CLIMATE RISK COUNTRY PROFILE

SOUTH AFRICA

WORLD BANK GROUP

COPYRIGHT

1818 H Street NW, Washington, DC 20433
Telephone: 202-473-1000; Internet: www.worldbank.org

RIGHTS AND PERMISSIONS

Please cite the work as follows: Climate Risk Profile: South Africa (2021): The World Bank Group.

Cover Photos: © John Hogg/World Bank, "Hout Bay, Cape Town Western Cape, South Africa" June 28, 2011 via Flickr, Creative Commons CC BY-NC-ND 2.0. © Trevor Samson/World Bank, "Worker pruning fruit trees" August 13, 2007 via Flickr, Creative Commons CC BY-NC-ND 2.0.

Graphic Design: Circle Graphics, Inc., Reisterstown, MD.

ACKNOWLEDGEMENTS

This profile is part of a series of Climate Risk Country Profiles developed by the World Bank Group (WBG). The country profile synthesizes most relevant data and information on climate change, disaster risk reduction, and adaptation actions and policies at the country level. The country profile series are designed as a quick reference source for development practitioners to better integrate climate resilience in development planning and policy making. This effort is managed and led by Veronique Morin (Senior Climate Change Specialist, WBG) and Ana E. Bucher (Senior Climate Change Specialist, WBG).

This profile was written by MacKenzie Dove (Senior Climate Change Consultant, WBG). Additional support was provided by Yunziyi Lang (Climate Change Analyst, WBG), Fernanda Zermoglio (Senior Climate Change Consultant, WBG), Jason Johnston (Operations Analyst, WBG) and Megumi Sato (Junior Professional Officer, WBG).

Climate and climate-related information is largely drawn from the Climate Change Knowledge Portal (CCKP), a WBG online platform with available global climate data and analysis based on the latest Intergovernmental Panel on Climate Change (IPCC) reports and datasets. The team is grateful for all comments and suggestions received from the sector, regional, and country development specialists, as well as climate research scientists and institutions for their advice and guidance on use of climate related datasets.

CONTENTS

FOREWORD 1

COUNTRY OVERVIEW 2

CLIMATOLOGY 4

Climate Baseline 4

Overview 4

Key Trends 6

Climate Future 7

Summary Statistics 7

Key Trends 9

CLIMATE RELATED NATURAL HAZARDS 10

Overview 10

Key Trends. 12

Implications for DRM 13

CLIMATE CHANGE IMPACTS TO KEY SECTORS 14

Agriculture 14

Water 16

Energy 19

Health. 20

ADAPTATION 23

Institutional Framework for Adaptation. 23

Policy Framework for Adaptation 23

Recommendations 24

Research Gaps. 24

Data and Information Gaps 24

Institutional Gaps 24

FOREWORD

Climate change is a major risk to good development outcomes, and the World Bank Group is committed to playing an important role in helping countries integrate climate action into their core development agendas. The World Bank Group is committed to supporting client countries to invest in and build a low-carbon, climate-resilient future, helping them to be better prepared to adapt to current and future climate impacts.

The World Bank Group is investing in incorporating and systematically managing climate risks in development operations through its individual corporate commitments.

A key aspect of the World Bank Group's Action Plan on Adaptation and Resilience (2019) is to help countries shift from addressing adaptation as an incremental cost and isolated investment to systematically incorporating climate risks and opportunities at every phase of policy planning, investment design, implementation and evaluation of development outcomes. For all IDA and IBRD operations, climate and disaster risk screening is one of the mandatory corporate climate commitments. This is supported by the Bank Group's Climate and Disaster Risk Screening Tool which enables all Bank staff to assess short- and long-term climate and disaster risks in operations and national or sectoral planning processes. This screening tool draws up-to-date and relevant information from the World Bank's Climate Change Knowledge Portal, a comprehensive online 'one-stop shop' for global, regional, and country data related to climate change and development.

Recognizing the value of consistent, easy-to-use technical resources for client countries as well as to support respective internal climate risk assessment and adaptation planning processes, the World Bank Group's Climate Change Group has developed this content. Standardizing and pooling expertise facilitates the World Bank Group in conducting initial assessments of climate risks and opportunities across sectors within a country, within institutional portfolios across regions, and acts as a global resource for development practitioners.

For developing countries, the climate risk profiles are intended to serve as public goods to facilitate upstream country diagnostics, policy dialogue, and strategic planning by providing comprehensive overviews of trends and projected changes in key climate parameters, sector-specific implications, relevant policies and programs, adaptation priorities and opportunities for further actions.

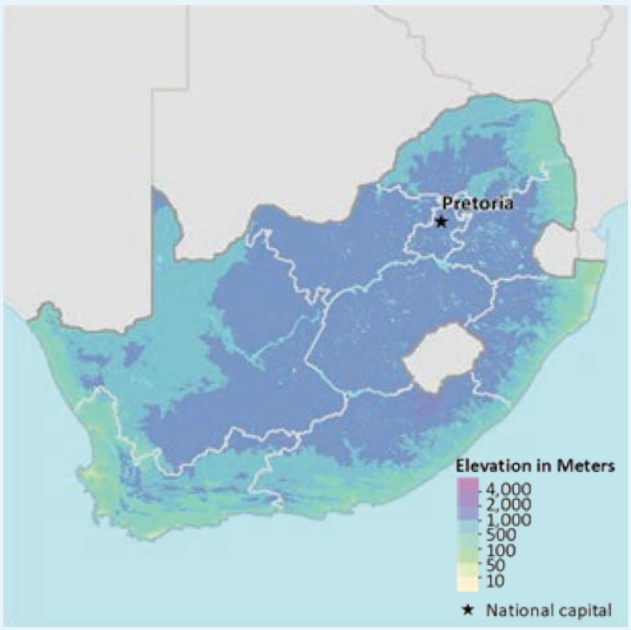
It is my hope that these efforts will spur deepening of long-term risk management in developing countries and our engagement in supporting climate change adaptation planning at operational levels.

Bernice Van Bronkhorst
Global Director
Climate Change Group (CCG)
The World Bank Group (WBG)

COUNTRY OVERVIEW

The Republic of South Africa, located in the southern tip of Africa, shares borders with six countries: Namibia, Botswana, Zimbabwe, Mozambique, eSwatini, and Lesotho (the last of which is landlocked by the South African territory). The country's coastline is extensive, approximately 3,000 kilometers (km) long, and starts at the Mozambican border in the east to the Namibian border in the west. The Indian Ocean lies on the eastern coast of South Africa and the Atlantic Ocean on the western coast, with the two oceans meeting at the country's southernmost point, Cape Agulhus. South Africa's land area totals 1,219,602 km^2. The Great Escarpment is the country's most prominent and continuous relief feature. This divides the country into four distinct regions: the interior plateau, the eastern plateau slopes, the Cape Fold belt, and the western plateau slopes. The interior plateau lies at approximately 1,200 meters (m) above sea level and extends from the Kalahari Desert in the west, to the grasslands in the east and the semi-arid Karoo in the south. The Great Escarpment comprises the Roggeveld Scarp in the south west, which sits at an elevation of 1,500 m above sea level and the KwaZulu-Natal Drakensberg in the east, with an elevation of 3,482 m above sea level (**Figure 1**). Nearly one-fifth of the extensive coast has some form of development within 100 m of the shoreline, where natural buffers against storm surges and rising seas have been degraded. As a result, people and property are at risk to storm surges, and the impacts of climate change.[1]

FIGURE 1. Elevation of South Africa[2]



South Africa is an upper middle-income country, with a relatively stable political environment. In 2020, it had a population of 59.3 million people, with an annual population growth rate of 1.3%. The country's population is projected to reach 66.4 million people by 2030 and 72.8 million people by 2050. Over two-thirds of the current population resides in urban areas, a rate expected to increase to 72% and 80% by 2030 and 2050, respectively.[3] The country has a Gross Domestic Product (GDP) of US$301.9 billion (2020), experiencing an annual growth rate of 0.2% in

[1] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[2] World Bank (2019). Internal Climate Migration Profile – South Africa.

[3] World Bank Open Data, Data Retrieved April 2021. Data Bank: Population Estimates and Projections, South Africa. URL: https://databank.worldbank.org/data/reports.aspx?source=health-nutrition-and-population-statistics:-population-estimates-and-projections

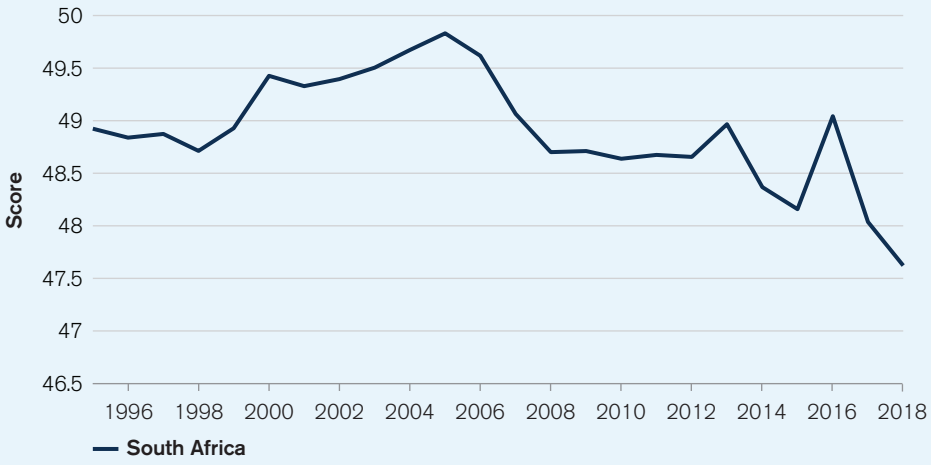
2019 and –7.0% in 2020 (**Table 1**).[4] The impacts of climate change on South Africa's overall economic growth have been predominantly negative and, in the future climate change in South Africa is anticipated to continue to severely hamper economic growth, energy generation, job creation, and inequality.[5]

TABLE 1. Data Snapshot: Key Development Indicators[6]

Indicator	
Life Expectancy at Birth, Total (Years) (2019)	64.1
Population Density (People per sq. km Land Area) (2018)	47.6
% of Population with Access to Electricity (2019)	85.0%
GDP per Capita (Current US$) (2020)	$5,090.70

The ND-GAIN Index[7] ranks 181 countries using a score which calculates a country's vulnerability to climate change and other global challenges as well as their readiness to improve resilience. This Index aims to help businesses and the public sector better identify vulnerability and readiness in order to better prioritize investment for more efficient responses to global challenges. Due to a combination of political, geographic, and social factors, South Africa is recognized as vulnerable to climate change impacts, ranked 92 out of 181 countries in the 2020 ND-GAIN Index. The more vulnerable a country is the lower their score, while the more ready a country is to improve its resilience the higher it will be. Norway has the highest score and is ranked 1st. **Figure 2** is a time-series plot of the ND-GAIN Index showing South Africa's progress through 2018.

FIGURE 2. ND-GAIN Index for South Africa



[4] World Bank Open Data, Data Retrieved April 2021. Data Bank: World Development Indicators, South Africa. URL: https://databank.worldbank.org/data/reports.aspx?source=2&country

[5] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[6] World Bank (2021). DataBank – World Development Indicators. URL: https://databank.worldbank.org/source/world-development-indicators

[7] University of Notre Dame (2020). Notre Dame Global Adaptation Initiative. URL: https://gain.nd.edu/our-work/country-index/

South Africa submitted its Nationally Determined Contribution to the UNFCCC in 2016 and published its Third National Communication in 2018, in support of the country's efforts to realize its development goals and increase its resilience to climate change by enhancing mitigation and adaptation efforts. South Africa is especially vulnerable to climate change given its water and food insecurity, as well as the potential impacts for health, human settlements, infrastructure, and critical ecosystem services. The country has integrated its climate change strategies with its development framework in support of robust plans to eliminate poverty and eradicate inequality. A central strategic focus is on the sustainability of the environment, water resources, land management, agriculture, and health.[8] At the time of writing, South Africa was finalizing the production of its Updated Nationally Determined Contribution.

Green, Inclusive and Resilient Recovery

The coronavirus disease (COVID-19) pandemic has led to unprecedented adverse social and economic impacts. Further, the pandemic has demonstrated the compounding impacts of adding yet another shock on top of the multiple challenges that vulnerable populations already face in day-to-day life, with the potential to create devastating health, social, economic and environmental crises that can leave a deep, long-lasting mark. However, as governments take urgent action and lay the foundations for their financial, economic, and social recovery, they have a unique opportunity to create economies that are more sustainable, inclusive and resilient. Short and long-term recovery efforts should prioritize investments that boost jobs and economic activity; have positive impacts on human, social and natural capital; protect biodiversity and ecosystems services; boost resilience; and advance the decarbonization of economies.

CLIMATOLOGY

Climate Baseline

Overview

South Africa is comprised of a large central plateau that is home to extensive grasslands, a continuous escarpment of mountain ranges that surround the plateau on the west, south and east, and a narrow strip of low-lying land along the coastline. The country is located within what is considered a 'drought belt' and is the fifth most water scarce country in sub-Saharan Africa. Approximately 50% of the country's water supplies are used by its extensive industrial agriculture sector. The country's topography varies from desert to semi-desert in the drier northwestern region to sub-humid and wet along the country's eastern coast; approximately 50% of the country is classified as arid or semi-arid.[9] South Africa has both sub-tropical and temperate climate conditions, which are influenced by the ocean along the east and west coasts as well as the interior plateaus, bringing a cool, wet climate in the Drakensberg region, to warm, sub-tropical in the northeast. The country has a Mediterranean climate in the southwest and a warm

[8] South Africa (2016). Nationally-Determined Contributions. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/South%20Africa%20First/South%20Africa.pdf

[9] Adaptation Partnership (2011). Review of Current and Planned Adaptation Action. South Africa. URL: https://www.preventionweb.net/files/25785_southafrica.pdf

dry desert environment in the central-west and northwest. Average annual rainfall in South Africa is approximately 456 millimeters (mm), with the Western Cape getting the majority of its rainfall in winter (June to August) and the rest of the country receiving summer (December to February) rainfall. Average temperatures in South Africa range from 15°C to 36°C in the summer and –2°C to 26°C in the winter.[10]

South Africa is highly vulnerable to climate variability and change due to the country's high dependence on rain-fed agriculture and natural resources, high levels of poverty, particularly in rural areas, and a low adaptive capacity.[11] The high evaporation rate of already dry soils and the virtual absence of permanent surface water over large parts of the country make water a scarce resource, with some projections indicating that even without climate change, the country is likely to run through its existing surface water resources in the near-term future. Primary challenges posed by climate include those related to water resource availability, changing precipitation patterns, and increasing population demands. Further, the climatic and socio-economic environments in semi-arid areas renders these communities vulnerable to food insecurity and unstable livelihoods and promotes unsustainable agroecological systems which suffer from crop failures and reduce the productivity of rangelands.[12]

Analysis of data from the World Bank Group's Climate Change Knowledge Portal (CCKP) (**Table 2**) presents information for the current climatology, 1991–2020. Mean annual temperature for South Africa is 18.3°C, with average monthly temperatures ranging between 22°C (December, January) and 11°C (June, July). Mean annual precipitation is 456.0 mm, with highest rainfall occurring November to March, coupled with extremely low precipitation occurring between June to August, for the latest climatology, 1991–2020 (**Figure 3**).[13] **Figure 4** shows the spatial representation observed annual precipitation and mean annual temperature across South Africa for the latest climatology.

TABLE 2. Data Snapshot: Summary Statistics

Climate Variables	1991–2020
Mean Annual Temperature (°C)	**18.3°C**
Mean Annual Precipitation (mm)	**456.0 mm**
Mean Maximum Annual Temperature (°C)	**26.0°C**
Mean Minimum Annual Temperature (°C)	**10.8°C**

[10] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[11] Adaptation Partnership (2011). Review of Current and Planned Adaptation Action. South Africa. URL: https://www.preventionweb.net/files/25785_southafrica.pdf

[12] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[13] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa URL: https://climateknowledgeportal.worldbank.org/country/south-africa/climate-data-historical

FIGURE 3. Average Monthly Temperature and Rainfall for South Africa, 1991–2020[14]

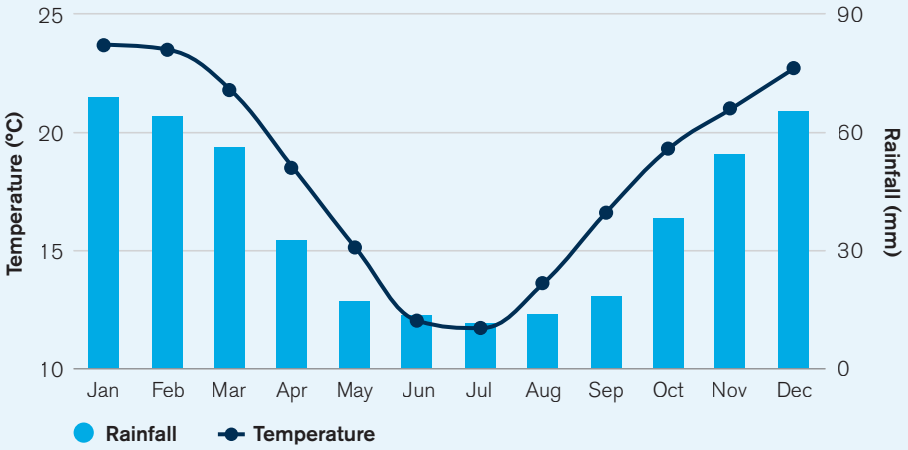
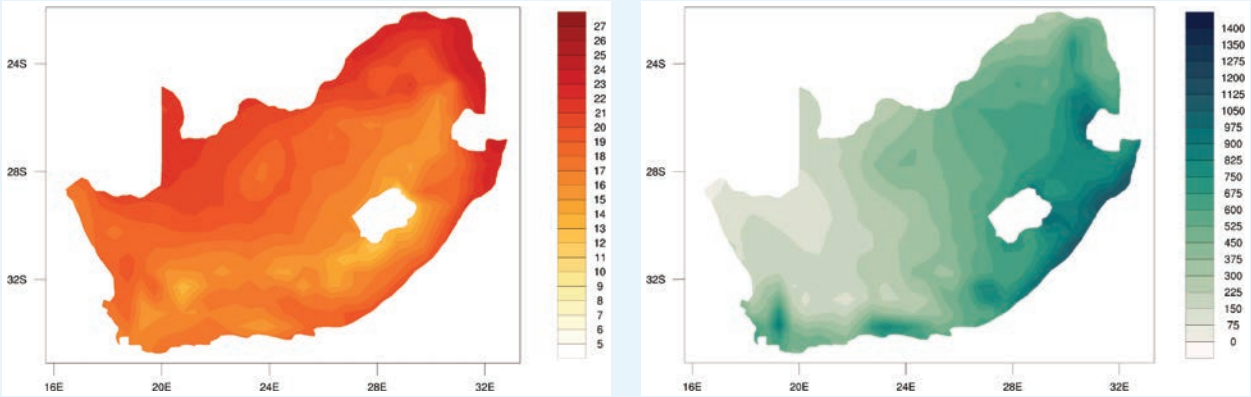


FIGURE 4. Map of Mean Annual Temperature (°C) (left); Annual Precipitation (mm) (right) for South Africa, 1991–2020[15]



Key Trends

Temperature

South Africa has already seen considerable temperature increases since the 1960s (**Figure 5**), when average temperatures have increased by 1.5°C, with more marked increases across arid, inland areas of the country. Both maximum and minimum daily temperatures have risen, across all seasons.[16] Temperature extremes have also increased significantly, both in frequency and intensity, while low particularly in the western and northern interior

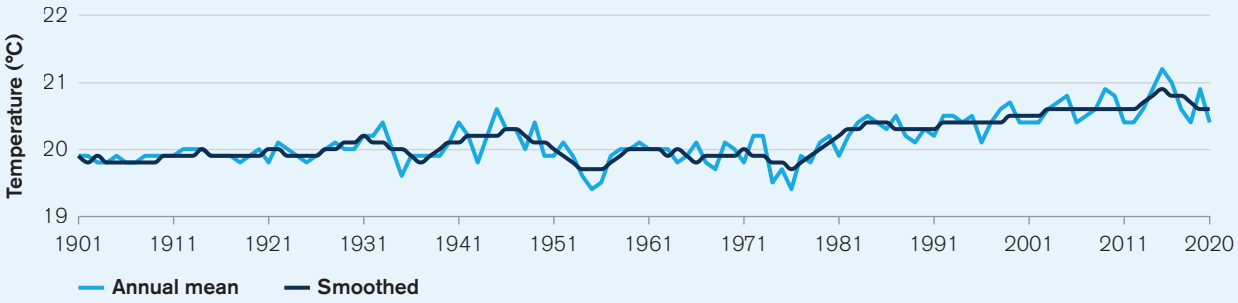
[14] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa URL: https://climateknowledgeportal.worldbank.org/country/south-africa/climate-data-historical

[15] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa. URL: https://climateknowledgeportal.worldbank.org/country/south-africa

[16] USAID (2018). Building Urban Resilience to Climate Change – A review of South Africa. URL: https://www.climatelinks.org/sites/default/files/asset/document/180327_USAID-ATLAS_Building%20Urban%20Resilience%20to%20CC_South%20Africa_to%20CL_rev.pdf

regions of the country are becoming rarer. Notably, the rate of temperature change has fluctuated, with the highest rates of increase identified during the mid 1970s to early 1980s, with highest rates again observed in the late 1990s to mid 2000s.[17]

FIGURE 5. Observed Temperature for South Africa, 1901–2020[18]



Precipitation

Precipitation trends have continued to exert a high degree of interannual variability for South Africa, as they have for southern Africa as a whole. Since the 1960s, a marginal reduction in rainfall was experienced during the autumn months.[19] While annual rainfall trends are weak overall, observations appoint to potentially significant decreases in the number of rain days across almost all hydrological zones, implying a tendency towards an increase in the intensity of rainfall events, coupled with prolonged dry spells.[20] High inter-annual rainfall variability is evident in the historical record, with above average rainfall value received during 1970s, late 1980s and mid-to-late 1990s. However, below average rainfall values were observed in the early 2000s.

Climate Future

Summary Statistics

The main data source for the World Bank Group's Climate Change Knowledge Portal (CCKP) is the CMIP5 (Coupled Model Inter-comparison Project Phase5) data ensemble, which builds the database for the global climate change projections presented in the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). Four Representative Concentration Pathways (i.e. RCP2.6, RCP4.5, RCP6.0, and RCP8.5) were selected and defined by their total radiative forcing (cumulative measure of GHG emissions from all sources) pathway and level by 2100. The RCP2.6 for example represents a very strong mitigation scenario, whereas the RCP8.5 assumes

[17] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[18] WB Climate Change Knowledge Portal (CCKP, 2021). South Africa URL: https://climateknowledgeportal.worldbank.org/country/south-africa/climate-data-historical

[19] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[20] USAID (2018). Building Urban Resilience to Climate Change – A review of South Africa. URL: https://www.climatelinks.org/sites/default/files/asset/document/180327_USAID-ATLAS_Building%20Urban%20Resilience%20to%20CC_South%20Africa_to%20CL_rev.pdf

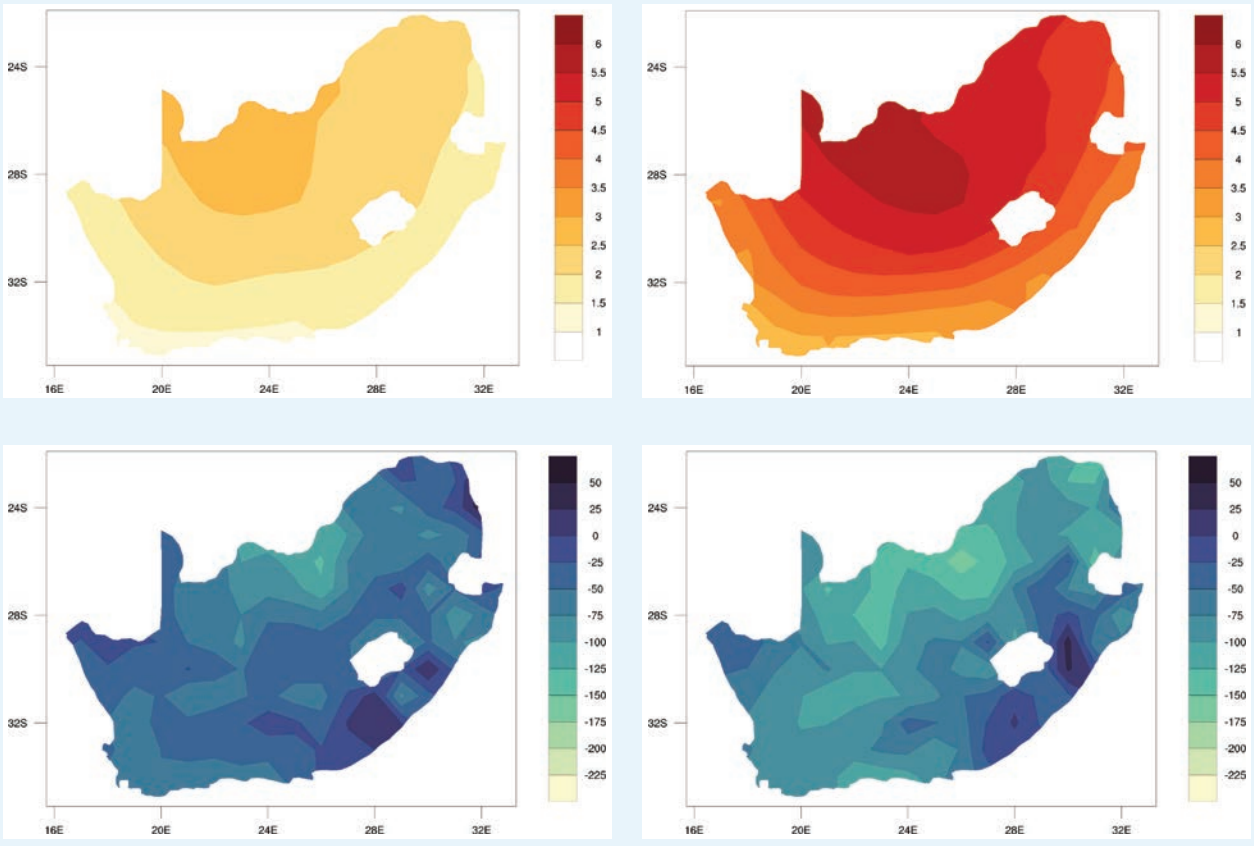
business-as-usual scenario. For more information, please refer to the RCP Database. For simplification, these scenarios are referred to as a low (RCP2.6); a medium (RCP4.5) and a high (RCP8.5) emission scenario in this profile. **Table 3** provides CMIP5 projections for essential climate variables under high emission scenario (RCP8.5) over 4 different time horizons. **Figure 6** presents the multi-model (CMIP5) ensemble of 32 Global Circulation Models (GCMs) showing the projected changes in annual precipitation and temperature for the periods 2040–2059 and 2080–2099.

TABLE 3. Data Snapshot: CMIP5 Ensemble Projections

CMIP5 Ensemble Projection	2020–2039	2040–2059	2060–2079	2080–2099
Annual Temperature Anomaly (°C)	**+0.5 to +1.7** (+1.2°C)	**+1.4 to +2.9** (+2.0°C)	**+2.4 to +4.4** (+3.2°C)	**+3.3 to +6.0** (+4.2°C)
Annual Precipitation Anomaly (mm)	**–16.2 to +14.0** (–1.6 mm)	**–21.4 to +11.9** (–3.7 mm)	**–22.2 to +13.2** (–4.3 mm)	**–26.1 to +12.4** (–5.9 mm)

Note: The table shows CMIP5 ensemble projection under RCP8.5. Bold value is the range (10th–90th Percentile) and values in parentheses show the median (or 50th Percentile).

FIGURE 6. CMIP5 Ensemble Projected Change (32 GCMs) in Mean Annual Temperature (top) and Precipitation (bottom) by 2040–2059 (left) and by 2080–2099 (right), Relative to 1986–2005 Baseline Under RCP8.5[21]



[21] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa Projected Future Climate. URL: https://climateknowledgeportal.worldbank.org/country/south-africa/climate-data-projections

Key Trends

Temperature

Rising temperatures are expected to continue for the region and specifically for South Africa, with mean monthly temperatures projected to rise 2.0°C by the 2050s and 4.2°C by the 2090s, under a high-emission scenario (RCP8.5). The most pronounced increases in temperature are projected for the summer months, between November to March. As temperatures rise, more intense heat waves and higher rates of evapotranspiration will follow, affecting multiple aspects of local economic development and agricultural productivity.[22] Warming is expected to be most pronounced in the western and central interior regions of the country. One of the most serious consequences of increased heat for South Africa is the projected increase in the number of 'hot days' (TMax >35°C). By mid-century, the Northern Cape, North West and Limpopo will all likely see an increase of 'hot days' of 20 and 40 days per year; while by the end of the century projections that hot days will occur more than 120 days per year across the country's interior.[23]

Across all emission scenarios, temperatures will continue to rise in South Africa throughout the end of the century. As seen in **Figure 7**, under a high-emission scenario (RCP 8.5), average temperatures are projected to increase rapidly by mid-century. Across the seasonal cycle, temperature increases will be most pronounced between April to September (**Figure 8**) Rising heat and extreme heat conditions will result in significant implications for human and animal health, agriculture, water resources, and ecosystems.

FIGURE 7. Projected Average Temperature for South Africa (Reference Period, 1986–2005)[24]

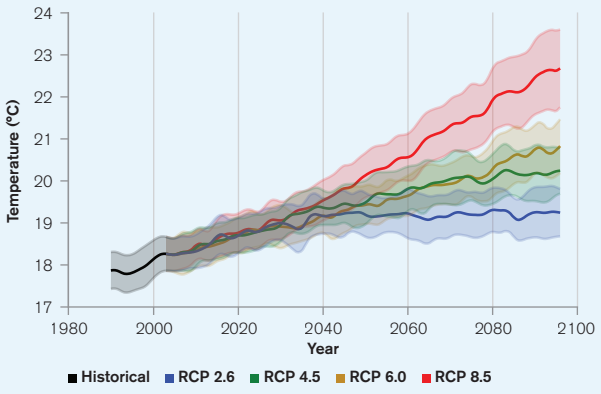
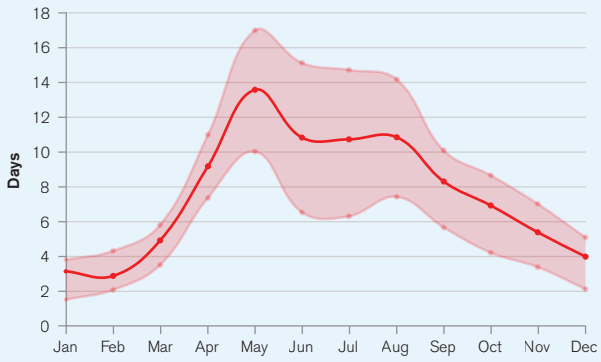


FIGURE 8. Projected Change in Summer Days (Tmax >25°C) (RCP8.5, Reference Period, 1986–2005)[25]



[22] USAID (2016). Climate Change Risk Profile – Southern Africa. Regional Fact Sheet. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016%20CRM%20Fact%20Sheet%20-%20Southern%20Africa.pdf

[23] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

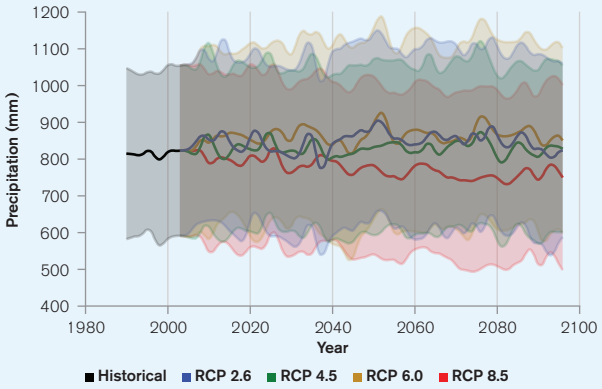
[24] WBG Climate Change Knowledge Portal (CCKP, 2021). Interactive Climate Indicator Dashboard – Agriculture. South Africa. URL https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=ZAF&period=2080-2099

[25] WBG Climate Change Knowledge Portal (CCKP, 2021). Interactive Climate Indicator Dashboard – Agriculture. South Africa. URL https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=ZAF&period=2080-2099

Precipitation

Rainfall in South Africa is highly variable. The southwestern Cape is a rainfall region that receives the bulk of its annual rainfall in the form of frontal rain during (austral) winter, with west coast areas being arid to semi-arid. While rainfall projections remain uncertain, a majority of models point to annual rainfall declines for the country, although winter rainfall amounts are projected to increase along the east coast areas and the eastern escarpment.[26] A drier dry-season (April and May) is projected for the cities of Durban, and Cape St. Lucia (Northeastern coast) is expected to receive mixed wetter and drier results for the other months of the year. By mid-century, a drying trend is also projected for western portions of the country, extending into desert areas of Namibia and Botswana by end of the century. The southwestern regions of the country are thought to be at high-risk of severe droughts during this century and beyond. During the austral summer months (November to March), dry conditions are projected for the southwestern region of South Africa. Additionally, austral spring months (August to October) are projected to be drier, implying a delay in the seasonal summer rains.[27] **Figure 9** shows the projected annual average precipitation for South Africa,[28] pointing to projected decrease in average annual precipitation by the of the century under a high emissions scenario (RCP8.5).

FIGURE 9. Projected Annual Average Precipitation in South Africa (Reference Period, 1986–2005)[29]



CLIMATE RELATED NATURAL HAZARDS

Overview

South Africa is likely to become hotter and drier in the future, with rainfall variability continuing and temperatures rising, the country will continue to experience extreme events like droughts, floods, and other climate-related hazards.[30] This will likely result in adverse environmental impacts including soil erosion, deforestation, recurrent droughts, desertification, land degradation, and the loss of biodiversity including the country's unique wildlife populations. Key

[26] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[27] USAID (2015). Climate Change Information Fact Sheet – South Africa. URL: https://www.climatelinks.org/sites/default/files/asset/document/South%20Africa%20Climate%20Info%20Fact%20Sheet_FINAL.pdf

[28] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa Water Dashboard. Data Description. URL: https://climateknowledgeportal.worldbank.org/country/south-africa/climate-sector-water

[29] WBG Climate Change Knowledge Portal (CCKP, 2021). Climate Data-Projections. South Africa. URL: https://climateknowledgeportal.worldbank.org/country/south-africa/climate-sector-water

[30] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

sectors including agriculture and livestock, health, water resources, and tourism are increasingly vulnerable. Water resources are likely to be increasingly strained as warmer temperatures accelerate the rate of evapotranspiration for the country. As droughts become more frequent and severe water supplies, biodiversity, and agriculture are likely to suffer. A potentially simultaneous increase in floods poses a serious threat to water quality, affecting the integrity of wetland ecosystems as well as agriculture and livestock communities.[31]

South Africa already experiences a high degree of risk from natural hazards and disasters, in particular to droughts, floods, and storm-related events, such as high winds, coastal storm surges, and hail, all of which are likely to be exacerbated by climate change. Extreme rainfall events already result in costly infrastructure repairs, road closures, limiting access to electricity, and flooding and pollution as sewage and storm water systems are overwhelmed. Temperature anomalies are also already affecting critical infrastructure, such as roads and rail lines. Rainfall and temperature changes will continue to affect agriculture and food security, and extreme weather events can hamper tourism and the livelihoods that depend on the sector. Past flooding has already contaminated water supplies. Additionally, decreased rainfall and higher temperatures (including heat waves) have led to significant water restrictions and increased demand for water and energy for cooling across all sectors. Extreme rainfall continues to erode soils, degrade lands, and put ecosystems and the services they provide at risk. Finally, increased sedimentation rates due to more intense rainfall can reduce the storage capacity of critical dams.[32]

Data from the Emergency Event Database: EM-Dat database, presented in **Table 4**, shows the country has endured various natural hazards, including floods, landslides, epidemic diseases, and storms.

TABLE 4. Natural Disasters in South Africa, 1900–2020[33]

Natural Hazard 1900–2020	Subtype	Events Count	Total Deaths	Total Affected	Total Damage ('000 USD)
Drought	Drought	11	0	20,925,000	2,585,000
Earthquake	Ground Movement	5	37	3,112	20,000
Epidemic	Bacterial Disease	4	323	111,960	0
	Viral Disease	1	1	0	0
Extreme Temperatures	Cold Wave	2	52	0	0
	Heat Wave	1	11	20	0
Flood	Flash Flood	6	232	9,212	123,300
	Riverine Flood	19	822	509,196	1,651,729
Landslide	Landslide	1	34	0	0
Wildfire	Forest Fire	2	30	1,600	0
	Land Fire (Brush, Bush, Pasture)	7	97	5,780	440,000
Storm	Convective Storm	20	148	148,558	1,275,041
	Tropical Storm	2	64	501,350	92,000

[31] USAID (2016). Climate Change Risk Profile – Southern Africa. Regional Fact Sheet. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016%20CRM%20Fact%20Sheet%20-%20Southern%20Africa.pdf

[32] Department of Environmental Affairs (2016). South Africa National Adaptation Strategy (Draft). URL: https://www.environment.gov.za/sites/default/files/docs/nas2016.pdf

[33] EM-DAT: The Emergency Events Database – Universite catholique de Louvain (UCL) – CRED, D. Guha-Sapir, Brussels, Belgium. URL: http://emdat.be/emdat_db/

Key Trends

Climate change is expected to increase the risk and severity of water scarcity and drought across South Africa, affecting all sectors, including water, agriculture and forestry, human health, marine fisheries, and biodiversity. Additionally, the projected increased frequency of intense rainfall events will increase the risk of floods, both through river bank over flow and flash flooding. Intense rainfall and flooding may also result in soil erosion and water logging of crops, potentially reducing yields and food insecurity; particularly for subsistence farmers. Small rural farmers are more sensitive to impacts of disasters (floods, dry periods) because they have limited resources with which to influence and increase adaptive capacity.[34] Higher temperatures and the resultant increases in aridity may also lead to livestock stress.[35] This is likely to result in significant economic losses, damage to agricultural lands, and infrastructure as well as human casualties.

The three most significant drivers of climate-related disasters in South Africa are drought, floods, and wildfires. Drought affected an estimated 15 million South Africans between 1980 and 2013. The floods that occurred between1980–2013 affected over 483,000 people. Wildfire damage to agriculture and forestry is also significant. Coastal storms can impact developments, infrastructure, fishing communities, as well as coastal biodiversity. Annually, these disasters incur approximately Rand 3 billion (US$163.3 million) a year in damages.

Increasingly, droughts and floods, along with rising temperatures and sea levels, are presenting new challenges for municipalities in South Africa. For example, recently, the Western Cape struggled with one of the worst droughts in 100 years, severely limiting water supplies in urban areas. Water scarcity is expected to increase, impacting the central, northern and southwestern regions, potentially constraining development goals and exacerbating conflicts between agricultural and urban/industrial users.[36] Future flood risk is also likely to increase across the entire country, but particularly in KwaZulu-Natal, the Eastern Cape and Limpopo. In May 2017, a storm resulted in very heavy rainfall with over 100 mm of rain occurring in the city of Durban within a 24-hour period, with floods forcing evacuations, damaging homes, cars and infrastructure.[37] As flood risks rise, so too will the incidence of waterborne diseases common in South Africa, such as cholera, dysentery, typhoid, and other rotavirus infections.[38] Coastal cities such as Cape Town, Durban and Port Elizabeth are at risk from rising sea levels that could impact infrastructure and important economic sectors, such as tourism and fisheries. Rising temperatures can additionally lead to increased heat-related human health risks, such as heat stress and respiratory illnesses.

Disaster risks from rising temperatures are expected to (i) exacerbate existing tensions for water between agricultural and livestock needs as well as human populations needs, especially during the dry season; (ii) alter water quality from available surface and groundwater sources; and (iii) increase pressures on urban zones as urbanization rates grow.[39]

---

[34] FAO (2018). Partnering for Sustainable Development and Resilient Communities – South Africa. URL: http://www.fao.org/3/ax279e/AX279E.pdf

[35] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[36] USAID (2018). Building Urban Resilience to Climate Change – A review of South Africa. URL: https://www.climatelinks.org/sites/default/files/asset/document/180327_USAID-ATLAS_Building%20Urban%20Resilience%20to%20CC_South%20Africa_to%20CL_rev.pdf

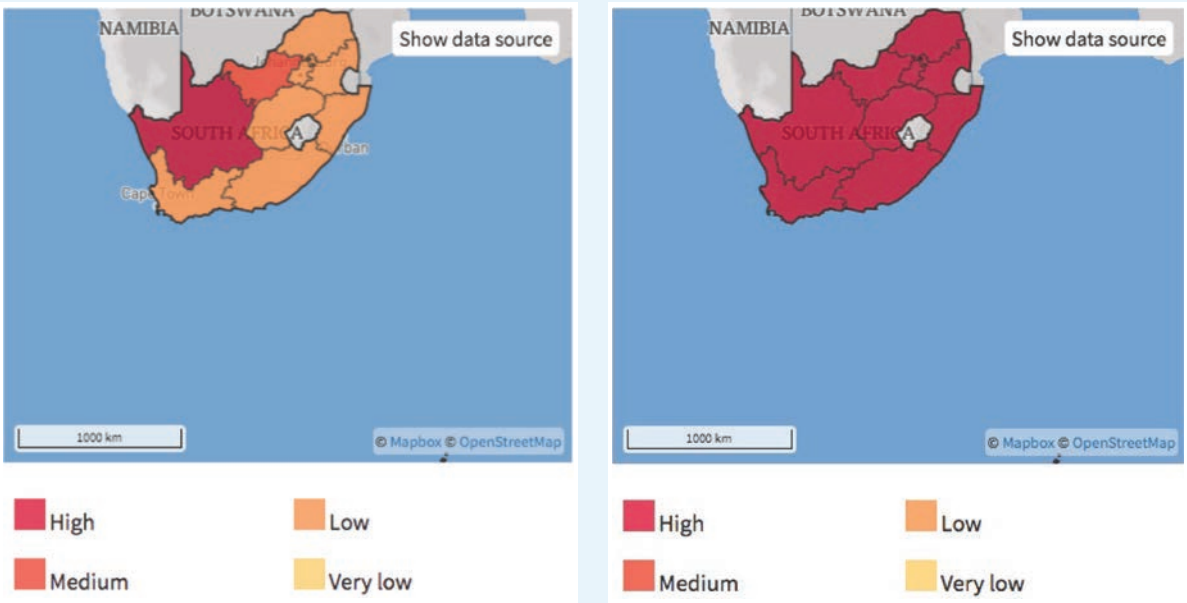
[37] Davies, Richard. (2017). South Africa Hundreds Evacuated, 1 Feared Dead After Floods in KwaZulu-Natal. Flood list. URL: http://floodlist.com/africa/south-africa-floods-kwazulu-natal-may-2017

[38] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[39] USAID (2018). Building Urban Resilience to Climate Change – A review of South Africa. URL: https://www.climatelinks.org/sites/default/files/asset/document/180327_USAID-ATLAS_Building%20Urban%20Resilience%20to%20CC_South%20Africa_to%20CL_rev.pdf

Changing rainfall patterns will significantly alter agricultural productivity and shift harvest seasons, as later rainfall onsets expected to impact crop productivity as well as livestock health. Droughts remain one of the key drivers of food insecurity for the country, with increased aridity and drought resulting in crop damage, loss of pasture and water sources, loss of animals, hunger, disease outbreaks, asset depletions, malnutrition, and migration. Rising temperatures and degraded agricultural conditions are expected to adversely affect 'working days', impacting the livelihoods and the economic resilience of vulnerable groups. **Figure 10** present the risk of urban flooding and wildfires for South Africa.

FIGURE 10. Risk of Urban Flooding (left)[40]; Risks of Wildfires (right)[41]



Implications for DRM

The country is currently guided by the Disaster Management Act (2002) and Disaster Management Framework (2005).[42] The Government of South Africa is focused on the prevention, mitigation, preparedness, response and recovery to disasters and is working to integrate an effective disaster management strategy into sectoral policies and programs. This work is led by the National Disaster Management Advisory Forum, a technical committee tasked with coordinating and managing disaster recovery and preparedness actions. Currently, South Africa is working to mainstream its disaster risk reduction, adaptation, and management into development activities. Efforts are also ongoing to ensure these tasks are aligned with key policy goals, shifting thinking towards more pro-active risk reduction and adaptation planning from a current largely re-active system.

[40] ThinkHazard! (2020). South Africa – Urban Flooding. URL: http://thinkhazard.org/en/report/227-south-africa/UF
[41] ThinkHazard! (2020). South Africa – Wild Fires. URL: http://thinkhazard.org/en/report/227-south-africa/WF
[42] South Africa (2005). South Africa National Disaster Management Framework. URL: https://www.gov.za/sites/default/files/gcis_document/201409/275340.pdf

South Africa's key economic sectors are highly vulnerable to climate variability and change. The impacts of climate change are already being experienced across the country. Water scarcity and drought conditions are expected to increase the risks of food insecurity, and may exacerbate conflict situations over scarce resources, potentially forcing additional population displacement. Sea level rise will also impact much of the country's coast.[43]

As urbanization rates grow, so do the challenges facing municipalities in terms of providing critical lifeline services and related infrastructure. These challenges are compounded by climate stressors, such as floods and droughts, which put additional pressure on service delivery and finances.[44] Environmental degradation, altered quality and quantity of available water resources, and loss of biodiversity and ecosystem services constitute serious obstacles to the country's continued development and poverty reduction efforts, increasing vulnerability.[45]

Gender

An increasing body of research has shown that climate-related disasters have impacted human populations in many areas including agricultural production, food security, water management, and public health. The level of impacts and coping strategies of populations depends heavily on their socio-economic status, socio-cultural norms, access to resources, poverty as well as gender. Research has also provided more evidence that the effects are not gender neutral, as women and children are among the highest risk groups. Key factors that account for the differences between women's and men's vulnerability to climate change risks include: gender-based differences in time use, access to assets and credit, treatment by formal institutions, which can constrain women's opportunities, limited access to policy discussions and decision making, and a lack of sex-disaggregated data for policy change.[46]

Agriculture

Overview

Agriculture is a critical sector for the South African economy, upon which local livelihoods depend. The sector employs more than 860,000 people, contributes significantly to food security and export revenues. Maize dominates the sector, followed by wheat and to a lesser extent sugar cane and sunflower seed. Livestock production is a significant part of the sector. While the country's agriculture sector is diverse, it includes both commercial and subsistence farming systems. Only 14% of the country is considered arable, with just one-fifth of this land characterized as having high agricultural potential. The climate is critical driver of agricultural activities and suitability across the

[43] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[44] USAID (2018). Building Urban Resilience to Climate Change – A review of South Africa. URL: https://www.climatelinks.org/sites/default/files/asset/document/180327_USAID-ATLAS_Building%20Urban%20Resilience%20to%20CC_South%20Africa_to%20CL_rev.pdf

[45] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[46] World Bank Group (2016). Gender Equality, Poverty Reduction, and Inclusive Growth. URL: http://documents1.worldbank.org/curated/en/820851467992505410/pdf/102114-REVISED-PUBLIC-WBG-Gender-Strategy.pdf

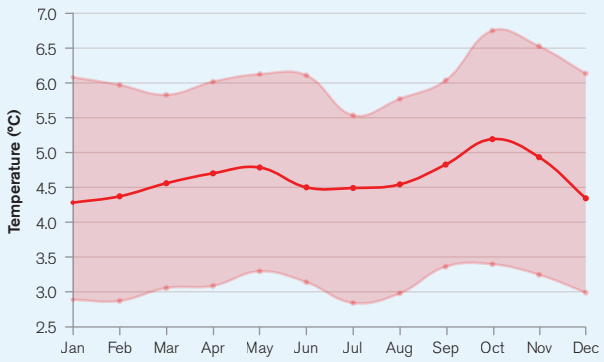
country. Climate change is expected to have generally adverse impacts on cereal crop production, high value export agricultural production and intensive animal husbandry practices.[47] However, climate change trends are likely to positively impact the productivity of key tropical crops, such as sugarcane, though these gains could also be offset by increased pest diversity and distribution.

Climate Change Impacts

The projected impacts from a changing climate to food production, agricultural livelihoods, and food security in South Africa are significant national policy concerns. Impacts are crucially linked to future projected water supply constraints. Subsistence, dry-land farmers are more vulnerable to climate change than commercial farmers, as large-scale irrigated production relies heavily on irrigation.[48] Increased heat stress is likely to hamper crop productivity and more variable rainfall will likely alter the growing seasons. Reduced water availability will likely also not only reduce yields, but also increase soil moisture deficits, potentially changing the suitable areas for agriculture or the production of specific crops.[49] As droughts and prolonged dry periods become more intense and prolonged, land degradation will likely continue and may further intensify. Rising temperatures, particularly the number of 'very hot days' (TMax >35°C) are likely to increase the presence of pests and risks of wildfires. As extreme events become more intense and more frequent, 'regulating services' such as soil water maintenance, base flows and filtration, will likely also suffer.[50]

Under present climate conditions, heat stress already poses challenges for heat dissipation in livestock populations, rendering them vulnerable to heat stress during certain periods of the year. Heat stress can reduce milk production and reproduction, particularly for cattle. As heat increase, so is the likelihood of altered growing seasons. Concurrently, as water availability is reduced, so will it likely increase soil moisture deficits and crop yields. **Figure 11** shows the projected change in average daily maximum temperatures for South Africa as a whole across the seasonal cycle; higher temperatures are expected throughout the year

FIGURE 11. Projected Change in Average Daily Maximum Temperature for South Africa (RCP8.5, Reference Period, 1986–2005)[51]



[47] DEA (2014). *Climate Change and the Agricultural Sector.* Climate and Impacts Factsheet Series. Long-Term Adaptation Scenarios Flagship Research Programme. URL: https://www.environment.gov.za/sites/default/files/docs/climate_trends_bookV3.pdf

[48] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[49] USAID (2016). Climate Change Risk Profile – Southern Africa. Regional Fact Sheet. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016%20CRM%20Fact%20Sheet%20-%20Southern%20Africa.pdf

[50] USAID (2016). Climate Change Risk Profile – Southern Africa. Regional Fact Sheet. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016%20CRM%20Fact%20Sheet%20-%20Southern%20Africa.pdf

[51] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa Agriculture. Dashboard URL: https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=ZAF&period=2080-2099

Adaptation Options

The challenges posed by climate change problems are super-imposed upon the many other stressors that the South African agriculture sector already faces due to environmental degradation, disease outbreaks, and higher input costs, which are themselves compounded by issues of land rights and inequality. Adaptation options for the sector include implementing climate smart agriculture practices, improving water management, monitoring and early warning, the development of knowledge and decision-support systems, and the development of new crop varieties and technologies to support farming systems. Barriers to adaptation are linked to a much-reduced extension service network and a slow uptake of Climate Smart Agriculture and Conservation Agriculture techniques. Conversely, there are clearly potential benefits from a changing climate for some crops as CO_2 levels increase, but these are also temperature- and rainfall-dependent.[52] Implementing soil and water conservation strategies should be a focus.

Water

Overview

Across South Africa's arid and semi-arid climate, less than 9% of the annual rainfall received filters into the region's rivers and only about 5% goes on to recharge groundwater aquifers. As a result, South Africa is a highly water-stressed country and highly vulnerable to a changing climate. Projected climate change impacts on the water sector in South Africa could exacerbate existing conflicts and further increase inequalities regarding as the limited access to potable water.[53]

Climate Change Impacts

Changes in the quality and availability of water will be the dominant challenge for the country through the end of the century. Stream flows for the Limpopo and Okavango catchments are projected to decrease by 35% and 20%, respectively. More variable rainfall is also likely to increase disasters associated with droughts, floods, and waterborne diseases. For the region, water resources cut across a number of transboundary basins and are unevenly distributed, both seasonally and geographically. This presents a significant challenge and concern for the region. Currently, a majority of the region already faces supply deficits during at least part of the year, limiting development goals. Rising water demand and increased pollution across shared water resources are a critical problem. Droughts and floods are common events, as are a number of natural cycles of climate variability that cause flood pulsing. Infrastructure developments intended to safeguard water supplies have increased the geographical imbalance of water resources, as dams are built to store water

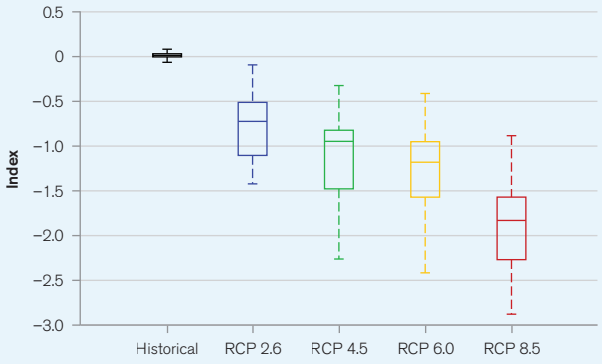
[52] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[53] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

during the unpredictable and often long dry periods, particularly in South Africa. Currently, South Africa does not have the capacity to expand its water storage or increase its generation of hydropower. Rising temperatures are expected to decrease water availability and thus stream flows, increasing evapotranspiration and reducing runoff. As rainfall events become more intense, there is an increased likelihood of floods, potentially compromising irrigation potentials.[54]

Rainfall and evaporative changes can also alter water infiltration and groundwater recharge rates This has the potential to further decrease the reliability of unimproved groundwater sources and surface water sources during droughts or prolonged dry periods. These can increase strain on pumping mechanisms, leading to breakdowns if maintenance is neglected.[55] **Figure 11** shows the projected changes in the annual Standardized Precipitation Evapotranspiration Index (SPEI) for drought across South Africa. SPEI is a drought index which represents the measure of the given water deficit in a specific location, accounting for contributions of temperature-dependent evapotranspiration and providing insight into increasing or decreasing pressure on water resources. Negative values for SPEI represent dry conditions, with values below –2 indicating severe drought conditions, likewise positive values indicate increased wet conditions. This is an important understanding for the water sector in regards to quantity and quality of supply for human consumption and agriculture use as well as for the energy sector as reductions in water availability impacts river flow and the hydropower generating capabilities. South Africa is projected to experience heightened dry conditions and increased pressure on water resources by mid-century and by end of the century is likely to be experience severe drought conditions and water scarcity. While **Figure 12** shows the projected intensity of SPEI for South Africa at a nationally aggregated scale, **Figure 13** shows the spatial variation of SPEI for the 2050s and 2090s, under emissions scenario RCP8.5. The southwestern areas of South Africa are projected to experience the most severe drought conditions.

FIGURE 12. Projected Annual SPEI Drought Index in South Africa (Reference Period, 1986–2005)[56]

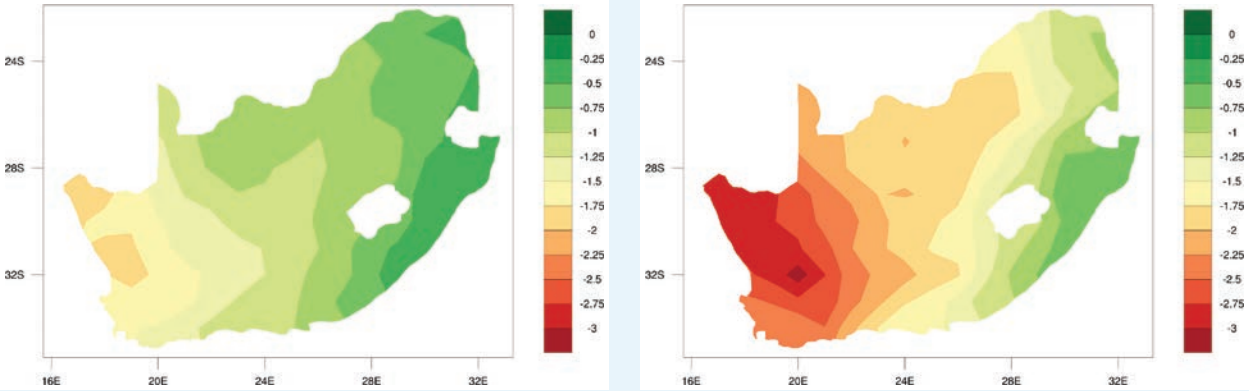


[54] USAID (2016). Climate Change Risk Profile – Southern Africa. Regional Fact Sheet. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016%20CRM%20Fact%20Sheet%20-%20Southern%20Africa.pdf

[55] IOM (2017). Spaces of vulnerability and areas prone to natural disaster and crisis in six SADC countries. Disaster risks and disaster risk management capacity in Botswana, Malawi, Mozambique, South Africa, Zambia and Zimbabwe. URL: https://publications.iom.int/system/files/pdf/spaces_of_vulnerability.pdf

[56] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa Water Sector Dashboard. URL: https://climatedata.worldbank.org/CRMePortal/web/water/land-use-/-watershed-management?country=ZAF&period=2080-2099

FIGURE 13. Projected SPEI for South Africa by 2040–2059 (left) and by 2080–2099 (right), Relative to 1986–2005 Baseline, Under RCP8.5[57]



Adaptation Options

South Africa's current water usage already exceeds the available resource, and extreme fluctuations in rainfall translate into fairly large water use restrictions during years of drought. Additional water resource capacity is required and needs to be developed in order to meet a growing demand for domestic needs. Water resource management strategies need to incorporate sourcing from catchment and river systems, storage, abstraction, and securing return-flows from irrigation projects. At present, there are 794 large dams in the country (dams are considered to have a wall height ≥15 m, or a wall height between 5 and 15 m and a storage capacity exceeding 3 million m^3), with a combined storage capacity in the order of 31 billion m^3, and over two-thirds of the country's mean annual runoff is stored in these dams. As a water-scarce country, the river systems and aquifers are already highly used and developed, though poor maintenance makes them highly degraded.[58]

Sustainable and reliable storage and use of the water resources of South Africa is a top priority that needs to be guided by a robust water resources management policy that promotes the efficient, equitable, and optimum utilization of the resource. South Africa has integrated water management into all important economic sectors and has developed a National Water Master Plan to support its broader climate change adaptation agenda.[59] Planning and adaptation strategies for water resources should also be included within development strategies for agriculture, infrastructure, and energy sectors.

[57] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa Agriculture. Dashboard URL: https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=ZAF&period=2080-2099

[58] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[59] South Africa (2016). Nationally-Determined Contributions. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/South%20Africa%20First/South%20Africa.pdf

Energy

Overview

South African energy is highly dependent on the country's cheap and abundantly available coal, which comprises roughly 92% of energy generation, which is supplemented through crude oil imports. A limited quantity of natural gas is also available for energy production. Enriched uranium is imported for South Africa's nuclear power plant, Koeberg. Hydropower is the primary source of renewable energy for the country, however as of 2017, it comprised just 1% of energy generation, followed by biomass and solar. The government plans to diversify the country's energy supply by promoting the use of renewable energy technologies and improving efficiencies throughout the economy.[60] South Africa's strong economic growth, expanding tourism sector, and population growth will put greater demand on energy production in the near- and long-term future.[61]

Climate Change Impacts

Rising temperatures already pose limitations to the cooling capacities of power generating stations, reducing outputs. Rising temperatures are likely to alter future demand for electricity, increasing peak load demands during hotter summers. Projected trends in rainfall and temperature are also expected to increase costs of maintenance and repair to power and energy infrastructure, in addition to disrupting supplies and transmission. As runoff and surface water availability is reduced, so will hydropower generation; which is a challenge for South Africa in terms of meeting its renewable energy goals.[62]

Cooling Degree Days show the relationship between daily heat and cooling demand, typically sourced through a form of active cooling or an evaporative process. The change in cooling degree days provides insight into the potential for extended seasons of power demand or periods in which cooling demand (power demands) might increase. As seen **Figure 14**, seasonal increases for cooling demands are expected to increase over an extended summer period (September to April). Warm Spell Duration represents the number of days in a sequence of at least six days in which the daily maximum temperature is greater than the 90th percentile of daily maximum temperature. As shown in **Figure 15**, warm spells are expected to sharply increase in the second half of the century.

[60] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[61] EC-LEDS (2015). Development Impact Assessment Case Study: South Africa. URL: https://www.nrel.gov/docs/fy15osti/61757.pdf

[62] USAID (2016). Climate Change Risk Profile – Southern Africa. Regional Fact Sheet. URL: https://www.climatelinks.org/sites/default/files/asset/document/2016%20CRM%20Fact%20Sheet%20-%20Southern%20Africa.pdf

FIGURE 14. Projected Change in Cooling Degree Days (65°F) in South Africa for the Period 2040–2059 (Reference Period, 1986–2005)[63]

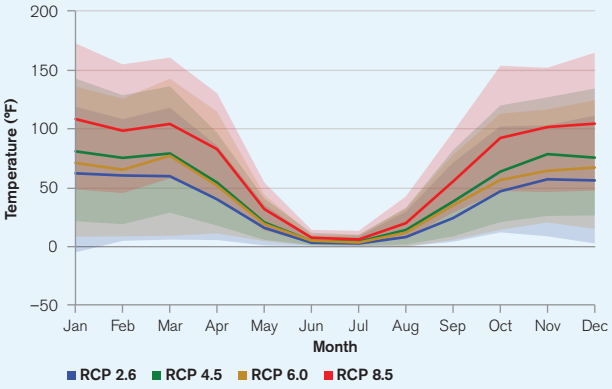
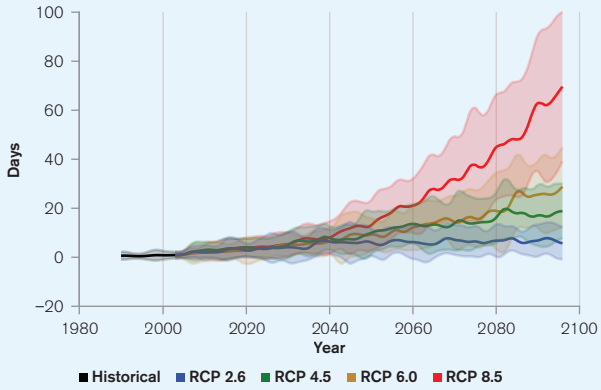


FIGURE 15. Projected Warm Spell Duration Index in South Africa (Reference Period, 1986–2005)[64]



Adaptation Options

Energy generation, transmission, and expanded use is critical to the overall development agenda and economic growth of South Africa. Additionally, South Africa is a major energy supplier for Southern Africa and reductions in energy generation could result in adverse trickle-down impacts for the region. The country's Energy Strategy is focused on supporting the country's transition to a low carbon economy, with major implications for its energy sector. Since 2016, substantial investments have been made in renewable energy and two new high-efficiency coal-fired power stations are nearing completion as part of the ageing plant replacement program. In addition, programs to increase efficiency and reduce emissions across the economy are being rolled out.[65]

Health

Overview

While South Africa is a middle-income country, it still faces high poverty and has one of the highest inequality rates in the world, making the health of the country's population vulnerable to climate change impacts. Climate change projections point to continued rising temperatures, more variable rainfall, rising seas, and more frequent extreme weather events. Impacts are expected in food and water security, human settlements, infrastructure and ecosystems, as well as health. Health impacts are expected to be realized through increasing heat stress, the altered range, seasonality and distribution of vector-borne diseases including malaria, dengue fever and yellow fever, air pollution and associated respiratory illnesses, communicable diseases such as HIV/AIDS, as well as water-borne illnesses such as cholera and diarrheal disease.[66]

---

[63] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa – Energy. URL: https://climateknowledgeportal.worldbank.org/country/south-africa/climate-sector-energy

[64] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa Energy Sector Dashboard. URL: https://climatedata.worldbank.org/CRMePortal/web/energy/oil-gas-and-coal-mining?country=ZAF&period=2080-2099

[65] South Africa (2016). Nationally-Determined Contributions. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/South%20Africa%20First/South%20Africa.pdf

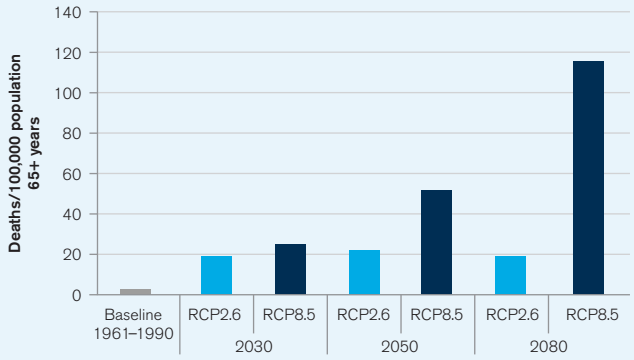
[66] WHO (2015). Climate and Health Country Profile – South Africa. URL: https://apps.who.int/iris/bitstream/handle/10665/246153/WHO-FWC-PHE-EPE-15.44-eng.pdf?sequence=1

Climate Change Impacts

In addition to coastal flooding due to rising seas, inland river floods are common in South Africa. By the 2030s, an additional 8,500 people may be at risk of river floods annually as a result of climate change and 8,000 due to socio-economic change above the estimated 45,900 annually affected population in 2010. In addition to loss of life from drowning, flooding can have extensive, indirect health effects, including impacts on food production, water provision, ecosystem disruption, infectious disease outbreak and vector distribution. The longer-term effects of flooding may include posttraumatic stress and population displacement. Projected increases of mean annual temperature and the intensity and frequency of heat waves will result in a greater number of people at risk of heat-related medical conditions. The elderly, children, the chronically ill, the socially isolated and at-risk occupational groups are particularly vulnerable to heat-related conditions.[67]

Additionally, rising temperatures, along with water scarcity, are of increasing concern for South Africa. Under a high emissions scenario for heat-related death in the elderly (65+ years) are projected to increase to about 1deaths per 100,000 by 2080 compared to the estimated baseline of approximately 2 deaths per 100,000 annually between 1961 and 1990. A rapid reduction in emissions could limit heat-related deaths in the elderly to about 20 deaths per 100,000 in 2080 (**Figure 16**).

FIGURE 16. Heat Related Mortality in Population of 65 Years or Older in South Africa.[68]



In South Africa, the annual distribution of days with a high-heat index provides insight into the health hazard of heat. The annual distribution of days with a high-heat index provides insight into the health hazard of heat. **Figure 17** shows the expected Number of Days with a Heat Index >35°C through the 2090s; appointing to a sharp increase in the number of very hot days, which will accelerate by mid-century and continue to sharply increase under a high-emission scenario (RCP8.5) through the end of the century. Night-time temperatures (>20°C), will follow a similar warming, rising rapidly under a high-emission scenario (RCP8.5). Health impacts can be tracked by looking at the changing frequency of tropical nights, which will again, follow similar warming patterns. Tropical Nights (**Figure 18**) graph represents the projected increase in tropical nights for different emission scenarios to demonstrate the difference in expected numbers of tropical nights.

[67] WHO (2015). Climate and Health Country Profile – South Africa. URL: https://apps.who.int/iris/bitstream/handle/10665/246153/WHO-FWC-PHE-EPE-15.44-eng.pdf?sequence=1

[68] WHO (2015). Climate and Health Country Profile – South Africa. URL: https://apps.who.int/iris/bitstream/handle/10665/246153/WHO-FWC-PHE-EPE-15.44-eng.pdf?sequence=1

FIGURE 17. Projected Days with a Heat Index (Reference Period, 1986–2005)[69]

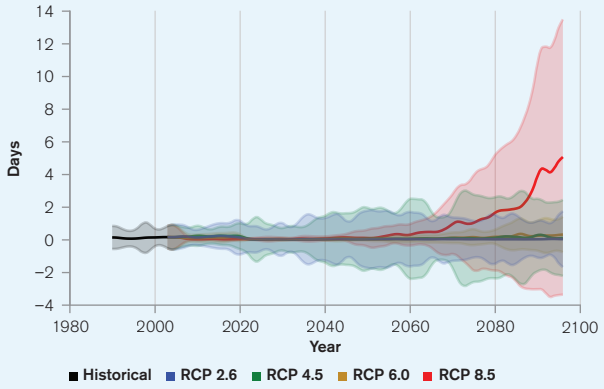
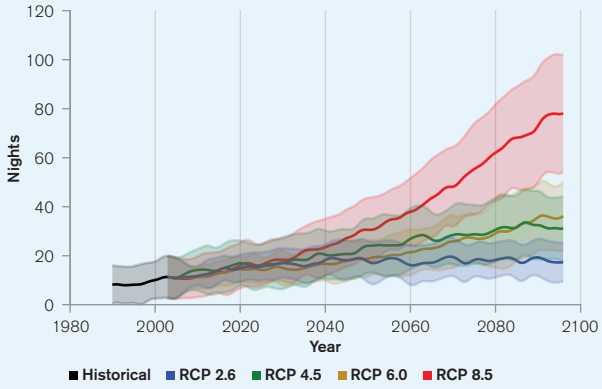


FIGURE 18. Projected Number of Tropical Nights (Tmin >20°C) (Reference Period, 1986–2005)[70]



Adaptation Options

A quantitative vulnerability and risk assessment for South Africa's health sector is an important first step in identifying the most critical climate change impacts and the most vulnerable populations and communities. To reduce the impacts of climate change on public health, context specific actions need to be implemented, particularly ones that align with the realities of the communities affected. As such, there is a need to develop locally-relevant health vulnerability assessments. South Africa's National Climate Change Response Policy advocates for adaptation measures to reduce the impacts of climate change on human health, such as: reducing certain criteria pollutants (PM, Ozone and Sulphur Dioxide); developing and strengthening existing public awareness campaigns; developing heat-health action plans; improving biosafety; developing a spatial and temporal health data capture system; and integrating food security and sound nutritional policies into all adaptation strategies.[71]

South Africa's health-care infrastructure can be upgraded to support more systemic climate change resilience. Capacity needs to be built in the requisite responses across all sectors of the population. Health care system personnel should receive additional training to be better informed of the relationship between climate change, seasonal variability, and health impacts. Building the capacity of the health sector will be instrumental in properly identifying diseases as they emerge.[72]

[69] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa Health Sector Dashboard. URL: https://climatedata.worldbank.org/CRMePortal/web/health/systems-and-service?country=ZAF&period=2080-2099

[70] WBG Climate Change Knowledge Portal (CCKP, 2021). South Africa Health Sector. URL: https://climateknowledgeportal.worldbank.org/country/south-africa/climate-sector-health

[71] GIZ (2018). Climate Change and Human Health – South Africa. Climate and Impacts Factsheet Series, Factsheet 5 of 7. URL: https://www.environment.gov.za/sites/default/files/docs/factsheet_climatechange_health.pdf

[72] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

Institutional Framework for Adaptation

South Africa's Department of Environmental Affairs serves as the country's climate change focal point and is responsible for developing and implementing the Climate Change Strategy, and ensuring the country is on track to meet its obligations outlined in its NDC and development plans. In South Africa, climate change is recognized as a cross-cutting issue and policies and implementation include cross-sector efforts and coordination. Cross sector efforts involve actions from national departments of: Energy, Mineral Resources, Basic & Higher Education, Health, Agriculture, Forestry & Fisheries, Cooperative Governance and Traditional Affairs including the National Disaster & Risk Management Centre, Transport, Science and Technology, Statistics, National Treasury, Trade and Industry, Water Affairs, Human Settlements, International relations & Cooperation, Public Enterprises, and the Presidency.[73]

Policy Framework for Adaptation

South Africa submitted its Third National Communication to the UNFCCC in 2018, its Second Biennial Update Report in 2017, and its Nationally Determined Contributions to the UNFCCC in 2016; South Africa's Updated Nationally Determined Contribution is expected to be released late 2021. These documents, in conjunction with its National Climate Change Adaptation Strategy (2018) and National Climate Change Response-White Paper (2017), provide the guidance and platform to integrate responsible environmental management with climate change adaptation strategies, in line with the country's social and economic development targets.[74] These strategies focus on the preparation and strengthening of institutional frameworks for improved management of climate change effects and to make available the necessary resources to support strategic adaptation activities and to advance low emission and climate resilient development.[75]

National Frameworks and Plans

- Third National Communication to the UNFCCC (2018)
- Second Biennial Update Report (2017)
- Nationally Determined Contribution (2016)
- Second National Communication to the UNFCCC (2011)
- National Climate Change Adaptation Strategy, draft (2018)
- Climate Change Response-White Paper (2017)
- National Energy Act (2008)
- National Climate Change Response Strategy (2004)

[73] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[74] Department of Environmental Affairs (2017). National Climate Change Response – White Paper. URL: https://www.environment.gov.za/sites/default/files/legislations/national_climatechange_response_whitepaper.pdf

[75] South Africa (2016). Nationally-Determined Contributions. URL: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/South%20Africa%20First/South%20Africa.pdf

Recommendations

Research Gaps

- Gain a better understanding of the timing and magnitude of incidence of several important indicators of climate change in the future, as well as the key vulnerabilities, development impact, and possible adaptation responses
- Widen the participation of the public, scientific institutions, women, and local communities in planning and management, accounting for approaches and methods of gender equity
- Strengthen environmental monitoring capabilities for strengthened and more effective environmental management
- South Africa has one of the most advanced research, observation, and climate modeling programs in Africa, however additional investment in weather stations and expanding the country's national hydro-meteorological monitoring system can further advance networking for the measurement of climate parameters[76]
- Strengthen the technical capacity to integrate climate-smart agriculture and climate change risk management into farmer's and the wider agricultural sector[77]

Data and Information Gaps

- Develop early warning systems about dangerous hydrometeorological phenomena and climate risk management
- Ensure that nation-wide climate change and atmosphere monitoring systems are maintained and enhanced where necessary, including through monitoring networks at appropriate spatial density and frequency[78]

Institutional Gaps

- Ensure integration of National Environmental Strategy goals are developed within sectoral and regional plans[79]
- Implement cross-sectoral climate-smart solutions at national and subnational levels
- Integrate climate change concerns into relevant policies and planning processes at the state and national levels

---

[76] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[77] SADC Secretariat (2016). Climate Change Adaptation in SADC, A strategy for the Water Sector. URL: https://www.sadc.int/files/2213/5293/3544/SADC_Climate_Change_Adaptation_for_the_Water_Sector_booklet.pdf

[78] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

[79] Department of Environmental Affairs (2018). South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. URL: https://unfccc.int/sites/default/files/resource/South%20African%20TNC%20Report%20%20to%20the%20UNFCCC_31%20Aug.pdf

CLIMATE RISK COUNTRY PROFILE

SOUTH AFRICA

WORLD BANK GROUP