. Some of these measures are described in South Africa's Greenhouse Gas (GHG) Mitigation Potential Analysis (MPA) (DEA 2014) and the Energy and Climate Change Strategy for the Public Building Sector: 2015–2050 (ECCS) (DoE 2015)) (**Figure 38**).

Passive energy efficiency measures	Active energy efficiency measures	Behavioural energy efficiency measures
Measures do not rely on mechanical or electronic mechanisms. Examples include: • Insulation and draught proofing (roof, floor and wall); • Glazing • Reflective/cool surfaces • Day lighting (maximise use of natural light) • Shading	Measures improve efficiency through the use of energy effiicent equipment which is an integral component due to building/energy management systems. Examples include: • Heat pumps • Efficient lighting • Efficient appliances • Efficient heating, ventilation and air conditioning systems (HVAC)	Measures rely on behavioural change to achieve energy efficiency. Examples include: • Information and awareness

FIGURE 38: Built environment energy efficiency measures identified in the Mitigation Potential Analysis and the Energy and Climate Change Strategy for the public building sector

The marginal abatement costs of energy efficiency interventions in existing buildings described in South Africa's GHG Potential Analysis are negative with comparatively short payback periods. The range of options identified in the MPA for buildings are primarily active energy efficiency measures, prioritising technology interventions for both existing and new-build buildings, expanding to include passive interventions for new-build buildings. It is key to note that each of the energy efficiency interventions identified in the MPA have a negative marginal abatement cost, ranging from an average of - R294 /tCO₂e to - R1,242 /tCO₂e in 2020 and 2050 respectively (DEA 2014).

The full implementation of the EEPIBP is guided by the ECCS and NEES, the envisaged benefits of which are summarised in **Figure 39**.



FIGURE 39: Envisaged climate change mitigation and energy efficiency benefits of the full implementation of the Energy Efficiency in Public Infrastructure and Buildings Programme

Barriers to implementation

Despite the range and maturity of energy efficiency options available in the South African market, adoption of measures within public buildings has been very slow and remains low. Several barriers to implementation have been identified that have hampered uptake in the public sector. Table 15 provides a summary of the main barriers to implementation and Figure 40 outlines key enablers.

TABLE 15: Barriers to implementation of energy efficiency in public buildings

Public Sector	Private Sector
Financial barriers	
 Provinces and municipalities lack the financial ability to prepare bankable projects for energy efficiency interventions in their buildings. Access to national incentive mechanisms for energy efficiency is complex. National incentives do not leverage local or private investments. No national platform to access financial and technical services for public buildings energy efficiency and related climate finance for provinces and municipalities. 	 The private energy services company (ESCo) industry is still young, very few 'true ESCos' are operating in the market. The majority of ESCos have a weak capital base and very limited access to debt financing. Finance facilities are difficult to access, particularly for SMMEs and local government. The finance community are uncertain and reluctant to provide energy efficiency funding, or to introduce new products into complex lending systems.
Technical barriers	
 Lack of accessible subsidy mechanisms for provinces and municipalities. Procurement complexity and cost (especially in legal fees) is an inhibitor to both the public and private sector, but especially for the public sector. Lack of modelled procurement procedures, to enter into three year or longer contracts between the public sector and the private sector (ESCos). Fragmented and poor-quality data coupled with limited access to data and high-quality analysis. 	Lack of modelled procurement procedures, e.g. regulatory hurdles to enter into three year or longer contracts between provinces/ municipalities and the private sector (ESCos).
Capacity barriers	
 Insufficient capacity to assess energy efficiency potential. Insufficient capacity to develop bankable investment plans and to apply to existing financial support mechanisms. Insufficient capacity at national level to implement effective energy efficiency support programmes for provinces and municipalities. 	 Insufficient capacity in ESCos to provide energy services. Insufficient capacity in financing institutions to evaluate energy services business plans.
Policy barriers	
 The regulatory framework for energy efficiency and monetary and non-monetary incentives not yet fully developed. The monitoring of energy consumption and benefits of energy efficiency interventions in public buildings not yet systematically measured, reported and verified. 	The government incentive and policy structure is not well understood and is incomplete.

Defining the transformative impact of the EEPIBP

The EEPIBP aims to reduce GHG emissions in South Africa by catalysing an energy efficiency transformation within the public sector by addressing the barriers to implementation discussed above.

Financial	Technical support	Capacity	Policy
 Provide financial support to the public sector to develop bankable energy efficiency investment plans. Provide support to private sector energy services companies (ESCos) to obtain loans from financing institutions to finance energy efficiency interventions in public buildings and to mature the ESCo industry. 	Provide support to the public sector through a 'one-stop-shop'- an Energy Efficiency project support office - with tailor-made support for access to subsidy and incentive mechanisms including hands-on-support through secondment of energy efficiency managers.	Provide support and capacity building to various target groups in both the public and private sectors.	 Provide support for the further development of framework conditions for energy efficiency interventions in public buildings in all spheres of government. Enhance the MRV- system.

FIGURE 40: Removing barriers to energy efficiency measures through the Energy Efficiency in Public Infrastructure and Buildings Programme (EEPIBP)

The main beneficiaries of the EEPIBP include municipal, provincial and national spheres of government, as recipients of energy efficiency services. A second key group of beneficiaries of the EEPIBP is private sector energy services companies (ESCos). The EEPIBP focuses explicitly on stimulating the ESCo market by providing access to the vast public sector building portfolio, facilitating access to private sector finance for energy efficiency initiatives and providing risk reduction measures. **Table 16** provides an overview of the EEPIBP indicators.

TABLE 16: Summary	y of the	EEEPIBP	Indicators
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Indicator	Description
Climate change mitigation and energy	 Volume of energy savings and GHG emissions mitigation realised through energy efficiency interventions triggered by the EEPIBP. Number of public buildings where energy efficiency interventions triggered by the EEPIBP. Proportion of public buildings where public sector institutions who have accessed the EEPSO have carried out interventions. Number of people directly benefitting from the EEPIBP.
Public, private and climate finance	 Volume of contributions from national programmes, provincial and municipal own sources for energy efficiency interventions. Amount of money from the public sector budgets complementing private/ESCo investments. Volume of contributions from private sources (financial institutions) for energy efficiency interventions. Amount of money invested by ESCos. Volume of contribution from climate finance mechanisms accessed.
Policy development	 Number of policies, strategies, programmes and projects, which refer to or are triggered and informed by experiences and best practices from the EEPIBP. GHG emissions mitigated by the EEPIBP tracked and reported as part of South Africa's NDC. EEPIBP linked to the national climate change monitoring and evaluation system.
Market development	 Number of ESCos offering Energy Services to public and/or private entities. Finance products tailored for ESCos and energy efficiency implementation. Amount of energy savings and GHG emissions realised through energy efficiency interventions by ESCos. Number of public buildings where interventions by ESCos have been realised.

Implementation model

The programme's transformative impact hinges on the provision of technical and financial support necessary to identify and implement appropriate energy efficiency interventions in buildings and infrastructure in a consistent and replicable manner (**Figure 41**).

Technical component:	Financial component:
project support office	first loss instruments
 Access to a service desk and technical support mechanisms and capacity building. A project preparation and grant facility. A core team of experts supported by service providers. 	 A guarantee fund to reduce the initial cost of capital for ESCos to make investment more attractive. Preferential loan agreements negotiated with financial institutions to stimulate lending across existing energy efficiency funds and private sector financial institutions.

FIGURE 41: Technical and financial support provided by the EEPIBP

An Energy Efficiency Project Support Office (EEPSO) will be established offering a range of technical and advisory services to public sector clients. The EEPSO will include a project preparation grant facility to enable clients to assess their building stock, compilation of a portfolio of buildings and its energy efficiency potential, detailed audits to estimate efficiency potentials, selection of preferred business models, to develop bankable investment plans for energy efficiency intervention and tender/procurement processes. The EEPSO will assist in developing standardised procurement and contracting procedures, capacity building, awareness, training and project preparation support.

A grant facility will be established as part of a project preparation facility located within the EEPSO and will provide for the following support measures:

- Energy efficiency assessments to public sector clients.
- Support for procuring energy meters to establish accurate data baselines.
- Enhanced credit vetting reducing the risk and administrative overhead for financial institutions.

The EEPSO will ideally be housed within the Department of Energy, with sub-programmes supported by the implementation partners. First loss instruments will be provided for commercial funds and ESCos through the establishment of a guarantee fund, hosted by the Industrial Development Corporation (IDC). The guarantee fund will enable private sector ESCos to access concessional loans to finance and implement energy efficiency and other GHG mitigating activities in public buildings. The guarantee fund will unlock access to credit lines for private sector ESCos through a partial guarantee against delays in payments or defaults by public institutions. Figure 42 provides an overview of the EEPIBP implementation and cooperation structure.



The EEPIBP enables the national government to provide the right framework conditions (policy advice, capacity building) for the establishment of the energy services market including improved incentives and regulation, and to measure results and impact of the interventions carried out by provinces/municipalities and ESCos on climate change mitigation, energy security and co-benefits.

There have been several notable milestones in the development of the EEPIBP over the past year. In July 2015, South Africa submitted a funding proposal, for the implementation of the EEPIBP, to the NAMA Facility, in response to the 3rd call for NAMA Support Project Outlines. In April 2016, the NAMA Facility Board granted pre-approval of the EEPIBP funding proposal. The proposal is subject to a detailed appraisal by the NAMA Facility Technical Support Unit as part of the second stage of the selection process. The EEPIBP will be implemented once final approval has been granted by the NAMA Facility Board in 2018.

The EEPIBP aims to use funding from the NAMA Facility to mobilise public and private sector investments in public buildings in the initial phases of the consolidated EEPIBP (Figure 43).



FIGURE 43: Positioning NAMA facility funding in the full-scale implementation of the EEPIBP

The core financial element of the EEPIBP NAMA Facility proposal is to enable provinces and municipalities to mobilise private sector energy efficiency investments in their building stock. This forms a key component of a medium-term plan building on existing and future planned programmes and drawing from a variety of funding sources, to create a national energy efficiency programme that will stimulate the energy efficiency market.

Once a market for private sector Energy Services in public buildings of all government spheres has been matured, the indirect leverage of private sector investments as well as the GHG mitigation potential goes far beyond the direct financial and mitigation ambition. It will deliver a relevant (30–50%) contribution to the mitigation target estimated in the ECCS for the public buildings sector of up to 4,800 kt CO_2 e annually in 2050 and will trigger energy efficiency interventions in other buildings sub-sectors (commercial, industrial, households).

The Waste Management Flagship Programme

Diversion of Municipal Waste (DMW) from Landfill

The Waste Management Flagship Programme aims to deliver significant climate change mitigation results and increased resilience at the level of the waste management sector of South Africa. The Waste Management Flagship Programme therefore aims to mitigate emissions from this sector by addressing barriers to the implementation of mitigation projects in the waste sector, demonstrating real-world approaches to project implementation and attracting investment in the sector.

Disposal of solid waste by landfill is currently the primary approach to municipal waste management in South Africa but, as waste volumes are increasing annually throughout the country, it has now become apparent that this approach is no longer ideal nor preferable in the long-term because landfill space in many urban areas is now running out and the methane released from landfilling is significantly contributing to climate change. Many municipalities, however, have not yet given priority to alternative forms of waste treatment.

The current waste management practice, especially in secondary cities is collection and landfilling of 90% of the waste stream. The experience with waste recovery and private sector engagement is limited in municipalities. Green and organic waste is generally a high proportion of the waste stream, about 25% and higher by weight, but there is a lack of data to show this and generally there are no weigh-bridges at landfill sites. Because GHG emissions in the waste sector primarily come from organic waste in the landfills, there is a need to promote and demonstrate the proper implementation of the waste management hierarchy, thereby avoiding landfilling of organic waste.

The Diversion of Municipal Waste from Landfill (DMW) component of the Waste Management Flagship Programme focuses on strengthening an enabling environment for the uptake of projects that divert waste from landfills, supporting the paradigm shift from landfilling to proper implementation of the waste-hierarchy through the following initiatives:

- Developing a scaled-up programme that demonstrates and promotes implementation of the waste hierarchy by employing a fit-for-purpose combination of mechanical and biological treatment methods in five municipalities.
- Packaging the scaled-up programme into a NAMA and a fundable programme.
- Submitting the packaged programme for funding to support implementation in the respective municipalities.

The key objectives include:

- To scope and evaluate the current status of waste disposal, in the context of diversion from landfills, including undertaking a waste characterisation study for the identified municipalities and respective landfill sites.
- To assess the suitability of different technologies for the specific waste streams in each municipality and determine the potential for a programmatic/ scalable approach for waste diversion initiatives through fit-for-purpose technologies.
- To design systematic fit-for-purpose combinations/scenarios of various waste management technologies such that the solid municipal waste is diverted from landfills in the identified municipalities.
- To compile a business plan for the operation of the desired waste management combinations/ systems for the identified areas and to propose the development of an implementation plan for the selected scenario(s)

The implementation model for the DMW component of the Waste Flagship Programme

The DMW component of the Waste Management Flagship Programme focuses on diverting food and organic waste from landfills. Six municipalities were chosen to pilot alternative waste treatment technologies. The municipalities selected include metropolitan and local municipalities with rural characteristics, to cover a broad range of conditions representative of the South African landscape and context.

Waste characterisation in the six municipalities selected as pilot projects, showed that a significant amount of municipal waste is made up of food waste and garden waste. It is reasonable to assume that waste composition is similar in other local municipalities in South Africa of similar size with a predominantly urban character, similar housing structures and population densities. The current waste management process in the six municipalities is indicative of the situation in other municipalities targeted by the Programme, namely collection and disposal. The Mitigation Potential Analysis (MPA) study then identified eight viable mitigation options in the waste sector, shown in Table 17.

TABLE 17: Mitigation options in the waste sector

Mitigation option	Description
Landfill gas recovery – flaring	Recovery and flaring of landfill gas from managed landfill sites
Landfill gas recovery – electricity generation	Recovery of landfill gas from managed landfill sites and utilising it for electricity generation
Waste incineration	Incineration of municipal solid waste (MSW) with energy production
Anaerobic digestion of food and garden waste	Diversion of food and garden waste from landfill with source- separated collection to anaerobic digestion facility where biogas is produced
Windrow composting	Diversion of garden waste from landfill to large scale windrow composting.
In-vessel composting	Diversion of food and garden waste from landfill with large scale in-vessel composting facilities.
Household waste separation and composting	Separation and diversion of food and garden waste from landfill with small, household composting facilities
Paper recycling	Additional source-separated waste collection schemes to divert dry recyclable from landfill. Increased recycling of paper

A technology-based approach to scaling-up of climate smart waste management has been adopted as the core of this component of the Waste Management Flagship Programme, supported by the implementation and rollout out of capacity development and implementation tools. **Figure 44** shows the initial technology-based approaches for diverting food and organic waste from landfills.



FIGURE 44: Diversion of municipal waste from landfill to technology-based alternative waste treatment options

An initial set of five technologies were selected for each of the six municipalities participating in the piloting of alternative waste treatment technologies. All five of the treatment options target treatment of the organic waste streams, ensuring significant mitigation impact through the avoidance of methane emissions that would occur if this waste stream was landfilled.

The five technologies chosen to implement the DMW work package are low-hanging fruits, as they are relatively low cost, yield significant GHG mitigation and diversion from the landfill and are labour intensive, especially if capital expenditure (CAPEX) risk is minimised or avoided entirely. The majority of the technologies chosen do not result in excessive financial pressure on municipalities.

The strategies developed as part of the studies undertaken in 2015, encompass advance waste treatment technologies and relevant soft interventions. The studies addressed technical, financial and environmental feasibility for the selected intervention and propose a marketing strategy, financing scheme, procurement strategy and an operator model for implementation. Implementation and business plans were then developed for each municipality and attached to the document. The solutions proposed through the business plan reports are designed to add to the existing systems and, where needed, rehabilitate and use existing facilities. The level of detail of the studies conducted within the framework of the Waste Management Flagship Programme was done at least at the level of a prefeasibility study for each of the six municipalities participating in the piloting of alternative waste treatment technologies. All the projects are targeting food waste and garden waste from residential and commercial areas.

Implementation of the alternative treatment options based on the five technologies selected will be replicated across a range of eligible municipalities throughout South Africa. A second phase of 30 municipalities has been implemented.

Scaling up approach

The transformation of the waste sector and scaling up of the waste management flagship Programme to achieve significant mitigation, adaptation, environmental, social and economic impacts, as well as to contribute towards Nationally Determined Contribution (NDC) targets requires that other municipalities implement similar interventions in the coming years, building on the knowledge and lessons learned from the first municipalities.

For upscaling the DMW work package, municipalities of similar size and characteristics to the six pilot municipalities will be considered. Approximately 226 local municipalities in the B1, B2, B3, and B4 categories are suitable in terms of population size and their predominantly urban character to go through a selection process (**Table 18**)
TABLE 18: Number of different municipal categories in South Africa

Category	Description	National proportion
A1	Metropolitan municipalities (metros)	3%
B1	Secondary cities, local municipalities with the largest budgets	7%
B2	Local municipalities with a large town as core	10%
B3	Local municipalities with small towns, but no large town as core	40%
B4	Local municipalities which are mainly rural with communal tenure	25%
C1	District municipalities	8%
C2	District municipalities	7%

Scaled-up implementation of the DMW component of the Waste Management Flagship Programme will follow a phased roll out: The initial focus on six municipalities will be followed by a second phase incorporating an additional 30 municipalities (**Figure 45**).



FIGURE 45: Scaled-up implementation of the DMW component of the Waste Management Flagship Programme

All 30 municipalities participating in the second phase of implementation, are expected to have fully operational projects by 2024. **Figure 46** shows the cumulative waste diversion impact of the 30 implemented sub-projects and the spread of technologies assumed. By the end of the financial year in 2024 it is forecast that projects will be operational in all 30 municipalities



FIGURE 46: Waste diverted per technology for 30 municipalities

The climate change mitigation impact of the DMW for 30 municipalities is as follows:

- 546,800 tCO₂e/year avoided due to diversion of organic waste away from disposal sites where it would cause the generation of methane.
- 26,000 tCO₂e/year reduced due to fuel switch from traditional sources to renewable energy generated by anaerobic digestion from organic waste.

The total estimated GHG emission reduction per annum is 572,800 tCO₂e/year.

Additional mitigation benefits can be achieved through:

- Replacing chemical fertilisers with compost
- Improved carbon sequestration of soils through the application of compost
- In case of home-composting, reduction of transport emissions that would otherwise occur when transporting organic waste to the disposal site.

Figure 47 provides an overview of the funding structure of the DMW project of the Waste Management Flagship Programme.



FIGURE 47: Diversion of municipal waste - funding structure

Carbon Capture and Storage (CCS) Flagship Programme

Carbon capture and storage (CCS) is an internationally tried and tested technology to decrease carbon dioxide (CO_2) emissions into the atmosphere while allowing the continued use of fossil fuels, thus being one of the options in the UNFCCC's tool-kit to address global warming and ocean acidification.

The technology involves four stages:

- 1. Capture of carbon dioxide from the emissions of inter alia industry, synthetic fuel production and electricity generating stations.
- 2. Transport to a suitable storage site, usually by pipeline,
- 3. Injection into an appropriate geological storage site, usually 1–2 km deep.
- 4. Monitoring and verification to ensure safety and permanent storage.

South Africa relies on fossil fuels for most of its primary energy supply. Approximately 90% of primary energy is derived from fossil fuels – 72% of which is coal. Furthermore, coal provides 85% of electricity generation capacity and 92% of electricity production. Coal is also used for the production of liquid fuels including approximately 30% of the petroleum used in South Africa. This reliance on fossil fuels has led to an approximate 400 MtCO2 emissions per year. South Africa's coal industry contributes significantly to employment opportunities and income generation, as well as accounting for 6% of the country's total merchandised exports.

Notwithstanding the recent advances made in renewable energies and energy efficiency measures, it is evident that fossil fuels will remain the main contributor to South Africa's energy economy for some decades to come.

During the UNFCCC Conference of Parties in Copenhagen, the South African President committed the country to lower greenhouse gas emissions – provided that international support in the form of funding and technology was forthcoming to assist with such an action. Such a commitment entails the application of a portfolio of clean technologies – including carbon capture and storage.

The International Energy Agency (IEA) has stated that the least cost approach to limiting global temperature must include CCS. Moreover, the Paris target of holding the global temperature increase to significantly below 2°C cannot be achieved without CCS. CCS is viewed as a critical transition measure until nuclear and renewables become more dominant in the national energy supply.



South Africa's CCS implementation roadmap is shown in Figure 48.

FIGURE 48: South Africa's CCS roadmap

The Pilot Carbon Storage Project (PCSP) involves the injection, storage and monitoring of 10,000–50,000 t/ CO_2 in South African conditions with the primary aim of:

- Demonstrating safe and secure CO₂ handling, injection, storage and monitoring in South African conditions, in particular South African geology.
- Increasing the South African human and technical capacity for the development and operation of CO₂ handling, injection, storage and monitoring.
- Raising awareness among the South African public of the potential importance of CCS.
- Working with government to ensure that the development and operation of the PCSP can occur within the South African legal and regulatory environment.

Programme implementation partners are shown in Table 19.

TABLE 19: South	Africa's CCS Clin	ate Change Flac	ship Programme	implementing partners

Organisation	Role and responsibility
Department of Energy (DoE)	The primary project sponsor within South Africa, and provides high level direction and authority for SANEDI.
South African National Energy Development Institute (SANEDI)	A state-owned entity that has been mandated by the DoE to investigate the technical potential for CCS in South Africa and ultimately be responsible for the successful execution of the project. In addition, SANEDI is responsible for conducting procurement for the project, as well as tracking the project budget.
Council for Geosciences (CGS)	Carries a mandate for basic geoscience research as established by the Geoscience Act, 1993 (Act No. 100 of 1993), and thus is an integral member of the project team. CGS resources are used extensively to review legacy data, and to acquire and interpret new data. CGS is expected to be the project operator, at least for the exploration and site characterisation stages of the PCSP to allow the project to be undertaken under the Geoscience Act.
Petroleum Agency of South Africa (PASA)	The oil and gas regulatory body of South Africa, works with the PCSP team to provide support and expertise related to geology, geophysics, and modelling. PASA maintains a database for all oil and gas exploration wells in South Africa.
World Bank	Partly funding the PCSP through its Carbon Capture and Storage Trust Fund. The World Bank overseas procurement using its funds, and has appointed the Project Technical Advisory Services (PTAS) consultant.
Project Technical Advisory Services (PTAS) Consultant	The PTAS consultant has been hired by SANEDI and the World Bank to provide technical and management consultancy services throughout the various phases of the PCSP. The PTAS project manager is located on site with SANEDI, and works as an integral member of the team to build local capacity and to coordinate technical and management inputs for the execution of the PCSP.

The PCSP will involve the investigation and characterisation of a suitable geological CO_2 storage site and the subsequent injection, storage, and monitoring of CO_2 in the identified storage site. Before, during, and after the geological storage, the CO_2 will be monitored to ensure that it is behaving as modelled and projected. The volume of CO_2 to be stored as part of the PCSP is between 10,000 and 50,000 metric tons of CO_2 . The location considered for storage investigation will be in the Zululand geological basin in the uMkhanyakude District Municipality in the KwaZulu-Natal Province of South Africa. The project is divided into seven distinct stages (**Figure 49**).



FIGURE 49: CCS programme phases

Planning for the PCSP has commenced to the extent that a plan for the project has now been developed and pre-existing data has been analysed. The next stage is field exploration, leading to an injection site selection and characterisation. It is envisaged that the actual undertaking of the injection, monitoring, analyses and determination of CCS potential within the particular basin will take place during the 2019 – 2022 period, focusing on the design, procurement, construction, operation, closure and post closure activities.

Agriculture, Food Systems and Food Security Flagship Programme

The Agriculture, Food Systems and Food Security Flagship Programme is a new Climate Change Flagship Programme by the Department of Agriculture, Forestry and Fisheries (DAFF) and builds on DAFF programmes including LandCare, Fetsa Tlala (end hunger) and other key national programmes. The Agriculture, Food Systems and Food Security Flagship Programme seeks to enhance agricultural productivity and climate resilience at all scales of production, decoupling agricultural growth from greenhouse gas emissions growth, and driving the growth and competitiveness of the South African agricultural sector.

The primary programme objective, which drives the programme approach is the simultaneous implementation of a comprehensive, cohesive and integrated set of climate change mitigation and adaptation measures to build climate-smart agricultural and food production systems. Thus, the programme seeks to ensure that a comprehensive and complementary set of climate change response measures are implemented in a systematic way to bring out clear climate change response benefits, as outlined below:

- increased productivity and production efficiency
- reduced risks and enhanced disaster preparedness and management
- enhanced sustainability of agricultural and food systems

Agriculture has a rich policy and regulatory framework from which to draw in the development and implementation of a national Agriculture, Food Systems and Food Security Flagship Programme. Firstly, agriculture is identified as one of the most important national jobs drivers in all relevant policies and strategy documents. The sector is envisioned to provide opportunities for 300,000 households in smallholder schemes by 2020, create 145,000 agro-processing jobs and enhance employment on commercial farms by 2020. Secondly, the location of agriculture primarily within rural areas is a catalyst and mechanism for driving rural development, livelihoods and infrastructure. Agriculture is positioned to stimulate sustainable rural enterprises, investment in agro-processing, and opportunities for broader economic participation.

The Integrated Growth and Development Plan for Agriculture, Forestry and Fisheries (IGDP) (DAFF 2012), which seeks to achieve transformation and restructuring of the sector, highlights the importance of sustainable resource management as a basis for growing the sector. The Agriculture Policy Action Plan (DAFF 2014), which translates the high-level responses identified in the IGDP into tangible, actionable steps, begins to integrate the themes of agricultural expansion and development with the themes of climate change and food security.

The NCCRP identifies agriculture as a priority sector in South Africa's climate change response, due to the sector's social and economic importance. The rural poor are most vulnerable to the effect of climate change and climate-resilient agriculture provides a significant opportunity to improve the adaptive capacity of those most vulnerable to climate change, such as the rural poor. The NCCRP highlights a number of specific areas as key for the sector's growth in the context of increased climate variability and impacts. The current priority packages for the Climate Change Flagship Programme are shown in **Figure 50**.



FIGURE 50: Agriculture, Food Systems and Food Security Flagship Programme current priority packages

DAFF, in partnership with the DEA, has sought to understand the climate change vulnerability and mitigation potential of prioritised agricultural value chains in a changing climate in order to identify climate resilient land-use, mitigation and adaption approaches that hold the greatest agricultural growth/opportunities for these priority value chains. In light of this, in February 2018, DAFF in partnership with the DEA commissioned a study on the Development and Optimisation of Climate Smart Agriculture Interventions for South Africa's Priority Agricultural Value Chain for a Changing Climate, funded by GEF-UNEP.

This work package is still in the inception phase and will be implemented until February 2019 with the key outputs shown in **Figure 51**.



FIGURE 51: Climate smart agriculture interventions for South Africa's priority agricultural value chains for a changing climate – study outputs

The other work package is conducting a skills audit for training extension practitioners on climatesmart agriculture, developing a comprehensive skills plan for DAFF over a period of six months and collaboration between DAFF, DEA and GIZ through the latter's Climate Support Programme III. DAFF supports the implementation of Climate Smart Agriculture (CSA) as an approach that promotes adaptation by enhancing the resilience of agricultural production systems, mitigation against the adverse impacts of climate change and ensures food security. DAFF's situational analysis report for the development of its CSA Strategic Framework has highlighted the importance of capacitating DAFF and the sector on technical issues relating to CSA and climate change.

The need to capacitate the extension practitioners on CSA was identified through various interactions and engagement with DAFF line functions based on their role in providing advisory services to farming communities. The need was also informed by gaps identified by DAFF's legislative policies, strategies and plans including the Agriculture Policy Action Plan (APAP) (DAFF 2014), DAFF Climate Change Sector Plans, National Policy on Extension and Advisory Services, and the National Framework for Extension Recovery Plan. The objective is to conduct a skills audit that will enable DAFF to assess the competencies to facilitate a training programme for extension practitioners on Climate Smart Agriculture. The skills audit will be agreed upon by main partners including the nine Provincial Departments of Agriculture (PDAs). The work of the consultancy includes identifying existing skills and knowledge as well as conducting a training needs assessment based on the outcome of the audit. The outcome of the audit will identify skills gaps and opportunities for skills upgrading of more than 1,000 extension practitioners. This will be supported by a professional development programme for DAFF that will focus on developing high-level skills for the benefit of the entire sector.

The DEA and the FAO are also supporting DAFF on a GCF application for Strengthening Systems, Technologies and Practices for Building Resilient and Climate Smart Smallholder Crop and Livestock Value Chains in Vulnerable Biomes of South Africa. The programme seeks to improve economic, social and environmental resilience to climate change and harnesses mitigation benefits by building systemic adaptation capacities in agricultural ecosystems. It strives to strengthen local systems/institutions and facilitate commercial as well as market-based development and adoption of technologies and best practices in cereal, horticultural and livestock agricultural ecosystems in the most affected biomes.

The Programme catalyses public and private investment in climate smart technologies along value chains through implementing tailored, structured ecosystem-based measures, facilities and incentives. It seizes the opportunity of ongoing agrarian reforms driven by government including the 'one household one hectare' programme, the commitment to establishing 300,000 smallholder farmers and the LandCare and AgriParks Programmes to address resilience challenges.

The programme is expected to deliver the following outcomes:

- Directly, at least 60,000 households using agricultural land within the Grassland, Nama Karoo, Indian Ocean Coastal belt, Savannah, Fynbos, and Forest biomes become more resilient through sustainable use of soil, water and rangeland and a variety of ecosystembased adaptation management. Additionally, 2.5 million beneficiaries (learners and adults) reached through climate education and awareness programmes.
- Increased private and public sector investment supporting Climate Smart technologies along value chains and other ecosystem-based investments for better management of climate related agricultural risks.
- Functional and strengthened business driven agricultural and farmer service institutions and local governance arrangements for ecosystembased adaptation for smallholders in key agricultural value chains.

Transport Flagship Programme

Road transport is the primary source of transport-related CO_2 emissions in South Africa, having been estimated as contributing 91,2% of total transport related GHG emissions in 2010 (DEA 2014). This emphasises the strong need for immediate intervention in the road sector. The heavy reliance of the sector on fossil fuels contributes significantly to total GHG emissions in South Africa. As the second largest contributor to emissions in South Africa, transport must play a significant role in reducing emissions to combat the negative effects of climate change.

To address the significant contribution of transport to national GHG emissions, the Department of Transport (DoT) has published a Draft Green Transport Strategy (GTS) for comment (DoT 2017). The GTS aims to minimise the adverse impact of transport on the environment while addressing current and future transport demands based on sustainable development principles.

The GTS serves as a guide to the DoT to implement mitigation and adaptation measures that will significantly reduce GHG emissions produced by the transport sector in South Africa and result in a more resilient sector, with the following objectives:

- 'Enabling the transport sector to contribute its fair share to the national effort to combat climate change in a balanced fashion, taking into account the DoT and the sector's primary responsibility of promoting the development of the efficient integrated transport system to enable socio- economic development.
- 2. Promoting sustainable and cleaner mobility development.
- 3. Engaging the low carbon transition of the sector, to assist with the aligning and developing policies which promote energy efficient and less carbon intensive mobility.
- 4. Facilitate the sector's just transition to a climate resilient and low carbon economy and society.' (DoT 2017, 196)

Figure 52 provides an overview of the strategic pillars of the GTS.



FIGURE 52: An overview of 8 strategic pillars of the Green Transport Strategy

The GTS is envisaged to minimise the negative effects of energy usage upon human health and the environment. This will be achieved by encouraging sustainable energy development and energy use through efficient practices and investing heavily in green transport in order to meet its global obligations and ensure that its people and environment are secure in the future.

The Renewable Energy Flagship Programme: Hydrogen and Fuel Cell Technologies

The Department of Science and Technology (DST) has a Medium Term Strategic Framework (MTSF) target of deploying 25 hydrogen fuel cell units incorporating technologies developed through the Hydrogen South Africa (HySA) Programme by 31 March 2020. To date, two units have been installed in the form of a hydrogen fuel cell (HFC) powered forklift at Impala Platinum Refineries in Johannesburg and a 2.5kW stationary unit at a rural school near Ventersdorp in North West Province. The focus will now be on deploying the remaining 23 in a number of identified sectors.

A multi-stakeholder forum comprising Government and the private sector has identified a number of sectors such as stationary, mobility, material handling and underground mining equipment as potential markets for HFC technology uptake. Deployment of HySA technologies in the form of fuel cell systems in these sectors will provide valuable performance information as well as opportunities for optimisation in preparation for upscaling and commercialisation of the technology. The DST has, therefore, embarked on a number of projects for deployment in the identified sectors that will contribute towards the MTSF target.

Stationary sector

The DST liaised with the Department of Basic Education (DBE) to select a school where demonstration of a HySA-developed HFC unit would make an impact. Poelano High School in Goedgevonden, Ventersdorp, North West Province was selected. The 2.5 kW HFC unit deployed at Poelano High School is coupled with 17kW of photovoltaic (PV) solar panels, which convert energy from the sun to electrical energy used to power an electrolyser, which separates hydrogen and oxygen from water to generate renewable hydrogen. The project funding of R9.8 million was provided by the DST. The installation of the HFC unit will assist the school in meeting its power requirements for lighting and powering essential learning equipment and reduce its reliance on grid electricity.

It should be noted that as a result of this HySA installation at the school, a number of organisations have expressed interest in installing similar or larger systems at their premises. One of those organisations is Mintek, a provider of minerals processing and metallurgical engineering product and services, which is looking to install a 5kW HFC system at the main entrance to its Campus in Randburg.

The short-term (potential) market for the 2.5kW fuel cell unit is in rural schools and clinics, with an estimated market potential of 13.5 MW. This number is made up of approximately 4 300 schools and 1 000 clinics across the country that do not have access or have limited access to reliable electricity. In rural schools, the 2.5 kW fuel cell system will be capable of powering classroom lights and some computers. In a typical rural clinic, the fuel cell system will be capable of powering lights, a computer and a fridge for storing vaccines. It should be noted that the modular nature of fuel cells would enable similar units to be combined, with minimum changes to the plant, to make 5kW, 7.5kW or larger systems as required. In that case, the potential MW could be much higher than the 13.5 MW estimate. Given the distance of some of these facilities from the Eskom grid (>20km) and the high cost of putting up the required transmission infrastructure in some of these areas, distributed generation becomes the most feasible way to provide power to the communities. In comparison to solar home systems, the HFC system provides more power and incorporates energy storage in the form of hydrogen gas.

Mobility sector

The 2017 Hydrogen Council study (Hydrogen Council 2017) indicates that the biggest market for hydrogen and fuel cells will be in the mobility sector. The DST is supporting a number of projects in the sector, shown in **Figure 53**.

Hydrogen platform for clean mining operations Fuel cells as rangeextenders for electric scooters Fuel-cell bus range-extender project

South African hydrogen and fuel-cell projects

FIGURE 53: An overview of hydrogen and fuel cells projects implemented in South Africa

Hydrogen platform for clean mining operations: The DST has allocated funding of R24 184 214 to investigate the use of renewable hydrogen in an underground mining environment through one of the HySA Centres at North West University. The International Agency for Research on Cancer (IARC) in June 2012 declared diesel exhaust to be a Group 1 human carcinogen. In this regard, the Department of Mineral Resources (DMR) is currently exploring various regulatory mechanisms specifically to control exposure to diesel exhaust and particulate matter underground. The safe use of renewable hydrogen coupled with fuel cells in an underground mining environment will become the most viable alternative for the mining sector if diesel powered equipment is banned. In related work, the use of liquid organic hydrogen carriers (LOHC) technology is being investigated for the cost-effective distribution, storage and safe use of hydrogen in both above ground and underground environments.

Fuel cells as range extenders for electric scooters: The DST has allocated R4.1 million to a project to use fuel cells for extending the range of battery-electric scooters in collaboration with the South African Post Office (SAPO). Similar technology has already been used by HySA Systems at the University of the Western Cape to double the range of a golf cart. To address the significant contribution of transport to national GHG emissions, the Department of Transport is developing a Green Transport Strategy which aims to minimise the adverse impact of transport on the environment while addressing current and future transport demands based on sustainable development principles. The electric scooter project is therefore of great relevance to the GTS.

Fuel cell bus range extender project: The project, which has received R5 million from the DST, is a collaboration between HySA and Busmark, a bus manufacturer located in Randfontein. The function of the fuel cell is to increase the range of the electric bus and reduce the total weight so the bus can carry more passengers. Compared to a pure battery (electric) bus, the technical performance benefits directly translate into economic benefits for example, increased passenger carrying capacity, which directly translates to better returns for bus operators. In addition, greater uptake of fuel cell buses will contribute to emissions reduction by avoiding the use of diesel-powered buses.

Technology demonstration is critical in the process of translating research and development (R&D) outcomes from the laboratory into the society and creating early markets. From the work outlined above, the DST is creating awareness around the role played by emerging cleaner energy technologies in resolving societal challenges. It is also widely accepted that hydrogen and fuel cell technologies will play a critical role in decarbonising both the energy and transport sectors as well as facilitating greater integration and optimal use of renewable energy sources.

Water Conservation and Water Demand Management (WCWDM) Flagship Programme: Rainwater Harvesting Strategy Development

The looming water crisis facing the country poses a serious threat to the whole economy. The draft National Water and Sanitation Master Plan states that 'This water scarcity is being exacerbated by escalating demand due to economic and population growth, urbanisation and rising standards of living, unsustainable use and high levels of wastage and loss, and increasing pollution which renders water not fit for use (DWS 2018: 1-1).'

There is an urgent need to explore other alternative technologies, such as Rainwater harvesting on a national scale.

The DEA in partnership with the Department of Water and Sanitation (DWS) has appointed the Institute of Natural Resources as a service provider to assist in developing a national rainwater harvesting (RWH) strategy. The purpose of the strategy is to drive the scaled-up and accelerated implementation of rainwater harvesting as a key component of the conservation and management of South Africa's water resources and its commitment to climate change adaptation and mitigation as set out in the country's NDC.

The aim of the strategy is to develop a coherent framework for the scaled-up implementation of rainwater harvesting, as detailed in the NCCRP. The strategy should include:

- a programme for implementation
- a detailed analysis of DAOs expected to result from the programme, aligned with existing DAOs
- a proposal for realising local sustainable development benefits
- a well-defined reporting format, which will include a set of relevant indicators and an annual reporting process

Furthermore, the national rainwater harvesting strategy will provide an implementation plan for the support component of South Africa's NDC and represents an elaboration of South Africa's Green Climate Fund (GCF) Investment Framework for the relevant priority area.

Figure 54 presents the main programme activities envisaged for scaling-up the implementation of rainwater harvesting.



FIGURE 54: Main programme activities envisaged for scaling up the implementation of rainwater harvesting

Adaptation Research Flagship Programme – Defining South Africa's climate change adaptation research agenda

South Africa has vast climate change research networks and an adaptation research landscape that is as immeasurable. In order for the Department of Environmental Affairs to better understand them, guidance was obtained from the National Climate Change Response Policy 2011 to develop the Long Term Adaptation Scenarios (LTAS) Flagship Research Programme.

The first phase of the LTAS established a collective understanding of South Africa's climate change trends and projections. It summarised key climate change impacts and identified potential response options for primary sectors, namely: water, agriculture and forestry, human health, marine fisheries, and biodiversity.

The LTAS analysed climate trends over the last five decades and climate projections for 2030, 2050 and 2100. Climate projections derived from a range of modelling approaches and scenarios were simplified into four fundamental climate future scenarios to describe South Africa's climate to the end of this century, namely warmer/wetter, warmer/drier, hotter/wetter and hotter/drier. These broad and consensus climate futures provide a framework within which users of climate information can position a wide range of specific climate change and impact projections with results depending on a range of emissions scenarios, global climate models and downscaling techniques.

The climate projections/adaptation scenarios were then used to analyse i) possible impacts on each of the above-mentioned sectors, ii) determine or propose possible adaptation options/responses, iii) indicate gaps that the study could not provide which are possible future research areas. Phase 2 also looked into modelling additional aspects such as food security and looking into the viability of the staple food crops in South Africa, disaster risk reduction and management focusing on the risks for flooding, drought, sedimentation and sea level rise as well as the economics of adaptation. The adaptation scenarios were further given narratives that describe the type of adaptation and development pathway that South Africa, and in particular certain areas of the country, will need to achieve under a particular climate future. Priority highly vulnerable sub-national areas in need of specific adaptation responses are identified, as well as win-win adaptation responses suitable to all possible climate futures.

Looking at the climate change adaptation research landscape generally, it is acknowledged that an immeasurable amount of research has been ongoing before, during and after the LTAS process. LTAS outputs also identified future research needs for key sectors which also supported or formed part of the sectoral research agendas. Given this, the DEA commissioned work that aims to define South Africa's climate change adaptation research agenda in order to inform the scope of the subsequent Research and research recommendations which have shaped the adaptation policy landscape, including but not limited to LTAS I & II, as well as summarising findings into a timeline and noting gaps and areas of further research.

This work will take the form of two phases with phase one focusing on the review of the climate change adaptation research landscape and developing a timeline which will be an infographic depicting the research plotted on a timeline to date, coupled with a reference list of the reviewed research; and phase two seeking to define the scope of work for LTAS III which will be highly detailed, well researched, strategically focused on advancing the implementation and integration of climate change adaptation into South Africa's development agenda and presented in a well organised, concise manner.

7.3.3. Implementation of the Climate Change Flagship Programmes Going Forward

There is still a considerable amount of preparatory work required to build each individual Climate Change Flagship Programme. The DEA in collaboration with lead implementation national departments and key implementation partners, have continued to intensify efforts towards this end, using the scaling up mechanisms and approaches shown in **Table 14**, **Figure 28** and **Figure 29**.

Figure 55 provides an indication of the implementation readiness of individual work packages and activities for selected Climate Change Flagship Programmes.



FIGURE 55: Maturity model for the 2016 Flagship Programmes priority work packages

The key success factors, required to achieve full scale climate action are listed below:

- A well-defined and established regulatory framework.
- The core activity(ies) and indicators in the regulatory framework readily translate into a quantifiable climate change impact.
- An existing funding stream drawn from fiscal allocations is already in place.
- Tested private sector investment models exist and are well-understood.
- Uses a range of finance instruments beyond grants.
- Main technologies and/or practices are mature and well-established.
- An established implementation base is in place at demonstration scale.
- A designated champion leading the work within the relevant national department.

The DEA has established dedicated advisory, technical, climate finance, coordination and implementation capacity within the Climate Change Response Near-term Flagship Programmes Directorate. This capacity supports the relevant lead national departments and other key implementation partners collaborating with DEA to prepare and operationalise detailed business plans for financing and implementing South Africa's NDC.

Subsequent phases of implementing the Climate Change Flagship Programmes has included the introduction of new Climate Change Flagship Programmes to anchor climate action leadership and reflect the importance of both adaptation and mitigation action as part of a holistic national climate change response. With the increasing maturation of the Climate Change Flagship Programme implementation pipeline, phase four of the work of the Climate Change Flagship Programmes is increasingly focused on articulating the investment case for the full implementation of the Climate Change Flagship Programmes and unlocking economy-wide financing of the priority climate change programmes.

Table 22 and Table 23 featured in the chapter on Climate Finance provide an overview of how South Africa is catalysing economy-wide investment for scaled-up climate action through the Climate Change Flagship Programmes. Section 7.3.4 below, discusses in more detail South Africa's NAMAs nominated for submission to the UNFCCC NAMA Registry.

7.3.4. Submission of South Africa's NAMAs to the UNFCCC NAMA Registry

A key development in the implementation of the Climate Change Flagship Programmes since 2016, includes the submission of six NAMAs to the UNFCCC NAMA Registry. South Africa's NAMAs are nested and developed within the mitigation Climate Change Flagship Programmes and are the building blocks or components of these programmes. Figure 26 shows the positioning of the Climate Change Flagship Programmes in South Africa's Climate Change Response as the country's NAMAs in the context of the UNFCCC.

Designating specific components of programmes as NAMAs allows for greater agility and speed in programme development. This targeted development approach addresses specific programme objectives systematically and facilitates more efficient use of the limited human resources available. Subdividing a Flagship Programme along these lines simplifies the complexity and demands of MRV.

The identified NAMAs were further reviewed and nominated for submission to the members of the Climate Change Flagship Programmes Steering Committee where they were tabled by the lead organisation in the course of 2016 and 2017. The above-mentioned NAMAs were also presented to the Intergovernmental Committee on Climate Change for recognition in the course of 2016 and 2017. Table 20 below lists the NAMAs that have been nominated for submission to the UNFCCC NAMA Registry.

NAMA for submission	Lead organisation	Type of NAMA	Flagship programme	Corresponding nationally appropriate mitigation action described in the delivery agreement for outcome 10 of 2010
Renewable Energy Independent Power Procurement Programme	 DEA National Treasury DBSA 	Renewable Energy	Renewable Energy	 Energy use and supply Initial lower CO₂ electricity supply: Renewable energy technologies and nuclear power Enhanced lower CO₂ electricity supply: Earlier renewable and nuclear technologies.
Integrated Demand Management	Eskom	Energy Efficiency	Energy Efficiency and Energy Demand	 Energy use and supply Improved efficiency in industry Efficient commercial building and public buildings
Industrial Energy Efficiency Project (Phase 1)	National Cleaner Production Centre	Industrial Energy Efficiency	Management	Energy use and supplyImproved efficiency in industry
Gautrain (Phase 1)	Department of Transport	Passenger Modal Shift: Road to Rail		 Transport and liquid fuels
Transnet Freight Modal Shift	Transnet	Freight Modal Shift: Road to Rail	Transport	 Sustainable transport development
Implementation of carbon capture and storage roadmap for South Africa	SANEDI – South African Centre for Carbon Capture and Storage	Carbon capture and storage	Carbon Capture and Sequestration	 Non-energy emissions Reducing industrial process emissions: CCS on new synfuels plants

TABLE 20: South Africa's NAMAs for recognition to be submitted for the NAMA Registry

7.4. THE CLIMATE CHANGE FLAGSHIP PROGRAMMES STEERING COMMITTEE

The NDC's are at the heart of the Paris Agreement as reflected in Articles 3 and 4.2 of the Agreement, as the main avenue for national action and achievement of the long-term goals of the UNFCCC. Large-scale climate action requires effective coordination and strong governance frameworks, processes and structures. The Climate Change Flagship Programmes allow for robust country-level programming to transition South Africa to a low carbon economy and a climate resilient society at scale. The Climate Change Flagship Programmes, by consolidating and extending existing climate change response implementation measures, are feeding into for South Africa's portfolio of climate actions responding to the NDC and funding proposals to the GCF.

The NCCRP indicates that the appropriate line function Ministry should take the lead in the implementation of Climate Change Flagship Programmes as they have the relevant technical expertise to provide the service, thus the DEA is required to work closely with relevant line departments in order to fulfil its mandate.

Although the NCCRP had provided guidance on the coordination and governance of the Climate Change Flagship Programmes, this guidance was not implemented to the required extent, with the following consequences:

- a. Although Climate Change Flagship Programmes or components thereof, were implemented by the relevant line function Ministry, all the Climate Change Flagship Programmes, with the exception of the CCS Flagship Programme, lacked clearly discernible coordination or governance structures and any associated programme documentation or implementation framework, as had been directed by the NCCRP.
- b. In most cases, there had been no analysis or quantification of the mitigation or adaptation outcomes expected from the programme, nor was there a defined reporting format and climate change related indicators as directed by the NCCRP.

The Department: Planning Monitoring and Evaluation (DPME) similarly, found major issues in the planning and coordination of implementation programmes across all spheres of government, caused by poor programme design, planning and coordination; resulting in ineffective and inefficient implementation of government policy (DPME 2013, 2) $\!\!\!$

The poor performance of implementation programmes resulted from several factors including:

- a. A lack of congruence between the main planning and coordination system (strategic plans and annual performance plans), the budget system and implementation systems, often via implementation programmes (Goldman, Mathe, Jacob et al. 2015, 6). The DPME noted that although Government had a standard definition for budget programmes, this definition does not correspond with implementation programmes used by government to execute policy (DPME 2013, 2).
- b. The actual spending on implementation programmes across government is often not known (Goldman, Mathe, Jacob et al. 2015, 6).
- c. The plans of implementation programmes are often poor, lacking clarity and often requiring major redesign (Goldman, Mathe, Jacob et al. 2015, 6).

The governance maturity of the Climate Change Flagship Programmes has increased substantially over the past few years, however, further institutionalisation and strategic positioning is required to achieve the coordination efficiency required to prepare and operationalise detailed business plans to implement South Africa's NDC. The first phase of the Climate Change Flagship Programmes Steering Committee which spanned 2011 to date, focused on identifying the relevant departments, entities and associated focal points involved in implementing Climate Change Flagship Programmes; then defining the scope and boundaries of individual Flagship Programmes at operational level and finally; building partnerships to enable the scaled-up implementation of these programmes.

As previously mentioned, a Climate Change Flagship Programmes Steering Committee under the Intergovernmental Committee on Climate Change (IGCCC) is in place as a first step to addressing the planning and coordination deficit in implementing the Climate Change Flagship Programmes. The Committee has consistent representation from all relevant national line departments, and relevant departments in all nine provinces and in local government. However, the Climate Change Flagship Programmes need to be operationalised as climate change response actions to a greater extent to achieve South Africa's NDC.

Operationalising the programmes entails actually effecting the necessary actions to implement each of the programmes, informed by the NCCRP and enabled by robust programme level governance structures and climate change monitoring and evaluation. An even greater level of coordination and rigour is now required to enable the development of concrete and detailed business plans for implementing national-scale climate action as part of South Africa's NDC; and thereby achieving the level of climate-finance readiness required to attract economy-wide investment in South Africa's NDC.

The DEA has worked hard to improve the cohesion and coordination of Climate Change Flagship Programmes in partnership with lead departments and other partners in the implementation of these programmes. The repositioning and refocusing of the existing Climate Change Flagship Programmes Steering Committee to become the catalyst of South Africa's NDC Implementation is the crucial next step mechanism. This is necessary to enable the level of rigorous coordination and planning of large-scale climate action, the development of the associated business plans required to attract investment and finance to operationalise these national programmes by 2020 as part of South Africa's NDC, and ultimately to contribute to the informed and timeous preparation of South Africa's future NDCs with regard to implementation programmes.

The Climate Change Flagship Programmes work packages on which the DEA is working, in partnership with line departments and key roleplayers, anchor South Africa's NDC by unpacking, concretising and programming climate action to meet South Africa's goals.

The Climate Change Flagship Programmes Steering Committee has been operational since 2015, with consistent representation from all relevant national line departments, including the Department of Cooperative Governance; all nine provinces and the South African Local Government Association.

CHAPTER REFERENCES

- Department of Agriculture, Forestry and Fisheries (DAFF), 2012. Integrated Growth and Development Plan for Agriculture, Forestry and Fisheries. Pretoria Department of Agriculture, Forestry and Fisheries. Accessed 24 August 2018 at: http://www.daff.gov.za/ docs/Policy/IGDP121.pdf
- Department of Agriculture, Forestry and Fisheries (DAFF), 2014. Agricultural Policy Action Plan. Pretoria Department of Agriculture, Forestry and Fisheries. Accessed 24 August 2018 at: https://www.tralac.org/ images/docs/8095/south-africa-agricultural-policyaction-plan-november-2014.pdf
- Department of Energy, 2015. Energy & Climate Change Strategy for the Public Building Sector 2015 – 2050. Accessed 7 December 2018 at: http://www.redirect1. gpg.gov.za/gchip/Documents/Energy%20and%20 CC%20Strategy%2026%20Feb%202015.pdf
- Department of Environmental Affairs (DEA), 2012. National Climate Change Response White Paper. Accessed on 9 March 2018 at: https://www.environment.gov.za/ sites/default/files/legislations/national_climatechange_ response_whitepaper.pdf
- Department of Environmental Affairs (DEA), 2014. South Africa's Greenhouse Gas Mitigation Potential Analysis. Pretoria: Department of Environmental Affairs. Accessed 24 August 2018 at: https:// www.environment.gov.za/sites/default/files/docs/ mitigationreport.pdf
- Department of Environmental Affairs (DEA), 2015. South Africa's 1st Annual Climate Change Report: Theme H: Near-Term Priority Climate Change Flagship Programmes. Accessed 24 August 2018 at: https://cer. org.za/virtual-library/gvt_docs/south-africas-annualclimate-change-reports
- Department of Environmental Affairs (DEA), 2017. The Climate Change Near-term Priority Flagship Programmes Vision 2030
- Department of Environmental Affairs and Tourism, 2009. Green Building in South Africa: Emerging Trends.
- Department of Minerals and Energy, 2005. Energy Efficiency Strategy of South Africa. (Pretoria, Department of Energy, 2005) Available at: http://www. energy.gov.za/files/esources/electricity/ee_strategy_05. pdf
- Department of Transport (DoT), 2017. Draft Green Transport Strategy. Government Gazette No. 41064, 25 August 2017, p189. Pretoria: Government Printing Works. Accessed 26 August 2018 at: https://www.gov. za/sites/default/files/41064_gon886.pdf

- Department of Water and Sanitation (DWS), 2018. National Water & Sanitation Master Plan: Vol 2: Plan to Action. Pretoria: Department of Water and Sanitation. Accessed 26 August 2018 at: http://www.dwa.gov. za/National%20Water%20and%20Sanitation%20 Master%20Plan/Documents/20180329%20 NWSMP%20Volume%202%20Final%20Draft%20(3.3). pdf
- Department: Planning Monitoring and Evaluation (DPME), 2013. Guideline for the planning of new implementation programmes. Draft DPME Guideline No. 2.2.3. 30 July, Pretoria: Department: Planning Monitoring and Evaluation. Accessed 26 August 2018 at: https://evaluations.dpme.gov.za/images/gallery/ Guideline%202.2.3%20Implementation%20%20 Programmes%2013%2007%2030.pdf
- Department: Planning Monitoring and Evaluation (DPME), 2014, Annual Report on National Evaluation System 2013–14.22 October 2014. Pretoria: Department: Planning Monitoring and Evaluation. Accessed 26 August 2018 at: https://www.dpme.gov.za/ keyfocusareas/evaluationsSite/Evaluations/Annual%20 Report%20on%20Evaluations%20compressed%20 2013-14%2014%2010%2022.pdf
- Goldman, I., Mathe, J.E., Jacob, C., Hercules, A., Amisi, M., Buthelezi, T. et al., 2015, 'Developing South Africa's national evaluation policy and system: First lessons learned', African Evaluation Journal 3(1), Art. #107, 9 pages. http://dx.doi. org/10.4102/aej.v3i1.107
- Hartmann A and Linn JF 2007. Scaling Up: A Path to Effective Development, 2020 Focus Brief on the World's Poor and Hungry People. Washington, DC: International Food Policy Research Institute. Accessed 24 August 2018 at: https://www.brookings.edu/wp-content/ uploads/2016/06/200710_scaling_up_linn.pdf
- Hydrogen Council, 2017. Hydrogen Scaling Up: A sustainable pathway for the global energy transition: Hydrogen Council November 2017. Accessed 26 August 2018 at: http://hydrogencouncil.com/ wp- content/uploads/2017/11/Hydrogen-scaling-up-Hydrogen-Council.pdf
- National Planning Commission (NPC), 2011. National Development Plan 2030: Vision for 2030. Executive Summary. Pretoria: The Presidency. Accessed 12 April 2017 at: https://www.gov.za/sites/default/files/ devplan_2.pdf
- United Nations Framework Convention on Climate Change (UNFCCC), 2014. Focus: Mitigation – NAMAs, Nationally Appropriate Mitigation Actions. Accessed 5 May at 2016 http://unfccc.int/focus/mitigation/ items/7172.php



INTERNATIONAL CLIMATE CHANGE REGULATORY FRAMEWORK AND NEGOTIATIONS

CHAPTER 8

INTERNATIONAL CLIMATE CHANGE REGULATORY FRAMEWORK AND NEGOTIATIONS

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Abbreviations and acronyms

A-NDC	Adaptation Nationally Determined Contribution
AR5	Assessment Report 5
BUR	Biennial Update Report
CBIT	Capacity Building Initiative for Transparency
CBDR&RC	Common but Differentiated Responsibilities and Respective Capabilities
СМА	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
COP	Conference of Parties
DEA	Department of Environmental Affairs
FD	Facilitative Dialogue
GEF	Global Environmental Facility
GGA	Global Goal on Adaptation
GHG	Greenhouse Gas

GST	Global Stocktake
IPCC	Intergovernmental Panel on Climate Change
LEG	Least Developed Countries Experts Group
M&E	Monitoring and Evaluation
MOI	Means of implementation
NAS	National Adaptation Strategy
NDC	National Determined Contribution
LTF	Long Term Finance
UN	United Nations
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change

8.1. INTRODUCTION

Climate change is a global challenge requiring both international and domestic solutions. South Africa is an active participant and regional leader in the global climate change response. This section will focus on what South Africa considers to be big-ticket items as informed by the positions and decisions that South Africa has advanced and influenced through the United Nations Framework Convention on Climate Change (UNFCCC) negotiations and other related forums.

The implications for South Africa in view of these big-ticket items will also be discussed. The major victory has been to shift the tectonic plates of the negotiations, characterised by mitigation centricity prior to COP 15 in Copenhagen in 2009, to parity between mitigation and adaptation. Added to that were the corresponding support needs for both (UNFCCC, 2015a).

Decision 1. CP 17 taken at COP 17 in Durban (UNFCCC, 2011) gives us a glimpse of the package of issues that should be sustained beyond 2020. This is further enshrined in the Paris Agreement (UNFCCC, 2015a), the details of which were articulated in South Africa's second Climate Change Report (2nd CCR) (DEA, 2016). In a nutshell, the big-ticket issues include mitigation, adaptation, means of implementation (MOIs) (finance, technology and capacity building) and transparency. Related to mitigation is the issue of accounting for Nationally Determined Contributions (NDCs). Regarding adaptation the focus is on communication of adaptation needs and costs but also on recognition of the adaptation efforts of developing countries. In terms of finance the focus is on the adaptation fund serving the Paris Agreement (PA) while the need for transparency in reporting and support also features.

Figure 56 shows the big-ticket issues identified by South Africa.





The above are big-ticket items in terms of climate change negotiations as they have high priority over the remaining period of the second commitment period of the Kyoto Protocol (KP) for smooth transition and implementation of the Paris Agreement. It is important to highlight that these issues will also characterise the climate change space for the post 2020 regime informed by the Paris Agreement. The major milestones between now and 2020 are the 2018 Facilitative dialogue; the Conference of the Parties (COP) 24 when the Conference of the Parties, serving as the meeting of the Parties to the Paris Agreement (CMA), is expected to fully resume and also the end point of the Kyoto Protocol in 2020. These big-ticket items are a package that will usher us into the new era (post 2020) – their importance carries the same weight both pre- and post-2020.

8.2. BIG-TICKET ITEMS UNDER UNFCCC NEGOTIATIONS OVER THE PERIOD TO 2020 AND IMPLICATIONS FOR SOUTH AFRICA

8.2.1. Climate Finance Mechanisms

Climate finance, in spite of the hazy definition, has tended to be highly politicised, either due to the underlying motive to escape responsibility on the part of developed countries or to transfer the burden to developing countries. In essence, whatever the definition, the fundamental issues is that climate finance should be new, additional and predictable.

The developing trend related to climate finance is the increasing emphasis on, and requirement for, co-financing applicable to financing mechanism(s) both under the convention and those outside it.

Box 3: Institutionalisation of Climate Finance Assessments

The common objective that should focus all these entities in order that these challenges are minimised is to translate the identified needs into integrated, coherent and aligned projects and programmes.

An idea that has been proposed amongst parties at international level is the institutionalisation of climate finance assessments in developing countries (Box 3).

Institutionalisation of Climate Finance Assessments in the South African context covers a number of entities including the National Treasury, the Disaster Management Centre, DEA and sector departments.

Regarding long term finance (LTF), there are a number of challenges that we need to be proactive in attending to transversally (including across government spheres, sectors and sub-sectors). LTF is a

commitment to financial support expected from developed to developing countries in support of climate change actions. Among these challenges is that of different reporting channels, which leads to inconsistencies and lack of comparability of the identified needs.

Part of the existing plans that can facilitate progress towards such an objective is to make use of the NDCs as one of the immediate vehicles. Moreover, at domestic level, the NDCs should somewhat be linked to infrastructure investment planning and other sectoral processes. This should be coupled with support for formulating financial plans and development of project pipelines.

Regarding access to climate finance, it suffices at this point to highlight some of the key requirements to be able to access climate finance as shown in **Figure 57**.



Chapter 9 of this report covers climate finance mechanisms, sources and flows and should be consulted for further details on this topic.

8.2.2. Guidance for Accounting for Parties' Nationally Determined Contributions

The need for guidance on accounting stems from the fact that, subsequent to the submission of NDCs, parties have unavoidable obligations to carry out domestic measures towards meeting NDCs. A corollary to that is that parties are obliged to report on progress on their GHG inventories and progress on implementation. Further to that, they are expected to communicate their NDCs every five years – despite some NDCs being over a 10-year term.

The object within negotiations that leads to the guidance on accounting is informed by Art 4.13 which clearly states that parties "shall" account for their NDCs and this clearly indicates the broad outcomes aligned to the objectives (UNFCCC, 2015a). This should further be read with paragraph 31 contained in decisions that give effect to the PA – which indicates ancillary elements that need to be prioritised including in subsequent NDCs:

- a. Parties account for anthropogenic emissions and removals in accordance with methodologies and common metrics assessed by the Intergovernmental Panel on Climate Change and adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement;
- b. Parties ensure methodological consistency, including on baselines, between the communication and implementation of nationally determined contributions;
- c. Parties strive to include all categories of anthropogenic emissions or removals in their nationally determined contributions and, once a source, sink or activity is included, continue to include it;
- d. Parties shall provide an explanation of why any categories of anthropogenic emissions or removals are excluded; (UNFCCC 2015b, 6).

In the 2nd CCR, we previously indicated how ominous the issue of the diversity of NDCs is and the implication this has for other milestones such as the 2018 Facilitative Dialogue (FD) and later, the Global Stock-take (GST). However, parties will have to accept that NDCs are nationally determined yet on the other hand parties have to account internationally. This presents an opportunity for parties to progressively set up systems that will enable them to improve their NDCs over time. In the case of South Africa this will be given attention in what is currently referred to as NDC tracking. NDC tracking is still at its initial stages, conceptually it is a process that seeks to align domestic policies taking into account international milestones without compromising domestic policy. This is a big-ticket item as it reinforces the fulcrum of the post 2020 regime, which is essentially grounded on accounting and transparency. Moreover, the 2018 Facilitative Dialogue, a process aimed at taking stock of collective efforts and informing the preparation of NDCs, should not only concentrate on mitigation. This process, in terms of its scope should also encompass communication of adaptation needs, costs and investments - so as to sustain political

parity. Developing countries face major risk if the 2018 Facilitative Dialogue is limited to mitigation which the text from Paris seems to be leaning more towards in relation to accounting for NDCs. Guidance on accounting should be balanced within the context of Article 13.1, which contains the principle of enhanced transparency of action and support as well as associated flexibilities. In addition, the IPCC methodologies are likely to be more comprehensive given the anticipated 1.5 degrees Celsius report due in 2018.

8.2.3. Recognition of Adaptation Efforts of Developing Country Parties

The premise for this is that many developing countries have expressed adaptation needs in their NDCs. They also draw from their own resources/ fiscus in order to respond to and address climate change impacts. The Global Goal on Adaptation (GGA) is tied to the temperature goal, however, this does not mean that adaptation is addressed passively through mitigation as impacts are already experienced. A number of studies have already pointed at the emissions and adaptation gaps, including those in IPCC Assessment Report 5 (AR5), the NDC synthesis, and the emissions gap report by UNEP. Therefore, ambition is slack for both pre- and post-2020.

This therefore requires recognition of investments by developing countries as part of their contribution/spend in dealing with climate change impacts on such issues as adaptation infrastructure. Adaptation infrastructure partly encompasses roads, dams, bridges, relocation of homes from areas where high impacts are likely; provision of support to different sectors and so on.

The 2nd CCR mentioned products that should be focused on in order to meet some of the mandatory requirements, such as a national framework for vulnerability assessment, impacts and associated needs. The current work under the National Adaptation Strategy (NAS) also encompasses this scope.

Further to this, methodologies for assessing adaptation needs with a view to assisting developing country Parties then become an integral part of the exercise and this is further linked to the adequacy and effectiveness of adaptation and the support required. The broad methodologies emanating from the draft methodologies from the Adaptation Committee and the Least Developed Countries Experts Group (LEG) are an important reference (UNFCCC Adaptation Committee and Least Developed Countries Experts Group 2017). South Africa together with other developing countries need to spearhead this work, especially given that article 7.9 expressed mandatory requirements for planning and actions (UNFCCC 2015a). It is in relation to this latter point that South Africa needs to be even more resolute in enhancing communication of adaptation needs, costs and investments; as well as influencing, through the NAS, guidance on adaptation planning, implementation and reporting. This necessitates that appropriate administrative processes be put in place to coordinate this transversally within government and relevant sector departments/entities. The A-NDC assumes the 'Development & implementation of a climate change adaptation communication, education and awareness framework, with a view to drive behaviour change based on the early warning and vulnerability assessments and studies of response effectiveness. Specific indicators for tracking outcomes and scale of domestic investment and any international support will be developed and reported.' (DEA 2015, Goal 6, p5).

8.2.4. Transparency

Reporting is one of the foundational blocs of the UN climate change regime: it provides transparency and is the basis for understanding and assessing the action and support towards implementing the Convention and the Paris Agreement.

To achieve the collective objective of the Convention, Parties need to report and disclose accurate, consistent and internationally comparable data on trends in GHG emissions and on efforts to change these trends, all within the context of Common but Differentiated Responsibilities and Respective Capabilities (CBDR&RC) and sustainable development. Communicating information, actions and support on the most effective ways to reduce emissions and adapt to the adverse effects of climate change also puts the world collectively on the path towards more sustainable forms of development, in particular developing countries as they are more vulnerable.

Parties are expected to communicate certain information to the Conference of the Parties (COP), within agreed time lines, namely, Biennial Update Reports (BURs) and National Communications. The main elements of this information are the details on their actions to implement the Convention – that is, their climate change policies and measures – and their national inventories of GHGs. The required contents of national reports and the timetable for their submission are different for Annex I Parties and non-Annex I Parties, in accordance with the principle of CBDR&RC. What emerges strongly from the Paris Agreement is the amount of support that developed countries need to communicate ex-ante, bi-annually. All Parties to the Paris Agreement will report under its enhanced transparency framework for action and support, with expected flexibilities for developing countries.

8.2.5. Scope of Capacity-building Initiative for Transparency

As part of the Paris Agreement, Parties to the UNFCCC agreed to establish a Capacity-building Initiative for Transparency (CBIT). The goal of the CBIT is to strengthen the institutional and technical capacities of developing countries to meet the enhanced transparency requirements of the Paris Agreement. These enhanced transparency requirements are defined in Article 13 of the Paris Agreement. The Paris Agreement requested the GEF to support the establishment of the CBIT through voluntary contributions during Global Environment Facility - Period 6 (GEF-6) and future replenishment cycles. Transparency and accountability are a key pillar of the Paris Agreement, and the CBIT will help developing countries, pre- and post-2020, strengthen their ability to meet this essential element of the agreement. This builds upon the GEF's provision of support to Non-Annex I Parties to fulfil their obligations under the UNFCCC, including National Communications and Biennial Update Reports, (http://www.thegef.org/topics/capacitybuilding-initiative-transparency-cbit).

The South African government is currently in the process of getting its CBIT proposal under the Global Environment Facility (GEF) approved. The United Nations Environment Programme (UNEP) in Kenya is an implementing agency for the GEF in this project. The main objectives of South Africa's CBIT project proposal is to build South Africa's technical capacity in the quantification of mitigation actions, policies and measures; development of national greenhouse gas inventories as well as the operationalisation of South Africa's Climate Change Monitoring & Evaluation (M&E) System. The proposed CBIT project aims to enhance South Africa's capacity and build institutional memory in developing greenhouse gas inventories, assessment of mitigation actions, policies and measures as well as the operationalisation of South Africa's Climate Change M&E System. All of this will contribute to South Africa's enhanced reporting in Biennial Update Reports and National Communication Reports.

CHAPTER REFERENCES

- Department of Energy, 2005. Energy Efficiency Strategy of South Africa. (Pretoria, Department of Energy, 2005) Available at: http://www.energy.gov.za/files/esources/ electricity/ee_strategy_05.pdf
- Department of Environmental Affairs, 2015. South Africa's Intended Nationally Determined Contribution (INDC) Accessed 26 August 2018 at: http://www4.unfccc.int/ ndcregistry/PublishedDocuments/South%20Africa%20First/ South%20Africa.pdf
- Department of Environmental Affairs, 2016. South Africa's 2nd Annual Climate Change Report. Pretoria: Department of Environmental Affairs. Accessed 26 August 2018 at: https:// cer.org.za/wp-content/uploads/2017/11/South-Africas-Second-Climate-Change-Report-2016.pdf
- UNFCCC Adaptation Committee and Least Developed Countries Experts Group, 2017. Draft recommendations developed by the Adaptation Committee and the Least Developed Countries Expert Group to Address Decision 1/CP.21, paragraph 41 and, in Collaboration with the Standing Committee on Finance, to Address Decision 1/ CP.21, paragraph 45. Accessed 26 August 2018 at. https:// unfccc.int/sites/default/files/ac11_5cde_mandates_acleg. pdf
- United Nations Framework Convention on Climate Change (UNFCCC), 2009. Report of the Conference of the Parties on its Fifteenth Session, held in Copenhagen from 7 to 19 December 2009. Accessed 26 August 2018 at: https:// unfccc.int/resource/docs/2009/cop15/eng/11.pdf
- United Nations Framework Convention on Climate Change (UNFCCC), 2011. Report of the Conference of the Parties on its Seventeenth Session, held in Durban from 28 November to 11 December 2011, Accessed 26 August 2018 at: https://unfccc.int/resource/docs/2011/cop17/ eng/09a01.pdf
- United Nations Framework Convention on Climate Change (UNFCCC), 2015a. Adoption of the Paris Agreement, 21st Conference of the Parties, Paris: United Nations. Accessed 26 August 2018 at: https://unfccc.int/files/meetings/paris_ nov_2015/application/pdf/paris_agreement_english_.pdf https://unfccc.int/sites/default/files/english_paris_ agreement.pdf
- United Nations Framework Convention on Climate Change (UNFCCC), 2015b. Decisions adopted by the Conference of the Parties. In: Report of the Conference of the Parties on its Twenty-First Session, held in Paris from 30 November to 13 December 2015. Accessed 8 December 2018 at: https://unfccc.int/resource/docs/2015/cop21/eng/10a01. pdf



CLIMATE FINANCE

CHAPTER 9

CLIMATE FINANCE

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Abbreviations and acronyms

АСМР	Association of Cementitious Material Producers
AF	Adaptation Fund
AFB	Adaptation Fund Board
ВА	Biennial Assessment and Overview of Climate Finance Flows
BR	Biennial report
BUR	Biennial update report
CDM	Clean Development Mechanism
CIF	Climate Investment Funds
COP	Conference of Parties
CTF	Clean Technology Fund
CSP	Climate Support Programme
CTCN	Climate Technology Centre and Network
FA0	Food and Agriculture Organisation
FP	Focal Point
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIZ	Gesellschaft für Internationale Zusammenarbeit
IPCC	Intergovernmental Panel on Climate Change
LTF	Long Term Finance
MDB	Multilateral development bank
NAMA	Nationally Appropriate Mitigation Action
NAS	National Adaptation Strategy
NAP	National Adaptation Plan
NDA	Nationally Designated Authority
NDC	National Determined Contributions
NDE-RSA	National Designated Entity for South Africa
NDP	National Development Plan: Vision for 2030
RITE	Research Institute of Innovative Technology for the Earth
SCCF	Special Climate Change Fund
SGP	Small Grants Programme
SPA	Strategic Priority on Adaptation
TA	Technical Assistance
UNEP	United Nations Environment Programme
UNFCCC	United Nations Convention on Climate

9.1. CLIMATE FINANCE: A BRIEF OVERVIEW OF COMMITMENTS, CHANNELS, INSTRUMENTS AND SOURCES AND FLOWS

The multilateral financial architecture for climate change is a complex and evolving network of international, bilateral, and regional funds that provide financial resources to developing countries to support the transition towards low emissions and climate resilient development. Each fund has a unique combination of thematic areas and mandates, and each has its own set of information requirements and eligibility criteria for assessing funding requests. Understanding this constantly evolving terrain of climate finance can be a very difficult task for governments and project developers and it is the hope that this brief overview can help achieve more successful formulation and funding of programme and project ideas.

9.1.1. Multilateral climate finance

Issues of climate finance are addressed in a number of the provisions of the UN Climate Change Convention (UN 1992), the Kyoto Protocol (UNFCCC 1997) and the Paris Agreement (UNFCCC 2015)

Finance under the UNFCCC

Developed countries (generally referred to as Parties included in Annex II) are to provide new and additional financial resources to meet the 'agreed full costs' incurred by developing countries in supplying national communications (UN 1992, Article 4.3 & Article 12.1).

They are also to finance the 'agreed full incremental costs' to developing countries of implementing certain measures, which include (UN 1992, Article 4.3):

- Formulating and implementing national and regional programmes containing measures to mitigate climate change and to facilitate adequate adaptation;
- Cooperating in the development and transfer of technologies to mitigate climate change in all relevant sectors;

- Cooperating in the conservation and enhancement of sinks and reservoirs of greenhouse gases including biomass, forests, oceans and other ecosystems;
- Cooperating in preparing for adaptation to the impacts of climate change, develop appropriate plans for coastal zones, water and agriculture and protection and rehabilitation of areas affected by drought, desertification and floods;
- Taking climate change into account in relevant policies and actions, and employing appropriate methods to minimise adverse effects of projects or measures to mitigate or adapt to climate change;
- Promoting scientific and other forms of observation to improve understanding of climate change and the consequences of response strategies;
- Exchange and communicate information and promote education, training and public awareness (UN 1992, Articles 4.3 and 4.1).

The Convention commits developed countries to 'assist developing countries that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation to those adverse effects' (UN 1992, Article 4.4).

It also commits them to take all practicable steps to 'promote, facilitate and finance ... the transfer of or access to environmentally sound technologies and know-how [and in the process to] support the enhancement of endogenous capacities and technologies of developing country Parties.' (UN 1992, Article 4.5).

Under the Convention, the Conference of Parties (COP) is responsible for seeking to mobilise financial resources, and for arranging to support developing countries' national communications and 'in identifying the technical and financial needs associated with proposed projects and response measures under Article 4' (UN 1992, Article 12.7).

It is also responsible, with the entity or entities entrusted with the operation of the financial mechanism, to agree on arrangements for the 'determination in a predictable and identifiable manner the amount of funding necessary and available for the implementation of this Convention and the conditions under which that amount shall be periodically reviewed.' ((UN 1992, Article 11.3(d)).

Under Article 11, Parties established the financial mechanism for the provision of financial resources on a grant or concessional basis, including for transfer of technology (UN 1992). The governance of the financial mechanism has been designated to two operating entities, namely the Global Environmental

Facility (GEF) and the Green Climate Fund (GCF). The negotiating process has also created specialised funds, including the Special Climate Change Fund, Least Developed Countries Fund, and Adaptation Fund.

Finance under the Paris Agreement

Article 9 of the Paris Agreement relates to the provision of financial resources by developed country Parties to developing country Parties (UNFCCC 2015, Article 9.1). The whole approach for the provision of financial resources in the Paris Agreement reaffirms this country-driven and needs-based approach. Article 9.3 on the mobilisation of climate finance, provides that it includes supporting country-driven strategies, and taking into account the needs and priorities of developing country Parties.' Article 9.4 likewise stipulates that 'The provision of scaled-up financial resources should aim to achieve a balance between adaptation and mitigation, taking into account country-driven strategies, and the priorities and needs of developing country Parties'. It further provides for 'considering the need for public and grant-based resources for adaptation.' (UNFCCC 2015, Article 9.4).

9.1.2. Overview of the Multilateral Climate Funds

The Green Climate Fund

In Cancun in 2010, COP 16 established a Green Climate Fund under Article 11 as an operating entity of the financial mechanism of the Convention (UNFCCC 2010, para 102, p17). At COP 17 in Durban in 2011 the Parties decided to launch the Green Climate Fund (decision 3/CP.17) (UNFCCC, 2011, Decision 3/CP.17) to which is annexed the 'Governing instrument of the Green Climate Fund'. The overarching goal of the GCF is to support projects, programmes and policies in developing country Parties and it is intended to be the main fund for global climate finance.

Box 4: South Africa's Participation in Establishing the Green Climate Fund

South Africa co-chaired the drafting of the Governing Instrument of the Green Climate Fund (GCF) and facilitated the decision on the GCF that was adopted at COP 17 in Durban in 2011. The operationalisation and functioning of the Fund remains a high priority for South Africa. We were also elected as the first Co-Chair of the GCF Board with Australia, and were re-elected as Co-Chair of the GCF Board for the second time in October 2015 in Zambia.

Minister Edna Molewa, Parliament of the Republic of South Africa, 28 October 2016

The Global Environment Facility

The Global Environment Facility (GEF) is the largest independent financial organisation in the environment sector providing assistance or grants to both government and non-government entities for implementing projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants.

The GEF has emphasised that projects must be consistent with government priorities and programmes (Climate Change, Biodiversity and other Focal Areas) and must benefit the global environment linking local, national and global environment challenges and promoting sustainable livelihoods; they must also address one or more of the GEF Focal Areas, improving the global environment or advancing the prospects of reducing risks to it; they must be consistent with the GEF Operational Strategy and must show that there will be global environment benefits. Project proposals must give an indication that there is co-funding and must have been developed with the assistance of one of the GEF's approved implementing agencies; they must not be on a study or research, must involve the public in the project design and its implementation and finally the proposals must seek GEF financing for the agreed-on incremental costs in measures to achieve global environmental benefits.

The Small Grants Programme (SGP) is a programme of the GEF that specifically invests in the development of underprivileged communities impacted by the effects of environmental degradation. The work that has been done by the GEF SGP supported projects has contributed significantly to conservation of the environment.

The Strategic Priority on Adaptation (SPA) under the GEF Trust Fund was established to show how adaptation planning and assessment can be practically translated into projects that provide real benefits. The SPA Projects primarily target Global Environmental Benefits under the GEF Focal Areas, whereas the other GEF administered funds have development as their primary focus. A total of 21 adaptation projects have been approved for support through the SPA and a total of US\$50 million has been allocated.

The Special Climate Change Fund (SCCF) was established in November 2004 to support a number of climate change activities such as mitigation and technology transfer, but prioritises adaptation. The GEF operates as the secretariat for the SCCF which is based on voluntary donor contributions.

The Adaptation Fund

The Adaptation Fund (AF) is a multilateral fund under the UNFCCC and its Kyoto Protocol. The fund was established in 2001 to finance concrete adaptation projects and programmes and became operational in 2009. The main governing body is the Adaptation Fund Board (AFB), with the GEF serving as the interim secretariat and the World Bank as the interim trustee. The AF is financed from a share of the proceeds (2%) from the Kyoto Protocol's clean development mechanism (CDM) project activities and voluntary contributions from donors. The Fund finances concrete adaptation projects and programmes whose principal and explicit aim is to adapt to impacts of climate change and increase climate resilience. The Fund defines a concrete adaptation project/programme as a set of activities aimed at addressing the adverse impacts of, and risks posed by, climate change. The activities should aim to produce visible and tangible results on the ground by reducing vulnerability and increasing the adaptive capacity of human and natural systems to respond to the impacts of climate change, including climate variability. Stand-alone research is not eligible for funding. Research activities will only be supported if they are targeted to support concrete actions.

Climate Technology Centre and Network

The Climate Technology Centre and Network (CTCN) is the operational arm of the UNFCCC Technology Mechanism established at COP 16 in 2010. The CTCN aims to promote accelerated, diversified and scaled-up transfer of environmentally sound technologies for climate change mitigation and adaptation, in developing countries, in line with their sustainable development priorities.

The Climate Technology Centre and Network Activities in South Africa are discussed in more detail below.

Climate Investment Funds

The Climate Investment Funds (CIF) worth approximately US\$8.3 billion allow for 72 developing and middle-income countries to receive funding for climate mitigation and adaptation activities. The CIF has managed to attract an additional US\$58 billion in cofinancing and has over 300 projects within its portfolio. Within the CIF, South Africa has access to the Clean Technology Fund (CTF). The CTF's focus is on the renewable energy, energy efficiency and sustainable transportation sectors with a vision to promote scaled-up finance for demonstration, deployment and transfer of lowcarbon technologies. The CTF has several aims including: providing incentives through public and private sector investments; supporting programmes and projects which align with national plans; promoting projects that realise co-benefits (social and environmental); and lastly, encouraging international cooperation on climate change. Project eligibility as well as the level of finance applied for is dependent on the potential 'transformative' impact of the project while highlighting the need for concessional finance.

9.1.3. Instruments of Climate Finance

Closely related to whether financial resources are provided from public or other sources is the nature of the resources provided. In relation to the UNFCCC financial mechanism, the Convention refers to the provision of finance on a 'grant or concessional basis'. The balance struck in the provision of resources to developing countries between grants (which do not require repayment) and concessional loans (which do require repayment) has significant implications for developing countries. So too does the extent to which any loans are offered on a concessional basis. Different forms of resources may be appropriate in different situations. In relation to adaptation, for example, the provision of loans may increase the burden on vulnerable communities and, in many cases, adaptation projects may not lend themselves to support through loans and other market-based instruments.

Understanding the implications of different sources of, and means for providing finance – such as grants, loans and market-based instruments – is important for developing countries when assessing whether financial resources will meet various requirements such as whether they are new and additional or adequate to meet the needs of developing countries and to ensure the effective implementation of the Convention.

The 2016 Biennial Assessment and Overview of Climate Finance Flows (BA), prepared by the UNFCCC's Standing Committee on Finance reported that about 35% of the bilateral, regional and other finance reported to the UNFCCC in biennial reports (BRs) is spent as grants, 20% as concessional loans, 10% as non-concessional loans, and the remainder through equity and other instruments. About 38% of the reported finance is channelled through multilateral institutions, many of which are multilateral development banks (MDBs) that use capital contributions and commitments from member countries to raise low-cost capital from other sources of funding, including for donor contributions. This enables MDBs to offer a range of instruments and financial products, including grants (9%), loans, including

concessional loans, (83%), equity (2%) and other instruments (6%). About 53% of funding from multilateral climate funds is provided as grants, and the remainder is largely concessional loans, which have increased as a share of approved funding over time. Forty-nine per cent of bilateral climate finance reported to the OECD is provided as grants, and 47% as concessional loans (UNFCCC 2016a).

9.1.4. Flows and Sources of Climate Finance

In terms of flows from developed to developing countries as reported in BRs, the BA reports that US\$25.4 billion in 2013 and US\$26.6 billion in 2014 of climate-specific finance was reported in BURs, of which US\$23.1 billion in 2013 and US\$23.9 billion in 2014 was channelled through bilateral, regional and other channels. This represents an increase of about 50% from public finance reported through the same channels in 2011–2012 (UNFCCC 2016a).

In terms of flows from multilateral climate funds, the BA reports that US\$1.9 billion in 2013 and US\$2.5 billion in 2014 was channelled through the UNFCCC funds and multilateral climate funds on the basis of their financial reports (UNFCCC 2016a).

In terms of flows of climate finance from multilateral development banks, it was reported that climate finance provided by MDBs to developing countries from their own resources was reported as US\$20.8 billion in 2013 and US\$25.7 billion in 2014 (UNFCCC 2016a). **Table 21** provides an overview of South Africa's climate finance portfolio.

TABLE 21: South Africa's climate finance portfolio

Sources	Grants (US\$)	Loans (US\$)	Co-financing (US\$, in cash and in kind)
GEF	78,244,375	15,000,000	402,841,552
GCF	380,000	Not Applicable	Not Applicable
AF	9,937,737	Not Applicable	Not Applicable
CTF		442,5000,000	2,706,800,000*
Bilateral	69,531,441	Not Applicable	Not Applicable
TOTAL	158,093,553	457,500,000	3,109,641,552*

*Estimated

9.2. ACCESSING CLIMATE FINANCE

One of the unique features of dedicated climate funds (Adaptation Fund, Green Climate Fund and the Global Environment Facility) is the ability of countries to nominate and access financial resources directly through national entities. The direct access by national entities, which has been operationalised by the AF, GCF, and the GEF, ensures that priorities, particularly those articulated in the Nationally Determined Contributions (NDCs) and Nationally Appropriate Actions (NAAs), set by countries are addressed while enhancing ownership of the projects and programmes being implemented. To date, over 40 national institutions have been accredited as direct access entities by the AF, GCF and GEF that have huge potential for sharing and learning from important experience of accredited institutions and lessons from entities that have successfully developed proposals and are implementing them.

South Africa has a number of entities accredited to the multilateral climate funds as shown in **Table 22** below. In addition, South Africa can also access resources from international and regional accredited entities accredited to the GCF and GEF.

	TABLE 2	22: South	Africa's	direct	access	entities
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Fund	Entity	Status
	South African National Biodiversity Institute, National Implementing Entity for projects no greater than US\$50 million	Accredited
Green Climate Fund	Development Bank of Southern Africa for projects greater than US\$250 million	Accredited
	Land Bank of South Africa	Undergoing accreditation
Global Environment Facility	Development Bank of Southern Africa	Accredited
Adaptation Fund	South African National Biodiversity Institute, National Implementing Entity for projects no greater than US\$50 million	Accredited

Country ownership

A key foundation of the GCF and the AF is the principle of country ownership. In the case of the GCF, it is mandated to pursue a country driven approach and promote and strengthen engagement at the country level through effective involvement of relevant institutions and stakeholders. Numerous Board decisions reflect this principle include the Board's decision to establish nationally designated authorities (NDAs) or Fund focal points (FPs) to act as a liaison between countries and the Fund, including to facilitate no-objection letters to support funding proposals. NDAs and FPs play a key role in the formulation of country programmes and proposal pipelines, as well as in the consideration of implementation partners, and financial planning. The development of country programmes, identifying national priorities for investment in climate change related activities, is also recognised as a key component of ensuring country ownership. These programmes should take into account existing plans, strategies, laws and policy frameworks at national and international level.

9.3. CLIMATE TECHNOLOGY CENTRE AND NETWORK ACTIVITIES IN SOUTH AFRICA

The Climate Technology Centre and Network (CTCN) promotes the accelerated transfer of environmentally sound technologies for low carbon and climate resilient development at the request of developing countries. A Party to the UNFCCC gives a National Designated Entity (NDE) responsibility to manage requests made to the CTCN. The NDE for South Africa (NDE-RSA) was established in 2016 when the South African Government decided that the Department of Science and Technology (DST) with support from the Department of Environmental Affairs (DEA) would host the NDE. The DST made the Directorate: Environmental Services and Technologies fill the role of NDE-RSA.

The NDE-RSA constituted an Advisory Committee to assist with decision-making regarding country requests, the representatives of which are shown in **Figure 58** below.



FIGURE 58: CTCN National Designated Entity for South Africa Advisory Committee representatives

The Advisory Committee recommendations are tabled at the Outcome 10 meeting convened by the DEA for noting.

Each country is allowed one Technical Assistance (TA) at a time, South Africa currently has two TAs and this is the reason that the NDE-RSA did not issue a call for one in 2017. The call will be announced in March 2018 and closed in June 2018. The next Advisory Committee will then sit in July to evaluate these requests, unless there is a need to call for it to sit earlier.

The two awarded TAs are:

- a) Substantial GHG emissions reduction in the cement industry by using waste heat recovery combined with mineral carbon capture and utilisation in South Africa: Request from the Association of Cementitious Material Producers (ACMP) and UNEP awarded the implementation to the Research Institute of Innovative Technology for the Earth (RITE) from Japan.
- b) The development of Technology Road Maps at sub-national level: Joint request from iLembe District Municipality and the KwaZulu Natal Department of Economic Development, Tourism and Environmental Affairs. UNEP awarded this TA to the UNEP DTU Partnership who partnered with the Council for Scientific and Industrial Research (CSIR) to implement the TA.

The ACMP TA is nearly complete and RITE have submitted the final report to the CTCN for review. Once this becomes available, the NDE-RSA will be presenting the findings at the next available Outcome 10 meeting.

9.4. TRIGGERING ECONOMY-WIDE INVESTMENT FOR SCALED-UP CLIMATE ACTION THROUGH THE CLIMATE CHANGE FLAGSHIP PROGRAMMES

The NCCRP envisages the Climate Change Flagship Programmes as the crucial mechanism to direct and anchor immediate ambitious and practical action at an economy-wide scale and to stimulate the investment required to firmly entrench the transition to low emissions and resilient development.

Just as the ability to achieve South Africa's NDC is premised on accessing adequate finance, technology and capacity building support; the required support needs to be directed by a clearly articulated set of investment priorities. In addition, this needs to be led by an identifiable champion, governance structure and implementation approach. The Climate Change Flagship Programmes fulfil this specific function. The Climate Change Flagship Programmes provide a focal point for attracting and leveraging investment from both the private and public sectors at the scale required to enable meaningful climate action.

The Climate Change Flagship Programmes reflect South Africa's climate change response priority areas and constitute the national climate change response investment portfolio. Climate resilience, adaptation and climate change mitigation are key pillars of the national climate change response, necessary to enable South Africa's NDC and to achieve the level of economic growth and social development envisaged by the National Development Plan: Our future – make it work (NPC 2011).

The Climate Change Flagship Programmes are South Africa's main link to the primary climate finance mechanism of the UNFCCC, the GCF and other funding opportunities.

Table 23 provides a summary of how the Climate Change Flagship Programmes have contributed to catalysing economy-wide investment for scaled-up climate action.

Funding source	Roles of climate change flagship programmes	Accredited entity
NAMA Facility Funding	DEA in collaboration with the Department of Energy, Department of Public Works, the National Business Initiative, the Carbon Trust, Local Government, the IDC and GIZ have successfully applied for funding from the NAMA Facility to implement an Energy Efficiency in Public Infrastructure and Buildings Programme as part of scaling up the Energy Efficiency and Energy Demand Management Flagship Programme. The programme is set to be implemented in 2019.	GIZ
South Africa's Green Climate Fund Strategic Investment Framework	The current expanded set of Climate Change Flagship Programmes forms the foundation for South Africa's Green Climate Fund (GCF) Strategic Framework developed to enable a coherent engagement with the GCF and to ensure that South Africa's GCF investments are aligned to the national climate change response priorities. The national GCF Framework was presented at MINTEC and MINMEC in 2016 and 2017.	Not Applicable
South Africa's Green Climate Fund Country Programme	The Climate Change Flagship Programmes currently constitute the vast majority of South Africa's GCF country programme at over 95% of the GCF proposal pipeline. The Climate Change Flagship Programme team, in collaboration with the relevant lead partners, is actively involved in developing the following funding proposals to the GCF:	
	 National Public and Private Sector Energy Efficiency Programme Proposal (project lead – Department of Energy) National Public Sector Renewable Energy Programme (project lead – Department of Public Works and Passenger Rail Agency of South Africa (PRASA) National Renewable Energy Programme (project lead – Department of Energy) Diversion of Solid Waste from Landfills – Alternative Waste Management Technologies (project lead – Department of Environmental Affairs) Climate Resilient Agriculture Programme (project lead – Department of Agriculture, Forestry and Fisheries) Credit Lines for Climate Resilient Agriculture (project lead – Land Bank) Greening Higher Education Residences Programme (project lead – Department of Higher Education and Training) Wayside Energy Storage (Transnet) 	 DBSA DBSA None DBSA FAO Land Bank DBSA KfW
GEF	DEA has also received support through the Global Environmental Facility (GEF) to scale-up the Agriculture, Food Systems and Food Security Flagship Programme and the Water Conservation and Demand Management Flagship Programme	UNDP
GIZ Climate Support Programme	The majority of the Department's work on the Climate Change Flagship Programmes is supported through the Climate Support Programme (CSP) as part of the South African and German bilateral collaboration anchored by DEA and the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety's (BMU) International Climate Initiative (IKI). The CSP specifically, is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of BMU and has entered its 3rd phase (2017–2019) CSP III supports aspects of scaling-up all of the Climate Change Flagship Programmes, except for Carbon Capture and Storage. In addition to CSP III support, the Climate Change Flagship Programmes also receive support through a number of global projects including, funding from BMU-IKI in other areas, such as the NAMAs for energy efficiency in public buildings and in the transport sector.	GIZ
Submission of NAMAs to the UNFCCC NAMA Registry	NAMAs are one of the cornerstones of international climate negotiations, first introduced in the Bali Action Plan of 2007. The UNFCCC NAMA Registry has been set up to facilitate the matching of finance, technology and capacity building support with these actions, and to recognise voluntary GHG mitigation action and unilateral climate action taken by developing countries as part of a country's sustainable development objectives (UNFCCC, 2014) The individual NAMAs are discussed in more detail in Table 20 in Chapter 7 of this report	Not Applicable

TABLE 23: Catalysing economy-wide investment for scaled-up climate action through the Climate Change Flagship Programmes

CHAPTER REFERENCES

- Department of Environmental Affairs (2016): Minister Molewa's speech at the Parliamentary Colloquium "Unpacking the Paris Agreement: Implications for the Nation," Parliament of the Republic Of South Africa, 28 October 2016. Accessed 27 August 2018 at: https://www.environment. gov.za/speech/molewa_unpackingparisagreement_ implicationsforthenation
- Department of Environmental Affairs (2018): Background to the Global Environmental Facility. Accessed 21 March 2018 at: https://www.environment.gov.za/projectsprogrammes/ donorfunded/aboutgef
- Department of Environmental Affairs (DEA) 2016. South Africa's Green Climate Fund Strategic Framework
- Department of Environmental Affairs (DEA) 2017. South Africa's 2nd Annual Climate Change Report. Pretoria: Department of Environmental Affairs
- Department of Environmental Affairs (DEA), 2016. South Africa's First Climate Change Annual Report - 2015. Accessed 1 March 2018 at: https://www.environment.gov. za/otherdocuments/reports/southafricas_firstnational_ climatechange
- Fakir, Z (2016): Briefing Note on Adaptation Finance (Supplied by Author).
- Fakir, Z (2017): Climate Finance Inflows to South Africa (Mitigation versus adaptation). Accessed 27 August 2018 at: https://pmg.org.za/files/171128CLIMATE_FINANCE.ppt
- Global Environment Facility 2018: Background to the Global Environmental Facility (accessed March 2018)
- Green Climate Fund 2017: Country Ownership Guidelines Accessed 27 August 2018 at: https://www.greenclimate. fund/documents/20182/490910/GCF_B.15_06_-_Country_ Ownership_Guidelines.pdf/1dd8b4d1-3478-4ab4-a2fca94c6151d768
- Green Climate Fund 2018: GCF 101. Webpage. Accessed March 2018 at: https://www.greenclimate.fund/gcf101
- Green Climate Fund 2018: Accredited Entity Directory. Accessed March 2018 at: https://www.greenclimate.fund/ how-we-work/tools/entity-directory
- National Planning Commission 2011. National Development Plan 2030: Our future – make it work. Pretoria: National Planning Commission. Accessed 27 August 2018 at: https://www.gov.za/sites/default/files/devplan_2.pdf

- United Nations 1992. United Nations Framework Convention on Climate Change. Geneva: United Nations. Accessed 8 December 2018 at: https://unfccc.int/resource/docs/ convkp/conveng.pdf
- United Nations Framework Convention on Climate Change (UNFCCC) 1997. Kyoto Protocol to the United Nations Framework Convention on Climate Change adopted at COP3 in Kyoto, Japan, on 11 December 1997. Accessed 27 August at: %20http://unfccc.int/resource/docs/ cop3/07a01.pdf
- United Nations Framework Convention on Climate Change (UNFCCC) Standing Committee on Finance (2016b): 2016 Biennial Assessment and Overview of Climate Finance Flows Report. Website accessed 27 August at: https://unfccc.int/topics/climate-finance/resources/biennialassessment-of-climate-finance
- United Nations Framework Convention on Climate Change (UNFCCC) Standing Committee on Finance 2016a. 2016 Biennial Assessment and Overview of Climate Finance Flows Report. Report accessed 27 August at: http://unfccc. int/files/cooperation_and_support/financial_mechanism/ standing_committee/application/pdf/2016_ba_technical_ report.pdf
- United Nations Framework Convention on Climate Change 1998. Kyoto Protocol to the United Nations Framework Convention on Climate Change. Geneva United Nations. Accessed 8 December 2018 at: https://unfccc.int/resource/ docs/convkp/kpeng.pdf
- United Nations Framework Convention on Climate Change 2010. Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010. Decision 1/CP.16. Accessed 8 December 2018 at: https://unfccc.int/resource/docs/2010/cop16/ eng/07a01.pdf#page=17
- United Nations Framework Convention on Climate Change 2011. Decision 3/CP.17 in Report of the Conference of the Parties on its seventeenth session, held in Durban from 28 November to 11 December 2011. Accessed 8 December 2018 at: https://unfccc.int/resource/docs/2011/cop17/ eng/09a01.pdf
- United Nations. & Canada. (1992). United Nations Framework Convention on Climate Change. New York: United Nations, General Assembly. Accessed 27 August 2018 at: https:// unfccc.int/resource/docs/convkp/conveng.pdf



CONCLUSION

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S outh Africa is likely already committed to relatively large and rapid increases in temperature (compared to the global average). Key sectors are already sensitive to extreme temperatures and exposure, making further climate change a serious risk to South Africa's development and efforts to address poverty and inequality. A timely and coordinated national response to climate change also offers South Africa equitable access to inclusive economic growth and social benefits addressing key development priorities such as water, energy and food security, in addition to opening up new markets.

South Africa's climate change response landscape is growing and advancing on all fronts, drawing on the action and leadership of actors in all sectors of society including civil society organisations, labour, research and scientific institutions and all spheres of government. The participation of all stakeholders from industry, business, labour and civil society is essential to achieve the objectives set out in the NCCRP. A significant amount of work has been done to raise the awareness of different stakeholder groups on climate changerelated issues.

Civil society organisations in particular, have worked to ensure that South Africa's climate change response is participatory and just, recognising the importance and voice of all actors in guiding the transition. At provincial and local government levels, efforts have been focused on building capacity to address localised climate vulnerabilities and to integrate climate change considerations into provincial and municipal planning and service delivery. However, the current impacts of climate change and related extreme weather phenomena, signal the need to prioritise and fast-track the implementation of these response plans.

Considerable effort has been invested and commendable progress achieved in the course of the past seven years in implementing the NCCRP through the practical implementation of the Climate Change Flagship Programmes. Scalingup the Climate Change Flagship Programmes has taken many forms, based on the maturity and complexity of the targeted work packages undertaken by lead national departments and other spheres of government, government institutions, the private sector and civil society in collaboration with DEA. South Africa already has a well-developed base for mitigating climate change and building climate resilience in the Climate Change Response Flagship Programmes. They cover all key areas of South Africa's climate change response, with the exception of disaster risk reduction and disaster management.

Energy efficiency has been the largest contributor to climate change mitigation in the country, accounting for approximately 82% of GHG emission reductions since 2010. The Energy Efficiency and Demand Management Flagship Programme is one the most important and mature scaling-up efforts in the national portfolio of Climate Change Flagship Programmes. Under the leadership of the DOE, in collaboration with the DPW, the DEA, the NBI and Carbon Trust, the Energy Efficiency in Public Infrastructure and Buildings Programme (EEPIBP) has been launched, building on the extensive national investment and experience in energy efficiency garnered over more than a decade. The EEPIBP consolidates and extends work undertaken by a range of implementers and organises these various measures into a cohesive programme within a single integrated national energy efficiency and climate change framework. This points to the importance of consolidating climate action and enabling collaborative action to achieve scale and to mobilise resources. The Waste Management Flagship Programme has enjoyed similar success, focusing on diverting food and organic waste from landfills and implementing alternative waste management technologies.

The expanded list of the Climate Change Flagship Programmes, which elevate climate action that can realise and amplify both adaptation and mitigation benefits, are being scaled up using the same approach, enabled by boldness of vision, collaborative and collective action, creating opportunities and leveraging resources. Given the impact of the national drought and the vulnerability of the agricultural sector, current efforts at scaling up the Water Conservation and Demand Management Flagship Programme through the development of the National Rainwater Harvesting Strategy, and the implementation of climate resilient agriculture through the Agriculture, Food Systems and Food Security Flagship Programme, are particularly important.

Just as the ability to achieve South Africa's NDC is premised on accessing adequate finance, technology and capacity building support, the required support needs to be directed by a clearly articulated set of investment priorities. The multilateral financial architecture for climate change is a complex and evolving network of international, bilateral, and regional funds that provide financial resources to developing countries to support the transition towards low emissions and climate resilient development. Understanding the implications of different sources and means of providing finance - grants, loans and market-based instruments - is important for developing countries when assessing whether financial resources will meet various requirements, such as whether they are new and additional or adequate to meet the needs of developing countries and ensure the effective implementation of the Convention. The DEA has established dedicated advisory, technical, climate finance, coordination and implementation, and climate change monitoring and evaluation capacity to work with the relevant lead national departments and other key implementation partners collaborating with the DEA to prepare and operationalise detailed business plans for financing and implementing South Africa's NDC.

Transparency and reporting progress in responding to climate change are key to the effective implementation of South Africa's Climate Change Response Policy. The regulatory framework for mitigating climate change has been enhanced significantly with the promulgation of the National GHG Emission Reporting Regulations that took effect on 3 April 2017. These regulations will improve South Africa's ability to track the national GHG emissions trajectory and to build an accurate national inventory. They represent yet another cog in the National Climate Change M&E system. The mandatory reporting regulations will assist in targeting climate response measures where they are most required, including supporting the forthcoming carbon tax.

Other key developments in improving South Africa's climate change M&E capability are the continued refinement and strengthening of the Desired Adaptation Outcomes (DAOs) Framework, notably working with a very broad range of stakeholders. The DAOs have been customised for different stakeholders including: business, sector departments, provincial and municipal government through stakeholder consultations. These DAOs have been aligned with various international environmental and climate change adaptation related agreements to which South Africa is a signatory or participant. The progress on the DAOs indicates the broader gains made in establishing and operationalising the national Climate Change M&E system. The web-based platform of the Climate Change M&E system is operational. South Africa's climate change transparency priorities and key themes have been identified and are being integrated into the webbased platform. The Climate Change M&E system will inform South Africa's domestic and international reporting obligations and facilitate South Africa's ability to respond to and manage the increasing transparency requirements at the heart of the Paris Agreement.

South Africa's climate change response is part of a broader global effort to mitigate and manage the effects of global warming, embedded within the UNFCCC and associated international mechanisms. On the international front, the issues that have been reflected upon here carry important signals and messages on how best parties can position themselves in anticipation of the post 2020 regime. The manner in which these issues are advanced in negotiations risks shifting a greater share of the burden onto developing countries. It is in the interest of developing countries to maintain the spirit of the Paris Agreement, for its ultimate test lies in the elements contained under Article 2 of the 2015 Paris Agreement: they speak to the enhanced collective efforts to limit the increase in global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels (UNFCCC 2015a).




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