

National Climate Change Adaptation Strategy

Republic of South Africa

Version UE10

13 November 2019



environment, forestry
& fisheries

Department:
Environment, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

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Definitions¹

Term	Definition
Adaptation	The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.
Adaptive capacity	The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.
Climate change	Refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use.
Climate-smart agriculture	Climate-smart agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes, adapting and building resilience to climate change, and reducing and/or removing greenhouse gas emissions, where possible.
Ecological infrastructure	Ecological infrastructure refers to naturally functioning ecosystems that deliver valuable services to people, such as water and climate regulation, soil formation and disaster risk reduction (SANBI 2019a)
Ecosystems	An ecosystem is a functional unit consisting of living organisms, their non-living environment and the interactions within and between them. The components included in a given ecosystem and its spatial boundaries depend on the purpose for which the ecosystem is defined: in some cases they are relatively sharp, while in others they are diffuse. Ecosystem boundaries can change over time. Ecosystems are nested within other ecosystems and their scale can range from very small to the entire biosphere. In the current era, most ecosystems either contain people as key organisms, or are influenced by the effects of human activities in their environment.
Ecosystem-based adaptation	Ecosystem-based Adaptation (EbA) is the use of biodiversity and ecosystems to support communities to adapt to life in a less predictable climate system (SANBI 2019b)
Environment	The surroundings within which humans exist and that are made up of i) the land, water and atmosphere of the earth; ii) micro-organisms, plant and animal life; iii) any part or combination of i) and ii) and the interrelationships among and between them; and iv) the physical, chemical, aesthetic and cultural properties and

¹ The majority of these definitions have been taken from: IPCC. 2014. Annex II: Glossary [Mach, K.J., S. Planton and C. von Stechow (eds.)]. In: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, pp. 117-130. Other references are indicated in the text for each individual definition.

conditions of the foregoing that influence human health and well-being. (Republic of South Africa 1998)

Gini coefficient	The Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution (OECD 2006)
Greenhouse gas	The gaseous constituents of the global atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation.
Mitigation	A human intervention to reduce the sources or enhance the sinks of greenhouse gases (GHGs). This report also assesses human interventions to reduce the sources of other substances which may contribute directly or indirectly to limiting climate change, including, for example, the reduction of particulate matter emissions that can directly alter the radiation balance (e.g., black carbon) or measures that control emissions of carbon monoxide, nitrogen oxides, Volatile Organic Compounds and other pollutants that can alter the concentration of tropospheric ozone which has an indirect effect on the climate.
Natural capital	Natural capital are natural assets in their role of providing natural resource inputs and environmental services for economic production (OECD 2005).
Representative Concentration Pathways (RCPs)	Scenarios that include time series of emissions and concentrations of the full suite of greenhouse gases (GHGs) and aerosols and chemically active gases, as well as land use/landcover. The word representative signifies that each RCP provides only one of many possible scenarios that would lead to the specific radiative forcing characteristics. The term pathway emphasizes the fact that not only the long-term concentration levels but also the trajectory taken over time to reach that outcome are of interest.
Resilience	The ability of a social, economic or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation and the capacity to adapt to stress and change.
Sustainability	A dynamic process that guarantees the persistence of natural and human systems in an equitable manner.
Sustainable Development	The integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations(Republic of South Africa 1998).
Transformative Change	A system-wide change that requires more than technological change through consideration of social and economic factors that, with technology, can bring about rapid change at scale.
Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Abbreviations

Acronym	Definition
AFIS	Advanced Fire Information System
AR5	IPCC Fifth Assessment Report
ARC	Agricultural Research Council
BGIS	Biodiversity Geographic Information System
CAPS	Curriculum Assessment Policy Statements
CBD	Convention on Biological Diversity
CCSAP	Climate Change Strategy and Action Plan
COPs	Conference of Parties
CPP	Coastal Public Property
CPZ	Coastal Protection Zone
CSA	Climate-Smart Agriculture
CSIR	Council for Scientific and Industrial Research
DALRRD	Department of Agriculture, Land Reform and Rural Development
DAOs	Desired Adaptation Outcomes
DBE	Department of Basic Education
DBSA	Development Bank of Southern Africa
DCDT	Department of Communications and Digital Technologies
DCOG	Department of Cooperative Governance
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DFIs	Development Finance Institutions
DHET	Department of Higher Education and Training
DHS	Department of Human Settlements
DMRE	Department of Mineral Resources and Energy
DOH	Department of Health
DOT	Department of Transport
DPE	Department of Public Enterprises
DPSA	Department of Public Service and Administration
DPWI	Department of Public Works and Infrastructure
DSI	Department of Science and Innovation
DTIC	Department of Trade, Industry and Competition
DWS	Department of Water and Sanitation
DWYPD	Department of Women, Youth and Persons with Disabilities

E&HRU	Environment & Health Research Unit of the South African Medical Research Council
GHGs	Greenhouse Gases
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
IDEWS	Infectious Diseases Early Warning System
IDPs	Integrated Development Plans
IGCCC	Intergovernmental Committee on Climate Change
IPCC	Intergovernmental Panel on Climate Change
LTAS	Long Term Adaptation Scenarios
M&E	Monitoring and Evaluation
MDGs	Millennium Development Goals
MTEF	Medium- Term Expenditure Framework
NAAQMN	National Ambient Air Quality Monitoring Network
NAP	National Adaptation Plan
NBI	National Business Initiative
NCCAS	National Climate Change Adaptation Strategy
NCCC	National Committee on Climate Change
NCCIS	National Climate Change Information System
NCCRP	National Climate Change Response Policy
NCRVAF	National Climate Risk and Vulnerability Assessment Framework
NDC	Nationally Determined Contribution
NDMC	National Disaster Management Centre
NDP	National Development Plan
NERSA	National Energy Regulator of South Africa
NFDRS	National Fire Danger Rating System
NGO	Non-Governmental Organisation
NICD	National Institute of Communicable Diseases
NPC	National Planning Commission
NSSD	National Strategy for Sustainable Development
OCIMS	National Oceans and Coastal Information Management System
RCP	Representative Concentration Pathway
SAAQIS	South African Air Quality Information System
SAEON	South African Environmental Observation Network
SAFFG	South African Flash Flood Guidance
SALGA	South African Local Government Association

SAMA	South African Medical Association
SAMRC	South African Medical Research Council
SANBI	South African National Biodiversity Institute
SARVA	South African Risk and Vulnerability Atlas
SAWS	South African Weather Service
SDBIPs	Service Delivery and Budget Implementation Plans
SDFs	Spatial Development Frameworks
SDGs	Sustainable Development Goals
SPI	Standardised Precipitation Index
SWWS	Severe Weather Warning System
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WAMIS	Wide Area Monitoring Information System
WMO	World Meteorological Organization

Acknowledgements

The National Climate Change Adaptation Strategy (NCCAS) involved numerous people and organisations and was characterised by a spirit of collaboration and cooperation across organisational and disciplinary boundaries. The Department of Environment, Forestry and Fisheries (DEFF) would like to thank the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) for technical assistance in all the development phases of the NCCAS. The NAP Global Network's United States In-Country NAP Support Program is also acknowledged for providing support in the final stages of revising the NCCAS.

The DEFF would also like to thank all the national departments, provincial departments, municipalities, research and academic institutions, non-government organisations, community-based organisations, business, and civil society that have participated and provided technical expertise and key inputs to the development of the NCCAS.

DEFF would also like to acknowledge the NCCAS Task Team, NCCAS Reference Group and the NCCAS Project Management Team who contributed their time and energy to the development of this strategy. DEFF would also like to thank the panel that reviewed comments received from stakeholders on the draft of the NCCAS that was gazetted in May 2019. The panel consisted of: Alinah Mthembu (DEFF), Barney Kgope (DEFF), Funanani Muremi (DEFF), Mikateko Sithole (DEFF), Ntando Mkhize (DEFF), Sibonelo Mbanjwa (DEFF), Sindisiwe Nabane (DEFF), Tlou Ramaru (DEFF), Tsepang Makholela (DEFF), Leluma Matoane (Department of Science and Innovation), Mahlodi Tau (South African National Biodiversity Institute).

1. Introduction

South Africa is experiencing significant effects of climate change particularly as a result of increased temperatures and rainfall variability. The observed rate of warming has been 2 C per century or even higher – more than twice the global rate of temperature increase for the western parts and the northeast (DEA 2017, 72). There is evidence that extreme weather events in South Africa are increasing, with heat wave conditions found to be more likely, dry spell durations lengthening slightly and rainfall intensity increasing. Climate zones across the country are already shifting, ecosystems and landscapes are being degraded, fires are becoming more frequent, and overused natural terrestrial and marine systems are under stress (DEA 2017). According to the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5), climate change is likely to increase the frequency and magnitude of many extreme events and will certainly increase the risk of slow-onset events such as sea level rise and drought (IPCC 2013).

Climate change has the potential to redress the gains made on the Millennium Development Goals (MDGs) and impede the country's ability to achieve the Sustainable Development Goals (SDGs) and also poses risks to opportunities for socioeconomic development. There is increasing international recognition that strong and sustainable socioeconomic development can reduce vulnerability to climate change and ensure resilience (UN 2016; Chaudhury 2017). Despite the advancements that have been made in South Africa, there are still many South Africans that live below the poverty line. These and other vulnerable groups, including the elderly, sick, children, and disabled, will be affected the most by climate change. In terms of gender, women in South Africa are still more vulnerable to the impacts of poverty and face different challenges to men in the workplace, in society and at home (Commission for Gender Equality n.d.). Climate change is one such challenge that women will experience differently to men.

Adaptation to climate change presents South Africa with an opportunity to transform both the health and the economy, to strengthen the social and spatial fabric, and to become more competitive in the global marketplace (Segal and Cloete, 2012; Western Cape Government, 2018). However, systemic changes are required in order to minimise the impacts of climate change. Technological advancements that consider social and economic factors can assist in making these transformative changes.

The National Climate Change Adaptation Strategy (NCCAS) provides a common vision of climate change adaptation and climate resilience for the country, and outlines priority areas for achieving this vision. The NCCAS's vision draws on South Africa's National Climate Change Response Policy (NCCRP) (DEA 2011), the National Development Plan (NDP) (NPC 2011), the National Strategy for Sustainable Development (NSSD) (DEA 2011b), the adaptation commitments included in its Nationally Determined Contributions (NDCs), sector adaptation plans, provincial adaptation plans and municipality adaptation plans. It should be noted that since the NCCAS is specifically focussed on adaptation to climate change, mitigation of greenhouse gas emissions (GHGs) is dealt with in other policy documents. It is however acknowledged that adaptation and mitigation that adaptation action and mitigation action impact on one another. In some cases, adaptation and mitigation action are mutually supportive and in other cases mitigation action and adaptation action are mutually contradictory.

The NCCAS builds upon principles in other pieces of legislation and policy in South Africa, including the National Environmental Management Act, the guiding act for environmental issues, and the Constitution, particularly Section 24, that speaks to the rights to a safe and healthy environment.

The NCCAS is an important step forward for South Africa, as it:

- Acts as a common reference point for climate change adaptation efforts in South Africa in the short to medium-term², providing guidance across all levels of government, sectors, and stakeholders affected by climate variability and change.
- Provides a policy instrument in which national climate change adaptation objectives for the country can be articulated to provide overarching guidance to all sectors of the economy.
- Facilitates the degree to which development initiatives at different levels of government and business integrate and reflect critical climate change adaptation priorities, and thus inform resource allocation by the various stakeholders towards climate change resilience.
- Guides stronger coherence and coordination on climate change adaptation activities between different institutions and levels of government.
- Supports South Africa in meeting its international obligations by defining the country's vulnerabilities, plans to reduce such vulnerabilities and leverage opportunities, outlining the required resources for such action, whilst demonstrating progress on climate change adaptation.

The NCCAS also serves as South Africa's National Adaptation Plan and fulfils South Africa's commitment to its international obligations as outlined in the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). The NCCAS will be used as the basis for meeting South Africa's obligations in terms of the adaptation commitments outlined in the NDC. The NCCAS is a ten-year plan that will be reviewed every five years.

The NCCAS is divided into sets of strategic objectives, strategic interventions and strategic outcomes with associated actions. The document is directed not only at national government departments, but speaks to South African society as a whole, including the key relevant sectoral institutions, provincial governments and municipalities, and non-governmental entities including the private sector, the research community and civil society.

The National Climate Change Response Policy (NCCRP) identifies the following priority adaptation related sectors: water, agriculture and commercial forestry, health, biodiversity and ecosystems, human settlements (urban, rural and coastal), and disaster risk reduction and management (DEA 2011a). The NCCAS goes beyond these sectors to include transportation and infrastructure, energy, mining, oceans and coast.

It should however be noted that the NCCAS is a national strategy and as such does not go into detail of how adaptation will take place in the many sectors impacted by climate change.

² Time frames for the NCCAS are: Short term 1-3 years, Medium term 4-10 years, Long term - More than 10 years.

2. Context

The purpose of this chapter is to contextualise the NCCAS within the international climate change regime and leverage alignment with South African policies, legislation and other strategic frameworks. Furthermore, it highlights the projected climatic changes South Africa is expected to experience and some of the key impacts on different sectors.

2.1. International Context

The 2019 edition of the Global Risk Report by the World Economic Forum highlights environmental risks such as extreme weather events, natural disasters, and the failure to respond to climate change effectively, as among the top risks to the globe in terms of impact and likelihood (WEF 2019). Climate change was ranked first by Global Risks Perception Survey respondents as an “underlying driver of developments in the global risks landscape” (WEF 2019, 13). In 2018, a report on global warming was released by the Intergovernmental Panel on Climate Change (IPCC) (IPCC 2018). This watershed report highlights the urgency of the climate change challenge and states that the current commitments by countries across the globe are not enough to prevent an increase of 1.5 degrees in global temperatures. It highlights that the situation is worse than previously thought and that an increase in 1.5 degrees will have a greater impact than was estimated (IPCC 2018). There are a number of global agreements and decisions that South Africa has participated in that aim to respond to and prepare for the impacts of climate change.

In particular, South Africa is a Party to the United Nations Framework Convention on Climate Change (UNFCCC) which aims to achieve the ‘stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic [human induced] interference with the climate system’ (UN 1992, 4). Under the UNFCCC, it is envisaged that: ‘Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner’ (UN 1992, 4). The two key Conference of Parties (COPs) to the UNFCCC that prioritised the importance of climate change adaptation were COP16 held in Cancun in 2010 and COP21 held in Paris in 2015. COP16 resulted in the adoption of the Cancun Adaptation Framework, which placed climate change adaptation on the same level of importance as climate change mitigation for the first time. It also established the National Adaptation Plan process (UNFCCC 2011, 4–7). The Cancun Adaptation Framework laid the foundation for the Paris Agreement, an outcome of COP21. The Paris Agreement elevates the importance of climate change adaptation through the establishment of a ‘global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change’ and provides extensive guidance on how countries should approach adaptation as a priority (UN 2015a, Article 7). As a signatory, South Africa is required to compile a set of Nationally Determined Contributions (NDCs) which outline the country’s contributions to the global goals to reduce national greenhouse gas emissions and adapt to the impacts of climate change (UN 2015a, Article 7). South Africa’s goals regarding adaptation outlined in its NDC document are:

- Goal 1: Develop a National Adaptation Plan, and begin operationalization as part of implementing the NCCRP for the period from 2020 to 2025 and for the period 2025 to 2030;

- Goal 2: Take into account climate considerations in national development, sub-national and sector policy frameworks for the period 2020 to 2030;³
- Goal 3: Build the necessary institutional capacity for climate change response planning and implementation for the period 2020 to 2030;
- 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 National Adaptation Plan with rolling five-year implementation periods;
- Goal 5: Development of a vulnerability assessment and adaptation needs framework by 2020 to support a continuous presentation of adaptation needs; and
- Goal 6: Communication of past investments in adaptation for education and awareness as well as for international recognition (DEA 2015a, 3-6).

In the same year that the Paris Agreement was signed, the 2030 Agenda for Sustainable Development was adopted, along with a set of 17 Sustainable Development Goals (SDGs). The SDGs support the Paris Agreement as climate change is specifically highlighted under SDG 13: ‘Take urgent action to combat climate change and its impacts’, and features across many of the other SDGs, because of its cross-cutting nature (UN 2015b, Goal 13). SDG 13 specifically mentions targets relating to strengthening resilience and adaptive capacity which align directly with the adaptation goal in the Paris Agreement (UN 2015b, Goal 13). In addition, The Sendai Framework for Disaster Risk Reduction 2015–2030, adopted on 18 March 2015, notes that climate change is one of the ‘underlying disaster risk drivers’, and that climate change can exacerbate the seriousness of a disaster (UNISDR 2015, p10). Preparing for climate related disaster and building resilience are key priorities in the Sendai Framework.

Another international agreement that contributes to the global climate change adaptation response is the decision on Biodiversity and Climate Change that was adopted in 2016 at the Conference of the Parties to the Convention on Biological Diversity (CBD) in Cancun (UNEP 2016, 34). The Decision encourages all Parties to take into account the importance of protecting biodiversity, preserving ecosystems, and using ecosystem-based approaches, when developing their NDCs. It also encourages the integration of ecosystem-based approaches into climate change adaptation, mitigation, disaster risk reduction and other strategic plans (UNEP 2016, 34). Finally, the Global Framework for Climate Services was developed to help guide nations, especially those most vulnerable, to prepare and adapt to climate change through the development and use of science-based climate information in policy, planning and practice (WMO 2016).

2.2. African Context

Africa is likely to experience changes in climate earlier than other regions, and therefore adaptation measures are urgently required on the continent (Giordano and Bassini 2019; Besada and Sewankambo 2009). Africa’s Adaptation Gap 2: Technical Report (2013) notes that the costs of adaptation in Africa could increase to USD 100 billion/year by 2050 in a world that experiences more than 4 degrees Celsius warming by 2100. Increased funds from developed countries for adaptation in

African countries would help to fund these costs. However, finances for adaptation are required from continental and national levels as well (UNEP 2015, iv).

The Southern African Development Community's Climate Change Strategy and Action Plan (CCSAP) (SADC 2015) emphasises the need for enhanced climate change adaptation responses in Africa due to the wide range of pressing vulnerabilities. The CCSAP aims to coordinate regional and national climate change responses in Africa, and to 'climate proof' SADC's policies, strategies and protocols (SADC 2015).

2.3. National Context

Although the South African post-apartheid political and policy landscape looks markedly different from its apartheid predecessor, the legacy of apartheid is still very evident from a developmental vantage point. South Africa remains a dual economy with one of the highest Gini Coefficients in the world, perpetuating both inequality and exclusion. The continued social and economic exclusion of millions of South Africans, reflected in high levels of poverty and inequality, has been identified as South Africa's biggest challenge by the National Planning Commission's diagnostic report (NPC nd). In terms of gender inequality, the report also notes that poverty is higher in woman-headed households and that women still continue to earn less than men (NPC nd).

The South African economy is dependent on primary sectors such as agriculture and mining, particularly minerals extractives, which are natural resource dependent and energy intensive, with energy generation being very important as it is also subject to climate variability and change. Therefore, changes in climate are predicted to exacerbate these challenges, as increased temperatures, rainfall variability and increased coastal storms and sea level rise will have direct impacts on South Africa's natural resources and infrastructure, affecting food security and health, threatening water and coastal resources, and impacting on development. These impacts will be especially felt by the poor, as they will be more exposed to them and have fewer resources to cope with these impacts. Climate change is therefore predicted to result in further widening of the gap between the rich and poor (Ziervogel et al. 2014; Chikulo 2014). Climate change impacts are however, already happening in South Africa with increased storms, drought conditions and temperature increases being felt across different parts of the country.

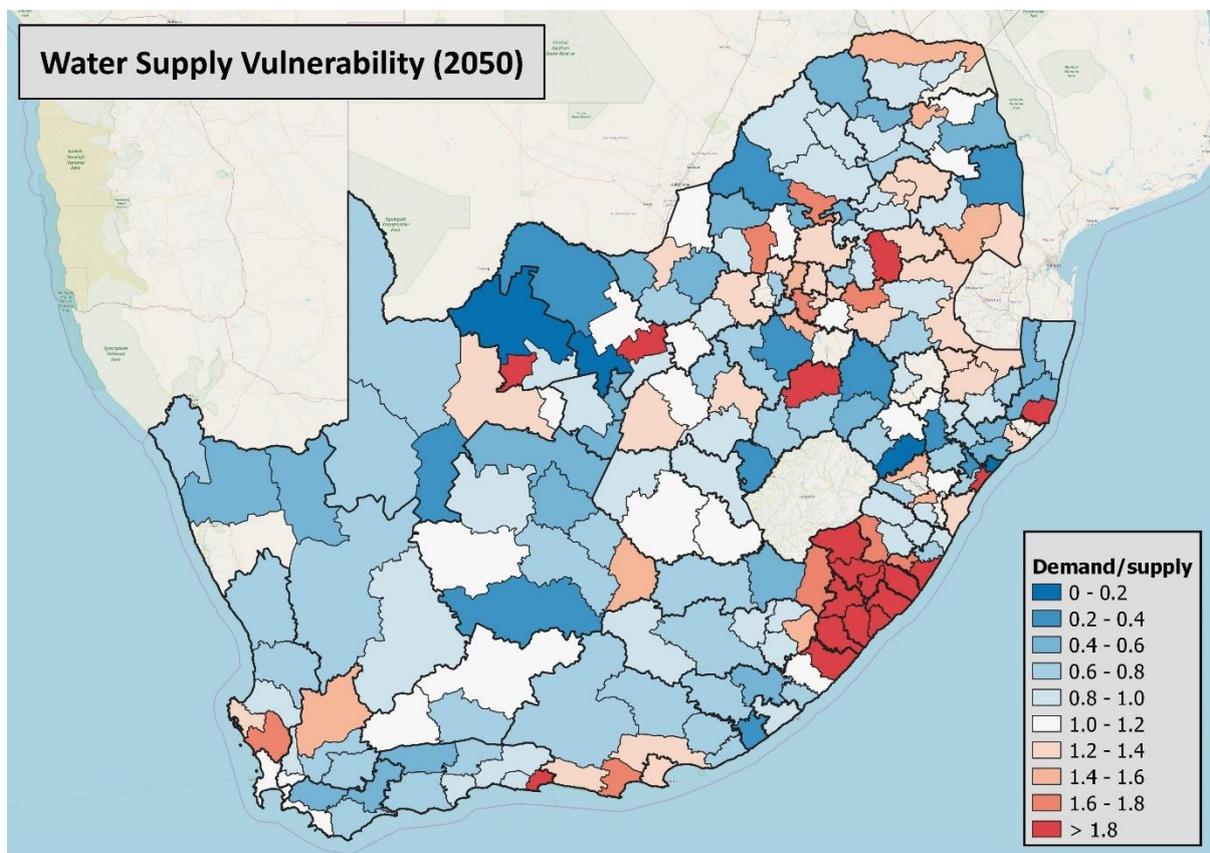
The National Development Plan (NDP) of South Africa seeks to eliminate poverty, deliver environmental protection and promote economic development by 2030. However, the NDP does not test the sensitivity of achieving these goals in light of climate change and variability. Finance set aside for development needs to incorporate climate change so that infrastructure and communities are resilient to future climate impacts. Furthermore, climate change needs to be mainstreamed into budgetary processes in all spheres of government.

South Africa has, however, made progress in developing a plan that responds to and prepares for the impacts of climate change. The National Climate Change Response Policy (NCCRP), published in 2011, prioritizes both climate change mitigation and adaptation in moving towards a climate-resilient and lower-carbon economy and society (DEA 2011). The overarching approach to adaptation, as identified in the NCCRP, focuses on the development of adaptation responses that are flexible to changing

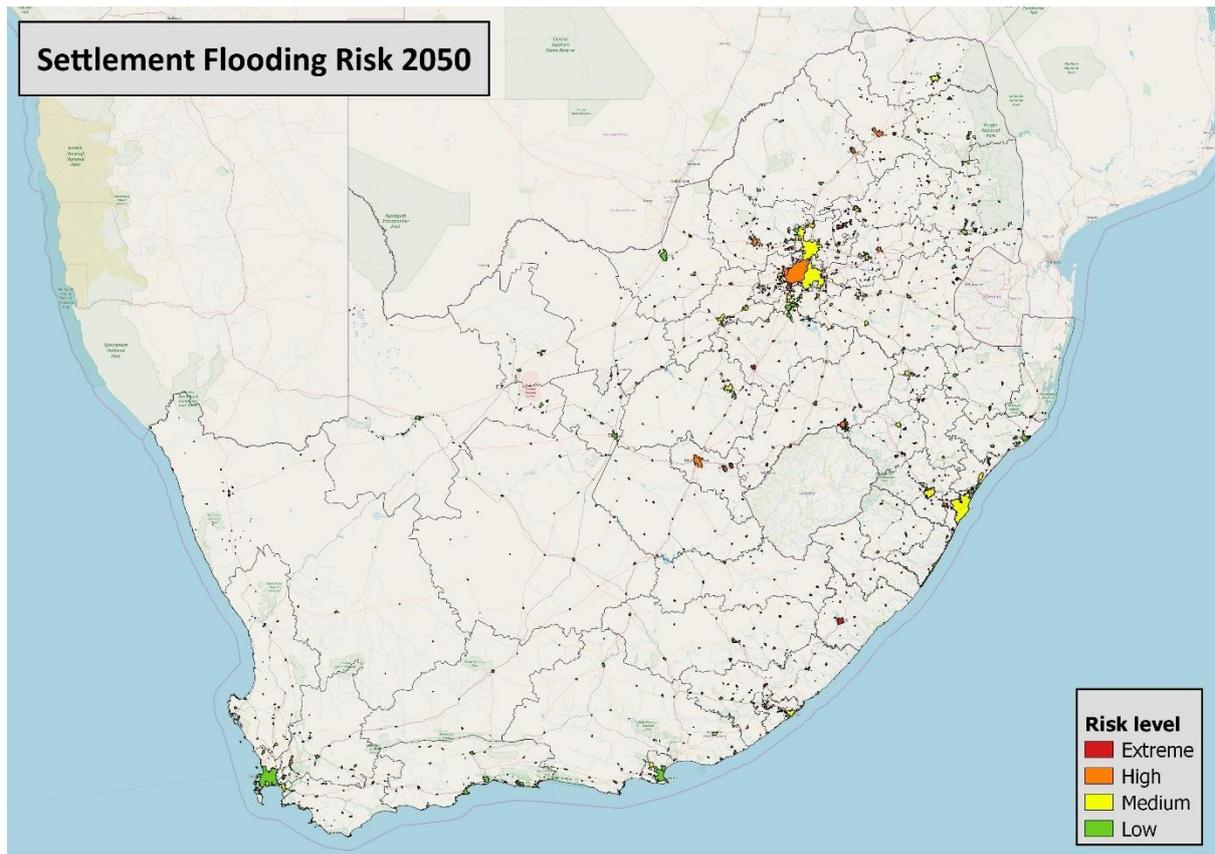
conditions, that take local context and local knowledge into account and that are informed by rigorous research. The NCCRP identifies a set of key adaptation related sectors including water, health, human settlements, agriculture and commercial forestry, biodiversity and ecosystems, and disaster risk reduction and management, and advocates the inclusion of climate change into plans for these sectors (DEA 2011). Since the development of the NCCRP, considerable progress has been made in developing adaptation policies, plans and strategies in various sectors and spheres of government, including the development of climate adaptation plans in local and provincial government.

A sector where significant strides have been made in the integration of climate change adaptation is disaster management. The Disaster Management Amendment Act, 2015 (Act No. 16 of 2015), is a critical piece of legislation that directly responds to climate change adaptation. The Amendment Act assigns responsibility to national, provincial and local spheres of government to invest in disaster risk reduction and climate change adaptation interventions for their respective jurisdictions. Each organ of state is required to develop disaster management plans that include climate change risks and responses.

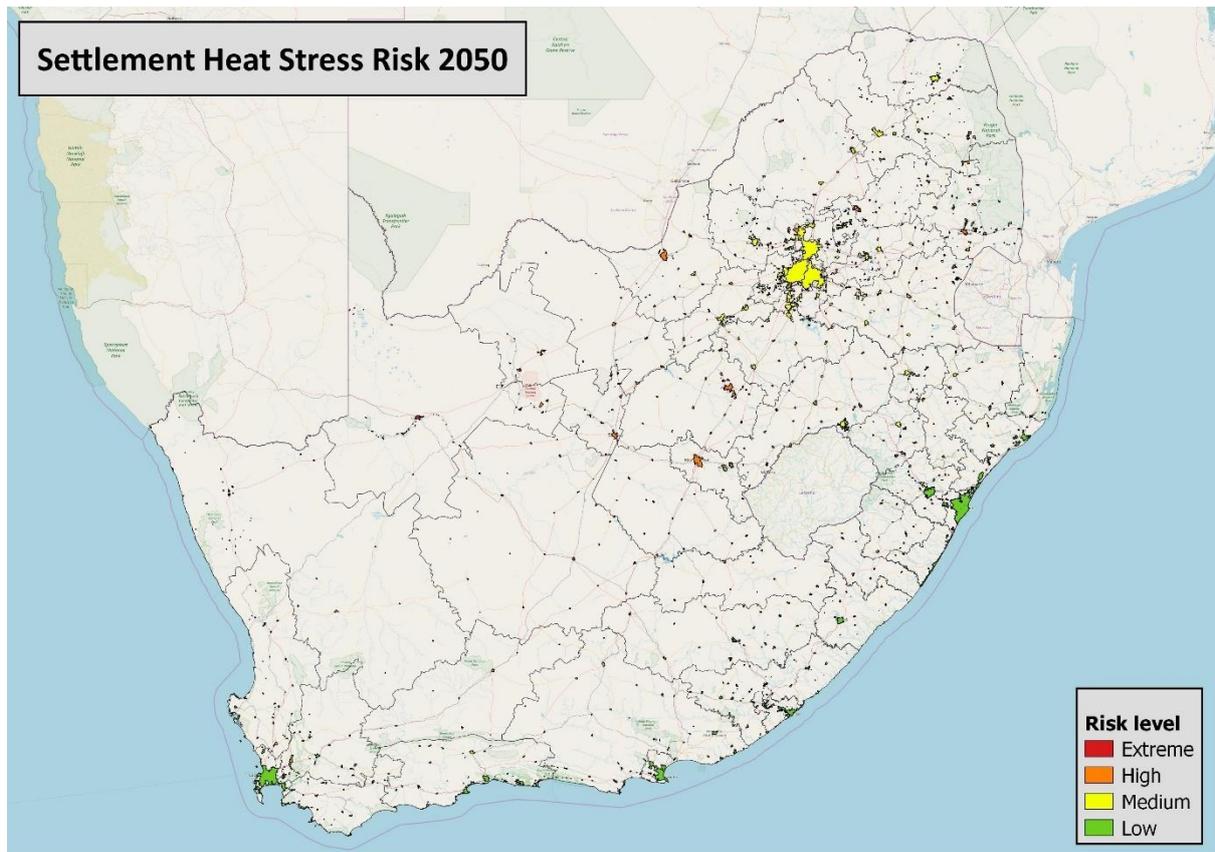
2.4 Maps



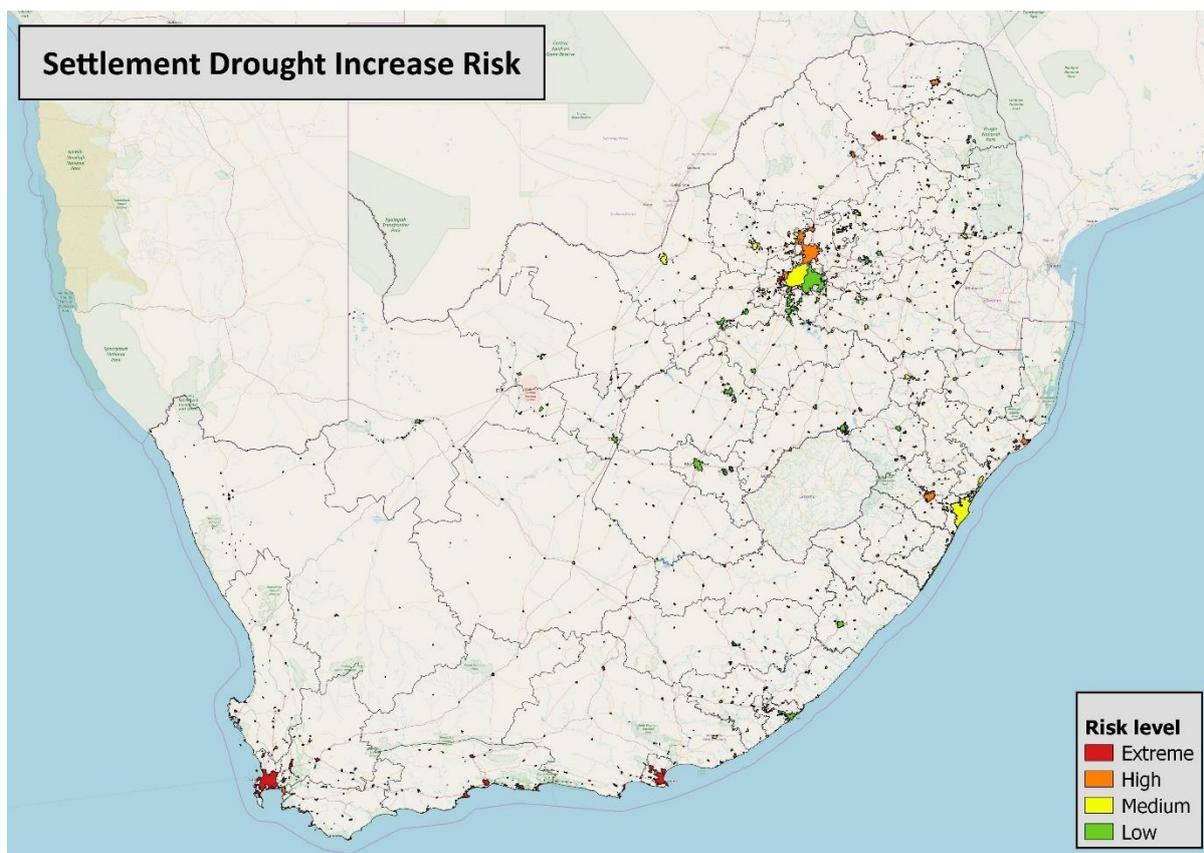
The estimated future water supply vulnerability (2050) for Local Municipalities under a medium projected growth scenario. A value of 1 indicates that the water demand and supply of the Local Municipality are equal, a value of less than 1 indicates that there is surplus supply and a value of more than 1 indicates that either the demand is too high and/or the supply is too low (Cullis and Phillips, 2019 in CSIR, 2019).



The settlements at risk of projected increases in floods using a risk matrix (low, medium, high or extreme) that considered a calculated flood hazard index and the projected change in extreme rainfall days for 2050 (Maitre, Kotzee, Le Roux and Ludick, 2019 in CSIR, 2019).



The projected impact of climate change on settlements using a settlement heat stress risk (low, medium, high or extreme) based on a combination of the projected increase in very hot days and heatwave days (Engelbrecht, Le Roux, Arnold and Malherbe, 2019 in CSIR, 2019).



The settlements at risk of projected drought tendencies using a risk matrix (low, medium, high or extreme) that considered the different values within a drought index and whether they indicate an increase or decrease in drought tendencies (Beraki, Le Roux and Ludick, 2019 in CSIR, 2019).

2.5. Climate Change Context

A summary of projected future changes in climate in South Africa are provided in the table below. These projections have been taken from the Third National Communication to the UNFCCC (DEA 2017) and compare projected climate change impacts under high mitigation interventions (Representative Concentration Pathway (RCP) 4.5), and low mitigation interventions (RCP 8.5). RCPs are used to help climate researchers and modelers to understand how different mitigation scenarios will impact on future concentrations of GHGs.

Category	Projected Climate Changes	
Temperature	<ul style="list-style-type: none"> ● Under low mitigation: temperatures to increase drastically. <ul style="list-style-type: none"> ○ 2080–2099 period: Temperature increases greater than 4 °C across South Africa. Increases greater than 6 °C possible in western, central and northern interior. 	<ul style="list-style-type: none"> ● Under high mitigation: temperatures in the interior could be constrained between 2.5 to 4 °C.

	<ul style="list-style-type: none"> ○ Increases in the number of heat-wave days and very hot days. ● 	
Rainfall	<ul style="list-style-type: none"> ● More uncertainty in rainfall projections than in temperature projections. ● Under low mitigation: <ul style="list-style-type: none"> ○ South Africa to experience drier conditions overall. ○ Extreme rainfall events to increase over the interior. ○ 	<ul style="list-style-type: none"> ● Under high mitigation: Different projections <ul style="list-style-type: none"> ○ Large number of projections predict generally wetter conditions over the central and eastern interior. ● Other projections predict generally drier conditions.

The table below summarises the vulnerability of key socio-economic sectors in South Africa to climate change (DEA 2017).

Sector	Sensitivity analysis	Exposure Analysis		
	Current stresses to the systems	Climatic driver	Impacts	Area
Agriculture and Forestry	<ul style="list-style-type: none"> ● Land use and change ● Water stress ● Invasive alien plants 	↓ rainfall	Reduction in yields	KwaZulu-Natal, Mpumalanga, Western Cape
		Δ rain distribution	Impacts on crop production	National
		↑ heat waves	Pressure on water resources	National
Coastal zone	<ul style="list-style-type: none"> ● Direct wave impacts ● Coastal flooding / inundation ● Erosion and under-scouring ● Land use change 	<ul style="list-style-type: none"> ● Intrusion of saltwater ● Loss / changes to coastal wetlands ● Higher (ground) water levels and limited soil drainage ● Flooding of low-lying areas and erosion 		
Health	<ul style="list-style-type: none"> ● Quadruple burden of disease ● Poor housing, infrastructure and service delivery ● Change in distribution of diseases ● Catastrophic events may affect the health of the population. 	<ul style="list-style-type: none"> ● A changing climate can have a myriad of impacts on the health sector. ● There is a lack of understanding of the linkages between climate and health in South Africa (e.g. quantitative link between high temperatures and mortality). 		

Sector	Sensitivity analysis	Exposure Analysis		
	Current stresses to the systems	Climatic driver	Impacts	Area
Terrestrial Ecosystems	<ul style="list-style-type: none"> Habitat fragmentation Land use change Invasive alien plants 	<ul style="list-style-type: none"> ↑ temperature and extremes Δ in rainfall and distribution Changes in fire 	<ul style="list-style-type: none"> Changes across the biomes through the alteration of habitats, species distribution, and ecosystems functioning. 	
Urban and Rural Settlements	<ul style="list-style-type: none"> Deficit in infrastructure and provision of services 	<ul style="list-style-type: none"> Different human settlement types and locations having varying vulnerabilities and capacities Informal settlements and their population are most exposed 		
Water Resources	<ul style="list-style-type: none"> High water demand: current water usage already exceeds reliable yield High levels of variability in rainfall, resulting in frequent floods and droughts Deteriorating water quality in river systems, water storage reservoirs and groundwater 	↓ rainfall	<ul style="list-style-type: none"> Increase in demand from agriculture, power generation, settlements 	
		↑ intense rainfall	<ul style="list-style-type: none"> Increased erosion and sedimentation of dams and rivers 	
		↑ temperature	<ul style="list-style-type: none"> Increased evaporation loss from dams Effect on biological and microbiological processes 	

Further information on projected climate changes and vulnerabilities of key socio-economic sectors in South Africa is available in Third National Communication under the United Nations Framework Convention on Climate Change. This document is available at the UNFCCC website.

3. Strategic Focus

This chapter outlines the vision, strategic objectives, strategic interventions and strategic outcomes of the NCCAS.

3.1. Vision

To transition to a climate resilient South Africa, which will follow a sustainable development path, guided by anticipation, adaptation and recovery from a changing climate and environment to achieve our development aspirations.

3.2. Principles and key elements of adaptation and climate resilience

The guiding principles for the implementation of the NCCAS are outlined below:

Guiding Principle	Description
A country-driven approach	The development and implementation of the NCCAS will be driven by South Africa and the NCCAS will be coordinated with national sustainable

	development objectives, plans, policies, programmes.
Based on best available science and traditional knowledge	The development and implementation of the NCCAS will be based on best available science on observed climate and projected climate changes as well as relevant traditional knowledge on climate impacts and potential responses.
Participatory, bottom up approach	A wide range of stakeholders, including government, communities, civil society organisations, research community and private sector actors will be involved in the development and implementation of the NCCAS.
People-centred	The development and implementation of the NCCAS will place people, their needs and their rights at the forefront and serve their physical, developmental, cultural and social interests equitably.
Equity	The development and implementation of the NCCAS should support and promote equity in South Africa.
Gender-responsive	The development and implementation of the NCCAS will promote the participation of women, take gender differences in vulnerability to climate change into account, address the needs and priorities of both women and men and will not exacerbate gender inequalities.
Consideration of vulnerable groups	The development and implementation of the NCCAS will promote the participation of vulnerable groups and build resilience and adaptive capacity of the most vulnerable people such as women, and especially poor and/or rural women; children, especially infants and child-headed families; the aged; the sick; and the physically challenged.
Environmental support for climate adaptation	The development and implementation of the NCCAS will promote the protection of ecosystems and biological diversity because of the role they play in supporting South Africa's adaptation to climate change.
Address capacity gaps	The development and implementation of the NCCAS will promote the development of capacity in climate change adaptation throughout South Africa.
Facilitate mainstreaming of adaptation	The development and implementation of the NCCAS will promote the integration of adaptation in the policies and planning of sectors as well as all three spheres of government.
Continuous, progressive, iterative process	The NCCAS will have a strong Monitoring and Evaluation (M&E) System and further iterations of the NCCAS will be influenced by outcomes of M&E.
Transformative change	The implementation of the NCCAS requires transformative change. This entails advancements in technology that consider social and economic factors that result in system-wide change.

3.3. Strategic Objectives

As different departments and spheres of government continue to develop and strengthen their own comprehensive adaptation strategies, it is critical that they all reflect a shared vision. A common reference point is needed to help align ongoing efforts across the country. This document – South Africa’s NCCAS – is intended to be the cornerstone for climate change adaptation in the country and to reflect a unified, coherent, cross-sectoral, economy-wide approach to climate change adaptation.

It outlines priority areas for adaptation, both to guide adaptation efforts and to inform resource allocation. The strategic objectives of the NCCAS are as follows:

- Objective 1: Build climate resilience and adaptive capacity to respond to climate change risk and vulnerability.
- Objective 2: Promote the integration of climate change adaptation response into development objectives, policy, planning and implementation.
- Objective 3: Improve understanding of climate change impacts and capacity to respond to these impacts.
- Objective 4: Ensure resources and systems are in place to enable implementation of climate change responses.

3.4. Strategic Interventions

The strategic interventions of the NCCAS are presented below. Each intervention has a dedicated Chapter to outline the envisaged actions associated with the intervention.

- Intervention 1: Reduce human, economic, environmental, physical and ecological infrastructure vulnerability and build adaptive capacity.
- Intervention 2: Develop a coordinated Climate Services system that provides climate products and services for key climate vulnerable sectors and geographic areas.
- Intervention 3: Develop a vulnerability and resilience methodology framework that integrates biophysical and socio-economic aspects of vulnerability and resilience.
- Intervention 4: Facilitate mainstreaming of adaptation responses into sectoral planning and implementation.
- Intervention 5: Promote research application, technology development, transfer and adoption to support planning and implementation.
- Intervention 6: Build the necessary capacity and awareness for climate change responses.
- Intervention 7: Establish effective governance and legislative processes to integrate climate change in development planning.
- Intervention 8: Enable substantial flows of climate change adaptation finance from various sources.
- Intervention 9: Develop and implement an M&E system that tracks implementation of adaptation actions and their effectiveness

3.5. Strategic Outcomes

The NCCAS outlines strategic outcomes towards achieving the vision of the transition to a climate-resilient South Africa. These are outlined below:

- Outcome 1.1: Increased resilience and adaptive capacity achieved in human, economic, environmental, physical and ecological infrastructure.
- Outcome 2.1: Climate products and services for key climate vulnerable sectors and geographic areas developed and implemented
- Outcome 3.1: A Climate Risk and Vulnerability Assessment Framework developed and implemented across 100% of key adaptation sectors.
- Outcome 4.1: Effective adaptation planning that covers at least 100% of the South African sectors identified in the NCCAS.

- Outcome 4.2: Achieve a 100% coverage of climate change considerations in sectoral operational plans.
- Outcome 5.1: Increased research output and technology uptake to support planning and implementation.
- Outcome 6.1: Capacity building and awareness for climate change response enhanced.
- Outcome 7.1: Adaptation governance defined and legislated through the Climate Change Act once approved by parliament
- Outcome 7.2: Institutional structures for climate change adaptation strengthened
- Outcome 7.3: Enhanced public-private-civil society collaboration and stewardship
- Outcome 8.1: Adequate financial resources for national adaptation priorities from national fiscus and international sources
- Outcome 9.1: A national M&E system developed and implemented

3.6. Linkages between strategic objectives, interventions and outcomes

Objective	Intervention	Outcome
Objective 1: Build climate resilience and adaptive capacity to respond to climate change risk and vulnerability.	Intervention 1: Reduce human, economic, environmental, physical and ecological infrastructure vulnerability and build adaptive capacity.	Outcome 1.1: Increased resilience and adaptive capacity achieved in human, economic, environmental, physical and ecological infrastructure.
	Intervention 2: Develop a coordinated Climate Services system that provides climate products and services for key climate vulnerable sectors and geographic areas.	Outcome 2.1: Climate products and services for key climate vulnerable sectors and geographic areas developed and implemented.
Objective 2: Promote the integration of climate change adaptation response into development objectives, policy, planning and implementation.	Intervention 3: Develop a vulnerability and resilience methodology framework that integrates biophysical and socio-economic aspects of vulnerability and resilience.	Outcome 3.1: A Climate Risk and Vulnerability Assessment Framework developed and implemented across 100% of key adaptation sectors
	Intervention 4: Facilitate mainstreaming of adaptation responses into sectoral planning and implementation.	Outcome 4.1: Effective adaptation planning that covers at least 100% of the South African sectors identified in the NCCAS.
Outcome 4.2: Achieve a 100% coverage of climate change considerations in sectoral operational plans.		
Objective 3: Improve understanding of climate change impacts and capacity to respond to these impacts.	Intervention 5: Promote research application, technology development, transfer and adoption to support planning and implementation.	Outcome 5.1: Increased research output and technology uptake to support planning and implementation.
	Intervention 6: Build the necessary capacity and awareness for climate change responses.	Outcome 6.1: Capacity building and awareness for climate change response enhanced.
Objective 4: Ensure resources and systems are in place to enable implementation of climate change responses.	Intervention 7: Establish effective governance and legislative processes to integrate climate change in development planning.	Outcome 7.1: Adaptation governance defined and legislated through the Climate Change Act once approved by parliament.
		Outcome 7.2: Institutional structures for climate change adaptation strengthened.
		Outcome 7.3: Enhanced public-private-civil society collaboration and stewardship.
	Intervention 8: Enable substantial flows of climate change adaptation finance from various sources.	Outcome 8.1: Adequate financial resources for national adaptation priorities from national fiscus and international sources.
	Intervention 9: Develop and implement an M&E system that tracks implementation of adaptation actions and their effectiveness.	Outcome 9.1: A national M&E system developed and implemented.

4. Reduce Vulnerability and Build Adaptive Capacity

Reduce human, economic, environment, physical and ecological infrastructure vulnerability and build adaptive capacity.

4.1. Introduction

South Africa is already experiencing the negative effects of climate change and is expected to suffer significant consequences in the future. To promote adaptation to these impacts it is necessary to take measures to reduce human and economic vulnerability as well as to reduce the vulnerability of physical and ecological infrastructure to climate change. In addition, it is necessary to build the adaptive capacity of individuals and society to respond to climate change impacts. Since vulnerability to climate change differs depending on gender, age, wealth, social status and other factors, adaptation actions must be targeted in ways that ensure equitable benefits for the individuals and communities that are most vulnerable to climate change. Furthermore, the contributions of vulnerable groups should not be underestimated as their insights and capacities can help to develop actions that are most effective. Existing strategies that focus on the inclusion of vulnerable groups should be drawn upon, such as DEFF's gender mainstreaming strategy in the environmental sector (DEA 2016c).

Both the Paris Agreement and South Africa's National Climate Change Response paper highlight the importance of adopting an inclusive approach that considers vulnerable groups in climate change response (United Nations 2015; DEA 2011a). One of the principles in South Africa's National Climate Change Response paper is to consider those with "special needs and circumstances" that are vulnerable to the impacts of climate change. Those with special needs highlighted include "women, and especially poor and/or rural women; children, especially infants and child headed families; the aged; the sick; and the physically challenged" (DEA 2011a, 12). A second principle in the NCCRP that relates to the vulnerable is "Uplifting the poor and vulnerable". This principle relates to the need to address the needs of vulnerable groups whilst striving for sustainability in response to climate change (DEA 2011a). Including vulnerable groups in climate change adaptation planning, does not only mean considering them, but also including vulnerable groups in decision-making processes, and ensuring that they benefit from adaptation actions (NAP Global Network 2019).

The key outcome for this strategic intervention is: *Increased resilience and adaptive capacity achieved in human, economic, environment, physical and ecological infrastructure* (Strategic Outcome 1.1).

4.2. Status Quo

South Africa has invested in understanding its climate change vulnerabilities since the late 1990s. From as early as 1999 a set of reports on climate change vulnerability focusing on certain sectors were developed under the programme "South African Country Reports on Climate Change" (DEA 2018). In the early 2000s South Africa developed a national climate change response strategy and some of the metropolitan municipalities and provinces started to develop climate change vulnerability and adaptation strategies. The NCCRP was then published in 2011 and following that work began on the Long Term Adaptation Scenarios documents which provide important information on adaptation (DEA 2018). Since 2012 DEFF has been running the Lets Respond Toolkit programme, which has helped district and local municipalities to develop climate change vulnerability assessments and adaptation strategies (DEA 2018).

There are a wide range of adaptation projects that are currently being implemented in South Africa by different stakeholders in different sectors. Some of the existing projects may not be acknowledged as 'climate adaptation projects' but contribute towards building adaptive capacity and reducing vulnerability. Similarly, the adaptation related sectors, that are identified by the NCCRP, are not the only sectors to be affected by climate change, and actions in new emerging adaptation related sectors are being developed in order to prepare for the impacts of climate change.

The priority "adaptation" related sectors for South Africa, as identified in the NCCRP, are water, agriculture and commercial forestry, health, biodiversity and ecosystems, human settlements (urban, rural and coastal), and Disaster Risk Reduction and Management (DEA 2011a). However, it is becoming more apparent that these sectors are not the only ones to be affected by climate change in South Africa. New emerging adaptation related sectors include energy, infrastructure (including transport), tourism, mining, oceans and coast. In order to ensure that emerging sectors and adaptation actions are considered going forward, to reduce vulnerability and build capacity, the NCCAS is adopting a cluster approach. The clusters include:

- A: Increased human resilience and adaptive capacity
- B: Increased economic resilience and adaptive capacity
- C: Increased environment and ecological infrastructure resilience and adaptive capacity
- D: Increased physical infrastructure resilience and adaptive capacity

Some of the existing projects in South Africa addressing human resilience and adaptive capacity include those that have focused on investigating the complex relationships between climate change, diseases such as HIV/AIDS, and food security. Improving health care can help to build the resilience of communities to better be able to cope with climate change impacts (DEA 2016a). In the economic cluster, existing projects include the investment in new technologies such as decentralised energy and waste beneficiation. Under the environmental cluster, an effective set of projects that have been implemented are the Working for Water, Working for Coast, and Working for Wetlands Programmes which involve the removal of invasive alien species and protection of water resources (DEA 2017). Under the infrastructure cluster, a range of adaptation projects are being implemented at different spheres of government that involve climate-proofing settlements and infrastructure and developing local early warning systems for communities.

Stakeholders that have been key implementers of climate adaptation projects include: government actors, provincial stakeholders and municipalities, state entities, non-governmental organisations (NGOs) and business, among others (DEA 2017).

4.3. Actions

The actions to achieve this outcome are outlined below. It should be noted that this is not an exhaustive list. There will also be interdependencies and trade-offs between these actions that will need to be explored: In addition the actions in this chapter should be read in conjunction with the actions in the mainstreaming chapter.

Outcome 1.1: Increased resilience and adaptive capacity achieved in human, economic, environment, physical and ecological infrastructure

The actions have been divided up into the four clusters:

- A: Increased human resilience and adaptive capacity
- B: Increased economic resilience and adaptive capacity
- C: Increased environment and ecological infrastructure resilience and adaptive capacity
- D: Increased physical infrastructure resilience and adaptive capacity

A: Increased human resilience and adaptive capacity

	Action	Description
1.1.1	Strengthen local organizations to support individual (male and female) and community adaptation	Provide support to local organisations to support both individuals (male and female) and communities, especially the vulnerable, to adapt to climate change.
1.1.2	Identify individuals (male and female) and communities at most risk from climate change within municipalities and deliver targeted climate change vulnerability reduction programmes for these individuals and communities.	This will involve the identification of at-risk individuals (male and female) and communities within municipalities. Based on this identification targeted vulnerability reduction programmes can be designed and delivered, addressing issues such as gender inequality and marginalization which represent underlying causes of vulnerability to climate change.
1.1.3	Develop a list of resilience-building projects that can easily be replicated.	This will involve developing a list of recent successful resilience-building programmes and projects that can easily be replicated in other areas or sectors. This action stresses the importance of learning from successfully implemented programmes to identify key elements that have provided best results in resilience-building in order to replicate them in similar environments.
1.1.4	Capacitate and operationalise South Africa's National Disaster Management Framework to strengthen proactive climate change adaptive capacity, preparedness, response and recovery.	This will involve conducting an assessment of gaps and needs with regard to the National Disaster Management Framework to identify elements of the framework that have not yet been achieved. In particular all Disaster Management Centres will need to integrate climate change within their terms of reference.

	Action	Description
1.1.5	Equip and capacitate emergency response departments, such as health and fire, to prepare for and manage climate related disasters.	This will involve continued capacity building of emergency response workers to provide them with the skills to respond to and manage climate change related incidences. It will also include equipping the emergency response infrastructure.
1.1.6	Invest in knowledge and capacity building for the public, especially vulnerable groups (male and female), to prepare and adapt to climate change	Develop awareness programmes that focus on making the public aware of the potential risks of climate change and how to practically prepare for these risks.
1.1.7	Invest in knowledge and capacity building for climate-resilient rural livelihoods	Support rural livelihoods through knowledge and capacity building, particularly for women from vulnerable households. This could include capacity in areas like climate-smart and conservation agricultural practices, water-saving practices, and building climate resilient structures.
1.1.8	Launch an enhanced climate change public flagship programme to build a healthier, more resilient society.	This will involve the development of an evidence-based white paper on National Climate Change and a Public Flagship Programme as well as establishing key implementation nodes in provinces and municipalities.
1.1.9	Equip and capacitate healthcare facilities to manage climate change-related health effects and climate-sensitive diseases.	This will involve continued capacity building of healthcare workers to provide them with the skills to respond to and manage climate change related incidences. It will also include equipping the healthcare infrastructure.
1.1.10	Support small-scale fishers (male and female) to become more climate resilient through use of early warning systems and sea-safety training.	This will involve the development of sea-safety and early warning systems training programmes targeted at small-scale fishers.
1.1.11	Support farmers (male and female) to implement more efficient climate-smart and conservation agriculture practices.	This will involve setting up programmes to provide support to the sector to implement climate-smart and conservation agricultural practices. These are sustainable agricultural practices that work with the environment and help to increase productivity, build resilience of farmers to stresses, and lower carbon emissions. Particular emphasis will be placed on reaching the most vulnerable farmers, taking gender into consideration.
1.1.12	Promote the expansion of food garden programmes outside of land classified as agricultural land or farmland to reduce food insecurity and hunger.	This will involve the promotion of urban agriculture, including community and household food gardens, in areas not classified as agricultural. Growing food will help to reduce the potential food security risks associated with changes in climate. Particular efforts will be made to engage women from vulnerable households in these initiatives.

	Action	Description
1.1.13	Enhance the role of agricultural extension officers in supporting the most vulnerable farmers (male and female).	Enhance the knowledge and capacities of agricultural extension officers in relation to climate change adaptation. Facilitate their access to and ability to support women and men in vulnerable communities. Increase the number of female extension officers.
1.1.14	Invest in knowledge and capacity building for climate-resilient rural homestead gardening.	Support rural homestead gardens through knowledge and capacity building, particularly for women from vulnerable households.
1.1.15	Support the integration of climate-smart and ecosystem-based approaches in forestry practices.	This will involve the integration of climate-smart and ecosystem-based approaches in forestry training curricula

B: Increased economic resilience and adaptive capacity

	Action	Description
1.1.16	Develop training programmes in effective saving methodologies and access to financial education to better manage meagre resources in vulnerable communities.	This will involve educating vulnerable groups (male and female) on how to manage their resources and provide them with the knowledge on how to attain support from government and other social organisations.
1.1.17	Investigate the potential for expanding sectors and kick-starting new industries that are likely to thrive as a direct or indirect result of climate change effects.	This will involve identifying climate change impacts that will bring about new industries and opportunities and then piloting sector specific projects with high opportunity potential. The process will kick off with the design of these projects and carry through to compiling lessons derived from final evaluation of the project.
1.1.18	Educate both informal and formal businesses on the potential economic implications of climate change risks and provide support on how to better prepare for these risks in advance.	This will involve making businesses aware of climate risks and encouraging and supporting them to make more informed decisions about the future of their businesses.
1.1.19	Encourage businesses to relocate to less hazardous areas through incentives and tax rebates.	This will involve encouraging businesses to relocate to areas that have a lower risk of climate related disaster. This could be done through incentives or tax rebates.

C: Increased environment and ecological infrastructure resilience and adaptive capacity

	Action	Description
1.1.20	Adopt climate resilient approaches to natural resource management to restore and maintain ecosystem goods and services.	This will involve using climate-smart and ecosystem-based approaches to restore ecological integrity of natural resources and improve community resilience to climate change, taking into account gender differences in access to and control over natural resources.
1.1.21	Conduct research into the value of ecosystem services and the economic benefits of restoring these services in comparison to the development of hard infrastructure.	This will involve research being done on the value of ecosystem services and the economic benefits of restoring these services.
1.1.22	Provide training for the public and private sectors on the value of ecosystem services and the benefits of restoring them.	This will involve educating both public and private sectors of the value of ecosystem services and the economic benefits of restoring these services.
1.1.23	Protect and conserve South Africa's most vulnerable ecosystems, landscapes and wildlife, and monitor and control the spread of alien invasives.	This will involve identifying vulnerable ecosystems that need further protection from impacts of climate change. Enforced action is required against illegal harvesting of coastal and offshore fish stock. Ecosystem-based approaches are also recommended to ensure the recovery of freshwater and marine fish stocks. Monitoring and controlling alien invasive species that benefit from climate change will reduce the risk of biodiversity loss
1.1.24	Monitor and control the spread of alien invasive species that benefit from climate change.	This will involve conducting research into identifying the alien invasive species that will benefit from climate change and developing responses to prevent these species from spreading. Different stakeholders in the biodiversity sector need to work together continuously to control the spread of these species and minimise the risk of biodiversity loss.
1.1.25	Promote the expansion of tree cover, forests and forest plantations in order to maintain the production of wood raw materials, and help reduce temperatures in cities, amongst other benefits.	This will involve identifying stakeholders that can play a role in the establishment and increase of tree cover and promotion of wood use in local (housing/furniture/other) structures. Other actions will include identifying areas where tree planting can occur, identifying suitable tree species especially drought resistant species, and long-term planning including risk management, and water catchment planning amongst others. These activities will ensure equitable benefits for women and men, including the most vulnerable groups.
1.1.26	Investigate the potential effects of an expanded forestry sector on water availability.	This will involve conducting research on the potential effects of an expanded forestry sector on water availability within the context of climate change impacts on water availability.
1.1.27	Support farmers (male and female) to use and manage water more sustainably.	This will involve the promotion and subsidisation of water conservation technologies, taking into account gendered roles and responsibilities in relation to water management.
1.1.28	Ensure that water management institutions incorporate adaptive management responses.	This will involve providing continued support and advice to water management institutions on how to incorporate adaptive management responses.

D: Increased physical infrastructure resilience and adaptive capacity

	Action	Description
1.1.29	Invest in high-quality, climate resilient and eco-sustainable/ reduced impact / public infrastructure and materials.	This will involve investing in high quality, climate resilient public infrastructure, including transport, stormwater, wastewater, water, and energy infrastructure, that will withstand disasters and have an extended lifespan.
1.1.30	Encourage the private sector to build in low climate risk areas, using resilient materials, through incentives and tax rebates.	This will involve the public sector developing guidelines and incentives for building infrastructure in low risk areas and using climate resilient materials.
1.1.31	Create a more adaptive energy system to reduce dependence on a centralised system and increase distributed generation, especially in rural areas.	This will involve encouraging the development of an adaptive and decentralised energy system so that the system is more resilient to climate disruptions.
1.1.32	Adopt water-wise water management practices in urban areas	This will involve identifying and adopting suitable water-wise water management practices in urban areas such as sustainable drainage systems and wastewater treatment systems that are able to clean wastewater to a high enough water-quality level that it can be re-used.

5. Climate Services

Develop a coordinated Climate Services system that provides climate products and services for key climate vulnerable sectors and geographic areas.

5.1. Introduction

South Africa experiences a wide range of weather and climate related impacts that are projected to worsen with climate change. Some of these impacts include drought, severe storms, flooding, heat waves, and change in the distribution of disease. These impacts pose risks to human lives, the natural environment, infrastructure, and the economy. Different areas, natural systems, sectors, and communities will be impacted in different ways, with some being more vulnerable than others. In order to prepare for these impacts, it is critical that sound information and data on climate change is available and that predictions and forecasts are disseminated so that informed and appropriate responses and decisions can be made. The term “Climate Services” (DEA and SAWS 2016, 18) is used to encapsulate the different information, data, forecasting and dissemination systems (DEA and SAWS 2016). The National Framework for Climate Services offers the following explanation of climate services: “Climate services offer science based information, weather forecasts, climate predictions and climate projections that can empower decision makers to manage the risks and opportunities of climate variability and change” (DEA and SAWS 2016).

It is critical that climate services are put in place to provide those sectors, areas, businesses and communities that are particularly vulnerable to climate change impacts, with accurate and timely information in order to reduce their risk and plan suitable responses. Furthermore, climate information should be accessible for all genders and social groups, and barriers to accessing information (e.g. literacy and access to technologies) should be considered for different groups.

The key outcome for this strategic intervention is: *Climate products and services for key climate vulnerable sectors and geographic areas developed and implemented* (Strategic Outcome 2.1).

5.2. Status Quo

There are several different stakeholders in the climate services space that provide climate information and data, modelling and prediction services, as well as dissemination of climate related disasters.

The table below highlights some of the climate products and services that have been developed to prepare for different types of climate impacts, including flood, drought, fire, disease, and increased heat, as well as the stakeholders involved (DEA 2015b). It should be noted that this is not an exhaustive list and does not include existing climate products and services in the private sector.

Table: Existing Climate Products and Services in South Africa (Adapted from: DEA and SAWS 2016; DEA 2015b. Additional references in footnotes)

Products/Services	Function of the product/service	System developers
The South African Flash Flood Guidance (SAFFG) system	The system provides guidance on potential flash flood watches and warnings within 1 to 6 hours.	South African Weather

Products/Services	Function of the product/service	System developers
		Service (SAWS)
Drought Early Warning systems	Provides information on drought conditions based on the interpretation of satellite and climate data.	National Disaster Management Centre (NDMC)
The Drought Monitoring Desk	System provides information on long range seasonal forecasts, observed rainfall as well as maps of Standardised Precipitation Index (SPI).	SAWS
National Fire Danger Rating System (NFDRS)	The NFDRS “provides a measure of a measure of the relative seriousness of burning conditions and threat of fire by providing an accurate measure as possible of the relative seriousness of burning conditions” (DAFF 2013).	Council for Scientific and Industrial Research (CSIR)/Department of Water and Sanitation (DWS)
The Advanced Fire Information System (AFIS)	System locate fires in near real time over Southern Africa.	CSIR
Severe Weather Warning System (SWWS)	Aims to make warnings easy to understand by the public, and focuses on managing disaster at a community level. The system integrates risk knowledge, monitoring and warning, dissemination, and response capability. The SWWS relies on good interactions between SAWS and local disaster management centres.	SAWS
Wide Area Monitoring Information System (WAMIS)	Uses satellite data to provide real-time monitoring and mapping of extreme events such as fires, floods and droughts.	CSIR
Umlindi/Watchman newsletter system (300 subscribers)	Provides information on drought conditions based on the interpretation of satellite and climate data, particularly targeted at the Agricultural sector.	Agricultural Research Council (ARC)
Provincial Early Warning Committees targeted at Agriculture sector	Assist in the implementation of early warning systems. Assist farmers to respond to warnings.	Department of Agriculture, Land Reform and Rural Development

Products/Services	Function of the product/service	System developers
Interpretation and dissemination of climate/weather data to farmers	Interprets climate/weather data in laymen's terms and disseminates it to member farmers via email and radio.	AgriSA
Early Warning System focused on malaria	Early Warning System focused on malaria	Department of Health (DOH)
Communication of issues related to communicable diseases such as outbreaks	Via online and in-house publications on a regular basis	National Institute of Communicable Diseases (NICD)
Climate change-related disease monitoring system.	A climate change-related disease monitoring and surveillance system has been developed.	NICD and SAMRC
The Infectious Diseases Early Warning System (IDEWS) project	The Environment & Health Research Unit (E&HRU) in the South African Medical Research Council (SAMRC) ⁴ is currently working with other institutions to understand the benefits of early warning systems and how these systems can help to reduce levels of malaria, diarrhoeal disease and pneumonia after climate related disasters (SAMRC 2019).	Environment & Health Research Unit (E&HRU) in SAMRC
Identification of towns at high risk of heat waves	This project aims to look at heat related health risks in small and medium sized towns in South Africa. This project will include the identification of towns of particular risk of heat waves and investigate the current heat coping mechanisms and identify the relationship between heatwaves and hospital admissions (SAMRC 2019).	Environment & Health Research Unit (E&HRU) in SAMRC
South African Risk and Vulnerability Atlas (SARVA)	The SARVA is an online system that enables users to understand vulnerability and risk according to location in the country at a spatial level.	Department of Science and Innovation, South African Environmental Observation Network (SAEON)

⁴ The E&HRU conducts population-based research on environmental risks to health - with particular emphasis on those living in poverty.

Products/Services	Function of the product/service	System developers
Seasonal Climate Watch quarterly updates from the SAWS	Seasonal Climate Watch uses satellite imagery and prediction models with the influence of El Niño to provide seasonal climate predictions for the country over a period of 3 to 6 months. These reports primarily predict rainfall and temperature and are released quarterly.	SAWS
The South African Air Quality Information System (SAAQIS)	The South African Air Quality Information System (SAAQIS) provides a common platform for managing air quality information across South Africa including its capture, storage, validation and analysis (DEA and SAWS 2019a). The data collected by SAAQIS is generated by the National Ambient Air Quality Monitoring Network (NAAQMN) which are a set of 130 monitoring stations located in areas with the highest density of people. These stations monitor common air pollutants including, but not limited to, ozone, carbon monoxide, sulphur dioxide, and nitrogen dioxide (Gwaze and Mashele 2018). Fifty of the stations report to SAAQIS monthly, while over 60 report live (Gwaze and Mashele 2018). The SAAQIS data is made available to the general public via their webpage (DEA and SAWS 2019b), as well as by a downloadable mobile application.	DEFF, SAWS
National Oceans and Coastal Information Management System (OCIMS)	Platform that provides information and decision support to key stakeholders for the day-to-day management of South Africa's oceans and coasts.	DEFF, DSI
DEFF Coastal Viewer	This platform provides information on Coastal Public Property (CPP) and Coastal Protection Zone (CPZ) which helps with decision-making regarding coastal developments.	DEFF
Biodiversity GIS (BGIS)	The BGIS website is an information portal that provides access to biodiversity related spatial datasets and metadata. Training is also offered on how to use the website and the various datasets and tools. The website also serves as a platform to showcase other online information resources on biodiversity.	SANBI
National Climate Change Information System (NCCIS)	The National Climate Change Information System (NCCIS) is an electronic platform designed to track South Africa's overall	SAEON, DEFF

Products/Services	Function of the product/service	System developers
	transition to a low carbon and climate resilient economy.	
Green Book	The Green Book online tool supports municipal planning with the development of climate resilient settlements. The tool aims to facilitates the mainstreaming of climate change adaptation into local government planning instruments and processes.	CSIR

Recent collaborations between different weather services, emergency services and other organisations has resulted in improved climate services, and a subsequent reduction in damage to infrastructure and loss of life as a result of climate related disasters (DEA and SAWS 2016).

In addition, a National Framework for Climate Services has been prepared in response to the Global Framework for Climate Services. It aims to provide a framework to better manage climate risks and hazards by incorporating climate science and prediction services into planning, policy and practice (DEA and SAWS 2016).

5.3. Actions

Although there are a number of climate products and services that have been implemented, there is still room for improvement. A network to share information and learnings on climate products and services associated technologies would also be particularly useful. It is also important to consider that government is not the only stakeholder that should be targeted to communicate climate related information and data, and that other stakeholders such as businesses, civil society and communities will also benefit from accessing climate information. The following actions to improve South Africa's climate products and services systems are highlighted below.

5.3.1. Climate products and services for key climate vulnerable sectors and geographic areas developed and implemented

Action	Description
2.1.1 Set up a National Climate Centre in an existing institution	This will involve identifying a suitable institutional home for a National Climate Centre. The National Climate Centre should coordinate the central collation of climate data, information, products and applications, and facilitate climate related research and development in South Africa. Since there are a number of existing institutions that play an important role in climate services in South Africa and already perform some of the functions associated with the proposed centre there is no need to establish a new institution.

Action	Description
2.1.2 Establish an Interactive Online Climate Service Platform	This will involve the development of a specially designed website which will act as a climate service knowledge portal. It will present information, research and data stored and archived in the national climate services database and data from various climate service providers. The platform will allow for various users to access sectoral climate services on the site or to be directed to service providers who can provide customised climate services or products.
2.1.3 Establish a Climate Change Science Advisory Technical Council	This will involve the establishment of an expert advisory group consisting of climate change professionals, climate related sector professionals, social scientist professionals from a range of fields, as well as science and technology advisors. This group will provide advice to the National Climate Centre.
2.1.4 Continue and enhance climate observation and monitoring networks	This will involve continued investment in and support for capturing climate observation and monitoring data. It will also involve identifying existing gaps in the monitoring and observation network and addressing these gaps to ensure that national climate data is reliable, comparable, up to date and accessible.
2.1.5 Continue to invest in climate change prediction and modelling data	This will involve the continued investment in and support for the development of climate change predictions and modelling.
2.1.6 Develop and continuously update a national climate information and early warning system to address the needs to different sectors.	This will involve developing a national climate information and early warning system that can interface with other information systems. A key component of the system will be methods of disseminating information to the stakeholders in an appropriate and timely manner, using a variety of different communication channels. It will also involve identifying appropriate channels for vulnerable groups to overcome the barriers they experience in accessing information
2.1.7 Develop provincial early warning systems for vulnerable geographical areas	This will involve provinces improving or developing early warning systems for risks that have been identified in their respective areas, particularly for vulnerable groups.
2.1.8 Develop municipal early warning systems for vulnerable geographical areas	This will involve municipalities improving or developing early warning systems for risks that have been identified in their respective areas, particularly for vulnerable groups.

Action	Description
2.1.9 Improve/develop national early warning systems for key climate vulnerable sectors and risks.	This will involve developing/improving early warning systems for key sectors, such as agriculture, health, coast, and water, and risks, such as flooding, in order to provide guidance on responding to climate related risk. For example, agricultural early warning systems could include warnings for crop and animal disease. Coastal warning systems could include developing platforms that link surfing data with real-time warnings for coastal communities. An example of a water related early warning system could be a system that focuses on warning of hydrological drought so that water restrictions can be implemented in advance.
2.1.10 Develop and support a climate change early warning and vulnerability network with the involvement of relevant stakeholders	This will involve setting up a climate change early warning and vulnerability network to promote collaboration and sharing of information on preparing for different climate related risks. Role players should include government and research institutions, as well as community organisations, civil society and neighbouring states.
2.1.11 Investigate alternative technologies that can be used considering the 4th industrial revolution	This will involve researching and investigating appropriate and accessible alternative technologies that can be used in developing effective and efficient climate services systems, considering new technologies as a result of the 4th industrial revolution.
2.1.12 Develop adaptation strategies for those that are displaced by climate change.	This will involve assisting those displaced by climate change impacts to plan for their futures.

6. Climate Risk and Vulnerability Assessment Framework

1: Develop vulnerability and resilience methodology framework that integrates biophysical and socio-economic aspects of vulnerability and resilience.

6.1. Introduction

Sector departments need to identify and map risks and vulnerabilities that are relevant to their sectors and to use this as a basis to develop a climate change response implementation plan. In addition, provinces and municipalities should undertake climate change needs and response assessments based on the vulnerabilities of the respective provinces and municipalities and use this as a basis to develop a climate change response implementation plan.

Accordingly, there is a need to develop a framework to guide sectors, provinces and municipalities on the process of undertaking and presenting a vulnerability assessment and the development of climate change response implementation plans. This will assist in framing the Climate Risk and Vulnerability Assessment process. The framework will support assessment quality and comparability by ensuring that government sectors, provinces and municipalities as well as business and civil society take a standard set of concepts and themes into consideration when interrogating climate risk and vulnerability. Robust understanding thereof will assist in the process of developing appropriate responses to climate change that will increase resilience and reduce risk.

The key outcome for this strategic intervention is: *An adaptation vulnerability and resilience framework developed and implemented across 100% of key adaptation sectors (Strategic Outcome 3.1).*

6.2. Status Quo

Climate change vulnerability assessments and associated climate change response plans have been developed in South Africa for a number of years by national departments, provinces, municipalities and various entities. All the nine provinces in the country have developed risk and vulnerability assessments. In the local sphere of government DEFF has supported all district municipalities to develop a vulnerability assessment and a climate change response plan. Many local municipalities have also conducted their own vulnerability assessments and developed an associated response plan.

Despite the various efforts on vulnerability and response plan development there is no agreed vulnerability and resilience methodology framework to provide guidance to this process. As a result, it is not always possible to compare the results of the assessments or aggregate the results in order to provide an overall picture of vulnerability and response across sectors and spheres of government in South Africa.

6.3. Actions

The actions to achieve this outcome are outlined below:

A Climate Risk and Vulnerability Assessment Framework developed and implemented across 100% of key adaptation sectors

Action	Description
3.1.1 Develop a National Climate Risk and Vulnerability Assessment Framework (NCRVAF)	This will involve developing an overarching adaptation and vulnerability resilience framework that provides guidance on the development of vulnerability assessments and climate change response plans developed by sectors and spheres of government as well as business and civil society. Since there is variability among sectors and geographic areas the framework should not be prescriptive. Rather it should provide a flexible yet structured guidance aimed at ensuring quality of assessments and improved coherence between assessments and plans, as well as allowing for comparisons of the results of the assessments and plans where possible. The framework should also provide a platform to assess trade-offs across sectors so as to further inform sector strategies and plans. The process to develop the framework should be done in consultation with various sectors, provinces, municipalities, research institutions and other relevant entities. The process should also build on work that has already been done on developing assessments and response plans.
3.1.2 Use the NCRVAF to guide sector assessments	This will involve sector departments using the NCRVAF as guidance when undertaking initial assessments and developing response plans. Sector departments should also use the NCRVAF as guidance when reviewing and revising existing assessments and response plans.
3.1.3 Use the NCRVAF to guide provincial assessments	This will involve provinces using the NCRVAF as guidance when reviewing and revising existing assessments and response plans.
3.1.4 Use the NCRVAF to guide local assessments	This will involve municipalities using the NCRVAF as guidance when undertaking initial assessments and developing response plans. Municipalities should also use the NCRVAF as guidance when reviewing and revising existing assessments and response plans.

7. Adaptation Planning and Mainstreaming

Strategic Intervention 4: Facilitate mainstreaming of adaptation responses into sectoral planning and implementation.

7.1. Introduction

Climate change is a cross-cutting issue that impacts on different sectors and contexts in different ways. Adapting to climate change therefore cannot be limited to the environmental sector and must be integrated into planning and implementation processes in different spheres of government, sectors, business and civil society. Developing climate change standalone strategies at different levels is essential to provide strategic guidance on responding to climate change in South Africa. However, these strategies need to be used as a basis to incorporate climate change adaptation into the different national sector plans, provincial and municipal plans, and private sector strategic plans, to ensure that it will be fully prioritised in these spheres.

The key outcomes for this strategic intervention are:

- Effective adaptation planning that covers at least 100% of the South African sectors identified in the NCCAS (Strategic Outcome 4.1)
- Achieving 100% coverage of climate change considerations in sectoral operational plans (Strategic Outcome 4.2)

7.2. Status Quo

All nine provinces have developed climate change response strategies that include climate adaptation interventions. Regarding the local sphere, DEFF and the South African Local Government Association (SALGA) facilitated the Local Government Climate Change Support Programme which resulted in the development of climate change response plans for all the district municipalities in South Africa, with associated adaptation interventions. Many local municipalities have also developed their own climate change response plans using the tools from this Programme. Some provinces and municipalities are in the process of integrating elements of their climate change response strategies into their strategic plans. Regarding specific sectors, many of the national departments are currently developing climate change plans for their sectors and in some cases, they are taking steps to integrate these into departmental operational plans. In addition, some private sector businesses have developed climate change response strategies.

7.3. Actions

The actions to achieve the outcomes associated with this intervention are outlined below:

An effective adaptation planning that covers at least 100% of the South African sectors identified in the NCCAS

Action	Description
4.1.1 Draft, approve, and implement updated National Climate Change Sector Plans to include climate change adaptation	This will involve ensuring that key sectors have drafted updated national climate change sector plans. Sector plans identified for inclusion of climate change adaptation interventions include: water, agriculture, forestry, fisheries, health, biodiversity and ecosystems, human settlements, and disaster risk reduction and management sectors, as well as, energy, mining, coast, transportation and infrastructure. These sector plans must be reviewed and published every five years.
4.1.2 Draft, approve, and implement updated provincial climate change adaptation strategies and associated implementation plans	This will involve each province drafting updated climate change strategies that include adaptation responses and drafting associated implementation plans to guide climate response in their province. These strategies and associated implementation plans should be reviewed and updated every five years.
4.1.3 Draft, approve, and implement updated municipal climate change adaptation strategies and associated implementation plans	This will involve each municipality drafting updated climate change strategies that include adaptation responses and drafting associated implementation plans to guide climate response in the respective municipality. Local municipalities should use the District municipal plans as resources. These strategies and associated implementation plans must be reviewed and updated every five years.

Achieve a 100% coverage of climate change considerations in sectoral operational plans

Action	Description
4.2.1 Integrate climate change adaptation into Provincial Growth and Development Strategies	This will involve each province ensuring that climate change projects and programmes are reflected in their strategic Provincial Growth and Development Strategies.
4.2.2 Integrate climate change adaptation into provincial sector plans.	This will involve ensuring that all priority sectors at a provincial level incorporate climate change into their strategic planning documents.

Action	Description
4.2.3 Amend Development Planning guidelines to incorporate climate change adaptation considerations	This will involve establishing a working group involving the National Planning Commission, DEFF, provincial representatives, South African Local Government Association, and civil society to amend existing development planning guidelines, at all levels including spatial planning, to include climate change adaptation.
4.2.4 Integrate climate change adaptation into Municipal Development Planning documents, budget documents, and by-laws.	This will involve each municipality ensuring that climate change projects and programmes are reflected in municipal strategic development planning and budget documents, including Integrated Development Plans (IDPs), Spatial Development Frameworks (SDFs), and Service Delivery and Budget Implementation Plans (SDBIPs). It will also involve incorporating climate change into municipal by-laws.
4.2.5 Integrate climate change adaptation into municipal sector plans.	This will involve ensuring that all priority sectors at a municipal level incorporate climate change into their strategic planning documents.
4.2.6 Mandate that all public infrastructure (including transport and energy infrastructure) be planned, designed, operated and managed after explicitly taking current and predicted future climate change impacts into account.	This will involve the Office of the President ensuring that all sectors factor climate change into infrastructure planning and development. It will entail capacity building and training of staff to ensure sufficient technical expertise in this transition.
4.2.7 Mainstream climate change adaptation in business strategic implementation plans	This will involve the provision of support to private sector businesses to incorporate climate change adaptation into their strategic implementation plans.

8. Research

Strategic Intervention 5: Promote research application, technology development, transfer and adoption to support planning and implementation.

8.1. Introduction

Climate change will result in significant physical and socioeconomic effects in South Africa. It is important that decisions made in planning for these effects are based on access to accurate and current data and a wide range of both social science and physical science research. Investment in high-quality climate modelling data and research on the projected impacts of climate change, among much other research, will help reduce risk and enable the development of more effective actions. Currently there are many institutions involved in climate related research in South Africa. However, there is a lack of coordination between the different institutions and no central database or platform where climate related data is shared.

The key outcome for this strategic intervention is: *Increased research output and technology uptake to support planning and implementation* (Strategic Outcome 5.1).

8.2. Status Quo

A wide range of institutions are involved in climate observation, modelling and climate-relevant research in South Africa. These include governmental agencies like the South African Weather Services (SAWS) and government departments such as the Department of Science and Innovation (DSI); and academic and research institutions, such as those based at, but not limited to, the University of Cape Town, Rhodes University, the University of the North-West, and the University of the Witwatersrand. There are also various NGOs and community organisations that contribute to the research space in climate adaptation.

8.3. Actions

The actions to achieve the outcomes associated with this intervention are outlined below:

8.3.1. Increased research output and technology uptake to support planning and implementation

Action	Description
5.1.1 Develop a research roadmap for climate change adaptation	This will involve developing a roadmap for climate change adaptation research in South Africa, and will involve identifying areas where new and additional research is required in South Africa, and recommending priorities for research and development funding. Research on climate change adaptation is not limited to climate science and will require a cross-disciplinary approach. Research should also include social and human sciences skills specialists, such as gender analysts, sociologists and historians. Some potential areas to research include the relationship between climate change and rural urban migration; adopting a regional approach to climate change; investigating impacts of forestry on water availability in the face of climate change; Investigating the vulnerability of the current building stock to climate shock; research into building the adaptive capacity of infrastructure; investigating the gendered impacts of climate change as well as gendered vulnerabilities and capacities etc.
5.1.2 Continue to invest in research that aims to understand the different impacts of climate change on the environment, economy and society	This will involve continued support for different research institutions that are developing an understanding of the impacts of climate change on the environment, economy and society, as well as the opportunities for different sectors. These include research reports such as the Long Term Adaptation Scenarios (LTAS) which outline adaptation scenarios for South Africa under projected future climate conditions.
5.1.3 Invest in research on the most effective adaptation responses to different climate change impacts	This will involve continued support for research into the most effective adaptation responses and new technological solutions that can be replicated.
5.1.4 Establish a programme to promote research into new climate change adaptation technologies	This will involve establishing a programme to promote research into new climate change adaptation technologies.
5.1.5 Establish a knowledge dissemination programme to encourage research uptake	This will involve establishing a programme to promote the dissemination of new climate change adaptation research knowledge and information on new technologies that have been developed to stakeholders to promote uptake of the research and information.

9. Awareness and Capacity Building

This section presents the approach to implementing *Strategic Intervention 6: Build the necessary capacity and awareness for climate change responses*.

9.1. Introduction

The importance of focusing on education in the climate change field is highlighted in the NCCRP (DEA 2011). Climate change is a challenge that will impact on multiple sectors and requires systematic interventions in order to improve the awareness and capacity of a range of stakeholders. Despite the advances made in South Africa since 1994, many adults, particularly women, cannot read and write, and therefore it is crucial that these stakeholders are also considered when creating communication and awareness programmes. Stakeholders need to understand the causes, impacts, and key vulnerabilities associated with climate change, as well as how to respond to these vulnerabilities (DEA 2011). One of the most effective ways of improving awareness is to mainstream climate change into different education and training curricula at different levels, such as schools and tertiary institutions. Awareness and capacity are also particularly important in all three government spheres so that politicians and officials are equipped to guide climate change response in their respective jurisdictions. Since new knowledge is being generated on the impacts of climate change and appropriate responses, awareness and capacity building is required on an ongoing basis.

The key outcome for this strategic intervention is: *Capacity building and awareness for climate change response enhanced* (Strategic Outcome 6.1).

9.2. Status Quo

There are a wide variety of stakeholders that currently provide climate change related education, training, and awareness programmes in South Africa, including NGOs, academic institutions, businesses and government entities. Climate change is also featured in school curricula and tertiary level courses.

At the school level, climate change and sustainability has been included in different subjects from grade 1–12 in the national Curriculum Assessment Policy Statements (CAPS). Climate change education materials have also been developed for teachers through the Fundisa for Change programme. At the university level, there are a variety of climate change Honours and Master's degree programmes being offered at many of the universities. Furthermore, a number of different research institutions and centres have been established in association with universities that focus on different aspects of climate change and sustainability (DEA 2017).

In the NGO sector, there are a wide range of local and international NGOs that work in different parts of the country in the climate change education and awareness sphere. These organisations are diverse and work on different climate change related sectors and with different stakeholders. A number of these NGOs work directly with the youth (DEA 2017).

In the business sector, associations, groups and forums play a role in educating business on the possible impacts and opportunities in the sustainability and climate change field and help to promote discussion and knowledge sharing in the private sector (DEA 2017).

In the government sector, capacity and skills in the climate change field have been identified as key challenges faced by government officials in responding to climate change (DEA 2016b). DEFF together with SALGA developed the Let's Respond Toolkit and Local Government Climate Change Support Programme to capacitate district and local municipality officials to understand the basics of climate change, how to identify their climate change vulnerabilities, and how to develop response plans. This programme adopted a hands-on approach during the workshops and developed a project website (<http://www.letsrespondtoolkit.org>) where officials could access the programme materials in their own time. All district municipalities were included in the programme and benefited from the capacity building and training exercises.

9.3. Actions

The actions to achieve the outcomes associated with this intervention are outlined below:

Capacity building and awareness for climate change response enhanced

Action	Description
6.1.1 Develop and implement an effective communication and outreach programme	<p>This will involve developing a communication strategy that should consider approaches such as: knowledge sharing events, repositories of information on climate change impacts, climate change forums, resources, translation of climate science into actionable policies and plans. The communication strategy should be inclusive and take into account gender, vulnerable groups and those that cannot read and write. Furthermore the strategy should also provide the opportunity for groups to also contribute to the co-creation of knowledge in the field, and recognise the importance of indigenous knowledge systems.</p> <p>The communication strategy should then be launched and a continuous communications campaign implemented. The content and target audiences should be revised annually based on learnings and feedback. The target audiences should prioritise the most vulnerable groups.</p> <p>Government should work closely with community based organisations and civil society organisations in the development and implementation of the communication and outreach programme. Proposed key messaging for the training programme can be found in Annex A.</p>

Action	Description
6.1.2 Develop and implement a training programme for government officials and politicians	<p>This will involve developing and implementing a training programme for government officials and politicians. Since a number of training initiatives already exist to promote the development of adaptive capacity by government officials and politicians, such as the Let's Respond Toolkit for municipalities, and SALGA's training on climate change for councillors, the programme will ensure that there is a unified approach to climate change adaptation training and that the impacts of the programme are monitored.</p> <p>The programme can then be revised annually based on learnings and feedback. The training programme should incorporate training to develop the technical capacity within the various spheres of government and key sector institutions that help build climate resilience and develop risk response strategies.</p> <p>In addition, the training programme should aim to build capacity to mainstream climate change adaptation into planning, programmes and new developments or projects throughout all spheres of government.</p>
6.1.3 Establish formally accredited training courses	<p>This will involve establishing one or more formally accredited climate change adaptation training courses for government officials to ensure consistency in training and to support the professional development of participating officials. This action will be implemented by government in partnership with other stakeholders such as research institutions.</p>
6.1.4 Develop a Climate Change Adaptation and Environmental Education and Training Programme	<p>This will involve developing a broader climate change adaptation and environmental education training programme for implementation across all sectors of society.</p>
6.1.5 Incorporate climate change adaptation into relevant, primary, secondary and tertiary curricula	<p>This will involve incorporating climate change adaptation into relevant primary, secondary and tertiary curricula to mainstream climate change knowledge into education and training. It should form part of the broader framework of education on sustainable development, be interdisciplinary and aim to equip South African citizens to orient society and the economic system towards climate resilience and sustainability. This action will be implemented by government in partnership with research institutions.</p>
6.1.6 Incorporate climate change into informal education and learning	<p>Establish reflective learning forums and committees where peer-to-peer learning and sharing of information on climate change adaptation can be shared informally amongst different stakeholders.</p>
6.1.7 Enhance social learning amongst all levels of society.	<p>This will involve enhancing social learning on climate change adaptation at all levels and be inclusive of gender.</p>

Action	Description
6.1.8 Develop climate change education materials that can be used for different sectors and contexts.	This will involve developing climate change education materials that can be used for different sectors and in different contexts. This will also include downscaling climate science to a sector and geographical scale.

10. Governance and Legislation

Strategic Intervention 7: Establish effective governance and legislative processes to integrate climate change in development planning.

10.1. Introduction

South Africa's international climate change commitments, the global sustainability movement, as well as changes experienced in climate have resulted in many government sectors and departments, as well as private organisations and communities, implementing climate change adaptation and related projects in South Africa. Despite some coordination taking place in different spheres and sectors, clarity around mandates, especially in the government sector, is unclear in current legislation. Communication between different sectors is lacking and there is a risk that organisations are conducting similar work, making use of funds that could be better spent. Adopting a more integrated approach to climate change where roles, responsibilities and mandates are clear and where partnerships are promoted will help to ensure that South Africa's climate change adaptation goals are met timeously and efficiently.

The key outcomes for this strategic intervention are:

- Adaptation governance defined and legislated through the Climate Change Act once approved by parliament (Strategic Outcome 7.1).
- Institutional structures for climate change adaptation strengthened (Strategic Outcome 7.2).
- Enhanced public-private-civil society collaboration and stewardship (Strategic Outcome 7.3).

10.2. Status Quo

Governance

Climate change adaptation responses are currently being implemented by different spheres of government and other sectors, such as business and research institutions. The current roles and responsibilities for the three spheres of government and for non-government entities regarding climate change adaptation are outlined below:

- **National Government:** The Department of Environment, Forestry and Fisheries (DEFF), a UNFCCC focal point, is the lead department responsible for coordinating the implementation of the NCCAS. Other line function national departments are responsible for integrating climate change response into their sectors.
- **Provincial Government:** Each province has an environmental department that is responsible for leading climate change response. Other line function provincial departments are responsible for integrating climate change response into their sectors.
- **Municipalities:** Many critical actions required for climate change responses fall within the responsibility of municipalities. These include the provision of basic services (water, electricity, waste removal, and sanitation and sewage infrastructure maintenance), road management, disaster risk management, and the provision of safe and healthy human settlements.
- **The private sector:** Climate change will affect business in several ways, including through potential changes to supply chains and direct climate risks posed to operations and assets. As business becomes more proactive in dealing with climate risk, their insights, experiences and resources will provide significant opportunities to leverage public sector benefits.

- **Civil society:** Civil society plays a pivotal role in advising on and supporting adaptation initiatives. Civil society groups are directly affected by the risks posed by a changing climate and the opportunities created by adaptation initiatives. Civil society can raise awareness about the need to adapt, facilitate debates, and support and monitor local implementation.
- **Labour:** Labour plays a pivotal role in advising on and supporting adaptation initiatives. Labour groups are directly affected by the risks posed by a changing climate and the opportunities created by adaptation initiatives. Labour has played a significant role in redressing past inequities in South Africa and is an influential agent of change and transformation.
- **Academia and research:** Academia is central to efforts to improve the understanding of climate science, vulnerabilities and the effects of climate change, as well as governance, political science, policy, psychology and communication related aspects central to a holistic climate change response, and to provide information on appropriate sectoral and community-based responses.
- **Community leadership:** Community leaders are critical partners in the implementation and awareness of climate change adaptation initiatives.

Coordinating Structures

At national level, there are several institutional structures that aim to improve coordination across departments and alignment in national efforts. The three key national climate change adaptation structures are:

- the Inter-Ministerial Committee on Climate Change
- the Intergovernmental Committee on Climate Change (IGCCC)
- the National Committee on Climate Change (NCCC)

In the provincial sphere, many of the environmental provincial departments have established provincial climate change forums where provincial stakeholders can learn about climate change and coordinate their climate change responses. In the local sphere DEFF's Municipal Climate Change Support Programme has been rolled out through established forums and working groups at municipal level. These are important platforms on which to build capacity and strengthen responses to climate change.

Legislation

A draft National Climate Change Bill (2018) has been developed for South Africa that outlines an integrated approach to responding to and preparing for climate change. The bill was published in June 2018 and went through a public comment review period.

10.3. Actions

The actions to achieve the outcomes associated with this intervention are outlined below:

Adaptation governance defined and legislated through the Climate Change Act once approved by parliament

Action	Description
7.1.1 Create formal climate change legislation for adaptation	This will involve developing Climate Change legislation and taking it through the parliamentary process for enactment. This is required as South Africa's rich body of climate resilience and adaptation knowledge, as reflected in policies, strategies and white papers, needs to be translated into a Climate Change Act. This will enable government's commitments to be backed up by legislation.

Institutional support structures for climate change adaptation strengthened

Action	Description
7.2.1 Facilitate the meeting of the Inter-Ministerial Committee on Climate Change	This will involve ensuring that the Inter-Ministerial Committee on Climate Change is set up and meets on a regular basis. The Inter-Ministerial Committee on Climate Change will aim to coordinate climate change efforts across sector departments and spheres of government.
7.2.2 Continue to facilitate the meeting of the Intergovernmental Committee on Climate Change (IGCCC)	This will involve ensuring that the IGCCC continues to meet on a regular basis. The IGCCC fosters information exchange, consultation, agreement and support among the spheres of government regarding climate change and government's response to climate change. As a high-level platform, it brings together representatives from National Treasury and the national departments of environment, forestry and fisheries; agriculture, land and rural development; minerals and energy; health; human settlements, water and sanitation; international relations and cooperation; trade and industry; transport; science and innovation; social development; and provincial environment departments; and from the South African Local Government Association (SALGA).

Action	Description
7.2.3 Establish a functioning Provincial Committee on Climate Change for each province (this can be an existing forum).	This will involve each province establishing a Provincial Committee on Climate Change, managed by the provincial environmental departments. This can however, be an existing forum, such as the disaster management provincial forums, that incorporates climate change issues on the agenda. The role of these committees is to coordinate climate change response actions in the relevant provinces (some provinces have already established such committees). The composition of these committees will be determined by the provincial lead departments. Potential stakeholders on these committees could include: Representatives from relevant provincial departments, political representation, civil society/business/academia, and representation from municipalities.
7.2.4 Establish a functioning Municipal Committee on Climate Change for each municipality	This will involve each municipality establishing a Municipal Committee on Climate Change. The role of these committees is to coordinate climate change response actions in the relevant municipalities (some municipalities have already established committees). The composition of these committees will be determined by the Municipal Lead departments. Potential stakeholders on these committees could include: Representatives from relevant municipal departments, political representation, and civil society/business/academia.

Enhanced public-private-civil society collaboration and stewardship

Action	Description
7.3.1 Continue to facilitate the meeting of the National Committee on Climate Change (NCCC), a multistakeholder climate change forum.	This will involve ensuring that the NCCC continues to meet on a regular basis. The NCCC is a multistakeholder climate change forum that consists of stakeholders from government departments, civil society, business, and academia. The forum advises DEFF on international climate change commitments and national climate change implementation. A wide range of stakeholders will be consulted under the NCCC.
7.3.2 Implement collaborative pilot resilience-building projects	This will involve government implementing resilience-building pilot projects jointly with business and industry, and with civil society and communities to demonstrate the benefits of building climate change resilience to the private sector and communities. These pilot projects can serve as the catalysts for future climate adaptation work in these sectors. Lessons from existing successful resilience-building projects should also be shared. Private-public partnerships could also be explored.

Action	Description
7.3.3 Continue to support knowledge sharing platforms	This will involve providing continued support to community-based organisations, academic organisations, NGOs, business organisations and civil society organisations which provide platforms where lessons, ideas, and knowledge can be shared to build climate resilience. This will promote learning from the experiences of stakeholders in different sectors, including NGOs, academia, business and communities to support adaptation to climate change.

11. Finance

Strategic Intervention 8: Enable substantial flows of climate change adaptation finance from various sources.

11.1. Introduction

The projected cost range for South African adaptation response from 2020 to 2030 under the low mitigation scenario is between R4.2 bn and R308 bn (DEA 2015a, 5). For the moderate to high mitigation scenario the project cost range is R34 bn to R298 bn (DEA 2015a, 5). The wide-ranging projected costs in these scenarios reflect the lack of certainty and data regarding the effects of climate variability, which make it difficult to calculate the cost of adaptation. However, it is clear that substantial finance will be required to implement the NCCAS in order to achieve meaningful adaptation in South Africa.

The key outcome for this strategic intervention is: Adequate financial resources for national adaptation priorities from the national fiscus and international sources (Strategic Outcome 8.1)

11.2. Status Quo

Adaptation initiatives that are spread across government departments are very often not labelled as adaptation projects. The primary funding for adaptation activities in South Africa is through direct allocations from the national budget via the Medium Term Expenditure Framework (MTEF) including expenditure on research programmes and activities that directly contribute to building and supporting resilience. The other principal source of public sector finances are public intermediaries. Relevant public intermediaries for South Africa include the Global Environment Facility (which functions as an operating entity of the financial mechanism of the UNFCCC); Development Finance Institutions (DFIs) such as the Development Bank of Southern Africa (DBSA), the World Bank and the African Development Bank; and Official Development Assistance Institutions and Climate Funds, for example the Green Fund, the Green Climate Fund and the Adaptation Fund.

South Africa's private sector has also invested in adaptation activities, including sustainable farming practices, building ecological infrastructure and improving water infrastructure. Going forward, the private sector will play a strategic role in both implementation and funding.

Civil society and other community groups and NGOs also play a vital role in developing and implementing adaptation projects and programmes, especially for grassroots communities including women.

A range of economic and financial instruments exist that are being employed by both private and public investors to support adaptation projects. These include grants, equity, concessional and non-concessional loans and debt, and the operational funding of private and state-owned companies. More recently, leading private sector companies are using combinations of these instruments to mainstream adaptation into their operational activities (for example, an energy company investing in improving the resilience of its transmission lines to extreme weather events) or a company that

develops products and services that support adaptation (such as a seed company developing drought-resistant seeds).

11.3. Actions

The actions to achieve the outcomes associated with this intervention are outlined below:

Adequate financial resources for national adaptation priorities from national fiscus and international sources

Action	Description
8.1.1 Carry out a cost-benefit analysis of the NCCAS	This will involve developing a cost-benefit analysis of the NCCAS, initially to determine the full cost of implementing the NCCAS. Thereafter the benefits of the NCCAS will be identified and quantified.
8.1.2 Develop a gender responsive Resource Mobilisation Strategy	This will involve developing a resource mobilisation strategy, through a participatory process involving different stakeholders, that will highlight all activities involved in securing new and additional resources for implementing the Strategy. The Resource mobilisation strategy will also recommend ways to maximise the use of existing resources and ensure that the most vulnerable groups are included and that they are beneficiaries.
8.1.3 Develop a gender responsive national climate investment plan	This will involve developing a national climate investment plan, through a participatory process involving different stakeholders, which will provide an overview of a set of robust and financeable adaptation projects and programmes for consideration by domestic and international funders. The plan will ensure that the most vulnerable groups are included and that they are beneficiaries.
8.1.4 Expand the list of government entities accredited for climate financing	This will involve identifying additional government entities that would be appropriate to accredit for climate financing and supporting them through the accreditation process. The throughput of adaptation projects to dedicated multilateral climate funds would be maximised by expanding the list of accredited government entities to include well-capacitated municipalities and provinces.
8.1.5 Build capacity of local accredited implementing entities to access adaptation finance	This will involve building the capacity of accredited implementing entities to improve their ability to secure finance. This will assist South Africa to maximise the allocation of adaptation finance from dedicated multilateral climate funds.
8.1.6 Develop a project preparation assistance fund	This will involve establishing a project preparation fund to support entities with the potential to prepare applications but insufficient internal funding for the process.

Action	Description
8.1.7 Mainstream NCCAS priorities into the Medium Term Strategic Framework and assign implementation responsibilities	This will involve mainstreaming NCCAS priorities into the Medium Term Strategic Framework and assigning implementation responsibilities to ensure that the NCCAS is implemented by sectors and spheres of government.
8.1.8 Investigate options to include climate change adaptation parameters in the equitable share allocations of state revenue calculations	This will involve investigating options to include climate change adaptation parameters in the equitable share allocations of state revenue calculations.
8.1.9 Promote knowledge exchange on the economic benefits of public and private sector adaptation action	This will involve documenting public and private sector adaptation actions and the economic benefits of these actions, and ensuring that this information is shared widely. This will assist in promoting the uptake of adaptation action by other public and private sector entities.
8.1.10 Invest in new gender responsive technology and innovation.	This will involve investing in new technologies and innovations that can support climate change adaptation in South Africa.
8.1.11 Build a business case for adaptation in terms of national budgeting for adaptation and develop co-finance mechanisms to leverage donor funds.	This will involve building a business case for adaptation in terms of national budgeting for adaptation actions in the country and developing co-finance mechanisms to leverage donor funds.
8.1.12 Create a financial oversight mechanism for donor funding.	This will involve ensuring that the public have oversight over adaptation finance.

12. Monitoring and Evaluation

Strategic Intervention 9: Develop and implement an M&E system that tracks implementation of adaptation actions and their effectiveness.

12.1. Introduction

Since the effects of climate change differ across geographies and will shift over time, adaptation actions will work in some locations and time periods, and not in others. A 'learning by doing' approach is therefore needed. This approach will help South Africa progressively improve the NCCAS, and as a result, its ability to deal with the inherent uncertainty of climate change science. In order to implement a learning by doing approach the strategic outcomes of the NCCAS must be monitored and evaluated to understand whether progress has been made towards achieving these strategic interventions. The results of this monitoring and evaluation can then be used to determine if any shifts are required in terms of the strategic outcomes of the NCCAS.

The key outcome for this strategic intervention is: *A national M&E system developed and implemented* (Strategic Outcome 9.1)

12.2. Status Quo

The Climate Change Adaptation Monitoring and Evaluation approach for South Africa has been organised into Desired Adaptation Outcomes (DAOs). Nine generic DAOs have been developed, each of which is of cross-cutting, cross-sectoral relevance and describes, in a general sense, a desired state that will enhance South Africa's transition towards climate resilience. These DAOs fall into two distinct groups: six DAOs, goal 1 to goal 6, (G1-G6) describe the inputs (for example, 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). These DAOs are shown in the table below.

Desired Adaptation Outcomes (DAOs)	
<i>Inputs to enable effective adaptation</i>	
G1	Robust/integrated policies, programmes and plans for effective delivery of climate change adaptation, together with monitoring, evaluation and review over the short, medium and longer-term.
G2	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.
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.

Desired Adaptation Outcomes (DAOs)	
<i>Inputs to enable effective adaptation</i>	
G4	Capacity development, education and awareness programmes (formal and informal) for climate change adaptation (for example informed by adaptation research and with tools to utilise data/outputs).
G5	New and adapted technologies, knowledge, research and other cost-effective measures (for example nature-based solutions) used in climate change adaptation.
G6	Climate change risks, impacts and vulnerabilities identified and addressed.
<i>Impacts of adaptation interventions and associated measures</i>	
G7	Systems, infrastructure, communities and sectors less vulnerable to climate change impacts (for example, through effectiveness of adaptation interventions/response measures).
G8	Non-climate pressures and threats to human and natural systems reduced (particularly where these compound climate change impacts).
G9	Secure food, water and energy supplies for all citizens (within the context of climate change and sustainable development).

Clearly defined synergies exist between the NCCAS strategic outcomes and the climate change adaptation monitoring and evaluation – and, by implication, their corresponding data/information requirements and potential data/information outputs. This should help to ensure a robust approach to reporting on adaptation in South Africa and monitoring the country’s journey towards climate resilience. The relationship between the twelve NACCS strategic outcomes and the Desired Adaptation Outcomes for climate change adaptation monitoring and evaluation is shown in the table below:

Strategic Outcomes	Desired Adaptation Outcomes for monitoring and evaluation (condensed descriptions)
Strategic Outcome 1.1: Increased resilience and adaptive capacity achieved in human, economic, environment, physical and ecological infrastructure vulnerability	<p>Systems, infrastructure, communities and sectors in businesses, provinces and municipalities less vulnerable to climate change impacts (G7)</p> <p>Non-climate pressures and threats to human and natural systems reduced (particularly where these compound climate change impacts) (G8)</p> <p>Secure food, water and energy supplies for all citizens (within the context of sustainable development) (G9)</p>

Strategic Outcomes	Desired Adaptation Outcomes for monitoring and evaluation (condensed descriptions)
Strategic Outcome 2.1: An early warning and monitoring system for key climate vulnerable sectors and geographic areas developed and implemented	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 (G3).
Strategic Outcome 3.1: An adaptation vulnerability and resilience framework developed and implemented across 100% of key adaptation sectors	Climate change risks, impacts and vulnerabilities (including frameworks) identified and addressed in businesses, sectors, provinces and municipalities (G6).
Strategic Outcome 4.1: Effective adaptation planning that covers at least 80% of the South African sectors identified in the NCCAS	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 (G1).
Strategic Outcome 4.2: Achieve a 100% coverage of climate change considerations in NCCAS relevant sectoral operational plans	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 (G1).
Strategic Outcome 5.1: Increased research output and technology uptake to support planning and implementation	New and adapted technologies, knowledge, research and other cost-effective measures (e.g. nature-based solutions) used in climate change adaptation.
Strategic Outcome 6.1: Capacity building and awareness for climate change response enhanced	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) (G4).
Strategic Outcome 7.1: Adaptation governance defined and legislated through the Climate Change Act once approved by parliament	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 (G1).
Strategic Outcome 7.2: Institutional structures for climate change adaptation strengthened	Institutional and governance structures to facilitate climate change adaptation (G2).

Strategic Outcomes	Desired Adaptation Outcomes for monitoring and evaluation (condensed descriptions)
Strategic Outcome 7.3: Enhanced public-private-civil society collaboration and stewardship	Partnerships, 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) (G4).
Strategic Outcome 8.1: Adequate financial resources of national adaptation priorities from national fiscus and international sources	Appropriate resources (including current and past financial investments) to facilitate climate change adaptation (G2).
Strategic Outcome 9.1: A national M&E system developed and implemented	Robust monitoring, evaluation and review over the short, medium and longer-term (G1).

A climate change M&E system focusing on tracking

The M&E system will focus on tracking the outcomes and impact of each strategic outcome together with the associated actions and indicators under each strategic outcome. The information/data collected through M&E will be analysed and profiled on the Climate Change Information System. The National Climate Change Information System (NCCIS) was recently launched and is part of the national effort to track South Africa’s overall transition to a low-carbon and climate-resilient economy as required by the National Development Plan (Vision 2030) and the National Climate Change Response Policy (2011) as well as the South Africa’s Nationally Determined Contributions (2015) to the United Nations Framework Convention on Climate Change (UNFCCC).

The NCCIS offers a series of methodologies and decision support tools that can be used to apply tools to enhance tracking, assessment and communication of the effects of climate action response policies and actions in an accurate, consistent and, transparent manner at all scales of implementation to inform policy and decision-making.

The information generated by the system can be used to provide insights regarding the country’s progress in responding to climate change as implemented by a range of stakeholders and; achieving national and international goals and targets. It further showcases necessary information for domestic and international reporting requirements and informs positions in various negotiating platforms nationally and internationally.

Structured pragmatic engagements, tailored made for targeted stakeholders within adaptation landscape, will be undertaken with for capacity building on M&E. These engagements will also be used to provide progress on M&E and will highlight challenges, gaps, opportunities and lessons learnt.

12.3. Actions

The actions to achieve the outcomes associated with this intervention are outlined below:

A national M&E system developed and implemented

Action	Description
9.1.1 Establish a M&E system to track progress in achieving the strategic outcomes of the NCCAS	This will involve setting up an effective M&E system to track and assess success in achieving the strategic outcomes of the NCCAS. Proposed indicators for each strategic outcome are shown in Annex B.
9.1.2 Report on success in achieving the strategic outcomes of the NCCAS	This will involve using the information collected in the M&E system to report annually on progress in achieving the strategic outcomes. The report should also highlight key lessons learnt as well as any shifts that may be required to achieve the strategic outcomes of the NCCAS.
9.1.3 Update the NCCAS based on the M&E learnings	This will involve updating the NCCAS every five years based on the learnings that have been developed as a result of the establishment of an M&E system and development of annual reports.
9.1.4 Ensure that M&E information is accessible to stakeholders	This will involve that M&E tracking reports are communicated effectively at a community level in accessible formats.

13. Implementation Framework

Time Frame Definitions: Short Term 1 - 3 Years, Medium Term 4 - 10 Years, Long Term Above 10 Years.

Intervention 1: Reduce human, economic, environment, physical and ecological infrastructure vulnerability and build adaptive capacity				
<i>Outcome 1.1: Increased resilience and adaptive capacity achieved in human, economic, environment, physical and ecological infrastructure</i>				
Action	Lead	Partners	Time Frame	Indicator
1.1.1 Strengthen local organizations to support individual (male and female) and community adaptation	DEFF	Department of Women, Youth and Persons with Disabilities (DWYPD), non-governmental organisations (NGOs) municipalities, provincial government departments	Short Term	Number of individual and community adaptation programmes implemented
1.1.2 Identify individuals (male and female) and communities at most risk from climate change within municipalities and deliver targeted climate change vulnerability reduction programmes for these individuals and communities	Municipalities	DEFF, DWYPD, Department of Public Works and Infrastructure (DPWI), Department of Health (DOH), provincial government departments, NGOs	Short Term	Number of vulnerability reduction programmes implemented per municipality
1.1.3 Develop a list of resilience-building projects that can easily be replicated	DEFF	Sector departments, provincial governments, municipalities and NGOs	Short Term	List of successful resilient building programmes and projects that can be replicated
1.1.4 Capacitate and operationalise South Africa's National Disaster Management Framework to strengthen proactive climate change adaptive capacity, preparedness, response and recovery	Department of Cooperative Governance (DCOG)	DEFF	Short Term	Number of Disaster Management Centres that include climate change in their terms of reference
1.1.5 Equip and capacitate emergency response departments, such as health and fire, to prepare for and manage climate related disasters	DCOG	DEFF, provincial governments, municipalities	Short Term	Number of emergency response worker trained in climate change related incidences
1.1.6 Invest in knowledge and capacity building for the public, especially vulnerable groups (male and female), to prepare and adapt to climate change	DEFF	DWYPD, provincial governments, municipalities, NGOs	Short Term	Number of knowledge and awareness campaign programmes implemented
1.1.7 Invest in knowledge and capacity building for climate-resilient rural livelihoods	Department of Agriculture, Land Reform and	DEFF, provincial governments, municipalities, NGOs	Short Term	Number of knowledge and awareness

	Rural Development (DALRRD)			campaign programmes implemented
1.1.8 Launch an enhanced climate change public flagship programme to build a healthier, more resilient society	DOH	DEFF	Short Term	A National Climate Change and Health Flagship Programme established
1.1.9 Equip and capacitate healthcare facilities to manage climate change-related health effects and climate-sensitive diseases	DOH	DEFF, the South African Medical Association (SAMA)	Short Term	Number of healthcare worker training programmes on health and climate change created Number of individuals who have received training
1.1.10 Support small-scale fishers (male and female) to become more climate resilient through use of early warning systems and sea-safety training	DEFF	Provincial and local economic development institutions, research institutions, the broader fishing industry, NGOs and the private sector	Short Term	Number of sea safety training programmes created Number of individuals who have received training
1.1.11 Support farmers (male and female) to implement more efficient climate-smart and conservation agriculture practices	DALRRD	DEFF, provincial governments, municipalities and the private sector	Short Term	Number of climate-smart and conservation agriculture programmes created
1.1.12 Promote the expansion of food garden programmes outside of land classified as agricultural land or farmland to reduce food insecurity and hunger	DALRRD	Provincial government departments, municipalities, NGOs	Short Term	Number of urban farms and food gardens outside land classified as agricultural
1.1.13 Enhance the role of agricultural extension officers in supporting the most vulnerable farmers (male and female)	DALRRD	Provincial government departments, DWYPD, municipalities, NGOs	Short Term	Number of agricultural extension officers trained in climate change adaptation
1.1.14 Invest in knowledge and capacity building for climate-resilient rural homestead gardening	DALRRD	Provincial government departments, municipalities, NGOs	Short Term	Number of knowledge and capacity building programmes implemented
1.1.15 Support the integration of climate-smart and ecosystem-based approaches in forestry practices	DEFF	Department of Basic Education (DBE), Department of Higher Education and Training (DHET)	Short Term	Inclusion of climate-smart and ecosystem-based approaches in

				forestry training curricula
1.1.16 Develop training programmes in effective saving methodologies and access to financial education to better manage meagre resources in vulnerable communities	National Treasury	DBE, DHET	Short Term	Inclusion of effective saving methodologies and financial education in training curricula
1.1.17 Investigate the potential for expanding sectors and kick-starting new industries that are likely to thrive as a direct or indirect result of climate change effects	Department of Trade, Industry and Competition (DTIC)	DEFF, Department of Science and Innovation (DSI), Department of Communications and Digital Technologies (DCDT) and the private sector	Medium Term	Number of pilot projects implemented
1.1.18 Educate both informal and formal businesses on the potential economic implications of climate change risks and provide support on how to better prepare for these risks in advance	DEFF	National Treasury, provincial government departments, municipalities, NGOs	Short Term	Number of businesses that have received education on the potential economic implications of climate change risks
1.1.19 Encourage businesses to relocate to less hazardous areas through incentives and tax rebates	DCOG	DEFF, National Treasury, Department of Human Settlements (DHS), provincial government departments, municipalities	Medium Term	Number of incentives and tax rebates put in place Number of businesses that have relocated away from hazardous areas
1.1.20 Adopt climate resilient approaches to natural resource management to restore and maintain ecosystem goods and services	Conservation Agencies	NGOs	Medium Term	Number of climate resilience projects for natural resource management implemented
1.1.21 Conduct research into the value of ecosystem services and the economic benefits of restoring these services in comparison to the development of hard infrastructure	DEFF	Conservation Agencies, research institutions, NGOs and the private sector	Medium Term	Number of research reports on ecosystem restoration in South Africa produced
1.1.22 Provide training for the public and private sectors on the value of ecosystem services and the benefits of restoring them	DEFF	Conservation Agencies, research institutions, NGOs and the private sector	Medium Term	Number of training programmes implemented regarding ecosystem services and ecosystem restoration Number of individuals who have received training

1.1.23 Protect and conserve South Africa's most vulnerable ecosystems, landscapes and wildlife, and monitor and control the spread of alien invasives	DEFF	Conservation agencies, provincial government departments, municipalities, NGOs and the private sector	Medium Term	Number of developed climate resilience management plans for vulnerable ecosystems
1.1.24 Monitor and control the spread of invasive alien species that benefit from climate change	DEFF	Conservation agencies, provincial government departments, municipalities, NGOs and the private sector	Short Term	Number of effective invasive alien species management projects
1.1.25 Promote the expansion of tree cover, forests and forest plantations in order to maintain the production of wood raw materials, and help reduce temperatures in cities, amongst other benefits	DEFF	Provincial government departments, municipalities, NGOs and the private sector	Medium Term	Number of trees planted
1.1.26 Investigate the potential effects of an expanded forestry sector on water availability	DEFF	Department of Human Settlement, Water and Sanitation (DWS), DALRRD, DCOG, provincial government departments, municipalities and the private sector	Short Term	Report on plantation sector expansion and the effects on water availability
1.1.27 Support farmers (male and female) to use and manage water more sustainably	DALRRD	DWS, DEFF, provincial government departments, municipalities, NGOs	Short Term	Number of farmers supported
1.1.28 Ensure that water management institutions incorporate adaptive management responses	DHWS	DEFF, provincial governments, municipalities and the private sector	Short Term	Number of climate change adaptation responses adopted by water management institutions
1.1.29 Invest in high-quality, climate resilient and eco-sustainable/reduced-impact public infrastructure and materials	Department of Transport (DOT), DPWI	DEFF, DHS	Long Term	Percentage of new public infrastructure that incorporates principles of climate resilience
1.1.30 Encourage the private sector to build in low-climate-risk areas, using resilient materials, through incentives and tax rebates	DCOG	DEFF, National Treasury, DHS, provincial government departments, municipalities	Long Term	Percentage of new private sector infrastructure built with climate-resilience materials in low-climate-risk areas
1.1.31 Create a more adaptive energy system to reduce dependence on a centralised system and increase distributed generation, especially in rural areas	Department of Mineral Resources and Energy (DMRE)	National Energy Regulator of South Africa (NERSA), DEFF, municipalities, private sector	Short Term	Extent and duration of electricity disruptions as a result of climate events

1.1.32 Adopt water-wise water management practices in urban areas	DWS	DEFF, provincial government departments, municipalities, NGOs and the private sector	Medium Term	Number of initiatives to promote water-wise urban water management practices implemented
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Intervention 2: Develop a coordinated Climate Services system that provides climate products and services for key climate vulnerable sectors and geographic areas

Outcome 2.1: Climate products and services for key climate vulnerable sectors and geographic areas developed and implemented

Action	Lead	Partners	Time Frame	Indicator
2.1.1 Set up a National Climate Centre in an existing institution	DEFF	South African Weather Service (SAWS), research institutions	Medium Term	Institutional home for National Climate Centre identified
2.1.2 Establish an Interactive Online Climate Service Platform	DEFF	SAWS, research institutions	Medium Term	An established online climate services platform
2.1.3 Establish a Climate Change Science Advisory Technical Council	DEFF	Research Institutions, NGOs	Short Term	Climate Change Science Advisory Technical Council established
2.1.4 Continue and enhance climate observation and monitoring networks	SAWS	Research institutions, DEFF	Medium Term	Reliable, comparable, up-to-date climate data available
2.1.5 Continue to invest in climate change prediction and modelling data	SAWS	Research institutions, DEFF	Short Term	Climate projections for South Africa revised
2.1.6 Develop and continuously update a national climate information and early warning system to address the needs to different sectors	SAWS	DCOG, research institutions, DEFF, DCDT	Medium Term	An efficient national information system
2.1.7 Develop provincial early warning systems for vulnerable geographical areas	Provincial lead departments	DEFF, SAWS, DALRRD	Medium Term	Number of provincial early warning systems
2.1.8 Develop municipal early warning systems for vulnerable geographical areas	Municipalities	DEFF, SAWS, DALRRD	Medium Term	Number of municipal early warning systems
2.1.9 Improve/develop national early warning systems for key climate vulnerable sectors and risks	Sector departments	DEFF, SAWS	Medium Term	Number of national early warning systems for key sectors and risks
2.1.10 Develop and support a climate change early warning and vulnerability network with the involvement of relevant stakeholders	SAWS	DEFF, DALRRD, research institutions, NGOs, and neighbouring states.	Medium Term	A multi-stakeholder network that collaborates and shares information on early warning systems established

2.1.11 Investigate alternative technologies that can be used considering the 4th industrial revolution	DEFF	DCDT, SAWS	Medium Term	Number of alternative early warning system application options
2.1.12 Develop adaptation strategies for those that are displaced by climate change	DCOG	DEFF, DALRRD, Provincial government departments, municipalities, NGOs	Long Term	Number of adaptation strategies developed

Intervention 3: Develop a vulnerability and resilience methodology framework that integrates biophysical and socio-economic aspects of vulnerability and resilience

Outcome 3.1: A Climate Risk and Vulnerability Assessment Framework developed and implemented across 100% of key adaptation sectors

Action	Lead	Partners	Time Frame	Indicator
3.1.1 Develop a National Climate Risk and Vulnerability Assessment Framework (NCRVAF)	DEFF	Sector departments, provincial lead departments, municipalities	Short Term	National Climate Risk and Vulnerability Assessment Framework (NCRVAF) drafted
3.1.2 Use the NCRVAF to guide sector assessments	Sector departments	DEFF	Medium Term	Number of sector assessments and response plans guided by the NCRVAF
3.1.3 Use the NCRVAF to guide provincial assessments	Provincial lead departments	DEFF	Medium Term	Number of provincial assessments and response plans guided by the NCRVAF
3.1.4 Use the NCRVAF to guide local assessments	Municipalities	DEFF, provincial lead departments	Medium Term	Number of municipality assessments and response plans guided by the NCRVAF

Intervention 4: Facilitate mainstreaming of adaptation responses into sectoral planning and implementation

Outcome 4.1: Effective adaptation planning that covers at least 100% of the South African sectors identified in the NCCAS

Action	Lead	Partners	Time Frame	Indicator
4.1.1 Draft, approve, and implement updated National Climate Change Sector Plans to include climate change adaptation	Sector departments	DEFF	Medium Term	Number of updated national climate change sector plans
4.1.2 Draft, approve, and implement updated provincial climate change adaptation strategies and associated implementation plans	Provincial lead departments	DEFF	Medium Term	Number of updated provincial climate change strategies and implementation plans

4.1.3 Draft, approve, and implement updated municipal local government climate change adaptation strategies and associated implementation plans	Municipalities	DEFF, provincial lead departments	Medium Term	Number of updated municipal climate change strategies and implementation plans
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Intervention 4: Facilitate mainstreaming of adaptation responses into sectoral planning and implementation				
<i>Outcome 4.2: Achieve a 100% coverage of climate change considerations in sectoral operational plans</i>				
Action	Lead	Partners	Time Frame	Indicator
4.2.1 Integrate climate change adaptation into Provincial Growth and Development Strategies	Provincial lead departments	DEFF, municipalities	Medium Term	Percentage of provincial growth and development strategies that include climate change adaptation projects and programmes
4.2.2 Integrate climate change adaptation into provincial sector plans	Provincial lead departments	DEFF, provincial sector departments	Short Term	Percentage of provincial sector plans that include climate change adaptation projects and programmes
4.2.3 Amend Development Planning guidelines to incorporate climate change adaptation considerations	National Planning Commission (NPC), DCOG	South African Local Government Association (SALGA), DEFF	Medium Term	Development planning guidelines amended to include climate change adaptation
4.2.4 Integrate climate change adaptation into Municipal Development Planning documents, budget documents, and by-laws	Municipalities	DEFF, provincial government departments	Medium Term	Percentage of IDPs that include climate change projects and programmes. Percentage of SDFs that respond to climate change.
4.2.5 Integrate climate change adaptation into municipal sector plans	Municipalities	DEFF, SALGA, provincial government departments	Medium Term	Percentage of municipal sector plans that include climate change adaptation projects and programmes
4.2.6 Mandate that all public infrastructure (including transport and energy infrastructure) be planned, designed, operated and managed after explicitly taking current and predicted future climate change impacts into account	Office of the President	DPWI, NPC, provincial governments and municipalities	Medium Term	Percentage of large-scale infrastructure projects that include climate change in their planning
4.2.7 Mainstream climate change adaptation in business strategic implementation plans	DEFF, National Business Initiative (NBI)	Private sector	Medium Term	Number of business strategic implementation plans that incorporate climate change adaptation

Intervention 5: Promote research application, technology development, transfer and adoption to support planning and implementation				
<i>Outcome 5.1: Increased research output and technology uptake to support planning and implementation</i>				
Action	Lead	Partners	Time Frame	Indicator
5.1.1 Develop a research roadmap for climate change adaptation	DEFF	Research institutions	Medium Term	A clear roadmap for climate change adaptation research
5.1.2 Continue to invest in research that aims to understand the different impacts of climate change on the environment, economy and society	DEFF	Research institutions	Medium Term	Long Term Adaptation Scenarios (LTAS) reports updated
5.1.3 Invest in research on the most effective adaptation responses to different climate change impacts	DSI	DEFF, Research institutions		Annual reports drafted on research conducted on the most effective adaptation responses to different climate change impacts
5.1.4 Establish a programme to promote research into new climate change adaptation technologies	DSI	DEFF, Research institutions		Programme to promote research into new climate change adaptation technologies established
5.1.5 Establish a knowledge dissemination programme to encourage research uptake	DSI	DEFF, Research institutions		Climate change adaptation knowledge dissemination programme established

Intervention 6: Build the necessary capacity and awareness for climate change responses				
<i>Outcome 6.1: Capacity building and awareness for climate change response enhanced</i>				
Action	Lead	Partners	Time Frame	Indicator
6.1.1 Develop and implement an effective communication and outreach programme	DEFF	Provincial government departments, municipalities, NGOs	Short Term	Climate Change Adaptation Communication and outreach programme drafted. Annual reports on the implementation of the communication and outreach programme.
6.1.2 Develop and implement a training programme for government officials and politicians	DEFF	Provincial government departments, municipalities	Short Term	Climate Change Adaptation training programme drafted. Annual reports on the implementation of the training programme.
6.1.3 Establish formally accredited training courses	DEFF	Provincial government departments, municipalities	Medium Term	Number of formally accredited climate change adaptation training courses. Number of participants who successfully complete formally accredited adaptation training courses.

6.1.4 Develop a Climate Change Adaptation and Environmental Education and Training Programme	DEFF	Provincial government departments, municipalities, research institutions, NGOs	Medium Term	Climate Change Adaptation and Environmental Education and Training Programme implemented. Annual reports on the implementation of the training programme.
6.1.5 Incorporate climate change adaptation into relevant, primary, secondary and tertiary curricula	DBE, DHET	DEFF	Medium Term	Number of secondary and tertiary curricula amended to incorporate climate change adaptation.
6.1.6 Incorporate climate change into informal education and learning	DEFF	Department of Higher Education and Training	Medium Term	Number of reflective learning forums and committee that promote sharing of climate change adaptation learning established.
6.1.7 Enhance social learning amongst all levels of society	DEFF	DBE, DHET, NGOs, research institutions	Medium Term	Annual reports drafted on the enhancement of social learning
6.1.8 Develop climate change education materials that can be used for different sectors and contexts	DEFF	DBE, DHET, NGOs, research institutions	Medium Term	Number of climate change education materials developed.

Intervention 7: Establish effective governance and legislative processes to integrate climate change in development planning				
<i>Outcome 7.1: Adaptation governance defined and legislated through the Climate Change Act once approved by parliament</i>				
Action	Lead	Partners	Time Frame	Indicator
7.1.1 Create formal climate change legislation for adaptation	DEFF	Research institutions, NGOs	Short Term	Climate Change Act enacted by Parliament

Intervention 7: Establish effective governance and legislative processes to integrate climate change in development planning				
<i>Outcome 7.2: Institutional structures for climate change adaptation strengthened</i>				
Action	Lead	Partners	Time Frame	Indicator
7.2.1 Facilitate the meeting of the Inter-Ministerial Committee on Climate Change	DEFF	Research institutions, NGOs	Short Term	Number of annual meetings of the Inter-Ministerial Committee on Climate Change
7.2.2 Continue to facilitate the meeting of the Intergovernmental Committee on Climate Change (IGCCC)	DEFF	National Treasury, DALRRD, DMRE, DOH, DHS, DTIC, DOT, DSI, DCDT, DWS, Department of International Relations and Cooperation, Department of Social Development, provincial	Short Term	Number of annual meetings of the IGCCC

		government departments, and SALGA.		
7.2.3 Establish a functioning Provincial Committee on Climate Change for each province (this can be an existing forum)	Provincial lead departments	DEFF	Short Term	Percentage of provinces that have Provincial Committees on Climate Change that meet at least twice per year
7.2.4 Establish a functioning Municipal Committee on Climate Change for each municipality	Municipalities	DEFF, provincial lead departments	Short Term	Percentage of Municipalities that have Municipal Committees on Climate Change that meet at least twice per year

Intervention 7: Establish effective governance and legislative processes to integrate climate change in development planning				
<i>Outcome 7.3: Enhanced public-private-civil society collaboration and stewardship</i>				
Action	Lead	Partners	Time Frame	Indicator
7.3.1 Continue to facilitate the meeting of the National Committee on Climate Change (NCCC), a multistakeholder climate change forum	DEFF	National government departments, NGOs and the private sector	Short Term	Number of annual meetings of the NCCC
7.3.2 Implement collaborative pilot resilience-building projects	DEFF	NGOs, municipalities	Medium Term	Number of joint resilience-building pilot projects implemented
7.3.3 Continue to support knowledge sharing platforms	DEFF	NGOs, municipalities	Medium Term	Number of active knowledge sharing platforms

Intervention 8: Enable substantial flows of climate change adaptation finance from various sources				
<i>Outcome 8.1: Adequate financial resources for national adaptation priorities from national fiscus and international sources</i>				
Action	Lead	Partners	Time Frame	Indicator
8.1.1 Carry out a cost-benefit analysis of the NCCAS	DEFF	Research institutions	Short Term	Cost-benefit analysis drafted
8.1.2 Develop a gender responsive Resource Mobilisation Strategy	DEFF	NGOs and the private sector, DWYPD	Short Term	Resource mobilisation strategy drafted
8.1.3 Develop a gender responsive national climate investment plan	DEFF	National Treasury, DWYPD	Medium Term	Investment plan developed
8.1.4 Expand the list of government entities accredited for climate financing	DEFF	National Treasury, South African Revenue Service, Department of Public Service	Short Term	Number of entities accredited to secure climate finance

		and Administration (DPSA), Department of Public Enterprises (DPE)		
8.1.5 Build capacity of local accredited implementing entities to access adaptation finance	DEFF	Accredited implementing entities	Short Term	Amount of adaptation finance secured annually from climate funds
8.1.6 Develop a project preparation assistance fund	DEFF	National Treasury	Medium Term	Project preparation fund established
8.1.7 Mainstream NCCAS priorities into the Medium Term Strategic Framework and assign implementation responsibilities	National Treasury	DEFF	Medium Term	Medium Term Strategic Framework reflects the priorities of the NCCAS
8.1.8 Investigate options to include climate change adaptation parameters in the equitable share allocations of state revenue calculations	National Treasury	DEFF	Short Term	Climate change and equitable share report drafted
8.1.9 Promote knowledge exchange on the economic benefits of public and private sector adaptation action	NBI	DEFF	Short Term	Number of private sector adaptation actions documented
8.1.10 Invest in new gender responsive technology and innovation	DEFF	DSI, DCDT, DWYPD	Medium Term	Number of new gender responsive technologies and innovations developed
8.1.11 Build a business case for adaptation in terms of national budgeting for adaptation and develop co-finance mechanisms to leverage donor funding	DEFF	National Treasury	Short Term	Business case for adaptation developed
8.1.12 Create a financial oversight mechanism for donor funding	DEFF	National Treasury	Short Term	Financial oversight mechanism for donor funding developed

Intervention 9: Develop and implement an M&E system that tracks implementation of adaptation actions and their effectiveness

Outcome 9.1: A national M&E system developed and implemented

Action	Lead	Partners	Time Frame	Indicator
9.1.1 Establish a M&E system to track progress in achieving the strategic outcomes of the NCCAS	DEFF	Provincial government departments, municipalities, research institutions	Short Term	NCCAS M&E System established
9.1.2 Report on success in achieving the strategic outcomes of the NCCAS	DEFF	Provincial government departments, municipalities, research institutions	Short Term	Annual M&E reports drafted

9.1.3 Update the NCCAS based on the M&E learnings	DEFF	Provincial government departments, municipalities, research institutions	Medium Term	NCCAS updated
9.1.4 Ensure that M&E information is accessible to stakeholders	DEFF		Short Term	NCCAS M&E information accessible in multiple formats and languages

14. Annex A: Proposed Key Messaging for Climate Change Adaptation Communication and outreach programme

- ***Adapting to create a resilient South Africa has been conceptualised as the key message of the NCCAS:*** This message will be central to all NCCAS related communications during both the strategy development phase and implementation phase. In addition, there are a number of subsidiary messages which reinforce the key message.
- ***South Africa needs to adapt to climate change:*** Sustained warming and increasing rainfall variability over the short to medium term (the next two to three decades) will have increasingly adverse effects on key sectors of South Africa's economy in the absence of effective adaptation responses.
- ***Climate change threatens development:*** The projected adverse effects of ongoing climate change in South Africa are likely to threaten the achievement of urgent national development needs, and well-founded aspirations to address historical inequities.
- ***The poor are most vulnerable to climate change impacts:*** The increasing frequency of extreme weather events is likely to have a disproportionate impact on the poorest in society (both rural and urban), amplifying existing social inequalities. The poor typically have limited opportunities and, consequently, are disproportionately affected by the negative impacts of climate change.
- ***The NCCAS will give South Africa an advantage in the future:*** Planning for climate change ensures that South Africa is in a position to leverage opportunities that arise due to changing climatic conditions and enhance its global competitiveness.
- ***Climate change presents investment opportunities:*** New funding flows to support adaptation represent the biggest acceleration of development investment since the achievement of democracy in South Africa. This provides a unique opportunity to both ensure climate resilience and achieve development aspirations.
- ***Transformational change:*** Transformational, systemic change is required to address the challenges presented by climate change.
- ***The need for integration and collaboration:*** Sectoral and integrated cross-sectoral approaches are essential to building societal resilience in a holistic way.
- ***Linkages between adaptation and mitigation are increasingly vital:*** This is because there is an intensified international focus on keeping global warming below 2°C, and therefore adaptation responses need to be cognisant of their mitigation implications. At the same time, the adverse impacts of climate change on resource availability potentially limits energy development options. An adaptation and mitigation strategy requires integrated planning. For instance, some forms of energy generation require large amounts of water. Since South Africa is projected to experience drier conditions under some climate change scenarios, shortages of water could limit energy development options.

15. Annex B: Indicators for monitoring and evaluation of the NACCS strategic outcomes

NACCS strategic outcomes	Data/information needed to monitor and evaluate progress and understand effectiveness	
	Monitoring	Evaluation
Strategic Outcome 1.1: Increased resilience and adaptive capacity achieved in human, economic, environmental, physical and ecological infrastructure	<p>Evidence of reduced risk/vulnerability as a result of addressing the identified risk/vulnerability.</p> <p>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.</p> <p>Climate smart agricultural practices, conservation agriculture practices, and water conservation and demand practices.</p>	<p>Lack of behavioural/system/infrastructure change/modification as a result of addressing identified risks (including climate risk) and vulnerabilities to reduce climate change impacts (red).</p> <p>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 (amber).</p> <p>Evidence of proactive behavioural/system/infrastructure change/modification as a result of addressing identified risks (including climate risk) and vulnerabilities to reduce climate change impacts (green).</p>
Strategic Outcome 2.1: Climate products and services for key climate vulnerable sectors and geographic areas developed and implemented	<p>(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 (v) maintenance and enhancements of monitoring and forecasting facilities/networks.</p>	<p>No dissemination and utilisation of weather and climate-related information (red).</p> <p>Dissemination but no utilisation of weather and climate-related information (amber).</p> <p>Dissemination and utilisation of weather and climate-related information at provincial, municipal and community levels (green).</p>
Strategic Outcome 3.1: A Climate Risk and Vulnerability Assessment Framework developed and implemented across 100% of key adaptation sectors	<p>Details of sectoral, business, provincial and municipal risk and vulnerability frameworks; risk profiles and vulnerability assessments and measures/actions to address the identified risks, impacts and vulnerabilities in businesses, sectors, provinces and municipalities.</p>	<p>No risk and vulnerability frameworks and profiles (red).</p> <p>Risk and vulnerability frameworks profiles identified/developed (amber).</p> <p>Risks, impacts and vulnerabilities addressed in policies, plans and actions (green).</p>
Strategic Outcome 4.1: Effective adaptation planning that covers at least 100% of the South African sectors	<p>Number of business, sectoral, provincial and municipal legal frameworks, plans/strategies, policies, programmes and projects that incorporate climate change adaptation</p>	<p>Legal frameworks, plans/strategies, policies, programmes and projects not informed by existing risk and vulnerability profiles that include climate risks and impacts (red).</p>

<p>identified in the NCCAS</p> <p>Strategic Outcome 4.2: Achieve a 100% coverage of climate change considerations in sectoral operational plans</p> <p>Strategic Outcome 7.1: Adaptation governance defined and legislated through the Climate Change Act once approved by parliament</p> <p>Strategic Outcome 9.1: A national M&E system developed and implemented</p>		<p>Legal frameworks, plans/strategies, policies, programmes and projects informed by risk and vulnerability profiles that include climate risks and impacts (amber).</p> <p>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 (green).</p>
<p>Strategic Outcome 5.1: Increased research output and technology uptake to support planning and implementation</p>	<p>(i) 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 (vi) other adaptation challenges and opportunities on technologies, research and knowledge.</p>	<p>Lack of awareness/understanding of newly developed technologies, research and knowledge leading to poor or no application (red).</p> <p>Awareness/ understanding of technologies, research and knowledge but no implementation and utilisation (amber).</p> <p>Evidence of implementation and utilisation of technologies and knowledge</p>
<p>Strategic Outcome 6.1: Capacity building and awareness for climate change response enhanced</p> <p>Strategic Outcome 7.3: Enhanced public-private-civil society collaboration and stewardship</p>	<p>i) number of capacity development programmes (including students, staff, researchers and institutions) addressing climate change adaptation; (ii) coverage of adaptation research and training being undertaken and financed; (iii) uptake of research outcomes and human capacity trained in adaptation; (iv) collaboration and partnerships between sectors, businesses, provinces, municipalities and researchers; and (v) incorporation of climate change issues into school curriculum.</p>	<p>No capacity building programmes (including research), collaboration and partnerships to address climate change adaptation and no incorporation into school curriculum (red).</p> <p>Attendance of capacity building programmes but no utilisation, collaboration and partnerships to address climate change adaptation and no incorporation into school curriculum (amber).</p> <p>Capacity building programmes (including research and utilisation), collaboration and partnerships to address climate change adaptation, incorporation into school curriculum, and utilisation to inform policy and decision-making (green).</p>

<p>Strategic Outcome 7.2: Institutional structures for climate change adaptation strengthened</p> <p>Strategic Outcome 8.1: Adequate financial resources for national adaptation priorities from national fiscus and international sources</p>	<p>i) dedicated climate change champions/nodes/units and funding for businesses, sectors, provinces and municipalities (metropolitan, district and local); (ii) 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 (iii) implementation of forum/committee climate change action plans; iv) dedicated budget/funding (including monetary incentives).</p>	<p>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 (red).</p> <p>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 (amber).</p> <p>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 (green).</p>
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RED indicates that no or only preliminary work has begun towards the strategic outcome
 AMBER indicates that significant progress is being made towards the strategic outcome
 GREEN indicates that work on the strategic outcome is in an ideal state.

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