DEPARTMENT OF FORESTRY, FISHERIES AND THE ENVIRONMENT

NO. 8135 **6 November 2026**

CLIMATE CHANGE ACT, 2024 (ACT NO. 22 OF 2024)

PUBLICATION OF THE DRAFT SECOND BIENNIAL TRANSPARENCY REPORT FOR THE REPUBLIC OF SOUTH AFRICA UNDER THE PARIS AGREEMENT FOR PUBLIC COMMENT

I, David Maynier, Minister of Forestry, Fisheries and the Environment, hereby publish the draft Second Biennial Transparency Report (draft BTR2) of the Republic of South Africa for public comment in terms of section 31 and 32 of the Climate Change Act, 2024 (Act No. 22 of 2024), as set out in the Schedule hereto.

South Africa, as a Party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, is required, under the Enhanced Transparency Framework of the Paris Agreement, to submit Biennial Transparency Reports every two years. South Africa submitted its First Biennial Transparency Report (BTR1) to the UNFCCC in December 2024 and has prepared its Second Biennial Transparency Report, which is due for submission in December 2026.

The draft BTR2 provides information on South Africa's national circumstances and institutional arrangements, national greenhouse gas inventory, progress towards its Nationally Determined Contribution (NDC), mitigation policies and measures, climate change impacts and adaptation, as well as financial, technology development and transfer, and capacity-building support needed and received.

Members of the public are invited to submit, within 14 days from the date of publication of this Notice in the Government *Gazette*, or in the newspaper, whichever date comes last, written comments on the draft BTR2 to any of the following addresses:

By post to: The Director: United Nations Framework Convention on Climate Change Matters & National Focal Point
Attention: Ms Sandra Motshwanedi
Department of Forestry, Fisheries and the Environment
Private Bag x447
Pretoria
0001

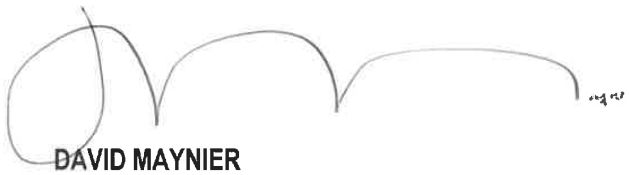
By email at: mmmudau@dffe.gov.za or SMotshwanedi@environment.gov.za

By hand at: Reception, Environment House, 473 Steve Biko Road, Arcadia, Pretoria, 0083

Any inquiries in connection with this Notice can be directed to Ms Sandra Motshwanedi on Tel: (012) 399 9155 or through email: SMotshwanedi@environment.gov.za.

The Department of Forestry, Fisheries and the Environment complies with the Protection of Personal Information Act, 2013 (Act No. 4 of 2013). Comments received and responses thereto will be included in a comments and response report which may be made available to the public. If a commenting party has any objection to his or her name, or the name of the represented company/organization, being made publicly available in any comments and responses report, such objection should be highlighted as part of the comments submitted.

Comments or objections received after the closing date may be disregarded.



DAVID MAYNIER
MINISTER OF FORESTRY, FISHERIES AND THE ENVIRONMENT
DATE:

forestry, fisheries & the environment
Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

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SOUTH AFRICA'S SECOND BIENNIAL TRANSPARENCY REPORT TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE UNDER THE PARIS AGREEMENT

DEPARTMENT OF FORESTRY, FISHERIES AND THE ENVIRONMENT

DRAFT

September 2026

First-order Draft (FOD)

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Overview Chapter: Executive Summary of the Second BTR of South Africa

Chapters in South Africa's BTR2 (First Order Draft) are presented as follows:

1. National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases
2. Information necessary to track progress made in implementing and achieving NDCs under Article 4 of the Paris Agreement
3. Information related to climate change impacts and adaptation under Article 7 of the Paris Agreement
4. Information on financial, technology development and transfer and capacity-building support needed and received under Articles 9–11 of the Paris Agreement

The Executive Summaries (ES) for each of the four main chapters are provided below:

ES.1 National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases

ES1.1: Introduction

A summary of the National Greenhouse Gas (GHG) Inventory for South Africa is presented in this chapter. The Inventory covers the period of 1990 to 2024, and the GHG emissions are reported under five sectors: Energy; Industrial Process and Product Use (IPPU), Agriculture, Land Use, Land Use Change and Forestry (LULUCF) and Waste.

ES.1.2 Institutional arrangements

The Department of Forestry, Fisheries and the Environment (DFFE) is responsible for the co-ordination and management of all climate change-related information, including mitigation, adaption, monitoring and evaluation, and GHG inventories. The DFFE therefore played a lead role in the compilation, implementation and reporting of the national GHG inventory, with other relevant agencies and ministries providing support through the provision of data used in the inventory. The compilation of the inventory is further supported by the National Greenhouse Gas Emission Reporting Regulations, 2016 under Notice No. 275 in the Gazette No. 40762 of 03 April 2017 (DEA, 2017a) and the South African Greenhouse Gas Emissions Reporting System (SAGERS).

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ES1.3 Summary of national emission and removal trends

GWP

In this inventory the emissions for each of the major GHGs are presented as carbon dioxide equivalents (CO_2e) using the 100- year global warming potentials (GWPs) from the 2014 IPCC Fifth Assessment Report (AR5) (IPCC, 2014b).

Gas trends

Carbon dioxide (CO_2) is the dominant source of South Africa's GHG emissions, accounting for 82.5% of total emissions in 2024 (excluding LULUCF) (Figure ES 1.1). Methane (CH_4) is the second-largest contributor to South Africa's total GHG emissions. In 2024, CH_4 accounted for 12.7% of national emissions excluding LULUCF and 14.3% when LULUCF is included. Nitrous oxide (N_2O) emissions made up a relatively small but declining share of South Africa's total GHG emissions, decreasing from 3.9% in 1990 to 3.3% in 2024 (excluding LULUCF). When LULUCF is included, the contribution declined, from 4.3% in 1990 to 3.9% in 2024, reflecting an increase in N_2O emissions from the LULUCF sector over time.

Fluorinated gas (F-gas) emissions, specifically HFCs and PFCs, are estimated only for the IPPU sector in South Africa and accounted for 1.5% of total GHG emissions (including LULUCF) in 2024. CO emissions varied between 232 Gg CO to 1 190 Gg CO between 1990 and 2024. The NO_x emissions were between 11 Gg NO_x and 62 Gg NO_x, while NMVOCs were between 34 Gg NMVOCs and 167 Gg NMVOCs over the period 1990 to 2024.

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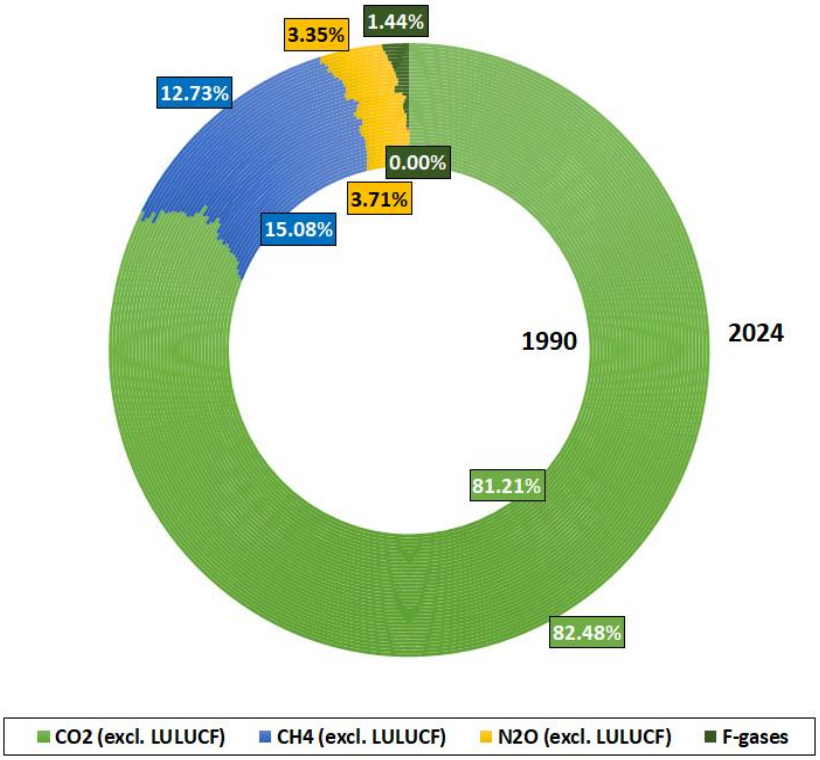


Figure ES 1.1: Gas contribution to South Africa's emissions (excl. LULUCF) between 2000 and 2024.

Sectoral trends

In 2024, Energy emissions accounted for 78.6% of South Africa's total emissions, excluding LULUCF (**Error! Reference source not found.** ES 1.2). Most energy-sector emissions came from *Energy Industries* (61%) and *Transport* (16%), while the *Manufacturing Industries and Construction* emissions contributed 6%. The lowest emissions were from *Solid Fuels* (0.6%) and *Oil and Natural Gas* activities (0.03%).

In 2024, the IPPU sector produced 30 372 Gg CO_2e which is 6.4% of South Africa's emissions (excluding LULUCF) (**Error! Reference source not found.** ES 1.2). The largest source category was the *Ferroalloy production* category which contributed 52.6% to the total IPPU sector emissions. The *Mineral industry* and the *Product used as substitutes for ozone depleting substances* subsectors contributed 16.4% and 22.9%, respectively, to the IPPU sector emissions.

Agriculture emissions for South Africa amounted to 52 744 Gg CO_2e in 2024, accounting for approximately 11% of total emissions excluding LULUCF and 12% including LULUCF (Figure

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ES 1.2). Most agriculture sector emissions originate from *Enteric fermentation* (68%), followed by *Agricultural soils* (18%) and *Manure management* (8%).

LULUCF sector is a sink of 33 412 Gg CO_2e in 2024 (**Error! Reference source not found.**). *Forest lands* are the largest contributors to this sink, while all other land sectors are estimated to be an overall source of emissions. The dominant *Forest land* sinks are thickets and woodlands. *Harvested wood products* (*HWP)* are a sink in 2024 (1 718 Gg CO_2e).

Waste sector emissions for 2024 accounted for 4% (excl. LULUCF) and 4.4% (incl. LULUCF) of the national emissions (Figure ES 1.2). Most of the waste-sector emissions are from *Wastewater treatment and discharge* which contributes 46.8% to the total waste sector emissions. This is followed by *Solid waste disposal*, which contributes 38.3%. *Biological treatment of solid waste* and *Incineration and Open Burning of Waste* contributed 13.6% and 0.01% of the total waste emissions, respectively.

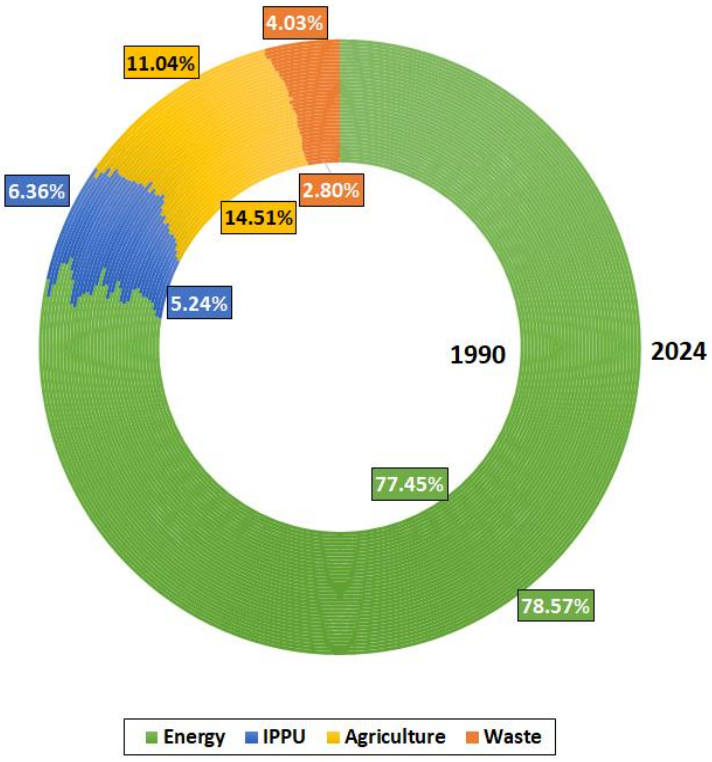


Figure ES 1.2: Sector contribution to total emissions (excluding LULUCF) in South Africa between 2000 and 2024.

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ES1.4 Key category analysis

A Tier-1 level and trend assessment were conducted, following Approach 1 (IPCC, 2006), on both the emissions including and excluding LULUCF to determine the key categories for South Africa. In the previous inventory there were 53 key categories, while in this inventory there are 43. **Error! Reference source not found.** shows the top 10 key categories with full details being provided in Section 1.4 of this report.

Other sectors – solid fuels, *forest land converted to grassland*, other sectors – liquid fuels, and other– solid fuels are new to the top 10 key categories in the 2024 inventory. In the previous inventory, these categories were ranked 16th (other sectors – solid fuels), 26th (*land converted to grassland*), 35th (other sectors – liquid fuels), and 10th (other – solid fuels), respectively.

ES1.5 Improvements introduced

Energy

Energy sector emission estimates were improved through the application of country-specific CO_2 emission factors for solid fuels. These factors are based on a study completed in 2022, which developed temporary Tier 2 CO_2 emission factors for solid fuels. In addition, the time series was extended back to 1990, compared to the previous series which covered the period from 2000 onward.

IPPU

The IPPU sector emission estimates were extended from 2000 back to 1990 to complete the timeseries. Tier 2 and Tier 3 estimates were introduced into the SAGERS data from 2022 onwards in the IPPU sector. Calculations with increased accuracy were achieved for *Other Chemicals and Product Use*, specifically ceramics, soda ash and dolomite usage. Verification of some selected production plants identified areas previously not included and increased accuracy.

Agriculture

The agriculture sector inventory is subject to continuous improvement, resulting in periodic recalculations. Key updates include the inclusion of organic soils for cropland and grassland within the agriculture sector and the application of 2019- IPCC Refinement emission factors for soil management, which are disaggregated by wet and dry climate conditions. For the agriculture sector, historical data for the early years (1990–1999) have been included, extending the dataset to cover the full period from 1990 to 2024 and ensuring time-series completeness.

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LULUCF

Several improvements were made in the LULUCF sector including the addition of burnt-area data for early years (1990-1999), enhanced historical information for harvested wood products and fuelwood use, updated biomass and carbon stock datasets, refined wetland methodologies, and improved soil carbon estimates through soil-specific land-change matrices. Recent years also incorporated the updated 2020–2022 land-change data, revised land-use change assumptions, and the removal of a previous land conversion error, resulting in more consistent and accurate land-use information.

Waste

A change in the source of the waste composition data to a more country-specific source led to changes in emission estimates in this sector. An additional improvement was the use of the waste composition and the update of the Methane Correction Factor (MCF) that is on the State of the waste report (DFFE, 2019).

ES1.6 Improvement plan

Table ES summarizes the planned actions to improve various sectors of inventory. Further details on current efforts, barriers, and future goals are provided in Chapter 9.

Table ES 1.1: Improvements that are currently in progress and planned or proposed improvements

Sector	Improvement
Tasks in progress	
Energy	Improve uncertainty data for all sectors by incorporating more country specific uncertainty values
	Incorporate NOx, CO, NMVOC, and SOx emissions
	Update of the VKT study, including segregation of on-road/off-road
	Comparison of next VKT approach with fuel statistics
Agriculture	Incorporate all background data and equations for the Tier 2 calculations of enteric fermentation
LULUCF	Improve the uncertainty analysis for the Land sector to incorporate more detail.
	Improvement of land change data through detailed assessment of maps and tracking of land parcels
	Improve the biomass burning emissions
	Incorporate organic soils study to include emissions from organic soils
	Move to a higher tier level for DOM in forest lands
Waste	Data collection on quantities of waste disposed of into managed and unmanaged landfills
Tasks outstanding	
Cross cutting	Implement the IPCC Software

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Sector	Improvement
Energy	Further disaggregation of 1A2
	Collect more activity data for estimating emissions associated with non-energy fuel use
	Inclusion of methodology documentation/summary/approval process for tier 3 methods
	CO_2, CH_4 and N_2O from spontaneous combustion of coal seams
	CH_4 emissions from abandoned mines
	Investigate pipeline transport
	Investigate ground activities at airports and harbours
	Comparison of next VKT approach with fuel statistics
	Segregation of military energy use.
	Incorporate emissions from biogas
	CO_2 transport and storage
	CO_2, CH_4 and N_2O emissions from combined heat and power (CHP) combustion systems
IPPU	Update the fluorinated gasses with higher accuracy figures from SARS
	Include emissions from electronics industry
	Incorporate emissions SF_6 emissions
Agriculture	Improve manure management data, including biogas digesters as a management system
LULUCF	Update SOC reference data
	Initiate data collection on controlled fires
	Perform a more detailed assessment of HWP to include a wider range of products
	Collect data on other disturbances besides fire in forest lands
Waste	Include economic data for different population groups
	Include information on population distribution in rural and urban areas as a function of income
	Include HWP in solid waste
	Obtain data on waste streams and the bucket system
	CH_4, N_2O emissions from biological treatment of waste
	CO_2, CH_4 and N_2O from waste incineration

ES 1.7 Conclusions

The latest inventory provides a complete 1990–1999 time series and an updated assessment of South Africa's greenhouse gas emissions from 1990 to 2024. In 2024, the energy sector remained the largest source, accounting for 78.6% of total emissions excluding LULUCF, followed by Agriculture (11.0%), IPPU (6.4%) and Waste (4.0%). Including LULUCF, these shares were 84.5%, 6.8%, 11.9% and 4.3%, respectively. LULUCF remained a net sink, removing an estimated 33 412 Gg CO_2e.

Over the 1990–2024 period, the share of emissions from Agriculture declined slightly, while the contribution of the other sectors increased. Overall emissions excluding LULUCF increased initially, stabilised, and have declined gradually in recent years. The inclusion of the LULUCF sink results in a similar overall trend, but with lower net emissions.

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Energy has consistently been the dominant source of emissions. Energy emissions increased steadily until around 2009, followed by fluctuations and a gradual decline. Fuel combustion remained the main source throughout the time series, with emissions peaking around 2008–2009 before declining in subsequent years.

Agriculture emissions remained relatively stable over the period, with a small overall decline. LULUCF continued to function as a net sink in 2024, with forest land accounting for most removals, while other land-use categories remained net sources. Waste sector emissions increased by 69.6% since 1990, reaching 19 245 Gg CO_2e in 2024. Wastewater treatment and discharge was the largest source, contributing 47% of waste emissions, followed by solid waste disposal at 38%.

ES.2 Information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement

This chapter presents South Africa's progress in implementing and achieving its Nationally Determined Contribution (NDC) under Article 4 of the Paris Agreement, covering national circumstances, institutional arrangements, and metrics and methodologies used to track progress. It also reports on mitigation policies and measures (PAMs) and the resulting Greenhouse Gas (GHG) emission reductions or removals.

This reporting demonstrates how South Africa's actions contribute to the global goal of limiting temperature increases under the Paris Agreement. It enhances transparency by enabling consistent reporting that allows stakeholders to assess the effectiveness of the country's mitigation efforts, promotes accountability by tracking the country's climate commitments against actual outcomes, and feeds into the Global Stocktake process, which evaluates collective progress toward the Agreement's long-term goals.

ES2.1 National circumstances and institutional arrangements

South Africa's national circumstances reveal a country navigating the intersection of demographic growth, economic vulnerability, and mounting climate pressure. The population has climbed steadily, from 57 million in 2017 to 62 million by 2023–2024, with Gauteng home to the largest share (25%) and the Free State the smallest (5%). This growth has been accompanied by rising urbanisation, driven partly by rural-to-urban migration linked to climate stress, poverty, and diminishing agricultural viability. Migrants, particularly into Gauteng and the Western Cape, often arrive in search of opportunity but instead settle in informal areas

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lacking basic services, intensifying competition for land, water, and housing, and pushing climate mitigation down the list of governmental priorities as basic needs take precedence.

Economically, South Africa remains an upper middle-income country, with Gross Domestic Product (GDP) rising modestly from R4.60 trillion in 2022–2023 to R4.70 trillion in 2024. Growth is concentrated in services—manufacturing, wholesale and retail trade, and professional and personal services—while National Treasury has flagged electricity, rail and port logistics, water infrastructure, and tourism as key levers for future growth. Yet this economy is structurally exposed: South Africa is a net exporter of GHG emissions, with roughly 78% of its exports (worth $135 billion) destined for net-zero-committed economies. Emissions-intensive sectors—basic metals, automotive, and agriculture—face growing exposure to carbon border adjustment mechanisms, turning emissions intensity into an emerging trade barrier just as global markets pivot toward decarbonised supply chains. The country's fortunes are thus tightly bound to its coal-dependent energy system, which also explains why it carries the highest per capita CO_2 emissions on the continent (7.164 tCO_2/capita in 2024), even as the electricity sector shows signs of easing: loadshedding fell sharply from 25 TWh shed in 2023 to just 4 TWh in 2024, and energy-sector emissions swung from a 2% decline to a 3.5% rebound as supply stabilised.

Land use tells a more encouraging story. South Africa possesses significant natural carbon reservoirs and an increasingly important land-use sector. In 2024, the Land Use, Land-Use Change and Forestry (LULUCF) sector functioned as a net carbon sink, removing approximately 33 million tonnes CO_2-equivalent from the atmosphere. Forest lands, particularly thickets and woodlands, are the primary contributors to this sink, while harvested wood products provide additional carbon storage benefits. The sink capacity of the sector has strengthened substantially since 1990, largely driven by expansion of forested areas. Nevertheless, other land-use categories, including croplands, grasslands, wetlands, settlements and other lands, remain net emission sources. South Africa's terrestrial carbon stock is dominated by soil organic carbon, which represents nearly 90% of stored carbon and is concentrated primarily in grassland and savanna ecosystems. These ecosystems are increasingly threatened by climate change, habitat fragmentation, invasive species and land-use conversion, placing future carbon sequestration potential at risk.

Climatically, the pressure is intensifying. 2024 was South Africa's hottest year since 1951, with a warming trend of about 0.17 °C per decade since 1951. In 2024, South Africa recorded its warmest year since records began in 1951, with a statistically significant long-term warming trend of approximately 0.17 °C per decade. Recurrent flooding events in the Western Cape,

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Eastern Cape and KwaZulu-Natal during 2023 and 2024 resulted in loss of life, displacement of communities, and extensive damage to infrastructure, further straining public resources and development efforts.

Taken together, these national circumstances describe a country where climate vulnerability and socio-economic strain reinforce one another: an emissions-intensive, coal-reliant economy exposed to a decarbonising global trading system; a growing, rapidly urbanising population, straining service delivery; and a changing climate already delivering measurable harm. Realising South Africa's real strengths—abundant renewable resources, globally significant mineral reserves, and renewable capacity growth already outpacing targets—will depend heavily on international climate finance commitments including through mechanisms such as the Just Energy Transition Partnership, so that the country's transition to a low carbon economy is supported.

ES2.2 Legal arrangements for mitigation

South Africa has established a robust legal, institutional, and administrative framework to support the implementation, monitoring, reporting, archiving of information, and stakeholder engagement related to NDCs under Article 4 of the Paris Agreement. The Department of Forestry, Fisheries and the Environment (DFFE) serves as the central authority responsible for coordinating and formulating climate change policy, with its mandate derived from the National Environmental Management: Air Quality Act (Act 39 of 2004) and strengthened by the Climate Change Act (Act 22 of 2024). Through the Climate Change and Air Quality (CCAQ) Branch, the DFFE leads South Africa’s transition to a low-emissions and climate-resilient development pathway and oversees the fulfilment of international reporting obligations under the Paris Agreement. Since the submission of South Africa’s First Biennial Transparency Report (BTR1) in December 2024, institutional arrangements have been further refined to improve coordination across national, provincial, and local spheres of government, while enhancing transparency, accountability, and alignment with the requirements of the Enhanced Transparency Framework (ETF).

To support the monitoring and tracking of mitigation actions and NDC progress, South Africa has strengthened its climate mitigation data management system through the National GHG Emission Reporting Regulations (NGERs), which provide the legal basis for the collection of activity and GHG emissions data across sectors. The regulations require reporting entities to register and submit emissions data, thereby improving the accuracy, completeness, consistency, and sustainability of the National GHG Inventory. Building on earlier reporting arrangements, the DFFE is developing the South African Industrial GHG Emission

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Management System (SAIGE) to replace the South African GHG Emissions Reporting System (SAGERS). SAIGE will serve as an integrated, web-based platform for industrial GHG reporting, Carbon Budgets, and Mitigation Plans, enabling efficient data submission, approval, archiving, analytics, and regulatory compliance. Once fully operational, the system will strengthen national monitoring and reporting capabilities, support evidence-based decision-making on emission reductions, and enhance South Africa's ability to track and report progress towards achieving its NDC targets.

ES2.3 Domestic Arrangements for Internationally Transferred Mitigation Outcomes

South Africa is expected to participate in Article 6 mechanisms under the Paris Agreement in the future, including hosting Article 6.4 projects and engaging in Article 6.2 cooperative approaches. Although the country is not yet actively involved in Article 6 activities, the DFFE published a Draft South African Article 6 Framework in November 2024 to prepare for implementation. The framework proposes an Internationally Transferred Mitigation Outcomes (ITMO) lifecycle that builds on existing carbon tax offset systems. Mitigation outcomes (MOs), or carbon credits, would be generated through recognised standards such as the Article 6.4 Mechanism, Gold Standard, Verified Carbon Standard, and other approved programmes. To qualify for international transfer, projects must receive both project-level authorisation (PLA) and credit-level authorisation through the Authorisation for International Transfer (AIT) process, converting MOs into Authorised Mitigation Outcomes (AMOs) that can eventually become ITMOs.

The proposed South African Article 6 Registry will serve as the central system for recording, authorising, tracking, and managing both domestic carbon offsets and internationally transferable credits. Rather than functioning as a trading platform, the registry will provide oversight of project approvals, credit issuance, transfers, and retirements while ensuring compliance with Article 6 requirements. It may build on existing systems such as the Carbon Offset Administration System (COAS) and the System for Administration of Integrated GHG Emissions (SAIGE). The registry will support interoperability with the Article 6.4 Mechanism Registry and registries of partner countries, enabling transparent information exchange and corresponding adjustments to greenhouse gas inventories. Unique identifiers will be assigned to all ITMOs to ensure traceability, accountability, and the integrity of international carbon market transactions.

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ES2.4 Cross-cutting institutional arrangements for climate response

South Africa maintains an integrated climate information management system to support NDC monitoring and reporting. The DFFE oversees the National Climate Change Information System (NCCIS), which serves as a key source of data for the national GHG inventory. The DFFE also collaborates closely with the South African Weather Service (SAWS), which maintains climate information through the Climate Information Portal (CIP) and the National Hazardous Events Database (NHED), while climate response data is managed through national and provincial databases designed for future integration across all spheres of government.

Mitigation, adaptation, and climate finance information are tracked through the national Tracking and Evaluation (T&E) System and its T&E Portal, which functions as the primary platform for monitoring progress towards South Africa's NDC commitments. Climate finance data is collected in collaboration with National Treasury, donor organisations, and other stakeholders under the National Climate Finance Support Strategy, while information generated through the Climate Change Monitoring and Evaluation System supports international reporting requirements, including Biennial Transparency Reports and National Communications.

ES2.5 Description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates

South Africa's NDCs under the Paris Agreement establish economy-wide GHG emission reduction targets using fixed emissions ranges rather than baselines or reference years. In its 1st NDC, submitted in 2021, South Africa committed to limiting annual GHG emissions to between 398 and 510 Mt CO_2-eq by 2025 and between 350 and 420 Mt CO_2-eq by 2030, excluding emissions resulting from natural disturbances. The 1st NDC is implemented over two periods, 2021 to 2025 and 2026 to 2030, with progress tracked through a national GHG inventory-based accounting system using the latest National Inventory Reports (NIRs) – Which is currently for this BTR the 2024 NID. While South Africa hosted Clean Development Mechanism (CDM) projects from the Kyoto Protocol era, it is not currently participating in any Article 6 carbon market activities under the Paris Agreement, and therefore no corresponding accounting adjustments have been required.

South Africa's second NDC, submitted on 18 October 2025, extends the country's mitigation ambition with a 2035 target of reducing annual net GHG emissions to between 320 and 380 Mt CO_2-eq. The target maintains the same economy-wide coverage as the first NDC,

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encompassing all sectors and gases included in the 2024 NID while excluding emissions from natural disturbances in the Land Use, Land-Use Change and Forestry (LULUCF) sector. Accounting will continue to be based on the national GHG inventory framework. Although South Africa has expressed an intention to participate in cooperative approaches and ITMOs under Article 6, the necessary domestic framework is still being finalized, and no Article 6 activities are currently in operation. Consequently, no corresponding adjustments have been reported. South Africa has also clarified that achievement of NDC targets will be assessed and reported only in BTRs covering the relevant target years, with progress toward the 2025 target expected to be reported in BTR3.

ES2.6 Information necessary to track progress made in implementing and achieving South Africa's nationally determined contribution under Article 4 of the Paris Agreement

This section presents information on the indicator used to track progress against South Africa's NDC under Article 4, namely total GHG emissions and removals, including those from LULUCF, expressed in absolute terms; this total excludes emissions due to natural disturbances from wildfires and deadwood in the LULUCF sector. The 2024 NID provides the basis for the accounting methodology underpinning this indicator. Coverage is economy-wide, including the land sector, and encompasses the gases CO_2, CH_4, N_2O, HFCs, and PFCs, with Global Warming Potential (GWP) metrics drawn from the IPCC's 5th Assessment Report (AR5) applied throughout. The Energy, IPPU, AFOLU, and waste sectors are covered, and the methodologies, as per the 2024 NID, align with UNFCCC guidelines, following the 2006 IPCC Guidelines for National GHG Inventories, IPCC Good Practice Guidance, and the 2019 Refinement to the 2006 IPCC Guidelines.

Indicator values have been reported for 2021 to 2024. These values exceed the lower bound but remain below the upper bound of the 2025 target, indicating progress towards achieving the 2025 target; however, they also surpass both the lower and upper bounds of the 2030 target, highlighting the need for significantly increased mitigation efforts if this target is to be met. Meeting the 2025 and 2030 targets is premised on the assumption that the Paris Agreement will be fully implemented, and that support will be provided for the implementation of the specified targets and goals for mitigation, adaptation, loss and damage.

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ES2.7 Mitigation policies and measures, actions and plans, related to implementing and achieving a nationally determined contribution under Article 4 of the Paris Agreement

South Africa's mitigation PaMs framework supports the implementation of NDCs under the Paris Agreement by prioritising interventions with the greatest potential to reduce GHG emissions and enhance removals. The country applied a structured prioritisation approach based on Climate and Development Knowledge Network guidance, focusing on policies that significantly influence national emissions across key sectors. Cross-cutting instruments such as the National Development Plan (NDP) 2030, the Climate Change Act No 22 of 2024, Sectoral Emission Targets (SETs), NGERs, the Carbon Tax Act, the Hydrogen Commercialisation Strategy, and the Just Energy Transition Implementation Plan (JET-IP) provide the overarching governance, regulatory, reporting, and financing framework required to drive economy-wide decarbonisation. While many of these instruments do not have directly quantifiable emission reductions due to overlaps with sectoral measures, they play a critical role in enabling and guiding mitigation action.

The energy sector remains the most significant contributor to mitigation outcomes and contains the largest portfolio of implemented measures. Key initiatives include the Integrated Resource Plan (IRP) 2019, the Renewable Energy Independent Power Producer Procurement Programme (REI4P), energy efficiency incentives, municipal demand-side management programmes, appliance efficiency standards, and cleaner production initiatives. Renewable energy deployment has delivered the largest energy-sector reductions, with the IRP achieving annual emission reductions of approximately 17.43 Mt CO_2-eq in 2023–2024 mostly due to the Renewable Energy Independent Power Producer Procurement programme (17 Mt CO_2-eq). Complementary programmes such as the Section 12L Tax Incentive and municipal energy efficiency initiatives have further reduced energy demand while generating economic benefits, including job creation, operational cost savings, energy security improvements, and industrial competitiveness. The JET-IP reinforces these measures by mobilising an estimated US$98 billion to support renewable energy, green hydrogen, electric vehicles, grid expansion, and a just, socially inclusive shift away from coal.

Mitigation actions in transport, industry, waste, agriculture, forestry and other land use (AFOLU) sectors also contribute significantly to emissions reductions while delivering broader socio-economic benefits. Transport measures such as Bus Rapid Transit systems, the Transnet Road-to-Rail Programme, and support for electric vehicles aim to reduce fossil fuel consumption and improve mobility. In the industrial sector, initiatives such as glass recycling

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and circular economy measure lower process emissions and resource use. The AFOLU sector delivers some of the largest mitigation benefits through nature-based solutions, including afforestation, conservation agriculture, grassland restoration, thicket restoration, shrubland rehabilitation, and forest ecosystem restoration. Among these, afforestation and landscape restoration measures account for the highest annual emission reductions, with afforestation alone achieving over 55 Mt CO_2-eq in 2024. Waste-sector interventions, including landfill gas management and the National Waste Management Strategy, further support emissions reductions through improved waste diversion, recycling, methane management, and circular economy practices.

South Africa's future mitigation pathway is expected to be shaped primarily by the Climate Change Act No. 22 of 2024, Sectoral Emission Targets, carbon budgets, and just transition-related investment. Analysis undertaken for the determination of SETs indicates that current and planned policies can enable South Africa to meet its 2030 NDC targets, although additional mitigation effort will be required to remain comfortably within the target range. More ambitious policy scenarios are projected to reduce emissions further while creating employment growth, particularly in services, manufacturing, and construction sectors. The transition is expected to require substantial climate finance, potentially exceeding R800 billion annually under higher ambition scenarios, but it is also projected to support economic development, job creation, improved energy security, enhanced air quality, and increased resilience. Overall, South Africa's mitigation strategy combines regulatory reforms, market-based instruments, technological transformation, and ecosystem restoration to deliver a long-term transition toward a low-carbon, climate-resilient economy.

ES2.8 Summary of greenhouse gas emissions and removals

South Africa's GHG emissions projections for 2024 to 2035 have been developed under two scenarios: a "with measures", or "with existing measures" (WEM) scenario reflecting currently implemented policies and measures, and a "with additional measures" (WAM) scenario incorporating more ambitious mitigation actions. Due to current data and modelling limitations, a "without measures" (WOM) scenario has not been produced. The projections support reporting under South Africa's BTR and are aligned with the country's 2nd NDC. While the Climate Change Act No. 22 of 2022 provides the legislative basis for future emissions trajectories, the national trajectory has not yet been formally specified, requiring reliance on NDC-based mitigation analysis for projections through 2035.

Under the WEM-scenario, total GHG emissions including LULUCF are projected to decline from approximately 428 Mt CO_2-eq in 2024 to 352 Mt CO_2-eq by 2035, demonstrating a

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gradual reduction in emissions under existing policies. The energy sector remains the dominant source of emissions throughout the projection period, although substantial reductions are expected from the electricity subsector due to planned coal power plant retirements and the expansion of renewable and other low-emission generation capacity. Additional reductions are expected from increasing electric vehicle adoption, while industrial process emissions remain relatively stable. Emissions from agriculture, waste, and other land-use activities show more modest changes, with LULUCF continuing to provide a growing carbon sink.

The WAM-scenario shows the potential impact of enhanced mitigation measures, producing significantly lower emissions outcomes by 2035. Depending on the level of intervention, total emissions could fall to between approximately 99 Mt CO_2-eq and 16 Mt CO_2-eq by 2035. These reductions would require substantial expansion of low-carbon electricity generation, accelerated coal retirement, reduced emissions from synthetic fuel production, greater electrification of transport, improved energy efficiency, and technological changes in industry. The analysis highlights important trade-offs between reducing emissions in the electricity sector and synthetic fuel production, with the electricity sector remaining the primary source of mitigation across all additional-action pathways.

The projections were developed using the South African TIMES Model-General Equilibrium (SATIMGE) framework, which integrates energy system modelling, economy-wide modelling, and sector-specific models for agriculture, land use, and waste. Sensitivity analysis indicates that interventions in the electricity sector have the largest influence on future emissions outcomes. Policies such as the Draft Integrated Resource Plan (IRP 2024), the South African Renewable Energy Masterplan (SAREM), carbon taxation, and energy efficiency measures deliver the greatest reductions, while modal shifts in transport have comparatively limited impact. Overall, the analysis demonstrates that South Africa can achieve meaningful emissions reductions under existing policies, but significantly deeper decarbonisation by 2035 will depend on accelerated implementation of renewable energy, industrial transformation, and broader economy-wide mitigation measures.

ES.3 Information related to climate change impacts and adaptation under Article 7 of the Paris Agreement

South Africa's bio-geophysical conditions, socio-economic and demographical profile make it highly sensitive and exposed to climate variability and change. The country is water-scarce,

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with rainfall that is geographically unevenly distributed and highly seasonal. Climate hazards include drought, flooding, heatwaves, wildfires, coastal flooding, storm surges and coastal erosion. These hazards interact with existing environmental degradation, including land degradation, wetland and river degradation, invasive alien plants and coastal ecosystem pressures, reducing the ability of ecosystems to mediate climate impacts.

Socio-economic factors such as high poverty in certain areas, inequality, unemployment and uneven access to basic services further contribute to increased vulnerability. Around 63% of South Africa's population lives in urban areas, many in rapidly growing and poorly serviced settlements exposed to flooding, heat stress and service disruption. Rural communities are also highly vulnerable due to reliance on climate-sensitive livelihoods, rain-fed agriculture and natural resources. Gender inequality further affects adaptive capacity, with women often facing greater exposure to poverty, care burdens, limited access to land and finance. These conditions mean that climate change acts as a risk multiplier, amplifying existing development challenges.

South Africa has made important progress in building the foundations for adaptation. The country has moved from early policy development, risk and vulnerability assessment towards a more advanced adaptation system. This includes legislation, national strategies, sectoral planning, spatial decision-support tools, monitoring and evaluation processes and emerging work on adaptation indicators. The National Climate Change Adaptation Strategy provides the overarching national framework for adaptation and serves as South Africa's National Adaptation Plan. The Climate Change Act further strengthens this foundation by providing a legislative basis for coordinated climate action across spheres of government and for integrating adaptation into planning and implementation.

The Department of Forestry, Fisheries and the Environment (DFFE) plays a central role in South Africa's adaptation system. As the national custodian of climate change policy and adaptation coordination, DFFE is responsible for implementing the National Climate Change Adaptation Strategy, aligning adaptation efforts with the Climate Change Act, coordinating national reporting under the Paris Agreement, and strengthening key national systems. These include the National Climate Change Information System, the National Climate Change Response Database and the Tracking and Evaluation Portal. Ongoing work to redevelop these platforms is an important step towards a more integrated national system for monitoring, reporting and evaluating adaptation.

The climate risk and vulnerability sectoral analysis highlights water as a central adaptation priority. Climate change is expected to increase pressure on already stressed catchments through higher evaporation, rainfall variability, drought, declining water quality and more

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intense flood events. Biodiversity and ecosystems are also highly vulnerable, particularly rivers, wetlands, estuaries, coastal ecosystems and arid biomes, where climate impacts interact with land degradation, invasive alien species and habitat fragmentation. Ecosystem-based adaptation, including wetland restoration, catchment rehabilitation and sustainable land management, is therefore identified as a key response that can reduce risks while delivering co-benefits for biodiversity, livelihoods and water security.

The chapter also shows that climate risks are deeply unequal. Poverty, unemployment, informal settlement growth, poor service access and historical spatial inequalities increase exposure and reduce adaptive capacity. Women, children, older persons, persons with disabilities, rural households and informal settlement communities are often disproportionately affected. Gender is therefore treated as a cross-cutting issue, particularly in relation to household water and food security, disaster impacts, safety risks during displacement and access to resources.

Disaster risk and loss and damage are increasingly important for South Africa's adaptation reporting. Floods, storms and droughts dominate the country's disaster profile, with recent events causing loss of life, displacement, major infrastructure damage and rising recovery costs. Recent disasters include the January 2026 flooding in Limpopo and Mpumalanga, and May 2026 multi-province severe weather impacts. These events reinforce the need to strengthen early warning systems, disaster risk financing, resilient infrastructure, spatial planning, ecosystem-based risk reduction and post-disaster recovery systems.

Monitoring, evaluation and learning is an area of significant progress. South Africa has established core systems through the NCCIS, NCCRD and Tracking and Evaluation Portal, and is developing and testing adaptation indicators linked to the Second NDC and the Belém Adaptation Indicators. This reflects a shift from simply tracking whether adaptation actions are implemented, towards assessing whether they reduce vulnerability, avoid losses and strengthen resilience.

Overall, South Africa has made substantial progress in establishing the policy, institutional, scientific and reporting foundations for adaptation, but implementation must now be accelerated and better resourced. The next phase of adaptation requires stronger coordination, improved data flows, increased finance and integration of adaptation into core development, infrastructure and service delivery systems. This will be essential to reduce climate risks, protect vulnerable communities, limit loss and damage, and build a more climate-resilient South Africa.

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ES.4 Information on financial, technology development and transfer and capacity-building support needed and received under Articles 9–11 of the Paris Agreement

This chapter reports on South Africa's financial, technology development and transfer, and capacity-building support needed and received under Articles 9–11 of the Paris Agreement for the period 1 January 2023 to 31 December 2024. It situates these needs and support flows within South Africa's evolving climate policy, legal and institutional framework, including the Climate Change Act, the Second Nationally Determined Contribution, the National Climate Change Adaptation Strategy, and the Low Emission Development Strategy.

The chapter shows that South Africa continues strengthening the systems used to track, report and mobilise climate-related support. Financial support needed is substantial, with the Second NDC estimating investment needs of approximately ZAR 250 billion for priority adaptation actions and ZAR 3.47 trillion for mitigation over 2026–2035. These figures represent the broader investment envelope required to implement national climate priorities, while international support remains critical for adaptation, mitigation, loss and damage, technology deployment and institutional strengthening.

Technology development and transfer needs are concentrated in sectors central to South Africa's low-carbon and climate-resilient transition, including energy, transport, water and sanitation, biodiversity and ecosystems, human settlements, health, agriculture and coastal systems. Key priorities include renewable energy and storage, grid expansion, electric mobility, green hydrogen and Power-to-X technologies, climate-resilient infrastructure, early warning systems, water reuse and demand management technologies, improved monitoring and modelling systems, and technologies that support ecosystem restoration and climate-smart livelihoods. Reported technology support received includes cleantech innovation programmes, green technology stocktake activities, Just Energy Transition implementation initiatives, electric vehicle pilots, hydrogen-related projects, municipal energy projects and skills-linked technology support.

Capacity-building needs remain extensive and cross-cutting. Priority areas include strengthening greenhouse gas inventory systems, improving data collection and quality assurance, enhancing modelling capacity for policies and measures, improving land-use and LULUCF data, developing road transport and F-gas emission estimation systems, improving waste-sector data systems, and adapting national reporting systems to the Enhanced Transparency Framework. Additional capacity needs are identified for Climate Budget Tagging, adaptation planning and monitoring, local government implementation, climate

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services, early warning, gender-responsive and socially inclusive adaptation, indigenous and local knowledge integration, and Just Energy Transition skills development.

Capacity-building support received during the reporting period and shortly thereafter reflects strong engagement with international and regional transparency-support initiatives, including peer learning exchanges, UNFCCC and CBIT-GSP training, BTR preparation workshops, IPCC Inventory Software and GHG inventory tool training, COPERT training, and regional workshops on NDC tracking and the Enhanced Transparency Framework. These activities have supported improved technical capacity, peer learning, reporting readiness, transparency systems and institutional coordination. However, the chapter also highlights persistent needs for sustained finance, data systems, institutional capacity, technical expertise and coordinated implementation to ensure that South Africa can meet its Paris Agreement reporting obligations and deliver its mitigation, adaptation and just transition priorities.

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List of Abbreviations

Abbreviation	Name
ACRU	Agricultural Catchments Research Unit model
ADZs	Aquaculture Development Zones
AFOLU	Agriculture, Forestry and Other Land Use
AGB	Above-ground biomass
AIT	Authorisation for International Transfer
AMO	Authorised Mitigation Outcome
AR5	(IPCC) Fifth Assessment Report
AR6	Sixth Assessment Report of the Intergovernmental Panel on Climate Change
ARC	Agricultural Research Council
AU	African Union
Bbl/d	Barrels per day
BCEF	Biomass conversion and expansion factor
BEF	Biomass expansion factor
BMA	Biodiversity Management Agreements
BMP	Biodiversity Management Plan
BNF	Biological nitrogen fixing
BOD	Biological oxygen demand
BRT	Bus Rapid Transit
BTR	Biennial Transparency Report
BTR1	South Africa's First Biennial Transparency Report
BTR2	South Africa's Second Biennial Transparency Report
BTR3	South Africa's Third Biennial Transparency Report
BUR	Biennial Update Report
C	Carbon
C2F4	Tetrafluoroethylene
C2F6	Carbon hexafluoroethane
CA	Compressed Air
CALC	Computer Automated Land Cover
CASP	Comprehensive Agricultural Support Programme
CBAMs	Carbon Border Adjustment Mechanisms
CBIT	Capacity Building Initiative for Transparency
CBIT	Capacity-Building Initiative for Transparency
CBT	Climate Budget Tagging
CCAMP	Climate Change Adaptation and Mitigation Plan
CCAQ	(Branch:) Climate Change and Air Quality
CCAQM	Climate Change Air Quality Management
CCD&IM	Climate Change Development and International Mechanisms
CCRS	Climate Change Response (Adaptation and Mitigation) Strategy
CDD	Consecutive Dry Days

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Abbreviation	Name
CDKN	Climate and Development Knowledge Network
CDM	Clean Development Mechanism
CF4	Carbon tetrafluoromethane
CFC	Chlorofluorocarbons
CGE	Consultative Group of Experts
CH4	Methane
CHASA	Climate and Health Alliance of South Africa
CHBS	Climate-Based Health Services Project
CHIRPS	Climate Hazards InfraRed Precipitation with Station Data
CHP	Combined Heat and Power
CII	Carbon Intensity Indicator
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
CMIP6	Coupled Model Intercomparison Project Phase 6
CMIP6	Coupled Model Intercomparison Project Phase 6
CO	Carbon monoxide
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
CO2e/CO2eq	Carbon Dioxide equivalent
COAS	Carbon Offset Administration System
COL	Cut-off-low
COP	Conference of the Parties
CRF	Concentration Response Function
CRT	Common Reporting Table
CRT	Common reporting tables
CRU	Climatic Research Unit
CRV	Climate Risk and Vulnerability
CSA	Climate Smart Agriculture
CSAG	Climate System Analysis Group
CSIR	Council for Scientific and Industrial Research
CSIR	Council for Scientific and Industrial Research
CSP	Country Strategy Paper
CTF	Common Tabular Formats
CTF	Common Tabular Format
CTL	Coal-to-Liquids
CWD	Consecutive wet days
CWD	Consecutive Wet Days
DAFF	Department of Agriculture, Forestry and Fisheries
DAFF	Department of Agriculture Affairs, Forestry and Fisheries
DALRRD	Department of Agriculture, Land Reform and Rural Development
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs
DBSA	Development Bank of Southern Africa
DEA	Department of Environmental Affairs

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Abbreviation	Name
DEA	Department of Environmental Affairs
DEE	Department of Electricity and Energy
DFFE	Department of Forestry, Fisheries and Environment
DFFE	Department of Forestry, Fisheries and the Environment
DFFE-ACF	DFFE Adaptive Capacity Facility
DFID	Department for International Development
DFP	Designated Focal Point
DG	Director-General
DJF	December–January–February, representing summer
DM	Dry matter
DMD	Dry matter digestibility
DMR	Department of Mineral Resources
DMRE	Department of Mineral Resources and Energy
DoE	Department of Energy
DOH	Department of Health
DOM	Dead organic matter
DPME	Department of Planning, Monitoring and Evaluation in the Presidency
DRI	Direct Reduced Iron
DSI	Department of Science and Innovation
DTI	Department of Trade and Industry
DTIC	Department of Trade, Industry and Competition
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EbA	Ecosystem-Based Adaptation
EE	Energy Efficiency
EEDSM	Energy Efficiency and Demand Side Management
EEP	Energy Environment Partnership
EEXI	Energy Efficiency Existing Ship Index
EF	Emission factor
EM-DAT	Emergency Events Database
ENSO	El Niño–Southern Oscillation
EPR	Extended Producer Responsibility
ESM	Earth System Model
ETF	Enhanced Transparency Framework
EV / EVs	Electric Vehicle(s)
FAO	Food and Agriculture Organisation
FAW	Fall armyworm
FertASA	Fertiliser Association of South Africa
F-gases	Fluorinated gases: e.g., HFC, PFC, SF6 and NF3
FOD	First order decay
FOLU	Forestry and Other Land Use

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Abbreviation	Name
FRA	Forest resource assessment
FSA	Forestry South Africa
FWI	Fire Weather Index
GAP	Gender Action Plan
GBF	Global Biodiversity Framework
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEI	Gross energy intake
GFRSA	Global Forest Resource Assessment for South Africa
GFT	Green Finance Taxonomy
Gg	Gigagram
GH2	Green Hydrogen
GHG	Greenhouse gas
GHGI	Greenhouse Gas Inventory
GHS	General Household Survey
GIS	Geographic Information Systems
GIS	Geographical Information Systems
GPG	Good Practice Guidance
GPG	(IPCC) Good Practice Guidance
GTS	Governmental Transport Strategy (aviation sector reference document)
GWH	Gigawatt hour
GWL	Global Warming Level
GWP	Global Warming Potential
HFC	Hydrofluorocarbons
HSRC	Human Sciences Research Council
HWD	Heatwave Duration
HWN	Heatwave Number
HWP	Harvested wood products
HWP / HWPs	Harvested Wood Product(s)
HySA	Hydrogen South Africa
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICAT	Initiative for Climate Action Transparency
IDM	Integrated Demand Management
IDP	Integrated Development Plan
IFPRI	International Food Policy Research Institute
IKS	Indigenous Knowledge Systems
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
IPG	International Partner Group
IPPU	Industrial Processes and Product Use

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Abbreviation	Name
IRP	Integrated Resource Management Plan
IRP	Integrated Resource Plan
ISIMIP	Inter-Sectoral Impact Model Intercomparison Project
ISO	International Organization for Standardization
ISRIC	International Soil Reference and Information Centre
ISWC	Institute of Soil, Water and Climate
ITCZ	Intertropical Convergence Zone
ITMO/ITMOs	Internationally Transferred Mitigation Outcome(s)
IWRM	Integrated Water Resource Management
JET	Just Energy Transition
JET-IP	Just Energy Transition Implementation Plan (also referred to as the Just Energy Transition Investment Plan)
JETP	Just Energy Transition Partnership
JJA	June–July–August, representing winter
KCA	Key category analysis
KZN	KwaZulu-Natal
L&D	Loss and Damage
LC	Land cover
LEDS	Low Emissions Development Strategy
LNG	Liquefied Natural Gas
LPG	Liquefied petroleum gas
LTAS	Long-Term Adaptation Scenarios
LULUCF	Land Use, Land Use Change and Forestry
M&E	Monitoring and Evaluation
MAM	March–April–May, representing autumn
MARPOL	International Convention for the Prevention of Pollution from Ships
MCDA	Multi-Criteria Decision Analysis
MEPS	Minimum Energy Performance Standards
MH-EWS	Multi-hazard Early Warning System
MO/MOs	Mitigation Outcome(s)
MPGs	Modalities, Procedures and Guidelines (for the Enhanced Transparency Framework, Paris Agreement)
MRV	Measurement, Reporting and Verification
MSPF	Marine Spatial Planning Framework
MTDP	Medium-Term Development Plan
MTSF	Medium-Term Strategic Framework
MURP	Municipal Risk Pooling
MW	Megawatt
MWH	Megawatt hours
MWTP	Municipal wastewater treatment plant
N2O	Nitrous oxide
NAEIS	National Atmospheric Emissions Inventory System
NAP	National Adaptation Plan

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Abbreviation	Name
NBA	National Biodiversity Assessment
NBF	National Biodiversity Framework
NBSAP	National Biodiversity Strategy and Action Plan
NCCARA	National Climate Change Adaptation Research Agenda
NCCAS	National Climate Change Adaptation Strategy
NCCHAP	National Climate Change and Health Adaptation Plan
NCCIS	National Climate Change Information System
NCCMR&E Framework	National Climate Change Monitoring and Evaluation System Framework
NCCRD	National Climate Change Response Database
NCCRP	National Climate Change Response Policy
NCCRS	National Climate Change Response Strategy
NCPC	National Cleaner Production Centre (South Africa)
NCs	National Communications
NCV	Net calorific value
NDC	Nationally Determined Contributions
NDMC	National Disaster Management Centre
NDMF	National Disaster Management Framework
NDP	National Development Plan
NE	Not estimated
NEDLAC	National Economic Development and Labour Council
NEES	National Energy Efficiency Strategy
NEMBA	National Environmental Management: Biodiversity Act
NEV	New Energy Vehicles
NFCS	National Framework for Climate Services
NGER	National Greenhouse gas Emissions Regulation
NGERs	(National) Greenhouse Gas Emission Reporting Regulations
NGHGIS	National Greenhouse Gas Inventory System
NHED	Natural Hazard Events Database
NICD	National Institute for Communicable Diseases
NID	National Inventory Document
NIR	National Inventory Report
NMVOC	Non-methane volatile organic compound
NO	Not occurring
NOx	Oxides of nitrogen
NPC	National Planning Commission
NQF	National Qualifications Framework
NT	National Treasury
NTCSA	National Terrestrial Carbon Sinks Assessment
NTCSP	National Treasury Cities Support Programme
NWMS	National Waste Management Strategy
OECD	Organisation for Economic Co-operation and Development
OECM	Other Effective Area-Based Conservation Measures

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Abbreviation	Name
OIMPs	Other International Mitigation Purposes
PAM / PAMs	Policies and Measures (also "Policy and Measures")
PBN	Performance Based Navigation
PCC	(Presidential) Climate Commission
PFC	Perfluorocarbons
PGMs	Platinum Group Metals
PLA	Party-Level Authorisation
PPAs	Power Purchase Agreements
PPP	Public–Private Partnership
PRCPTOT	Total annual precipitation / total precipitation
PSC	Project Steering Committee
PSEE	(South African) Private Sector Energy Efficiency (Programme)
PV	Photovoltaic
QA/QC	Quality Assurance / Quality Control
QA/QC	Quality assurance/quality control
R10mm	Annual count of days when precipitation is greater than or equal to 10 mm
r20mm	Count of extreme rainfall days which is used for events that potentially lead to floods
R20mm	Annual count of days when precipitation is greater than or equal to 20 mm
RE	Renewable Energy
REI4PP	Renewable Energy Independent Power Producer Procurement Program
RISDP	(SADC) Regional Indicative Strategic Development Plan
RSA	Republic of South Africa
Rx1day	Maximum 1-day precipitation
Rx5day	Maximum 5-day precipitation
SA	South Africa
SAAQIS	South African Air Quality Information System
SADC	Southern African Development Community
SAEON	South African Environmental Observation Network
SAF	Sustainable Aviation Fuel(s)
SAGERS	South African Greenhouse Gas Emission Reporting System
SAGERS	South African GHG Emissions Reporting System
SAIGE	South African Industrial Greenhouse Gas Emission (Management) System / System for Administration of Integrated Greenhouse Gas Emissions
SAMA	South African Medical Association
SAMI	South African Minerals Industry
SAMRC	South African Medical Research Council
SAMSA	South African Maritime Safety Authority
SANBI	South African National Biodiversity Institute
SANEDI	South African National Energy Development Institute
SANLC	South African National Land Cover
SAPIA	South African Petroleum Industry Association
SAR	Second Assessment Report
SAREM	South African Renewable Energy Master Plan

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1 National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases

1.1 National GHG Inventory Summary

1.1.1 Introduction

This chapter presents a summary of South Africa's National Greenhouse Gas (GHG) Inventory ("the Inventory") for the year 2024. It also reports on the GHG trends for the period 1990 to 2024. The inventory was compiled in accordance with the International Panel on Climate Change (IPCC) 2006 guidelines for Inventories, IPCC Good Practice Guidance (GPG) (IPCC, 2000; IPCC, 2003; IPCC, 2014) and the 2019 Refinement to the 2006 IPCC Guidelines (IPCC, 2019).

The Inventory covers sources of GHG emissions and removals by sinks, resulting from human (anthropogenic) activities for the major GHGs: carbon dioxide (CO2), methane (CH4), nitrogen dioxide (N2O), perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs). The indirect GHGs: carbon monoxide (CO), nitrous oxides (NOX) and non-methane volatile organic compounds (NMVOCs) are also included for biomass burning. The gases are reported under five sectors: Energy; Industrial Processes and Product Use (IPPU); Agriculture, Land Use, Forestry and Land Use Change (LULUCF) and Waste.

This report incorporates significant improvements, including the completion of the 1990–1999 time series across all sectors. It provides a comprehensive analysis of South Africa's emissions profile from 1990 -2024.

1.2 National circumstances

1.2.1 Background information on GHG inventories

The Republic of South Africa ratified the UNFCCC in August 1997. South Africa submitted its first national GHG inventory in 1998 (Van der Merwe & Scholes, 1998) using 1990 data and was subsequently published the 2004 national GHG inventory using data for 1994. These inventories were developed using the 1996 IPCC Guidelines for National Greenhouse Gas Inventories. The national GHG inventory that followed for 2000 (DEAT, 2009) used the 2006 IPCC Guidelines (IPCC, 2006). Subsequently, the 2014 the GHG inventory for the years 2000 to 2010 (DEA, 2014), an update for 2011 and 2012 in 2017 (DEA, 2017), 2013 to 2015 in 2019 (DEA, 2019), 2017 in 2021 (DFFE, 2021), and for 2018, 2019 and 2020 in 2023 (DFFE,

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2023) and the current inventory being reported for the period 1990-2024 (DFFE, 2026) were compiled using the 2006 IPCC guidelines.

1.2.2 Global warming potentials

As GHG's vary in their radiative activity, and in their atmospheric residence time, converting emissions into carbon dioxide equivalents (CO_2e) allows the integrated effect of emissions of the various gases to be compared. To comply with international reporting obligations under the United Nations Framework Convention on Climate Change (UNFCCC), emissions are presented as CO_2e using the 100- year global warming potentials (GWPs) from the 2014 IPCC Fifth Assessment Report (AR5) in accordance with the Modalities, Procedures, and Guidelines (MPGs) for transparency framework for action and support referred to in Article 13 of the Paris Agreement (**Error! Reference source not found.**).

Table 1.1. Global warming potential (GWP) of greenhouse gases used in 1990-2024 National GHG inventory and taken from AR5 (IPCC, 2014b).

GHG	Chemical formula	AR5 GWP
Carbon dioxide	CO_2	1
Methane	CH_4	28
Nitrous oxide	N_2O	265
Hydrofluorocarbons (HFCs)		
HFC-23	CHF_3	12 400
HFC-32	CH_2F_2	677
HFC-125	CHF_2CF_3	3170
HFC-134a	CH_2FCF_3	1300
HFC-143a	CF_3CH_3	4 800
HFC-227ea	C_3HF_7	3350
HFC-365mfc	$C_4H_5F_5$	804
HFC-152a	CH_3CHF_2	138
Perfluorocarbons (PFCs)		
PFC-14	CF_4	6 630
PF-116	C_2F_6	11 100

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1.2.3 Institutional arrangements

1.2.3.1 National Entity

The Department of Forestry, Fisheries and the Environment (DFFE) serves as South Africa's lead national authority for environmental governance, providing strategic direction, policy development and coordination on environmental matters. Its mandate is guided by the Constitution of the Republic of South Africa and supported by a range of environmental legislation and policies aimed at promoting sustainable environmental management and addressing climate change.

In terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), the DFFE is responsible for formulating, coordinating and monitoring national environmental information, policies, programmes and legislation.

As the country's lead institution on climate change, the DFFE is responsible for coordinating climate change mitigation and adaptation initiatives, as well as monitoring, evaluation and reporting processes. This includes the compilation and maintenance of South Africa's National Greenhouse Gas (GHG) Inventory. Within the Department, the Climate Change and Air Quality Branch is responsible for managing and coordinating the development, quality assurance and reporting of the national GHG inventory (**Error! Reference source not found.**).

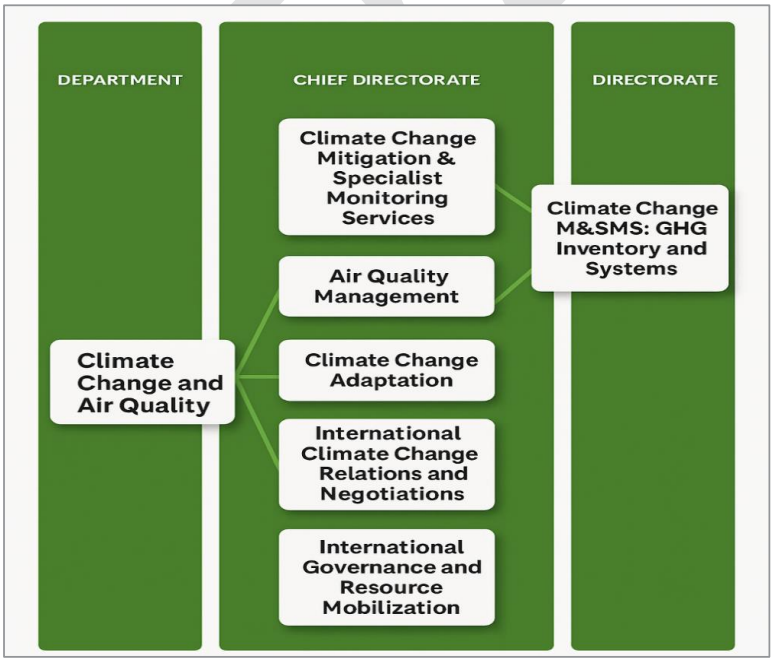


Figure 1.1: Organogram showing where the GHG Inventory compilation occurs within DFFE.

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1.2.3.2 Legal Arrangements

The National GHG Inventory relies on activity data obtained from a wide range of sources, including government departments, research institutions, industry associations and private sector organisations. Historically, data collection has not been governed by formal interdepartmental agreements, resulting in the need to source information from multiple providers across different sectors.

To strengthen the collection of activity and emissions data, the National Greenhouse Gas Emission Reporting Regulations (NGER) were published in 2017 under the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004). The Regulations establish a single national reporting framework for GHG emissions and provide the basis for maintaining South Africa's National GHG Inventory, meeting the country's reporting obligations under the UNFCCC, and supporting the development and implementation of climate change policy and legislation.

The NGER provides the regulatory framework for collecting the activity and emissions data required to compile complete, accurate, transparent and consistent national GHG inventories. The first mandatory reporting cycle commenced on 31 March 2018, requiring designated data providers to register with the DFFE and submit activity and emissions data in accordance with the Regulations.

To further strengthen the national reporting system, the DFFE is replacing the South African Greenhouse Gas Emissions Reporting System (SAGERS) with the South African Industrial GHG Emission Management System (SAIGE). The new web-based platform is being developed to improve the reporting, management and analysis of industrial GHG emissions while streamlining regulatory compliance.

SAIGE will integrate GHG reporting with Carbon Budgets and Mitigation Plans into a single system, enabling the submission, review, approval and analysis of emissions data. Once fully implemented, the platform will support more efficient reporting by regulated entities while providing the DFFE with improved information to support emissions monitoring, policy development and strategic decision-making.

Compilation of the National GHG Inventory is coordinated through the National GHG Information Management System (NGHGIS), a central web-based platform that manages the collection, storage and processing of inventory data.

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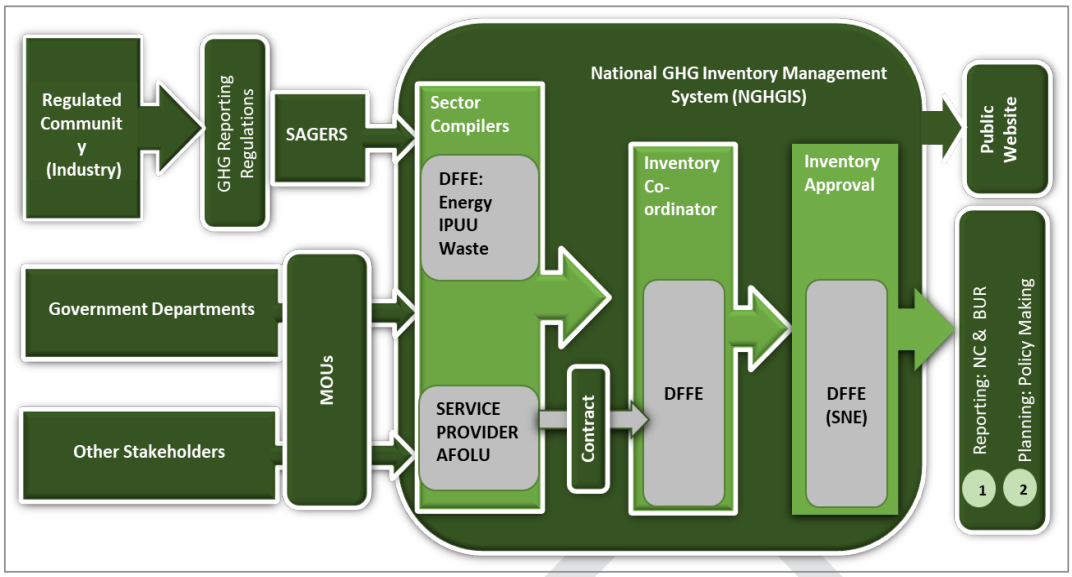


Figure 1.2: The inventory compilation process in South Africa.

1.2.4 Inventory management and inventory preparations

1.2.4.1 Inventory management

South Africa uses a hybrid (centralised and distributed) approach to managing the National GHG Inventory. The DFFE, as the Single National Entity, is responsible for the centralised coordination, compilation, publication and submission of the inventory. Currently the DFFE is responsible for collecting data, compiling and quality control (QC) of the Energy, IPPU, Agriculture and Waste sector inventories, while the LULUCF sector is compiled (in collaboration with DFFE) by external consultants (Gondwana Environmental Solutions (GES)) who are appointed on contract and funded through donor support. DFFE assists with the QC of the LULUCF sector. DFFE were also responsible for combining and compiling the overall inventory and compiling the draft National Inventory Report.

1.2.4.2 Inventory preparation

The 2024 inventory compilation commenced with a planning meeting in January 2024 that established timelines and activities needed for data collection to finalise the National Inventory Document (NID). Targeted training was provided on inventory preparation, calculation tools, QC, time-series consistency, splicing techniques and uncertainty analysis to the new team members joined the inventory team. The planning phase also included the preparation of templates and compilation files.

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The inventory preparation process comprised five key stages: data collection, compilation, report writing, improvement and finalisation. During the collection phase, activity data were obtained, cleaned, checked and formatted for analysis. The compilation phase involved estimating emissions, conducting QC, uncertainty and key category analyses, and assessing any recalculations. The writing phase focused on preparing the draft inventory report and completing cross-cutting analyses, followed by a quality assurance (QA) review through a public commenting process. Review comments were incorporated into the final report before archiving, obtaining approvals and submitting the inventory to the UNFCCC.

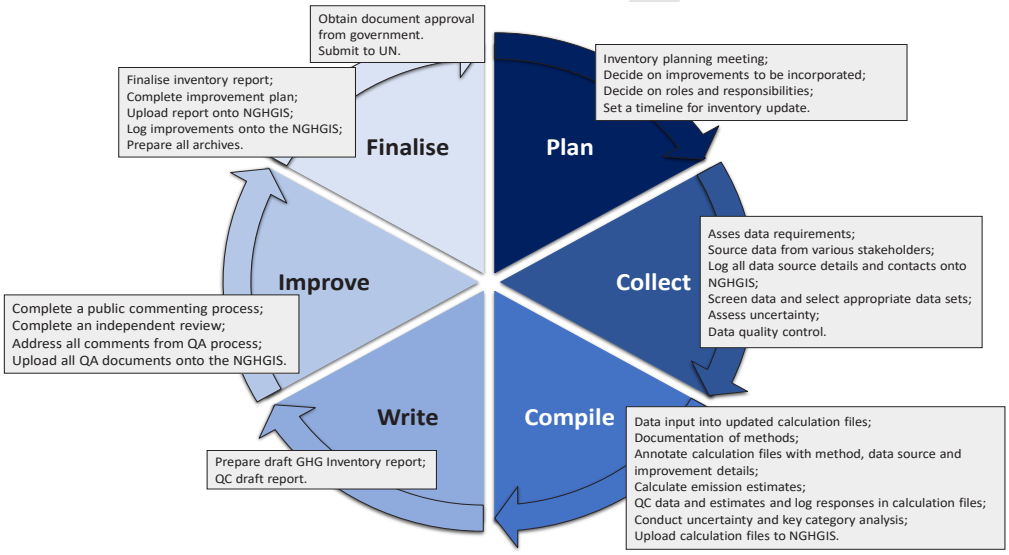


Figure 1.3: Overview of the phases of the GHG inventory compilation and improvement process undertaken for South Africa's 2024 GHG inventory.

1.2.5 Data collection, storage and archiving

1.2.5.1 Data collection

Data collection and documentation are undertaken by the relevant sector experts using three primary data sources. The first is South Africa's GHG Reporting Programme, through which regulated entities are legally required to report activity and emissions data in accordance with the NGER. The programme run by the DFFE serves as the primary source of emissions data for the national inventory and has significantly strengthened the completeness, consistency, accuracy, comparability and transparency of South Africa's GHG inventories.

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The second source comprises data obtained from government departments, research institutions and other organisations through established, but largely informal, data-sharing arrangements. The third involves the use of publicly available information, including official statistics, industry association data, technical reports, scientific publications and third-party research. Collectively, these data sources provide the activity data required for the compilation of the National GHG Inventory.

1.2.5.2 Data preparation and emission calculations

The process of data preparation and emissions calculation comprises the following steps:

- Data entry;
- Data preparation (model formation, disaggregation, aggregation);
- Calculation of emissions;
- Preparation of report sections (texts); and
- Approval by the relevant experts.

Report texts are prepared along with the time series for activity data, emission factors, uncertainties, and emissions. As a result, the term "data" is understood in a broad sense. In addition to number data, time series, etc., it also includes contextual information such as the sources for time series, and descriptions of calculation methods, and it also refers to preparation of report sections for the NID and documentation of recalculations.

After all checks have been carried out, and the relevant parties were consulted where necessary, the emissions are calculated in excel by each sector lead based on the following principle:

activity data * emission factor = emission

As much of the data as possible is included in the calculation files, but where larger data sets are referred to these are stored in the NGHGIS. Following complete preparation of data, report sections and QC/QA checklists by the experts responsible, these materials are transmitted to the Single National Entity where it is reviewed by category-specific specialists at the Single National Entity. The results of this review are then provided to the sector lead experts to revise and finalise their contribution.

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1.2.5.3 Data storage and archiving

The NGHGIS for South Africa assists in managing and storing the inventory related documents and processes. The NGHGIS in part, keeps records of the following:

- Stakeholder list with full contact details and responsibilities;
- List of input datasets which are linked to the stakeholder list;
    - QA/QC plan;
    - QA/QC checks;
    - QA/QC logs which will provide details of all QA/QC activities;
    - All method statements;
    - IPCC categories and their links to the relevant method statements together with details of the type of method (Tier 1, 2 or 3) and emission factors (default or country-specific) applied;
    - Calculation and supporting files;
    - Key references;
    - Key categories; and
    - All inventory reports.

The procedures for data storage and archiving are described in detail in the QA/QC plan that has been developed as presented in the latest NIR (DFFE, 2026). The NGHGIS is used to archive inventory data.

1.2.6 Brief description of methods and data

The methods used for the individual categories are outlined in the sector overview sections in each of the sector chapters of the National Inventory Report (DFFE, 2026).

In terms of data, for the Energy Sector, the primary source of data for the Energy sector is derived from reports submitted by data providers under South Africa's GHG Reporting Programme. Data from South Africa's GHG Reporting Programme is supplemented by energy balance data compiled by the Department of Electricity and Energy (DEE), formerly the Department of Mineral Resources and Energy (DMRE). At present, there are no formal processes in place for requesting or obtaining data directly from DEE.

Data for the IPPU sector is obtained mostly through South Africa's GHG Reporting Programme. The HFC and PFC data was supplied by the DFFE Waste and Chemicals branch and supplemented with the 2016 5-year periodic survey conducted by DFFE. There is no formal data collection process in place for this.

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Agricultural data are sourced from multiple institutions, as there is no single, formalised data collection system covering all agriculture-related data.

Cropland data is provided by the Department of Agriculture, Land Reform and Rural Development (DALRRD). Data on fertiliser use and liming are obtained from the South African Revenue Service (SARS), the Department of Mineral Resources and Energy (DMRE), and the Fertilizer Association of South Africa (FertASA). Some crop statistics are sourced from Statistics South Africa (Stats SA).

Livestock data are primarily obtained from DALRRD and the Agricultural Research Council (ARC). There are no formal data collection processes in place for all the other land, such as carbon stock data and fuel wood removals. Data is obtained from available government reports, agricultural association reports, statistical databases and scientific literature. Plantation data is supplied by Forestry SA, and the cropland data is supplied by DALRRD. Burnt area data is obtained from the MODIS burnt area product which is processed by Gondwana Environmental Solutions.

Waste data is collected from various data reports, statistics and global data sets. The main data providers for the Waste sector are Statistics SA, DFFE, Department of Water and Sanitation (DWS) and UN. Currently no formal data collection processes are place, though it is expected that it may be possible, for future inventories, to collect some of the Waste data through South Africa's GHG Reporting Programme.

1.2.7 Quality assurance, quality control and verification plans and procedures

This report is guided by the inventory quality principles as defined in IPCC 2006 Guidelines (IPCC, 2006). As part of the NGHGIS, South Africa developed a formal quality assurance/quality control plan (Annex IV). This provides a list of QC procedures that are to be undertaken during the preparation of the inventory. In this inventory the relatively new team was provided with QA/QC training, and each team member was assigned to a sector. Each quality controller went through the sector calculation files and provided comments. A programme, QA Analyst, assisted with the process of tracking the comments by keeping a log in the front of each file.

The QC procedures are performed by the experts during inventory calculation and compilation. QC measures are aimed at the attainment of the quality objectives. The QC procedures comply with the IPCC good practice guidance and the IPCC 2006 Guidelines. General inventory QC checks include routine checks of the integrity, correctness and completeness of data, identification of errors, deficiencies, and documentation and archiving of inventory data and quality control actions.

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In addition to general QC checks, category-specific QC checks including technical reviews of the source categories, activity data, emission factors and methods are applied on a case-by-case basis focusing on key categories and on categories where significant methodological and data revisions have taken place.

The general quality checks are used routinely throughout the inventory compilation process. Although general QC procedures are designed to be implemented for all categories and on a routine basis, it is not always necessary or possible to check all aspects of inventory input data, parameters, and calculations every year. Checks are then performed on selected sets of data and processes. A representative sample of data and calculations from every category may be subjected to general QC procedures each year.

Several workshops and training sessions between the team and the wider group at the DFFE were held during the preparation of this inventory. An initial planning meeting started the process off, followed by several team meetings to share data and queries. This has been useful even with the previous inventories. Everyone had a chance to understand other sectors, and it also improved the cross linkages. This should continue in future inventories.

The expert and public reviews each present opportunity to uncover technical issues related to the application of methodologies, selection of activity data, or the development and choice of emission factors. The expert and public reviews of the draft document offer a broader range of researchers and practitioners in government, industry and academia, as well as the public, the opportunity to contribute to the final document. The comments received during these processes are reviewed and, as appropriate, incorporated into the NID or reflected in the inventory estimates.

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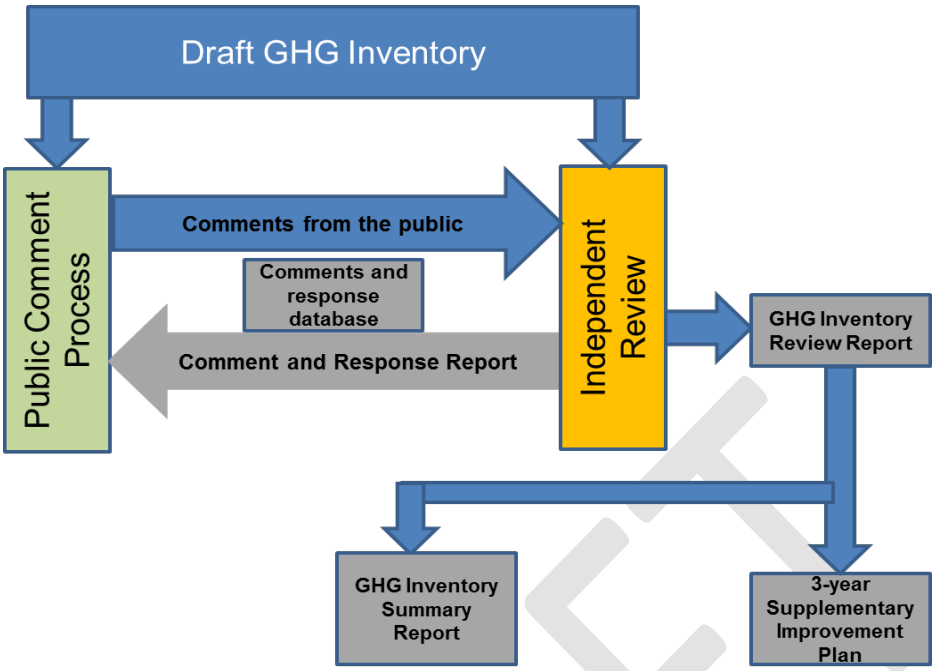


Figure 1.4: The quality assurance review process for the 2000 – 2022 inventory.

1.2.8 Key Category analysis

A key category is one that is prioritised within the national inventory system because its estimate has a significant influence (either as a source or a sink) on a country's total inventory of GHG's in terms of the absolute level, the trend, or the uncertainty in emissions and removals (IPCC, 2006). There are two approaches which can be used to determine the key categories: namely, the level approach and the trend approach. The former is used if only one year of data is available, while the latter can be used if there are two comparable years. The level assessment determines the contribution from the categories to the total national inventory. The trend assessment identifies categories that may not be large enough to be identified by the level assessment, but whose trend is significantly different from the trend of the overall inventory and should therefore receive particular attention. The trend can be an increase or a decrease in emissions. This inventory provides emissions for more than one year; therefore, both the level and trend assessments for key category analysis were performed.

The key categories (shown in Table 1.2) were assessed using the Approach 1 level (L1) and Approach 1 trend (T1) methodologies from the IPCC 2006 Guidelines (IPCC, 2006). Key categories based on uncertainty have not yet been included due to a lack of country specific data on uncertainties. The level and trend key category analysis

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identify key categories of emissions and removals as those that sum to 95% of the gross (excl. LULUCF) or net (incl. LULUCF) emissions and those that are within the top 95% of the categories that contribute to the change between 2000 and 2024, or the trend of emissions. This includes both source and sink categories. The level assessment was conducted on the base year (1990) and the current year (2024), while the trend assessment utilised the base year 1990 and 2024.

In the previous inventory there were 54 key categories, while in this inventory there are 43.

Table 1.2: Key categories for `South Africa for 2024 (including LULUCF) and their ranking.

Rank	IPCC code	IPCC Category	GHG[#]	Criteria
1	1.A.1	Fuel combustion - Energy Industries - Solid Fuels	CO_2	L,T
2	1.A.4	Other Sectors - Solid Fuels	CO_2	L,T
3	4.A.2.b	Grassland converted to forest land – all pools	CO_2	L,T
4	4.C.2.a	Forest land converted to Grassland – all pools	CO_2	L,T
5	1.A.3.b	Road Transportation	CO_2	L,T
6	4.A.1.a	Forest land remaining forest land – biomass (above and below)	CO_2	L,T
7	4.C.2.e	Other land converted to Grassland – all pools	CO_2	L,T
8	1.A.4	Other Sectors - Liquid Fuels	CO_2	L,T
9	4.C.1.a	Grassland remaining Grassland – biomass (above and below)	CO_2	L,T
10	1.A.5	Other (Not specified elsewhere) - Solid Fuels	CO_2	L,T
11	2.C.2	Ferroalloys Production	CO_2	L,T
12	2.C.1	Iron and Steel Production	CO_2	L,T
13	1.A.1	Fuel combustion - Energy Industries - Liquid Fuels	CO_2	L,T
14	5.A	Solid Waste Disposal	CH_4	L,T
15	3.A.1.a.ii	Non-dairy Cattle	CH_4	L,T
16	3.A.2	Sheep	CH_4	L,T
17	1.A.2	Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CO_2	L,T
18	4.F.2.c	Grassland converted to other land – all pools	CO_2	L,T
19	4.B.2.a	Forest land converted to Cropland – all pools	CO_2	L,T
20	1.A.3.a	Domestic Aviation	CO_2	L,T
21	1.B.3	Fugitive emissions from - Other emissions from energy production	CO_2	L,T
22	4.E.1.a	Settlements remaining Settlements – biomass (above and below)	CO_2	L,T
23	1.A.2	Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CO_2	L,T
24	4(II)	Emissions and removals from drainage and rewetting and other management of organic and mineral soils	CH_4	T
25	5.D	Wastewater Treatment and Discharge - Domestic	CH_4	L,T
26	1.A.5	Other (Not specified elsewhere) - Liquid Fuels	CO_2	L,T

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Rank	IPCC code	IPCC Category	GHG#	Criteria
27	1.A.2	Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CO_2	T
28	4.F.2.a	Forest land converted to other land – all pools	CO_2	T
29	2.C.3	Aluminium Production	CO_2	T
30	5.B	Biological Treatment of Solid Waste	CH_4	T
31	2.B.2	Nitric Acid Production	N_2O	L,T
32	4.C.2.c	Wetland converted to Grassland – all pools	CO_2	T
33	4.C.2.b	Cropland converted to Grassland – all pools	CO_2	L,T
34	4.E.2.b	Cropland converted to settlements – all pools	CO_2	T
35	2.D.2	Non-energy Products from Fuels and Solvent Use - Paraffin wax use	CO_2	T
36	1.B.2	Oil and Natural Gas	CO_2	T
37	3.A.4	Goats	CH_4	L,T
38	4.G	Harvested Wood Products	CO_2	T
39	3.A.1.a.i	Dairy Cattle	CH_4	L,T
40	3.B.4	Poultry	N_2O	T
41	3.G	Liming	CO_2	L,T
42	3.H	Urea Application	CO_2	T
43	1.A.4	Other Sectors - Gaseous Fuels	CO_2	T

1.2.9 Procedures for determination of uncertainty

Uncertainty is inherent within any kind of estimation and arises from the limitations of the measuring instruments, sampling processes and model complexities and assumptions. Managing these uncertainties, and reducing them over time, is an important element of inventory preparation and development as described in the IPCC 2006 Guidelines. Chapter 3 of the 2006 IPCC Guidelines (IPCC, 2006) describes the methodology for estimating and reporting uncertainties associated with annual estimates of emissions and removals. There are two methods for determining uncertainty:

- Tier 1 methodology which combines the uncertainties in activity rates and emission factors for each source category and GHG in a simple way; and
- Tier 2 methodology which is generally the same as Tier 1; however, it is taken a step further by considering the distribution function for each uncertainty and then carries out an aggregation using the Monte Carlo simulation.

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As South Africa still lacks data in terms of country specific uncertainty for all sectors, the simple propagation of error (Approach 1) method was used to determine the uncertainty in this inventory. A trend uncertainty between the base year (1990) and 2024 was determined, as well as a combined uncertainty of activity data and emission factor uncertainty. As more uncertainty data becomes available it will be incorporated into the uncertainty assessment. It is recognised that there is a general need to build capacity and develop projects to assess the uncertainty in each sector.

1.2.9.1 Uncertainty assessment results

Emission estimate uncertainties typically are low for CO_2 from energy consumption as well as from some industrial process emissions. Uncertainty surrounding estimates of emissions are higher for LULUCF and synthetic gases.

The total uncertainty for the inventory including LULUCF was determined to be between 14.1% and 14.51%, with a trend uncertainty of 16%[1]. This is an increase on the uncertainty in the last inventory (8.8%), however there were a few new categories in this inventory and a more detailed uncertainty assessment for *Forest lands* have been included. This led to an increase in uncertainty on the activity data, but a reduction in the emission factor uncertainty. Excluding LULUCF reduces the overall uncertainty to 5.7%-6.4%, which is a reduction of the uncertainty from the last inventory.

The Energy sector's uncertainty was reduced slightly (by 5% on the upper limit) compared to the previous inventory. The IPPU trend uncertainty increased by 32% compared to the last inventory. The IPPU sector did introduce some new categories in 2022 and 2024 and update some of the uncertainty estimates to be based on country specific data rather than defaults so these changes could contribute to the uncertainty change. The agriculture sector's uncertainty reduced for both the overall uncertainty and trend uncertainty. The uncertainty data did not really change but the emission estimates did, and there was also reallocation of some categories between Agriculture and LULUCF to align with the ETF CRT reporting.

LULUCF uncertainty increased by about 30% compared to the previous inventory uncertainty analysis. Part of this change was due to the introduction of new land change maps; however additional changes were made due to a more in-depth analysis of the uncertainty data rather than it being an actual change in uncertainty. The

[1] *The full uncertainty assessment is provided in Annex II.*

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uncertainty data is one aspect of the inventory, which is being improved, so it is likely there will be further changes in the next inventory. Waste sector uncertainty was reduced, but this is likely due to the reduction in the emissions in this sector due to improvements.

1.2.10 Assessment of completeness

The South African GHG emission inventory for the period 1990 – 2024 is not complete, mainly due to the lack of sufficient data. Table 1.3 provides information on the completeness of the inventory. It shows which activities are not estimated (NE), included elsewhere (IE) or that is not occurring (NO) within the South African authority.

Table 1.3: Activities in the 2024 inventory which are not estimated (NE), included elsewhere (IE) or Not Occurring (NO)

NE, IE or NO	IPCC Category	Activity	Comments
NE	1B1b	CO_2, CH_4 and N_2O from spontaneous combustion of coal seams	Research to be initiated in future, depended on availability of funding to initiate a study.
	1B1ai2	CH_4 emissions from abandoned mines	Research to be initiated in future, depended on availability of funding to initiate a study.
	1C1	CO_2 transport	Insufficient data to include
	2D2	CH_4 and N_2O emissions from paraffin wax use	Insufficient data to include,
	2E	Electronics industry	Insufficient data to include, an assessment to assess the significance of this source in South Africa.
	2F5	PFCs and HFCs from solvents	Insufficient data to include
	2G1	PFCs from electrical equipment	Insufficient data to include
	2G2	PFCs from other product uses	Insufficient data to include
	2G3	N_2O from product uses	Insufficient data to include
	3C7	CH_4 emissions from Rice cultivation	CH_4 emissions from Rice cultivation is assessed to be Insignificant.
	3I	Other carbon containing fertilisers	Research needs to be done to investigate the availability of this category in South Africa.
	4(I)C & 4(I)D	Direct and indirect N_2O emissions from N inputs to managed soils	Not included due to insufficient data.
	4(II)A & 4(II)E	Emissions and removals from drainage and rewetting and other management of organic and mineral soils	Not included due to insufficient data. Organic soils are also only partially included for Croplands and Grasslands.
	4D1a, 4D2a	Emissions from peat extraction	Some data has been identified but time series is not complete and there was insufficient time to verify and include the data. This will be incorporated as part of the proposed land mapping system.

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NE, IE or NO	IPCC Category	Activity	Comments
	Energy, IPPU, Waste	NOx, CO, NMVOC emissions	These have only been included for biomass burning in the Agriculture and LULUCF sectors due to a lack of data in other sectors
	Energy, IPPU, Waste	SO_2 emissions	Insufficient data.
IE	1A1aii	CO_2, CH_4 and N_2O emissions from Combined Heat and Power (CHP) combustion systems	Not separated out but is included within 1A1ai
	1A3eii	CO_2, CH_4 and N_2O emissions from off-road vehicles and other machinery	Included under Road transportation.
	1A5b	Non-specified mobile	Included under Non-specified Mobile (1A3b)
	3E	Prescribed burning of savannas	Emissions are included under LULUCF Forest land (4A) as prescribed burning could not be separated from wildfires.
	4A, 4D-4F	Organic soils	Included under mineral soils as insufficient data to separate.
NO	2B3	CO_2, CH_4 and N_2O emissions from Adipic acid production	
	1C2	Injection and storage	
	2B4	CO_2, CH_4 and N_2O Caprolactam, Glyoxal and Glyoxylic acid production	
	3J	Other	

1.2.11 Improvements and Recalculations

Improvements were made to emission estimates from each sector and therefore recalculations were completed for the full-time series. a comparison between the current emission estimates and the previous submission, both excluding and including LULUCF, for the period 2000-2024. The recalculations result in a structural downward revision of the net sink contribution from the land sector, particularly evident from 2014 onward. Consequently, total emissions including LULUCF in the current submission are higher relative to the previous submission in recent years, despite improvements in methodological accuracy.

The most significant differences occur in 2021 and 2022, where revised LULUCF estimates materially alter total national emissions. These changes are not indicative of real-world emission increases but rather reflect improved data quality, methodological consistency, and correction of historical artefacts in the time series. Overall, the recalculated time series improves consistency across the full 2000 - 2024 period, enhances transparency, and ensures alignment with updated national datasets and current good practice guidance.

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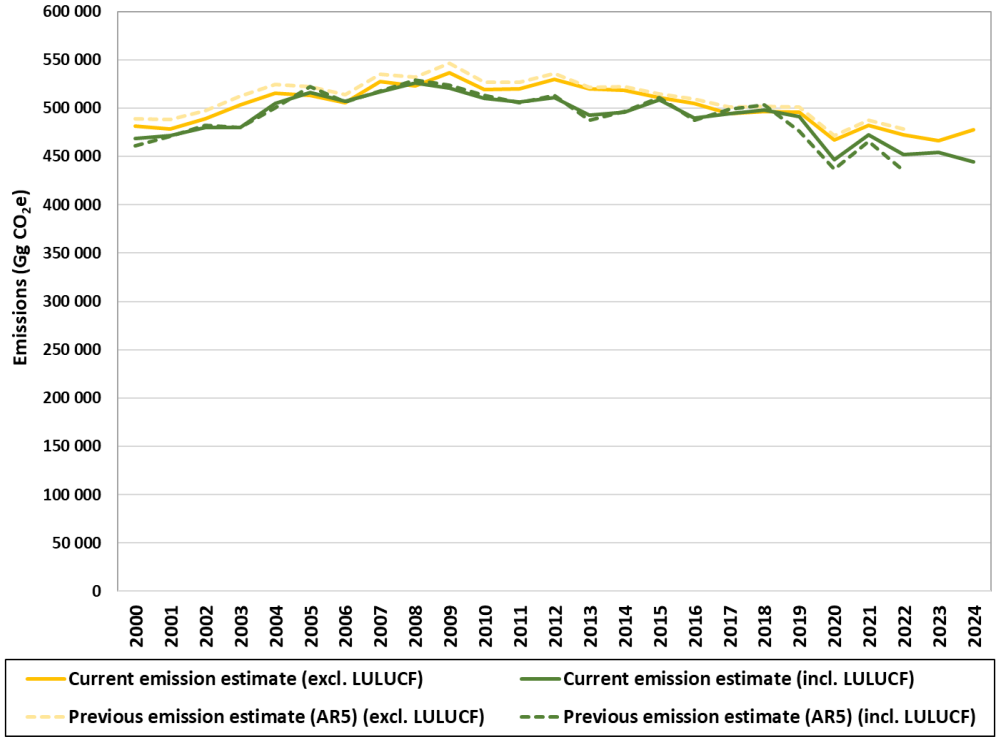


Figure 1.5: Impacts of recalculations on the overall emission estimates for South Africa.

1.2.12 Improvement Plan

South Africa continues to strengthen its quality assurance and quality control (QA/QC) framework for the national GHG inventory. In response to findings and recommendations from the external technical expert review under the UNFCCC enhanced transparency framework, a systematic and structured approach has been implemented to address all identified issues.

All review findings were assessed and categorised in line with key inventory quality principles, that is, transparency, consistency, comparability, completeness, and accuracy, and were incorporated into the national inventory improvement plan. Priority was assigned to issues that have a material impact on emission estimates, methodological application, time-series consistency, and documentation.

Actions undertaken include recalculations, where necessary, improvements to activity data and emission factors, enhanced documentation and methodological descriptions, and the strengthening of institutional arrangements. Efforts have also been made to improve the documentation and application of higher-tier (Tier 2 and Tier 3) methodologies, where appropriate.

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The inventory improvement plan (Table 1.4) reflects a combination of completed actions, ongoing improvements, and longer-term methodological developments. While significant progress has been made in enhancing transparency and sectoral detail, the implementation of certain improvements remains dependent on sustained financial resources, strengthened institutional capacity, and improved collaboration with national data providers.

South Africa will continue to apply a continuous improvement approach to its inventory system, with a focus on addressing priority issues ahead of future BTR submissions. Constraints to the full and immediate resolution of all review findings include resource limitations and reliance on external data providers for key activity data and sector-specific information. Notwithstanding these constraints, the continued strengthening of the QA/QC system remains a national priority to ensure the credibility, robustness, and transparency of the GHG inventory.

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Table 1.4: List of planned improvements for South Africa's GHG inventory

Sector	Improvement	Priority	Reason	Status	Completeness timeframe	Barriers and constraints
Tasks in progress						
Cross-cutting	Improve uncertainty data for all sectors by incorporating more country specific uncertainty values	High	Improve transparency, accuracy and consistency in uncertainty analysis	Ongoing – more detailed uncertainty analysis included for LULUCF; further disaggregation required	Continuous improvement; phased incorporation as data becomes available (2025–2027)	Lack of uncertainty data constrains this activity. As data becomes available it will be incorporated. In this inventory a more detailed analysis of uncertainty for LULUCF sector was included but further disaggregation is required to improve the analysis.
	Improve QA/QC process by addressing all issues in external review	High	Strengthen transparency, consistency, accuracy and completeness of the national GHG inventory and ensure alignment with UNFCCC review recommendations	Ongoing- review findings are being systematically assessed and incorporated into the improvement plan	Continuous; priority issues to be addressed before next BTR submission	Resource and capacity constraints.
Energy	Incorporate NOx, CO, NMVOC, and SOx emissions	Medium	Improve completeness of inventory and align with reporting requirement	Partly resolved	Continuous improvement; phased incorporation as data becomes available (2025–2027)	Partly resolved.
	Update of the VKT study, including segregation of on-road/off-road	High	Improve accuracy of transport sector emissions	Planned	to be initiated before next BTR submission (2026)	Project to be initiated before next BTR

Sector	Improvement	Priority	Reason	Status	Completeness timeframe	Barriers and constraints
	Comparison of next VKT approach with fuel statistics	Medium	Improve QA/QC and consistency checks	Planned	to be initiated before next BTR submission (2026)	Project to be initiated before next BTR
Agriculture	Incorporate all background data and equations for the Tier 2 calculations of enteric fermentation	High	Improve transparency and methodological robustness	Partially completed - equations included; some parameters rely on average data	Full completion dependent on sustainable annual data source (2027-2029)	Partially completed. All background equations are included, but some factors still rely on average data rather than annual data due to the absence of a sustainable data source; although the investigation was conducted, no sustainable data source has been identified so far
LULUCF	Improve the uncertainty analysis for the Land sector to incorporate more detail.	High	Improve robustness of Land sector estimates	Partially completed - more detailed analysis included; further disaggregation needed	2027-2029	A more detailed uncertainty analysis was included in this inventory but further disaggregation is required to improve the analysis.
	Improvement of land change data through detailed assessment of maps and tracking of land parcels	High	Improve accuracy of land representation and reduce misclassification	Ongoing - 2022 SANLC map incorporated; key categories identified; seasonality removal prioritised	Progressive improvement through next inventory cycles	This 2024 inventory incorporated a more detailed assessment of the land change data and identified the most important land change categories that need attention. The assessment also identified improvements that need to be done moving forward and the priority of these improvements. Removing changes due to seasonality is top priority and this will be improved as more land change maps are obtained. The 2022 SANLC map was used to make improvements. Tracking of land parcels over time still remains a critical process to undertake.

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Sector	Improvement	Priority	Reason	Status	Completeness timeframe	Barriers and constraints
	Improve the biomass burning emissions	Medium	Improve representation of fire-related emissions	Analysis undertaken for 2024; assessment pending for replication in other years	Decision on expansion in next inventory.	An analysis of biomass burning was undertaken for 2024, and the resulting emission impacts need to be assessed to determine the value of conducting similar analyses for other years.
	Incorporate organic soils study to include emissions from organic soils	Medium	Improve completeness (CO_2 emissions from drained organic soils)	Initial estimates included using ISRIC, FAOSTAT and IPCC defaults	Further refinement required (2027 onwards)	Organic soil area was determined from ISRIC data. The area of drained organic soils for *Grasslands* remaining *grasslands* and *Croplands remaining Croplands* were obtained from FAOSTAT. These datasets were used, together with IPCC default factors to estimate CO_2 emissions from drained organic soils. Further organic soil studies are required to improve emission estimates.
	Move to a higher tier level for DOM in forest lands	Medium	Improve accuracy of forest carbon pool estimates	Partially addressed - disturbance matrix improved; some data gaps remain	To be completed in next inventory	This was considered in the 2022 inventory and more detailed disturbance matrix data was included to determine the amount of biomass entering the DOM pool, however there were still one or two pieces of data missing which requires further investigation. This will be completed and included in the next inventory.
Tasks outstanding						
	Use IPCC Software	Medium	Improve transparency, consistency and QA/QC of calculations	Planned migration to IPCC Software to be initiated	2027-2028 inventory cycle	Use of the IPCC software to be initiated in future.

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Sector	Improvement	Priority	Reason	Status	Completeness timeframe	Barriers and constraints
Energy	Improve completeness	TBD	Improve completeness and accuracy of non-energy use emissions	Planned research to be initiated	2027-2028 inventory cycle	Research to be initiated in future.
	Further disaggregation of 1A2	High	Improve sectoral resolution.	Ongoing - currently disaggregated to 1A2a, 1A2b, 1A2-ab; further breakdown required	Progressive improvement through next inventory cycles	Current inventory breaks down 1A2 into 1A2a, 1A2b and 1A2-ab. Further work is required to further disaggregate this sector and have emissions calculated per sub-sector
	Inclusion of methodology documentation/summary/approval process for tier 3 methods	Medium	Improve transparency	Planned - to be collated and included	2027-2028 inventory cycle	To be collated and included in future.
	CO_2, CH_4 and N_2O from spontaneous combustion of coal seams	Medium	Improve completeness	Planned research to be initiated	TBD, based on funding availability.	Funding to initiate study required
	CH_4 emissions from abandoned mines	Medium	Improve completeness	Planned research to be initiated	TBD, based on funding availability.	Research to be initiated in future.
	CO_2 transport and storage	Medium	Anticipate CCS developments	Proposed	TBD	Proposed
	CO_2, CH_4 and N_2O emissions from combined heat and power (CHP) combustion systems	Medium	Improve completeness of combustion systems	Proposed	TBD	Proposed
IPPU	Assess significance of emissions from electronics industry	Medium	Improve completeness of IPPU sector	Proposed	TBD,Proposed; not implemented due to funding constraints	Proposed

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Sector	Improvement	Priority	Reason	Status	Completeness timeframe	Barriers and constraints
	Update the fluorinated gasses with higher accuracy figures from SARS	High	Improve accuracy of F-gas estimates	Ongoing	2027-2028 inventory cycle	Access to all data and ensuring that the data is accurate.
Agriculture	Update SOC reference data	Medium	Improve soil carbon stock accuracy	Proposed	TBD, Proposed; not implemented due to funding constraints	Proposed
	Improve manure management data, including biogas digesters as a management system	High	Improve accuracy of CH_4 and N_2O estimates	Proposed	Proposed; not implemented due to funding constraints	Proposed as a project due to the high variability in the dataset; however, it was not carried out because of insufficient funding.
LULUCF	Initiate data collection on controlled fires	High	Improve disaggregation biomass burning estimates	Proposed	TBD	Proposed
	Perform a more detailed assessment of HWP to include a wider range of products	Medium	Improve carbon stock change estimates	Proposed	TBD	Proposed project that could be considered under the GHGIP. For future evaluation.
	Collect data on other disturbances besides fire in forest lands	High	Accuracy -Improve forest carbon accounting	Proposed	TBD	This would require a study so will be recommended as a project under the GHGIP.
Waste	Include information on population distribution in rural and urban areas as a function of income	Medium	Improve waste generation estimates	Proposed	TBD	Insufficient data.
	Include HWP in solid waste	Medium	Improve completeness	Proposed	TBD	Insufficient data.
	Obtain data on waste streams and the bucket system	Medium	Improve wastewater and solid waste estimates	Proposed	TBD	Insufficient data.
	CH_4, N_2O emissions from biological treatment of waste	Medium	Improve completeness	Proposed	TBD	Insufficient data.

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Sector	Improvement	Priority	Reason	Status	Completeness timeframe	Barriers and constraints
	CO_2, CH_4 and N_2O from waste incineration	Medium	Improve completeness	Proposed	TBD	Insufficient data.
	Data collection on quantities of waste disposed of into managed and unmanaged landfills	Medium	Improve completeness	Proposed	TBD	Funding to initiate study.

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1.2.13 Processes for official consideration and approval of inventory

The NIDs are endorsed by the Project Steering Committee (PSC), being chaired by the DFFE and comprising of various stakeholder before they are submitted to the Minister of the DFFE for approval. Once the reports are approved by Minister, they are submitted to the UNFCCC by the Chief Directorate for Climate Change International Relations and Reporting and undergo an international review process.

1.2.14 Application of Flexibility Provisions

South Africa's 2024 NID includes one flexibility provision related to completeness for insignificant emissions. The rational to applying this flexibility is as follows:

1.2.14.1 Completeness Provisions for Insignificant Emissions:

Flexibility Provision: Emissions sources contributing less than 0.1% of total national GHG emissions (excl. LULUCF) or less than 1,000 kilotons (kt) of CO_2-equivalent may be considered insignificant. South Africa commits to assessing categories that are not estimated in the current NID for significance by 2028.

Covered Sectors and Specific Emissions Categories (Table 1.5):

- IPPU: Subcategories involving N_2O, HFCs, PFCs, and SF_6, specifically in the electronics industry, solvents, and other product uses.
- Agriculture: Emissions from other carbon containing fertilisers (CO_2).
- Waste: Emissions from waste incineration (CH_4).

Improvement Timeline: The significance of these emissions categories will be evaluated and updated by the third Biennial Transparency Report (BTR 3), due December 2028.

Table 1.5: Summary of Flexibility Provision Applied by Sector

Year	Sector	Category	Gas	Explanation for using flexibility provision	Timeframe for improvement
2024	IPPU	2.E Electronics Industry	N_20 HFCs PFCs SF_6	Completeness (32) Flexibility to consider emissions insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, or 1,000 kt CO_2 eq, whichever is lower. South Africa will assess the significance of this source and report if significant.	BTR 3 (December 2028)

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Year	Sector	Category	Gas	Explanation for using flexibility provision	Timeframe for improvement
		2.F.5. Solvents	HFCs PFCs SF6	Completeness (32) Flexibility to consider emissions insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, or 1,000 kt CO_2 eq, whichever is lower. South Africa will assess the significance of this source and report if significant.	BTR 3 (December 2028)
		2.G.1 Electrical equipment	HFCs PFCs SF6	Completeness (32) Flexibility to consider emissions insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, or 1,000 kt CO_2 eq, whichever is lower. South Africa will assess the significance of this source and report if significant.	BTR 3 (December 2028)
		2.G.2. SF6 and PFCs from other product use	PFCs SF_6	Completeness (32) Flexibility to consider emissions insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, or 1,000 kt CO_2 eq, whichever is lower. South Africa will assess the significance of this source and report if significant.	BTR 3 (December 2028)
		2.G.3. N_2O from product uses	N_20	Completeness (32) Flexibility to consider emissions insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, or 1,000 kt CO_2 eq, whichever is lower. South Africa will assess the significance of this source and report if significant.	BTR 3 (December 2028)
2024	Agriculture	3.I. Other carbon-containing fertilizers	CO_2	Completeness (32) Flexibility to consider emissions insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, or 1,000 kt CO_2 eq, whichever is lower. South Africa will assess the significance of this source and report if significant.	BTR 3 (December 2028)
2024	Waste	5.C.1 Waste Incineration	CH_4	Completeness (32) Flexibility to consider emissions insignificant if the likely level of emissions is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, or 1,000 kt CO_2 eq, whichever is lower. South Africa will assess the significance of this source and report if significant.	BTR 3 (December 2028)

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1.2.15 Areas of improvement in response to review process

In response to the issues identified during the technical expert review of South Africa's first Biennial Transparency Report, several targeted improvements have been implemented in the current National Inventory compilation process. These include strengthened QA and QC procedures to improve consistency, systematic checks of data transfers from calculation files, and corrections to previously identified reporting inconsistencies.

Where feasible, recalculations have been undertaken to improve time-series consistency following methodological updates, while additional documentation has been provided to clarify assumptions, emission factors, activity data sources. Sector-specific enhancements were also introduced to address data gaps, improve methodological transparency. Collectively, these improvements enhance the transparency, accuracy, completeness, consistency, and comparability of the inventory and reflect South Africa's commitment to continuous improvement under the enhanced transparency framework.

1.2.16 Areas of improvement related to flexibility provisions applied

The list of improvements South Africa plans to implement considering the flexibilities used in the 2022 inventory are as follows:

Time Series Reporting Improvements: Collect and report consistent annual data starting from 1990 to meet mandatory requirements, with completion targeted by BTR 2 in December 2026.

Assessment of Insignificant Emissions: Evaluate the significance of the following emissions sources that are not estimated in the current inventory:

- Abandoned underground mines (CH_4).
- Post-mining activities (CO_2, CH_4, N_2O).
- Various IPPU categories, including:
- Electronics industry (N_2O, HFCs, PFCs, SF_6).
- Solvents and electrical equipment (HFCs, PFCs, SF_6).
- PFCs from other product use.
- N_2O from product uses.

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Incorporate these sources if emissions exceed thresholds (0.1% of total national emissions or 1,000 kt CO_2e). Assessments and updates are planned for BTR 3 in December 2028.

1.3 Summary of 2024 National GHG Inventory

1.3.1 National GHG inventory Emissions for 2024

The 2024 National Inventory Report (NIR) for South Africa is the country's 2024 NID report and provides estimates of South Africa's net GHG emissions for the period 1990 to 2024. The NIR will be submitted to United Framework Convention on Climate Change (UNFCCC) to fulfil South Africa's reporting obligations under the UNFCCC. The NIR was compiled in accordance with the 2006 IPCC Guidelines, the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol (IPCC, 2014a) and the 2019 Refinement.

National emissions of CO2, CH4 and N2O and GHG precursors for 2024 are provided in Table 1.6.

Emissions of GHG precursor gases (NOx, CO and NMVOCs) are only estimated from Biomass burning. Global Warming Potentials (GWPs)) from the 2014 IPCC Fifth Assessment Report (AR5) were used.

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Table 1.6: National emissions of GHGs and GHG precursors for 2024.

IPCC 2006 category	Emissions and removals									
	Net CO_2	CH_4	N_2O	HFCs	PFCs	SF6	NOx	CO	NMVOC	Total GHGs
		(Gg)		(Gg CO_2e)			(Gg)			(Gg CO_2e)
Emissions (incl. LULUCF)	**356 325.7**	**2 276.1**	**65.0**	**6 685.1**	**113.0**	**84.7**	**49.4**	**930.0**	**78.9**	**444 164.5**
Emissions (excl. LULUCF)	**393 909.3**	**2 171.1**	**60.3**	**6 685.1**	**113.0**	**84.7**	**1.4**	**53.2**	**0.0**	**477 576.4**
1 - Energy	**368 289.1**	**186.5**	**6.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**375 215.7**
1.A - Fuel Combustion Activities	344 347.2	16.4	6.4				NE	NE	NE	346 505.1
1.B - Fugitive emissions from fuels	23 941.9	170.1	0.0				NE	NE	NE	28 710.6
1.C - Carbon dioxide Transport and Storage	NE									NE
2 - Industrial Processes and Product Use	**23 029.6**	**4.2**	**1.3**	**6 685.1**	**113.0**	**84.7**	**0.0**	**0.0**	**0.0**	**30 371.6**
2.A - Mineral Industry	4 956.1	NE								4 956.1
2.B - Chemical Industry	1 290.6	4.2	1.3							1 749.8
2.C - Metal Industry	15 605.2	0.0	0.0	NE	113.0					15 718.3
2.D - Non-Energy Products from Fuels and Solvent Use	1 177.7	NE	NE							1 177.7
2.E - Electronics Industry	NE		NE	NE	NE					NE
2.F - Product Uses as Substitutes for Ozone Depleting Substances	NE			6 685.1	NE					6 685.1
2.G - Other Product Manufacture and Use			NE	NE	NE	84.7				84.7
2.H - Other	NA	NA	NA							NA
3 - Agriculture	**2 561.7**	**1 351.4**	**46.6**	**0.0**	**0.0**	**0.0**	**1.4**	**53.2**	**0.0**	**52 744.4**

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IPCC 2006 category	Emissions and removals									
	Net CO_2	CH_4	N_2O	HFCs	PFCs	SF6	NOx	CO	NMVOC	Total GHGs
		(Gg)		(Gg CO_2e)			(Gg)			(Gg CO_2e)
3.A – Enteric fermentation		1 287.4								36 048.3
3.B – Manure management		62.4	10.0							4 399.8
3.C – Rice cultivation		NO								NO
3.D – Agricultural soils		NA	36.5				NE	NE	NE	9 680.2
3.E – Prescribed burning of savannas		IE	IE				IE	IE	IE	IE
3.F – Field burning of agricultural residues		1.6	0.0				1.4	53.2	NE	54.5
3.G – Liming	1 890.9									1 890.9
3.H – Urea application	670.8									670.8
3.I – Other carbon-containing fertilisers	NE									NE
4 - LULUCF	**-37 583.7**	**105.0**	**4.6**	**0.0**	**0.0**	**0.0**	**48.0**	**876.7**	**78.9**	**-33 411.9**
4.A – Forest land	-55 744.0	14.2	1.2				17.6	368.2	51.6	-55 036.7
4.B - Cropland	8 083.9	2.5	0.6				0.1	3.2	0.3	8 311.1
4.C - Grassland	3 047.5	18.5	1.3				24.4	406.8	21.9	3 917.9
4.D - Wetland	106.8	69.0	0.3				4.7	77.8	4.1	2 105.3
4.E - Settlements	-1 452.7	0.7	0.4				1.2	20.7	1.1	-1 325.7
4.F – Other land	10 093.1	0.0	0.9				0.0	0.0	0.0	10 334.5
4.G – Harvested wood products	-1 718.3									-1 718.3
5 - Waste	**28.9**	**628.9**	**6.0**							**19 244.7**
5.A - Solid Waste Disposal		263.5	NE							7 376.7

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IPCC 2006 category	Emissions and removals									
	Net CO_2	CH_4	N_2O	HFCs	PFCs	SF6	NOx	CO	NMVOC	Total GHGs
		(Gg)		(Gg CO_2e)			(Gg)			(Gg CO_2e)
5.B - Biological Treatment of Solid Waste		64.0	3.1							2 620.2
5.C - Incineration and Open Burning of Waste	28.9	6.0	0.1							240.8
5.D - Wastewater Treatment and Discharge		295.5	2.8							9 007.0
5.E – Other	NO	NO	NO							NO
Memo items										
International bunkers	**4 166.1**	**0.2**	**0.1**							**4 200.9**
International aviation	*2 621.2*	*0.0*	*0.1*							*2 640.6*
International water-borne transport	*1 544.9*	*0.1*	*0.0*							*1 560.3*
Multilateral operations	*NA*	*NA*	*NA*							*NA*

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1.3.2 Trends in total GHG emissions and removals since 1990

1.3.2.1 Overall emissions (excluding LULUCF)

Total emissions (excluding LULUCF) cover those from the Energy, IPPU, Agriculture, and Waste sectors. This excludes emissions and removals associated with land use change and harvested wood products, which together make up the LULUCF sector.

1.3.2.1.1 1990 - 2024

National emissions have changed markedly over this period, reflecting shifts in the structure of the economy, energy production patterns, and industrial activity. South Africa's GHG emissions (excluding LULUCF) increased by 17.8% between 1990 and 2024. Long-term trends in emissions excluding LULUCF show an initial period of growth, followed by stabilisation and a gradual decline in more recent years. Emissions generally increased between 1990 and 2004, with only two years during this period recording slight annual decreases (Table 1.2). This was followed by a plateau from around 2005 to 2012, during which the average annual increase was just 0.36%. After 2012, emissions began to decline, with most years, except 2018, 2021, and 2024, showing year-on-year reductions.

1.3.2.1.2 2000- 2024

A 0.8% reduction in national emissions (excluding LULUCF) occurred between 2000 and 2024. This reflects a shift from rising emissions in 2000 to a declining trend by 2024, driven by changes in the national energy and industrial systems.

1.3.2.1.3 2022 - 2024

There has been a modest increase in emissions (Figure 1.6) of 1.1% between 2022 and 2024 which is consistent with post-pandemic economic recovery and fluctuations in electricity generation patterns.

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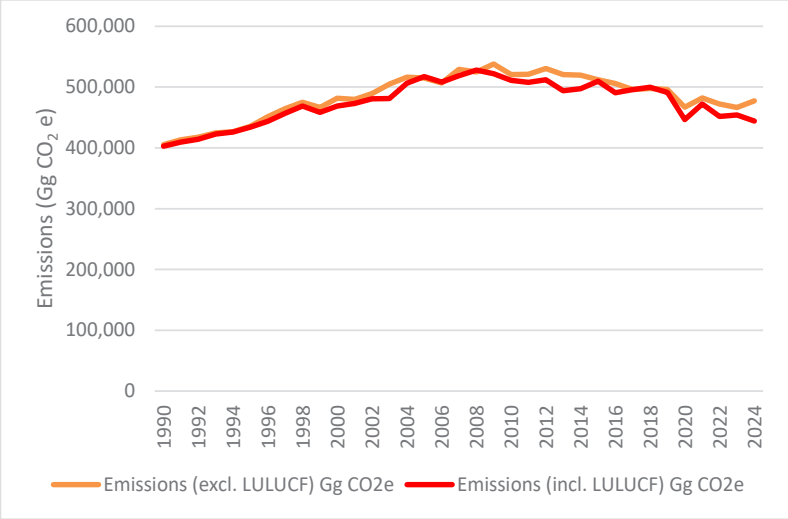


Figure 1.6: National GHG emissions (excluding and including FOLU) for South Africa, 1990 – 2024.

1.3.3 Emission Trends by Sector

1.3.3.1 Energy

The Energy sector is the largest contributor to South Africa's emissions (Figure 1.2), accounting for 78.6% of total emissions (excluding LULUCF) in 2024, as well as on average since 1990. In 1990, the Energy sector contributed 77.4% to total emissions (excluding LULUCF), indicating a modest overall increase of approximately 1.2 percentage points over the 34-year period.

Energy sector emissions have increased by 19.5% since 1990, although most of this growth occurred between 1990 and 2000. Emissions declined between 2000 and 2022. Between 2019 and 2020, the sector's share of total emissions decreased slightly from 80.9% to 79.6%, a reduction of approximately 1.3 percentage points. This decline is associated with an annual reduction of 6% in 2020, likely due to the impacts of COVID-19.

Energy sector emissions began to increase again between 2022 and 2024, rising by 1.4% over this period. In 2023, annual emissions decreased by 2%, followed by an increase of 3.5% in 2024. The decline observed in 2023 may have been influenced by intensified loadshedding, which reduced electricity generation and associated emissions. In contrast, the increase in 2024 corresponds with reduced loadshedding and a rebound in energy supply.

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1.3.3.2 IPPU

In 2024, the IPPU sector emitted 30 372 Gg CO_2e, accounting for 6.4% and 6.8% of South Africa's total emissions excluding and including LULUCF, respectively. Its contribution increased from 5.2% in 1990 to 6.4% in 2024 (excluding LULUCF).

Emissions were dominated by CO_2 (75.8%), followed by fluorinated gases (22.6%), with CH_4 and N_2O contributing less than 1.5%. Emissions from fuel combustion are reported under the Energy sector. Ferroalloy production is the largest source (52.6%), followed by Product Uses as Substitutes for Ozone-Depleting Substances (22.9%) and the Mineral Industry (16.4%). IPPU emissions increased by 43.0% since 1990, with most growth occurring between 1990 and 2000.

Emissions declined thereafter and remain 2 411 Gg CO_2e (7.4%) below 2000 levels in 2024, despite post-pandemic economic recovery. The decline is mainly due to reduced metals production (39.0%), particularly iron and steel and aluminum, and a 31.4% decrease in the chemicals industry, driven by lower global demand. In contrast, emissions from Cement Production and Non-Energy Product Use from Fuels and Solvents increased by 2 081 Gg CO_2e, reflecting rising domestic cement demand.

1.3.3.3 Agriculture

Between 1990 and 2024, the agriculture sector contributed 10 to 14% of total emissions (excluding and including LULUCF). Over this period, emissions declined by 4 573 Gg CO_2e (10.3%), with most reductions occurring between 2000 and 2022, followed by a slight increase (1.3%) from 2022 to 2024.

The sector's share of total emissions decreased from 14.5% in 1990 to 11.0% in 2024, reflecting changes in livestock populations, improved management practices, and shifts in land use. Livestock remains the main driver of emissions, contributing about 77% in 2024.

Enteric fermentation is the largest source (68.3%), followed by manure management (8.3%). Declines in enteric emissions are linked to reduced livestock numbers, while increasing poultry populations have driven a gradual rise in manure management emissions. Agricultural soils contribute 18.4% of emissions, while smaller sources include liming (3.6%), urea application (1.3%), and field burning of residues (0.1%).

The main driver of change in the agriculture sector is the livestock population, as livestock contribute to emissions from *Enteric fermentation*, *Manure management*, and direct and indirect N_2O emissions from managed soils.

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1.3.3.4 LULUCF

The LULUCF sector remains a net carbon sink, reaching 33,412 Gg CO_2e in 2024, which represents a substantial increase of 20 769 Gg CO_2e since 1990. Despite year-to-year variability, the overall trend shows a steady strengthening of the sink, including a notable 64.5% increase between 2022 and 2024.

Over the long term, Forest land has driven the largest percentage gains in sequestration, while more recent changes (2000–2024 and especially 2022–2024) have been more pronounced in Grassland and Wetland categories. Across all periods, converted lands have been the dominant contributors to both emissions and removals, except in Settlements.

Forest lands are the largest sink, estimated at 55 037 Gg CO_2e, largely due to thickets and woodlands. Earlier lower sink estimates (1990–2000) are linked to extrapolated burnt area data, while increased variability after 2001 reflects fluctuations in fire activity. Since 2018, the forest sink has strengthened further, mainly due to conversion of Grasslands to Forest land.

In contrast, all other land categories are net emission sources in 2024 (except for minor sequestration in Settlements). Other lands contribute the largest emissions, increasing since 2014 due to land conversions, though many of these changes may reflect seasonal variation rather than permanent shifts. Croplands remain a consistent emission source, with a spike around 2019–2020 linked to forest conversion. Grasslands emissions have risen over time, largely from forest-to-grassland conversion, while Wetlands contribute a small but growing source due to increasing conversions from other land types.

Overall, the sector's expanding sink is driven primarily by forest dynamics, while emissions from other land categories are closely tied to land-use conversions and, in some cases, short-term variability.

1.3.3.5 Waste

The Waste sector's contribution to national emissions has grown steadily, rising from 2.8% in 1990 to 4.0% in 2024, with overall emissions increasing by 69.6% over the period.

In 2024, total Waste sector emissions were 19 245 Gg CO_2e, dominated by:

- Wastewater treatment and discharge: 9,007 Gg CO_2e (47%)
- Solid waste disposal: 7,377 Gg CO_2e (38%)
- Biological treatment of solid waste: 2,620 Gg CO_2e (14%)

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- Incineration and open burning: 241 Gg CO_2e (1%)

Emission trends show that:

- Solid waste disposal increased significantly (+47.6% since 1990)
- Incineration and open burning also rose (+53.1% since 1990)
- Wastewater emissions grew more gradually overall

The rise in wastewater emissions is mainly driven by a 35.6% increase in domestic wastewater, which outweighs a 9.4% decline in industrial wastewater emissions. Overall, the sector's emissions growth reflects gradual but sustained increases, particularly from solid waste and domestic wastewater, leading to its expanding share in national emissions.

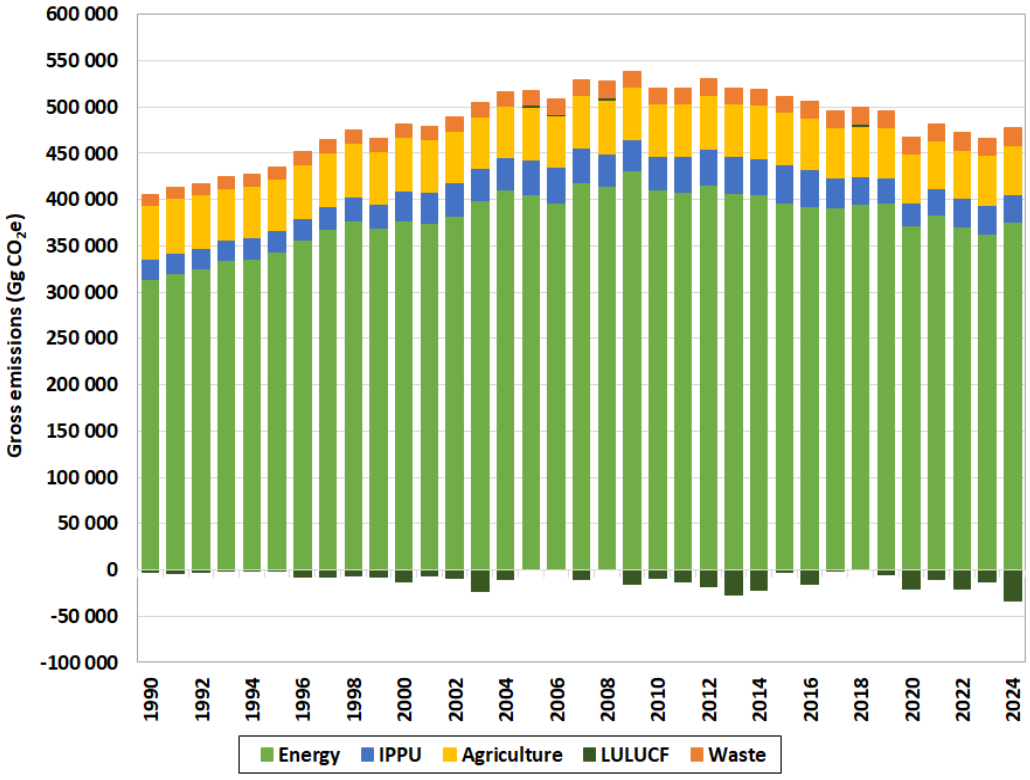


Figure 1.7: Trend in emissions by sector for 1990 to 2024.

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1.3.4 Emission Trends by Gas

1.3.4.1 Carbon Dioxide (CO_2)

Carbon dioxide (CO_2) is the dominant source of South Africa's GHG emissions, accounting for 82.5% of total emissions in 2024 (excluding LULUCF) (Figure 1.8). In 2024, the energy sector was the largest contributor to CO_2 emissions, responsible for 93.5%, followed by IPPU at 5.8% and agriculture at 0.7%. This distribution is consistent with long-term trends between 1990 and 2024, where the average contributions were 92.6% (energy), 6.9% (IPPU), and 0.6% (agriculture).

The LULUCF sector acts as a carbon sink, removing 37 584 Gg CO_2 in 2024, an increase compared to 1990 levels. This sink reduces emissions, from CO_2 levels at 393,917 Gg to 356,334 Gg in 2024.

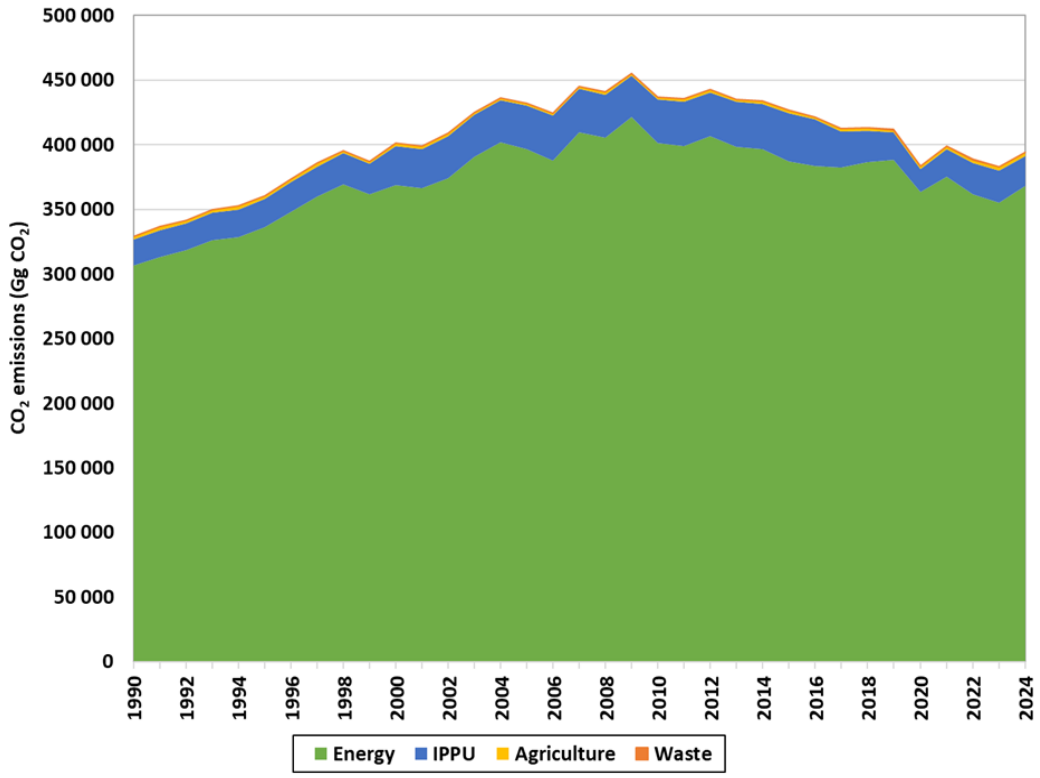


Figure 1.8: Trend and sectoral contribution to CO2 emissions (excl. LULUCF), 1990-2024.

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1.3.4.2 *Methane (CH_4)*

Methane (CH_4) is the second-largest contributor to South Africa's total GHG emissions. In 2024, CH_4 accounted for 12.7% of national emissions excluding LULUCF and 14.3% when LULUCF is included. This represents a decline from 1990 levels, when CH_4 contributed 15.1% (excluding LULUCF) and 15.8% (including LULUCF) (Figure 1.9). The Agriculture and Waste sectors are the primary sources of CH_4 emissions. Within Agriculture, Enteric Fermentation is the main contributor, while in the Waste sector, emissions are largely driven by Wastewater Treatment and Discharge.

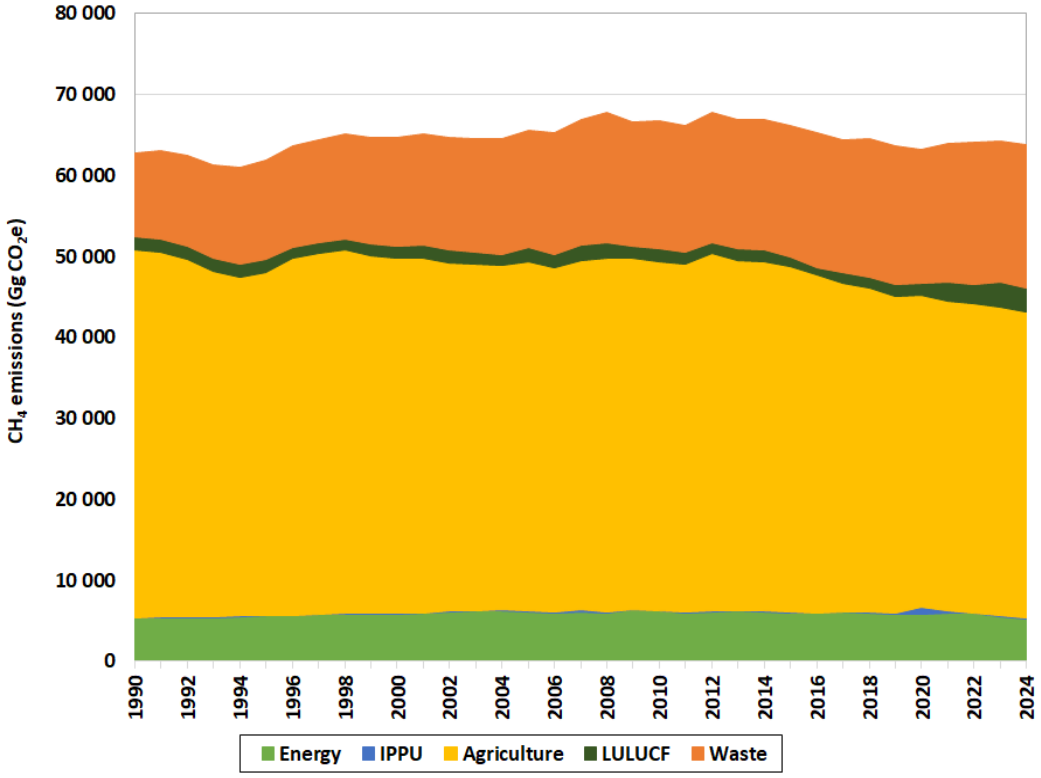


Figure 1.9: Trend and sectoral contribution to the CH4 emissions, 1990 – 2024.

1.3.4.3 *Nitrous oxide (N_2O)*

Nitrous oxide (N_2O) emissions made up a relatively small but declining share of South Africa's total GHG emissions, decreasing from 3.9% in 1990 to 3.3% in 2024 (excluding LULUCF). When LULUCF is included, the contribution declined, from 4.3% in 1990 to 3.9% in 2024, reflecting an increase in N_2O emissions from the LULUCF sector over time.

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The agriculture sector remains the dominant source of N_2O emissions, contributing 71.7% of total emissions (including LULUCF) in 2024. This is followed by the energy sector (9.9%) and the waste sector (9.3%). Despite its continued link to agricultural and industrial activities, the overall share of N_2O in national emissions has gradually decreased (Figure 1.10).

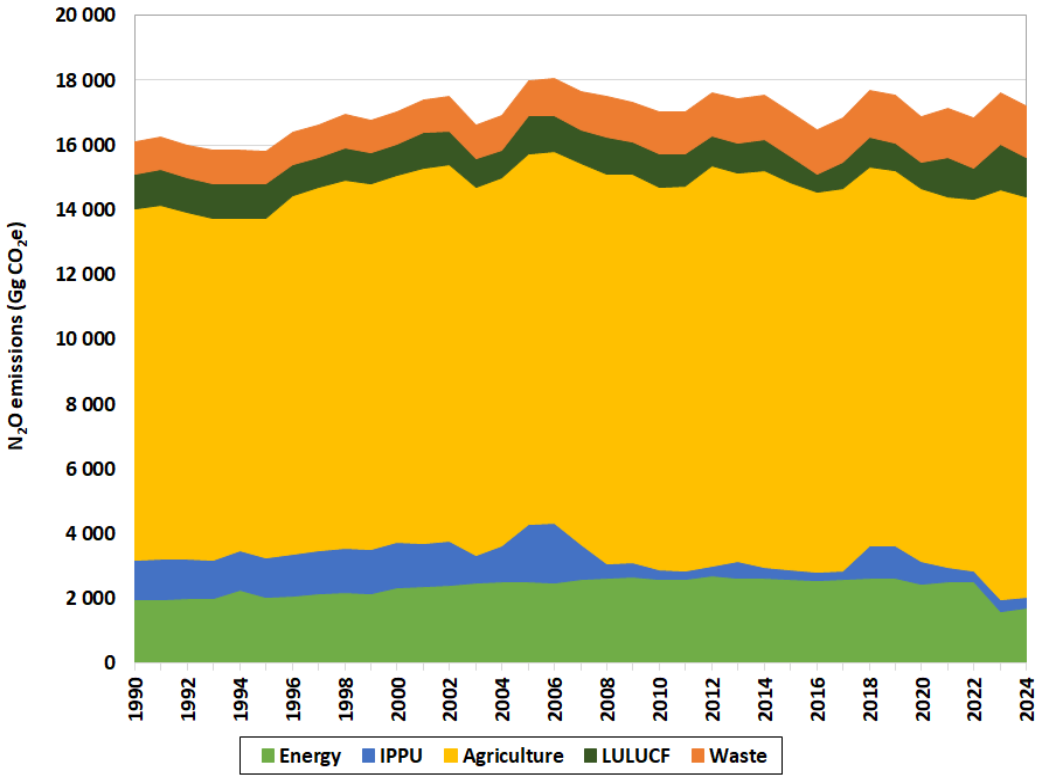


Figure 1.10: Trend and sectoral contribution to N_2O emissions in South Africa, 1990 – 2024.

1.3.4.4 F gases

Fluorinated gas (F-gas) emissions, specifically HFCs and PFCs, are estimated only for the IPPU sector in South Africa and accounted for 1.5% of total GHG emissions (including LULUCF) in 2024 (Figure 1.6). Annual estimates show variability, particularly from 2011 onward, when emissions increased due to the inclusion of additional HFC sources such as air conditioning, foam blowing agents, fire protection, and aerosols. As data are unavailable prior to 2005, the time series is not fully consistent, and the apparent rise in emissions reflects the incorporation of new categories.

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PFC emissions, which arise from aluminium production, show a declining trend in recent years. Updated production data from 2014 onward are significantly lower than earlier estimates, contributing to this decrease. A notable drop between 2007 and 2009 is linked to reduced aluminium output caused by electricity supply constraints and lower demand during the 2008/2009 economic crisis. Temporary increases in 2011 and 2012 were driven by operational inefficiencies in aluminium plants, as facilities adjusted to rotational load shedding. Frequent shutdowns and restarts led to elevated emissions of gases such as tetrafluoroethylene (C_2F_6) and carbon tetrafluoromethane (CF_4).

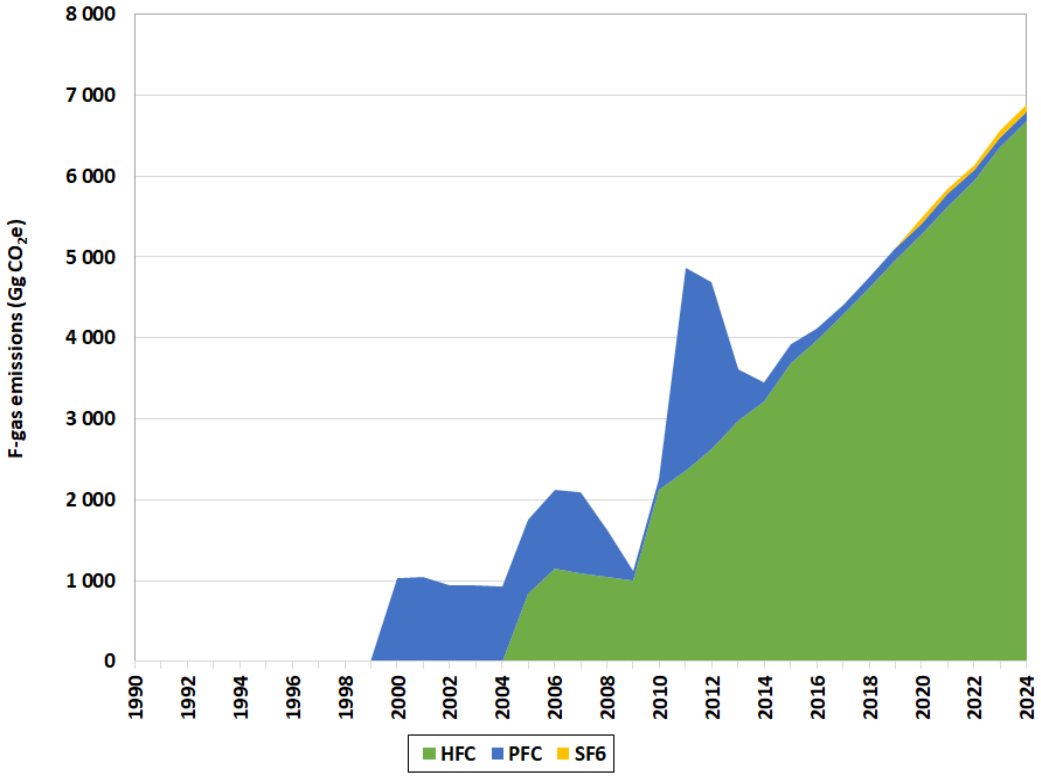


Figure 1.11: Trend in F-gas emissions in South Africa, 1990 – 2024.

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1.3.5 Key Categories

A key category is one that is prioritised within the national GHG inventory because it has a significant influence, either as a source or a sink, on total emissions, trends, or the uncertainty of estimates (IPCC, 2006). Two approaches are used to identify key categories: the level approach and the trend approach. The level approach assesses each category's contribution to total national emissions and is typically applied when only a single year of data is available. The trend approach, used when comparable data for at least two years exist, identifies categories whose emission trends differ significantly from the overall inventory, even if their absolute contributions are relatively small.

As this inventory includes multiple years, both approaches were applied. Key categories were identified using the IPCC (2006) Approach 1 level (L1) and trend (T1) methodologies. Categories were classified as key if they cumulatively account for 95% of total emissions, either gross emissions (excluding LULUCF) or net emissions (including LULUCF), or if they fall within the top 95% of contributors to emission changes between 1990 and 2024. Both emission sources and sinks were considered. The level assessment was conducted for the base year (1990) and the latest year (2024), while the trend assessment compared these same years.

Key categories based on uncertainty were not included due to a lack of country-specific uncertainty data. Overall, the number of identified key categories decreased from 54 in the previous inventory to 43 in the current inventory (Table 1.7).

Table 1.7: Key categories for South Africa for 2024 (including LULUCF) and their ranking.

Rank	IPCC code	IPCC Category	GHG#	Criteria
1	1.A.1	Fuel combustion - Energy Industries - Solid Fuels	CO_2	L,T
2	1.A.4	Other Sectors - Solid Fuels	CO_2	L,T
3	4.A.2.b	Grassland converted to forest land – all pools	CO_2	L,T
4	4.C.2.a	Forest land converted to Grassland – all pools	CO_2	L,T
5	1.A.3.b	Road Transportation	CO_2	L,T
6	4.A.1.a	Forest land remaining forest land – biomass (above and below)	CO_2	L,T
7	4.C.2.e	Other land converted to Grassland – all pools	CO_2	L,T
8	1.A.4	Other Sectors - Liquid Fuels	CO_2	L,T
9	4.C.1.a	Grassland remaining Grassland – biomass (above and below)	CO_2	L,T
10	1.A.5	Other (Not specified elsewhere) - Solid Fuels	CO_2	L,T
11	2.C.2	Ferroalloys Production	CO_2	L,T
12	2.C.1	Iron and Steel Production	CO_2	L,T

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Rank	IPCC code	IPCC Category	GHG[#]	Criteria
13	1.A.1	Fuel combustion - Energy Industries - Liquid Fuels	CO_2	L,T
14	5.A	Solid Waste Disposal	CH_4	L,T
15	3.A.1.a.ii	Non-dairy Cattle	CH_4	L,T
16	3.A.2	Sheep	CH_4	L,T
17	1.A.2	Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CO_2	L,T
18	4.F.2.c	Grassland converted to other land – all pools	CO_2	L,T
19	4.B.2.a	Forest land converted to Cropland – all pools	CO_2	L,T
20	1.A.3.a	Domestic Aviation	CO_2	L,T
21	1.B.3	Fugitive emissions from - Other emissions from energy production	CO_2	L,T
22	4.E.1.a	Settlements remaining Settlements – biomass (above and below)	CO_2	L,T
23	1.A.2	Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CO_2	L,T
24	4(II)	Emissions and removals from drainage and rewetting and other management of organic and mineral soils	CH_4	T
25	5.D	Wastewater Treatment and Discharge - Domestic	CH_4	L,T
26	1.A.5	Other (Not specified elsewhere) - Liquid Fuels	CO_2	L,T
27	1.A.2	Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CO_2	T
28	4.F.2.a	Forest land converted to other land – all pools	CO_2	T
29	2.C.3	Aluminium Production	CO_2	T
30	5.B	Biological Treatment of Solid Waste	CH_4	T
31	2.B.2	Nitric Acid Production	N_2O	L,T
32	4.C.2.c	Wetland converted to Grassland – all pools	CO_2	T
33	4.C.2.b	Cropland converted to Grassland – all pools	CO_2	L,T
34	4.E.2.b	Cropland converted to settlements – all pools	CO_2	T
35	2.D.2	Non-energy Products from Fuels and Solvent Use - Paraffin wax use	CO_2	T
36	1.B.2	Oil and Natural Gas	CO_2	T
37	3.A.4	Goats	CH_4	L,T
38	4.G	Harvested Wood Products	CO_2	T
39	3.A.1.a.i	Dairy Cattle	CH_4	L,T
40	3.B.4	Poultry	N_2O	T
41	3.G	Liming	CO_2	L,T
42	3.H	Urea Application	CO_2	T
43	1.A.4	Other Sectors - Gaseous Fuels	CO_2	T

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1.3.6 Trends in Precursor Gases

The trend in emissions of CO, NO_x and NMVOCs (Table 1.8), that were estimated for biomass burning only. The is annual variability is noted as the emissions include wildfires as well as controlled fires.

Table 1.8: Trends in Precursor Gases between 1990 and 2024.

	NO_x	CO	NMVOC
		(Gg)	
1990	46.3	917.9	111.3
1991	45.6	894.8	105.0
1992	45.6	895.8	105.5
1993	45.7	900.4	107.0
1994	46.1	917.6	112.1
1995	46.6	933.5	116.8
1996	38.0	700.1	65.8
1997	35.6	664.5	66.0
1998	41.7	775.5	76.3
1999	39.5	742.5	76.1
2000	40.8	756.9	72.4
2001	50.9	923.7	80.8
2002	48.1	874.2	78.1
2003	37.6	731.5	83.7
2004	32.9	652.0	79.1
2005	54.8	1 008.5	94.0
2006	51.3	964.1	97.2
2007	49.8	1 063.2	155.3
2008	56.7	1 190.2	167.3
2009	43.1	805.9	79.5
2010	45.9	833.3	73.6
2011	44.3	801.0	69.1
2012	37.0	673.9	60.8
2013	37.9	715.4	73.2
2014	40.0	740.5	70.6
2015	27.1	503.1	48.8
2016	10.9	232.3	33.9
2017	27.1	515.3	55.0
2018	30.0	581.1	66.2
2019	26.8	508.3	52.5
2020	26.7	506.5	52.6

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	NO_x	CO	NMVOC
		(Gg)	
2021	51.4	919.2	75.0
2022	31.9	584.6	54.4
2023	62.2	1 096.6	83.0
2024	48.0	876.7	78.9

1.3.7 Uncertainty Analysis

1.3.7.1 Procedures for uncertainty determination

Uncertainty is inherent in all emission estimates, arising from limitations in measurement, sampling, and modelling assumptions. Managing and reducing these uncertainties over time is a key component of greenhouse gas inventory development, as outlined in the IPCC 2006 Guidelines. Chapter 3 of the guidelines provides methods for estimating and reporting uncertainty in annual emissions and removals.

Two main approaches are used: Tier 1, which applies a simple error propagation method combining uncertainties in activity data and emission factors; and Tier 2, which uses more advanced techniques such as Monte Carlo simulation to better characterise uncertainty distributions.

Due to limited availability of country-specific uncertainty data across sectors, South Africa applied the Tier 1 (Approach 1) method in this inventory. This includes estimating both the combined uncertainty of activity data and emission factors, as well as the uncertainty in emission trends between the base year 1990 and 2024. As more detailed data become available, these estimates will be refined, highlighting the need for continued capacity building and targeted efforts to improve sector-specific uncertainty assessments.

1.3.7.2 Uncertainty assessment results

Uncertainty in South Africa's GHG inventory varies by sector and gas type. Estimates for CO_2 emissions from energy consumption and some industrial processes generally have low uncertainty, while higher uncertainty is associated with the LULUCF sector and synthetic gases. Overall, sectoral uncertainty ranges are consistent with typical values reported in the literature (IPCC, 2014).

The total inventory uncertainty, including LULUCF, is estimated at 14.1%–14.5%, with a trend uncertainty of 16%. This represents an increase from the previous inventory (8.8%), largely due to the inclusion of new categories and a more detailed assessment of forest land uncertainties. These updates increased uncertainty in activity data but improved the accuracy

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of emission factors. When LULUCF is excluded, overall uncertainty decreases to 5.7%–6.4%, reflecting an improvement compared to the previous inventory.

At the sectoral level, uncertainty in the Energy sector declined slightly, while the IPPU sector experienced a notable increase in trend uncertainty (by 32%), driven by the introduction of new categories and the use of country-specific data. The agriculture sector showed reduced uncertainty overall, mainly due to changes in emission estimates and the reallocation of certain categories to align with updated reporting frameworks. In contrast, LULUCF uncertainty increased by about 30%, influenced by new land-use change data and more comprehensive uncertainty analysis. The Waste sector showed reduced uncertainty, likely reflecting improvements in emissions estimation and declining emissions in this sector.

1.3.8 Recalculations and their impact

A comprehensive recalculation of Forest Land emissions and removals was undertaken to improve methodological consistency, data accuracy, and alignment with updated land representation and carbon stock information, in accordance with IPCC good practice principles.

Key improvements included the incorporation of updated land change maps for 2020–2022, corrections to the land-use change matrix to reflect technological advances and improved seasonal classification, and the removal of a previously identified error affecting estimates from 2014 onwards. Methodological refinements were also made to burnt area estimation, while soil type overlays were integrated with recent land cover datasets (2014–2018, 2018–2020, and 2020–2022) to enhance soil carbon stock estimates. In addition, biomass, deadwood, and litter carbon stocks were updated using improved emission factors and country-specific parameters, and assumptions distinguishing primary and secondary forests were refined to better capture carbon density variations.

Further enhancements included the incorporation of updated household fuelwood consumption data to improve estimates of removals linked to forest degradation, and the inclusion of both direct and indirect N_2O emissions from nitrogen inputs and mineralisation, improving the completeness of non-CO_2 reporting.

Collectively, these updates resulted in a structural revision of the Forest Land time series. The recalculated estimates indicate an average reduction in the net sink of 42.3% over the period 2000–2022, with year-to-year variation driven by land-use change dynamics, fire occurrence, and updated carbon parameters. For the most recent inventory years, net removals for 2021 and 2022 decreased by 39.2% (25,095 Gg CO_2e) and 38.7% (31,884 Gg CO_2e), respectively, compared to the previous submission.

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Recalculations were also undertaken in the Energy sector, where country-specific CO_2 emission factors for solid fuels, derived from a 2022 study, were applied in place of default IPCC values. Emissions for all relevant fuel combustion activities were recalculated across the full-time series to ensure methodological consistency and improved national representativeness.

The recalculations lead to a downward revision of the land sector's net sink, most notably from 2014 onward. As a result, total emissions including LULUCF are higher in the current submission compared to the previous one in recent years, despite improved methodological accuracy (Figure 1.12). Overall, these recalculations enhance the robustness, transparency, completeness, and internal consistency of the inventory, and ensure improved alignment with current methodological best practice and updated national datasets.

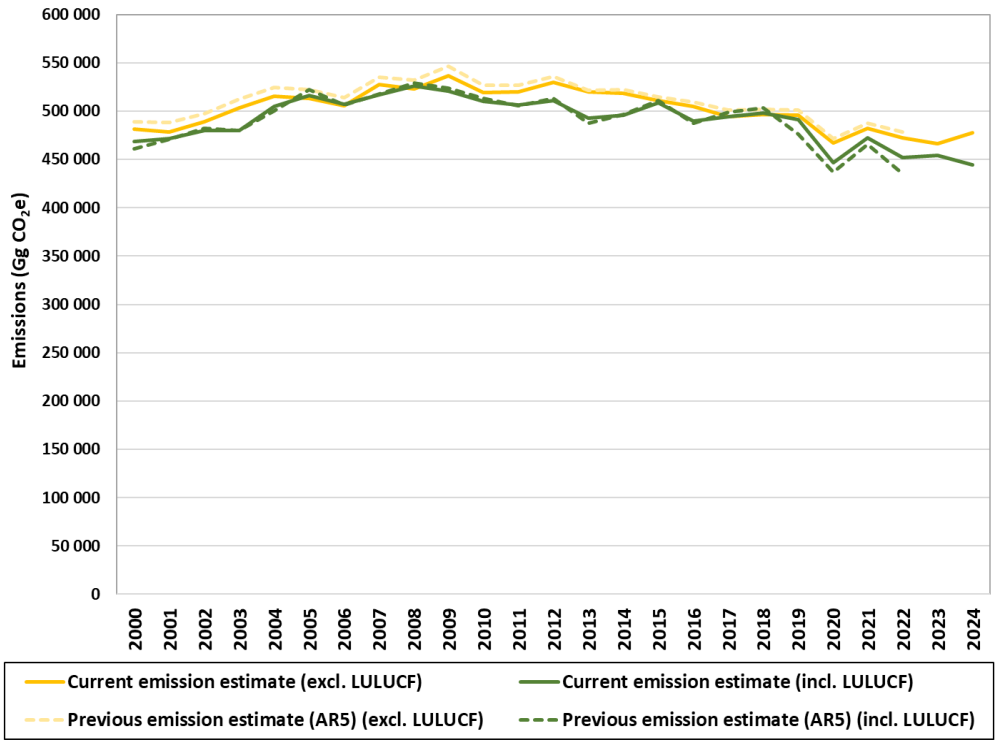


Figure 1.12: Impacts of recalculations on the overall emission estimates for South Africa.

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1.3.9 Time-Series Consistency

Time-series consistency has been assessed across all sectors in accordance with IPCC good practice guidance. Inconsistencies identified are primarily attributable to changes in methodologies (Tier 1 to higher tiers), improvements in data availability, inclusion of new source categories, and changes in data sources over time.

1.3.9.1 Energy

- 1B2a (Oil), the time series is complete; however, consistency is affected by a change in data source, with emissions estimates based on SAGERS data from 2019 onwards.
- 1B2b (Natural Gas), the time series is incomplete, as emissions data are only available from 2019 onwards through SAGERS.

1.3.9.2 IPPU

In the IPPU sector, time-series inconsistencies are mainly due to methodological improvements, incorporation of facility-level data via SAGERS, and the introduction of new categories without historical backcasting.

- **Cement Production (CRT 2.A.1):**
  The time series is not fully consistent due to the application of a Tier 1 method for 1990–2021 and Tier 2/3 methods from 2022 onwards. Clinker production was estimated using cement production and clinker fractions for 2000–2017, with company-specific data used from 2018 onwards. Import data were incorporated for 2008–2015.
- **Lime Production:**
  Estimates were based on Tier 1 and Tier 2 methods for 1990–2021, with methodological refinements including updated emission factors for hydrated lime (2017) and the inclusion of dolomitic lime (2019). A Tier 3 method has been applied from 2022 onwards.
- **Glass Production:**
  A Tier 1 method was applied for 2000–2017. Following implementation of the National Greenhouse Gas Emission Reporting Regulations (NGER), Tier 2/3 methods using a mass balance approach have been applied from 2018 onwards.
- **Other Process Uses of Carbonates (CRT 2.A.4):**
  This category was introduced in 2018. The time series is incomplete and not fully consistent due to the absence of historical data. Improvements are expected as reporting coverage expands.
- **Ammonia Production (CRT 2.B.1):**
  A Tier 1 method was applied prior to 2022, with a transition to Tier 3 methods from 2022 onwards.
- **Carbide Production (CRT 2.B.5):**

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A Tier 1 method was used across most of the time series, with plant-specific data limiting comparability. Silicon carbide was included from 2019, and Tier 3 methods applied from 2022 onwards.

- **Soda Ash Production (CRT 2.B.7):**
  Introduced in 2019; the time series is incomplete due to lack of historical data.
- **Petrochemical and Carbon Black Production (CRT 2.B.8):**
  A Tier 1 approach was applied consistently. Carbon black production via the acetylene process was reported only for 2016–2018.
- **Hydrogen Production (**CRT **2.B.8.g):**
  Introduced in 2018, resulting in an incomplete time series.
- **Other (CRT 2.B.10):**
  Introduced in 2020; no historical data are available.
- **Iron and Steel Production (CRT 2.C.1):**
  Time-series consistency is affected by changes in data sources, with a transition to facility-level reporting via SAGERS from 2020. Improvements in process disaggregation followed implementation of NGER. Variability in production during the COVID-19 period also contributes to inconsistencies.
- **Ferroalloys Production (CRT 2.C.2):**
  Inconsistencies are associated with changes in data sources in 2018–2019. Improved consistency is observed from 2020 onwards due to direct industry reporting.
- **Aluminium Production (CRT 2.C.3):**
  The time series reflects the use of both Tier 1 and Tier 3 methods across different processes and time periods, as well as the discontinuation of certain technologies in 2008. Greater reliance on Tier 3 methods in later years improves accuracy but reduces consistency.
- **Lead Production (CRT 2.C.5):**
  Changes in data sources (SAMI reports, SAGERS, and manual reporting) have resulted in time-series inconsistencies.
- **Zinc Production (CRT 2.C.6):**
  Data gaps since 2017 required extrapolation, reducing time-series consistency.
- **Lubricant Use (CRT 2.D.1)** and **Paraffin Wax Use (CRT 2.D.2):**
  Missing activity data from 2020 onwards required extrapolation, affecting consistency.
- **Fluorinated Gas Applications (CRT 2.F):**
  Time-series completeness and consistency are limited due to data availability:
- Emissions data are generally available only from 2005 or 2011 onwards.
- Post-2016 estimates rely on extrapolation or constant assumptions in several sub-categories.

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1.3.9.3 LULUCF

- **Land Use and Land-Use Change:**
  Minor inconsistencies were identified due to a transition from Landsat to Sentinel datasets between 2014 and 2018. These were corrected to ensure alignment. The time series is otherwise consistent, complete, and based on a uniform methodology for 1990–2024.
- **Harvested Wood Products (CRT 4.G):**
  Data from FAO and Forestry South Africa were combined using splicing techniques in line with IPCC good practice to ensure time-series consistency. Additional country-specific data for 2020–2024 were cross-checked against overlapping datasets.

1.4 SECTORAL ANALYSIS

1.4.1 Energy

South Africa's Energy sector inventory includes:

- Exploration and exploitation of primary energy sources;
- Conversion of primary energy sources into more useable energy forms in refineries and power plants;
- Transmission and distribution of fuels; and
- Final use of fuels in stationery and mobile applications.

The energy sector is South Africa's largest emitting sector. This sector is the largest source of CO_2 emissions and the second largest source of N_2O emissions mainly due to *Fuel Combustion* activities.

1.4.1.1 Trends

The total emissions from the energy sector for 2024 are shown in Table 1.9. Fuel combustion activities were the primary source of emissions within the Energy sector, contributing 92% of total sectoral emissions. Within this category, energy industries represented the largest share, accounting for around 65% of emissions from fuel combustion activities, highlighting the substantial role of electricity and heat generation in the sector's emissions profile. Fugitive emissions from fuels accounted for the remaining 8% of Energy sector emissions.

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Table 1.9: Summary of emissions from the Energy sector in 2024

GHG source and sink categories	CO_2	CH_4		N_2O		Total
	Gg CO_2e	Gg	Gg CO_2e	Gg	Gg CO_2e	Gg CO_2e
1. ENERGY	368 289	187	5 223	6	1 703	375 216
1A Fuel combustion activities	344 347	16	459	6	1 699	346 505
1B Fugitive emissions from fuels	23 942	170	4 764	0	5	28 711
1C CO_2 transport and storage	NO	NO	NO	NO	NO	NO

The time series of energy-related emissions by sector is presented in **Error! Reference source not found.**. Overall, emissions from the energy sector display a general upward trend from 1990 until approximately 2009, after which they fluctuate before gradually declining towards 2024. Fuel combustion remains the primary contributor to emissions throughout the entire period, accounting for the largest proportion of total emissions. Emissions associated with combustion activities rose steadily during the 1990s and early 2000s, reached a peak around 2008–2009, and then levelled off before showing a gradual decrease over the subsequent decade.

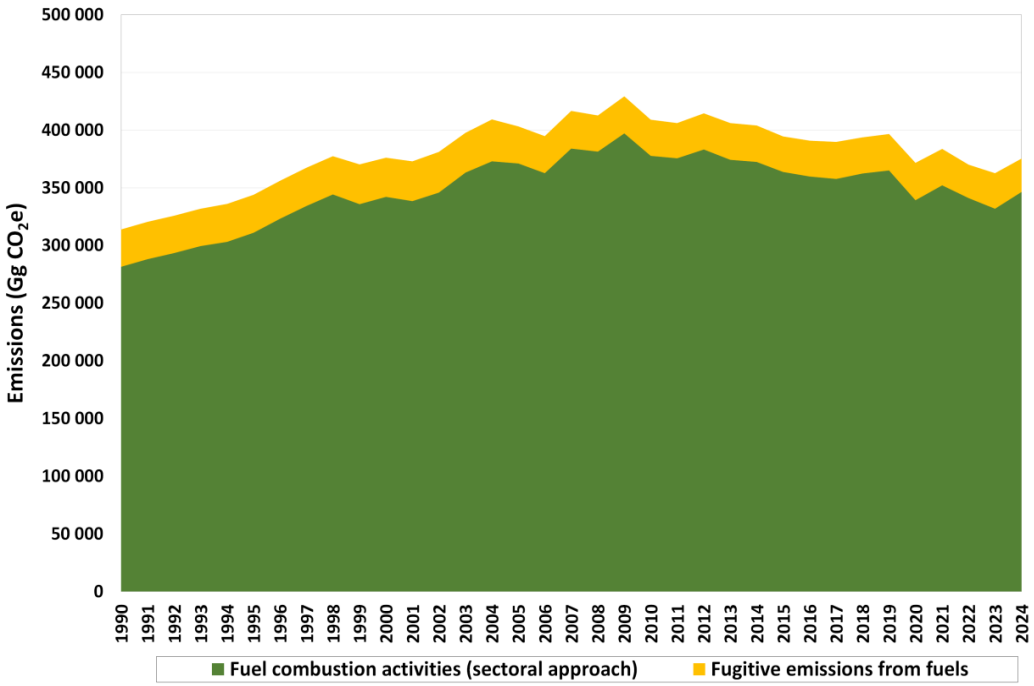


Figure 1.13. Trend in annual change in the total energy emissions in South Africa, 1990 – 2024.

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Fugitive emissions from fuel make up a relatively small share of total energy sector emissions. Over time, these emissions have generally been stable, with only modest increases in the mid-2000s and minor fluctuations in subsequent years.

At an aggregated level, the overall trend in Energy sector emissions since 1990 is illustrated in Figure 1.8. The annual percentage change between 1990 and 2024 shows a variable pattern, with alternating periods of slight growth and decline. In the period from 1990 to 2000, changes were generally modest, with annual increases typically ranging from 0% to 4%.

Between 2001 and 2010, the pattern became more volatile, with some years recording increases of up to 5% and others showing decreases of around 2% to 5%. This variability suggests a stronger influence of economic conditions and operational changes during this period. From 2011 onwards, year-on-year changes largely stabilised, remaining mostly within a range of –2% to +2%. A notable exception occurs in 2020, when emissions fell by 6%, likely due to reduced activity during the COVID-19 pandemic, followed by a rebound of 3% in 2021. In the most recent period (2022–2024), fluctuations persist, including a 4% decrease in 2023 and a 4% increase in 2024, indicating continued but moderate variability.

1.4.1.2 Methods and data

Table 1.10 indicates the type of methods and emission factors used for all categories under the *Energy* sector, including at sub-category level. The activities are shown as key categories in the 1990-2024 inventory. To ensure that good practise was followed, changes in methodology were required for emissions from all fuels used in the *Transport* sector. The country-specific CO_2 emission factors were used.

Table 1.10: Summary of methods and emission factors for the energy sector and an assessment of the completeness of the energy sector emissions.

GHG Source and sink category		CO_2		CH_4		N_2O		NO_x	CO	NMVOC	SO_2
		Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor				
1A	Fuel combustion activities										
1A1	*Energy industries*										
	a. Main activity electricity and heat production	T2	CS	T1	DF	T1	DF	NE	NE	NE	NE
	b. Petroleum refining	T1, T2	DF, CS	T1	DF	T1	DF	NE	NE	NE	NE

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GHG Source and sink category		CO_2		CH_4		N_2O		NO_x	CO	NMVOC	SO_2
		Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor				
	c. Manufacture of solid fuels and other energy industries	T3	CS	T3	CS	T3	CS	NE	NE	NE	NE
1A2	*Manufacturing industries and construction*	T1, T2	DF, CS	T1	DF	T1	DF	NE	NE	NE	NE
1A3	*Transport*										
	a. Civil aviation	T1	CS	T1	DF	T1	DF	NE	NE	NE	NE
	b. Road transportation	T2	CS	T1	DF	T1	DF	NE	NE	NE	NE
	c. Railways	T2	CS	T1	DF	T1	DF	NE	NE	NE	NE
	d. Water-borne navigation	T2	CS	T1	DF	T1	DF	NE	NE	NE	NE
	e. Other transportation	NO		NO		NO		NO	NO	NO	NO
1A4	*Other sectors*										
	a. Commercial/ Institutional	T1, T2	DF, CS	T1	DF	T1	DF	NE	NE	NE	NE
	b. Residential	T1, T2	DF, CS	T1	DF	T1	DF	NE	NE	NE	NE
	c. Agriculture/ Forestry/ Fishing/ Fish farms	T1, T2	DF, CS	T1	DF	T1	DF	NE	NE	NE	NE
1A5	*Non-specified*										
	a. Stationary	T1, T2	DF, CS	T1	DF	T1	DF	NE	NE	NE	NE
	b. Mobile	IE		IE		IE		IE	IE	IE	IE
1B	Fugitive emissions from fuels										
1B1	*Solid fuels*										
	a. Coal mining and handling	T2	CS	T2	CS						
	b. Uncontrolled combustion and burning coal dumps	NE		NE		NE		NE	NE	NE	NE
	c. Solid fuel transformation	T1	DF	T1	DF	T1	DF	NE	T1	NE	NE
1B2	*Oil and natural gas*										
	a. Oil	T3		T3		T3		NE	NE	NE	
	b. Natural gas	T3		T3		T3		NE	NE	NE	
1B3	*Other emissions from energy production*	T3		T3		NO		NE	NE	NE	NE

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GHG Source and sink category		CO_2		CH_4		N_2O		NO_x	CO	NMVOC	SO_2
		Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor				
1C	Carbon dioxide transport and storage										
1C1	*Transport of CO_2*										
	a. Pipelines	NE									
	b. Ships	NE									
	c. Other	NE									
1C2	*Injection and storage*										
	a. Injection	NE									
	b. Storage	NE									
1C3	*Other*	NE									

1.4.1.3 Reference and sectoral approach comparison

Emissions from fuel combustion activities were primarily estimated using the Sectoral Approach (SA), with the Reference Approach (RA) applied as a consistency check. A comparison of the two approaches is presented up to 2022 (Figure 1.14), in line with the latest available energy balance data from the DEE.

The RA consistently yields higher emission estimates than the SA, as observed in previous inventories. Despite this, both approaches exhibit a similar overall trend: steady growth in CO_2 emissions from the early 1990s to around 2008, followed by a period of stabilisation with moderate year-to-year fluctuations. The pre-2008 increase reflects expanded fossil fuel use, particularly in electricity generation and industry. A marked decline is evident around 2020, corresponding to reduced economic activity, followed by a recovery in 2021 and 2022. While trends are aligned, the magnitude of emissions differs, with the gap between RA and SA widening over time. Differences are minimal in the early 1990s but become increasingly pronounced from the mid-2000s onward, indicating growing divergence between energy balance data and sectoral fuel consumption statistics.

This divergence is largely due to structural and methodological differences between the approaches. The RA is based on national energy balances and incorporates adjustments for stock changes, transformation processes, and energy industry own use, whereas the SA relies on disaggregated end-use consumption data. Discrepancies may therefore arise from inconsistencies between supply and

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consumption datasets, differences in calorific values, treatment of non-energy use, and allocation of transformation losses. As fuel consumption increased over time, these small differences were amplified, contributing to the widening gap observed in recent years.

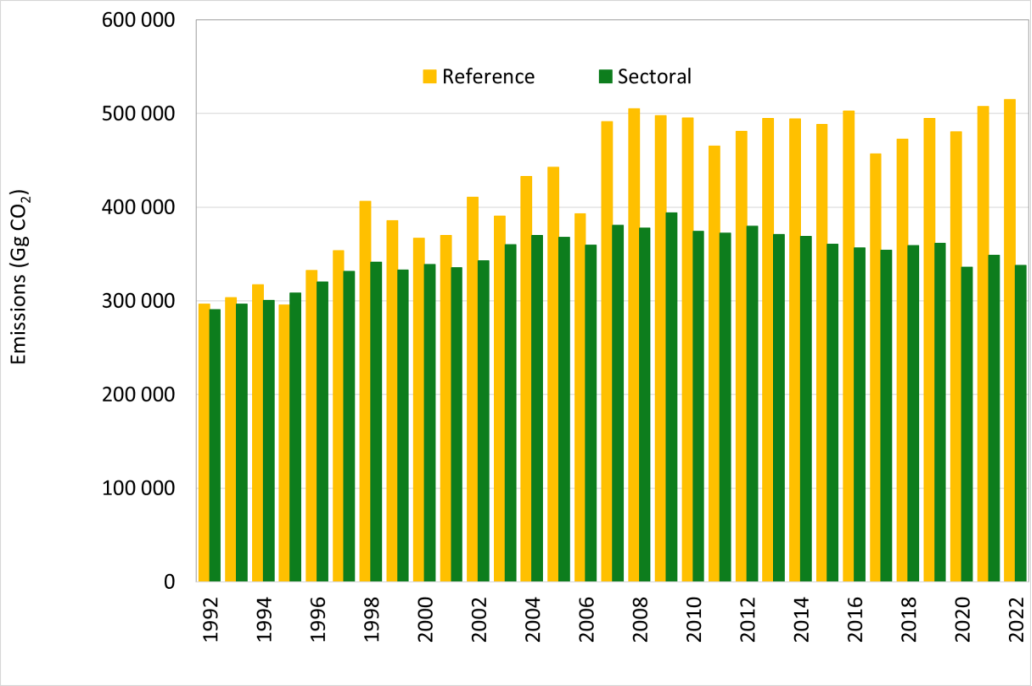


Figure 1.14. Comparisons between the reference and sectoral approach of determining the CO_2 emissions for the energy sector for South Africa.

1.4.1.4 Recalculations

Due to methodological improvements, specifically the use of country-specific CO_2 emission factors for solid fuels in place of default IPCC values, recalculations were undertaken. The revised emission factors were derived from a 2022 study; consequently, emissions across the entire time series were recalculated for the relevant fuel combustion activities to ensure methodological consistency and improved national representativeness.

The historical trend in total energy sector GHG emissions from 1990 to 2024 shows a comparison between the current and previous submissions (Figure 1.15). Minor differences between the two arise from recalculations performed to maintain time-series consistency in accordance with the IPCC 2006 Guidelines. These

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improvements have resulted in the current inventory being lower than the previous estimates, indicating a slight reduction in total emissions between the two inventory years.

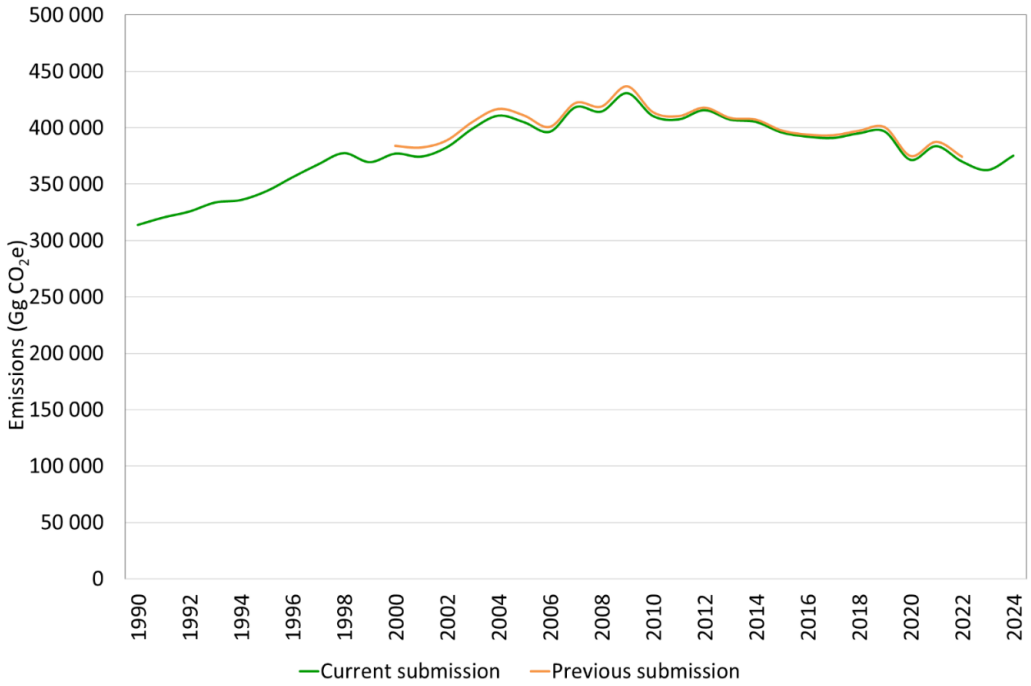


Figure 1.15: Recalculations for the Energy sector between 1990 and 2024.

1.3.1.5 Planned improvements

Improvements planned for the energy sector are as follows:

- Improving activity data for fuel wood consumption in different sub-sectors.
- Including emissions from abandoned mines and spontaneous combustion.
- Disaggregating the uncertainty assessment to align with the disaggregation used for key category analysis.

1.4.2 IPPU

The IPPU sector covers GHG emissions that arise from industrial activities not related to energy use. These emissions mainly originate from processes in manufacturing facilities where raw materials undergo chemical or physical transformation, resulting in the release of GHGs. Examples include the production of ammonia using fossil fuels (Table 1.11). The gases

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emitted through these processes include CO_2, CH_4, N_2O) hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6).

Table 1.11: Industrial processes included in South Africa's IPPU sector emission estimates.

IPPU Category	Industrial Process / Product Use
Mineral Industry	Cement Production
	Lime Production
	Glass Production
	Soda Ash Production
	Other Product Uses of Carbonates
Chemical Industry	Ammonia Production
	Nitric Acid Production
	Hydrogen Production
	Titanium Dioxide Production
	Other Chemicals Production
Metal Industry	Ferroalloys Production
	Production of Steel from Iron and Scrap Steel
	Aluminium Production
	Lead Production
	Zinc Production
	Vanadium Production
	Carbide Production
Petroleum & Petrochemical Industry	Petrochemical and Carbon Black Production
	Paraffin Wax Use
	Lubricant Use
Product Uses as Substitutes for ODSs	Use of HFCs, PFCs, SF6 etc. in refrigeration, air conditioning, foam blowing, fire protection, aerosols

1.3.2.1 Trends

In 2024, the IPPU sector emitted 30 372 Gg CO_2e, accounting for 6.4% of South Africa's total emissions (excluding LULUCF).

Within the sector, emissions are primarily composed of CO_2 emissions (75.8%) and fluorinated gases (22.7%) (Table 1.12). Any CO_2 and other emissions resulting from fuel combustion in these industries are instead reported under the Energy sector.

The Metal Industry is the dominant source within IPPU, contributing 53% of total emissions. Other key contributors include the Mineral Industry subsector (16.4%) and the use of products as substitutes for ozone-depleting substances (22.9%).

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Table 1.12: Summary of the estimated emissions from the IPPU sector in 2024 for South Africa.

GHG source categories	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	Total
	Gg CO_2e						
2.IPPU	23 030	119	340	6 685	113	85	30 372
2.A Mineral industry	4 956	NO	NO	NO	NO	NO	4 956
2.B Chemical industry	1 291	119	340	NE	NE	NE	1 750
2.C Metal industry	15 605	0	NO	NO	113	NO	15 718
2.D Non-energy products from fuels and solvents	1 178	NE	NE	NO	NO	NO	1 178
2.E Electronic industry	NE	NE	NE	NE	NE	NE	NE
2.F Product uses as substitute ODS	NO	NO	NO	6 685	NE	NO	6 685
2.G Other product manufacture and use	NE	NE	NE	NE	NE	85	85
2.H Other	NE	NE	NE	NE	NE	NE	NE

Although South Africa's economy recovered following the COVID-19 pandemic, IPPU sector emissions in the most recent estimates remain 2 411 Gg CO_2e (7.4%) below the 2000 level. This long-term reduction is largely driven by a contraction in metals production (61.0%), particularly in the iron and steel and aluminium industries, which reflects broader economic weakening. A further notable contribution to the decline comes from reduced activity in the chemicals industry (31.4%).

As shown in Figure 1.16, IPPU emissions rose by 18.0% between 2000 and 2006, before falling by 13.6% by 2009. This downturn coincided with the global financial crisis and South Africa's electricity supply constraints during the same period. From 2010 onwards, emissions trended upward again, supported by growth in the metals sector and the increased use of products that substitute ozone-depleting substances, alongside gradual economic recovery after the recession.

However, emissions began to decline again from 2016, mainly due to reduced demand for South African metals and chemical products. The COVID-19 pandemic further intensified this decline, with both domestic and international impacts evident between 2020 and 2021.

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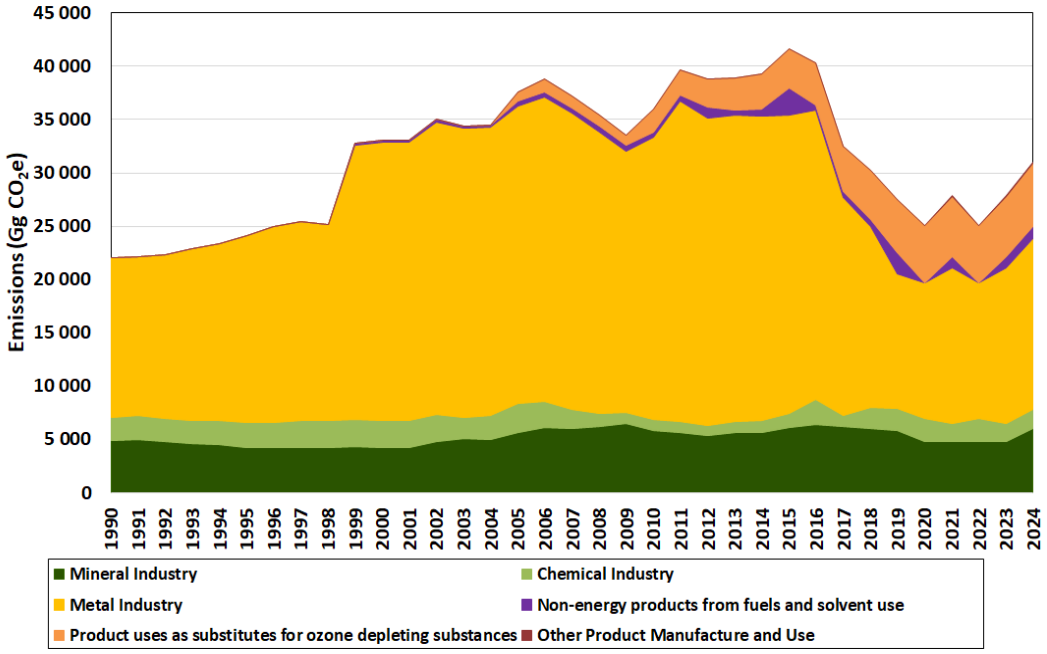


Figure 1.16: Trend in South Africa's IPPU sector emissions, 1990-2024.

1.3.2.2 Methods and data

A summary of the methods and emission factors applied to each subsector of IPPU is shown in Table 1.13 below.

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Table 1.13: Summary of methods and emission factors for the IPPU sector and an assessment of the completeness of the IPPU sector emissions

GHG Source and sink category		CO_2		CH_4		N_2O		HFCs		PFCs		SF6		NOx	CO	NMVOC	SO_2
		Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method Applied	Emission Factor				
A	Mineral industry																
1	*Cement production*	T2 & T3	CS	NE										NE	NE	NE	NE
2	*Lime production*	T3	CS	NE										NE	NE	NE	NE
3	*Glass production*	T3	CS	NE										NE	NE	NE	NE
4	*Other process uses of carbonates*	T3	CS	NE										NE	NE	NE	NE
B	Chemical industry																
1	*Ammonia production*	T3	CS	T3	CS	NE								NE	NE	NE	NE
2	*Nitric acid production*	NE		NE		T3	CS							NE	NE	NE	NE
3	*Adipic acid production*	NO		NO		NO								NO	NO	NO	NO
4	*Caprolactam, glyoxal and glyoxylic acid production*	NO		NO		NO								NO	NO	NO	NO
5	*Carbide production*	T3	CS	T1	DF	NE								NE	NE	NE	NE
6	*Titanium dioxide production*	T3	CS	NE		NE								NE	NE	NE	NE
7	*Soda Ash production*	T3	CS	NE		NE								NE	NE	NE	NE
8a	*Methanol*	IE		IE		IE								NE	NE	NE	NE
8b	*Ethylene*	IE		IE		IE								NE	NE	NE	NE
8c	*Ethylene Dichloride and Vinyl Chloride Monomer*	NO		NO		NO								NO	NO	NO	NO
8d	*Ethylene Oxide*	IE		IE		IE								NE	NE	NE	NE
8e	*Acrylontrile*	NO		NO		NO								NO	NO	NO	NO

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GHG Source and sink category		CO_2		CH_4		N_2O		HFCs		PFCs		SF6		NOx	CO	NMVOC	SO_2
		Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method Applied	Emission Factor				
8f	*Petrochemical and carbon black production*	T1	DF	T1	DF	NE								NE	NE	NE	NE
8g	*Hydrogen Production*	T3	CS	NE		NE								NE	NE	NE	NE
9	*Fluorochemical production*							NO		NO		NO		NO	NO	NO	NO
11	*Other*	T2	CS	T2	CS	NE		NE		NE		NE		NE	NE	NE	NE
C	Metal industry																
1	*Iron and steel production*	T3	CS	NE		NE								NE	NE	NE	NE
2	*Ferroalloy production*	T3	CS	T3	CS	NE								NE	NE	NE	NE
3	*Aluminium production*	T3	CS	NE						T3	CS			NE	NE	NE	NE
4	*Magnesium production*	NO						NO		NO		NO		NO	NO	NO	NO
5	*Lead production*	T1	DF											NE	NE	NE	NE
6	*Zinc production*	T1	DF											NE	NE	NE	NE
D	Non-energy products from fuels and solvents																
1	*Lubricant use*	T1	DF											NE	NE	NE	NE
2	*Paraffin wax use*	T1	DF	NE		NE								NE	NE	NE	NE
3	*Solvent use*													NE	NE	NE	NE
E	Electronics industry																
1	*Integrated circuit or semiconductor*	NE				NE		NE		NE		NE		NE	NE	NE	NE
2	*TFT flat panel display*							NE		NE		NE		NE	NE	NE	NE
3	*Photovoltaics*							NE		NE		NE		NE	NE	NE	NE
4	*Heat transfer fluid*													NE	NE	NE	NE
F	Product uses as substitute ODS																
1	*Refrigeration and air conditioning*	NE						T2a, T2b	DF	NE				NE	NE	NE	NE

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GHG Source and sink category		CO_2		CH_4		N_2O		HFCs		PFCs		SF6		NOx	CO	NMVOC	SO_2
		Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method Applied	Emission Factor				
2	*Foam blowing agents*	NE						T1	DF	NE				NE	NE	NE	NE
3	*Fire protection*	NE						T1	DF	NE				NE	NE	NE	NE
4	*Aerosols*							T1a, T2a	DF	NE				NE	NE	NE	NE
5	*Solvents*							NE		NE				NE	NE	NE	NE
G	Other product manufacture and use																
1	*Electrical equipment*									NE		NE		NE	NE	NE	NE
2	*SF6 and PFCs from other product uses*									NE		NE		NE	NE	NE	NE
3	*N_2O from product uses*					NE								NE	NE	NE	NE
H	Other																
1	*Pulp and paper industry*	NE		NE										NE	NE	NE	NE
2	*Food and beverage industry*	NE		NE										NE	NE	NE	NE

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1.4.2.1 Recalculations

Following the introduction of the NGER in 2017 (DEA, 2017a), subsequent amendments to the regulations in 2020 (DEFF, 2020), and the implementation of SAGERS, the GHG reporting tool, several additions and recalculations were made to the inventory up to 2020. A significant development during 2020 was the adoption of Tier 2 and Tier 3 calculation methods wherever feasible, which enhanced the overall accuracy of the inventory. In addition, an external verification process was introduced for key emission contributors, further improving accuracy. However, the extent of the accuracy improvement has not been quantified.

The 2024 national inventory does not contain any recalculations see Figure 1.17 below.

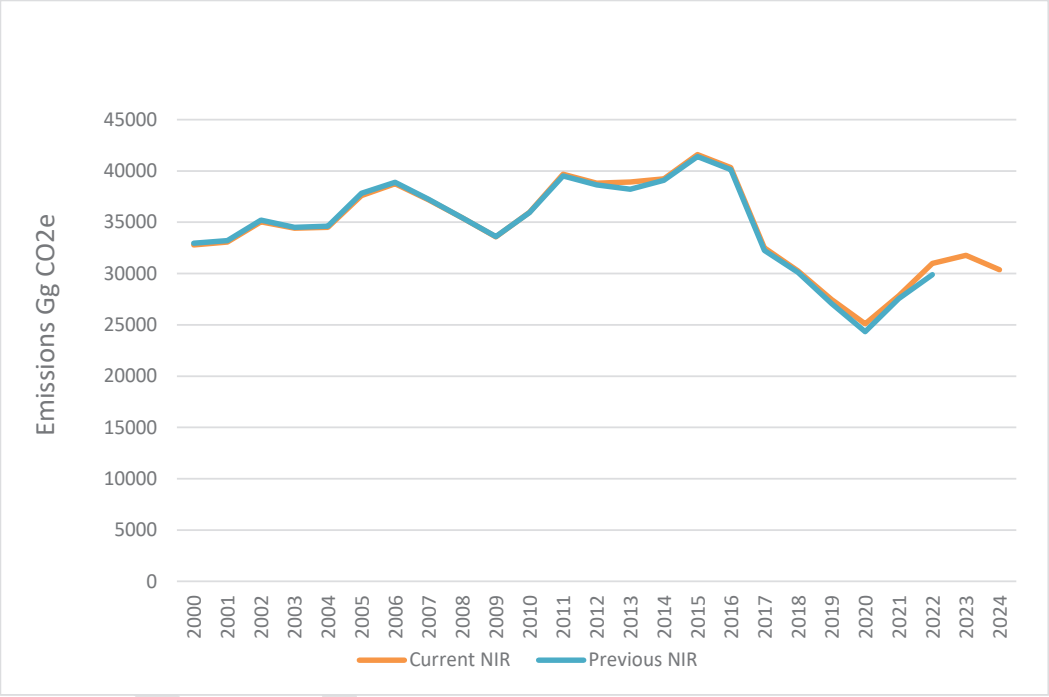


Figure 1.17: Recalculations for the IPPU sector.

1.3.2.4 Planned improvements

Planned improvements and recommendations are given in

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Table 1.14 below. These will be prioritised as required and depend on resources.

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Table 1.14: Planned improvements and recommendations

IPCC Code	Improvement/Recommendation
General	Have sector specific engagements discussing the expectations regarding moving to the higher Tier methods. Address time series consistency issues as data becomes available for specific categories that have been newly included in the inventory. Ensure that facility intensity data is available (even though not publicly). Expand reporting to have sector and technology specific intensities.
2A1	Investigate historical data for the imports and exports of clinker
2A2	Undertake a completeness assessment to determine if non-marketed lime is reported
2A3	Disaggregate the cullet ratio by facility.
2B6	Investigate the availability of the historical data.
2C5	Investigate the air quality database for those data providers that trigger reporting under Lead Battery processing
2C6	Investigate if secondary zinc production occurs in South Africa Investigate the air quality database regarding pyrometallurgical process involving the use of an imperial smelting furnace is used for combined zinc and lead production.
2D1	South Africa to undertake a desktop study regarding two-stroke engines and the use of blended lubricant.
2D	Investigate the availability of more accurate data
2F	Investigate the availability of more accurate data

1.4.3 Agriculture

This section presents GHG emissions from South Africa's agriculture sector, which is an important contributor to employment and the national economy. The sector includes a wide range of activities such as crop production, livestock farming, and horticulture, with major crops including maize, wheat, sugarcane, and citrus fruits, while livestock production mainly consists of cattle, sheep, poultry, goats, swine, horses, and related species. The inventory considers key IPCC emission categories, namely Enteric Fermentation (3A), Manure Management (3B), Direct and Indirect N_2O Emissions from Managed Soils (3D1 and 3D2), Field Burning of Agricultural Residues (3F), Liming (3G), and Urea Application (3H). These categories represent the primary sources of agricultural emissions in South Africa (Table 1.15).

Certain categories, such as Rice Cultivation (3C) and Other Carbon-Containing Fertilisers (3I), are reported as "Not Estimated (NE)" due to their limited significance or lack of sufficient data, while Prescribed Burning of Savannahs (3E) is included under the LULUCF sector as "Included Elsewhere (IE)." The "Other" category (3J) is classified as "Not Occurring (NO)" in the national context. Emissions from ruminants in privately owned game parks were excluded following recommendations from the UNFCCC review process. Fuel combustion emissions related to agricultural activities are also excluded from this chapter, as they are reported under

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the Energy sector in Category 1A4c (Agriculture/Forestry/Fisheries). These classifications and exclusions ensure consistency, transparency, and alignment with the IPCC 2006 Guidelines.

Table 1.15: Main IPCC categories included in the Agriculture sector emission estimates.

IPCC Category	Category name	Included
3A	Enteric fermentation	√
3B	Manure management	√
3C	Rice cultivation	NE
3D1	Direct N_2O emissions from managed soils	√
3D2	Indirect N_2O from managed soils	√
3E	Prescribed burning of savannahs	IE
3F	Field burning of agricultural residues	√
3G	Liming	√
3H	Urea Application	√
3I	Other Carbon-Containing Fertilisers	NE
3J	Other	NO

1.4.3.1 Trends

Agricultural emissions remained relatively stable between 1990 and 2024, generally ranging between 55 000 and 60 000 Gg CO_2e, although a slight overall decline was observed over the period. Enteric fermentation consistently remained the largest source of emissions, contributing approximately 70–75% of total sector emissions, followed by agricultural soils and manure management. application on sources, including field burning, liming, and urea application, contributed only marginally and remained largely unchanged over time. Emissions increased slightly between 2010 and 2015 before gradually declining, with the period from 2020 to 2024 showing a noticeable downward trend.

In 2024, the agriculture sector emitted approximately 52 744 Gg CO_2e, representing around 11% of South Africa's total emissions excluding LULUCF. Enteric fermentation remained the dominant source category, accounting for about 36 048 Gg CO_2e, or roughly 68% of sector emissions. Overall, emissions in 2024 were approximately 12% lower than in 2000, mainly due to declining livestock populations and improvements in manure and soil management practices (Figure 1.13).

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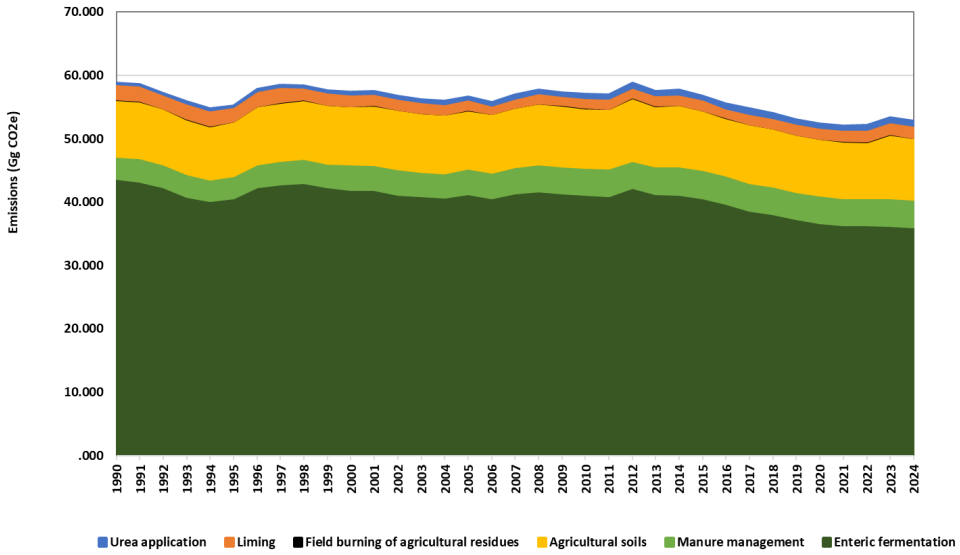


Figure 1:13: Trends in Agricultural emissions for South Africa between 1990 – 2024.

1.4.3.2 Methods and data

The agriculture sector inventory is compiled using the methodologies outlined in the IPCC 2006 Guidelines (IPCC, 2006), with selected updated approaches adopted from the IPCC 2019 Refinement (IPCC, 2019). Default constants and emission factors applied in the inventory are derived from these guideline documents, with further details provided in the methodology sections for each category. Table 1.16 presents the methods and emission factor types used in the agriculture inventory.

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Table 1.16: Summary of methods and emission factors for the agriculture sector and an assessment of the completeness of the agriculture sector emissions.

GHG Source and sink category		CO_2		CH_4		N_2O		NO_x	CO	NMVOC	NH_3
		Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor				
3A LIVESTOCK	***3.A Enteric fermentation***										
	3.A.1- Cattle										
	3.A.1.a - Dairy cows	NA	NA	T2	CS	NA	NA	NA	NA	NA	NA
	3.A.1.b - Other cattle	NA	NA	T2	CS	NA	NA	NA	NA	NA	NA
	3.A.2 - Sheep	NA	NA	T2	CS	NA	NA	NA	NA	NA	NA
	3.A.3 - Swine	NA	NA	T2	CS	NA	NA	NA	NA	NA	NA
	3.A.4 - Other										
	3.A.4.a - Buffalo	NA	NA	NO	NO	NA	NA	NA	NA	NA	NA
	3.A.4.b - Camels	NA	NA	NO	NO	NA	NA	NA	NA	NA	NA
	3.A.4.d - Goats	NA	NA	T2	CS	NA	NA	NA	NA	NA	NA
	3.A.4.e - Horses	NA	NA	T1	DF	NA	NA	NA	NA	NA	NA
	3.A.4.f – Mules and Asses	NA	NA	T1	DF	NA	NA	NA	NA	NA	NA
	3.B Manure management										
	3.B.1- Cattle										
	3.B.1.a - Dairy cows	NA	NA	T2	CS	T2	CS	NE	NA	NA	NE
	3.B.1.b - Other cattle	NA	NA	T2	CS	T2	CS	NE	NA	NA	NE
	3.B.2 - Sheep	NA	NA	T2	CS	NO	NO	NE	NA	NA	NE
	3.B.3 - Swine	NA	NA	T2	CS	T2	CS	NE	NA	NA	NE
	3.B.4 - Other										
	3.B.4.a - Buffalo	NA	NA	NO	NO	NO	NO	NE	NA	NA	NE

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GHG Source and sink category	CO_2		CH_4		N_2O		NO_x	CO	NMVOC	NH_3
	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor				
3.B.4.b - Camels	NA	NA	NO	NO	NO	NO	NE	NA	NA	NE
3.B.4.d - Goats	NA	NA	T2	CS	NO	NO	NE	NA	NA	NE
3.B.4.e - Horses	NA	NA	T2	CS	NO	NO	NE	NA	NA	NE
3.B.4.f – Mules and Asses	NA	NA	T2	CS	NO	NO	NE	NA	NA	NE
3.B.4.g - Poultry	NA	NA	T2	CS	T2	CS	NE	NA	NA	NE
3.B.5-Indirect N_2O emissions										
3.C – Rice cultivation	NE		NE		NE					
3.D –Agricultural soils										
3.D.1 – Direct N_2O Emissions from managed soils										
Synthetic fertilizers	NA		NA		T1	DF		NA	NA	
Animal waste added to soils	NA		NA		T2	CS		NA	NA	
Other organic fertilizers	NA		NA		T1	DF		NA	NA	
Urine and dung deposited by grazing livestock	NA		NA		T2	CS		NA	NA	
Crop residues	NA		NA		T1	DF		NA	NA	
3.D.2 – Indirect N_2O Emissions from managed soils										
Atmospheric deposition	NA		NA		T1	DF				
Nitrogen leaching and runoff	NA		NA		T1	DF				

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GHG Source and sink category		CO_2		CH_4		N_2O		NO_x	CO	NMVOC	NH_3
		Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor				
	3.E – Prescribed burning of savannas										
	Prescribed burning of savannas	NE		NE		NE					
	3.F – Field burning of Agricultural residues										
	Field burning of Agricultural residues	T2	DF, CS	T2	DF, CS	T2	DF, CS				
	3.G - Liming										
	Liming	T1	DF	NA		NA		NA	NA	NA	NA
	3. H - Urea application										
	Urea application	T1	DF	NA		NA		NA	NA	NA	NA
	3.I – Other carbon containing fertilisers										
	Other carbon containing fertilisers	NE		NE		NE					
	3.J - Other										
	Other	NO		NO		NO					

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1.4.3.3 Recalculations

The agriculture sector inventory is subject to continuous improvement, resulting in periodic recalculations. The main improvements implemented during this reporting cycle include the incorporation of organic soils for cropland and grassland under the agriculture sector. The area of drained organic soil for cropland was estimated at 4 173 ha for both 2023 and 2024, while drained organic soils for grassland were estimated at 15 678 ha for the same years. In addition, emission factors from the IPCC 2019 Refinement were adopted for soil management categories, allowing for differentiation between wet and dry climate conditions. Historical time-series data for the period 1990–1999 were also incorporated, extending the dataset to cover the full period from 1990 to 2024.

Further details regarding these improvements are provided in the relevant category and sub-category sections of this report. Although the recalculations maintained a consistent overall emissions trend, they resulted in a shift across the entire time series, as illustrated in Figure 1.14. Following the recalculations, estimated emissions were generally higher than those reported in the previous inventory.

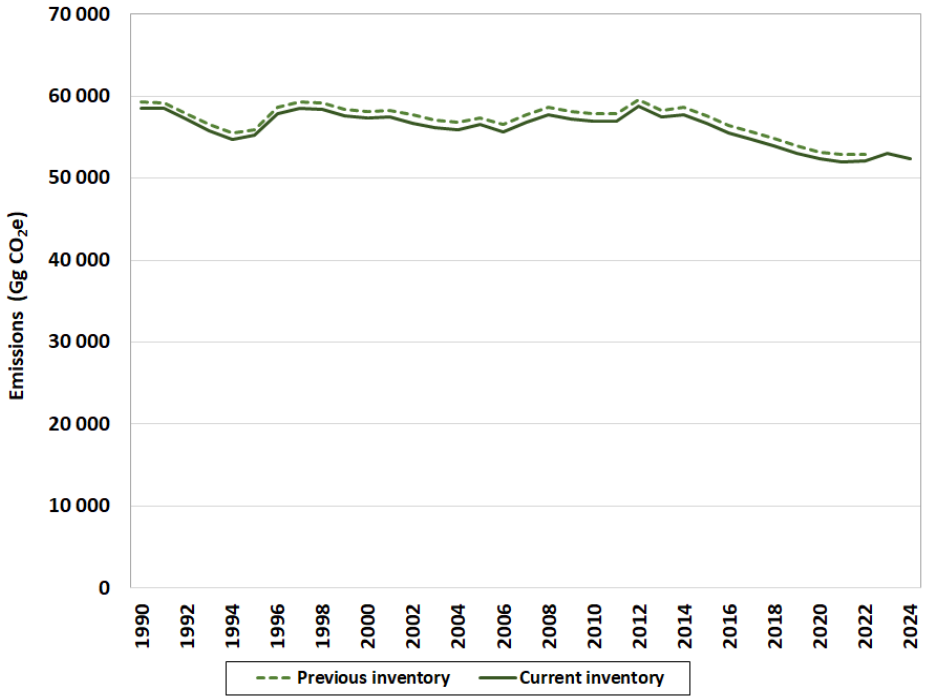


Figure 1.14: Change in Agriculture emission estimates due to recalculations since 2022 submission.

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1.4.3.4 Planned improvements

Planned improvements and recommendations for enhancing future agricultural sector estimates focus on improving data quality, reducing uncertainty, and strengthening methodologies. Key priorities include improving livestock population data, which remains one of the largest sources of uncertainty despite advances in emission factors. To address this, the establishment of a Livestock Estimates Committee is being considered, with the DFFE already engaging the Department of Agriculture and the Agricultural Research Council on potential collaboration. Another important recommendation is the development of a reliable national dataset on manure management systems, including better tracking of manure diverted to biogas systems as a mitigation measure.

Improved monitoring of manure management practices would support more accurate and dynamic emission estimates. In addition, conducting detailed studies on livestock herd composition and the number of days different livestock sub-categories are alive each year would further reduce uncertainty. The use of region- and year-specific Methane Conversion Factors (MCFs), based on average temperatures across South Africa, is also recommended to improve the accuracy of emissions calculations. Finally, there is a need to collect the necessary data to implement a Tier 2 approach for the soil management category, given its importance as a key emissions source.

1.4.4 Land use, Forestry and Land Use Change (LULUCF)

The Land Use, Land-Use Change and Forestry (LULUCF) sector inventory for South Africa reports both emissions (positive values) and removals (negative values) of CO_2, CH_4, and N_2O across the country's entire managed land area, covering approximately 122 008 kha. All land within South Africa is considered managed for reporting purposes. The national territory includes the two subantarctic islands, Marion Island and Prince Edward Island, collectively referred to as the Prince Edward Islands, and these territories are incorporated into the total reported land area.

The inventory includes the following land-use categories:

- Forest Land (4.A)
- Cropland (4.B)
- Grassland (4.C)
- Wetlands (4.D)
- Settlements (4.E)
- Other Land (4.F)

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Within each category, a distinction is made between land remaining in the same land-use category ("land remaining" categories 4.A.1–4.F.1) and land that has undergone land-use conversion ("land conversion" categories 4.A.2–4.F.2). Converted land is reported under the new land-use category for a period of 20 years, after which it is reclassified as land remaining in that category.

The inventory accounts for several carbon pools across the land categories, including above-ground biomass, below-ground biomass, litter, mineral soils, and organic soils. Above-ground biomass includes all living biomass above the soil surface, while below-ground biomass includes living roots. Litter comprises non-living biomass in various stages of decomposition above the soil, and mineral soils include soil organic carbon to a depth of 30 cm. Dead wood is reported separately from litter only within the Forest Land category. Harvested Wood Products (4.G) are also included in the inventory.

In addition to CO_2 emissions and removals, the inventory includes non-CO_2 emissions within each land category. Direct and indirect N_2O emissions from nitrogen inputs to managed lands are partially included due to data limitations, with current estimates covering forest plantations and golf courses, while cropland nitrogen inputs are reported under the agriculture sector. Emissions and removals associated with the drainage and rewetting of soils are also included, with N_2O emissions from drained organic soils estimated for grasslands and CH_4 emissions from rewetting reported for wetlands. Furthermore, direct and indirect N_2O emissions resulting from nitrogen mineralisation and mobilisation linked to land-use change and soil organic matter dynamics are included across most land categories. Biomass burning emissions are estimated for all land categories except Other Land, where burning is assumed negligible due to limited vegetation cover. Emissions of precursor gases such as CO, NOx, and NMVOC from biomass burning are reported within the LULUCF sector; however, the associated indirect CO_2 and N_2O emissions are reported separately in Chapter 8 of the National Inventory Document and Table 6 of the Common Reporting Tables and are therefore excluded from the LULUCF sector total.

1.4.4.1 Trends

The LULUCF sector remained a net sink in 2024 (

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Table 1.17), with Forest Land contributing the largest share of removals. In contrast, all other land categories were net sources of emissions, except for Settlements, which recorded a small level of sequestration. Other Land was identified as the largest source of emissions during the reporting year.

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Table 1.17: Summary of emissions from the LULUCF sector in 2024.

GHG source and sink categories	CO_2	CH_4		N_2O		Total
	Gg CO_2	Gg	Gg CO_2e	Gg	Gg CO_2e	Gg CO_2e
4. LULUCF	-37 584	105	2 941	5	1 231	-33 412
4.A. Forest land	-55 744	14	399	1	309	-55 037
4.B. Cropland	8 084	3	71	1	156	8 311
4.C. Grassland	3 048	19	519	1	351	3 918
4.D. Wetlands	107	69	1 932	0	67	2 105
4.E. Settlements	-1 453	1	21	0	106	-1 326
4.F. Other land	10 093	0	0	1	241	10 334
4.G. Harvested wood products	-1 718	NA	NA	NA	NA	-1 718

Figure 1.15 below presents the trends in LULUCF emissions and removals in South Africa over the 1990–2024 time series. These trends reflect changes in land use. Land-use change estimates were derived from the South African National Land Cover (SANLC) datasets for the reference years 1990, 2014, 2018, 2020, and 2022. Changes between reference years were linearly interpolated, resulting in more pronounced shifts immediately after each reference year and relatively stable emissions and removals between those periods. Notably the data for the period of 2022-2024 were extrapolated for inclusion.

Forest Land remains the largest contributor to the overall sink throughout the reporting period, with thickets and woodlands representing the dominant sources of removals. The smaller Forest Land sink observed between 1990 and 2000 is attributed to extrapolated burnt area data for that period, which is considered highly uncertain and appears substantially higher than estimates from 2001 onwards. Increased annual variability in emissions and removals, particularly within Forest Land from 2001 onwards, is primarily driven by fluctuations in burnt areas and associated biomass losses, as well as fuelwood collection and harvesting activities. The strengthening of the Forest Land sink between 2018 and 2024 is linked to the increasing conversion of Grasslands to Forest Land.

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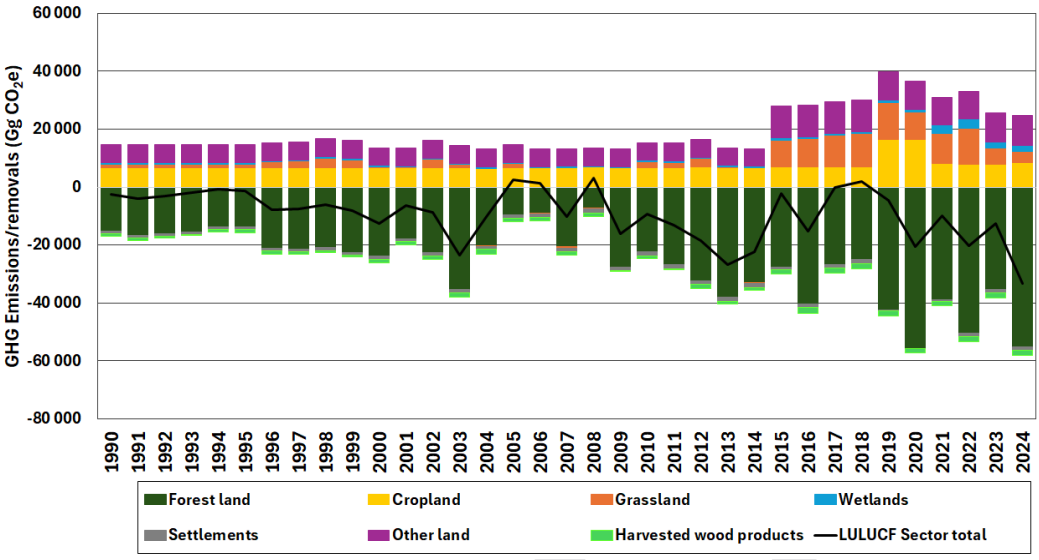


Figure 1.15: Time series for GHG emissions and removals by land type in the LULUCF sector, 1990-2024

1.4.4.2 Methods and data

A summary of the tier level of the methods and types of emission factors incorporated into the inventory are provided in Table 1.18.

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Table 1.18: Summary of methods and emission factors for the LULUCF sector and an assessment of the completeness of the sector.

GHG source and sink categories	Sub-category	CO2		CH4		N2O		NOx		CO		NMVOC	
		Method	EF	Method	EF	Method	EF	Method	EF	Method	EF	Method	EF
4.A. Forest land													
Forest land remaining forest land	4.A.1. Biomass	T2	CS										
	4.A.1. DOM	T1	CS										
	4.A.1. SOC	T2	CS										
	4(I).A.1.					T1	D						
	4(II).A.1.	NE	NA	NE	NA	NE	NA						
	4(III).A.1.					T1	D						
	4(IV).A.1.			T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	CS
Land converted to forest land	4.A.2. Biomass	T2	CS										
	4.A.2. DOM	T2	CS										
	4.A.2. SOC	T2	CS										
	4(I).A.2.					T1	D						
	4(II).A.2.	NE	NA	NE	NA	NE	NA						
	4(III).A.2.					T1	D						
	4(IV).A.2.			T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	CS
4.B. Cropland													
Cropland remaining cropland	4.B.1. Biomass	T1/T2	CS										
	4.B.1. DOM	T1/T2	CS										
	4.B.1. SOC	T2	CS										
	4(I).B.1.					IE	NA						
	4(II).B.1.	T1	D	T1	D	IE	IE						
	4(III).B.1.					T1	D						
	4(IV).B.1.			T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	CS
	4.B.2. Biomass	T2	CS										

GHG source and sink categories	Sub-category	CO2		CH4		N2O		NOx		CO		NMVOC	
		Method	EF	Method	EF	Method	EF	Method	EF	Method	EF	Method	EF
Land converted to cropland	4.B.2. DOM	T2	CS										
	4.B.2. SOC	T2	CS										
	4(I).B.2.					IE	NA						
	4(II).B.2.	NE	NE	NE	NE	NE	NE						
	4(III).B.2.					T1/T2	D						
	4(IV).B.2.			T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	CS
4.C. Grassland													
Grassland remaining grassland	4.C.1. Biomass	T1/T2	CS										
	4.C.1. DOM	T1/T2	CS										
	4.C.1. SOC	T2	CS										
	4(I).C.1.					NE	NA						
	4(II).C.1.	T1	D	T1	D	IE	IE						
	4(III).C.1.					T1	D						
	4(IV).C.1.			T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	CS
Land converted to grassland	4.C.2. Biomass	T2	CS										
	4.C.2. DOM	T2	CS										
	4.C.2. SOC	T2	CS										
	4(I).C.2.					NE	NA						
	4(II).C.2.	NE	NE	NE	NE	NE	NE						
	4(III).C.2.					T1/T2	D						
	4(IV).C.2.			T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	CS
4.D. Wetlands													
Flooded land remaining flooded land	4.D.1.b. Biomass	T2	CS										
	4.D.1.b. DOM	NA	NA										
	4.D.1.b. SOC	NA	NA										

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GHG source and sink categories	Sub-category	CO2		CH4		N2O		NOx		CO		NMVOC	
		Method	EF	Method	EF	Method	EF	Method	EF	Method	EF	Method	EF
	4(I).D.1.b.					NO	NA						
	4(II).D.1.b.	NA	NA	T1	D	NA	NA						
	4(III).D.1.b.					NA	NA						
	4(IV).D.1.b.			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other wetlands remaining other wetlands	4.D.1.c. Biomass	T1/T2	D/CS										
	4.D.1.c. DOM	T1	CS										
	4.D.1.c. SOC	T2	CS										
	4(I).D.1.c.					NO	NA						
	4(II).D.1.c.	T1	D	T1	D	NA	NA						
	4(III).D.1.c.					T1	D						
	4(IV).D.1.c.			T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	CS
Land converted to flooded land	4.D.2.b. Biomass	T1/T2	CS										
	4.D.2.b. DOM	NA	NA										
	4.D.2.b. SOC	NA	NA										
	4(I).D.2.b.					NO	NA						
	4(II).D.2.b.			T1	D	NA	NA						
	4(III).D.2.b.					T1	D						
	4(IV).D.2.b.			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Land converted to other wetlands	4.D.2.c. Biomass	T1/T2	CS										
	4.D.2.c. DOM	T1/T2	CS										
	4.D.2.c. SOC	T2	CS										
	4(I).D.2.c.					NO	NA						
	4(II).D.2.c.			T1	D	NA	NA						
	4(III).D.2.c.					T1	D						

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GHG source and sink categories	Sub-category	CO2		CH4		N2O		NOx		CO		NMVOC	
		Method	EF	Method	EF	Method	EF	Method	EF	Method	EF	Method	EF
	4(IV).D.2.c.			T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	CS
4.E. Settlements													
Settlements remaining settlements	4.E.1. Biomass	T1/T2	CS										
	4.E.1. DOM	T1	CS										
	4.E.1. SOC	T2	CS										
	4(I).E.1.					T1	D						
	4(II).E.1.	NE	NA	NE	NA	NE	NA						
	4(III).E.1.					T1	D						
	4(IV).E.1.			T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	CS
Land converted to settlements	4.E.2. Biomass	T2	CS										
	4.E.2. DOM	T2	CS										
	4.E.2. SOC	T2	CS										
	4(I).E.2.					T1	D						
	4(II).E.2.	NE	NA	NE	NA	NE	NA						
	4(III).E.2.					T1	D						
	4(IV).E.2.			T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	D	T1/T2	CS
4.F. Other land													
Other land remaining other land	4.F.1. Biomass	NO	NA										
	4.F.1. DOM	NO	NA										
	4.F.1. SOC	T2	CS										
	4(I).F.1.					NO	NA						
	4(II).F.1.	NE	NA	NE	NA	NE	NA						
	4(III).F.1.					T1	D						
	4(IV).F.1.			NO	NA	NO	NA	NO	NA	NO	NA	NO	NA
	4.F.2. Biomass	T2	CS										

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GHG source and sink categories	Sub-category	CO2		CH4		N2O		NOx		CO		NMVOC	
		Method	EF	Method	EF	Method	EF	Method	EF	Method	EF	Method	EF
Land converted to other land	4.F.2. DOM	T2	CS										
	4.F.2. SOC	T2	CS										
	4(I).F.2.					NO	NA						
	4(II).F.2.	NE	NA	NE	NA	NE	NA						
	4(III).F.2.					T1	D						
	4(IV).F.2.			NO	NA	NO	NA	NO	NA	NO	NA	NO	NA
4.G. Harvested wood products													
Harvested wood products	4.G.	T1	D										

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1.4.4.3 Recalculations

For the 2000–2024 period, several methodological and data improvements were implemented. These included the incorporation of the 2020–2022 land change matrix data, revised land-use change assumptions for technology corrections between 2014 and 2018, and the correction of a “land remaining land” error identified in the previous inventory. Further improvements involved updated methods to remove seasonal variation effects in land-use and land-cover data, the inclusion of initial estimates for organic soils in Croplands and Grasslands, and improved soil data through the incorporation of land change matrices by soil type for all change periods. Biomass, carbon stock, and emission factor data were also updated, alongside improvements to the burnt area methodology and revised fuelwood consumption data. Additional methodological refinements, particularly within the Wetlands category, were undertaken to strengthen alignment with IPCC methodologies and Common Reporting Tables (CRTs).

Collectively, the recalculations across the LULUCF sector maintained a similar emissions trend between 2000 and 2014 compared to the previous inventory, although the estimated sink was reduced by an average of 13.1%, mainly due to updates in soil data, biomass estimates, burnt area data, and fuelwood consumption. From 2014 onwards, recalculated estimates for 2014–2018 remained broadly consistent with the previous inventory, while estimates for 2018–2022 reflected an increased sink. Key drivers of these changes included the incorporation of the 2020–2022 land-use maps and correction of the “land remaining” error. Overall, recalculations resulted in an average 51.3% reduction in the estimated sink between 2014 and 2022. Consequently, the estimated LULUCF sink for 2022 decreased from 43 181 Gg CO_2e in the previous inventory to 20 305 Gg CO_2e in the current inventory, representing a 53.0% reduction in the sink estimates (Figure 1.16).

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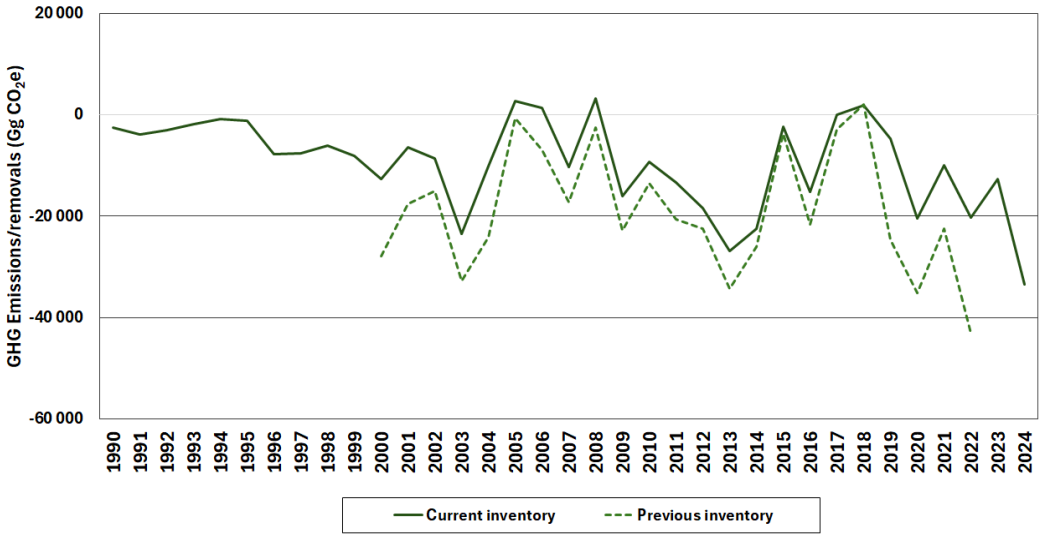


Figure 1.16: Change in LULUCF emission estimates due to recalculations since 2022 submission.

1.4.4.4 Planned improvements

The next inventory cycle will focus on four key improvements aimed at strengthening the accuracy and consistency of the LULUCF sector estimates, several of which were also highlighted in the UNFCCC TERT Review Report. A major priority is the development of a land mapping system to support progression towards Approach 3 reporting. Uncertainty in the LULUCF sector remains strongly linked to land conversion estimates, particularly due to the need for corrections that distinguish seasonal and technological changes from actual land-use change. The proposed mapping system will enable the tracking of land parcels over time, thereby improving the identification of land conversions, reducing challenges associated with seasonal variation, and enhancing the monitoring of burnt areas. The system is also expected to integrate additional spatial datasets, including soils, climate, peatlands, and ecozones, to improve the consistency and alignment of overlay data. Additional datasets, such as Climate Hazards InfraRed Precipitation with Station Data (CHIRPS) rainfall data, may also be incorporated to strengthen methods for adjusting seasonal variation. A preliminary system design and costing have already been completed, with implementation planned for the next inventory cycle.

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Another important improvement involves updating the Soil Organic Carbon (SOC) reference data. The current SOC reference dataset is based on older International Soil Reference and Information Centre (ISRIC) data and the 2014 South African National Land Cover (SANLC) dataset. Updating this data with improved and more recent land-use information is expected to enhance the comparability of South Africa's estimates with IPCC default values. Although this update is intended to form part of the broader land mapping system, it may also be implemented separately should the full system not be operational in time for the next inventory.

Further improvements are planned for Forest Land methodologies through the completion of the Tier 2 Dead Organic Matter (DOM) methodology. While Tier 2 equations and available data have already been integrated into the calculation framework, additional source data on mortality rates and transfer rates out of DOM pools are still required before the methodology can be fully implemented and included in inventory outputs.

Improving data collection on controlled fires is also identified as a priority. At present, there is no system in place to distinguish controlled burns from wildfires, limiting the ability to separately report natural disturbances. During the next inventory cycle, additional data sources will be explored, and discussions will be initiated on developing mechanisms for collecting and reporting such information.

In addition, the need for a national forest inventory remains an important outstanding issue, as highlighted in the UNFCCC TERT Review Report. Engagement with the Department of Forestry will continue to explore options for developing and implementing such an inventory.

1.4.5 Waste

The waste sector covers GHG emissions from the following sources:

- Solid Waste Disposal;
- Biological Treatment of Solid Waste;
- Open Burning of Waste (including pyrolysis); and
- Wastewater Treatment and Discharge.

1.4.5.1 Trends

Total emissions from the waste sector in 2024 were estimated at 19 245 Gg CO_2e, as presented in Table 1.19. Wastewater treatment and discharge were the largest contributors, accounting for 47% of total sector emissions, followed by solid waste disposal at 38%.

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Biological treatment of solid waste contributed 14%, while open burning of waste accounted for only 1% of total emissions.

Figure 1.18 provides an overview of waste sector emission trends for the 1990–2024 period. Over this time series, emissions from the sector increased by 69.6% compared to 1990 levels.

Table 1.19*: Summary of the estimated emissions from the Waste Sector in 2024.*

Source Categories	Emissions (Gg CO2e)		Change (%)	Contribution (%)
	1990	2024	1990-2024	
5 - Waste	11 346	19 245	69.6	
5A - Solid Waste Disposal	2 822	7 377	161.4	38.3
5B - Biological Treatment of Solid Waste	1 346	2 620	94.7	13.6
5C - Incineration and Open Burning of Waste	156	260	66.7	1.3
5C1 - Waste Incineration	*NE*	*NE*	*NE*	
5C2 - Open Burning of Waste	*156*	*241*	*54.7*	*1.3*
5D - Wastewater Treatment and Discharge	7 022	9 007	28.3	46.8
5D1 - Domestic Wastewater Treatment and Discharge	*2 772*	*4 287*	*54.7*	*22.3*
5D2 - Industrial Wastewater Treatment and Discharge	*4 251*	*4 720*	*11.0*	*24.5*
5E-Other (please specify)	NE	NE	NE	

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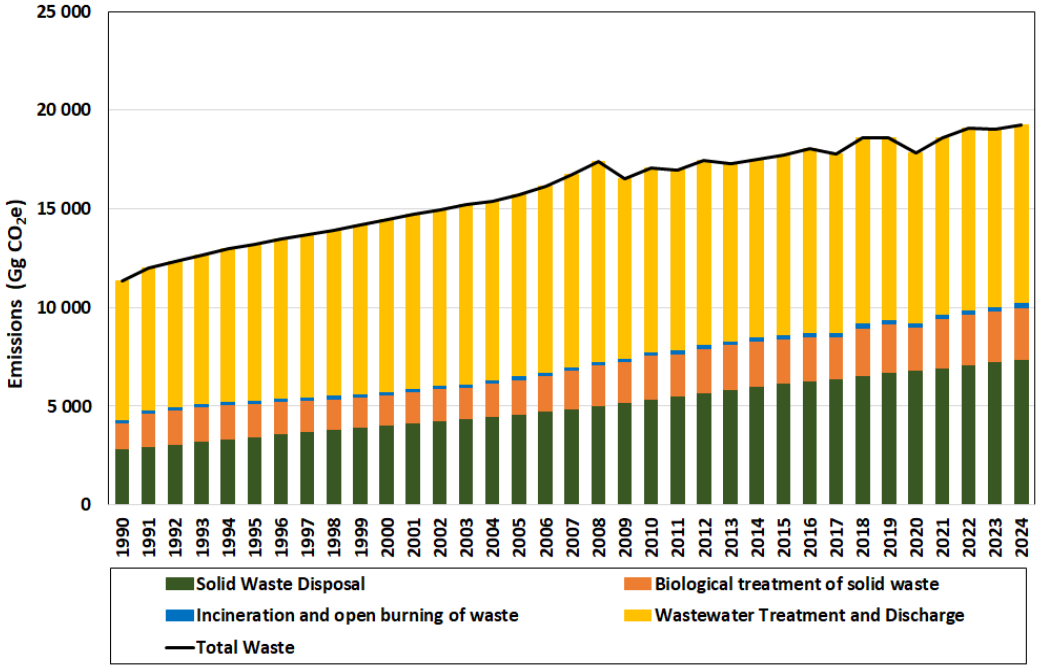


Figure 1.18*: Trend in emissions from Waste sector, 1990 – 2024.*

Emissions from all waste categories have shown an overall increase since 1990 (Table 1.16). Comparing the current inventory year (2024) with the previous GHG inventory (2022), emissions from solid waste disposal, biological treatment of solid waste, and open burning of waste increased over the period. In contrast, emissions from wastewater treatment and discharge decreased by 2.5%, mainly due to lower emissions from industrial wastewater treatment and discharge.

1.4.5.2 Methods and data

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Table 1.20 below highlights the methods and tier levels used for the waste inventory.

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Table 1.20: Summary of methods and emission factors for the Waste sector and an assessment of the completeness of the Waste sector emissions

GHG Source and sink category		CO_2		CH_4		N_2O		Details
		Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	
A	Solid waste disposal	NA	NA	T1	DF	NA	NA	Tier 1 FOD model was used.
B	Biological treatment of solid waste	NA	NA	T1	DF	T1	DF	IPCC 2006 Guidelines
C	Incineration and open burning of waste	T1	DF	T1	DF	T1	DF	IPCC 2006 Guidelines
D	Wastewater treatment and discharge	NA	NA	T1	DF, CS	T1	DF	IPCC 2006 Guidelines

1.4.5.3 Recalculations

Recalculations for the Waste sector were undertaken to incorporate several methodological and data updates. These included revisions to the methane correction factors, waste generation rates, and waste composition data based on the 2019 State of Waste Report. In addition, methane recovery data were removed from the solid waste estimates pending the collection of more reliable information for future inclusion in the National Inventory Document (NID).

The recalculations resulted in changes to the emissions trend across the entire time series as depicted in Figure 1.19 below, with recalculated emissions generally lower than those reported in the previous inventory.

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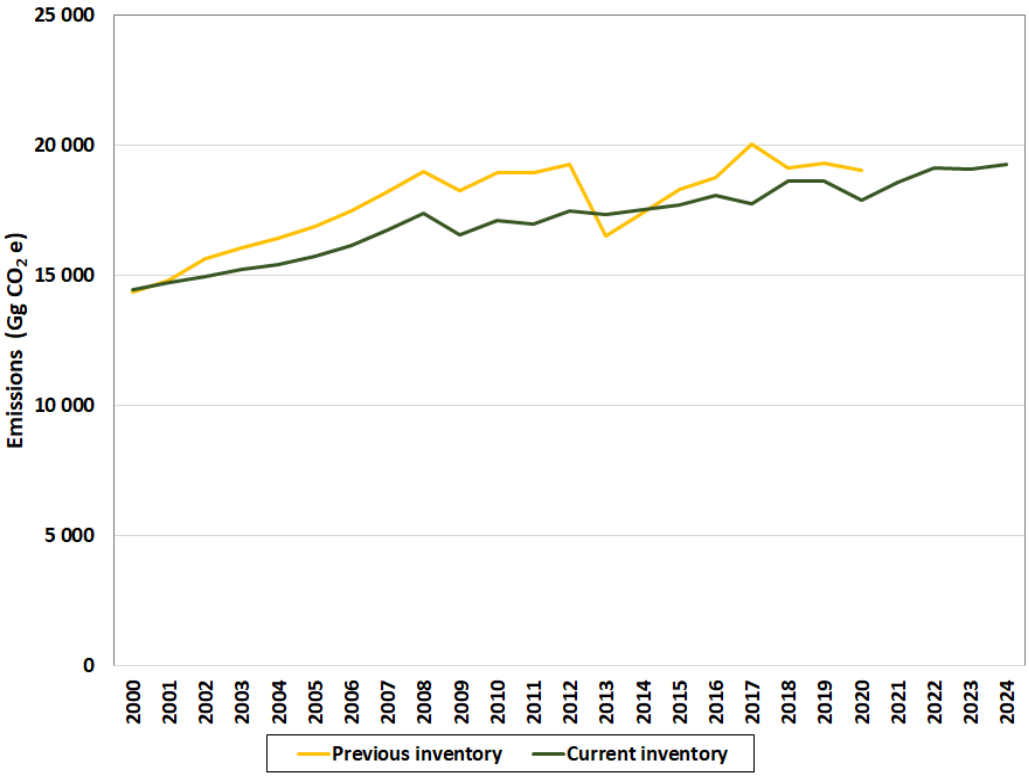


Figure 1.19: Change in Waste emission estimates due to recalculations since 2022 submission.

1.4.5.4 Planned improvements

One of the main challenges in estimating GHG emissions in South Africa's Waste sector remains the limited availability of country-specific activity data and emission factors. Consequently, emissions from both solid waste and wastewater sources are largely estimated using default values from the 2006 IPCC Guidelines, resulting in relatively high levels of uncertainty.

Although no specific improvements are currently planned, several priority areas have been identified for future enhancement of the inventory. These include improving data collection on the quantities and composition of waste disposed of at managed and unmanaged landfill sites, as well as strengthening the reporting of economic data to better reflect differences across population groups. The current assumption that GDP growth is evenly distributed across all groups may introduce significant uncertainty into the estimates. Additional priorities include obtaining improved information on population distribution trends between rural and urban

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areas in relation to income levels, conducting studies to better understand waste streams and the continued use of bucket sanitation systems in South Africa, and collecting reliable, metered data on CH_4 recovery at solid waste disposal sites.

1.5 Supplementary Information to Facilitate Tracking Progress on Implementation and Achievement of South Africa's NDC

South Africa's updated NDC outlines a framework for tracking progress on emission reductions in accordance with information for Clarity, Transparency and Understanding. Progress will be assessed by comparing emissions in 2025 and 2030 with annual data from South Africa's GHG inventory, excluding emissions from natural disturbances in the land sector. Emissions from natural disturbances will be reported separately in the NID by sector (Forest lands, Grasslands, Wetlands, Settlements) and disaggregated by relevant IPCC categories.

The estimated GHG emissions from natural disturbances for 2021 and 2022 have been recalculated as part of the preparation this NID. The revised estimates are lower than those previously reported due to an update in the treatment of natural disturbances within the LULUCF sector. In the 9th National GHG Inventory, the methodology excluded the immediate carbon losses associated with natural disturbance events (e.g. wildfires), while retaining the carbon removals resulting from post-disturbance vegetation regrowth. In this NID, the methodology has been revised to align with the 2006 IPCC Guidelines by consistently excluding both the disturbance-related carbon losses and the subsequent carbon removals associated with post-disturbance regrowth from anthropogenic LULUCF accounting. The exclusion of the subsequent carbon removals on disturbed lands was not applied in the previous inventory. Consequently, the reported LULUCF sink excluding natural disturbances is smaller than that reported in the previous NID (Figure 1.20).

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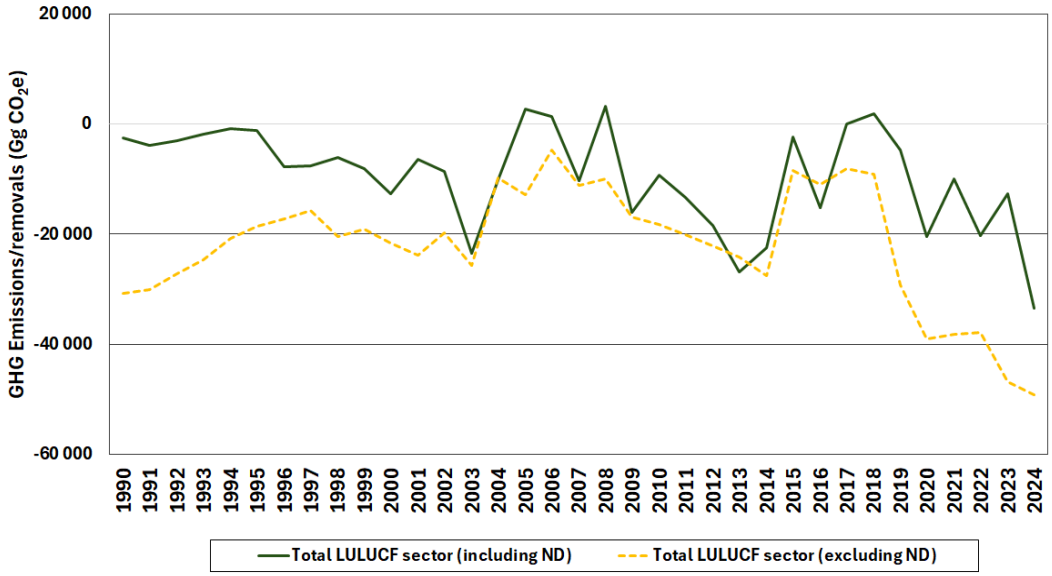


Figure 1.20: LULUCF sector sink with and without natural disturbance

1.6 References

IPCC, 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The National Greenhouse Gas Inventories Programme. Eggleston H S. Buenida L. Miwa K. Ngara T. and Tanabe K. eds; Institute for Global Environmental Strategies (IGES). Hayama. Kanagawa, Japan.

IPCC, 2019, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 3 Industrial Processes and Product Use, https://www.ipcc-nggip.iges.or.jp/public/2019rf/vol3.html [Accessed: September 2022]

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2 Information necessary to track progress made in implementing and achieving NDCs under Article 4 of the Paris Agreement

2.1 National circumstances and institutional arrangements

This section presents South Africa's national circumstances and the institutional arrangements established to track progress in implementing its Nationally Determined Contributions (NDCs). It provides the context of how the demography, economic landscape, and exposure to climate variability influence the country GHG emissions. The section further describes the institutional frameworks used to monitor NDC implementation, along with an update on progress achieved toward meeting these targets.

2.1.1 Government structure

The Government structure remains the same and information reported remains unchanged, as per BTR1 of South Africa p 56-57[2].

2.1.2 Population profile

Population estimates for the country have been updated with field data after the 2022 Population Census. The adjusted population estimates show that the total population has steadily grown from 57 million in 2017 to 60 million in 2021, 61 million in 2022 and 62 million in 2023 and 2024 (Stats SA, 2025). The country's real GDP expanded by 1% between 2022 and 2024, from R 4,60 trillion in 2022 and 2023 to R 4,70 trillion in 2024 (Stats SA, 2026b).

Energy production increased by 4% in 2024 from 213 TWh in 2023 to 221 TWh in 2024. However, South Africa's total energy demand declined by 3% compared to 2023 from 226 TWh in 2023 to 220 TWh in 2024. Peak demand for electricity declined from 2023 to 2024 due to rapid growth of the private sector embedded generation. South Africa experienced the highest loadshedding in 2023 than any other year with 25 TWh shed in 2023 compared to 4 TWh in 2024.

Between 2022 and 2024, South Africa's GHG emissions reflected a complex interplay between economic recovery, energy supply constraints, and shifting industrial activity. Energy

[2] MPGs Para 63. In reporting the information referred to in paragraphs 59 62 above, a Party may reference previously reported information.

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sector emissions, after declining by 2% in 2023 largely due to intensified loadshedding that curtailed electricity generation, rebounded with a 3.5% increase in 2024 as loadshedding eased and energy supply recovered, resulting in a net 1.4% rise in energy emissions over the period. Industrial production, particularly in the IPPU sector, showed a 2% decline since 2022, driven by falling cement production due to cheap imports and rising local fuel prices, alongside a slight downturn in the chemical and metal industries. Transportation emissions, by contrast, grew steadily from 2022 to 2024, reflecting the continued recovery of economic activity and mobility following the pandemic-era slowdown. Meanwhile, the LULUCF sector remained a significant carbon sink, with removals increasing by 64.5% between 2022 and 2024, largely driven by Forest Lands, even as other land categories such as Croplands, Grasslands, and Other Lands continued to act as emission sources due to ongoing land-use conversions. Overall, these trends show that while South Africa's economy continues to recover and diversify, its emissions profile remains closely tied to the reliability of coal-based energy supply and the pace of industrial and land-use change.

Electricity demand has increased with the number of households with electricity from mains growing from 14 million in 2017 to 16 million in 2024. Along with the steady growth in the population, overall urban area size has increased by 10% from 2018 to 2022.

In terms of service delivery in South Africa, 94% of households had access to electricity in 2023 and 95% in 2024, with 61% having access to refuse removal at least once a week in 2023 and 2024 and 80% of the population having access to piped water in those years (Stats SA, 2026b).

South Africa is characterised by its emerging economy and holds the distinction of being the world's largest exporter of platinum, alongside significant exports of other natural resources. The country’s GDP and economic growth are primarily driven by the services sectors.

With a human population of 62 million in 2024 and Total GHG emissions, including LULUCF, at 444 164 484 tCO2 in 2024, South Africa has the highest per capita CO2 emissions in Africa, reported at 7.164 tCO2/capita. This status is largely attributable to South Africa’s dependence on fossil fuel-based energy sources, particularly coal-fired and diesel-powered electricity generation. Significant GHG emissions also arise from the transport sector, which contributes approximately 13% of the country’s GHG emissions.

Regionally, Gauteng is home to 15.7 million people, making up 25% of the total population, the largest share among the provinces. KwaZulu-Natal follows with an estimated 12 million

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people, comprising 19% of the population, while the Free State has the smallest population share at about 3 million people (5%) (Stats SA, 2025).

For 2023 to 2024, 88% of households resided in formal dwellings, 3% in traditional dwellings and 9% in informal dwellings (Stats SA, 2026a). Gauteng and the Western Cape received the largest numbers of migrants. The trend of rural-to-urban migration—often driven by climate change, which exposes rural communities to poverty, hunger, and malnutrition—is expected to persist, exerting additional strain on urban governance and service delivery. Many migrants arrive in search of economic opportunities that ultimately prove unavailable, leaving them stuck in informal settlements and slums without access to basic services, effectively transferring poverty from rural to urban areas (Madzivhandila and Asha, 2024). This influx intensifies socio-economic vulnerabilities, reducing access to land and safe water and heightening resource competition, which undermines service delivery while increasing protection risks (Ndlovu and Maviza, 2026). Amid these compounding pressures, climate mitigation initiatives are often pushed to the backburner as meeting the population's basic needs is prioritised.

2.1.3 Geographical profile

As per BTR1 (pp. 57–58), an overview of South Africa’s geographical setting, including its location, extent, coastal environment, and major topographical features, was reported on.

Situated at the southern tip of the African continent, South Africa is characterised by a diverse and unique natural environment, ranging from the subtropical coastal forests of KwaZulu-Natal to the semi-arid and arid regions of the Karoo. The country supports eight distinct biomes, reflecting its rich ecological diversity and varied climatic conditions. The map of biomes is shown in Figure 2.1 below.

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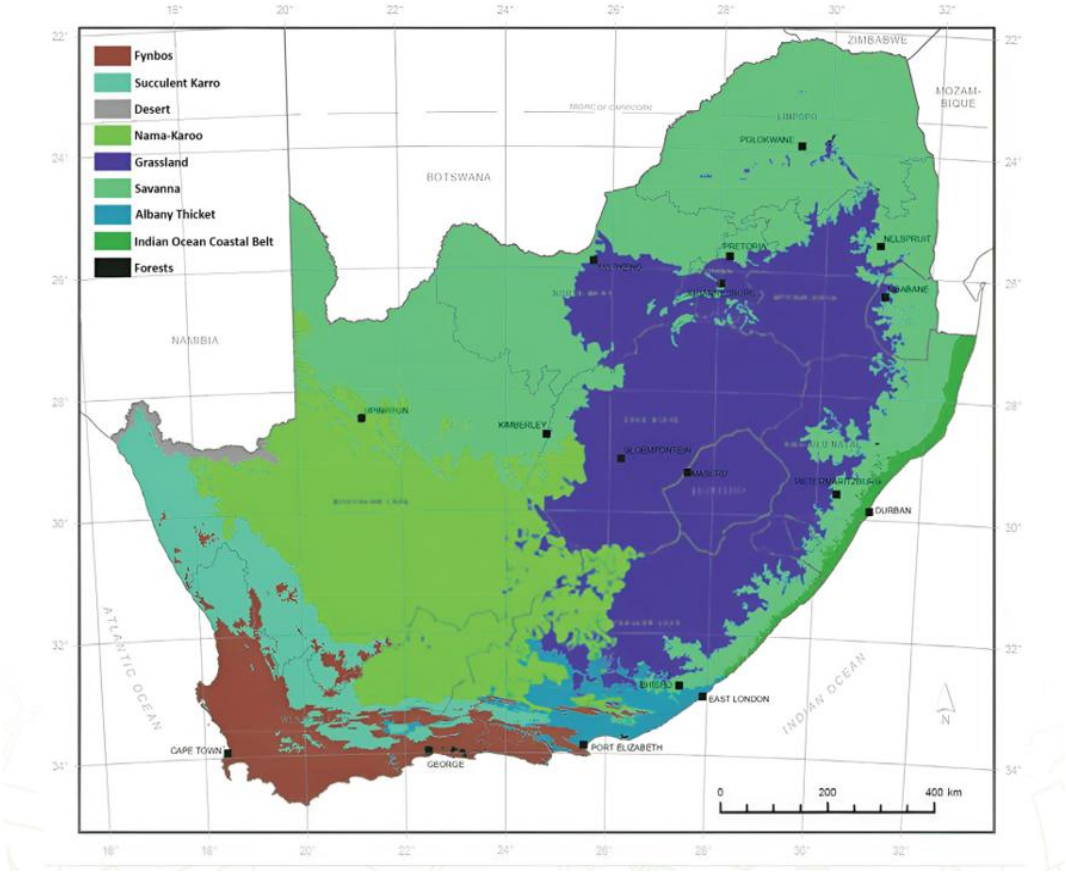


Figure 2.1: Biomes in South Africa (DFFE, 2024)

In relation to these biomes and South Africa's LULUCF sector, this sector functioned as a net carbon sink of 33 412 Gg CO_2e in 2024, meaning the sector removed more carbon dioxide equivalent than it emitted. Forest land is the primary driver of this sink, with thickets and woodlands acting as the dominant contributors within that category. By contrast, every other land-use category — croplands, grasslands, wetlands, settlements and other land — functions as a net source of emissions rather than a sink. Harvested Wood Products (HWP) added a further modest sink of 1 718 Gg CO_2e in 2024, reflecting carbon stored in timber and wood-derived products still in use.

The sector's overall sink capacity has grown over the past three-and-a-half decades, increasing by 30 954 Gg CO_2e between 1990 and 2024. This growth has not been evenly distributed across land categories:

- Forest land drove the bulk of this change, expanding its sink by 39 776 Gg CO_2e

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over the period, an increase directly linked to the growing area of land classified as forest.

- Wetlands moved in the opposite direction, with emissions roughly quadrupling from 503 Gg CO_2e to 2 105 Gg CO2e.
- Croplands were the most stable category, showing the smallest overall percentage change (27.2%) across the 34-year span.

Understanding these LULUCF trends requires understanding where carbon physically resides in South African ecosystems. The overwhelming majority — an estimated 89% — of the country's terrestrial carbon stock is held in soil organic carbon rather than above-ground biomass. Two biomes dominate this storage: grasslands hold roughly 36% of the national carbon stock and savannah a further 31%, together accounting for the majority of the country's soil carbon (DFFE, 2020).

Geographically, this carbon is evenly distributed. Northwest, Limpopo, Mpumalanga, KwaZulu-Natal, the Eastern Cape and the Free State each hold between 12% and 17% of the national total, while the Northern Cape, Gauteng and Western Cape hold considerably less, between 2% and 7% each — consistent with their smaller land areas and different biome compositions (DFFE, 2020).

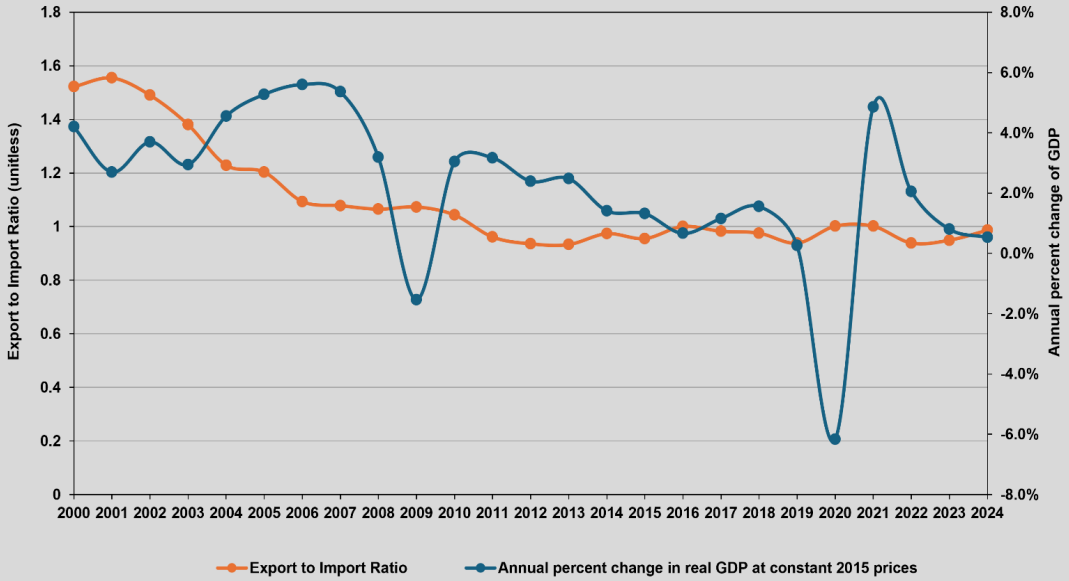
South Africa's growing LULUCF sink is fundamentally a story of land-cover change - particularly the expansion of forest land, much of it through conversion from grassland — rather than uniform improvement across all land categories. Grasslands and savannahs remain the country's primary carbon reservoirs by virtue of their larger soil carbon stocks, even as forest land drives the sector's above-ground sink dynamics. At the same time, wetlands and other land categories are trending toward greater emissions, and climate change, habitat fragmentation and invasive species are placing mounting pressure on the ecosystems — from mega-diverse forest fragments to coastal systems — that underpin both the country's carbon balance and its broader ecological and economic wellbeing (DFFE, 2024).

2.1.4 Economic Profile

South Africa is classified as an upper-middle-income country by the World Bank in both 2023 and 2024 (World Bank, 2024). The main economic sectors in those years are manufacturing, whole-sale and retail trade, professional business services and personnel services (Stats SA, 2026b). Key economic areas to unlock economic growth identified by the National Treasury include electricity sector, rail and port logistics, water infrastructure and tourism (National Treasury, 2026). Figure 2.2 shows that real GDP growth was strong in the early-to-mid 2000s (often above 4-5%) but slowed sharply after 2008, turning negative in 2009 and 2020 (the

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global financial crisis and COVID-19), and has continued its long-term deceleration, slowing from 0.81% in 2023 to 0.53% in 2024, well below the 3-5% rates seen in the early 2000s. Despite this weak growth, GDP at constant 2015 prices still edged up from R4.64 trillion in 2023 to R4.66 trillion in 2024, reflecting steady but increasingly marginal economic expansion. The export-to-import ratio declined steadily from 1.52 in 2000 to around 0.94–1.00 through most of the 2010s and 2020s remaining at this level in 2023 and 2024 (0.95 in 2023 to 0.99 in 2024), suggesting imports grew faster than exports over the period.



Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
GDP at constant 2015 prices in R trillions	2.83	2.90	3.01	3.10	3.24	3.41	3.60	3.80	3.92	3.86	3.97	4.10	4.20	4.30	4.36	4.42	4.45	4.50	4.57	4.58	4.30	4.51	4.60	4.64	4.66

Figure 2.2: Timeseries of annual percentage change in GDP and the export to import ratio as macro-economic indicators (Source: Stats SA, 2026)

In 2023 and 2024, South Africa has been a net exporter of GHG emissions. The carbon intensity of South Africa's exports is of relevance since about 78% of exports, valued at $135 billion, are destined for countries that have committed to net-zero emissions targets (Net Zero Tracker, 2025)

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The basic metals industry plays a significant role in trade, making up a quarter of total exports but it stands out as an intensive emissions industry. Of these exports, 70% go to nations that have committed to net-zero targets, while 30% are shipped to countries that already have Carbon Border Adjustment Mechanisms (CBAMs) in place or are planning to introduce them.

Nearly two-thirds (65%) of the automotive sector's export value — one of an emission-intensive industry that ranks as the country's third-largest exporter — is exposed to CBAMs that are either already active, coming into force, or under discussion.

South Africa's agricultural exports are also coming under mounting pressure to reduce the emission intensity of supply chains as there are competitors in other countries with far smaller carbon footprints.

The emission intensity of these sectors is emerging as a trade barrier making these export sectors more vulnerable as global markets pivot towards decarbonising supply chains.

South Africa stands at a crossroads of risk and opportunity. Its heavy reliance on carbon-intensive electricity and emissions-heavy exports leaves the economy exposed, with knock-on effects for jobs, inequality, and poverty. Yet the country also holds real strengths: abundant renewable resources, globally critical minerals like platinum, manganese, vanadium, and chromium, and strong multilateral ties through platforms like the Brazil, Russia, India, China, and South Africa (BRICS) bloc, alongside renewable capacity growth already outpacing its own targets. Realizing this potential, however, depends on developed nations - particularly Just Energy Transition Partnership (JETP) partners such as the UK, EU, and Germany — following through on their climate finance commitments, and on mechanisms like CBAMs being designed fairly, including through revenue-sharing, so they support rather than penalize South Africa's just transition (Net Zero Tracker, 2025).

2.1.5 Climate Profile

As per BTR1 (pp. 59) an overview of South Africa’s climatic characteristics, including rainfall patterns, temperature regimes, climatic zones, and the geographical and oceanic factors that influence the country’s diverse climate conditions is provided.

Currently, South Africa is experiencing an increase in extreme weather events, attributed to observed changes in the climate system. In 2024, South Africa experienced a new record warm year. The annual mean temperature anomaly for 2024, based on data from 26 climate stations, was approximately 9 ˚C above the average of the reference period (1991–2020), making it the hottest year since 1951 (see Figure 2.3). In comparison 2023 was the eighth

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hottest year on record since 1951. A warming trend of approximately 0,17 ˚C per decade is indicated for the country, over 1951–2024, statistically significant at the 5% level.

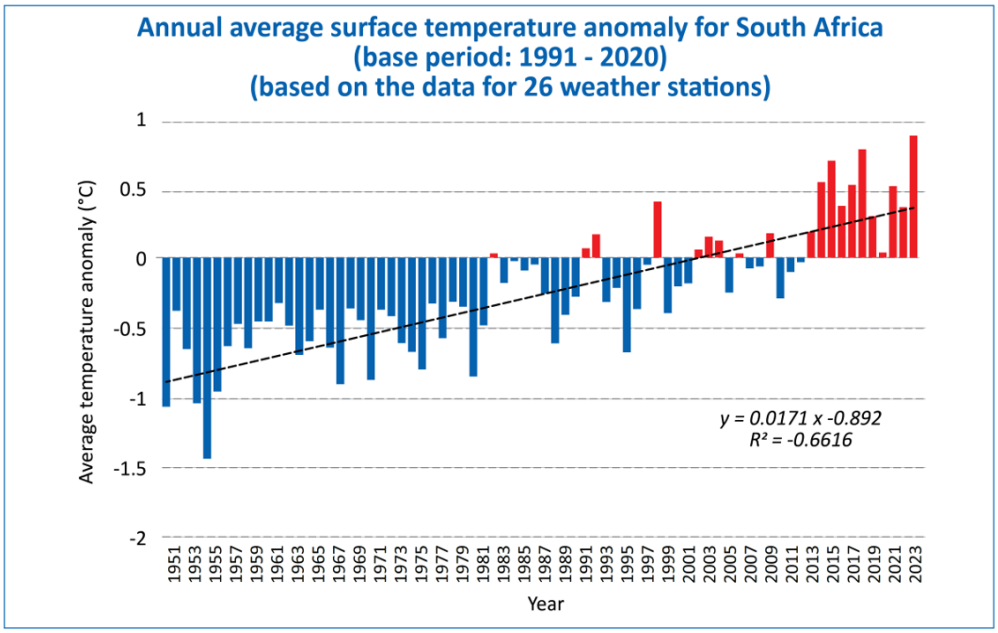


Figure 2.3: Annual average surface temperature deviation for South Africa. (Source: SAWS, 2025)

As per BTR1 (pp. 60-61) broadly reported on that South Africa has seen a marked rise in extreme weather since 2013, from severe droughts—including Cape Town's 2018 "day zero" crisis and Eastern/Northern Cape agricultural losses—to disasters like the 2017 Knysna fires and Cape Storm, and the catastrophic 2022 KwaZulu-Natal floods that killed 448 people. As per BTR1 (pp. 61), these events have caused billions in damages, mass displacement, and significant loss of life. Such trends are increasingly attributed to global climate change driven by global warming.

Flooding events were frequent in 2023 and 2024 affecting Western Cape, Eastern Cape and KwaZulu Natal Provinces mainly.

Some of the reported flooding events in 2023 (SAWS, 2024) were:

- Heavy rainfall on 13 May forced over 1,200 residents to evacuate their homes in the Nelson Mandela Bay Municipality, Eastern Cape.

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- Heavy rain on 24 and 25 September 2023 triggered flooding that killed 11 people, shut down more than 200 roads, and cut power to over 80,000 residents for a prolonged period.
- Flooding in Ladysmith, KwaZulu-Natal, largely occurring on 24 December, claimed more than 20 lives.

Some of the reported flooding events in 2024 (SAWS, 2025) were:

- On 13 March, Tropical Storm Filipo brought heavy rain that flooded Zululand, damaging infrastructure and causing deaths.
- Heavy rainfall in April, especially across central and southern areas, caused flooding and fatalities, including five deaths in Margate, where 250 mm fell within a single day.
- In June, intense rain triggered severe flooding in the Eastern Cape, killing seven people and forcing more than 1,100 residents from their homes.

2.1.6 Sector details

In line with South Africa's 2024 National Inventory Report (2024 NID), GHG emissions are measured across five key sectors: Energy, IPPU, LULUCF, Agriculture, and Waste. Sector-specific details and emission trends are presented in Chapter 1 of this Biennial Transparency Report (BTR2).

2.1.7 Effect of national circumstances on GHG emissions and removals over time

As per BTR1 (Section 2.1.7 pp. 61), explains that South Africa's economy has experienced modest post-pandemic growth, but continues to face severe unemployment, poverty, and inequality challenges, while its coal-dependent energy sector remains crucial for economic activity yet exposes the country to significant environmental and transition risks in a global shift toward cleaner energy.

2.1.8 Institutional arrangements in place to track progress made in implementing and achieving its NDC under Article 4

At the apex of South Africa’s climate governance structure is the Minister of the Department of Forestry, Fisheries and the Environment (DFFE), who serves as the Executive Authority and holds overall political oversight and accountability for the country’s climate change response. This includes the approval and submission of all international climate change reports under the United Nations Framework Convention on Climate Change (UNFCCC) and

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the Paris Agreement, including BTRs, National Communications (NCs), and updates to the Nationally Determined Contribution (NDC). An organogram is shown in Figure 2.4.

Reporting to the Minister is the Director-General (DG) of the DFFE, who, as the Accounting Officer, is responsible for the overall administration and strategic oversight of departmental programmes, including those related to climate change. Within the Department, the Branch: Climate Change and Air Quality (CCAQ) constitute the central institutional platform for the coordination, implementation, monitoring, and reporting of South Africa's climate change response. The Branch is mandated to lead, promote, facilitate, inform, monitor and review the mainstreaming of low-carbon development, climate resilience, and air quality management in support of sustainable development. It plays a central role in coordinating national, provincial, and local climate change responses, as well as in preparing for and informing international climate change reporting and engagements.

Within the CCAQ Branch, led by the Deputy Director-General, the tracking of progress towards the implementation and achievement of the NDC is undertaken through an integrated system involving key Chief Directorates. The Chief Directorate: Climate Change Mitigation and Specialist Monitoring Services provides the core technical basis for NDC tracking through the development and maintenance of the national GHG inventory and the broader climate change monitoring and evaluation system. These systems generate the quantitative data and indicators used to assess progress towards South Africa's emissions targets under the NDC. This technical foundation is complemented by analytical and implementation processes that support the assessment of mitigation pathways, the evaluation of policy and measures, and the tracking of sectoral mitigation efforts, including the implementation of Sectoral Emissions Targets (SETs), carbon budgets and the mitigation plans.

The Chief Directorate: International Climate Change Relations and Reporting provides the institutional link between domestic climate action and international reporting obligations. It is responsible for preparing for, negotiating, and informing the implementation of international climate change agreements, while ensuring that South Africa's climate actions are accurately reflected in its reporting under the UNFCCC and the Paris Agreement. Within this Chief Directorate, institutional arrangements for international reporting have evolved between reporting cycles. During the preparation of the BTR1, the responsibility for compiling and submitting Biennial Transparency Reports and National Communications resided within the Directorate: Climate Change Developments and International Mechanisms. For the current and future reporting cycles, these functions have been reassigned and consolidated within the Directorate: UNFCCC, which now serves as the central coordinating unit for the compilation,

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quality assurance, and submission of all UNFCCC reports, including BTRs, NCs, and the coordination of the Capacity Building Initiative for Transparency (CBIT). These are changes in institutional arrangements since BTR1, as explained. This adjustment enhances institutional clarity, strengthens coordination, and improves the efficiency of reporting processes, as the UNFCCC Directorate also serves as the National Focal Point to the UNFCCC.

In addition to internal institutional arrangements, the tracking and reporting of NDC implementation is supported by broader governance and stakeholder engagement structures. In particular, the Presidential Climate Commission (PCC) provides an independent, multi-stakeholder platform that supports a just transition to a low-emissions and climate-resilient economy. The PCC facilitates engagement across government, business, labour, academia, and civil society, ensuring that the implementation of the NDC is informed by inclusive and transparent processes. To support the preparation of international reports, a Project Steering Committee (PSC) is established to provide oversight of the reporting process. The PSC reviews draft outputs, facilitates interdepartmental coordination, and ensures that reporting remains aligned with national priorities and international requirements.

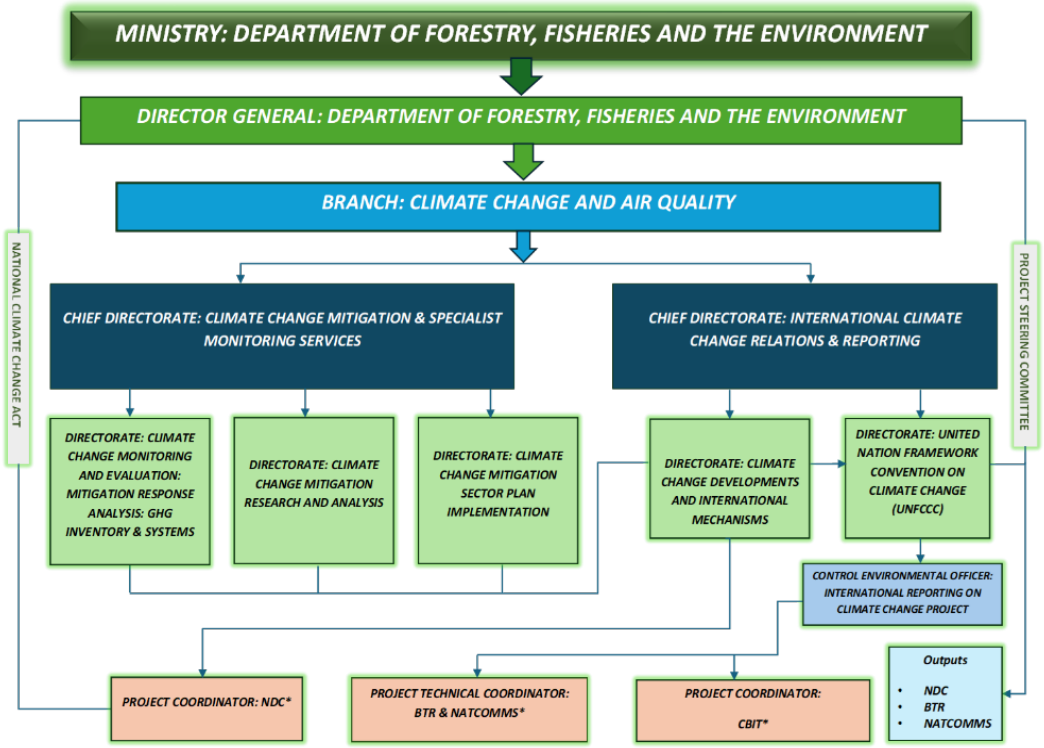


Figure 2.4: Overview of the DFFE Climate Change and Air Quality Branch

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2.1.9 Legal, institutional, administrative and procedural arrangements for domestic implementation, monitoring, reporting, archiving of information and stakeholder engagement related to the implementation and achievement of its NDC under Article 4

The DFFE is the central authority responsible for coordinating and formulating climate change policy in South Africa. In accordance with the National Environmental Management: Air Quality Act (Act 39 of 2004) and now the Climate Change Act (Act 22 of 2024), the Department is mandated to develop, coordinate, and oversee the implementation of environmental policies, legislation, and information systems, including those related to climate change. In this capacity, the DFFE leads the country's response to climate change and ensures the fulfilment of its international obligations under the Paris Agreement, including the tracking and reporting of progress towards the NDC. Within the Department, the Branch: CCAQ serves as the principal operational entity responsible for advancing South Africa's transition to a low-emissions and climate-resilient development pathway.

In line with this mandate, South Africa has established an evolving institutional framework to coordinate, manage, and report on the implementation of its NDC under Article 4 of the Paris Agreement. These arrangements are designed to enhance transparency, ensure accountability, and facilitate coordination across the national, provincial, and local spheres of government. Since the submission of South Africa's First Biennial Transparency Report (BTR1) in December 2024, the institutional arrangements for reporting have been further refined to improve coherence and align with the requirements of the Enhanced Transparency Framework (ETF).

2.1.9.1 Climate mitigation system

Data collection for previous GHG inventories has drawn on various providers across all sectors, coordinated by the DFFE. The National Greenhouse Gas Emission Reporting Regulations (NGERs) provide the legal basis for gathering activity data and GHG emissions data, particularly from the energy sector and industries such as plantations and certain agricultural operations. This regulatory framework supports the compilation of the National GHG Inventory, improving the quality, sustainability, accuracy, completeness, and consistency of the underlying data. Regulation 7(1) of the NGERs set the initial reporting cycle in motion on 31 March 2018, requiring data providers to register and submit activity and emissions data to the competent authority.

The DFFE has replaced the former SAGERS through the active development of the new reporting platform, the South African Industrial GHG Emission Management System (SAIGE).

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SAIGE is intended to serve as the national platform for the management and reporting of industrial GHG emissions. The system is envisaged as a comprehensive, web-based platform to support accurate reporting, monitoring, and management of GHG emissions by major emitters in South Africa. The purpose of SAIGE is to integrate key functionalities, including GHG reporting, Carbon Budgets, and Mitigation Plans. Upon completion of the development updates to SAIGE, the platform is expected to facilitate the submission, approval, data management, and data analytics of these modules, thereby supporting regulatory compliance by data providers and enabling national strategic decision-making on emission reductions by the DFFE.

Oversight also extends to the National Climate Change Information System (NCCIS), where tools must be kept up to date and data providers are expected to regularly refresh the information held on the system. The national GHG inventory draws directly on NCCIS data, and improvement projects for the system are initiated as needed, funding permitting.

A close working relationship exists with SAWS, which updates climate data on the Climate Information Portal (CIP) and the National Hazardous Events Database (NHED). The National Climate Change Response Database, meanwhile, is maintained centrally, complemented by Provincial Climate Change Response Databases kept up to date by provincial authorities. Both are designed with future integration in mind, including the possibility of municipal-level data being collected and progressively folded into provincial and national systems.

Mitigation, adaptation, and climate finance data are kept current within the national Tracking and Evaluation (T&E) system, a responsibility that anchors much of the broader reporting effort. Its T&E Portal, a sub-module of the NCCIS, serves as the primary platform for tracking South Africa's progress towards its NDC goals and commitments, enabling transparent, interactive, and accessible reporting of climate action to domestic and international audiences alike.

Climate finance data is also requested from donor organisations and subsequently uploaded to the T&E system — work carried out alongside the National Treasury and other stakeholders as part of implementing the National Climate Finance Support Strategy, which aims to strengthen how climate finance is tracked.

The Climate Change Monitoring and Evaluation System, for its part, supports the regular production of information describing South Africa's climate change actions. Once analysed, this information is shared with the directorate responsible for international reporting, for inclusion in BTRs and NCs.

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Figure 2.5 shows the overall institutional arrangements and data flows for the measurement, reporting, and verification (MRV) of GHG emissions, mitigation, adaptation, and support. Taken together, these systems and tools make it possible to continuously collect, manage, and archive the climate change information needed to track progress on the country's NDC and to meet reporting obligations under the UNFCCC and the Paris Agreement.

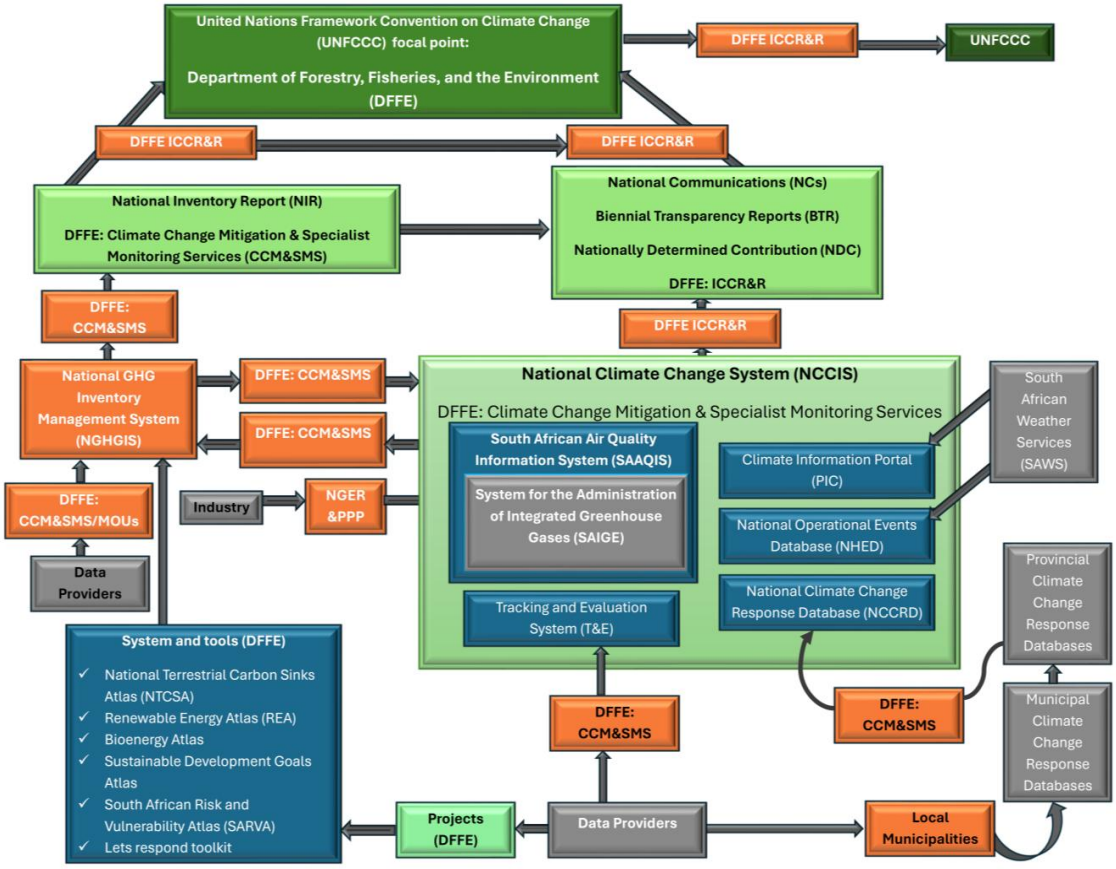


Figure 2.5: Diagram of the institutional arrangements and data flows for MRV in South Africa

2.1.9.2 Domestic Arrangements for Internationally Transferred Mitigation Outcomes

It is expected that South Africa will host Article 6.4 projects and may enter cooperative approaches with other countries under Article 6.2, but currently South Africa is not participating in any Article 6 activities under the Paris Agreement. In preparation for the country's eventual

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foray into Article 6 activities; a Draft South African Article 6 Framework (DFFE, 2024) was published for public comment with a notice gazetted on 22 November 2024. This framework guides the implementation of Article 6 projects in South Africa by clarifying evolving requirements under the Paris Agreement and outlining how they can be applied and operationalised locally.

Figure 2.6 shows the proposed Internationally Transferred Mitigation Outcomes (ITMO) lifecycle within South Africa's mitigation framework, which incorporates domestic offset mechanisms used under the carbon tax system. The lifecycle is designed to build on and leverage the existing systems, processes, and infrastructure that underpin South Africa's current mitigation architecture.

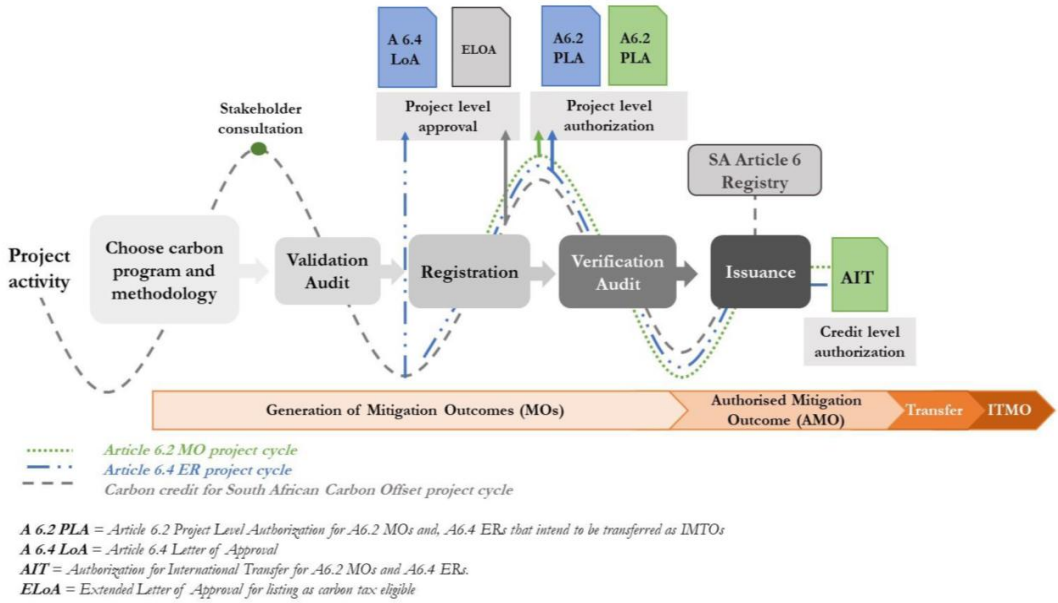


Figure 2.6: Proposed Lifecycle of South African ITMOs

All ITMOs would be generated through the registration of project activities and the issuance of mitigation outcomes (MOs) also called carbon credits under the recognised carbon programmes or standards that are eligible in South Africa's existing mitigation system, as outlined in the provisions for Carbon Offsets in Section 19 c of the Carbon Tax Act 15 of 2019. These include the:

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- Article 6.4 Mechanism;
- Gold Standard for Global Goals;
- Verified Carbon Standard; and
- Any other carbon programme/standard that the Minister of Energy may approve

Once mitigation outcomes have been verified by a third party and issued by a recognised carbon programme, the project entity may transfer these mitigation outcomes (MOs) to the South African Article 6 Registry. For project entities to transfer projects to the Article 6 Registry, the project entities must first obtain project-level authorisation from the Designated Focal Point (DFP), namely the DFFE. If the project entity intends to transfer MOs to a Participating Party for use against its NDC or Other International Mitigation Purposes[3] (OIMPs), the project entity must initiate the application for a credit level authorisation, through the AIT (Authorisation for International Transfer) process. This authorisation transforms a MO into an AMO (Authorised Mitigation Outcome) and is issued by the DFP through the Authorisation for International Transfer (AIT) process. All MOs intending to qualify as ITMOs must secure both PLA and AIT approvals. This distinction ensures that these credits are clearly differentiated from South African carbon offsets, which are restricted to use within the domestic carbon tax system.

To initiate the international transfer of an AMO, the project entity must request transfer of AMOs from the South African Article 6 registry, so that these may be listed in the receiving Party's registry. Transfer occurs when the receiving Party lists the AMO in its registry, after which it becomes an ITMO. The Participating Parties must be notified of transfers so that the necessary corresponding adjustments can be made to their respective GHG inventories.

South Africa's Article 6 Registry will be a single information repository for ITMOs going into and flowing out of South Africa's national borders. Accordingly, all ITMO trades will go through South Africa's Article 6 Registry. The registry regulation will be provisioned under the Climate Change Act 22 of 2024. The Registry Regulations will detail the mandatory information and design considerations for the Registry and will account for the linking of the South African registry to the global and other international registries.

[3] Mitigation outcomes authorised by a participating Party for use for international mitigation purposes other than achievement of an NDC or authorised for other purposes as determined by the first transferring participating Party. As provided for in Part I of the Annex to Decision 2/CMA.3.

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The registry may be built from scratch or leverage the existing Carbon Offset Administration System (COAS) and System for Administration of Integrated Greenhouse Gas Emissions (SAIGE). COAS is the existing digital platform used by the South African government to manage and facilitate the administration, tracking, and reporting of carbon offset projects and carbon credit. SAIGE has been designed to streamline the reporting, management, and analysis of GHG emissions and to integrate the setting of carbon budgets and mitigation plans into a single platform.

All Article 6 and domestic carbon tax MO listings will take place on the Article 6 Registry. Importantly, the registry will not function as a trading platform but rather as a comprehensive recording and authorisation system within the national borders.

The South African Article 6 Registry will be designed to manage both project-level approvals (in the case of Article 6.4 Mechanism and carbon tax offsets) and Article 6.2 project authorisations, as well as Article 6.2 credit-level authorisations, ensuring a comprehensive and streamlined process.

At the project level, the registry will facilitate the approval and authorisation of emission reduction project activities by providing a transparent platform for project entities to submit the required documentation. The registry will also accommodate Article 6.2 credit-level authorisations, allowing for the issuance, transfer, and retirement of ITMOs (emission reduction credits) generated by authorised projects. This dual functionality will enable stakeholders to track the progress of individual projects while ensuring the accurate accounting of ITMOs.

MOs (carbon credits) that are transferred into the registry are classified in several categories to distinguish credits that are eligible for use under the South African carbon tax (carbon offsets) or eligible for international transfer as ITMOs. MOs are only eligible for use as ITMOs if they have received both a PLA and AIT.

The Article 6 Registry will feature interoperability with the Article 6.4 Mechanism Registry and other country-specific Article 6 registries where a Bilateral or Multilateral Agreement exists ensuring accurate information exchange. This connectivity facilitates the transfer and tracking of emission reduction units between nations, allowing a collaborative approach to climate action.

The South African Article 6 Registry will assign unique identifiers to all ITMOs in compliance with Article 6 requirements to ensure traceability. These identifiers will serve as a key

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component in tracking and verifying the origin and status of each mitigation outcome. The use of unique identifiers enhances the credibility of the registry.

2.2 Description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates

2.2.1 First NDC

South Africa has set economy-wide goals for reducing GHG emissions in its 1st NDC, with specific targets for the years 2025 and 2030, submitted to the UNFCCC secretariat in 2021. The 1st NDC does not use reference points, levels, baselines, base years, or starting points - the NDC targets for these years are defined as fixed-level target ranges. In 2025, annual GHG emissions will be between 398 and 510 million tonnes of CO_2-eq (Mt CO_2-eq). In 2030, annual GHG emissions will be between 350 and 420 Mt CO_2-eq. Both target ranges exclude GHG emissions from natural disturbances.

The South African 1st NDC is structured into two five-year periods of implementation: the first from January 1, 2021, to December 31, 2025, and the second from January 1, 2026, to December 31, 2030, and progress in implementation and achievement of the NDC will be reported accordingly.

South Africa will use a GHG inventory-based accounting process in accounting for its NDC, using the most recently available national GHG inventory (2024 NID, submitted with this BTR, and summarised in Chapter 1).

South Africa hosts several Clean Development Mechanism (CDM) projects under the Kyoto Protocol. The transition of these projects to the Article 6.4 mechanism of the Paris Agreement is still under negotiation. It is expected that South Africa will host Article 6.4 projects and may enter into cooperative approaches with other countries under Article 6.2, but currently South Africa is not participating in any Article 6 activities under the Paris Agreement, and therefore no corresponding adjustments have been undertaken in this BTR.

2.2.2 Second NDC

The 2nd NDC was submitted to the UNFCCC on 18 October 2025. The 2035 target year has a period of implementation being 1 January 2031 to 31 December 2035. The NDC does not

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use reference points, levels, baselines, base years, or starting points - the NDC target for 2035 is defined as fixed-level target ranges. In 2035, annual GHG emissions will be between 320 and 380 Mt CO_2-eq. The GHG emissions of the target range for 2035 are defined as total net GHG emissions as specified in the national inventory report, including all sectors, and excluding emissions from natural disturbances in the land sector.

The scope and coverage of the mitigation target is the same as the 1st NDC. A GHG inventory-based accounting process is used in accounting for the NDC consistent with 2022 NID, submitted with the first BTR. The mitigation target is economy-wide emission reduction target, appropriate to the country's national circumstances. Coverage accounts for all economic sectors, including the land sector, and includes all gases, emission sectors and sources covered by the most recent national GHG inventory at the time which was the 2022 NID.

The status of South Africa's intention to use cooperative approaches that involve the use of ITMOs under Article 6 towards NDCs under Article 4 of the Paris Agreement remains the same as was previously reported in BTR1. The country's status remains intentional but is not formalised or established while the domestic framework for Article 6 mechanisms is being finalised. This step is necessary even before the country has institutionalised the ITMO lifecycle by building on and leveraging the existing systems, processes, and infrastructure that underpin South Africa's current mitigation architecture. No Article 6 activities under the Paris Agreement are currently underway. As a result, this BTR does not include any corresponding adjustments.

Owing to lack of guidance in the MPGs contained in the Annex, to Decision 18/CMA.1, on tracking multiple NDCs, the descriptions in BTR2 are clear and transparent about all the NDC targets of South Africa, including for 2025, 2030 and 2035. South Africa will not be accounting the achievement of any of the targets in this BTR (BTR2) as the reporting years of 2023 and 2024 are not one of the target years of the NDCs. Instead, when a reporting year coincides with a BTR target year, progress towards that target is reported in the corresponding BTR. For example, as BTR3 covers the 2025 and 2026 reporting years, achievement of the 2025 target will be reported in BTR3.

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2.3 Information necessary to track progress made in implementing and achieving its nationally determined contribution under Article 4 of the Paris Agreement

Narrative information has been provided in responding to paragraphs 65-78 of the annex to decision 18/CMA.1 below for selected elements of the structured summary. Tables 1-4 of the structured summary as contained in decision 5/CMA.3 have been included below; where applicable information is not contained in the narrative summary below, it is contained in Table 2.1.

2.3.1 Identification of the indicator which South Africa will use to track its NDC

The indicator South Africa will use to track its NDC is as identified in Table 2.1 (CTF Table 1). South Africa will track progress of the 1st NDC and 2nd NDC using a GHG inventory-based approach - therefore this indicator is defined as total GHG emissions including LULUCF as reported in the most recent national GHG inventory (contained in the relevant National Inventory Document), and included all gases, sectors and sources estimated in that GHG inventory, excluding GHG emissions from natural disturbances. In this BTR, this comprises total GHG emissions including LULUCF, reported in Table 2.1 of the 2024 NID (communicated with this BTR), excluding GHG emissions from natural disturbances, reported in Table A.VII of the 2024 NID.

Table 2.1 Structured summary: Description of selected indicators

Indicator(s) selected to track progress	Description
Total annual national GHG emissions and removals including LULUCF, excluding GHG emissions from natural disturbances.	South Africa will track progress of the 1st NDC and 2nd NDC using a GHG inventory-based approach - therefore this indicator is defined as total GHG emissions including LULUCF as reported in the most recent national GHG inventory (contained in the relevant National Inventory Document), and included all gases, sectors and sources estimated in that GHG inventory, excluding GHG emissions from natural disturbances. In this BTR, this comprises total GHG emissions including LULUCF, reported in Table 2.2 of the 2024 NID (communicated with this BTR), excluding GHG emissions from natural disturbances, reported in Table A.VII of the 2024 NID.
Information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate	Not applicable
Updates in accordance with any recalculation of the GHG inventory, as appropriate	No updates as the above is not applicable

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Indicator(s) selected to track progress	Description
Relation to NDC	South Africa's 1st NDC and 2nd NDC define the targets in CTF Table 3 as absolute economy-wide targets, consisting of all gases, sectors and sources reported in the most recent national GHG inventory, excluding GHG emissions from natural disturbances. The chosen indicator is therefore completely consistent with how South Africa defines the NDC targets.

2.3.2 Relation of the indicator to NDC under Article 4

South Africa's 1st NDC and 2nd NDC defines the NDC targets in CTF Table 3 (Table 2.5 in this report) as absolute economy-wide targets, consisting of all gases, sectors and sources reported in the most recent national GHG inventory, excluding GHG emissions from natural disturbances. The chosen indicator is therefore consistent with how South Africa defines the NDC targets.

2.3.3 Definitions needed to understand South Africa's NDC

South Africa's NDC, and the indicator described above which will be used to track progress, excludes emissions from natural disturbances. The term "natural disturbances" is used in the national GHG inventory consistent with the relevant IPCC guidelines used by the inventory. Approaches to natural disturbances are documented in section 6.5.1 of the NID, and data on natural disturbances is provided, with information on sources and data limitations, in Annex VII of the 2024 NID. Table 2.2 provides the definition for natural disturbances which is consistent in how it is defined in the 2024 NID and NDCs.

Table 2.2: Structured summary: Definitions needed to understand NDC

Definition needed to understand each indicator:	
Natural disturbances	**The term "natural disturbances" is used in the national GHG inventory consistent with the relevant IPCC guidelines used by the inventory. Approaches to natural disturbances are documented in section 6.5.1 of the NID, and data on natural disturbances is provided, with information on sources and data limitations, in Annex VII of the NID.**

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2.3.4 Accounting approach, and consistency of accounting approach with Article 4, paragraphs 13 and 14

Progress in implementation and achievement of South Africa's NDCs will be accounted for using the indicator described above, using a GHG-inventory-based approach, based on the 2024 NID submitted with this BTR and summarised in Chapter 1. Detailed descriptions of methodology, QA/QC processes and other relevant information on the use of IPCC guidelines are contained in the 2024 NID. Specific information on information on natural disturbances used to account for the NDCs is contained in Annex VII of the 2024 NID, and in Sections 2.3.3. and 2.7.1 of this BTR.

2.3.5 Most recent information for the indicator

The most recent information for the indicator, and the values for the indicator in the years 2021 and 2024 is provided in Table 2.3 and in the format of CTF Table 4 in Table 2.4 below.

Table 2.3 Most up-to-date information for the indicator, and indicator values for the years 2021-2024

	2021	2022	2023	2024
Total GHG emissions including LULUCF (summarised in Chapter 1 of BTR2 and sourced from Table 2.2 in the 2024 NID submitted with this BTR) - Gg CO_2-eq	472202	451889	453946	444164
Total GHG emissions from natural disturbances (sourced from Table A.VII in the NID submitted with this BTR and summarised in Chapter 1 of the BTR2) - Gg CO_2-eq	28254	17482	34136	15794
Most recent value of indicator in Gg CO_2-eq	443948	434407	419810	428370
Most recent value of indicator in Mt CO_2-eq	443.9	434.4	419.8	428.4

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Table 2.4 Structured summary: Tracking progress made in implementing and achieving the NDC under Article 4 of the Paris Agreement

	Units	Implementation period of the NDC covering information for previous reporting years and the most recent year, including the end year or end of period {MPGs, p. 68, 77(a)(ii–iii)}				Target level[b4]	Target year or period	Progress made towards the NDC, as determined by comparing the most recent information for each selected indicator, including for the end year or end of period, with the reference point(s), level(s), baseline(s), base year(s) or starting point(s) (paras. 69–70 of the MPGs)
		2021	2022	2023	2024			
Indicator(s) selected to track progress towards the implementation and/ or achievement of the NDC under Article 4 of the Paris Agreement: {MPGs, p. 65, 77(a)}								
Total annual national GHG emissions and removals including LULUCF, excluding GHG emissions from natural disturbances.	Mt CO2-eq	443.95	434.41	419.81	428.37	389-510 in 2025; 350-420 in 2030	2025 and 2030	**South Africa is on track to meet its 2025 and 2030 NDC target.**
Where applicable, total GHG emissions and removals consistent with the coverage of the NDC {MPGs, p. 77(b)}	Mt CO2-eq	472.20	451.89	453.95	444.16			
Contribution from the LULUCF sector for each year of the target period or target year, if not included in the inventory time series of total net GHG emissions and removals, as applicable {MPGs, p. 77(c)}	Not applicable							

[4] Reporting years 2021 and 2022 for the indicator were previously reported on page 73 of BTR1. The updated indicator for 2021 and 2022 in this BTR reflects the refinements and recalculations undertaken in the 2024 NID which is explained further in Section 2.7.1

	Units	Implementation period of the NDC covering information for previous reporting years and the most recent year, including the end year or end of period {MPGs, p. 68, 77(a)(ii–iii)}				Target level[b4]	Target year or period	Progress made towards the NDC, as determined by comparing the most recent information for each selected indicator, including for the end year or end of period, with the reference point(s), level(s), baseline(s), base year(s) or starting point(s) (paras. 69–70 of the MPGs)
		2021	2022	2023	2024			
Each Party that participates in cooperative approaches that involve the use of ITMOs towards an NDC under Article 4 of the Paris Agreement, or authorizes the use of mitigation outcomes for international mitigation purposes other than achievement of the NDC, shall provide: {MPGs, p. 7(d)}	Not applicable as South Africa has not entered into any co- operative approaches that involve the use of ITMOs, or authorised any issuance of 6.4 units.							
Assessment of the achievement of the Party's NDC under Article 4 of the Paris Agreement (para. 70 of the MPGs):	South Africa is within the first implementation of the 1st NDC update from January 1, 2021, to December 31, 2025. The most recent year being reported on in this BTR is 2024 which is not the target end year. This reporting requirement is not applicable.							
Restate the target of the Party's NDC:	In 2025, South Africa's annual economy wide GHG emissions including LULUCF and excluding emissions from natural disturbances will be in a range from 398-510 Mt CO_2-eq. In 2030, South Africa's annual economy wide GHG emissions including LULUCF and excluding emissions from natural disturbances will be in a range from 350-420 Mt CO_2-eq. In 2035, South					-	-	-

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	Units	Implementation period of the NDC covering information for previous reporting years and the most recent year, including the end year or end of period {MPGs, p. 68, 77(a)(ii–iii)}				Target level[b4]	Target year or period	Progress made towards the NDC, as determined by comparing the most recent information for each selected indicator, including for the end year or end of period, with the reference point(s), level(s), baseline(s), base year(s) or starting point(s) (paras. 69–70 of the MPGs)
		2021	2022	2023	2024			
	Africa's annual economy wide GHG emissions including LULUCF and excluding emissions from natural disturbances will be in a range from 320-380 Mt CO_2-eq.							
Information for reference point(s), level(s), baseline(s), base year(s), or starting point(s):	Not applicable, South Africa's NDC does not have reference point(s), level(s), baseline(s), base year(s), or starting point(s)							
Final information for the indicator for the target year/period, including the application of the necessary corresponding adjustments consistent with chapter III, annex, decision -/ CMA.3 (Corresponding adjustments) and consistent with future decisions from the CMA (para. 23(l), annex to decision -/CMA.3):	Not applicable							
Comparison:	Not applicable							
Achievement of NDC: {yes/no, explanation}	**Not applicable for reporting in BTR2; NDC targets are for 2025, 2030 and 2035. Achievement can only be assessed in those years.**							

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2.3.6 Consistency of the methodologies used when communicating the NDC

In terms of coverage, scope and methodological approaches, the 2025 and 2030 NDC targets are consistent with the 2017 NIR. Coverage of the NDC is economy-wide, including the land sector and includes the five gases CO_2, CH_4, N_2O, HFCs and PFCs. GWP metrics from the IPCC's 5th Assessment Report (AR5) has been used. The Energy, IPPU, AFOLU and waste sectors are covered in the NDC target. The 2017 NIR which is the basis for the accounting methodology of the 2025 and 2030 NDC targets has been compiled in accordance with the guidelines provided by the UNFCCC and follows the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories (IPCC, 2006), IPCC Good Practice Guidance (GPG) (IPCC, 2000; IPCC, 2003; IPCC, 2014); and the 2019 Refinement to the 2006 IPCC Guidelines (IPCC, 2019).

In terms of coverage, scope and methodological approaches, the 2035 NDC target is consistent with the 2022 NID. Coverage of the NDC is economy-wide, including the land sector and includes the five gases CO_2, CH_4, N_2O, HFCs and PFCs. GWP metrics from the IPCC's 5th Assessment Report (AR5) has been used. The Energy, IPPU, AFOLU and waste sectors are covered in the NDC target. The 2022 NID which is the basis for the accounting methodology of the 2035 NDC target has been compiled in accordance with the guidelines provided by the UNFCCC and follows the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories (IPCC, 2006), IPCC Good Practice Guidance (GPG) (IPCC, 2000; IPCC, 2003; IPCC, 2014); and the 2019 Refinement to the 2006 IPCC Guidelines (IPCC, 2019).

In terms of coverage, scope and methodological approaches, the indicator is consistent with the 2024 NID. Coverage of the indicator is also economy-wide, including the land sector and includes the five gases CO_2, CH_4, N_2O, HFCs and PFCs. GWP metrics from AR5 has been used. The Energy, IPPU, AFOLU and waste sectors are covered in the indicator. The 2024 NID which is the basis for the accounting methodology of the indicator has been compiled in accordance with the guidelines provided by the UNFCCC and follows the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories (IPCC, 2006), IPCC Good Practice Guidance (GPG) (IPCC, 2000; IPCC, 2003; IPCC, 2014), the 2019 Refinement to the 2006 IPCC Guidelines (IPCC, 2019) and Sections of the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (IPCC, 2014a).

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In the accounting methodology of the NDC target; to account for emissions and removals from HWPs, South Africa employs a production approach, following the updated guidance in the 2013 IPCC Kyoto Protocol Supplement (IPCC, 2014). In the accounting methodology of the indicator, to account for emissions and removals from HWPs, the country employs a production approach, following the IPCC 2006 guidelines. The core principles of the production approach described in the 2013 IPCC Kyoto Protocol Supplement (IPCC, 2014) and the IPCC 2006 guidelines are the same.

Information is also provided in tabular format in Table 2.5 below.

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Table 2.5: Structured summary: Methodologies and accounting approaches – consistency with Article 4, paragraphs 13 and 14, of the Paris Agreement and with decision 4/CMA.1

Reporting requirement	Description or reference to the relevant section of the BTR
For the first NDC under Article 4a	
Accounting approach, including how it is consistent with Article 4, paragraphs 13–14, of the Paris Agreement (para. 71 of the MPGs)	Progress in implementation and achievement of the 1st NDC will be accounted for using the indicator, using a GHG-inventory-based approach, based on the 2024 NID. Detailed descriptions of methodology, QA/QC processes and other relevant information on the use of IPCC guidelines is contained in the 2024 NID. Specific information on information on natural disturbances used to account for the NDCs is contained in Annex VII of the 2024 NID.
For the second and subsequent NDC under Article 4	
Information on the accounting approach used is consistent with paragraphs 13–17 and annex II of decision 4/CMA.1 (para. 72 of the MPGs)	Progress in implementation and achievement of the 2nd NDC will be accounted for using the indicator, using a GHG-inventory-based approach, based on the 2024 NID. Detailed descriptions of methodology, QA/QC processes and other relevant information on the use of IPCC guidelines is contained in the 2024 NID. Specific information on information on natural disturbances used to account for the NDCs is contained in Annex VII of the 2024 NID.
Explain how the accounting for anthropogenic emissions and removals is in accordance with methodologies and common metrics assessed by the IPCC and in accordance with decision 18/CMA.1 (para. 1(a) of annex II to decision 4/CMA.1)	South Africa will use a GHG inventory-based approach in accounting for the mitigation component of the 2nd NDC, for the period of implementation from 2031 to 2035. In accounting for anthropogenic emissions and removals corresponding to the 2nd NDC, we have promoted environmental integrity, transparency, accuracy, completeness, comparability and consistency, and ensure the avoidance of double counting; and provide further information in this regard here. South Africa's national inventory reports are prepared in accordance with decision 18/CMA.1, and any subsequent applicable CMA decisions. South Africa intends to perform corresponding adjustments in accounting for its NDC target in accordance with relevant decisions taken by the CMA in relation to Article 6 and the structured summary for implementation and achievement of its NDC. We note that in BTR1 (Dec 2024), we reported that South Africa had not entered into any cooperative approaches that involve the use of ITMOs, or authorised any issuance of 6.4 units; should this change, we will report accordingly. South Africa will account for its second NDC in accordance with the guidance contained in Annex II to decision 4/CMA.1.

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Reporting requirement	Description or reference to the relevant section of the BTR
Explain how consistency has been maintained between any GHG data and estimation methodologies used for accounting and the Party's GHG inventory, pursuant to Article 13, paragraph 7(a), of the Paris Agreement, if applicable (para. 2(b) of annex II to decision 4/CMA.1) diversification plans.	Progress and achievement will be accounted for by comparing the target ranges in 2035 with the annual emissions contained in South Africa's GHG inventory for all sectors, excluding emissions arising from natural disturbances in the land sector. Emissions arising from natural disturbances will be disaggregated in the NIR for each relevant IPCC category and reported separately, and used as the basis for accounting for implementation and achievement of the NDC targets
Explain how overestimation or underestimation has been avoided for any projected emissions and removals used for accounting (para. 2(c) of annex II to decision 4/CMA.1)	Mitigation analysis has been calibrated using available historical GHG information from the 2022 NID.
For the first NDC under Article 4a	
Accounting for anthropogenic emissions and removals in accordance with methodologies and common metrics assessed by the IPCC and adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement	
Each methodology and/or accounting approach used to assess the implementation and achievement of the target(s), as applicable (para. 74(a) of the MPGs)	South Africa has adopted a GHG inventory-based method to track its mitigation targets for 2025 and 2030. The 2017 NIR provides the basis for the accounting methodology of the NDC targets. The 2017 NIR has been compiled in accordance with the guidelines provided by the UNFCCC and follows the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories (IPCC, 2006), IPCC Good Practice Guidance (GPG) (IPCC, 2000; IPCC, 2003; IPCC, 2014); and the 2019 Refinement to the 2006 IPCC Guidelines (IPCC, 2019). GWP metrics from the IPCC's 5th Assessment Report has been used. As the NDC targets are defined fixed level GHG emissions range in 2025 and 2030; the provision of information about key parameters, assumptions, definitions, data sources and models used is not applicable. The 2024 NID provides the basis for the accounting methodology of the indicator. The 2024 NID have been compiled in accordance with the guidelines provided by the UNFCCC and follows the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories (IPCC, 2006), IPCC Good Practice Guidance (GPG) (IPCC, 2000; IPCC, 2003; IPCC, 2014) and the 2019 Refinement to the 2006 IPCC Guidelines (IPCC, 2019). GWP metrics from the IPCC's 5th Assessment

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Reporting requirement	Description or reference to the relevant section of the BTR
	Report has been used. As the indicator is expressed in absolute terms; the provision of information about key parameters, assumptions, definitions, data sources and models used is not applicable.
Each methodology and/or accounting approach used for the construction of any baseline, to the extent possible (para. 74(b) of the MPGs)	Not applicable, South Africa's NDC target is not defined in terms of a baseline
If the methodology or accounting approach used for the indicator(s) in CTF Table 1 differ from those used to assess the implementation and achievement the target, describe each methodology or accounting approach used to generate the information generated for each indicator in the tables 4 and 5 (para. 74(c) of the MPGs).	Not applicable.
Any conditions and assumptions relevant to the achievement of the NDC under Article 4, as applicable and available (para. 75(i) of the MPGs)	South Africa's NDC does not have a conditional or unconditional component but the NDC is based on the assumption that the Paris Agreement will be fully implemented.
Key parameters, assumptions, definitions, data sources and models used, as applicable and available (para. 75(a) of the MPGs)	The sole data source for accounting for South Africa's 1st NDC is the NIR. "Natural disturbances" is described in CTF Table 2.
IPCC Guidelines used, as applicable and available (para. 75(b) of the MPGs)	The NIR has been compiled in accordance with the guidelines provided by the IPCC: the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories (IPCC, 2006), IPCC Good Practice Guidance (GPG) (IPCC, 2000; IPCC, 2003; IPCC, 2014); and the 2019 Refinement to the 2006 IPCC Guidelines (IPCC, 2019).
Report the metrics used, as applicable and available (para. 75(c) of the MPGs)	GWP values used as specified in the 2022 NID (IPCC AR5, as referenced in the Annex to decision 18/CMA.1)
For Parties whose NDC cannot be accounted for using methodologies covered by IPCC guidelines, provide information on their own methodology used, including for NDCs, pursuant to Article 4, paragraph 6, of the Paris Agreement, if applicable (para. 1(b) of annex II to decision 4/ CMA.1	Not applicable

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Reporting requirement	Description or reference to the relevant section of the BTR
Provide information on methodologies used to track progress arising from the implementation of policies and measures, as appropriate (para. 1(d) of annex II to decision 4/CMA.1)	Not applicable
Where applicable to its NDC, any sector-, category or activity-specific assumptions, methodologies and approaches consistent with IPCC guidance, considering any relevant decision under the Convention, as applicable (para. 75(d) of the MPGs)	Not applicable
For Parties that address emissions and subsequent removals from natural disturbances on managed lands, provide detailed information on the approach used and how it is consistent with relevant IPCC guidance, as appropriate, or indicate the relevant section of the national GHG inventory report containing that information (para. 1(e) of annex II to decision 4/CMA.1, para. 75(d)(i) of the MPGs)	South Africa's NDC target range is defined excluding GHG emissions from natural disturbances. Information on GHG emissions from natural disturbances is contained in the 2022 NID in section 6.5.1 of the 2024 NID, and data on natural disturbances is provided, with information on sources and data limitations, in Annex VII of the 2024 NID.
For Parties that account for emissions and removals from harvested wood products, provide detailed information on which IPCC approach has been used to estimate emissions and removals (para. 1(f) of annex II to decision 4/ CMA.1, para. 75(d)(ii) of the MPGs)	Emissions and removals from harvested wood products are reported in the 2024 NID, with the relevant methodology, in sections 6.5.2 and 6.12. The 2024 NID uses a production approach, using the methodology specified in the IPCC 2019 Refinement.
For Parties that address the effects of age-class structure in forests, provide detailed information on the approach used and how this is consistent with relevant IPCC guidance, as appropriate (para. 1(g) of annex II to decision 4/CMA.1, para. 75(d)(iii) of the MPGs)	This approach is not used in the 2024 NID.
How the Party has drawn on existing methods and guidance established under the Convention and its related legal instruments, as appropriate, if applicable (para. 1(c) of annex II to decision 4/ CMA.1)	Not applicable.
Any methodologies used to account for mitigation co-benefits of adaptation actions and/ or economic diversification plans (para. 75(e) of the MPGs)	Not applicable.

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Reporting requirement	Description or reference to the relevant section of the BTR
Describe how double counting of net GHG emission reductions has been avoided, including in accordance with guidance developed related to Article 6 if relevant (para. 76(d) of the MPGs)	South Africa does not currently host any projects under Article 6 and does not use any ITMOs. South Africa's NDC has not been accounted for in terms of emissions reductions.
Any other methodologies related to the NDC under Article 4 (para. 75(h) of the MPGs)	Not applicable
Ensuring methodological consistency, including on baselines, between the communication and implementation of NDCs (para. 12(b) of the decision 4/CMA.1):	
Explain how consistency has been maintained in scope and coverage, definitions, data sources, metrics, assumptions and methodological approaches including on baselines, between the communication and implementation of NDCs (para. 2(a) of annex II to decision 4/CMA.1)	South Africa's 1st NDC was set on the basis of the 2017 NIR, and will be accounted for using the 2024 NID submitted with this BTR. The coverage of both GHG inventories is economy-wide, and the NID also includes estimation of SF6. The 2017 NIR used GWPs from AR2, whereas the 2024 NID uses GWPs from AR5. Other more detailed information on recalculations is contained in the 2024 NID.
Explain how consistency has been maintained between any GHG data and estimation methodologies used for accounting and the Party's GHG inventory, pursuant to Article 13, paragraph 7(a), of the Paris Agreement, if applicable (para. 2(b) of annex II to decision 4/ CMA.1) and explain methodological inconsistencies with the Party's most recent national inventory report, if applicable (para. 76(c) of the MPGs)	South Africa accounts for the NDC targets using its most recent inventory, so there are no inconsistencies.
For Parties that apply technical changes to update reference points, reference levels or projections, the changes should reflect either of the following (para. 2(d) of annex II to decision 4/CMA.1)	This section is not applicable to the South African NDC, since the NDCs, do not define mitigation targets in relation to a reference point, but as a fixed level GHG emissions range in 2025 and 2030.
Technical changes related to technical corrections to the Party's inventory (para. 2(d)(i) of annex II to decision 4/CMA.1)	
Technical changes related to improvements in accuracy that maintain methodological consistency (para. 2(d)(ii) of annex II to decision 4/CMA.1)	

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Reporting requirement	Description or reference to the relevant section of the BTR
Explain how any methodological changes and technical updates made during the implementation of their NDC were transparently reported (para. 2(e) of annex II to decision 4/ CMA.1)	
Striving to include all categories of anthropogenic emissions or removals in the NDC and, once a source, sink or activity is included, continuing to include it (para. 3 of annex II to decision 4/ CMA.1):	Not applicable to South Africa's 1st NDC.
Explain how all categories of anthropogenic emissions and removals corresponding to their NDC were accounted for (para. 3(a) of annex II to decision 4/CMA.1)	
Explain how Party is striving to include all categories of anthropogenic emissions and removals in its NDC, and, once a source, sink or activity is included, continue to include it (para. 3(b) of annex II to decision 4/CMA.1)	
Provide an explanation of why any categories of anthropogenic emissions or removals are excluded (para. 4 of annex II to decision 4/CMA.1)	
Each Party that takes part in cooperative approaches that involve the use of ITMOs towards an NDC under Article 4, or authorizes the use of mitigation outcomes for international mitigation purposes other than achievement of its NDC	Not applicable as South Africa has not entered any co- operative approaches that involve the use of ITMOs
Provide information on any methodologies associated with any cooperative approaches that involve the use of ITMOs towards an NDC under Article 4 (para. 75(f) of the MPGs)	
Provide information on how each cooperative approach promotes sustainable development, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	
Provide information on how each cooperative approach ensures environmental integrity consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	

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Reporting requirement	Description or reference to the relevant section of the BTR
Provide information on how each cooperative approach ensures transparency, including in governance, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs).	
Provide information on how each cooperative approach applies robust accounting to ensure, inter alia, the avoidance of double counting, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	
Any other information consistent with decisions adopted by the CMA on reporting under Article 6 (para. 77(d)(iii) of the MPGs)	
For the second NDC under Article 4a	
Accounting for anthropogenic emissions and removals in accordance with methodologies and common metrics assessed by the IPCC and adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement:	
Each methodology and/or accounting approach used to assess the implementation and achievement of the target(s), as applicable (para. 74(a) of the MPGs)	South Africa has adopted a GHG inventory-based method to track its mitigation target 2035. The 2022 NID provides the basis for the accounting methodology of the NDC target. The 2022 NID has been compiled in accordance with the guidelines provided by the UNFCCC and follows the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories (IPCC, 2006), IPCC Good Practice Guidance (GPG) (IPCC, 2000; IPCC, 2003; IPCC, 2014); 2019 Refinement to the 2006 IPCC Guidelines (IPCC, 2019) and sections of the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (IPCC, 2014a). GWP metrics from AR5 has been used. As the NDC target is defined as a fixed level GHG emissions range in 2035; the provision of information about key parameters, assumptions, definitions, data sources and models used is not applicable. The 2024 NID provides the basis for the accounting methodology of the indicator. The 2024 NID have been compiled in accordance with the guidelines provided by the UNFCCC and follows the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories (IPCC, 2006), IPCC Good Practice Guidance (GPG) (IPCC, 2000; IPCC, 2003; IPCC, 2014) and the 2019 Refinement to the 2006 IPCC Guidelines (IPCC, 2019). GWP metrics from AR5 has been used. As the indicator is expressed in absolute terms; the provision of information about key parameters, assumptions, definitions, data sources and models used is not applicable.

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Reporting requirement	Description or reference to the relevant section of the BTR
Each methodology and/or accounting approach used for the construction of any baseline, to the extent possible (para. 74(b) of the MPGs)	Not applicable, South Africa's NDC target is not defined in terms of a baseline.
If the methodology or accounting approach used for the indicator(s) in table 1 differ from those used to assess the implementation and achievement the target, describe each methodology or accounting approach used to generate the information generated for each indicator in the tables 4 and 5 (para. 74(c) of the MPGs)	Not applicable.
Any conditions and assumptions relevant to the achievement of the NDC under Article 4, as applicable and available (para. 75(i) of the MPGs)	South Africa's NDC does not have a conditional or unconditional component, but the NDC is based on the assumption that the Paris Agreement will be fully implemented.
Key parameters, assumptions, definitions, data sources and models used, as applicable and available (para. 75(a) of the MPGs)	The sole data source for accounting for South Africa's NDC is the NIR. "Natural disturbances" is described in CTF Table 2.
IPCC Guidelines used, as applicable and available (para. 75(b) of the MPGs)	The 2024 NID has been compiled in accordance with the guidelines provided by the IPCC: the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories (IPCC, 2006), IPCC Good Practice Guidance (GPG) (IPCC, 2000; IPCC, 2003; IPCC, 2014); 2019 Refinement to the 2006 IPCC Guidelines (IPCC, 2019) and sections of the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (IPCC, 2014a).
Report the metrics used, as applicable and available (para. 75(c) of the MPGs)	GWP values used as specified in the 2024 NID (IPCC AR5, as referenced in the Annex to decision 18/CMA.1)
For Parties whose NDC cannot be accounted for using methodologies covered by IPCC guidelines, provide information on their own methodology used, including for NDCs, pursuant to Article 4, paragraph 6, of the Paris Agreement, if applicable (para. 1(b) of annex II to decision 4/ CMA.1	Not applicable
Provide information on methodologies used to track progress arising from the implementation of policies and measures, as appropriate (para. 1(d) of annex II to decision 4/CMA.1)	Not applicable

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Reporting requirement	Description or reference to the relevant section of the BTR
Where applicable to its NDC, any sector-, category or activity-specific assumptions, methodologies and approaches consistent with IPCC guidance, taking into account any relevant decision under the Convention, as applicable (para. 75(d) of the MPGs)	Not applicable
Reporting requirement	Description or reference to the relevant section of the BTR
For Parties that address emissions and subsequent removals from natural disturbances on managed lands, provide detailed information on the approach used and how it is consistent with relevant IPCC guidance, as appropriate, or indicate the relevant section of the national GHG inventory report containing that information (para. 1(e) of annex II to decision 4/CMA.1, para. 75(d)(i) of the MPGs)	South Africa's NDC target range is defined excluding GHG emissions from natural disturbances. Information on GHG emissions from natural disturbances is contained in the 2024 NID in section 6.5.1 of the 2024 NID, and data on natural disturbances is provided, with information on sources and data limitations, in Annex VII of the 2024 NID.
For Parties that account for emissions and removals from harvested wood products, provide detailed information on which IPCC approach has been used to estimate emissions and removals (para. 1(f) of annex II to decision 4/ CMA.1, para. 75(d)(ii) of the MPGs)	Emissions and removals from harvested wood products are reported in the 2024 NID, with the relevant methodology, in sections 6.5.2 and 6.12. The 2024 NID uses a production approach, using the methodology specified in the 2019 IPCC Refinement.
For Parties that address the effects of age-class structure in forests, provide detailed information on the approach used and how this is consistent with relevant IPCC guidance, as appropriate (para. 1(g) of annex II to decision 4/CMA.1, para. 75(d)(iii) of the MPGs)	This approach is not used in the 2024 NID.
How the Party has drawn on existing methods and guidance established under the Convention and its related legal instruments, as appropriate, if applicable (para. 1(c) of annex II to decision 4/ CMA.1)	Not applicable.
Any methodologies used to account for mitigation co-benefits of adaptation actions and/ or economic diversification plans (para. 75(e) of the MPGs	Not applicable.

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Reporting requirement	Description or reference to the relevant section of the BTR
Describe how double counting of net GHG emission reductions has been avoided, including in accordance with guidance developed related to Article 6 if relevant (para. 76(d) of the MPGs)	South Africa does not currently host any projects under Article 6 and does not use any ITMOs. South Africa's NDC has not been accounted for in terms of emissions reductions.
Any other methodologies related to the NDC under Article 4 (para. 75(h) of the MPGs)	Not applicable
Ensuring methodological consistency, including on baselines, between the communication and implementation of NDCs (para. 12(b) of the decision 4/CMA.1):	
Explain how consistency has been maintained in scope and coverage, definitions, data sources, metrics, assumptions and methodological approaches including on baselines, between the communication and implementation of NDCs (para. 2(a) of annex II to decision 4/CMA.1)	South Africa's NDC was set based on the 2022 NID and will be accounted for using the 2024 NID submitted with this BTR. The coverage of both GHG inventories is economy-wide, and the 2024 NID also includes estimation of SF6. The 2024 NID uses GWPs from AR5. Other more detailed information on recalculations is contained in the 2024 NID.
Explain how consistency has been maintained between any GHG data and estimation methodologies used for accounting and the Party's GHG inventory, pursuant to Article 13, paragraph 7(a), of the Paris Agreement, if applicable (para. 2(b) of annex II to decision 4/ CMA.1) and explain methodological inconsistencies with the Party's most recent national inventory report, if applicable (para. 76(c) of the MPGs)	South Africa accounts for its NDC targets using its most recent inventory, so there are no inconsistencies.
For Parties that apply technical changes to update reference points, reference levels or projections, the changes should reflect either of the following (para. 2(d) of annex II to decision 4/CMA.1)	This section is not applicable to the South African NDC, since the NDC, does not define mitigation targets in relation to a reference point, but as a fixed level GHG emissions range in 2035.
Technical changes related to technical corrections to the Party's inventory (para. 2(d)(i) of annex II to decision 4/CMA.1)	
Technical changes related to improvements in accuracy that maintain methodological consistency (para. 2(d)(ii) of annex II to decision 4/CMA.1)	

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Reporting requirement	Description or reference to the relevant section of the BTR
Explain how any methodological changes and technical updates made during the implementation of their NDC were transparently reported (para. 2(e) of annex II to decision 4/CMA.1)	
Striving to include all categories of anthropogenic emissions or removals in the NDC and, once a source, sink or activity is included, continuing to include it (para. 3 of annex II to decision 4/ CMA.1):	Not applicable to South Africa's 2nd NDC.
Explain how all categories of anthropogenic emissions and removals corresponding to their NDC were accounted for (para. 3(a) of annex II to decision 4/CMA.1)	
Explain how Party is striving to include all categories of anthropogenic emissions and removals in its NDC, and, once a source, sink or activity is included, continue to include it (para. 3(b) of annex II to decision 4/CMA.1)	
Provide an explanation of why any categories of anthropogenic emissions or removals are excluded (para. 4 of annex II to decision 4/CMA.1)	
Each Party that takes part in cooperative approaches that involve the use of ITMOs towards an NDC under Article 4, or authorizes the use of mitigation outcomes for international mitigation purposes other than achievement of its NDC	Not applicable as South Africa has not entered any co- operative approaches that involve the use of ITMOs
Provide information on any methodologies associated with any cooperative approaches that involve the use of ITMOs towards an NDC under Article 4 (para. 75(f) of the MPGs)	
Provide information on how each cooperative approach promotes sustainable development, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	
Provide information on how each cooperative approach ensures environmental integrity consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	

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Reporting requirement	Description or reference to the relevant section of the BTR
Provide information on how each cooperative approach ensures transparency, including in governance, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	
Provide information on how each cooperative approach applies robust accounting to ensure, inter alia, the avoidance of double counting, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	
Any other information consistent with decisions adopted by the CMA on reporting under Article 6 (para. 77(d)(iii) of the MPGs)	

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2.4 Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving a nationally determined contribution under Article 4 of the Paris Agreement

South Africa has applied the guidance from the Climate and Development Knowledge Network (CDKN) Planning for NDC Implementation Guide (CDKN, 2016), which identifies mitigation actions—particularly Nationally Appropriate Mitigation Actions—as the primary means of delivering NDC mitigation commitments. The mitigation actions included in the first BTR were largely reported in earlier Biennial Update Reports (BURs) (as noted in the NDC report), with newly introduced actions including the Just Energy Transition Investment Plan (JET-IP) and the Climate Change Act (No. 22 of 2024).

In refining its approach, South Africa prioritised mitigation actions that have the greatest influence on GHG emissions and removals, particularly those linked to key categories in the national inventory. Following CDKN guidance, the country first identified and then prioritised policies and measures (PAMs). Identification was based on their coverage of IPCC emission source and sink categories, their potential impact on current and future emissions at national and sub-national levels, and the extent to which relevant mitigation technologies and approaches have been prioritised, piloted, or implemented. Given resource and practical constraints, not all identified PAMs could be monitored; therefore, a Multi-Criteria Decision Analysis (MCDA) approach was applied to narrow the list to a manageable shortlist.

2.4.1 Crosscutting PAMs

Specific crosscutting PAMs have been mentioned in the NDCs including the National Development Plan, 2030 (NDP); Climate Change Act No. 22 of 2024; Carbon Tax Act No 15 of 2019; National GHG Emission Reporting Regulations (NGERs) and the Just Energy Transition. An overview of these policy instruments is provided in this section.

2.4.1.1 National Development Plan, 2030

The NDP Vision 2030 seeks to eradicate poverty and reduce inequality by 2030 (NPC, 2011). Chapter 5 further aims to position South Africa as an environmentally sustainable society by that year, characterised by a growing low-carbon economy, lower emissions, and concurrent progress in addressing poverty, unemployment, and inequality. To support these objectives, the chapter outlines key mitigation measures, including achieving the peak-plateau-decline

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emissions trajectory, implementing an economy-wide carbon pricing mechanism, establishing zero-emission building standards, and reducing the volume of waste sent to landfill annually.

Following the ten-year review of the NDP, a Medium-Term Development Plan for 2024 to 2029 was published in 2024. The NDP remains South Africa's long-term country plan towards 2030 and is aligned with its international commitments. The Medium-Term Development Plan (MTDP) 2024–2029 is the medium-term plan towards the achievement of the NDP, replacing the Medium-Term Strategic Framework (MTSF) by aligning with international commitments[5] and emphasising development outcomes. The goals of the MTDP which are 1) A dynamic, growing economy; 2) A more equal society, where no person lives in poverty; 3) A capable state delivering basic services to all citizens; 4) A safe and secure environment; and 4) A cohesive and united nation. These goals are to be achieved across three strategic priorities:

- Driving inclusive growth and job creation;
- Reducing poverty and tackling the high cost of living, and
- Building a capable, ethical and developmental state

These three Strategic Priorities, along with a set of policy choices and priority interventions, have been implemented across all of government sectors where the MTDP is mentioned in each departmental strategic plan for 2025 to 2030. The DPME provides oversight and monitoring against development indicators and targets.

Table 2.6 provides a summary of the NDP and the information for emission reductions is indicated in Table 2.7.

Table 2.6: National Development Plan 2030

No.	Name	Description	Objectives	Type of instrument
1	National Development Plan 2030	A strategic framework aimed at eliminating poverty and reducing inequality by 2030 through inclusive economic growth and development. It outlines a comprehensive approach to improving education, healthcare, infrastructure, and governance while fostering social cohesion and environmental sustainability.	To eliminate poverty and reduce inequality by fostering inclusive economic growth and sustainable development by 2030.	Other

[5] Sustainable Development Goals; African Union's (AU) 'Agenda 2063; SADC Regional Indicative Strategic Development Plan (RISDP) 2020–2030

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Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	All	CO_2; CH_4 and N_2O	2012	National Planning Commission (NPC)

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Whole-of-government implementation; costs embedded across sector budgets and SOE capital programmes; no single attributable cost.	Poverty/inequality reduction; jobs; improved public services; infrastructure delivery; improved governance and planning certainty.	Umbrella framework that drives/aligns energy, transport, industrial and waste PAMs (incl. IRPs, REI4PP, road/rail, efficiency programmes) and supports enabling reforms.

Table 2.7 Estimates of GHG emission reductions of the National Development Plan 2030

Achieved	Expected
Emission Reduction (Mt CO_2-eq)	Emission Reduction (Mt CO_2-eq)
Not Reported[6]	Not Reported[4]

2.4.1.2 Climate Change Act 22 of 2024

The Climate Change Act, 2024 (Act No. 22 of 2024) commenced on 17 March 2025 (DFFE; 2025a). The Climate Change Act (No. 22 of 2024) establishes a regulatory framework to address climate change by improving adaptive capacity, enhancing resilience, and reducing vulnerability. It also seeks to ensure that South Africa contributes fairly to global efforts to stabilise greenhouse gas concentrations. Regarding mitigation, the Act provides for the development and periodic review of the national GHG emissions trajectory, the setting of sectoral emission targets (SETs) for sectors and sub-sectors, and the allocation of carbon budgets to companies. These SETs—whether qualitative or quantitative—are guided by sector-specific PAMs aimed at reducing emissions over a defined period. Carbon budgets will

[6] Estimates of expected and achieved GHG emission reductions are not reported for the NDP 2030. The NDP 2030 is not a mitigation intervention in itself but underpins the government paradigm for medium term planning in all sectors of the economy to take appropriate actions to reduce GHG emissions. The strategic objectives of the NDP 2030 have contributed to legal and policy development post 2012. Including the emission reductions from NDP 2030 will lead to double counting of GHG emission reductions as the GHG effect of the NDP 2030 cannot be separately distinguished and quantified from the other mitigation PAMs described in this chapter. The GHG emission reductions of NDP 2030 are not reported.

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primarily apply to industry, with applicable thresholds to be determined and published by the DFFE.

Certain provisions of the Act, namely, sections 12(6), 13(1), 13(2), 13(3)(b), 14(3)(a), 15(5), 15(6), 17, 18, 19, 20, 21, 22, 25(4)(c), 26(2) to (6), 27, 28 and 30(2)(a) and (b) have been deferred. Of these provisions 25(4)(c), 26(2) to (6), 27, 28 and 30(2)(a) and (b) relate to mitigation. The deferred provisions will commence once the regulations being developed to effect implementation are finalised after going through public consultations.

Error! Reference source not found. provides a summary of the Climate Change Act 22 of 2024 and the information for emission reductions is indicated in **Error! Reference source not found.**.

Table 2.8: Climate Change Act 22 of 2024

No.	Name	Description	Objectives	Type of instrument
3	Climate Change Act 22 of 2024	Concerning mitigation, the Act provides for "future review and determination of the national greenhouse gas emissions trajectory; determination of sectoral emissions targets for emitting sectors and subsectors; and allocation of carbon budgets. The Act further makes provision that a person to whom a carbon budget has been allocated, must prepare and submit to the Minister, for approval, a greenhouse gas mitigation plan. These mitigation plans are what used to be referred to as greenhouse gas pollution prevention plans.	To enable the development of an effective climate change response and the long-term, just transition to a climate-resilient and lower-carbon economy and society	Regulatory

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Commenced	All	CO_2; CH_4 and N_2O	2025	DFFE

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Policy framework; costs arise through implementing instruments/programmes across sectors; no single attributable cost.	Climate resilience; air quality co-benefits;	Provides overarching climate policy direction that is operationalised through Climate Change Act, NDC, carbon tax, sector plans (e.g., IRP, transport strategies), and reporting regs (NGERs).

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Table 2.9: Estimates of GHG emission reductions of the Climate Change Act 22 of 2024

Achieved	Expected
Emission Reduction (Mt CO_2-eq)	Emission Reduction (Mt CO_2-eq)
Not Reported[7]	Not Reported[7]

2.4.1.3 Sectoral Emission Targets (SETs)

SETS are provisioned in section 25 of the Climate Change Act 22 of 2024. SETs are either quantitative or qualitative GHG emission targets or aspirations assigned to an emitting sector or sub-sector, over a defined time period. Section 25 of the Climate Change Act 22 of 2024 aims to establish a multi-level governance framework for SETs through administrative measures (including gazetting), policy obligations, procedural safeguards, and system-wide alignment and review mechanisms. Most provisions under section 25 of the Act commenced on 17 March 2025.

Administrative provisions stipulate that the DFFE must gazette the targeted GHG emitting sectors and sub-sectors. Furthermore, the DFFE, in collaboration with relevant sector departments, must gazette the prescribed framework as well as the sectoral emission targets applicable to those sectors and sub-sectors.

Policy provisions place an obligation on sector departments to implement SETs through relevant planning instruments, policies, and programmes, and to adopt PAMs to support their achievement.

7 Estimates of expected and achieved GHG emission reductions are not reported for the Climate Change Act No 22 of 2024 and its instruments including SETs, carbon budgets and mitigation plans. These PaMs are not mitigation interventions in themselves but incentivise government departments and private companies to take appropriate actions, for example energy saving measures. As such mitigation measures and resulting emission reductions implemented to comply with Climate Change Act No 22 of 2024 regulations would be accounted for elsewhere There is double accounting of mitigation effects involved should the emission reductions of cross-cutting measures like SETs and carbon budgets as provisioned by the Climate Change Act be included in the accounting of emission reductions alongside sectoral PAMs.

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System provisions provide that SETs must be aligned with the national GHG emissions trajectory and be subject to periodic review and revision at five-year intervals.

Procedural provisions establish that the DFFE must consult sector departments when determining, reviewing, or revising sectoral and sub-sectoral targets; consider socio-economic impacts and scientific considerations in the determination process; and update targets based on the best available evidence.

Technical provisions relate to Section 25(4)(c) of the Climate Change Act 22 of 2024 which has been deferred. This provision is to specify that targets must encompass both quantitative and qualitative GHG emission reduction goals covering the first five-year period, the subsequent five to ten years, and a longer-term period of ten to fifteen years thereafter. This will be brought into operation later as there is groundwork that must still be done, including consultation with the interested and affected parties and the public participation process.

The enforceable elements of SETs include the gazetting of targeted sectors and sub-sectors, the establishment and implementation of sectoral emission targets by the DFFE and sector departments, and the alignment of these targets with the national GHG emissions trajectory, together with associated consultation and review processes. **Error! Reference source not found.** provides a summary of the SETs and the information for emission reductions is indicated in **Error! Reference source not found.**.

Table 2.10: Sectoral Emission Targets

No.	Name	Description	Objectives	Type of instrument
5	Sectoral Emission Targets	Quantitative or qualitative goals informed by sectoral policies and measures that may lead to GHG emission reductions, for the sector or sub-sector, over a defined time period as determined in terms of section 25 of the Climate Change Act (Act No 22 of 2024)	Designed to guide sectors towards transformative change in support of long-term climate action. They are grounded in sectoral PAMs that govern programmes and activities with significant potential to reduce GHG emissions when effectively implemented.	Other

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity

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Implemented	All	CO_2; CH_4 and N_2O	2025	DFFE

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Administrative/system costs for setting SETs, reporting and compliance; larger investment costs occur in sector PAMs responding to SETs.	Regulatory certainty; improved coordination; supports just transition planning; strengthens adaptation/response planning.	Together with carbon budgets shape sector PAM ambition and design (IRP 2025, carbon tax effectiveness, industrial decarbonisation, hydrogen, transport electrification).

Table 2.11: Estimates of GHG emission reductions of SETs

Estimates of GHG emission reductions	
Achieved	Expected
Not reported[8]	Not reported[6]

2.4.1.4 Carbon Tax Act

The Carbon Tax Act No 15 of 2019 (RSA, 2019a) has been implemented since the 1 June 2019. The Carbon Tax Discussion Paper: Phase 2 of the Carbon Tax was published in November 2024 for public comment. The Paper puts forward proposals on phase two of the carbon tax design from 2026 to 2035 for consultation, considering South Africa's NDC commitments. The discussion document includes proposed adjustments to the basic tax-free allowance, carbon offsets, the electricity levy, the renewable energy premium and the energy efficiency savings tax incentive.

Based on the discussion paper and the public consultation process undertaken; The Taxation Laws Amendment Act 2026 amends the Carbon Tax Act No 15 of 2019 primarily to align it with the Climate Change Act 22 of 2024 by introducing a formal carbon budget framework, strengthening regulatory oversight, and requiring DFFE-approved methodologies for emissions measurement. It establishes a stricter compliance regime by imposing a significant penalty tax on emissions exceeding

[8] The SETs are integrated with other tools like the carbon tax and carbon budgets mentioned in the sub-section about the Climate Change Act 22 of 2024. Including the emission reductions from the SETs will lead to double accounting of GHG emission reductions as the GHG effect of the SETs cannot be separately distinguished and quantified from the other mitigation PAMs described in this chapter. The GHG emission reductions of the SETs are not reported.

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approved carbon budgets and disallowing tax-free allowances on those excess emissions. At the same time, it restructures incentives by phasing out the carbon budget allowance after 2025, increasing carbon offset allowances across sectors, and tightening verification requirements through mandatory departmental confirmation. The amendments also introduce a refund mechanism for firms that stay within their allocated budgets, reinforcing ex-post compliance incentives. Overall, these changes transition the carbon tax from a largely transitional system to a more stringent, performance-based instrument with stronger enforcement and alignment to national climate policy. Updates to the supplementary instruments under the Carbon Tax Act No 15 of 2019 are reported on after this summary. **Error! Reference source not found.** provides an overview of the carbon tax and the information for emission reductions is indicated in **Error! Reference source not found.**.

Table 2.12: Carbon Tax Act No 15 of 2019

No.	Name	Description	Objectives	Type of instrument
5	Carbon Tax Act No 15 of 2019	Gives effect to the polluter-pays-principle for large emitters and helps to ensure that firms and consumers take the negative adverse costs (externalities) into account in their future production, consumption and investment decisions.	Makes provision for the imposition of taxes for South African taxpayers who conducts a listed activity with above threshold GHG emissions.	Economic

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	All	CO_2; CH_4 and N_2O	2019	South African Revenue Service (SARS)

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PAMs
Raises costs for liable activities; compliance/admin costs for firms; Net "cost" depends on design/allowances and pass-through.	Incentivises energy efficiency; innovation; operational cost savings over time; improves air quality if fossil combustion declines.	Reinforces IRP/RE/EE measures by pricing carbon; relies on NGERs for emissions quantification; works alongside Climate Change Act 22 of 2024 carbon budgets/SETs.

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Table 2.13: Estimates of GHG emission reductions of the Carbon Tax Act No 15 of 2019

Estimates of GHG emission reductions	
Achieved	Expected
Not reported[9]	Not reported[8]

2.4.1.4.1 Carbon Offset Regulations

Section 13 of the Carbon Tax Act, No. 15 of 2019 provides for the utilisation of carbon offsets against a taxpayer's carbon tax liability, and Section 19(c) empowers the Minister to make regulations governing that offset allowance. The National Treasury had mentioned a proposal in the explanatory memorandum to the Taxation Laws Amendment Bill 2023 (National Treasury, 2024) to change the utilisation period of the carbon offset regulation. Government proposed to change the alignment of the carbon offsets with the first phase of the Carbon tax from 1 January 2023 to 31 December 2025, which would take effect from 1 January 2023. The proposal was not adopted as it was not mentioned in the Taxation Laws Amendment Act 2023.

2.4.1.5 Hydrogen Commercialisation Strategy

In the 1st NDC, Green Hydrogen (GH2); is mentioned as a future fuel medium for electric vehicles and public transport. In the draft SETs report; The Hydrogen Commercialisation Strategy aims to position GH2 as an early contributor to decarbonization within the Just Energy Transition Implementation Plan. It prioritizes executing the green hydrogen strategy and developing a national GH2 infrastructure plan. The strategy also focuses on driving policy and regulatory changes for long-term industry growth and mobilizing government support for the new hydrogen industry in South Africa. The hydrogen production target in the commercialisation strategy is to produce 7 million tonnes of GH2 per annum by 2050. The Hydrogen Commercialisation Strategy is a cross-cutting policy because the production of GH2 and its applications in manufacturing and transport are considered. Table 2.14 provides a

[9] The tax is integrated with other tools like sectoral emission targets and carbon budgets mentioned in the sub-section about the Climate Change Act 22 of 2024. Including the emission reductions from the carbon tax will lead to double accounting of GHG emission reductions as the GHG effect of the tax cannot be separately distinguished and quantified from the other mitigation PAMs described in this chapter. The achieved and expected GHG emission reductions of the carbon tax are not reported.

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summary of the Hydrogen Commercialisation Strategy and the information for emission reductions is indicated in Table 2.15.

Table 2.14: Hydrogen Commercialisation Strategy

No.	Name	Description	Objectives	Type of instrument
5	Hydrogen Commercialisation Strategy	Focuses on leveraging the country's abundant platinum group metals and renewable energy potential to develop a competitive hydrogen economy. It outlines pathways to integrate hydrogen technologies into existing industries, promote innovation, and attract investments for sustainable energy solutions	To position the country as a global leader in green hydrogen production, drive economic growth, reduce greenhouse gas emissions, and create sustainable job opportunities.	Other

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy; IPPU; Transport; Waste	CO_2; CH_4 and N_2O	2023	DTIC

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Costs / Investment information: High-capex investments (electrolysers, renewables, transport/storage, ports, industrial conversion); mix of public enabling spend and private investment; exact costs project-dependent.	Industrial development using PGMs; export revenue; energy security (fuel diversification); skills and manufacturing development.	Depends on IRP/RE build for clean electricity; complements JET-IP (green industry, jobs) and can reduce emissions in transport/industry that are hard to electrify.

Table 2.15: Estimates of GHG emission reductions of the Hydrogen Commercialisation Strategy

Estimates of GHG emission reductions	
Achieved	Expected
Not reported[10]	Not reported[10]

[10] None of the projects mentioned in the Hydrogen Commercialisation Strategy have achieved commercial operational as these projects remain at investment decision, planning, pre-feasibility or feasibility status. The monitoring of the hydrogen projects form a part of the broader just energy transition monitoring and evaluation (M&E) system. The most recent M&E report covering

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2.4.1.6 Just Energy Transition Implementation Plan

The Just Energy Transition Implementation Plan (JET IP) will steer South Africa towards a low-carbon economy by expanding renewable energy sources. This plan outlines the necessary interventions and investments for South Africa to achieve a low-carbon and climate-resilient economy, in line with its NDC. Key investment areas include electricity, New Energy Vehicles (NEVs), and GH_2, with additional investments required in skills development and municipalities (The Presidency; 2023).

The JET-IP specifies short- and medium-term goals across six portfolios: Electricity, Mpumalanga Just Transition, New Energy Vehicles (NEVs), GH_2, Skills, and Municipalities. In 2024, three more portfolios will be introduced for JET financing support: the South African Renewable Energy Masterplan, Energy Efficiency, and Road-to-Rail. The plan identifies specific challenges in each focus area and outlines pathways to transform these priorities into actionable and tangible results, highlighting the need for resources and capacity building.

The first quarter of 2026 indicates that the Green Hydrogen Portfolio is advancing two export projects and one domestic project through pre-feasibility and feasibility studies, creating a pipeline of investment-ready opportunities. The Portfolio is strengthening governance, stakeholder coordination, funding engagement, and transparent investment tracking to move projects from planning to implementation and attract both concessional and commercial finance. The achieved and expected GHG emission reductions are not reported.

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Table 2.16 provides a summary of the JET-IP and the information for emission reductions is indicated in Table 2.17.

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Table 2.16: Just Energy Transition Implementation Plan (JET-IP) 2023–2027

No.	Name	Description	Objectives	Type of instrument
5	Just Energy Transition Implementation Plan (JET-IP) 2023–2027	Outlines the scope of the country's needs; the foundational investments required and planned projects in the medium term for advancing a Just Transition toward a low-carbon and climate-resilient economy, aligned with its updated NDC.	Aims to decarbonize the energy sector by transitioning from coal to renewable energy sources while ensuring energy security and economic growth. It also seeks to promote a just and inclusive transition by addressing social challenges, protecting jobs, and fostering industrial development in green sectors such as renewable energy, new energy vehicles, and green hydrogen	Other

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy; IPPU; Transport; Waste	CO_2; CH_4 and N_2O	2023	PCC

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Estimated investment requirement of approximately US$98 billion (~R1.8 trillion) over 2023–2027, including US$8.5 billion international partnership commitment	Worker reskilling; jobs and localisation; improved reliability of supply; industrial competitiveness.	Programmatic "container" that accelerates/enables IRP/REI4PP, grid investment, EV/NEV programmes, hydrogen strategy; aligns with Climate Change Act 22 of 2024/NDC.

Table 2.17: Estimates of GHG emission reductions for Just Energy Transition Implementation Plan (JET-IP) 2023–2027

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	0.00	2025	0.01
2024	0.00	2026	0.01

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2.4.2 National GHG Emission Reporting Regulations

The NGERs (DEA, 2017a), under Section 53(a), (o) and (p) read with section 12 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), in the Government Gazette of the 3rd April 2017, provides a foundation for the national reporting system for GHG emissions. NGERs introduced a single national reporting system for the transparent reporting of GHG emissions, which will be used (a) to update and maintain an inventory; (b) for the Republic of South Africa to meet its reporting obligations under the UNFCCC and instrument treaties to which it is bound; and (c) to inform the formulation and implementation of legislation and policy. The NGERs were amended in 2020 (DEFF, 2020). Companies will submit emissions data to SAIGE (discussed in section 2.1.9 of this report) which is a component of the National Atmospheric Emissions Inventory System (NAEIS). In accordance with regulation 7(1) of the NGERs the initial reporting cycle commenced on 31 March of 2018 requiring data providers to register and submit activity and GHG emissions data to the competent authority (DFFE**).** Table 2.18 provides a summary of the NGERS and the information on emission reductions is indicated in Table 2.19.

Table 2.18 National GHG Emission Reporting Regulations

No.	Name	Description	Objectives	Type of instrument
4	National Greenhouse Gas Emission Reporting Regulations (NGERs)	Set of rules that govern how GHG emissions are reported to DFFE	South Africa's NGERS establish a unified national system for transparent reporting of GHG emissions to support the National GHG Inventory and fulfil international reporting obligations under the UNFCCC	Regulatory

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	All	CO_2; CH_4 and N_2O	2017	DFFE

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Compliance and MRV costs for reporting entities (systems, verification, staffing); government administration costs	Better emissions data quality; improved corporate energy management; transparency; supports investment decisions.	Provides the MRV backbone for Carbon Tax (verification), Climate Change Act (budgets/SET monitoring), NDC reporting, and evaluation of PAM impacts (e.g., IRP, REI4PP, EE).

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Table 2.19 Estimates of GHG emission reductions of National GHG Emission Reporting Regulations

Estimates of GHG emission reductions	
Achieved	**Expected**
Not reported[11]	Not reported[11]

2.4.3 Sectoral Mitigation Policies and Measures

2.4.3.1 Energy

2.4.3.1.1 12L Tax Incentive Program

The Deduction for Energy-Efficiency Savings Regulation was established under Section 12L of the Income Tax Act (No. 58 of 1962), promulgated in 2013 and implemented from 2015. The role of this provision is to create a structured incentive that rewards demonstrable improvements in energy performance. Specifically, the Section 12L incentive allows firms to claim an income tax deduction based on the monetary value of verified energy efficiency savings achieved within a financial year. These savings, quantified in kilowatt-hours, must be independently measured and formally approved by the South African National Energy Development Institute (SANEDI). The measure is described on page 84 of BTR1.

The initial expiry date for this incentive was 31 December 2019, but in February 2019, this was extended by three years to 31 December 2022. In February 2022, it was extended by a further three years to 31 December 2025. Subsequently this has been extended to 31 December 2030.

[11] Estimates of expected and achieved GHG emission reductions are not reported for the NGERs. The NGERS are applicable for carbon tax, sectoral emission target, carbon budget and mitigation plan reporting. Including the emission reductions from the NGERS will lead to double counting of GHG emission reductions as the GHG effect of the NGERS cannot be separately distinguished and quantified from the other mitigation PAMs described in this chapter. The GHG emission reductions of NGERS are not accounted for and not reported.

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Table 2.20 provides a summary of the Section 12L Tax Incentive Program and the information for emission reductions is indicated in Table 2.21.

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Table 2.20: Summary of Section 12L Tax Incentive Program

No.	Name	Description	Objectives	Type of instrument
1	12L Tax Incentive Program	The 12L tax incentive program allows eligible businesses to receive a tax deduction for their confirmed energy savings resulting from energy efficiency upgrades. Managed by SANEDI, this initiative encourages investment in energy-efficient projects across multiple industries.	To incentivise companies to implement energy-saving measures and technologies, thereby contributing to a more sustainable and environmentally friendly economy.	Economic

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2013	SANEDI

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PAMs
Prominent beneficiaries of the 12L incentive include Woolworths Holdings Ltd, which achieved a 10% reduction in energy consumption and saved around R35 million in electricity costs over six years, and Golden Arrow Bus Services (Pty) Ltd, which recorded a two and a half percent (2.5%) decrease in energy consumption, resulting in savings exceeding R1.8 million between April 2016 and March 2017.	The new Job Impact Report released by SANEDI reveals that the programme has facilitated the creation of at least 449 jobs and injected approximately R136 million into the economy annually (SANEDI, 2024). Key findings from the report include total energy savings of 27.6 terawatt-hours (TWh), a gross tax rebate of R22.6 billion, and a reduction of 26.7 tonnes in GHG emissions.	Complements IDM, municipal EEDSM, NCPC/PSEE, appliance standards; reduces demand growth assumed in planning (affects IRP capacity needs).

Table 2.21: GHG emission reductions of the 12L Tax Incentive Program

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	0.59	2025	1.78
2024	1.26	2026	2.50

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2.4.3.1.2 Municipal Energy Efficiency and Demand Side Management programme

The South African Municipal Energy Efficiency and Demand Side Management (EEDSM) programme aims to enhance energy efficiency and manage electricity demand within municipalities. Its main objectives are to reduce energy consumption in municipal operations, lower electricity costs, and improve the overall efficiency of municipal infrastructure such as street lighting, water pumping, and public buildings. By implementing energy-saving technologies and practices, the EEDSM programme helps municipalities decrease their electricity usage, thereby reducing the demand on the national power grid. This reduction in energy consumption leads to fewer GHG emissions from power generation, supporting South Africa's efforts to mitigate climate change and promote sustainable development. Table 2.22 provides a summary of the Municipal EEDSM programme and the information for emission reductions is indicated in Table 2.23.

Table 2.22: Municipal Energy Efficiency and Demand Side Management programme

No.	Name	Description	Objectives	Type of instrument
3	Municipal Energy Efficiency and Demand Side Management programme	Allocation of grant funds to municipalities for the purpose of carrying out energy-efficient upgrades to their infrastructure	Facilitates the effective utilization of energy resources and offers associated incentives or rebates	Economic
Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2011	South African National Energy Development Institute (SANEDI)

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Public grant funding to municipalities plus municipal co-funding; capex for lighting, pumps, buildings, etc.	The EEDSM programme supports municipalities in their efforts to reduce electricity consumption by optimising their use of energy; reduced local air pollutants from reduced generation; local jobs.	Complements Eskom IDM and national EE incentives; demand reduction improves adequacy and reduces need for peaking generation in IRP.

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Table 2.23: GHG emission reductions of the Municipal Energy Efficiency and Demand Side Management programme

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	1.01	2025	0.47
2024	0.82	2026	0.47

2.4.3.1.3 The National Cleaner Production Centre South Africa program

The National Cleaner Production Centre South Africa (NCPC) program is a key initiative focused on promoting cleaner production techniques and sustainable practices across various industries. Its main objectives are to enhance resource efficiency, reduce waste, and minimize the environmental impact of industrial processes. By offering support and guidance on adopting energy-efficient technologies and waste reduction strategies, the NCPC program helps businesses improve their operational performance while lowering their environmental footprint. This leads to a reduction in energy consumption and GHG emissions, contributing significantly to South Africa's efforts to combat climate change and advance towards a more sustainable and environmentally responsible industrial sector. Table 2.24 Error! Reference source not found. **provides a summary of the NCPC program and the information for emission reductions is indicated in**

Table 2.25.

Table 2.24: The National Cleaner Production Centre South Africa (NCPC) program

No.	Name	Description	Objectives	Type of instrument
4	The National Cleaner Production Centre South Africa (NCPC) program	Implementation of projects within the private sector that enhance energy efficiency and boost the economic competitiveness of South African businesses by optimizing resources and processes	The action aims to facilitate energy efficiency measures, particularly in the industrial and commercial sectors, to mitigate GHG emissions related to the energy sector and stimulate job creation in the green economy.	International Agreements and Cooperation

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Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2011	National Cleaner Production Centre

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Compliance and MRV costs for reporting entities (systems, verification, staffing); government administration costs	Better emissions data quality; improved corporate energy management; transparency; supports investment decisions.	Provides the MRV backbone for Carbon Tax (verification), Climate Change Act (budgets/SET monitoring), NDC reporting, and evaluation of PAM impacts (e.g., IRP, REI4PP, EE).

Table 2.25: GHG emission reductions of The National Cleaner Production Centre South Africa (NCPC) program

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	0.04	2025	0.05
2024	0.05	2026	0.05

2.4.3.1.4 Energy Efficiency Standards and Appliance Labelling project

The regulations mandate that several appliances must display the South African Energy Efficiency Label. These Appliance Standards and Labelling Regulations have been established to ensure compliance. The primary goal of the South African Energy Efficiency Label is to provide consumers with information about an appliance's energy efficiency before purchase. Consequently, this label must be clearly visible on all designated appliances in both physical and online stores. To facilitate understanding of these labelling requirements, a comprehensive guide has been developed (DMRE, 2022).

Since 2015, the Program has targeted large residential appliances. It has introduced Minimum Energy Performance Standards (MEPS), appliance standards, labelling regulations, and energy efficiency labelling requirements. According to a 2021 study by SANEDI on residential energy consumption, the program likely reduced electricity use by approximately 3.5% in 2020. The majority of these savings came from refrigerators, which are widely owned across all household groups and consume a significant amount of energy. By 2030, electricity savings could reach 10%.

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Table 2.26 provides a summary of the Energy Efficiency Standards and Appliance Labelling project and the information for emission reductions is indicated in Table 2.27.

Table 2.26: Energy Efficiency Standards and Appliance Labelling project

No.	Name	Description	Objectives	Type of instrument
8	Energy Efficiency Standards and Appliance Labelling project	The aim of this project is to educate consumers about the energy efficiency of appliances before they make a purchase. By reducing energy consumption, it will lower electricity costs and decrease GHG emissions.	To ensure that consumers are informed about the relative energy efficiency of an appliance before purchasing.	Other

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2015	SANEDI

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Compliance and MRV costs for reporting entities (systems, verification, staffing); government administration costs	Better emissions data quality; improved corporate energy management; transparency; supports investment decisions.	Provides the MRV backbone for Carbon Tax (verification), Climate Change Act (budgets/SET monitoring), NDC reporting, and evaluation of PAM impacts (e.g., IRP, REI4PP, EE).

Table 2.27: Estimates of GHG Emissions Reductions for the Energy Efficiency Standards and Appliance Labelling project

Estimates of GHG emission reductions	
Achieved	Expected

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Not reported[12]	Not reported[13]

2.4.3.1.5 Renewable Energy in South Africa's Integrated Resource Plan

South Africa's IRP 2019 prioritises the expansion of renewable energy as part of a more diversified and lower-carbon electricity mix. The plan sets out significant new capacity additions, including about 14 400 MW of wind and 6 000 MW of solar PV by 2030. Overall, renewable energy is expected to grow to around 41% of installed capacity by 2030, reducing reliance on fossil fuels. The IRP also supports complementary investments in technologies such as hydropower and energy storage to enhance system flexibility and reliability.

Table 2.28 provides a summary of the IRP 2019 and the information for emission reductions is indicated in Table 2.29. The emission reductions quantified are for all renewable energy projects including those from the South African Renewable Energy Independent Power Producer Procurement Programme (REI4P) and from other private embedded projects.

Table 2.28: Integrated Resource Plan (IRP) 2019

No.	Name	Description	Objectives	Type of instrument
5	Integrated Resource Plan (2019)	The IRP is the key planning instrument in the electricity sector and has been the key driver for investment in low or zero-carbon technology such as wind and solar PV. The current IRP (2019) is being revised.	Implement electricity sector policy on new generation technologies, guarantee energy security, and provide for the achievement of related policy objectives.	Regulatory

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2019	Department of Mineral Resources and Energy

[12] No ex-post evaluation of the project has been undertaken to measure its impact on energy savings and GHG emissions. Therefore achieved emission reductions cannot be reported on.

[13] The current approach to reporting expected emission reductions is based on an extrapolation of the achieved emission reductions. As there is no data available for achieved emission reductions for the Energy Efficiency Standards and Appliance Labelling project, the expected emission reductions cannot be estimated based on extrapolations.

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Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PAMs
Compliance and MRV costs for reporting entities (systems, verification, staffing); government administration costs	Better emissions data quality; improved corporate energy management; transparency; supports investment decisions.	Provides the MRV backbone for Carbon Tax (verification), Climate Change Act (budgets/SET monitoring), NDC reporting, and evaluation of PAM impacts (e.g., REI4P and Energy Efficiency PaMs).

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PAMs
Enables large-scale capital investment in generation and grid via procurement/REI4P and Eskom programmes; IRP itself is a planning instrument (no single cost) but drives multi-year capex.	Security of supply planning; investor certainty; technology diversification; industrial development via renewables localisation.	Works with REI4P, grid planning (TDP), carbon tax; interacts with embedded generation policies and regulatory reforms.

Table 2.29: Estimates of GHG emission reductions of Renewable Energy Goals in the IRP

Achieved			Expected	
Year	Emission Reduction ($Mt\ CO_2$-eq)		Year	Emission Reduction ($Mt\ CO_2$-eq)
2023	17.33		2025	17.84
2024	17.54		2026	19.26

2.4.3.1.6 Renewable Energy Independent Power Producer Procurement programme

The South African Renewable Energy Independent Power Producer Procurement (REI4P) programme is a government initiative as part of the IRP aimed at increasing the country's renewable energy capacity by engaging private sector investment. Its main objectives are to diversify the energy mix, enhance energy security, and stimulate economic growth through the development of renewable energy projects such as wind, solar, and hydro power. By facilitating the procurement of clean energy from independent power producers, the REI4P programme significantly reduces the reliance on fossil fuels for electricity generation. This transition to renewable energy sources leads to a marked decrease in GHG emissions, supporting South Africa's efforts to mitigate climate change and achieve its environmental sustainability targets.

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Table 2.30 provides a summary of the Renewable Energy Independent Power Producer Procurement (REI4P) programme and the information for emission reductions is indicated in Table 2.31.

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Table 2.30: Renewable Energy Independent Power Producer Procurement (REI4P) programme

No.	Name	Description	Objectives	Type of instrument
7	Renewable Energy Independent Power Producer Procurement (REI4P) programme	Competitive procurement programme, where prospective power producers submit bids to supply Eskom with renewable energy. The Department of Mineral Resources and Energy adjudicates the bids according to various criteria, price being the most critical.	The Integrated Resource Plan makes provision for the generation of 17.8 GW of renewable energy by 2030, to be commissioned under the Programme.	Economic

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2011	Eskom

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PAMs
Private project finance/capex; costs recovered via PPAs/market arrangements; plus grid connection and transmission build requirements.	Jobs and localisation potential; improved air quality; lower water use than thermal generation; energy diversification.	Core implementation vehicle for IRP capacity allocations; depends on TDP/grid expansion; complemented by storage, gas flexibility and demand response; supported by carbon pricing.

Table 2.31: Estimates of GHG emission reductions of the Renewable Energy Independent Power Producer Procurement (REI4P) programme

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	16.88	2025	17.30
2024	17.11	2026	18.71

2.4.3.2 Transport

2.4.3.2.1 Bus Rapid Transport System

The South African Bus Rapid Transit (BRT) programme, funded through the Public Network Transport Grant, aims to improve urban public transportation by developing efficient, high-

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capacity bus networks in major cities. Its main objectives are to reduce traffic congestion, enhance mobility, and provide reliable and affordable public transport options. The purpose of the Public Network Transport Grant is to support the National Land Transport Act (Act No. 5 of 2009) and the Public Transport Strategy (PTS) and Action Plan in advancing the delivery of accessible, reliable, and affordable integrated municipal public transport services. Functional BRT systems have been implemented in cities such as Johannesburg (Rea Vaya), Cape Town (MyCiTi), and Pretoria (A Re Yeng). By prioritizing bus lanes and streamlining routes, the BRT programme encourages more people to use public transportation instead of private vehicles. This shift reduces the number of cars on the road, leading to lower fuel consumption and a significant decrease in GHG emissions. Consequently, the BRT programme helps mitigate climate change, promotes sustainable urban development, and improves air quality in South African cities.

Table 2.32 provides a summary of the BRT system and the information for emission reductions is indicated in Table 2.33.

Table 2.32: Bus Rapid Transport (BRT) System

No.	Name	Description	Objectives	Type of instrument
9	Bus Rapid Transport (BRT) System	An urban public transportation initiative aimed at improving the efficiency, reliability, and affordability of bus services in major cities. Funded through the Public Network Transport Grant, the program focuses on developing high-capacity bus networks with dedicated lanes, streamlined routes, and modern infrastructure.	Its main objectives are to reduce traffic congestion, enhance mobility, and provide accessible public transport options for all citizens	Economic

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2007	DoT

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Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Public capex funded via grants (e.g., Public Transport Network Grant) + municipal operating subsidies; fleet and infrastructure costs.	Reduced congestion; improved mobility and accessibility; lower local air pollution; road safety improvements.	Complements EV policies (potential electrification of bus fleets); interacts with road-to-rail in shifting passenger travel; depends on electricity decarbonisation (IRP) if electrified.

Table 2.33: Estimates of GHG emission reductions of the Bus Rapid Transport (BRT) System

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	0.07	2025	0.07
2024	0.07	2026	0.07

2.4.3.2.2 Transnet Road-to-Rail Programme

The Transnet Road-to-Rail Programme is an initiative aimed at shifting freight transportation from road to rail networks. Its main objectives are to alleviate road congestion, reduce road maintenance costs, and enhance the efficiency and reliability of the country's freight transport system. By promoting the use of rail for transporting goods, the programme significantly reduces the number of heavy trucks on the roads, which in turn decreases fuel consumption and lowers GHG emissions. This transition not only helps mitigate climate change but also contributes to improved air quality and a reduction in the environmental impact of freight transport in South Africa.

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Table 2.34 provides a summary of the Transnet Road-to-Rail Programme and the information for emission reductions is indicated in Table 2.35.

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Table 2.34: Transnet Road-to-Rail Programme

No.	Name	Description	Objectives	Type of instrument
10	Transnet Road-to-Rail Programme	The Programme is designed to shift freight transportation from road to rail, aiming to enhance rail infrastructure and reduce road congestion. By increasing the use of rail for cargo transport, the programme seeks to lower transportation costs, improve logistics efficiency, and decrease GHG emissions, supporting the country's climate goals and promoting more sustainable transport solutions.	The main objectives of the Transnet Road-to-Rail Programme are to enhance rail infrastructure and shift freight transportation from road to rail. This shift aims to reduce road congestion, lower transportation costs, and decrease GHG emissions, supporting more sustainable and efficient transport solutions.	Other

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2012	Transnet

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
High capital investment in rail infrastructure, rolling stock, signalling, terminals; financed via Transnet capex, public support, and potential partnerships.	Reduced road congestion and accidents; lower logistics costs; reduced road maintenance burden; improved freight reliability.	Complements carbon pricing; interacts with industrial strategy and port logistics; benefits increase if rail is electrified and electricity is cleaner (IRP).

Table 2.35: Estimates of GHG emission reductions of the Transnet Road-to-Rail Programme

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	0.28	2025	0.38
2024	0.29	2026	0.50

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2.4.3.3 Electric Vehicles

As of 2024, there are over 3000 electric motor vehicles (motorcars) recorded in South Africa (IEA, 2025). New energy vehicles that include electric vehicles and fuel cell electric vehicles are considered a priority investment sector in the Just Energy Transition Implementation Plan (JET-IP) published in 2022. The DTIC 2021 Green Paper preceded the Preceding the DTIC 2023 Electric Vehicle White Paper providing a roadmap for the manufacturing of electric vehicles. These policy reports communicate the government's medium-term plans for broadening the production of electric vehicles and their future predominance within South Africa's vehicle fleet. As of 2022, fuel cell electric vehicles which are powered by hydrogen gas are in the early stages of adoption with 3 vehicles recorded in South Africa. Ahjum et al. (2018) show that GHG emissions from transport in 2030 can be halved by 2045 with an 80% adoption rate of electric vehicles. Cumulative GHG emissions from the usage of electric vehicles in the country from 2010 to 2022 amount to 0.06 Mt CO_2-eq. Lower emission reductions from electric vehicles is attributed to the low adoption rate of electric vehicles in the country (Scholtz et al. 2023). Scholtz et al. 2023 indicates that greater adoption of electric vehicles is dependent on building domestic production capacity and support for expanding charging infrastructure, both activities supported by the DTIC 2023 Electric Vehicle White Paper and JET-IP.

Table 2.36 provides a summary for electric vehicles and the information for emission reductions is indicated in Table 2.37.

Table 2.36: Electric vehicles

No.	Name	Description	Objectives	Type of instrument
11	Electric vehicles	Policy measure that seeks to drive the transition from the predominant use of internal combustion engines in road transportation to electric vehicles. Government policies promoting EVs include the GTS 2018 (DoT; 2018); The EV White paper (DTIC; 2023) and the JET-IP (PCC, 2023).	Common objectives of government policies such as the GTS 2018 (DoT; 2018); The EV White Paper (DTIC; 2023) and the JET-IP (PCC, 2023) seek to implement actions which will radically transition the country's road transportation with mainly internal combustion engines with electric vehicles. To achieve this, the policies seek to transform local automotive manufacturing to mainly produce EVs including battery electric vehicles (BEVs), hybrid electric vehicles (HEVs), and plug-in hybrid electric vehicles (PHEVs), as well as building local capacity across the EV value chain — from battery and component	Other

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No.	Name	Description	Objectives	Type of instrument
			manufacturing to charging infrastructure — in order to retain export competitiveness, promote employment in the automotive sector, and support the broader decarbonisation of the transport system.	

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Transport	CO_2; CH_4; N_2O	2023	DTIC (through automotive industry policy) and PCC (through the JET-IP)

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Vehicle and battery capex (private + fleet); charging infrastructure investment; potential fiscal incentives; grid readiness investments over time.	Reduced urban air pollution and noise; lower operating costs; industrial development (NEV/EV manufacturing); reduced oil import dependence.	Depends on IRP for clean power; interacts with BRT (fleet electrification), hydrogen strategy (for heavy transport segments), and grid planning for charging loads.

Table 2.37: Estimates of GHG emission reductions of Electric Vehicles

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	0.02	2025	0.04
2024	0.03	2026	0.05

2.4.3.4 IPPU

2.4.3.4.1 Glass Recycling

Raw materials used in glass production such as limestone ($CaCO_3$), dolomite (calcium magnesium carbonate) $CaMg(CO_3)_2$ and soda ash (Na_2CO_3), emit CO_2 when they are melted (DEA, 2017). When recycled glass formerly termed as cullet is used, no CO_2 is emitted when the material is melted (Burger, 2022). Every kilogram of cullet used replaces 1.2kg of raw materials (Burger, 2022).

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Glass recycled is promoted in the 2020 Waste Management Strategy for which a target of 90% for glass recycling is to be achieved by 2025. The draft 2026 Waste Management Strategy also states a target of 90% for glass recycling to be achieved by 2026. The National Environmental Management: Waste Act (59/2008): Extended producer responsibility scheme for paper, packaging and some single use products requires manufacturers of glass packaging for example jars and bottles amongst the other materials mentioned in the regulation to set up procedures, processes and invest resources to implement the extended producer responsibility measures linked to- (a) collection of their products in the post- consumer stage; (b) reuse; (c) recycling; (d) recovery; and (e) disposal of their products in the post -consumer stage. The EPR Regulations reinforce and strengthen the National Waste Management Strategy's objectives for increased glass recycling and reuse by making producers responsible for the end-of-life management of glass packaging.

Table 2.38 provides a summary of glass recycling and the information for emission reductions is indicated in Table 2.39.

Table 2.38: Glass Recycling

No.	Name	Description	Objectives	Type of instrument
11	Glass Recycling	Glass recycling is promoted through South Africa's waste management policies and EPR regulations, which require producers to support the collection, reuse, and recycling of glass packaging.	Increase glass recycling and reuse by supporting the collection and recovery of glass packaging and promoting producer responsibility for its end-of-life management.	Regulatory

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	IPPU	CO_2	1999	Department of Forestry, Fisheries and Environment

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Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PAMs
Compliance and MRV costs for reporting entities (systems, verification, staffing); government administration costs	Better emissions data quality; improved corporate energy management; transparency; supports investment decisions.	Provides the MRV backbone for Carbon Tax (verification), Climate Change Act (budgets/SET monitoring), NDC reporting, and evaluation of PAM impacts (e.g., IRP, REI4PP, EE).

Table 2.39: Estimates of GHG emission reductions of Glass Recycling

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	0.14	2025	0.13
2024	0.13	2026	0.13

2.4.3.5 AFOLU

2.4.3.5.1 Conservation Agriculture

Conservation agriculture practices are promoted as part of Comprehensive Agricultural Support Programme (CASP); Ilima/Letsema Projects; Land Care Programme and the Working for Land Programme. These practices focus on sustainable farming techniques such as minimal soil disturbance, cover cropping, and crop rotation to improve soil health, enhance water retention, and increase agricultural productivity. The aim of the grant funded programs are to promote sustainable land management and job creation through community-based initiatives that support social, economic, and environmental sustainability. This involves assisting vulnerable South African farming communities to boost agricultural production and invest in critical infrastructure. By providing coordinated agricultural support and collaborating with industry initiatives, these programs enhance food productivity and supports land reform beneficiaries. By adopting conservation agriculture, South Africa aims to reduce GHG emissions through enhanced carbon sequestration in soils, decreased reliance on chemical inputs, and improved overall farm resilience, contributing to the country's climate change mitigation efforts. The grant programs also aim to revitalize agricultural colleges into centers of excellence and incentivizes provincial departments to create jobs through labour-intensive methods in areas like road maintenance, building upkeep, tourism, and waste management.

Table 2.40 provides a summary of for conservation agriculture and the information for emission reductions is indicated in Table 2.41.

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Table 2.40: Conservation Agriculture

No.	Name	Description	Objectives	Type of instrument
12	Conservation Agriculture	Grant funded projects which focus on sustainable farming practices that improve soil health, water conservation, and crop productivity.	To advance sustainable farming practices, improve soil and water management, and support rural development and environmental stewardship	Economic

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Agriculture	CO_2; CH_4; N_2O	2001	Department of Agriculture

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PAMs
Compliance and MRV costs for reporting entities (systems, verification, staffing); government administration costs	Better emissions data quality; improved corporate energy management; transparency; supports investment decisions.	Provides the MRV backbone for Carbon Tax (verification), Climate Change Act 22 of 2024 (budgets/SET monitoring), NDC reporting, and evaluation of PAM impacts (e.g., IRP, REI4PP, EE).

Table 2.41: Estimates of GHG emission reductions of Conservation Agriculture

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	1.64	2025	1.90
2024	1.76	2026	2.04

2.4.3.5.2 Grassland Restoration

The implementation of grassland restoration is guided by several key commitments and programs. It aligns with the United Nations Convention to Combat Desertification (UNCCD) medium-term goal to rehabilitate and sustainably manage 2,436,170 hectares of grassland by 2030. Additionally, it supports the natural land cover restoration objectives outlined in the National Biodiversity Strategy and Action Plan (NBSAP). This effort is further bolstered by the DFFE "Working for" programs, which focus on restoring ecological infrastructure, and the Department of Agriculture LandCare Programs, which emphasize sustainable land management in agricultural areas. Grassland restoration reduces GHG emissions by

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enhancing carbon sequestration in soils and vegetation, improving soil health, and preventing soil erosion and land degradation.

Table 2.42 provides a summary for grassland restoration and the information for emission reductions is indicated in Table 2.43.

Table 2.42: Grassland Restoration

No.	Name	Description	Objectives	Type of instrument
13	Grassland Restoration	Grassland restoration aims to enhance the productivity of grasslands by encouraging sustainable grazing practices that minimize topsoil loss and disruption, boost forage production and coverage, and preserve the diversity of essential forage species.	To restore and rehabilitate grasslands and grazing lands while reducing soil erosion	Regulatory measures

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Agriculture	CO_2; CH_4; N_2O	2001	Department of Agriculture; DFFE

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Compliance and MRV costs for reporting entities (systems, verification, staffing); government administration costs	Better emissions data quality; improved corporate energy management; transparency; supports investment decisions.	Provides the MRV backbone for Carbon Tax (verification), Climate Change Act (budgets/SET monitoring), NDC reporting, and evaluation of PAM impacts (e.g., IRP, REI4PP, EE).

Table 2.43: Estimates of GHG emission reductions of Grassland Restoration

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	3.02	2025	3.06
2024	2.98	2026	3.14

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2.4.3.5.3 Afforestation

Forestland management, including natural forests and plantations and the afforestation and restoration activities thereof, is regulated by the National Forests Act, 1998 (Act No. 84 of 1998). This Act emphasizes sustainable forest management and outlines how forests can be used by people and communities without causing destruction. Additionally, the National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) is crucial for managing forest fires and ensuring fire safety.

These laws are supported by various amendments and policies, such as the Forestry Laws Amendment Act, 2005 (Act No. 35 of 2005) and the National Forest and Fire Laws Amendment Act, 2001 (Act No. 12 of 2001). Together, they provide a comprehensive framework for the sustainable management and protection of South Africa’s forest resources

The National Forests Amendment Act, 2022 aims to enhance forest management and protection by clarifying definitions, establishing public trusteeship, promoting sustainability, controlling deforestation, reinforcing penalties, and providing an appeals process. The proposed 2023 amendment reinforces the appeals mechanism for provisions for appeals against delegated decisions, the formation of an appeals committee, specific timeframes for lodging and deciding appeals, and measures to ensure transparency and fairness, all aimed at enhancing accountability and fairness in forest management.

The afforestation programs managed by DFFE, including the Working for Land and Working for Ecosystems initiatives, focus on expanding and restoring forested areas to enhance environmental sustainability and ecosystem health. The main objectives of these programs are to increase forest cover, improve biodiversity, and rehabilitate degraded landscapes. By doing so, these initiatives help reduce South Africa's GHG emissions by sequestering carbon dioxide in vegetation and soil, improving overall carbon storage, and mitigating the effects of climate change.

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Table 2.44 provides a summary for afforestation and the information for emission reductions is indicated in Table 2.45.

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Table 2.44: Afforestation

No.	Name	Description	Objectives	Type of instrument
14	Afforestation	The afforestation programs managed by the Department of Forestry, Fisheries, and the Environment, including the Working for Land and Working for Ecosystems initiatives, focus on expanding and restoring forested areas to enhance environmental sustainability and ecosystem health.	To increase and rehabilitate forested regions in order to boost environmental sustainability, enrich biodiversity, and strengthen ecosystem health.	Regulatory measures

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2006	DFFE

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PAMs
Compliance and MRV costs for reporting entities (systems, verification, staffing); government administration costs	Better emissions data quality; improved corporate energy management; transparency; supports investment decisions.	Provides the MRV backbone for Carbon Tax (verification), Climate Change Act 22 of 2024 (budgets/SET monitoring), NDC reporting, and evaluation of PAM impacts (e.g., IRP, REI4PP, EE).

Table 2.45: Estimates of GHG emission reductions of Afforestation

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	51.21	2025	57.19
2024	55.70	2026	58.73

2.4.3.5.4 Forest and Woodland Restoration and Rehabilitation

The forest and woodland restoration and rehabilitation activities managed DFFE, including as part of the Working for Land and Working for Ecosystems initiatives, focus on revitalizing degraded forest and woodland areas to restore ecological balance and enhance environmental quality. The primary objectives are to rehabilitate damaged landscapes, increase biodiversity, and improve carbon sequestration. By expanding forest cover and

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improving the health of these ecosystems, these activities contribute to reducing South Africa's GHG emissions through enhanced carbon capture and storage, while also supporting overall climate resilience and ecological sustainability.

Table 2.46 provides a summary for forest and woodland restoration and rehabilitation activities and the information for emission reductions is indicated in Table 2.47.

Table 2.46: Forest and Woodland Restoration and Rehabilitation

No.	Name	Description	Objectives	Type of instrument
15	Forest and Woodland Restoration and Rehabilitation	As part of the Department of Forestry, Fisheries, and the Environment's Working for Land and Working for Ecosystems initiatives, the actions aim to restore degraded landscapes, enhance biodiversity, and improve carbon sequestration to support ecological balance and mitigate climate change.	To rehabilitate degraded landscapes, boost biodiversity, and improve carbon capture to strengthen ecological health and climate resilience.	Regulatory measures

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2006	DFFE

Table 2.47: Estimates of GHG emission reductions of Forest and Woodland Restoration and

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	2.25	2025	1.97
2024	1.92	2026	2.02

2.4.3.5.5 Thicket Restoration

The Biodiversity Act of 2004 in South Africa supports the restoration and afforestation of natural landscapes through conservation and sustainable use, ecosystem protection, biodiversity management plans, incentives for landowners, and monitoring and enforcement mechanisms. The National Biodiversity Framework serves as an implementation tool for the

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National Environmental Management: Biodiversity Act and outlines specific outcomes to achieve biodiversity conservation. The NBSAP provides a strategic framework for biodiversity management, which is operationalized through the National Biodiversity Framework (NBF) as mandated by Chapter 3 of the Biodiversity Act.

Thick restoration is driven by several key commitments and programs. It aligns with the medium-term (2030) UNCCD commitment to combat desertification by rehabilitating and sustainably managing 87,621 hectares (ha) of thicket. Additionally, it supports natural land cover restoration goals outlined in the National Biodiversity Strategy and Action Plan (NBSAP). The Department of Forestry, Fisheries, and the Environment's "Working for" programs focus on restoring ecological infrastructure, while the Department of Agriculture, Land Reform, and Rural Development's LandCare programs emphasize sustainable land management in agricultural areas.

Thicket restoration helps reduce GHG emissions by enhancing carbon sequestration, as restored thickets absorb and store carbon dioxide in their biomass and soil. Additionally, healthy thickets improve soil quality and stability, reducing the release of carbon stored in the soil and minimizing soil erosion. Overall, thicket restoration contributes to a more resilient and sustainable ecosystem that plays a crucial role in reducing the country's GHG emissions.

Table 2.48 provides a summary of thicket restoration and the information for emission reductions is indicated in Table 2.49.

Table 2.48: Thicket Restoration

No.	Name	Description	Objectives	Type of instrument
16	Thicket Restoration	Thicket restoration activities in South Africa focus on rehabilitating degraded thicket ecosystems to enhance biodiversity, improve soil quality, and increase carbon sequestration, thereby supporting environmental sustainability and climate change mitigation.	The main objective of thicket restoration in South Africa is to rehabilitate degraded thicket ecosystems involving the replanting of thicket vegetation to enhance biodiversity and improve ecological health, with the purpose of increasing carbon sequestration and thereby reducing GHG emissions.	Regulatory measures

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Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2006	DFFE; Department of Agriculture

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PaMs
Compliance and MRV costs for reporting entities (systems, verification, staffing); government administration costs	Better emissions data quality; improved corporate energy management; transparency; supports investment decisions.	Provides the MRV backbone for Carbon Tax (verification), Climate Change Act (budgets/SET monitoring), NDC reporting, and evaluation of PAM impacts (e.g., IRP, REI4PP, EE).

Table 2.49: Estimates of GHG emission reductions of Thicket Restoration

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	23.19	2025	23.52
2024	22.91	2026	24.15

2.4.3.5.6 Shrubland restoration and afforestation

Shrubland exists in South Africa distributed in the Northern Cape, Western Cape and Eastern Cape. Smaller areas of karroid type shrubland exists in other interior provinces such as Northwest and Free State. Shrubland restoration and afforestation aligns with the medium-term (2030) UNCCD commitment to combat desertification by rehabilitating and sustainably managing 1 349 714 ha of fynbos; 149 877 ha of Succulent Karoo and 528 632 ha of Nama Karoo. The restoration and afforestation of shrubland align with the National Biodiversity Framework (2019-2024) and the National Biodiversity Strategy and Action Plan (2015-2025) by promoting ecosystem restoration, enhancing climate resilience, protecting biodiversity, and supporting sustainable land use. The Working for Ecosystems programme, under the DFFE, focuses on restoring degraded landscapes through ecosystem rehabilitation and invasive alien species control, particularly in Karroid regions. Similarly, the Working for Water Programme targets the removal of invasive alien species that degrade water resources and ecosystems, including those affecting Karroid vegetation in arid regions, thereby helping to restore natural shrublands, enhance water availability, and improve biodiversity.

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The restoration and afforestation of shrubland vegetation help reduce South Africa's GHG emissions by enhancing carbon sequestration in arid and semi-arid regions. Restored shrublands capture and store carbon in plant biomass and soils, which can mitigate emissions from other sectors. Additionally, restoration prevents further land degradation, reducing the release of carbon stored in soils.

Table 2.50 provides a summary for shrubland restoration and afforestation and the information for emission reductions is indicated in

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Table 2.51.

Table 2.50: Shrubland Restoration and Afforestation

No.	Name	Description	Objectives	Type of instrument
17	Shrubland Restoration and Afforestation	Initiatives that are a part of the Department of Forestry, Fisheries, and the Environment's policy and programmes which focus on rehabilitating degraded shrublands, improving soil fertility, and restoring vegetation cover to prevent further degradation	For the Karoo, objectives include restoring degraded landscapes, enhancing soil and water management, and promoting sustainable land use to improve ecosystem health and carbon sequestration, while for the Fynbos, the goals are to conserve biodiversity, protect high-biodiversity areas, restore degraded lands, integrate biodiversity into land use planning, and enhance ecosystem resilience to climate change.	Regulatory measures

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2006	DFFE

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PAMs
Compliance and MRV costs for reporting entities (systems, verification, staffing); government administration costs	Better emissions data quality; improved corporate energy management; transparency; supports investment decisions.	Provides the MRV backbone for Carbon Tax (verification), Climate Change Act 22 of 2024 (budgets/SET monitoring), NDC reporting, and evaluation of PAM impacts (e.g., IRP, REI4PP, EE).

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Table 2.51: Estimates of GHG emission reductions of Shrubland Restoration and Afforestation

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	23.65	2025	27.02
2024	26.31	2026	27.74

2.4.3.6 Waste

2.4.3.6.1 Municipal Landfill Gas Destruction

Municipal Landfill Gas Destruction in South Africa, as mentioned in the National Waste Management Strategy of 2020 and regulated by the National Environmental Management: Waste Act of 2008: National Standards for the extraction, flaring or recovery of landfill gas 2013, focuses on capturing and destroying CH_4 emissions from landfills to mitigate GHG emissions and reduce environmental impact. The strategy promotes the installation of landfill gas extraction and flaring systems, encouraging municipalities to adopt these technologies to improve waste management practices. By converting landfill gas into energy, the initiative also supports renewable energy development and contributes to South Africa's broader climate change mitigation goals.

Table 2.52 provides a summary for municipal landfill gas destruction and the information for emission reductions is indicated in Table 2.53.

Table 2.52: Municipal Landfill Gas Destruction

No.	Name	Description	Objectives	Type of instrument
18	Municipal Landfill Gas Destruction	Municipal landfill gas extraction and flaring activities in South Africa involve capturing methane emissions from landfills and burning them to reduce GHG emissions and environmental impact	The capturing and safe destruction of methane from landfills, thereby mitigating climate change and minimizing the environmental impact of waste disposal.	Regulatory measures

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CO_2	2008	DFFE

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Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PAMs
Compliance and MRV costs for reporting entities (systems, verification, staffing); government administration costs	Better emissions data quality; improved corporate energy management; transparency; supports investment decisions.	Provides the MRV backbone for Carbon Tax (verification), Climate Change Act 22 of 2024 (budgets/SET monitoring), NDC reporting, and evaluation of PAM impacts (e.g., IRP, REI4PP, EE).

Table 2.53: Estimates of GHG emission reductions of Municipal Landfill Gas Destruction

Estimates of GHG emission reductions	
Achieved	Expected
Not reported[14]	Not reported[14]

2.4.3.7 National Waste Management Strategy

The National Waste Management Strategy (NWMS) published in 2020 establishes a cohesive strategy and framework for enacting the Waste Act, detailing the government's policy and strategic approach to waste management. The primary aim of the strategy (DFFE; 2020) is to create a sustainable, efficient, and inclusive waste management system that minimizes environmental impact, promotes socio-economic development, and transitions towards a circular economy. The NWMS 2020 addresses key waste management issues by providing a service delivery model based on the waste management hierarchy, with specific objectives, actions, and targets for different waste streams. This includes promoting alternatives to landfilling, composting, and energy recovery, encouraging sustainable product design and packaging, advancing residential separation at source programs, and supporting the development of skills in the waste sector. It also aims to strengthen the role of waste pickers, align enforcement responsibilities, support local governments in implementing integrated waste management plans, and coordinate a comprehensive public awareness program. An update to the NWMS 2020 is currently in draft – the Draft National Waste Management Strategy 2026 was gazetted on 19 December 2025.

The NWMS 2020 has helped cumulatively reduce GHG emissions through several initiatives: promoting waste minimization, enhancing recycling and reuse, encouraging composting and

[14] To avoid double accounting as there are projects registered under carbon credit mechanisms

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energy recovery, supporting sustainable product design, facilitating residential separation at source, integrating waste pickers into the formal system, developing waste management infrastructure, and raising public awareness. These efforts collectively reduce the amount of waste in landfills, lower methane emissions, and decrease the carbon footprint of production and disposal processes.

Table 2.54 provides a summary of the NWMS 2020 and the information for emission reductions is indicated in Table 2.55.

Table 2.54: National Waste Management Strategy

No.	Name	Description	Objectives	Type of instrument
19	Waste Management Strategy	The South African National Waste Management Strategy (NWMS) 2020 is a comprehensive framework designed to guide the country's efforts in managing waste sustainably and effectively. The strategy builds on previous versions, aiming to address current challenges and align with international best practices	Promote waste minimization, reuse, recycling, and recovery. Ensure effective and efficient delivery of waste services. Enhance the waste sector's contribution to the green economy. Raise awareness about the impact of waste on health, well-being, and the environment. Achieve integrated waste management planning. Ensure sound budgeting and financial management for waste services. Provide measures for the remediation of contaminated land. Establish effective compliance with and enforcement of the Waste Act.	Other

Status	Sector affected	Gases affected	Start year of implementation	Implementing entity
Implemented	Energy	CH_4	2011	DFFE

Costs / Investment Information	Key Non-GHG Mitigation Benefits	Interaction with other PAMs
Public sector programme and municipal service delivery costs; investments in collection, sorting, recycling infrastructure, landfill upgrades; potential private investment in recycling.	Public health; reduced pollution/leachate; job creation in recycling; improved municipal service delivery.	Provides enabling framework for landfill gas capture/destruction and recycling/composting measures; interacts with Climate Change Act targets and reporting.

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Table 2.55: GHG emission reductions of the National Waste Management Strategy

Achieved		Expected	
Year	Emission Reduction (Mt CO_2-eq)	Year	Emission Reduction (Mt CO_2-eq)
2023	0.02	2025	0.02
2024	0.02	2026	0.02

2.4.4 Identification and explanation for those PAMs that are no longer in place

The PAMs identified as no longer being in place have generally either been superseded by new regulatory frameworks, discontinued due to funding or implementation challenges, or are no longer being monitored and reported as standalone interventions. The National Climate Change Response Policy was replaced by the Climate Change Act No. 22 of 2024, which now serves as South Africa's overarching climate policy framework. The Integrated Demand Management Programme continues in a limited form but is no longer tracked separately for emissions reductions, making attribution difficult. Private sector embedded solar generation remains active; however, it is no longer monitored, tracked, or reported independently from other non-IPP renewable generation sources. The Private Sector Energy Efficiency Programme ceased after funding ended in November 2015, with no replacement funding secured and insufficient data available on ongoing project performance. The Natural Gas Fuel Switch Programme is assumed to have ended because there is no recent information confirming that associated carbon credit projects remain active, although natural gas continues to be supported through the emerging Gas Master Plan. Similarly, the Nitrous Oxide Reduction Projects are considered no longer in place because the related carbon credit projects are no longer active, with the last verified emissions reductions and crediting occurring up to 2019-2020, and insufficient evidence exists to confirm continued emissions reduction activities.

2.4.4.1 National Climate Change Response Policy

The National Climate Change Response Policy (NCCRP) is superseded by the Climate Change Act No 22 of 2024 as the umbrella regulatory framework that underpins the country's NDC and all of government's regulatory mitigation instruments. This PAM is no longer in place.

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2.4.4.2 Integrated Demand Management (IDM) Programme

This PaM is no longer in place. While the name "IDM" persists and its basic goal, reducing electricity demand is unchanged, it now operates as a smaller, distribution-level, tender- and advisory-driven programme with tighter funding, rather than the well-resourced, nationally coordinated effort it was at inception in 2005. The emission reductions of the PAM are no longer actively tracked since 2018. Since the emission reductions from the IDM Programme are no longer reported separately from those of the Municipal Energy Efficiency and Demand Side Management Programme and the 12L Tax Incentive Programme, disentangling and attributing emission reductions specifically to the IDM Programme is challenging.

2.4.4.3 Private sector embedded solar generation

For the BTR1 , the emission reductions were estimated from secondary activity data sets, specifically about new installed capacity additions in MW, which are converted to GWh. These data sets were obtained from the South Africa Solar PV Update Report by the Association for Renewable Energy Practitioners. However, a more recent report with data for 2023 to 2024 was not available. Methodologically for quantification of electricity generation and associated emission reductions from private sector embedded solar generation, this would need to be deducted from the aggregated data of renewable electricity generation in the country. Additionally, NERSA does present the data for non-IPP in graphical format in their monitoring performance reports – however this is not disaggregated by energy source.

This indicates that private sector embedded solar generation is no longer monitored, tracked and reported separately from other non-IPP energy generation. While the activity continues, it is considered as no longer in place as a PAM.

2.4.4.4 Private Sector Energy Efficiency Programme

The South African Private Sector Energy Efficiency (PSEE) Programme was designed to support and incentivize businesses to adopt energy-efficient practices and technologies. Its primary objectives were to improve energy performance, reduce operational costs, and promote the implementation of energy-saving measures across a range of industries. Through the provision of resources, technical assistance, and financial incentives, the programme assisted businesses in reducing their energy consumption, thereby lowering the demand for electricity generated from fossil fuel sources. This reduction in energy use contributed to decreased GHG emissions, supported South Africa’s broader climate objectives, and fostered a more sustainable and environmentally friendly economy.

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This PAM is no longer in place, Funding for the programme ended in November 2015 and no replacement funding was secured to continue activities after 2015. There is insufficient data available to ascertain whether the projects are ongoing or not and the level at which operational projects are performing (i.e. generating energy savings) for the carrying over of the GHG emission reductions from the programme for years after 2015.

2.4.4.5 Natural Gas Fuel Switch Programmes

The South African Natural Gas Fuel Switch programme was an initiative designed to promote the transition from coal and oil to natural gas as a cleaner energy source for industrial and power generation processes. A summary of the program is provided in Table 2.34. Its main objectives were to reduce GHG emissions, improve air quality, and enhance energy efficiency. By encouraging industries to adopt natural gas, which burns more cleanly and efficiently than coal and oil, the programme aimed to lower carbon dioxide and other harmful emissions. This shift helped to mitigate climate change, as natural gas produces significantly fewer GHGs compared to traditional fossil fuels, supporting South Africa's efforts to reduce its carbon footprint and advance towards a more sustainable energy future. The projects related to the program were registered under carbon credit mechanisms.

However, the most recent monitoring report for one of the projects under CDM is from 2017 and the most recent issuance of credits for one of the projects also under CDM is for 2012. As there is no information available to ascertain whether any of the projects under carbon credit mechanisms are still active, it is assumed that the natural gas fuel switch program is no longer in place.

Furthermore, natural gas remains relevant to the country’s fuel needs. Natural Gas as a fuel source is bolstered in policy by the draft Gas Master Plan gazetted on 26 April 2024. It aims to ensure secure and cost-effective gas supply by sourcing from both domestic and international markets, while developing infrastructure such as LNG import terminals, storage facilities, pipelines, and regasification plants. The Gas Master Plan will be reported as a separate Energy sector PAM once it is finalised by the Department of Electricity and Energy (DEE). The DEE Strategic Plan for 2025 to 2030 mentions the department is in the process of finalising the Gas Master Plan (DEE, 2025).

2.4.4.6 Nitrous Oxide Reduction Projects

South Africa's N_2O Reduction Projects typically involve the implementation of advanced technologies and process modifications to capture and convert N_2O into less harmful

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substances. A summary of the program is provided in Table 2.44. Techniques such as catalytic decomposition, where specialized catalysts break down N_2O into nitrogen and oxygen, and the integration of emission control systems are common. By reducing N_2O emissions, these initiatives aim to lower the environmental impact of nitric acid production, contribute to improved air quality, and support South Africa's climate goals by reducing GHG emissions.

The N_2O Reduction Projects are registered under carbon credit mechanisms. The most recent year for which emission reductions were monitored and credited was 2019. For all projects, the CDM registry indicates that certified emission reductions were requested up to December 2020. The CDM projects are no longer active under carbon credit mechanisms. There is insufficient data available to ascertain whether the projects continue to generate GHG emission reductions. The N_2O Reduction Projects are assumed to be no longer in place.

2.4.5 PAMs that influence GHG emissions from international transport

The Department of Transport's (DoT) Green Transport Strategy (GTS) references international transport policy and associated CO_2 emission reduction measures to contextualize its reporting and identify the actions and domestic policy interventions South Africa has implemented in response to these objectives (DoT, 2018).

2.4.5.1 International aviation

The GTS mentions the basket of measures ICAO is pursuing towards reducing GHG emissions (ICAO, 2019) including aircraft technology improvements, operational improvements, sustainable aviation fuels, and market-based measures (CORSIA). The State Action Plan 2016 covers Performance Based Navigation (PBN) (DoT, 2025). The Draft Comprehensive Civil Aviation Policy (DoT, 2025) mentions the State Action Plan 2016 and the focus on PBN but acknowledges that the country also has potential to produce Sustainable Aviation Fuels (SAF) and other low carbon energy sources useful for aviation. IATA also acknowledged South Africa's potential role in the region to become a major SAF producer in a 2024 press release (IATA, 2024).

2.4.5.2 International maritime transport

South African Maritime Safety Authority (SAMSA) serves as South Africa's primary maritime regulatory authority, implementing and enforcing national and international maritime standards and thereby enabling South Africa to fulfil its obligations as a Member State of the International Maritime Organization (IMO). In this role, it bridges international maritime law and domestic shipping practice. There has been progressive dialogue between the Department of Transport

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and SAMSA with the IMO towards aligning the country's maritime PAMs with the IMOs GHG reduction strategy (News Desk, 2025).

SAMSA Marine Notice MN 06-22 – This SAMSA notice explains the mandatory MARPOL Annex VI energy efficiency regime introduced to reduce GHG emissions from international shipping, covering the Energy Efficiency Existing Ship Index (EEXI), the Carbon Intensity Indicator (CII) rating, and the three-part Ship Energy Efficiency Management Plan (SEEMP Parts I–III), all taking effect from 2023. The regime applies to ships of 400 gross tonnage and above engaged in international voyages (SEEMP Part I), ships of 5,000 gross tonnage and above for fuel consumption data reporting under the IMO Data Collection System (SEEMP Part II), and cargo, RoPax, and cruise vessels above 5,000 GT trading internationally for CII rating purposes (SEEMP Part III); it excludes ships not propelled by mechanical means and platforms such as FPSOs, FSUs, and drilling rigs, as well as South African-flagged vessels engaged solely on domestic or coastal voyages, which are not currently required to comply with the EEDI or SEEMP requirements.

SAMSA has issued two marine notices in relation to readiness to implement the marine sulphur cap of 0.5%, as provided for in the MARPOL Annex VI (SAMSA, 2019). SAMSA's Marine Notice 8 of 2019, communicates the global commencement of the IMO's 0.50% sulphur cap on marine fuel from 1 January 2020. The notice outlines the compliance options available to ships, including low-sulphur compliant fuels, exhaust gas cleaning systems (scrubbers), and alternative fuels such as LNG and biofuels. MN-42-of-2020 – Supplementing MN 8 of 2019, this SAMSA notice confirms South Africa's continued acceptance of all approved Exhaust Gas Cleaning Systems (scrubbers) as a means of complying with the IMO's 0.50% sulphur cap on marine fuel, pending completion of a study into the environmental impact of open-loop wash-water discharge.

2.4.6 How actions, policies and measures are modifying longer-term trends in GHG emissions and removals

Many of the PAMs outlined in this BTR influence GHG emissions and removals in the short term. The Climate Change Act 22 of 2024 introduces instruments—such as sectoral emissions targets and carbon budgets and strengthens the implementation of mitigation plans—designed to guide sectors toward transformative actions that support long-term GHG emission reductions. A 2020 study conducted by DFFE on the long-term impacts of existing and planned PAMs found that four key factors have driven historical trends in GHG emissions over time.

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The decline in cost of renewable energy technologies has supported greater mitigation within the electricity sector. GHG emission reductions due to renewable energy production in 2023 and 2024 have doubled compared to 2014.

Reduced demand for liquid fuels is occurring because of improved efficiency, shifts in transport modes, and the growing adoption of fuel cell and electric vehicles. GHG emission reductions from electric vehicles are steadily increasing as the electric vehicle market has expanded to include more vehicle brands and lower priced vehicles.

Weaker economic growth has also contributed, resulting in decreased industrial activity and lower energy use.

Enhanced knowledge of South Africa's land-based carbon sequestration capacity suggests that previous estimates of removals in the land sector were too low.

2.4.7 Economic and social impacts of PAMs

The DFFE had undertaken mitigation analysis as part of the SETs determination to evaluate the socio-economic implications of stricter emission limits.

By 2030, all scenarios—including the "With Existing Measures" (WEM) scenario—are projected to meet the NDC targets, although the WEM scenario sits close to the upper limit, at about 5 Mt CO_2eq below the high end and much further from the lower limit. This close margin indicates that additional mitigation efforts are needed to remain within the upper NDC range. The Current Policy scenario performs better, achieving 396 Mt CO_2eq, followed by the Full Policy scenario at 376 Mt CO_2eq, both providing greater distance from the upper limit. The Towards the Net Zero Path scenario achieves the lowest emissions at 355 Mt CO_2eq, placing it very close to the lower end of the NDC range.

Stricter emission limits across the economy do not intend in restructuring the economy. The services sector requires the largest portion of climate finance investment for higher emissions reductions. The highest investments occur in the Full Policy and Net Zero scenarios, at about R808 billion per year between 2026 and 2030, compared to lower amounts under other scenarios. The Full Policy scenario needs slightly more funding due to higher spending on vehicles and electricity storage, while the Net Zero Path uses less energy because of efficiency and transport shifts. The JET-IP will be important for supporting these investments but may need to expand to cover more sectors.

The Full Policy and Net Zero Path scenarios are expected to create the most jobs, reaching about 16.37 million and 16.29 million jobs by 2030, compared to 15.8 million under the WEM

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scenario. This represents a 5% and 3.1% increase in employment, respectively, with the Full Policy scenario requiring slightly more jobs due to higher spending on transport and energy storage. The Current Policy scenario shows a smaller increase, reaching around 16.02 million jobs. Most employment is concentrated in the services sector, although job gains are strongest in manufacturing and construction, while employment declines slightly in electricity and petrochemical sectors.

2.5 Summary of greenhouse gas emissions and removals

A summary of the 2024 NID for South Africa is presented in a tabular format in Chapter 1 of this BTR and in CTF Table 6.

2.6 Projections of greenhouse gas emissions and removals, as applicable

GHG emissions are projected for a 'with measures' (With Existing Measures or WEM) scenario and a "with additional measures" (WAM) scenario for the period 2024 to 2035. The projections are shown in Figure 2.7 for the WEM scenario and in Figure 2.8 for the WAM scenario. South Africa has not identified the reported projection as its baseline. The GHG projections begin from the most recent year of the National Inventory extending to 2030 (2025 to 2030) with the preceding GHG emission values being from the National Inventory. The "with additional measures" scenario represents an expansion in the scope of GHG emissions projection reporting in South Africa's current BTR. However, South Africa is not yet in a position to report on a "without measures" (WOM) scenario, as this analysis was not included within the scope of the modelling exercise described in Section 2.6.2. The inclusion of a WOM scenario is being considered for future BTR submissions as reporting capabilities continue to evolve.

South Africa has applied the flexibility provision in para 95 of the MPGs to report the projections for the time period from 2024 until the endpoint of the 2nd NDC which is 2035. South Africa's Climate Change Act No. 22 of 2024, in Sections 25(4)(b) and (4)(c), provides for GHG emission reduction goals to be determined for at least the period 2025 to 2045, aligned with the national GHG emissions trajectory. This means that the national GHG emissions trajectory would need to be specified for the 2025 to 2045 period as well. As mentioned in Section 2.4.1.2, Section 25(4)(c) of the Act has been deferred. Section 24(2)(a) of the Act does not state the specified period for the emissions trajectory. A gazetted

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proclamation notice by the President is required for the commencement of Section 25(4)(c) of the Act. Section 25(4)(c) is a key provision in the Act, as it sets the periodic boundaries for reporting emission reduction goals and, by extension, for the national emissions trajectory.

Since the national GHG emissions trajectory has not yet been specified, Section 24(3) of the Climate Change Act No. 22 of 2024 provides that: 'Until such time as the Minister publishes the national GHG emissions trajectory in terms of subsection (1), the latest updated NDC serves as the trajectory'. However, as previously mentioned in Section 2.2 of this BTR, the NDC targets are economy wide. It is implied in MPG Paragraph 95 that it is preferred for projections to be reported for every year. Additionally, MPG Paragraph 98 requires that projections be reported on a sectoral basis and by gas, as well as for the national total. Since the quantitative NDC targets do not cover these aspects, the reporting of GHG emission projections until 2035 draws upon the mitigation analysis undertaken as part of developing South Africa's 2nd NDC.

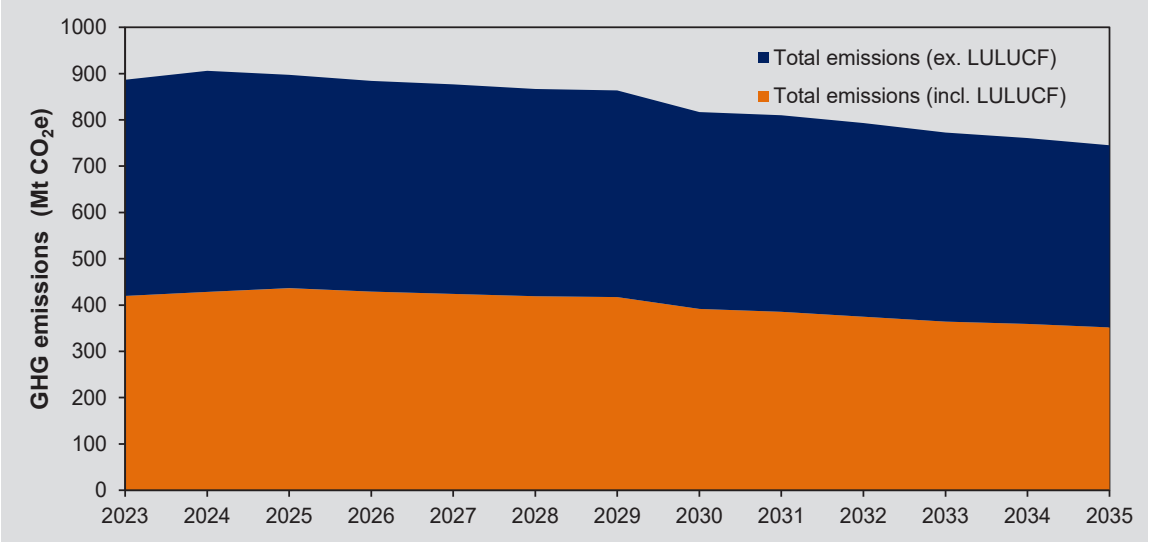


Figure 2.7: A 'with measures' (WEM) Projection of GHG Emissions and Removals 2024- 2035 and including inventory values for preceding years 2023 -2024

For the GHG emissions in WAM scenario shown in the figure below: A cumulative emissions constraint is used to model pathways with outcomes between 300 and 200 Mt CO_2-eq by 2035, showing that achieving lower emissions requires additional actions—particularly increased low-carbon electricity capacity—and involves trade-offs between reducing emissions in the electricity sector and synthetic fuel production. The electricity sector remains

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the main source of mitigation across all additional scenarios. Emissions reductions are also supported by cuts in synthetic fuel production at Secunda, which falls to minimum levels and even lower in scenarios allowing early retirement, easing mitigation pressure on power and industry. In the industry sector, emissions decline due to reduced economic activity and some technological shifts, such as changes in steel production methods and limited hydrogen use. Transport mitigation comes from a faster transition to electric vehicles and some shift from road to rail—especially in freight—depending on fuel and EV costs.

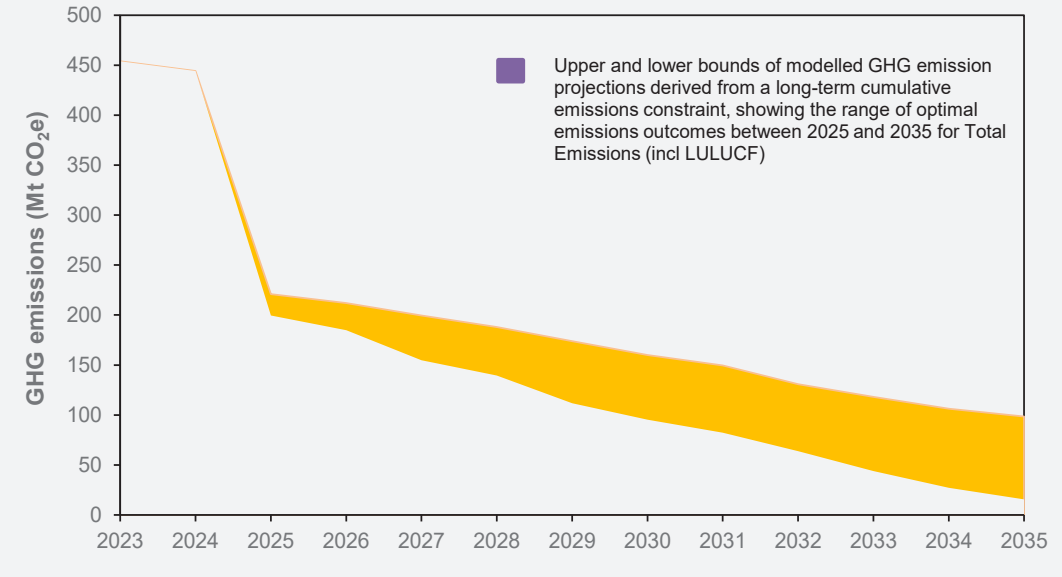


Figure 2.8: A 'with additional measures' Projection of Greenhouse Gas Emissions and Removals 2025- 2035 and including inventory values for preceding years 2023 -2024

2.6.1 Projections on a sectoral basis and national total

The scope of the applicable MPG para 98 for reporting in this sub-section is to include GHG emission projections on a sectoral basis, by gas and for the national total for WEM, WAM and WOM scenarios.

The reporting of the WAM scenario is an expansion in the scope of GHG emissions projection reporting in South Africa's current BTR compared to BTR1. Application of the flexibility provision para 102 of the MPGs allows South Africa an opportunity to report transparently to the extent possible in light of capacities at the time of compiling this BTR. As such, reporting of GHG emission projections in this BTR will not cover:

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- Projections by gas for the WEM scenario
- Projections on a sectoral basis for the WAM scenario
- Projections by gas for the WAM scenario
- Projections on a sectoral basis, by gas and for the national total for the WOM scenario.

These reporting requirements are not covered in this BTR because the GHG emission projection data for those aspects was not available. The mitigation analysis undertaken as part of developing South Africa's 2nd NDC is the source of the GHG emission projections shown in the figure in this sub-section. BTR3 submitted in 2028 will report on the 3rd NDC. The technical analysis for the mitigation component of the 3rd NDC will need to include the GHG emission projections for aspects mentioned above for the WEM and WAM scenarios along with the related methodology and assumptions. This technical analysis work for the 3rd NDC will require additional capacity in terms of financial resources covering direct project related costs to complete the extended GHG modelling.

The inclusion of a WOM scenario is being considered for future BTR submissions as reporting capabilities continue to evolve. Australia's BTR1 pp 103 explains that "it is difficult to disentangle the impact of climate policies in place for over 25 years from other prevailing economic factors that drive emissions and that any 'without measures' projection is fraught with uncertainty". Additionally, a WOM scenario is not reported in the BTR1 of the United Kingdom as the country had not found a suitable modelling methodology. As such the reporting of a WOM scenario in future South African BTR reports also is dependent on global best practice for modelling methodologies for which the country is eager to learn from its developed peers.

GHG emissions projections are reported on a sectoral basis in this sub-section for the WEM scenario in the figure below. GHG emissions projections are reported for the national total (including LULUCF) for the WEM scenario in Figure 2.7 and for the WAM scenario in Figure 2.8.

As shown in the figure below, for the WEM scenario, by 2035, total GHG emissions (incl LULUCF) decline to below 400 Mt CO_2e levels. Most GHG emissions still arise from the energy sector, particularly from energy supply, transformation, and use, with most of the changes from 2024 occurring in the electricity sector. The largest source of emissions reductions in the energy sector is the electricity subsector, driven by planned coal retirements and the addition of new low- and zero-emissions capacity. Contributions from the transport sector to emissions are mainly due to a market-driven increase in private and public electric vehicle (EV) uptake.

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Changes in the IPPU sector do not reflect significant emission reductions, as there are no major technological shifts.

Overall, AFOLU emissions are projected to grow in the medium term due to increases in livestock populations associated with positive economic growth, although this growth is partly offset by the expansion of the forest land carbon sink. Waste sector emissions are expected to grow slightly, driven by population increase particularly due to stable per capita waste generation and the organic fraction of waste disposed to landfills. Additionally, waste emissions are influenced by increases in wastewater treatment, reflecting growth in the number of households connected to centralized sewerage systems.

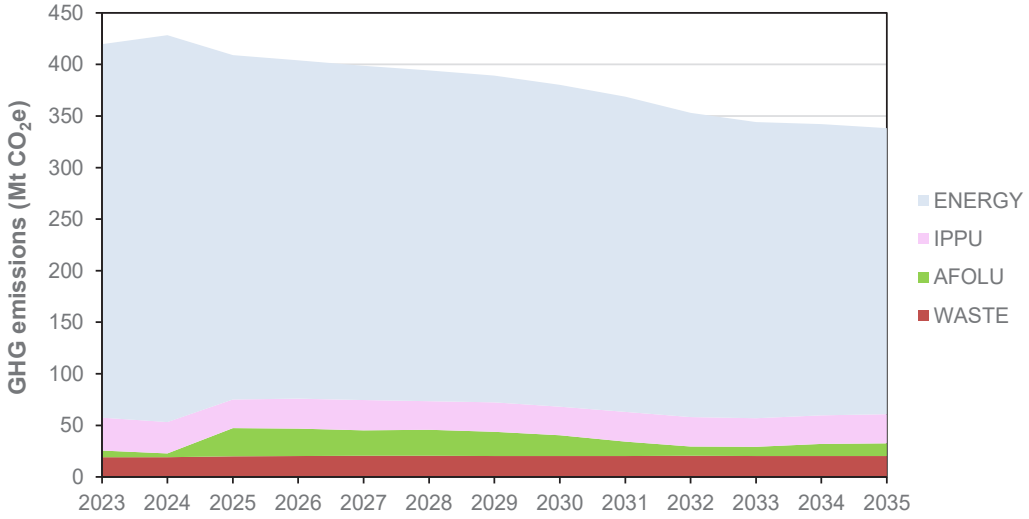


Figure 2.9: GHG emission projections up to 2035 disaggregated by emission sector for the WEM scenario.

2.6.2 GHG emission projection methodology

2.6.2.1 The model

The mitigation analysis of both existing and additional policies and measures has been conducted using the South African TIMES Model - General Equilibrium modelling framework (SATIMGE). The modelling framework combines the South African TIMES model—representing the country's energy and industrial system on the TIMES platform—with the eSAGE computable general equilibrium model, a dynamic, recursive, economy-wide model that simulates the functioning of the South African economy.

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The systems modelling framework consists of five components:

- The South African TIMES (SATIM) model is a representation of the country's energy and industrial system developed on the TIMES modelling platform. It has been built, maintained, and refined over more than two decades by the Energy Systems Research Group at the University of Cape Town. SATIM is an intertemporal, bottom-up, partial equilibrium optimisation model of South Africa's energy sector, incorporating key elements of the industrial system related to material flows and GHG emissions. The model is grounded in energy system and conversion principles, and its objective is to minimise the total discounted system costs over a defined planning horizon, subject to technological, economic, and policy constraints. As a comprehensive full-sector model, it captures all energy demand, supply, and transformation pathways. SATIM is calibrated to the 2017 national energy balance and aligned with the most up-to-date technology, energy, and emissions data. The underlying TIMES model framework is developed and supported by the IEA's ETSAP programme and is widely used internationally for energy and climate policy analysis.
- The eSAGE model is the energy-focused version of the South African General Equilibrium model, designed as a dynamic, recursive, economy-wide framework that operates at the national level to simulate the functioning of the South African economy. It builds on the core static computable general equilibrium (CGE) model developed by the International Food Policy Research Institute (IFPRI), calibrated using South Africa's social accounting matrix. The model has been enhanced with greater detail in the energy sector, allowing it to capture and analyse shifts in energy technologies more precisely.
- A spreadsheet-based model used to estimate greenhouse gas emissions from non-energy activities within the agriculture sector.
- A spreadsheet-based model of GHG emissions in the land sector, including those arising from land use, land-use change, and forestry (LULUCF)
- A spreadsheet-based GHG emissions model of the waste sector

The five components are closely integrated, with strong links that allow them to exchange key data such as drivers (e.g. population and GDP) and activity variables (e.g. investment and fuel use). This integration serves three main functions: first, SATIM provides a detailed, technology-rich representation of the physical energy and industrial systems; second, ESAGE feeds back into SATIM by capturing how investment decisions and system costs affect the broader economy and households; and third, the inclusion of the land, agriculture, and waste models ensures consistency in key drivers like GDP and population, as well as alignment across sectors where causal relationships exist. For example, activities such as firewood extraction for household energy use are represented both in SATIM and in the land sector model, ensuring coherence across the modelling framework.

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2.6.2.2 Key underlying assumptions and parameters used for projections

Projections of useful energy service demand are driven by the growth of key underlying factors that determine energy needs across sectors. GDP is the primary driver, influencing energy demand in all sectors, while population growth has a direct effect on residential and transport energy demand and an indirect impact on other sectors. GDP growth scenarios are based on data from National Treasury and the Organisation for Economic Co-operation and Development (OECD) forecasts. The three economic growth scenarios are shown in the figure below. Population growth assumptions are based on UN Population projections shown in Figure 2.11.

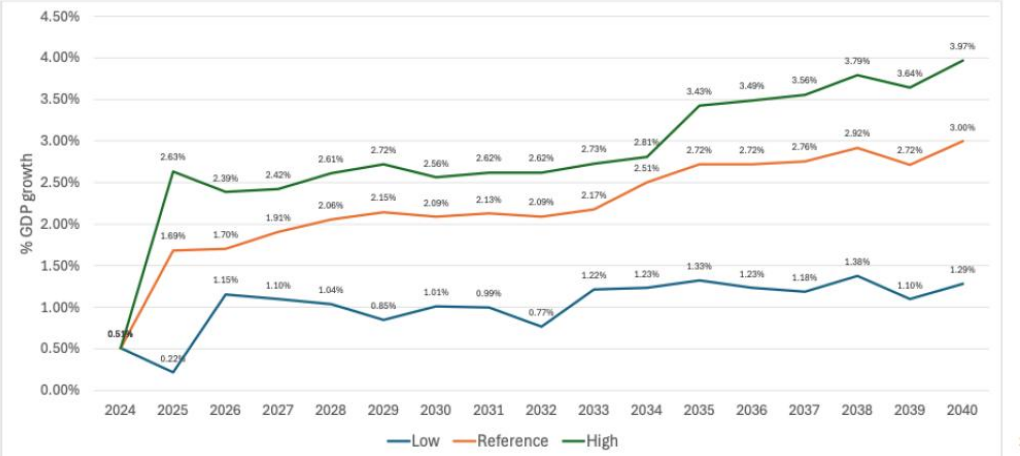


Figure 2.10: High, Low and Medium Growth Economic Scenarios used in SATIMGE modelling framework.

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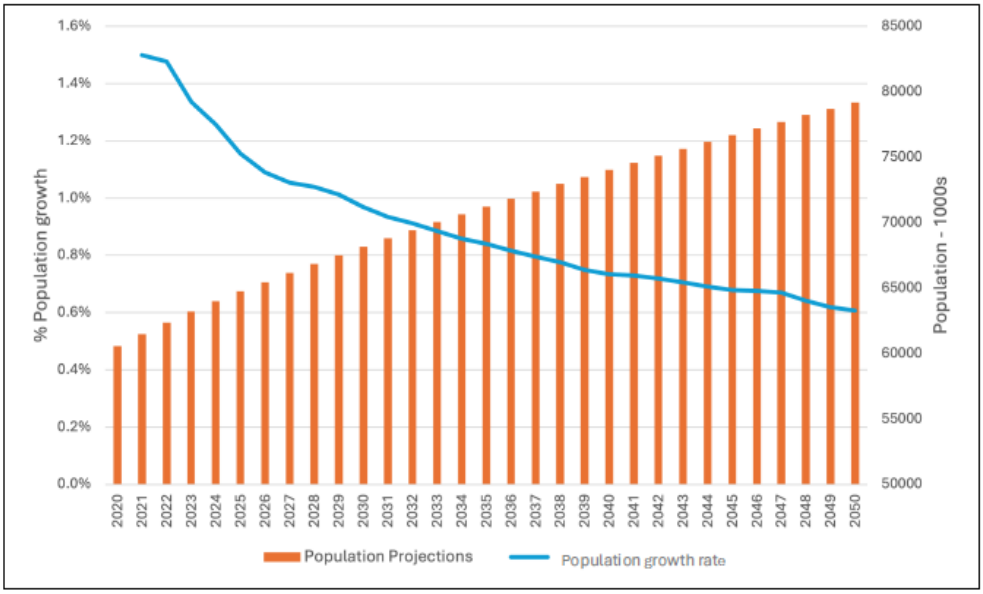


Figure 2.11: Population growth from UN population projections used in the SATIMGE modelling framework

2.6.3 Changes in the methodology since the Party's most recent biennial transparency report

In BTR1, the use of the Analytica based DFFE Integrated Climate Change Mitigation Model is mentioned as the model for GHG emission projections for South Africa up to 2050. These projections inform the SETs described in section 2.4.1.3. The SETs were first published for public comment in April 2024. In August 2025, GIZ put out a tender for a research study to refine and finalise the SETs for 2025 to 2030. The purpose of this refinement and finalisation is to incorporate stakeholder feedback, ensure the targets are realistic and achievable, and align the targets with the country's national climate goals and socio-economic objectives. The scope of work for the research study includes updating the Integrated Climate Change Mitigation Model. Information about the revised methodology and assumptions of the model are not available at the timing of producing this BTR as the research study is still ongoing. As such GHG emission projections and the modelling methodology and assumptions for SATIMGE sourced from the mitigation analysis undertaken as part of developing South Africa's 2nd NDC has been reported in this BTR.

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GHG emission projections from mitigation analysis of current PAMs and additional PAMs using the SATIMGE modelling framework is described in this BTR. SATIMGE is actively used in policy processes, including the first and second NDC updates. SATIMGE modelling framework is not used in the analysis to assess progress towards the implementation and achievement of South Africa's NDC mainly because it is a forward-looking, scenario-based optimisation model rather than a monitoring or evaluation tool.

2.6.4 Assumptions on policies and measures included in the 'with measures' projections and 'with additional measures' projections

Assumptions for key policies and plans which were quantified and implemented in SATIMGE are listed below by sector.

2.6.4.1 Electricity

Draft IRP 2024 (NEDLAC version) – Includes aligning key baseline assumptions (such as technology costs and the coal fleet retirement schedule), implementing the prescribed investment plan, introduces endogenous demand, optimisation after 2042, and simplifying technology assumptions, resulting in lower coal utilisation and emissions compared to the IRP baseline.

SAREM – represented by imposing minimum annual investment thresholds for wind and solar PV from 2027 to 2040, with specified technology splits and increasing total capacity targets, after which no minimums apply. It also incorporates modest cost increases for wind and PV technologies to reflect localisation of manufacturing, rising gradually from 0.6% by 2030 to 1.2% by 2050.

Transport: Passenger/freight modal shift – extrapolated from the GTS (2018), other sources. is represented through mode shifting and electrification pathways, including increased rail use for both freight and passengers, higher Bus Rapid Transit uptake, reduced private vehicle mileage growth, and improved travel speeds due to lower congestion.

Shifts to EVs – fast, medium and slow shift parameterized in terms of when EVs in different classes reach capital cost parity with ICEs – consistent with various levels and timing of the localisation of EV manufacture. Electrification is modelled via three EV uptake scenarios (slow, medium, fast) based on different cost parity timelines between electric and internal combustion vehicles across transport modes, influencing the pace of transition to electric mobility.

Synthetic fuels – Sasol "roadmap" for GHG emissions to 2030. The Sasol roadmap is modelled for the Secunda facility only, targeting a 30% reduction in Scope 1 and 2 emissions by 2030

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(relative to 2017), achieved through renewable energy procurement, efficiency improvements, reduced gas use, and limited carbon credits. These interventions are represented as gradual efficiency and fuel shifts to 2030 that lower coal- and gas-based generation and replace it with contracted renewables, with additional structural decarbonisation options available thereafter and scenario variations depending on whether the roadmap is implemented.

Iron and steel sector – AMSA roadmap implemented through operational efficiency improvements, increased scrap use, and a shift toward electric steelmaking via the construction of an approximately 1.7 Mtpa electric arc furnace at Vanderbijlpark by 2029, initially fed by coal-based Direct Reduced Iron (DRI). Renewable electricity use is incorporated through the existing power-sector build plan, while longer-term options such as hydrogen-based production and additional DRI capacity are not enforced but are instead determined endogenously by the mode.

Carbon tax – current proposals implemented as per 2025 budget for post-2025 period. In SATIMGE, carbon tax is modelled under two scenarios: one where the current (2024) regime persists with planned rate increases to 2030 and unchanged allowances thereafter, and another where the tax is progressively tightened in line with National Treasury proposals, including declining allowances and broader sectoral coverage after 2030. The revised option introduces stricter limits on exemptions (e.g., phasing out carbon budget and process allowances), maintains offset provisions, and transitions the electricity sector from revenue-neutral treatment to full tax liability beyond 2030.

Energy efficiency – demand-side measures informed by the Post-2015 NEES and the draft SETs technical work for recent market information. The assumptions for energy efficiency measures in industry are indicated in Table 2.56.

Table 2.56: Assumptions for Energy Efficiency (EE) in industry

End use	Target	Comment
Lighting	All LED by 2030 with minimum 105 lm/W requirement	Baseline assumption ~10% are still Fluorescents in 2030. Based on General Service Lamps min energy efficiency.
Motors	Faster phase out of IE0,1,2 motors, faster phase in of IE3 and above from 2030. National average motor efficiency rises from baseline estimate for 2030 of 92.9% to 93.7%, and from 93.7% to 94.6% for 2040.	A faster phase out of existing stock of motors. Based on proposed MEPs strategy. Affects other systems.
Cooling	5% EE gain by 2030, 13% by 2040	System improvements plus motor EE gain.

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End use	Target	Comment
Compressed air	CA systems improve from 5% to 5.25% by 2030, and from 5.1% to 5.6% by 2040	System wide improvements for CA. Includes Motors efficiency gain.
Pumping	Assume same efficiency gain as motors EE measure	
Fans	Assume same efficiency gain as motors EE measure	
HVAC	Assume same efficiency gain as motors EE measure	
Other motive	Assume same efficiency gain as motors EE measure	
Boilers and steam	Fuel boiler + steam systems: 6% by 2030, 20% by 2040.Electric boiler + steam systems: 2% by 2030, and 7% by 2040	Based on assumptions about uptake of various boiler systems efficiency measures like installing economisers, burner upgrades, insulation, and others

For the WAM scenario: A cumulative emissions limit is used to create different possible long-term pathways, leading to a range of emissions outcomes by 2035. The extra actions needed to achieve each outcome can be understood by comparing key system features—such as the amount of low-carbon electricity capacity—to what is already planned under current policies. Based on earlier results, scenarios with emissions between 300 Mt and 200 Mt CO_2-eq were analysed. Within this range, trade-offs appear between major sectors, especially between cutting emissions in the electricity sector and reducing emissions from synthetic fuel production.

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2.6.5 Sensitivity analysis

A set of core scenarios were developed to assess how different PAMs influence GHG emissions and broader policy objectives by 2035 for the sensitivity analysis. The results of the analysis are summarised in the Table 2.57. The analysis is based upon the WEM scenario which includes current plans but no additional mitigation policies—shows that electricity sector developments are the dominant driver of emissions outcomes, with the model selecting least-cost pathways to meet energy needs.

“Least-cost” pathways in SATIM are determined by minimizing total discounted system costs over the modelling horizon, subject to constraints, while excluding non-energy sectors (e.g. agriculture, land use, and waste) and leaving exogenous parameters—such as transport modal shares—unchanged; importantly, least-cost outcomes still require substantial implementation effort.

The WEM scenario includes existing industry roadmaps (for Sasol and ArcelorMittal South Africa), all scenarios are tested across multiple growth rates and sensitivities (e.g. oil prices, coal plant performance, emissions standards), and additional economy-wide emissions constraints are applied to identify more ambitious mitigation pathways, resulting in a total of 7 scenarios and 92 variants.

The disaggregated results by sector show varying levels of responsiveness to GHG constraints and mitigation measures. The electricity sector remains the dominant source of GHG emissions and the main driver of change from 2024 onwards. This sector exhibits the greatest variation and responsiveness, delivering the largest emissions reductions due to planned coal retirements and the expansion of low- and zero-emissions generation capacity. In contrast, the liquid fuels supply sector shows declining emissions linked to Sasol’s coal-to-liquids (CTL) transition pathway.

In the transport sector, GHG emissions decline modestly, largely driven by a market-led increase in EV uptake across both private and public transport. Passenger EV growth is primarily market-driven, while passenger rail sees only limited expansion. With increasing car ownership, private vehicle use gradually rises, offsetting some potential gains. Freight demand continues to grow steadily through to 2035, accompanied by an early transition from internal combustion engine vehicles to EVs in road freight, particularly due to improving cost competitiveness of heavy- and light-duty electric vehicles. However, road freight remains dominant, accounting for about 81% of tonne-kilometres, and no significant shift to rail is expected without further policy intervention.

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The manufacturing industries sector shows a slight increase in emissions in line with economic growth, with limited technological transformation overall. While general manufacturing activity raises emissions, some improvements in heavy industry such as the adoption of arc furnaces, clinker substitution, and limited biomass use help stabilise or slightly reduce emissions in certain subsectors.

The waste, agriculture and LULUCF sectors are grouped together in Other.

In the waste sector, emissions are dominated by solid waste disposal in landfills, with wastewater treatment also contributing significantly. Emission trends in this sector are influenced by factors such as per capita waste generation, disposal methods, waste composition, and industrial activity, including changes in industrial waste and ash handling. GHG emissions in the waste sector are also responsive to GDP growth.

Agricultural sector emissions rise with GDP growth, driven mainly by increases in livestock, with methane from enteric fermentation being the largest contributor. Secondary emissions sources include agricultural soils and manure management, while practices such as field burning and fertiliser use contribute only marginally.

The LULUCF sector shows minimal responsiveness to GDP growth, largely due to the absence of explicit mitigation policies modelled for it in SATIMGE. Despite this, LULUCF functions as a growing carbon sink, projected to increase sequestration by around 10 Mt by 2035, with forest land being the primary contributor.

Table 2.57: Individual Impact of PAMs compared to the WEM scenario

WEM scenario and PaMs	Sectors					
	Electricity	Liquid fuels supply	Manufacturing Industries	Transport	Other	Total
WEM	130	39	73	49	65	356
Freight modal shift	130	39	74	48	65	356
Passenger modal shift	130	39	74	48	65	356
EV fast uptake	131	39	74	47	65	355
Energy efficiency measures	125	39	72	48	64	349
Carbon tax	120	39	74	47	64	345
draft IRP 2024 "light"	108	39	73	46	64	330
SAREM	98	39	73	46	64	319
draft IRP 2024	85	39	69	45	62	300

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2.6.6 Projections of key indicator

The total GHG emissions indicated in Figure 2.6 is the projection of the key indicator which is the total GHG emissions including LULUCF and excluding emissions from Natural Disturbances.

2.7 Other information

2.7.1 Recalculation of the indicator for 2021 and 2022 based on 2024 NID GHG emissions and removals

The 2022 NID is the basis for the accounting methodology of the indicator as was reported in BTR1. The 2024 NID is the basis for the accounting methodology of the indicator reported in this BTR. The 2022 NID and 2024 NID has been compiled in accordance with the guidelines provided by the UNFCCC and follows the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories (IPCC, 2006), IPCC Good Practice Guidance (GPG) (IPCC, 2000; IPCC, 2003; IPCC, 2014), 2019 Refinement to the 2006 IPCC Guidelines (IPCC, 2019) and sections of the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (IPCC, 2014a). The GWPs from AR5 were applied.

The NIR is subject to continuous improvement, so due to recalculations and refinements made in the 2024 NID, the GHG emissions and removals are different to those previously reported in the 2022 NID. The indicator for 2021 and 2022 reported in this BTR is different to what was previously reported in BTR1 for those years reflecting the recalculations and refinements made in the 2024 NID. This section provides a summary of the main recalculations and refinements for each sector because the 2024 NID reports on the technical aspects.

2.7.1.1 Energy

Emission estimates for the energy sector were enhanced through the use of country-specific CO_2 emission factors for solid fuels. These factors were derived from a 2022 study that developed interim Tier 2 CO_2 emission factors.

2.7.1.2 IPPU

The minor difference between the total GHG emissions for the sector in the 10th and 9th inventories reflects the limited number of changes undertaken. From 2022 onwards, Tier 2 and Tier 3 methodologies were incorporated into the SAGERS dataset for the IPPU sector. This resulted in more accurate estimates for Other Chemicals and Product Use categories, particularly ceramics, soda ash, and dolomite use. In addition, verification of selected

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production facilities identified previously unaccounted-for activities, further improving the accuracy of the estimates.

2.7.1.3 Agriculture

Updates to the agriculture inventory resulted in recalculations that affected the estimated GHG emissions for 2021 and 2022. These recalculations are attributed to the inclusion of organic soils for cropland and grassland within the agriculture sector. They also reflect the application of the 2019 IPCC Refinement emission factors for soil management, which are disaggregated according to wet and dry climate conditions.

2.7.1.4 LULUCF

Collectively, these represent the main improvements to the LULUCF inventory across the 2000–2024 recalculated time series which have contributed to the smaller GHG removals in 2021 and 2022 including:

- New 2020‑2022 land change matrix data.
- A technology-correction adjustment for the 2014‑2018 change map.
- Removal of the "land remaining land" error identified in the previous inventory.
- A new climate-informed method for correcting seasonal (wet/dry) land-cover fluctuations. Initial inclusion of organic soils estimates for Croplands and Grasslands.
- Improved soil data via soil-type-specific land-change matrices for each period.
- Updated biomass, carbon stock, and emission factor data.
- An improved burnt-area methodology.
- Updated fuelwood consumption data.
- Updated methodological improvements for the Wetland category − to better align with IPCC guidance and CRT reporting requirements.
- For natural disturbances, disturbance losses and subsequent regrowth gains are excluded from anthropogenic LULUCF accounting, in line with IPCC 2006 guidance.

The changes that led to additional impacts during this period were the introduction of the 2020-2022 land use maps and the correction of the “land-remaining” error. For the 2024 NID compilation, the error was removed and the focus shifted to refining the land conversion matrices prior to applying the 20-year correction.

- Adjustments for highly unlikely land conversions were made when the conversions typically result from classification errors rather than actual land-use dynamics.

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These areas flagged with these improbable transitions were reverted to their original land class prior to the reported change.

- Forest plantation land conversion corrections were applied to align mapped plantation areas with Forestry South Africa data. Three adjustments were made: (1) implausible conversions into forest plantations from flooded lands, wetlands, croplands, or settlements were reverted to their original class, preventing overestimated plantation expansion; (2) implausible conversions from forest plantations to flooded lands or wetlands were similarly reverted back to plantation; and (3) for the remaining, plausible conversions, the total plantation area was checked against FSA data and the conversion rate was conservatively halved to better match observed trends.
- An improved methodology for adjusting for seasonal change impacts on land conversions is applied. Using SAWS climate data and CHIRPS rainfall data, each change period was classified as a "wetting" or "drying" cycle, with a pre-set list of conversion classes expected to be inflated by rainfall (drying favors woodland→ grassland, grassland→ bare ground, etc.; wetting favors the reverse). For affected classes, 75% of the mapped conversion area was reverted to the original land class as a seasonal artefact. For 2021, in the "wetting" 2020–2022 period, 75% of wetting-favoured conversions (e.g., grassland→ woodland, bare ground→ shrubland) were reverted. For 2022, the same wetting correction applied for 2020–2022, while its extrapolation into the "drying" 2022–2024 period instead reverted 75% of drying-favoured conversions (e.g., thicket→ woodland, woodland→ grassland/bare ground, low shrubland→ bare ground/eroded land).

The estimated GHG emissions from natural disturbance in 2021 and 2022 as reported in the 2924 NID is smaller than previously reported in the 2022 NID. This is also mentioned under section 1.5 of Chapter 1 in this BTR. Natural disturbance impacts are estimated by accounting for both the immediate biomass carbon losses caused by events such as fires and the subsequent carbon gains that occur as vegetation regrows over time. The methodology applied in the 2022 NID excluded the carbon losses associated with natural disturbances, they did not exclude the carbon uptake from post-disturbance regrowth. In the 2024 NID, both the disturbance-related losses and the subsequent regrowth gains are excluded from the anthropogenic LULUCF accounting, consistent with IPCC 2006 guidance. As a result, the reported LULUCF sink (excluding natural disturbance) is smaller than that reported in the 2022 NID.

2.7.1.5 Waste

The GHG emissions from solid waste and wastewater treatment in the 2024 NID were recalculated due to inclusion of updated data from the 2018 State of Waste Report (DEA,

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2018) for the methane correction factors, waste generation rate, and waste composition. Additionally, methane recovery data was removed on the solid waste results.

2.8 Application of flexibility provision; planned improvements and capacity constraints related to the reporting of GHG emission projections

South Africa has applied the flexibility provision in para 95 of the MPGs to report the projections for the time period from 2024 until the endpoint of the 2nd NDC which is 2035. South Africa's Climate Change Act No. 22 of 2024, in Sections 25(4)(b) and (4)(c), provides for GHG emission reduction goals to be determined for at least the period 2025 to 2045, aligned with the national GHG emissions trajectory. This means that the national GHG emissions trajectory would need to be specified for the 2025 to 2045 period as well. As mentioned in Section 2.4.1.2, Section 25(4)(c) of the Act has been deferred. Section 24(2)(a) of the Act does not state the specified period for the emissions trajectory. A gazetted proclamation notice by the President is required for the commencement of Section 25(4)(c) of the Act. Section 25(4)(c) is a key provision in the Act, as it sets the periodic boundaries for reporting emission reduction goals and, by extension, for the national emissions trajectory.

Application of the flexibility provision para 102 of the MPGs allows South Africa an opportunity to report transparently to the extent possible considering capacities at the time of compiling this BTR for the reporting of projections on a sectoral basis, by gas and for the national total. Reporting of GHG emission projections in this BTR does not cover:

- Projections by gas for the WEM scenario
- Projections on a sectoral basis for the WAM scenario
- Projections by gas for the WAM scenario
- Projections on a sectoral basis, by gas and for the national total for the WOM scenario.

These reporting requirements are not covered in this BTR because the GHG emission projection data for those aspects were not available. The mitigation analysis undertaken as part of developing South Africa's 2nd NDC is the source of the GHG emission projections reported in this BTR. BTR3, to be submitted in 2028, will report on the 3rd NDC. The technical analysis for the mitigation component of the 3rd NDC will need to include the GHG emission projections for the aspects mentioned above, along with the related methodology and assumptions. This technical analysis work for the 3rd NDC will require additional capacity in

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terms of financial resources, covering direct project-related costs to complete the extended GHG modelling.

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2.10 Use of flexibility provisions

Flexibility provisions used in this chapter are listed in Chapter **Error! Reference source not found.** of this report.

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3 Information related to climate change impacts and adaptation under Article 7 of the Paris Agreement

3.1 National circumstances, institutional arrangements and legal frameworks

3.1.1 National Circumstances

3.1.1.1 Bio-geophysical characteristics

South Africa is located at the southernmost point of Africa and is characterised by high climatic and spatial variability in rainfall, temperature and ecosystems. The country covers multiple climatic zones, ranging from Mediterranean areas in the south-western Cape to semi-arid and arid regions in the western interior with subtropical climates along the east coast. Rainfall is unevenly distributed, with a national average of approximately 450 mm per year which is significantly below the global average. This contributes to South Africa being classified as a water-scarce country. Rainfall variability is strongly influenced by large-scale climate drivers such as the El Niño–Southern Oscillation, resulting in frequent droughts and extreme rainfall events.

The country's location and topography therefore expose it to multiple climate hazards, including:

- Drought and water stress, affecting large parts of the interior and western regions
- Intense rainfall and flooding, particularly along the east coast and urban areas
- Heat extremes, increasing across the entire country and affecting agricultural productivity, human health and ecosystems
- Wildfire risk, especially in fire-prone biomes such as fynbos and grasslands
- Coastal hazards, including sea-level rise, storm surges and coastal erosion

A critical aspect of South Africa's bio-geophysical context is the condition of its ecosystems and natural resource base, which directly influences both vulnerability and adaptive capacity. South Africa hosts globally significant biodiversity, including the Cape Floristic Region and diverse savanna and grassland systems. These ecosystems provide essential ecosystem services that support adaptation, such as water regulation and storage, flood attenuation, soil stabilisation, erosion control, carbon sequestration and supporting livelihoods.

However, many of these systems are increasingly degraded, reducing their ability to buffer against climate impacts. These include:

- Land degradation, which is driven by overgrazing, unsustainable land use practices, deforestation, mining, and urban expansion. It is estimated that over 20% of the country's natural terrestrial ecosystem extent has already been lost (NBA, 2026) while

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remaining natural land is in a degraded or moderately degraded condition, reducing its ecological functionality and resilience.

- Catchment, river system and wetland degradation remain a critical concern. Many wetlands have been transformed, degraded or polluted, reducing their capacity to function as natural hydrological buffers. Approximately 65% of river length and 86% of wetland ecosystems are under threat, while only about 25% of rivers remain in a natural or near-natural condition (NBA, 2026). In addition, the spread of invasive alien plant species in catchments is a major pressure, increasing water loss through evapotranspiration and altering natural flow further weakening the resilience of river and wetland systems to droughts and floods.
- South Africa's coastal zone is under disproportionately high ecological pressure compared to the rest of the country. A total of 134 coastal ecosystem types (71%) are classified as threatened, collectively covering approximately 46% of the coastal extent (NBA, 2026).
- Fire regime changes, influenced by both climate change and land management practices, are increasing the frequency and intensity of wildfires in certain regions, further degrading ecosystems and reducing their recovery capacity.

These interconnected pressures mean that South Africa's ecosystems are less able to act as natural buffers against climate variability and extremes, thereby increasing reliance on built infrastructure and engineered solutions, which are often more costly and less sustainable. As a result, ecosystem condition is a critical determinant of national adaptive capacity. Strengthening ecosystem resilience through ecosystem-based adaptation (EbA), including wetland restoration, sustainable land management and catchment rehabilitation is increasingly recognised as a key strategy for reducing climate risks while delivering co-benefits for biodiversity and livelihoods.

3.1.1.2 Demographics, inequality and vulnerability context

South Africa's demographic and socio-economic conditions are a key determining factor of climate vulnerability and adaptive capacity. The country has a population of approximately 63.1 million people, with around 63% living in urban areas (Statistics South Africa, 2024). These people are often located in rapidly expanding cities and coastal zones that are increasingly exposed to flooding, heat stress, and coastal hazards.

A defining feature of South Africa's national circumstances is extreme inequality, with a Gini coefficient of approximately 0.63–0.67, among the highest globally (World Bank, 2023). As of the third quarter of 2025, the official unemployment rate stood at 31.9%. The broader measure, the combined rate of unemployment and potential labour force was 42.4%, while youth unemployment among those aged 15-24 was 58.5% (Statistics South Africa, 2025). In addition, an estimated 66.7% of the population lives below the national upper-bound poverty line, limiting the ability of households to cope with and recover from climate-related shocks.

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These socio-economic conditions translate into high levels of structural vulnerability. A significant proportion of the population resides in informal settlements, often located in high-risk areas such as floodplains, wetlands and steep slopes, and characterised by inadequate drainage, poor housing, and limited access to basic services.

In rural areas, vulnerability is further shaped by reliance on climate-sensitive livelihoods, particularly rain-fed agriculture, and natural resource use, combined with limited infrastructure and service access.

Gender inequality further influences vulnerability and adaptive capacity. Women, particularly in female-headed households (approximately 42% of households), are more likely to experience poverty and unemployment (Statistics South Africa, 2024). In rural areas, women are heavily involved in subsistence agriculture, increasing exposure to drought and land degradation, while in urban areas, they are overrepresented in informal settlements and the informal economy. Unequal access to land, finance and decision-making processes constrains their ability to implement adaptation measures, despite their critical role in local resilience.

Overall, South Africa's demographic profile reflects a context of high exposure combined with deep structural inequality, where poverty, unemployment, service delivery constraints, and gender disparities significantly limit adaptive capacity.

3.1.1.3 Economic context

South Africa's economic context plays a critical role in shaping its capacity to respond to climate change. While the country has a diversified upper-middle-income economy, structural challenges such as high unemployment, inequality, low economic growth, and energy insecurity constrain both public and private sector investment in adaptation.

Limited financial capacity and competing development priorities, such as service delivery, infrastructure backlogs and social support needs, reduce the resources available for climate adaptation. This is particularly apparent at the municipal level, where constraints in capacity and funding limit the ability to implement and maintain adaptation interventions.

South Africa's economy is highly climate-sensitive, with key economic activities that depend on water availability and functioning infrastructure systems. Climate variability and extreme events already result in economic losses and damages, as well as reduced productivity, placing additional strain on an already constrained economic environment.

Economic inequality further influences adaptive capacity, as a large proportion of households and small businesses lack access to financial resources which limits their ability to absorb and recover from climate shocks.

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Despite these constraints, South Africa has important economic and institutional strengths that support adaptive capacity. These include a relatively developed financial sector, access to international climate finance and growing efforts to align economic development with climate resilience. National initiatives, including the implementation of the Climate Change Act and broader economic transition strategies, provide opportunities to integrate adaptation into infrastructure investment, spatial planning and sectoral development pathways.

Overall, South Africa faces both challenges and opportunities in strengthening adaptation. Economic constraints, such as limited financial resources and competing development priorities, slow down the pace and scale of implementation. However, integrating adaptation into existing development planning and investment processes provides an important opportunity to build resilience over time and improve long-term adaptive capacity.

3.1.1.4 Infrastructure

Infrastructure systems in South Africa play a critical role in shaping exposure and adaptive capacity. While the country has relatively extensive infrastructure networks, these systems face multiple challenges, including ageing assets, maintenance backlogs, and uneven service delivery.

Climate change is exacerbating these pressures by:

- Increasing the frequency and severity of flood damage to transport and stormwater infrastructure
- Reducing water availability in key supply systems during droughts
- Increasing risks to coastal infrastructure from sea-level rise and storm surges
- Affecting energy systems through flash floods that inundate or wash away supporting infrastructure, strong winds that damage power lines and poles, fire that burn grid assets and localized hailstorms that can damage solar panels.

Infrastructure vulnerabilities are particularly severe in under-serviced and rapidly growing urban areas, where inadequate drainage, housing and service provision amplify climate risks. These conditions limit the effectiveness of adaptation interventions and increase recovery costs following extreme events. The interdependence of infrastructure systems (e.g. water–energy–transport linkages) further increases systemic risk, highlighting the need for integrated and climate-resilient infrastructure planning.

3.1.2 Institutional Arrangements

South Africa's climate change institutional arrangements span from the national to the local levels of government, emphasizing collaboration, research, civil society and sectoral action to

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combat climate change. The institutional arrangements and governance for climate change adaptation involve a comprehensive and integrated approach, with clear roles and responsibilities for various stakeholders. These arrangements are designed to ensure the effective assessment of climate change impacts, and the systematic and transparent conduct of decision-making, planning, coordination, consultation, participation, monitoring, and reporting. Collaboration between government bodies, research institutions, and civil society is essential for developing effective institutional arrangements, and such collaborative efforts are crucial for building resilience and adapting to the challenges posed by climate change. Figure 3.1 illustrates the institutional arrangements and governance for climate change adaptation in South Africa.

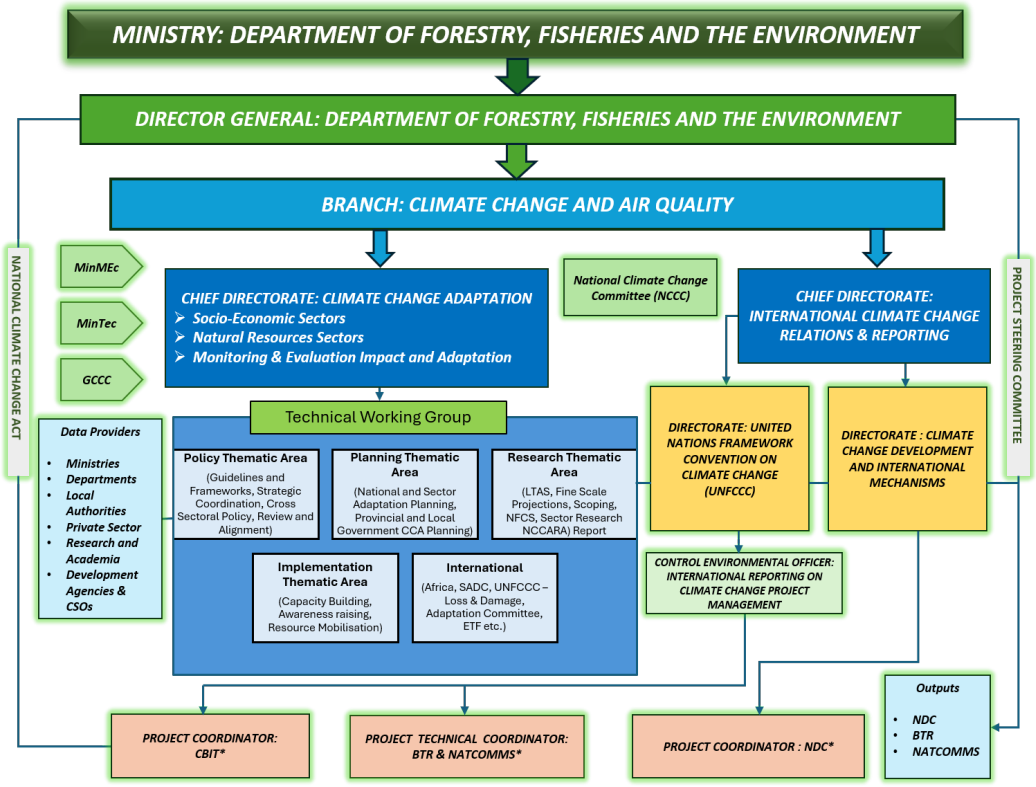


Figure 3. 1. Institutional arrangements and governance for climate change adaptation in South Africa.

3.1.2.1 Intra-departmental arrangements

At the centre of South Africa's climate change adaptation governance is the Department of Forestry, Fisheries, and the Environment (DFFE), which plays a pivotal role by providing leadership, policy direction, and support for various adaptation initiatives nationwide (Figure 3.1). Within the Ministry, under the Minister and Director General, sits the Branch: Climate Change and Air Quality (CCAQ), headed by a Deputy Director General. This Branch is

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specifically tasked with promoting, facilitating, informing, monitoring, and reviewing the integration of environmental sustainability, low carbon development, climate resilience, and air quality into South Africa's transition towards sustainable development.

The CCAQ Branch oversees several key functions through its Chief Directorates, which lead and support national, provincial, and local climate change adaptation responses. The Climate Change Adaptation Chief Directorate is responsible for national policy on adaptation and for enforcing implementation by sectors at provincial and local levels through three directorates:

- The **Directorate: Climate Change Monitoring and Evaluation – Impact and Adaptation** develops and maintains indicators to monitor and evaluate climate change impacts and adaptation responses, coordinates expert networks, and commissions research to improve monitoring and evaluation systems nationally.
- The **Directorate: Adaptation of Natural Resource Sectors** identifies climate change risks to the environment and provides strategic leadership to mainstream adaptation interventions into relevant sectors such as Agriculture, Oceans and Coast, Water, with a focus on managing and developing response measures for biodiversity and ecosystems. The National Climate Change Adaptation Strategy (NCCAS) is managed under the directorate.
- The **Directorate: Socio-Economic Sectors** identifies climate change risks to society and the environment and provides strategic leadership to mainstream adaptation interventions across social sectors, including infrastructure, human settlements, health, disaster risk management, , fisheries, and tourism.

The Chief Directorate: Climate Change Adaptation is responsible for the Monitoring and Evaluation (M&E) of adaptation efforts, drawing on data from various sources, with the web-based National Climate Change Information System (NCCIS) serving as one of the platforms used to consolidate information for reporting purposes. Analysed data from the National Climate Change Response Database (NCCRD) within the NCCIS by the Directorate: Climate Change Monitoring and Evaluation – Impact and Adaptation, is then used for national reporting purposes through the Climate Change Adaptation Annual Report as well as shared with the Chief Directorate: International Climate Change Relations and Reporting. Within this Chief Directorate, the Directorate: United Nations Framework Convention on Climate Change (UNFCCC) oversees reporting to international bodies, including the UNFCCC, through National Communications (NCs) and BTRs.

This work is further supported by donor-funded technical capacity. A Technical Project Coordinator for BTRs and NCs, embedded within the Directorate: UNFCCC, provides dedicated support to the UNFCCC mandatory reporting processes. In addition, an NDC Project Coordinator supports the Directorate: Climate Change Developments and International Mechanisms in the development and submission of South Africa’s Nationally

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Determined Contribution (NDC), both within the Chief Directorate: International Climate Change Relations and Reporting.

3.1.2.2 Inter-departmental institutional arrangements

Other national-level departments and government agencies such as the South African National Biodiversity Institute (SANBI), the South African Environmental Observation Network (SAEON), the Department of Agriculture, Land Reform and Rural Development (DALRRD), and the Department of Water and Sanitation (DWS) that support DFFE in its climate change agenda through collaborative efforts, integrated policies, and coordinated actions. The South African Weather Service (SAWS) plays a crucial role within DFFE by providing essential meteorological and climatological services that support the Department's mandate in addressing climate change, environmental management, and disaster risk reduction. SAWS operates as a public entity under the auspices of the DFFE, ensuring that its activities are aligned with national environmental and climate objectives. The different national-level departments and institutions collaborate on data collection, analysis, and sharing, as well as providing comprehensive and accurate information for informed decision-making and effective climate action. They also engage in collaborative research initiatives to develop innovative solutions for climate challenges, leveraging expertise and resources from multiple sectors.

3.1.2.3 Advisory Bodies

Coordination and oversight of adaptation activities are supported through complementary technical, intergovernmental, political and multi-stakeholder structures. The Climate Change Adaptation Technical Working Group (CCA:TWG) provides a forum for technical exchange, coordination and stakeholder input on adaptation policy, planning, implementation and reporting. The Intergovernmental Committee on Climate Change (IGCCC) promotes information sharing, policy alignment and coordination among national, provincial and local government, while MINTECH and MINMEC support environmental-sector coordination: technical matters are considered through MINTECH and may be referred to MINMEC, comprising the national Minister and provincial Members of the Executive Council responsible for environmental affairs, for political guidance and decision-making. The National Committee on Climate Change (NCCC) provides a broader multi-stakeholder consultation platform involving government, business, civil society and other relevant stakeholders. Collectively, these structures support collaboration and alignment across areas such as adaptation policy and strategy, sectoral and subnational planning, research and assessment, implementation, monitoring and reporting, and international climate commitments.

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3.1.2.4 Assessment of Impacts

Sectoral departments assess climate change impacts relevant to their mandates, supported by research institutions and universities through climate research, data collection, modelling and risk and vulnerability assessments. DFFE coordinates these processes and promotes the use of consistent, scientifically robust and risk-based assessment methodologies across sectors. The methodological approach is grounded in the Constitution, the National Environmental Management Act (NEMA), the National Climate Change Response Policy, the National Climate Change Adaptation Strategy and related sectoral policies and strategies, which provide the policy basis for identifying climate hazards, exposure, vulnerability and potential impacts and for using the findings to inform adaptation planning and decision-making.

3.1.2.5 Decision-Making, Planning, and Coordination

The Cabinet, informed by DFFE and other relevant departments, makes final decisions on national climate change strategies and policies. Sectoral departments develop their own climate change plans within the framework of national strategies. The NCCC plays a crucial role in coordinating climate change action across sectors and ensuring coherence in policies and plans.

3.1.2.6 Consultation and Participation

Stakeholder consultations are an essential part of the policy development process. DFFE and sectoral departments engage with civil society, the private sector, and communities to gather input and ensure that their needs are considered. Public participation platforms exist to allow citizens to voice their concerns and participate in decision making related to climate change.

3.1.3 Legal and policy frameworks

South Africa's BTR1 provided an overview of the country's policy environment and responses to international processes of relevance to adaptation in South Africa from 1997 to 2024. South Africa has submitted successive Nationally Determined Contributions (NDCs) under global climate framework with the country's first NDC submitted in 2015, and a revised NDC submitted in 2021. The BTR1 detailed progress on implementing the National Climate Change Adaptation Strategy (NCCAS), developed in 2020, which is the key adaptation component of the updated NDC1.

South Africa submitted its second NDC to the UNFCCC in October 2025. The NCCAS continues to provide a basis for climate change adaptation planning and implementation in the second NDC and is strengthened by the Climate Change Act of 2024 that establishes a mandatory and recurring process for climate risk and vulnerability assessments, adaptation planning, and reporting for national, provincial, and municipal government spheres and

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identified sectors. South Africa is moving increasingly to operational adaptation planning and implementing actions, and implementing the adaptation provisions of the Climate Change Act will include significant support for provincial and local government in South Africa (RSA, 2025).

The BTR1 described the Climate Change Act 22 of 2024, the country's key legislative instrument to coordinate and enhance climate change action in South Africa. The Act provides mechanisms for both mitigation and adaptation, defining roles for government departments to coordinate climate actions, fostering institutional coherence and enhancing climate change adaptation governance across the national, provincial and municipal spheres, between government, civil society and the private sector. Since the BTR1, the Climate Change Act was proclaimed on 17 March 2025 (which is the commencement of the Act). Although the Act has come into operation, the commencement of certain provisions of the Act have been deferred to a later date; these provisions are[15]:

- 12(6) (remuneration of commissioners)
- 13(1), 13(2), 13(3)(b) (appointment of a presidential commission executive director)
- 14(3)(a) (funds earmarked for the commission in the Minister's departmental vote)
- 15(5), 15(6) (ministerial and directorial reporting requirements)
- 17, 18, 19, 20, 21, 22 (provincial and municipal response to climate change; and national adaptation to climate change impacts)
- 25(4)(c) (quantitative and qualitative greenhouse gas emission reduction goals)
- 26(2) to (6) (listed greenhouse gases and activities)
- 27 (carbon budgets)
- 28 (phase-down and phase-out of synthetic greenhouse gas emissions and related declarations), and
- 30(2)(a) and (b) (regulations).

The reason for deferring these specific provisions is that the Department of Forestry, Fisheries and the Environment (DFFE) is developing a set of regulations that will enable implementation of these provisions. Some of the draft regulations are at an advanced stage of development and will be gazetted for public input and comment once they become available[16].

[15] https://legalacademy.co.za/news/read/climate-change-act-in-force
[16] https://www.dffe.gov.za/mediarelease/george_climatechangeact

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3.2 Impacts, risks and vulnerabilities

3.2.1 Observed climate hazards

Table 3.1 shows the climate indices that are used to characterise key climate hazards and their relevance for assessing climate change impacts and adaptation needs in South Africa.

Table 3.1: Selected climate indices used to characterise key climate hazards and their relevance for assessing climate change impacts and adaptation needs in South Africa.

Hazard	Index	Indicator
Heat	TXx – Maximum of maximum daily temperature	Highest daily maximum temperature Indicates extreme heat intensity Indicates overall heat conditions and general warming trends
	TNn – Minimum of minimum daily temperature	Minimum of daily minimum temperatures over a period Indicates overall extreme cold conditions
Drought	CDD - Consecutive Dry Days SPEI-3, SPEI-6, SPEI-12, SPEI-24	Longest dry spell Meteorological, agricultural and hydrological drought conditions severity.
Rainfall and Extreme rainfall events	PRCPTOT -Total Precipitation	Total accumulated rainfall over a specified period (e.g. year/season) Indicates overall wetness and long-term water availability
	Rx5day - Max 5-day precipitation	Highest rainfall over 5 consecutive days Indicates prolonged heavy rainfall
	R20mm - Annual count of days when precipitation ≥ 20 mm	Number of days in a year with heavy rainfall (≥20 mm) Indicates frequency of heavy rainfall events and flood risk
Flood/ Coastal/ Water Resources	Rx5day - Max 5-day precipitation	Sustained rainfall affecting coastal catchments
	PRCPTOT -Total Precipitation	Seasonal rainfall influences runoff to coastal zones
Fire	FWI-Fire Weather Index	Extended dry periods Increases fuel dryness and fire risk Fire danger potential, i.e. how favourable weather is for wildfire ignition, spread and intensity

The spatial pattern of observed annual **temperatures** is characterised by a latitudinal gradient with temperatures decreasing southwards. This is evident in the displayed long average of the maximum temperature in Figure 3.2. The highest maximum temperatures are observed over most parts of the Limpopo and Northern Cape during the four austral seasons. In the two provinces, elevated maximum temperatures (over 30° C) are experienced. For most parts of the country, daytime temperatures reach their hottest thresholds during the early summer (October-December) and/or during the late summer season (December-March). The temperature along the coast is influenced by the adjacent ocean, specifically the warm south-

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flowing Agulhas current in the east, and the cold north-flowing Benguela current in the west. During summer, cooler conditions occur over the plateau and in the south-western parts of the country, where cloud cover can cause temperatures to fall to around 22 °C. The plateau encompasses the interior Highveld, which extends across the central and eastern parts of the country (including the Free State, Gauteng, and neighbouring provinces). In winter (June - August), the coldest daytime temperatures are experienced in the interior plateau, including Lesotho, where the maximum temperature may average less than 14 °C. The extent of the central plateau is shown in Figure 3-3.

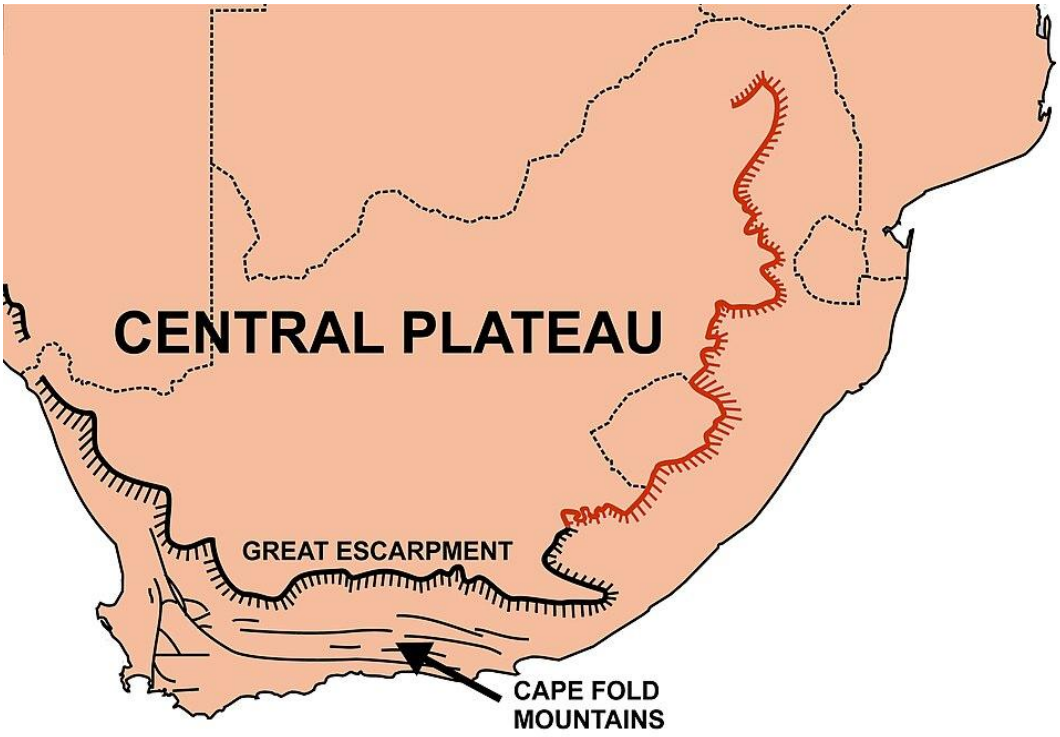


Figure 3.1: Map showing the Great Escarpment and the central plateau.

Figure 3.2 shows the average maximum temperatures during the austral seasons DJF, MAM, JJA, and SON.

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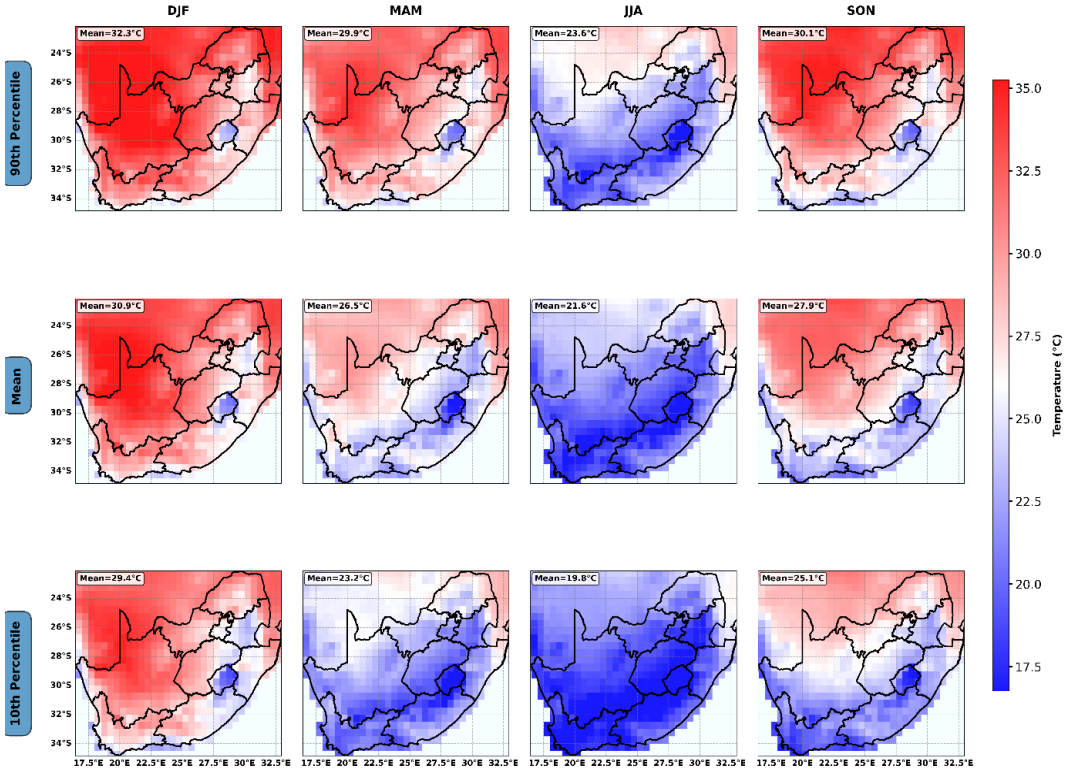


Figure 3-3: Average maximum temperatures during the austral seasons DJF, MAM, JJA, and SON. Top row: 90th percentile, middle row: mean, bottom row: 10th percentile (Source CRU).

Figure 3-4 clearly shows that most of the **rainfall** in South Africa occurs during the summer half of the year (October – March), except the Western Cape province, which receives most of its rainfall during the winter half of the year (April -September). In South Africa's summer rainfall regions (covering the central, eastern, and northern interior provinces), about 80% of the annual rainfall is recorded between December and February. The inter-annual rainfall variability is known to be influenced by the El Niño-Southern Oscillation phenomenon. In the summer rainfall region, for example, dry conditions typically occur during the warm (El Niño) phase of ENSO, while wet conditions are more common during its cool (La Niña) phase. Rainfall in South Africa is also influenced by the position of the Intertropical Convergence Zone (ITCZ) and the Botswana Upper High-pressure Influence (BUHI). ITCZ is generally characterised by convective rainfall activity, which also contributes to high rainfall accumulation over several Southern African countries, including South Africa. From time to time, the ITCZ gets suppressed by the BUHI, leading to a delayed onset of rainfall or even reduced annual rainfall.

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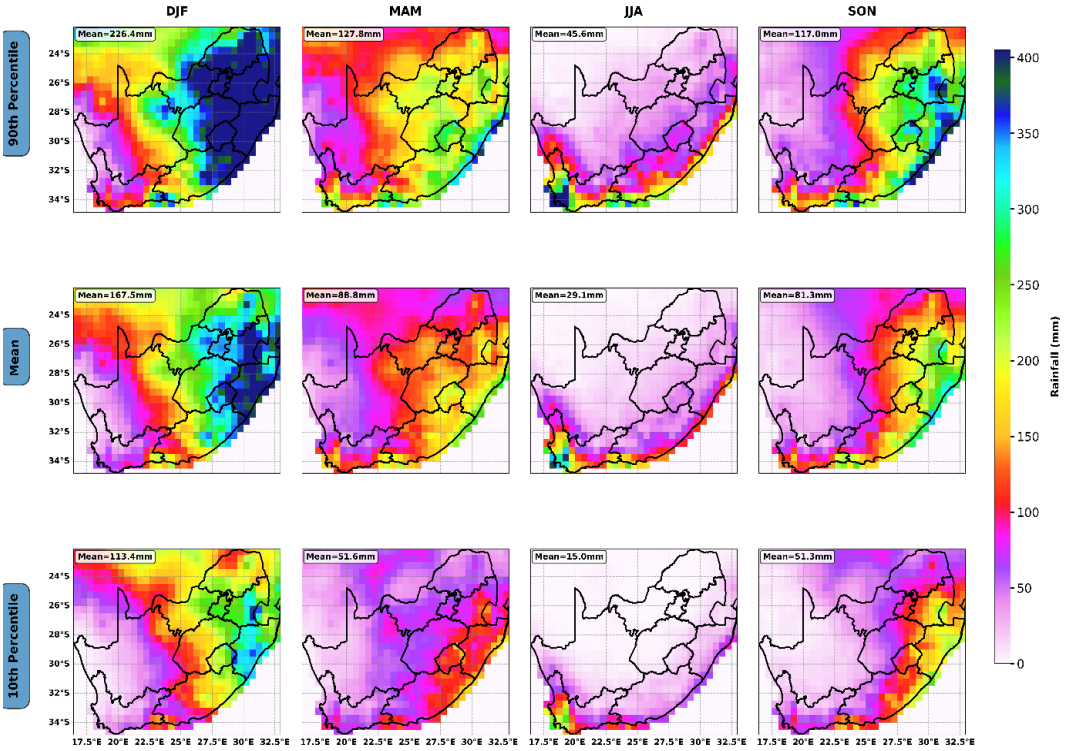


Figure 3.2: Average precipitation for DJF, MAM, JJA, and SON. Top row: 90th percentile, middle row: mean, bottom row: 10th percentile (CRU data).

3.2.2 Observed climate hazards trends

In South Africa, there are several weather stations with multi-decadal homogeneous time series. Trend analysis of the highest annual maximum temperatures (TXx), for the period 1994-2023, suggests a substantial statistically significant increase in both daytime temperature extremes for the whole country (Figure **3-4**). A warming trend in coldest night temperatures (TNn) is also evident at a substantial number of stations across the country; a few stations in the Western Cape, Eastern Cape, and KwaZulu-Natal show statistically significant cooling trends in TNn. The trend in heatwave number (HWN) and heatwave duration reflects a statistically significant increase from the north, extending to Southeastern stations. The temperature observations provide strong evidence that temperature extremes have been increasing over the last several decades in South Africa. The warming in temperatures over the country during the period is reported in South Africa's climate change facts sheets as virtually certain and unequivocally a consequence of anthropogenically induced global warming (Engelbrecht et al., 2025a).

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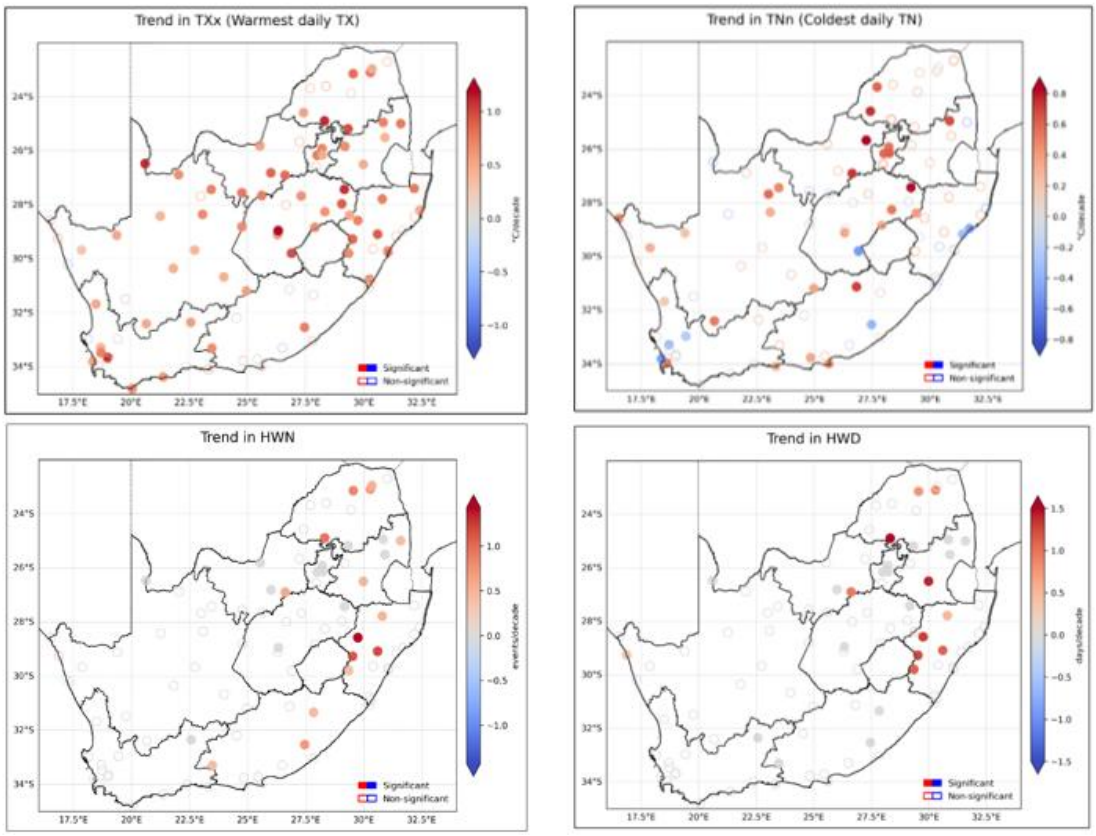


Figure 3-4: Decadal trend in the annual maximum of TX (TXx), the annual minimum of TN (TNn), the number of days that contribute to heatwaves (HWN), length of the longest heatwave identified (HWD) over the period 1994 – 2023.

Observed trends in annual rainfall during wet days (PRCPTOT) portray a nuanced picture, where a signal of multi-decadal natural variability may obscure that coming from anthropogenic global warming (McBride et al., 2022). The impact of global warming on temperatures manifests more strongly through changes in the temporal distribution of rainfall compared to annual totals. Erratic onset and cessation of the rainfall season; changes in the physical characteristics of storms and other extreme rainfall events, e.g., intense convective rainfall in connection with cut-off low-pressure systems. The observed multi-decadal rainfall trends indicate low confidence in a decrease in rainfall for a significant number of stations within the country's winter and summer rainfall regions during recent decades (Figure 3-4).

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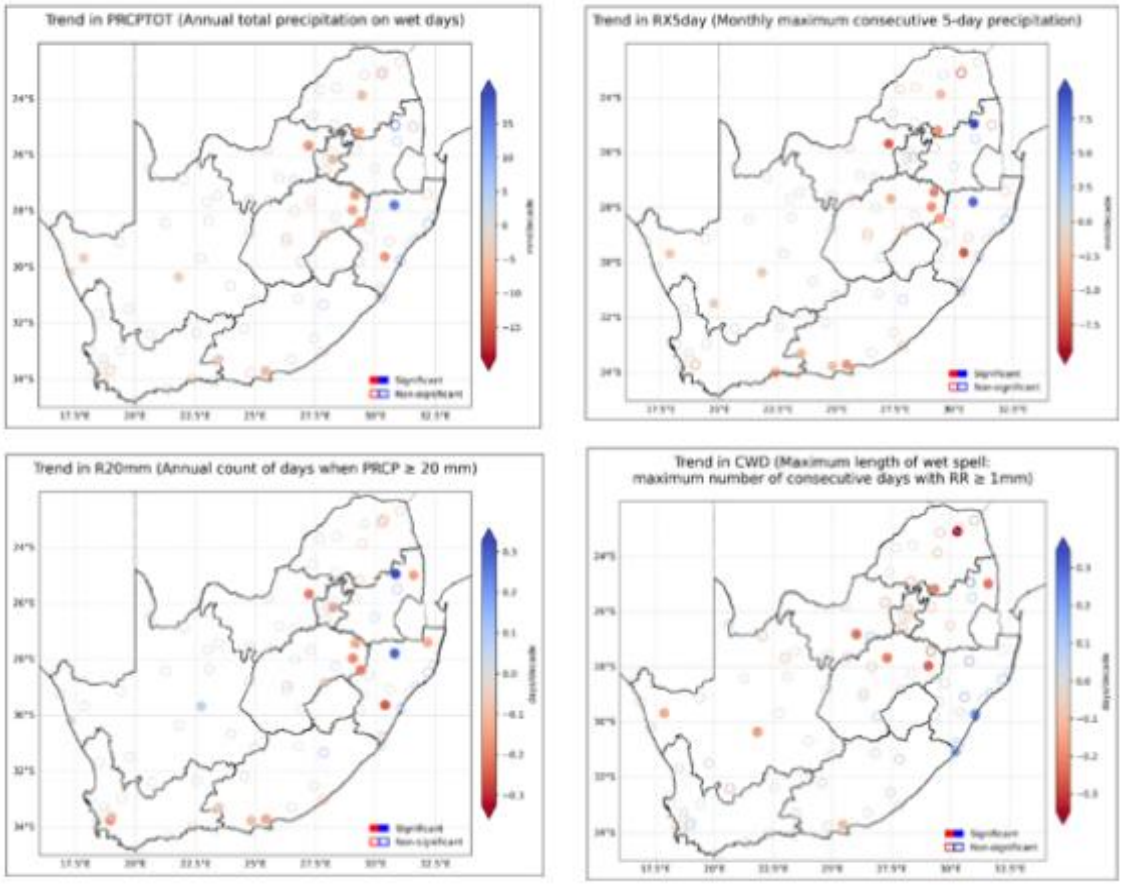


Figure 3-5: Decadal trend in annual Total Precipitation from Wet Days (PRCPTOT, mm), maximum 5-day precipitation (Rx5day), count of days when precipitation is greater than or equal to 20 mm (R20mm), the maximum number of consecutive days with RR >= 1 mm (CWD) duration i.e. the length of the longest heatwave identified by HWN, over the period 1994 – 2023.

An increasing trend in meteorological and agricultural drought has been observed in the recent decade over the winter rainfall region of South Africa. Most of the stations within regions do not reflect recent decades of drought as statistically significant Figure 3-6. The summer rainfall region of South Africa shows a low confidence signal of increasing meteorological and agricultural drought during the 1994-2023 period.

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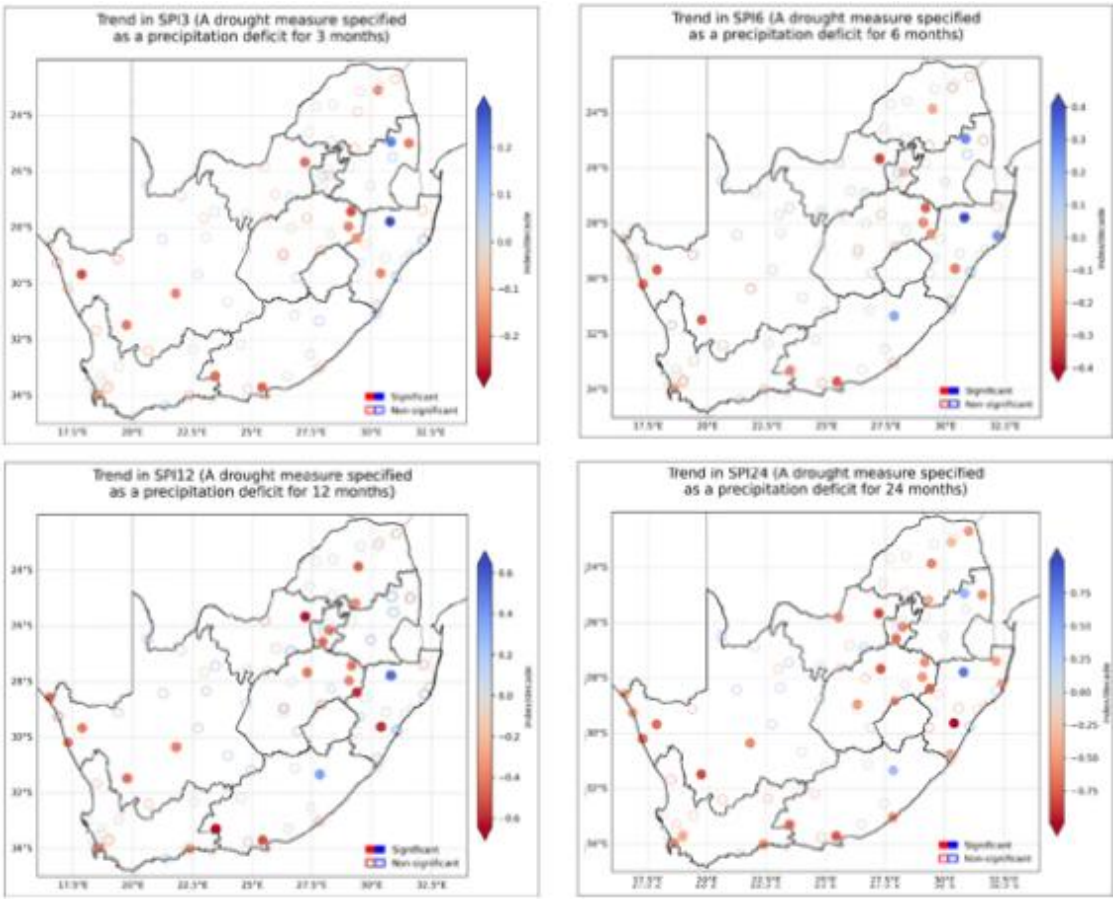


Figure 3-6: Decadal trend of the Standardised Precipitation Index for 3, 6, 12 and 24 months' time scale (SPI3, SPI6, SPI12 and SPI24), over the period 1994 – 2023. Filled circles represent statistically significant trends at the 5% level of significance.

Climate model outputs for historical and future climate across South Africa, shown in Figure 3-7, indicate broad agreement among models and reflect that temperatures are likely to continue rising toward the end of the 21st century under both low and high mitigation scenarios. The warming trend, together with associated climate extremes, is consistent with the observed changes. Studies exploring a range of mitigation futures indicate that the projected warming signal is of high confidence (Engelbrecht et al., 2015; Ranasinghe et al., 2021). Implementation of heat adaptation plans is therefore essential to protect the most vulnerable communities from the effects of global warming-associated temperature extremes.

Climate models project a general decline in rainfall over South Africa in a warmer world, as portrayed in Figure 3-7. Thermodynamic atmospheric processes are known to allow warmer air to hold and transport more moisture from the ocean to the land and from the surface to the higher atmosphere. As a result, despite the general decreasing trend in rainfall over recent

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decades (McBride et al., 2022), see Figure **3-**. Intense rainfall extremes contributed by elevated moisture within storm systems have been reported. Over the high-lying eastern escarpment regions of South Africa, there is a pronounced model uncertainty whereby about a third of climate change simulations suggest an increase in rainfall (Engelbrecht et al., 2025b). A general increase in the frequency of extreme rainfall events is projected by most models over South Africa with high confidence. Such conditions may increase runoff into the mega-dams while also driving sedimentation. In the face of uncertain model outputs, adaptation intervention should prioritise actions that lead to “no regret” despite the scenario that could potentially unfold.

3.2.3 Simulated current and projected climate

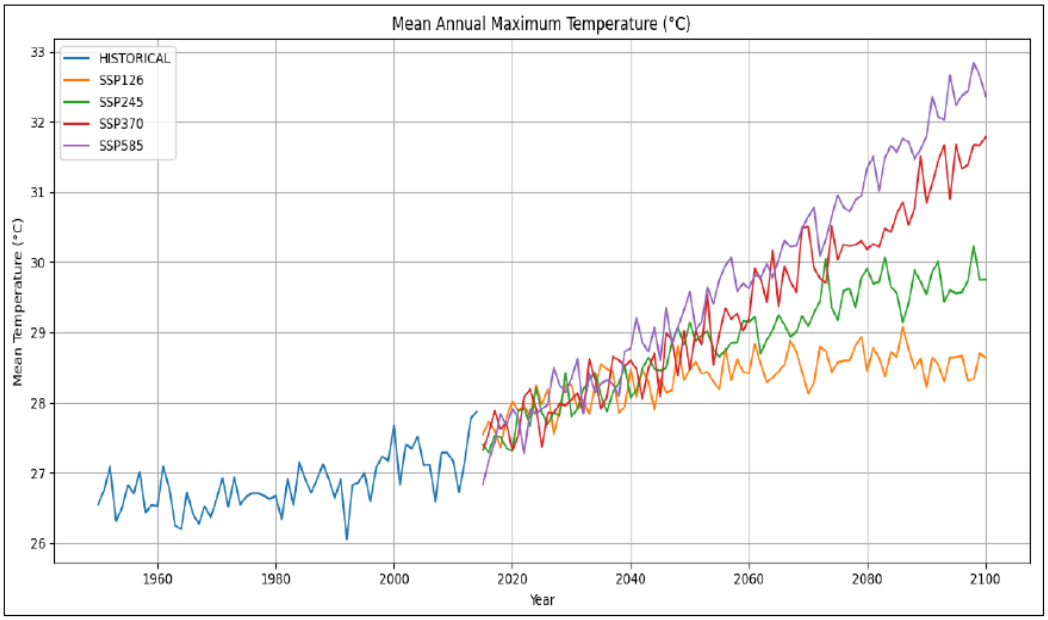


Figure 3-7: Mean Annual Maximum Temperature (°C) for South Africa from 1950 to 2100 during the historical period and under four future emission scenarios (SSP1–2.6, SSP2–4.5, SSP3–7.0, and SSP5–8.5). The historical record (1950–2014), shown in blue, indicates a gradual warming of approximately 1 °C during the latter half of the 20th century.

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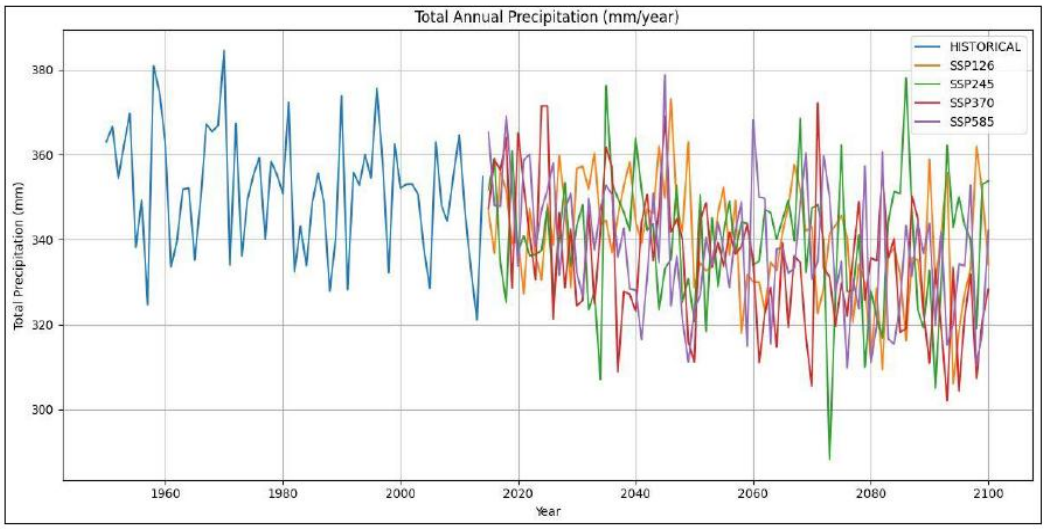


Figure 3-8: Total Annual Precipitation Trends for South Africa Historical against four future emission scenarios (SSP1–2.6, SSP2–4.5, SSP3–7.0, and SSP5–8.5) from (1950–2100). The blue line represents historical precipitation. The coloured lines (orange, green, purple, and red) depict future projections from different emission scenarios.

3.2.4 Model projections of change in extreme climate events

The current and projected impacts are analysed in view of the Paris Agreement global temperature targets, also referred to as global warming levels (GWLs). The following section looks at the changes for selected key indicators of climate hazards such as heat stress, flood, fire and drought. The changes in meteorological parameters or hazard indicators during a 20-year period, within which each of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP models reaches the specific global warming levels (GWLs; 1.5 °C, 1.2 °C and 3 °C), are quantified relative to the reference period (1961-1990).

Figure **3-** presents the hindcast and projection of the spatial distribution of the average annual maximum of maximum temperatures (TXx). The top row shows 1961-1900 average TXx values (in °C). The spatial pattern of the temperature extremes closely follows that of average temperatures, which are influenced by the warm Indian Ocean in the central and eastern parts of the country. The model outputs also show that the lowest temperatures occur over the high-lying escarpment regions. In summer, temperature extremes during the reference period can range as high as 35 - 45 °C across extreme heating hotspots. The agreement on the sign of change during the 1.5, 2.0 and 3.0 °C global warming levels, relative to the reference period, shows a high degree of model ensemble agreement on an increase in temperature extremes towards the 3 °C warmer world. This is specifically portrayed by the 10^{th}, 50^{th} and 90^{th} ensemble percentiles on the 2^{nd} -4^{th} rows on the panel plots. The implications of the change

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in extreme heat conditions in South Africa patterns are likely to be felt in the agriculture, water, health and energy sectors. Particularly, crop stress and yields, increase water evaporation, heat-related illnesses and energy demand due to cooling demand spikes.

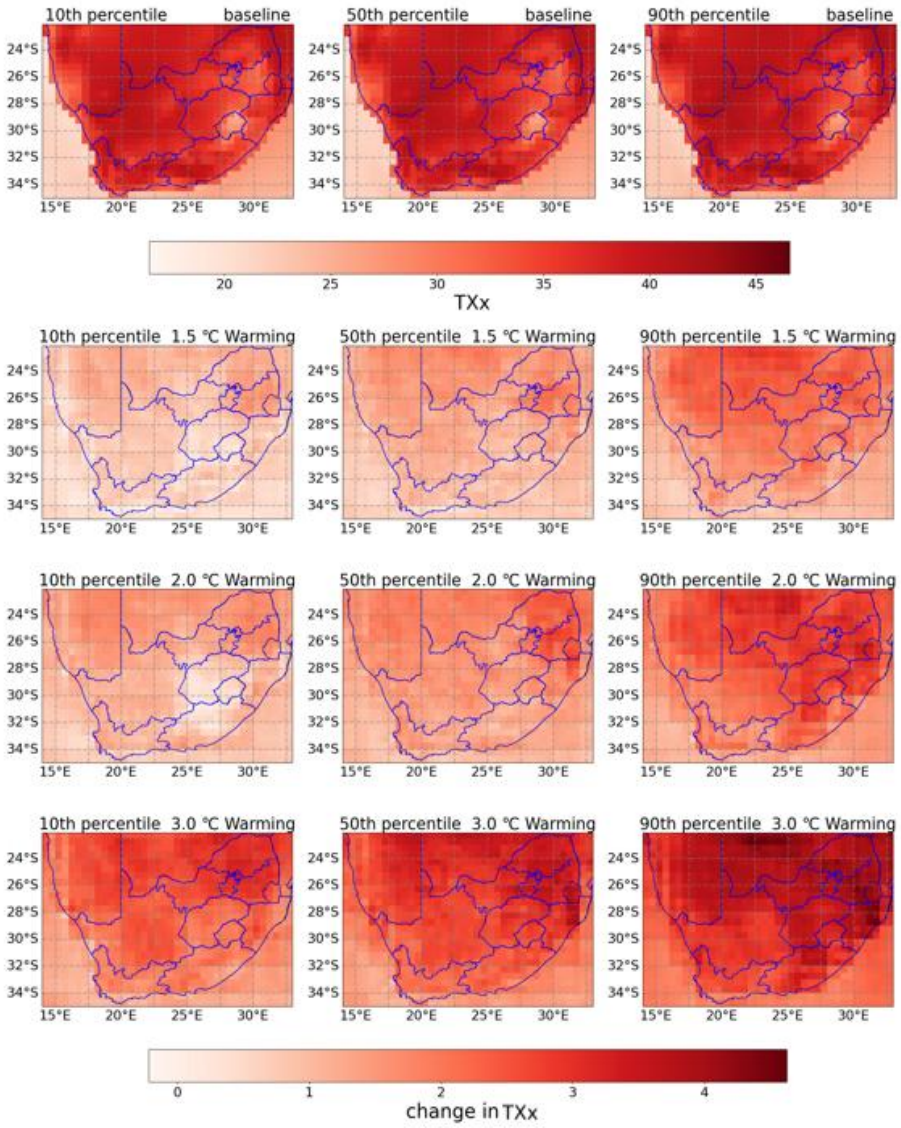


Figure 3-9 Simulated bias-corrected spatial distribution of the long-term average of annual maximum of maximum temperatures (TXx), in °C, during the periods when global temperatures reach 1.5°, 2.0°C and 3°C warming levels relative to the pre-industrial period, respectively.

Figure 3- Figure **3-11** reflects that South Africa is characterised by high spatial rainfall variability. The model outputs effectively capture the temporal pattern of annual rainfall as contributed by distinct rainfall seasons. As seen from CRU observations, most of the regions receive summer rainfall apart from the southwestern coast, where rainfall occurs in winter, driven by a Mediterranean-type climate in association with cold fronts that form in the Atlantic

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Ocean. Like most of subtropical Africa (about 15 °C south), excluding the Southwestern Cape, South Africa's climate is dry due to the predominant sub-tropical high-pressure systems and subsidence (Engelbrecht et al., 2009).

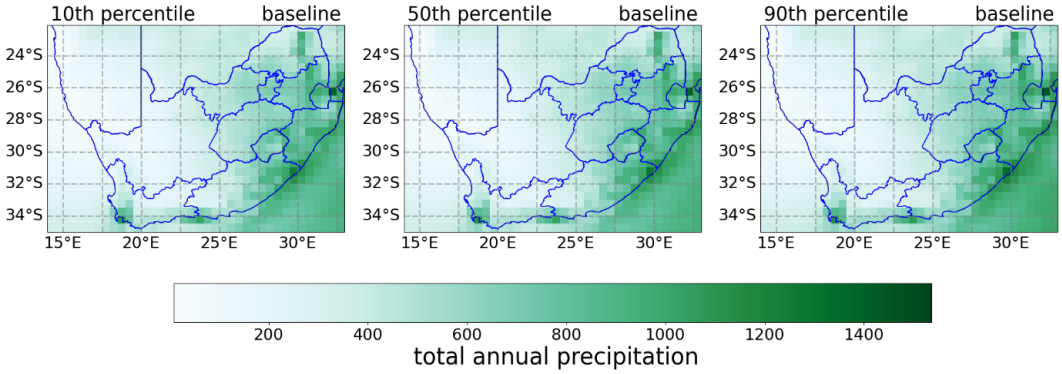


Figure 3-10: Total annual precipitation (mm) over South Africa during the period 1961-1990, reflecting the 10th, 50th and 90th ISIMIP 3b multi-model ensemble percentiles.

Figure 3-11 portrays the spatial distribution of the projected changes in total precipitation over South Africa at different global warming levels (i.e., 1.5 °C, 2 °C, and 2 °C) on an annual time scale. There is a projected decrease in precipitation over the South-western to north-eastern parts of South Africa. Over the Southeastern parts of South Africa, increases in precipitation, as large as 10%, are projected. This pattern has been found to be associated with increases in subsidence in the subtropics (Engelbrecht et al., 2009). There is uncertainty among the ISMIP models on the increase in precipitation for the region. The magnitude of the projected changes increases with the Global warming levels.

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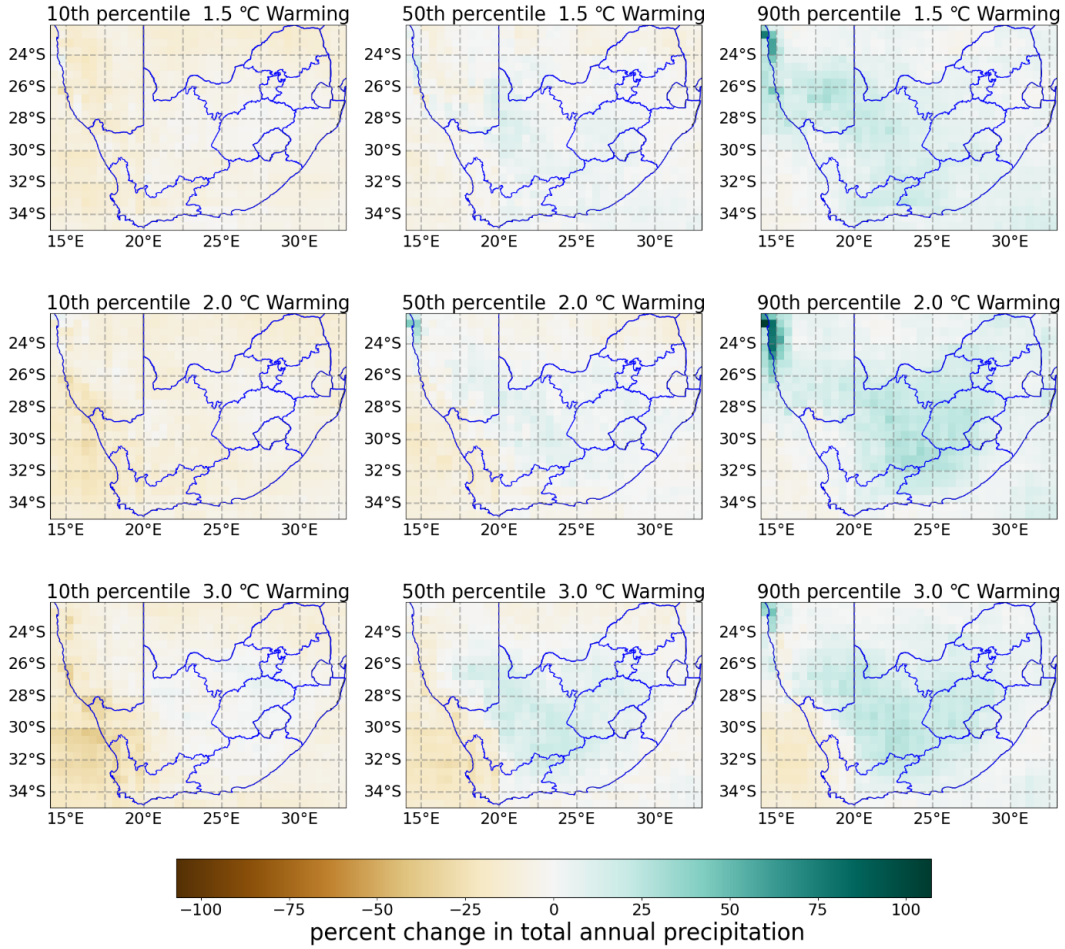


Figure 3-11: Change in annual precipitation (%), relative to the reference period, over South Africa during the period when global warming temperature reaches 1.5, 2.0 and 3.0 °C global warming levels (panel plot rows) higher than the pre-industrial baseline period. The columns reflect the 10th, 50th and 90th (panel plot columns) percentiles of the ISIMIP 3b multi-model ensemble.

3.2.4.1 Drought

The reference period consecutive dry days (CDD) patterns, in Figure 3.3, show that the longest dry periods already exist over large parts of the western and central interior of the country (Northern Cape), inland parts of the Western Cape, and parts of the Eastern Cape and Limpopo province. As global temperatures reach the 1.5 °C warming level, the maximum number of consecutive dry days (CDD) is projected to increase. This is more evident in the 50th and 90th ensemble percentiles, while the 10 percentiles show an opposite sign of change. The uncertainty in the model projections is consistent with that of precipitation during the period. As warming intensifies to the 2.0 °C and 3.0 °C scenarios, positive changes in maximum CDD become increasingly widespread and pronounced across the region, even

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within the lower-bound (10th percentile) model projections. The improved model agreement suggests increased model confidence of an increase in the consecutive number of days belonging to dry spells, highlighting the growing likelihood of more frequent or longer dry spell episodes under higher global temperature thresholds in South Africa.

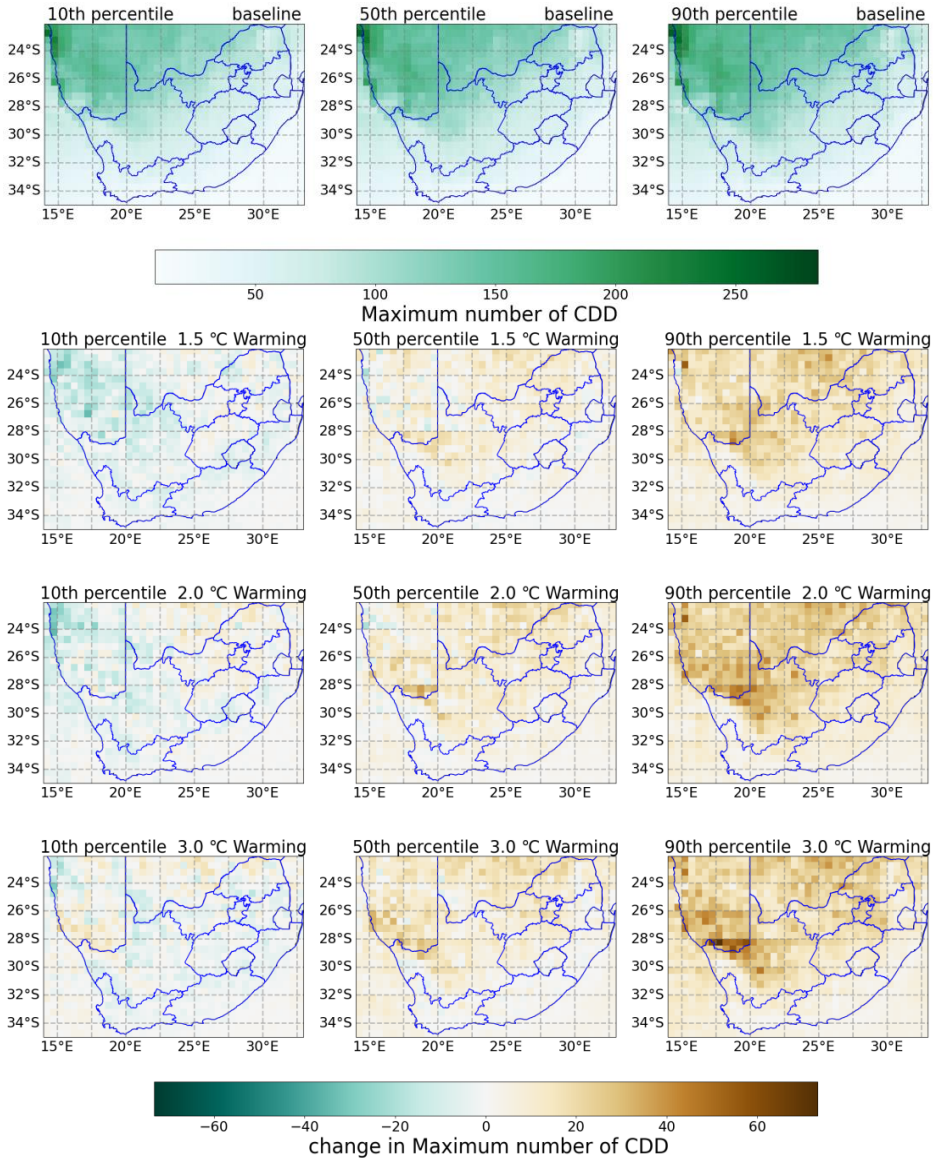


Figure 3-12: Consecutive dry days (CDD), measured in days, over South Africa during the reference period 1961-1990 (first row) and projected change in CDD during the 1.5 °C, 2.0 °C and 3.0 °C, reflecting the 10th, 50th and 90th ISIMIP 3b multi-model ensemble percentiles.

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3.2.4.2 Extreme precipitation indices

The frequency of very heavy precipitation days can be represented by a count of days in a year with rainfall above 20 mm (R20mm). While maximum precipitation contributed by wet spells is represented by five-day precipitation amounts (Rx5day). Plots of reference period and projected changes in R20mm and Rx5day indices during the GWLs are shown in Figure 3- and Figure 3.4**,** respectively. A general increase in the frequency of wet days relative to the 1961-1900 baseline is projected by most models over eastern South Africa at the 1.5, 2.0, and 3.0 °C global warming levels. This pattern is effectively captured by the projected r20mm index. The projected increase in frequency of rainfall extremes over the eastern escapement region is consistent with the findings of IPCC AR6 (Ranasinghe *et al.*, 2021). An increase in the maximum five-day precipitation is also projected over parts of the Northern Cape and Free State provinces, as reflected by most of the models, albeit with uncertainty. The projected increase in both the frequency and magnitude of wet spalls' precipitation accumulation, as represented by the R20mm and Rx5day indices, increases with the global warming levels.

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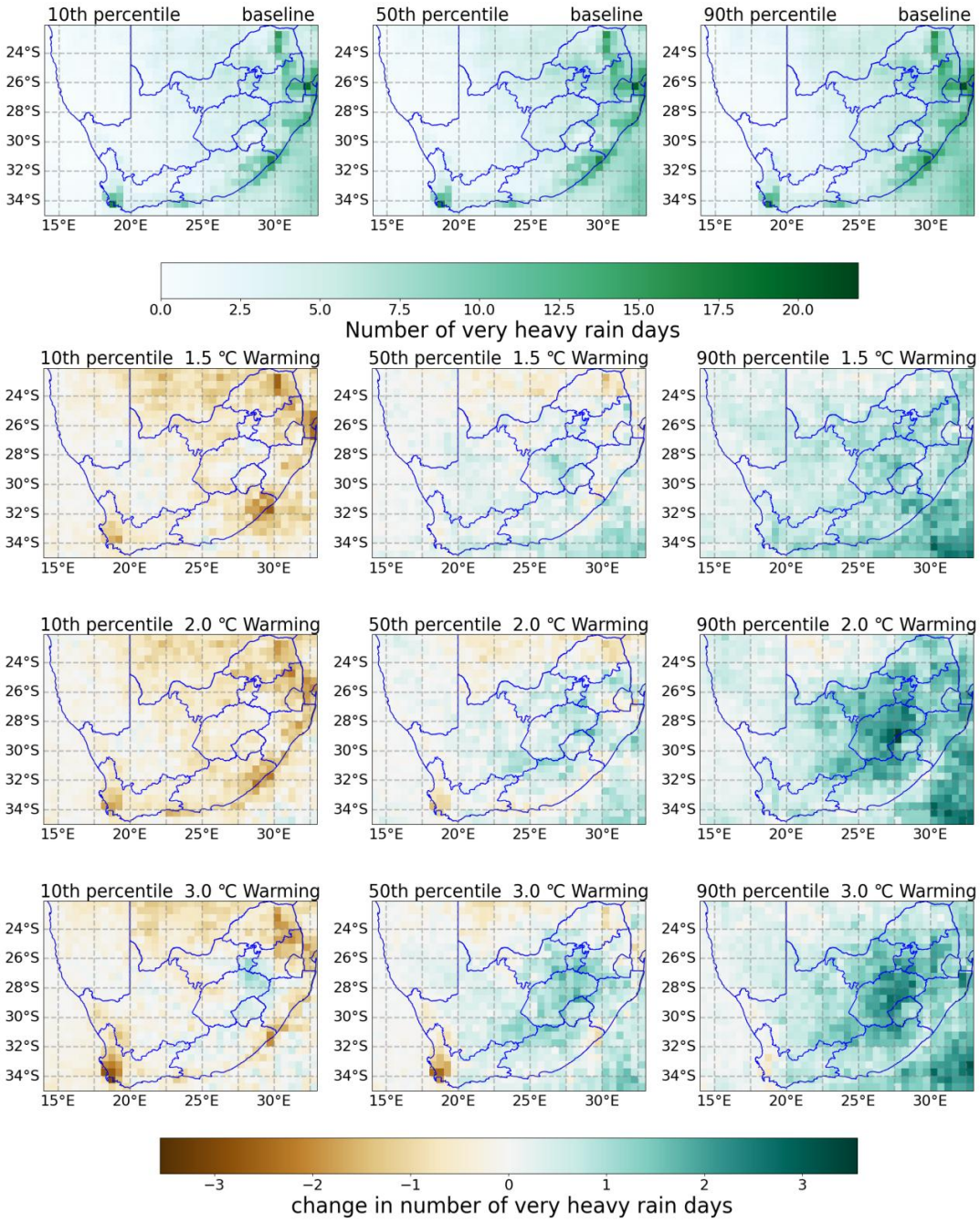


Figure 3.3: Very heavy rain days (R20mm) index (measured in days) over South Africa during the period 1961-1990 (first row) and projected change in R20mm (2nd and 4th row), relative to the reference period, when global temperature reaches 1.5°C, 2.0°C and 3.0°C warming level higher than the global temperature during the pre-industrial baseline periods, the columns 10th, 50th and 90th ISIMIP 3b multi-model ensemble percentiles.

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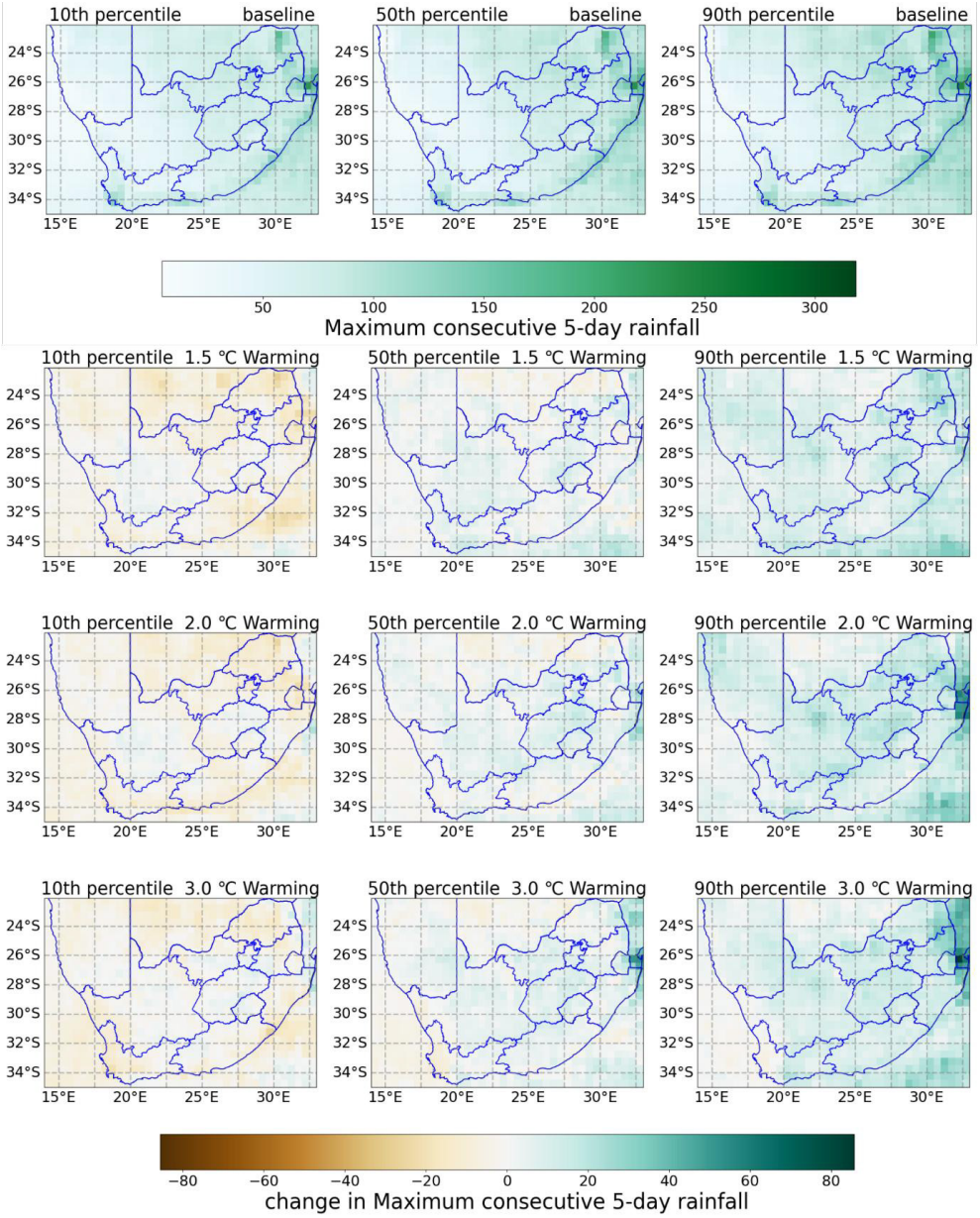


Figure 3-15: Maximum consecutive 5-day rainfall accumulation (Rx5day) index (measured in days) over South Africa during the reference period 1961-1990 (first row). Projected change in Rx5day (2nd and 4th row), relative to the 1961-1990 reference period, when global temperature reaches 1.5°C, 2.0°C and 3.0°C global warming levels higher than the pre-industrial period baseline global temperature. The columns 10th, 50th and 90th percentiles of the ISIMIP 3 b multi-model ensemble.

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3.2.4.3 Fire

Fire Weather Index is designed to estimate fire danger conditions. The index is based on the Canadian Forest Service Fire Weather Index Rating system (FWI). The index is classified into 6 classes (**very low**: FWI > 5.2, **low**: 5.2 < FWI ≤11.2**, high**: 11.3 < FWI ≤38.0, **very high**: 38.0< FWI ≤50.0 and **extreme**: FWI ≤50). The baseline period, Figure 3.4. The Northern Cape province would face extreme difficulty in managing fire should it occur. Followed by the Free State and Northwest Province. While Limpopo province is predominantly warm, FWI spatial patterns suggest that the FWI results range from high to very high. The projections in Figure 3.4 portray a future increase in FWI ranges during the 1.5° - 3 °C global warming levels. Specifically, areas that had low fire danger days along the north-eastern part of the country are likely to gain more days conducive to fire weather. The projected fire danger days (i.e., FWI> 28) during the 2° C and 3° C also have an increasing trend. Thus, associated fire impacts could be avoided by limiting the global temperatures below 1.5 °C.

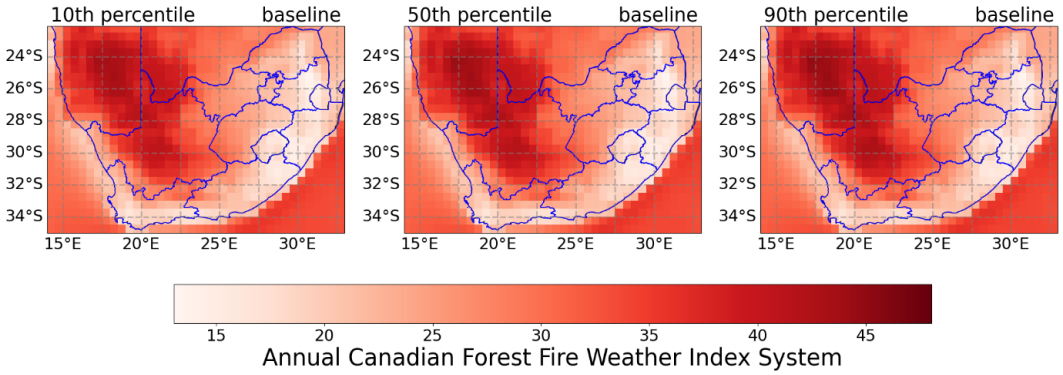


Figure 3.4: Annual Canadian Forest Fire Weather Index (FWI), dimensionless units, over South Africa during the reference period 1961-1990. The respective columns show the 10th, 50th and 90th ISIMIP 3b.

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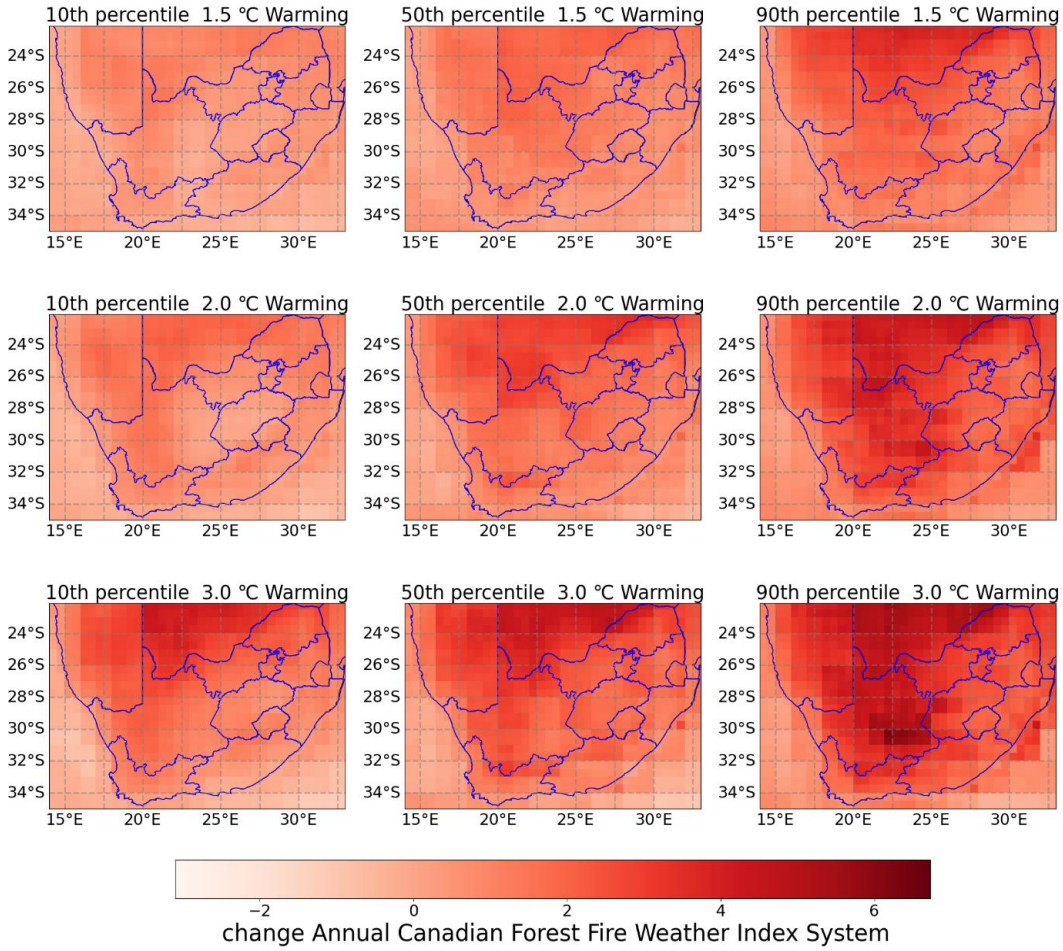


Figure 3-16: Change in annual Canadian forest fire weather index (FWI) relative to the reference period, when global temperature reaches 1.5°C, 2.0°C and 3.0°C (1st, 2nd and 3rd rows) warming levels relative to the pre-industrial period. The respective columns show the 10th, 50th and 90th ISIMIP 3b multi-model ensemble percentiles during the respective GWLs.

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3.2.5 Approaches, methodologies and tools, and associated challenges used in the above sections

The Earth system (ESM) simulation outputs from the sixth phase of the Coupled Model Intercomparison Project (CMIP6) for the emission scenarios SSP1-26, SSP3-70 and SSP5-85. Project. For the analysis, at least 10 years before and after the global warming level thresholds are reached. This is done for each of the respective models. The multi-model distribution is summarised through ensemble percentiles, namely the 10^{th},50^{th} and 90^{th} percentiles. In addition to changes in annual air temperatures (tas) and precipitation (pr), six climate indices are analysed to quantify the hazards. The respective indices are calculated from daily precipitation, maximum and minimum temperature fields. Changes in temperature, precipitation, and temperature during the overshoot year of the respective GWLs for each model are calculated relative to the 1850 – 1900 baseline period.

3.2.6 Observed and potential impacts of climate change, including sectoral, economic, social and/or environmental vulnerabilities

This section updates South Africa's assessment of observed and potential climate change impacts, including sectoral, economic, social and environmental vulnerabilities, since the previous BTR. It draws on updated national climate evidence, including the Climate Trends and Adaptation Scenarios for South Africa, observed climate hazard trends, and new analysis of projected changes under 1.5 °C, 2 °C and 3 °C global warming levels. The assessment focuses on key hazards such as heat, drought, extreme rainfall, flooding, fire and coastal impacts, and considers how these risks affect priority sectors including water, biodiversity and ecosystems, agriculture and food security, health, human settlements, infrastructure and disaster risk management. It also highlights that climate impacts are unevenly distributed, with poverty, inequality, gender, settlement patterns, ecosystem degradation and infrastructure constraints increasing vulnerability and reducing adaptive capacity in many parts of the country.

3.2.6.1 Water sector

Component	Description
Key climate hazards	Drought (meteorological, agricultural and hydrological), increased rainfall variability, intensified extreme rainfall events, rising temperatures, increased evapotranspiration, and altered seasonal rainfall distribution. *(LTAS 2026; SAWS climate indices; WEAP/ACRU modelling)*
Observed impacts	Increased frequency and spatial extent of drought conditions across multiple catchments (e.g. Limpopo, Vaal, Olifants, Gouritz) More intense rainfall events contributing to flood peaks and infrastructure damage (e.g. KZN floods) Reduced low flows and increasing flow variability in regulated and unregulated rivers Catchment-scale shifts in runoff timing and reduced baseflow contribution

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Component	Description
	Declining water quality linked to low flows, pollution concentration, and sediment mobilisation Increasing system stress where water demand already exceeds or approaches yield capacity (WEAP results across WMAs)
Potential impacts	Increasing frequency of multi-year drought conditions, reducing reliability of surface water systems across major Water Management Areas Reduced runoff generation due to higher evaporation and soil moisture deficits, particularly in western and interior catchments Intensification of flood events, increasing damage to dams, pipelines, abstraction infrastructure and urban drainage systems Greater variability in inflows and increased uncertainty in reservoir yield and system reliability (as shown in scenario modelling across Limpopo, Vaal, Tugela and Inkomati basins) Increased unmet water demand in agricultural, urban and industrial sectors under future climate scenarios (2021–2097 projections) Progressive reduction in ecological flow maintenance leading to degradation of riverine and wetland systems Increased competition between sectors (urban supply, irrigation, mining, energy generation and ecosystems), particularly during drought periods Increased system sensitivity in catchments where demand already doubles under baseline growth scenarios (e.g. Crocodile West)
Key vulnerabilities	High baseline water scarcity and strong spatial rainfall variability across South Africa Over-allocated and stressed catchment systems in key WMAs (e.g. Vaal, Olifants, Crocodile West) Ageing infrastructure, limited storage flexibility and constrained transfer systems High non-revenue water losses and inefficiencies in municipal supply systems Catchment degradation, wetland loss and invasive alien plants reducing runoff generation and baseflow stability Strong dependence on climate-sensitive surface water systems with limited redundancy Limited adaptive operating rules in some reservoirs under non-stationary climate conditions (WEAP calibration insights) Socio-economic inequality affecting access to reliable water services, particularly in rural and peri-urban areas
Gender vulnerabilities	Women disproportionately affected by water insecurity due to household water collection responsibilities, particularly in rural and informal settlements Increased burden on women during drought periods and service interruptions, including time poverty and reduced livelihood opportunities Higher exposure to water-borne disease risks in households with poor or intermittent water supply Reduced resilience of female-headed households to cope with repeated water service disruptions and increasing costs of alternative water access

3.2.6.2 Biodiversity and ecosystems

Component	Description
Key climate hazards	Rising temperatures, drought, changing rainfall patterns and seasonality, extreme rainfall and flooding, altered fire regimes and sea-level rise and storm surges in coastal systems.
Observed impacts	Climate change is already contributing to changes in vegetation structure, altered fire regimes, and more frequent climate extremes such as droughts and floods, with implications for ecosystem functioning and biodiversity persistence. Climate-related pressures are interacting with pollution, habitat degradation, unsustainable water use and invasive species, contributing to the deterioration of

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Component	Description
	biodiversity and ecosystem health (e.g. eutrophication and acidification of the ecosystems). Rivers, wetlands and estuaries are identified by the National Biodiversity Assessment of 2025 as the most threatened and least protected ecosystems in the country, which increases their sensitivity to drought, flood variability and warming. Along the coast, only about half of the coast remains in a natural to near-natural state, and 71% of coastal ecosystem types are threatened, indicating high exposure to climate-amplified pressures including sea-level rise, storm surges and altered coastal processes, SANBI 2025.
Potential impacts	Higher temperatures, prolonged drought and increasing rainfall variability are likely to reduce ecosystem resilience, increase the risk of species loss and local extinctions, and weaken overall ecosystem functioning. Climate change is also expected to intensify wildfire risk and alter fire frequency and intensity, with implications for ecosystem structure, recovery processes and long-term biodiversity persistence. At the same time, altered hydrological regimes will further degrade rivers, wetlands and estuaries, reducing their capacity for water regulation, flood attenuation and ecological buffering under increasing climate stress. These changes are expected to drive biome shifts, species range shifts and changes in ecosystem composition, as species respond individually to changing climatic conditions. Arid biomes such as the Nama-Karoo and Succulent Karoo are particularly vulnerable to increasing drought and desertification, while Grassland and Savanna biomes are highly sensitive to rainfall variability, rising temperatures and changes in fire regimes. More than half of South Africa's dwarf succulent species in the Karoo may lose over 90% of their suitable habitat under future warming (Young et al., 2016). The Fynbos biome is especially vulnerable to warming and increased fire frequency, which may exceed natural recovery thresholds (Higgens et al 2024). Freshwater ecosystems across all biomes remain highly vulnerable due to climate-driven changes in hydrology, and this vulnerability is further exacerbated by habitat fragmentation, which limits species' ability to adapt and increases the risk of biome shifts and local extinctions. Coastal and estuarine ecosystems are also increasingly at risk from reduced freshwater inflows, rising temperatures, sea-level rise and storm surges (SANBI, 2025). Some mangrove species in South Africa are shifting southwards, with projected changes in suitable coastal habitat causing losses for some species and gains for others.
Key vulnerabilities	High levels of existing ecosystem degradation and habitat fragmentation reduce adaptive capacity. Invasive alien plants and other invasive species reduce ecosystem resilience, alter fire regimes and hydrology, and undermine biodiversity under climate stress. Degraded ecological infrastructure, especially wetlands, rivers, riparian buffers and strategic water source areas, reduces the capacity of ecosystems to buffer droughts and floods. Limited monitoring, data, funding and restoration capacity constrain adaptive management. The vulnerability assessment notes the need for stronger national datasets on invasive species, land degradation, bush encroachment and biodiversity indicators. Freshwater systems are both highly threatened and poorly protected, making them especially vulnerable to future climate change.
Gender vulnerabilities	Women and rural households are often more directly dependent on ecosystem services such as water, fuelwood, wild foods and grazing resources. Climate driven ecosystem degradation can threaten their livelihoods. As ecosystem services decline, women may face a greater burden as caretakers. They have limited adaptive capacity due to unequal access to land, finance and information.

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3.2.6.3 Food security and agriculture

Component	Description
Key climate hazards	Heatwaves, drought, increasing rainfall variability, extreme rainfall and flooding, shifting seasons, increased evapotranspiration, and ocean warming (for fisheries).
Observed impacts	Declining crop yields and increased variability in production linked to drought, heat stress and rainfall variability Increased livestock stress and mortality during drought periods Shifts in planting and harvesting periods due to changing temperature and rainfall patterns Increased frequency of droughts and water shortages affecting agricultural productivity and food availability Increased soil moisture deficits and land degradation in arid and semi-arid regions Changes in pest and disease dynamics linked to warmer temperatures Evidence of household food insecurity, with only 36.5% of households food secure and 63.5% experiencing some level of food insecurity, reflecting climate-related and socioeconomic pressures on food systems (Simelane et al., 2023).
Potential impacts	Reduced agricultural productivity due to declining soil moisture, increased evapotranspiration and more variable rainfall, affecting food availability Increased frequency and severity of droughts leading to crop failure, reduced grazing capacity and instability in food supply (food stability) Increased occurrence and spread of crop pests, diseases and invasive species, reducing yields and food quality (food utilisation and availability) Increased irrigation demand and pressure on water resources, reducing reliability of production systems Increased variability in agricultural output, contributing to food price volatility and reduced economic access to food Disruptions to food supply chains due to extreme events (e.g. floods), affecting distribution and access Reduced dietary diversity and increased reliance on cheaper, less nutritious food under climate stress, contributing to malnutrition (food utilisation) Increased risk of systemic food insecurity due to the interaction between climate shocks, poverty and unemployment
Key vulnerabilities	High dependence on rain-fed agriculture and climate-sensitive production systems Limited access to irrigation, markets, extension services and adaptive technologies in smallholder systems Socio-economic vulnerability, including high unemployment and reliance on social grants, limiting household food access Land degradation, soil erosion and declining soil fertility reducing resilience Unequal access to land and productive resources Exposure to food price shocks and input cost increases Weak integration of climate risk into agricultural planning and food systems
Gender vulnerabilities	Female-headed households are more vulnerable to food insecurity due to limited access to land, finance, inputs and extension services Women play a central role in food production, preparation and household nutrition, increasing exposure to climate-related agricultural impacts Increased labour burdens during droughts, crop failure and food shortages Limited access to resources, information and decision-making reduces adaptive capacity

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3.2.6.4 Health sector

Component	Description
Key climate hazards	Increasing temperatures and heatwaves, extreme weather events (floods, storms, droughts), changing rainfall patterns, declining air quality, wildfire conditions and environmental changes directly affecting health, disease vectors or disrupting health services (DEA, 2013; Wright *et al.*, 2021; Lueme, L. C., 2023)
Observed impacts	Increasing heat-related illness, lost labour capacity, and even mortality, particularly in hotter inland regions such as the Northern Cape and Northwest, where extreme temperatures frequently exceed 35 °C Increased injuries, deaths, and disease outbreaks associated with flooding, notably during the KwaZulu-Natal floods, which resulted in loss of life, displacement, and disease risk Changing distribution of vector-borne diseases in low-lying areas of Limpopo, Mpumalanga, and northern KwaZulu-Natal where 10% of the population is at risk of contracting malaria, influenced by temperature and rainfall variability (Wright *et al.*, 2021) Increased water-borne diseases (e.g. cholera outbreaks in parts of Gauteng and KwaZulu-Natal) linked to compromised water quality and sanitation under climate stress Worsening respiratory and cardiovascular conditions in urban-industrial areas such as the Highveld (Gauteng and Mpumalanga), where climate conditions can exacerbate air pollution Increasing mental health impacts associated with extreme events, displacement, and livelihood loss Food and water insecurity; reduced sanitation security, increased risk of malnutrition due to drought, with Western Cape droughts among the most noticeable (58.7% of land area experienced at least one month of extreme drought each year, 33.3% at least three months, and 15.3% at least six months (Romanello *et al.*, 2024)
Potential impacts	Increased heat-related morbidity (including heat stroke, dehydration) and mortality, especially in urban heat islands such as Johannesburg, Pretoria, and Durban, and in poorly serviced informal settlements. Approximately 43.8% of heat-related deaths in South Africa between 1991 and 2018 were attributed to additional heat exposure associated with human-induced climate change, at a global warming level of about 0.9 °C. Heatwaves will especially affect agriculture, infrastructure, tourism and urban economies through lost work time, lower crop productivity and more pressure on household incomes. Hotter conditions can increase evaporation and intensify drought stress, with knock-on effects on water security and agricultural production – especially over the southwestern part of the country. More hot days can increase fire danger – especially in the north-east of the country, the Cape south coast and the south-western Cape. A higher demand for cooling will place additional pressure on energy systems. Expansion of vector-borne diseases into new areas as warmer temperatures make previously unsuitable regions viable for transmission Increased water- and food-borne diseases following flooding events and declining water quality, particularly in densely populated and under-serviced areas Increased malnutrition, especially in rural provinces such as the Eastern Cape and Limpopo, due to climate impacts on agriculture and food systems Increased burden of cardiovascular and respiratory diseases linked to heat stress and air quality deterioration – especially in air pollution priority areas such as the Highveld and the Vaal Triangle. Growing mental health impacts, including trauma and stress linked to repeated climate shocks and displacement

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Component	Description
	Increased strain on healthcare systems, particularly in resource-constrained provinces and rural districts Climate change acting as a risk multiplier, exacerbating existing health challenges such as HIV/AIDS and TB.
Key vulnerabilities	High burden of existing disease (HIV/AIDS, TB, respiratory and water-borne diseases) High exposure of populations in informal settlements to climate hazards such as flooding and extreme heat, particularly in metros such as eThekwini, Johannesburg, and Cape Town, coupled with inadequate basic service delivery which reduce the quality of water, sanitation, air. Poverty and inequality limiting access to adequate healthcare and limiting adaptive capacity Limited health system capacity in some provinces and municipalities Lack of comprehensive climate–health surveillance systems Strong interlinkages with water, agriculture, and environmental systems
Gender vulnerabilities	Women face increased caregiving burdens as climate-related illness, malnutrition, and water stress increase Pregnant women, children, and the elderly are more vulnerable to heat stress and disease Women in low-income and informal settlements face higher exposure to climate-related health risks Limited access to healthcare, resources and decision-making reduces adaptive capacity

3.2.6.5 Human settlements and infrastructure

Component	Description
Key climate hazards	Extreme rainfall and flooding (pluvial and fluvial), storm surges and sea-level rise, increasing temperatures and heatwaves, drought, wildfires, and strong winds/storms.
Observed impacts	Significant damage to housing, transport and service infrastructure from extreme rainfall and flooding, notably during the KwaZulu-Natal floods (eThekwini and surrounding areas), which caused widespread destruction of roads, bridges, water, and sanitation systems. High exposure of informal settlements to flooding, particularly in metros such as Johannesburg, eThekwini, and Cape Town, where settlements are often located in floodplains or poorly drained areas. Increasing urban heat stress in cities such as Pretoria, Johannesburg, and Durban, exacerbated by the urban heat island effect and limited green infrastructure. Coastal erosion and localised inundation affecting infrastructure along parts of the KwaZulu-Natal and Eastern Cape coastline. Disruptions to basic services (water, sanitation, electricity) following extreme events, affecting livelihoods and health.
Potential impacts	Increased frequency and severity of flooding, leading to repeated damage to housing and infrastructure, particularly in high-density urban and informal areas. Increased coastal flooding and erosion due to sea-level rise and storm surges, threatening infrastructure, and settlements along low-lying coastal zones (e.g. eThekwini, Nelson Mandela Bay). Intensification of urban heat stress, reducing liveability and increasing health risks, especially in densely built-up areas with limited vegetation. Increased infrastructure failure and maintenance costs due to extreme weather events and climate stress. By the 2050s, the annual national cost of climate change impacts in South Africa is projected to range from US$116.8 million at 2.0 °C global warming to US$228.7 million at 2.4 °C and could rise to US$522.0 million if no adaptation measures are implemented (Taylor et al. 2025).

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Component	Description
	Expansion of high-risk informal settlements as urbanisation continues, increasing exposure to climate hazards. Disruption of transport, energy, and water systems, with cascading impacts on economic activity and service delivery. Increased risk of displacement and loss of shelter, particularly following repeated extreme events.
Key vulnerabilities	Rapid urbanisation and growth of informal settlements in high-risk areas (floodplains, steep slopes, coastal zones). Poor spatial planning and historical segregation spatial patterns increasing exposure. Ageing and poorly maintained infrastructure systems. Limited stormwater management capacity in many municipalities. High levels of poverty and inequality limiting adaptive capacity. Dependence on climate-sensitive infrastructure systems (water, energy, transport). Strong interlinkages with water and disaster risk systems.
Gender vulnerabilities	Women and children are disproportionately exposed in informal settlements, particularly during flooding and extreme events. Increased safety risks, including gender-based violence, during displacement and disaster events. Greater burden on women in managing households under conditions of service disruption (water, sanitation, energy). Limited access to resources and decision-making reduces adaptive capacity.

3.2.6.6 Disaster risk management

Component	Description
Key climate hazards	Extreme rainfall, flooding, severe storms, strong winds, hail and lightning. Drought, heatwaves, wildfires/veld fires and coastal storm surges. Compound events where flooding or storms trigger infrastructure failure, service disruption, displacement and economic losses.
Observed impacts	Disaster impacts in South Africa are increasingly dominated by floods, storms and droughts, with repeated damage to homes, roads, bridges, schools, clinics, water, sanitation and electricity infrastructure The June 2025 Eastern Cape floods were declared a national disaster, with infrastructure repair costs estimated at R5.1 billion, 6,869 households affected, 4,724 people left homeless and 2,145 homes partially damaged. In January 2026, severe flooding and weather impacts led to a national disaster declaration, affecting Limpopo, Mpumalanga, KwaZulu-Natal, Eastern Cape and Northwest. Reported fatalities included 18 deaths in Limpopo and 20 in Mpumalanga, with damage in Limpopo at around US$240 million. In May 2026 a national disaster was declared for 6 provinces (Western Cape, Northwest, Free State, Eastern Cape, Northern Cape and Mpumalanga). The provinces were hit by heavy rainfall, flooding, thunderstorms, damaging winds and snowfall.
Potential impacts	Increased disaster losses, displacement and recovery costs as extreme rainfall, storms, drought and heat events intensify. Repeated damage to transport, water, electricity, schools and health facilities, with cascading impacts on service delivery and economic activity. Greater pressure on disaster relief funding: South Africa's disaster relief costs are estimated to average R3.7 billion per year, with 86% of losses uninsured and an annual funding gap projected to exceed R2.3 billion.
Key vulnerabilities	High exposure of informal settlements, rural communities and poorly serviced areas to flooding, storms and heat.

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Component	Description
	Ageing or poorly maintained infrastructure increases the likelihood of service failure during disasters. Poverty, unemployment and inequality reduce household recovery capacity. Municipal disaster management capacity remains uneven, with gaps in staffing, equipment, data systems, funding and post-disaster recovery planning.
Gender vulnerabilities	Women, children, older persons and persons with disabilities are often more exposed during disasters due to unequal access to income, mobility, services and information. Women often carry increased care burdens during disasters, including securing food, water, shelter and healthcare.

Figure 3.5 highlights that South Africa's key climate risks are strongly interconnected across sectors and systems. This underlines the need for integrated adaptation responses that address cross-sectoral risks rather than treating climate impacts in isolation.

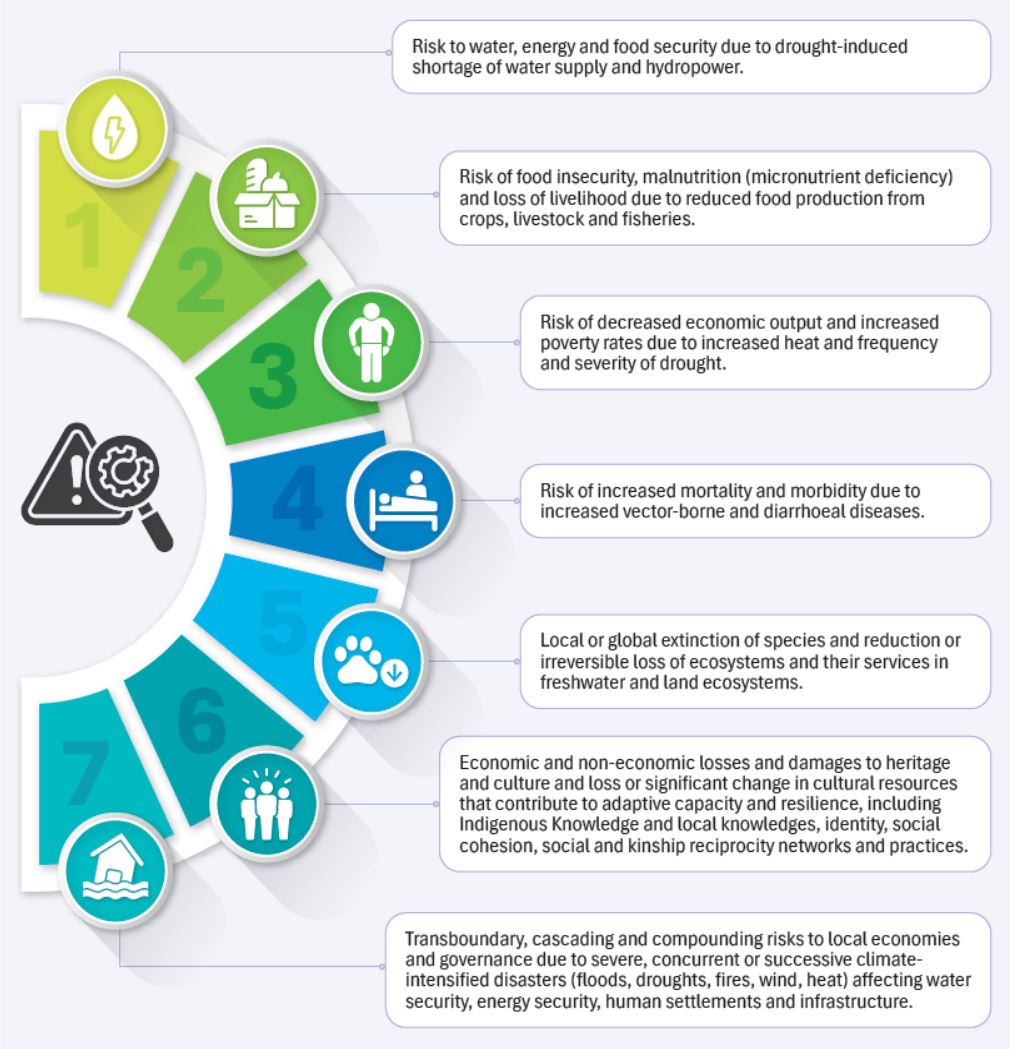


Figure 3.5: Key intersectoral risks according to Taylor et al., 2025

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3.3 Adaptation priorities and barriers

3.3.1 Domestic priorities

South Africa identified five goals in its updated and enhanced A-NDC in 2021. In updating the country's adaptation communication in its second NDC in 2025, these five goals were reviewed taking into account the thematic targets which were globally agreed in the Framework for Global Climate Resilience (FGCR) under the Global Goal on Adaptation (GGA) and referenced in the GST outcome (decisions 2/CMA.5 and 1/CMA.5, respectively).

Being committed to progression in its adaptation goals and interventions, with a strong focus on implementation, eight goals were identified, together with priority interventions to achieve them, ways of tracking progress, and support needed. South Africa will implement interventions to achieve these eight goals, consistent with the Climate Change Act and National Climate Change Adaptation Strategy. The eight adaptation goals communicated in the second NDC (RSA, 2025) are:

- **Goal 1** - Adapt South Africa's water and sanitation systems to drying conditions and drought and flood intensification, as water underpins human, plant and animal health and all economic and livelihood activities.
- **Goal 2** - Enhance disaster risk management, healthcare and sanitation provision, especially in informal settlements, to reduce impacts of flooding and heat stress on most vulnerable households.
- **Goal 3** - Upgrade critical transport infrastructure (roads, rail, ports) to maintain functioning under increased rainfall intensity, heat stress, wind speeds and storm surges.
- **Goal 4** - Enhance nutritious food access and affordability through support to agricultural and fisheries producers and distributors in adapting to warmer and windier conditions and changes in rainfall.
- **Goal 5** - Enhance climate services, with early warning and impact information made accessible to a wide range of users, tailored to different operational, language, gender, age and disability needs.
- **Goal 6** - Enhance ecosystem-based adaptation to heat and water stress, protecting South Africa's natural heritage, biodiversity and improving ecosystem functioning that underpins our cultural identity, food systems, human wellbeing and our tourism economy.
- **Goal 7** - Capacitate all spheres of government to implement adaptation through enacting and enforcing all provisions of Climate Change Act.
- **Goal 8** - Enhanced efforts to build climate-resilient human settlements and resilient infrastructure.

3.3.2 Adaptation challenges and gaps and barriers to adaptation

South Africa's adaptation agenda is moving from planning toward implementation, helped by the Climate Change Act and the National Climate Change Adaptation Strategy. The technical

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analysis to support adaptation component of South Africa's NDC highlighted a need for stronger monitoring, better spatial targeting, more private and blended finance, and more attention to peri-urban vulnerability and less-covered sectors (Taylor et al., 2025).

The State of Climate Action in South Africa 2024 (PCC, 2024), the Presidential Climate Commission's first assessment of climate action in South Africa, presents a snapshot of South Africa's progress toward reducing emissions, enhancing climate resilience, and improving the lives and livelihoods of all South Africans, particularly those most impacted in the climate transition. The report highlights that while there is strong public support and policy commitments for acting on climate change and driving a just transition in South Africa, there is disparity between policy ambitions and practical outcome. The three main drivers for the mismatch between commitments and action include:

- Contradictory public policies and positions, particularly regarding the future of the energy sector, as government wrestles with immediate trade-offs between energy security, economic growth, the health impacts of pollution from fossil fuels, and climate commitments.
- Inadequate technical and financial capacity constrains the role of local governments as the frontline responders to climate change and the just transition
- Limited investments in the just transition, from public, private, international, and domestic sources.

While the report points to fragmentation of strategic and technical responsibilities, it is expected that the country's Climate Change Act, as it is operationalised, will support ensuring a more coherent and integrated response to climate change.

3.4 Adaptation strategies, policies, plans, goals and actions

3.4.1 Sectoral adaptation plans and policies

South Africa's second adaptation communication, contained within the country's second NDC, includes the country's adaptation goals (described in Section 3.3.1) which represent South Africa's planned contribution to the global adaptation goal during the NDC period as well as actions to be taken, or measures to be implemented in achieving those goals.

The BTR1 provided an overview of adaptation actions and progress on key policy, strategy and legislation per sector for priority adaptation sectors such as agriculture, forestry, biodiversity and ecosystems, health, human settlements, water, and disaster risk reduction sectors, as well as for other relevant sectors such as the marine, mining, transportation and energy sectors.

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This section outlines progress on sectoral policies, plans, strategies and frameworks that support climate change adaptation per sector since 2024 in Table 3.2.

Table 3.2: Sectoral policies, plans, strategies and frameworks since BTR1

Sector	Year	Policy, Strategy, Framework	Description
Agriculture	2026	Climate Smart Agriculture Strategic Framework and Climate Change Mitigation and Adaptation Sector Plan (under review)	Based on a presentation of an overview of the climate change policies, strategies, plans and programmes in the agriculture sector in South Africa (Sep 2025), the Climate Smart Agriculture Strategic Framework and Climate Change Mitigation and Adaptation Sector Plan is under review.
Forestry	2020	Master Plan for the Commercial Forestry Sector in South Africa 2020-2025	The objectives of the Master Plan include encouraging forestry sector growth, investment, job creation and competitiveness. In terms of the DSI Forestry Cluster, the DSI and the Technology Innovation Agency (TIA) are broadening the scope of the current Forest Molecular Genetics Cluster Programme to include downstream activities – to strengthen the value chain and increase productivity and competitiveness within the ecosystem. The proposed cluster model aims to craft more opportunities in the innovation (upstream) value chain which can be applied in the downstream elements. One of the upstream elements includes 'Developing pest and disease-resistant tree varieties and mitigating climate change'.
Biodiversity and Ecosystems	2023	Climate Change Vulnerability Assessment and Adaptation Strategy for South Africa's Biodiversity and Ecosystems Sector	The aim of the strategy was to review the past adaptation plans in terms of progress made and challenges experienced, update the estimates of biome-level climate impacts and vulnerability, and update the new biome-scale adaptation plan for the biodiversity sector.
Health	2026	National Climate Change and Health Adaptation Strategy and Implementation Plan (2026-2030) (Draft in progress)	The strategy aims to provide a strategic and coordinated framework to assess and manage climate-related health risks, strengthen institutional and community capacity, and systematically integrate climate considerations into health planning, policy development, and service delivery, ensuring that the health system is prepared to protect current and future generations in a changing climate
Human Settlements	2023	Human Settlements Environmental Implementation Plan 2020-2025	The purpose and objectives of the EIP are to coordinate and harmonize the policies, plans, programmes, and decisions of the various national departments that exercise functions that may affect the environment

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Sector	Year	Policy, Strategy, Framework	Description
Water	2024	Climate Change Status Quo Analysis for Water Resources and the Development of a Climate Change Response Strategy for the Water and Sanitation Sector in South Africa	The Climate Change Response Strategy for the water sector provides a review of the previous CCRS for the water sector developed in 2013 in line with the updated mandate of the Department and an updated Status Quo Assessment of both climate change and water and sanitation related challenges in South Africa
Disaster Risk Reduction	2023	National Disaster Management Framework 2023 *(Reviewed copy 1)*	The Framework recognises a diversity of risks and disasters in southern Africa. Accordingly, it prioritises developmental measures that reduce the vulnerability of disaster-prone areas, communities and households.
Coastal	2025	Climate Change Adaptation Response Plan for South Africa's Coastal Sector 2025	The CARP was developed as a strategic framework to address climate change hazards affecting South Africa's coastal sector. The CARP is the response to the Climate Change Act's demand for the development of Sector Adaptation Strategies and Plans (Act 22 of 2024, Section 22), designed to enhance coastal resilience, and safeguard coastal communities, ecosystems, and economies through initiative-taking adaptation measures.
Mining	2025	Department of Mineral and Petroleum Resources 2025-2030 Strategic Plan	The report includes climate change in the context of energy transitions and decarbonization efforts to combat the effects of human induced climate change. The most significant policy development affecting mining decarbonisation is the Climate Change Act 22 of 2024 in which mining is explicitly identified as a priority sector.
Transportation	2024	Transport Just Transition Plan (TJTP) *(draft)*	The plan aims to guide the transport sector's shift toward a low-carbon, inclusive, and climate-resilient future by 2050, aligning with national policies like the Green Transport Strategy, the Climate Change Act, and the Just Transition Framework.
Energy	2025	Integrated Resources Plan 2025	The IRP 2025 is a comprehensive, forward-looking strategy that outlines the allocation of South Africa's primary energy resources ensuring the country's energy demand is met both cost efficiently and sustainably. The IRP 2025 incorporates comprehensive analyses of power system adequacy, grid constraints, legal frameworks, macro trends and generation technology costs and performance.

3.4.2 Provincial climate change responses

The Climate Change Act, 2024 mandates Provinces to undertake climate change needs and response assessments for the province and develop the associated implementation plan which its effective implementation should be coordinated through the Provincial Climate

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Change Forum in the form of annual reporting. The BTR1 provided an overview of South Africa's Provincial Climate Support Programme which supported provinces and municipalities to undertake climate change risk and vulnerability assessments and develop adaptation strategies. Climate change interventions that were being implemented by provinces in all identified key sectors were also outlined in the BTR1.

The Department of Forestry, Fisheries and the Environment (DFFE) leads South Africa's provincial and municipal climate change adaptation efforts through the National Climate Change Adaptation Strategy (NCCAS) (which serves as the country's National Adaptation Plan (NAP)). Interventions by the DFFE to help build climate resilience at local level and mainstream the necessary measures into provincial and municipal plans and budgets included[17]:

- Worked with nine district municipalities - Mopani, Vhembe, Capricorn, Sekhukhune, Waterberg, Garden Route, Overberg, Cape Winelands and West Coast Municipalities.
- Assisted the Free State and Mpumalanga Provinces to review and improve their climate change Strategies and plans.
- Together with SALGA, assessed local disaster management plans and ensured these are adequately re-orientated to take account of possible future climate-induced disaster in Bojanala, West Rand, iLembe, Chris Hani and Sedibeng District Municipalities.
- In Nelson Mandela Metropolitan Municipality, Sarah Baartman District Municipality, Buffalo City Metropolitan Municipality and the Amathole District Municipality, trained officials on the ocean vulnerability index so that effective planning can be undertaken to prepare for storm surges and sea level rise.
- Capacitated the Mopani, Mangaung, Madibeng, ZF Mgcawu, Joe Gqabi Municipalities and the Limpopo, Northwest and KwaZulu-Natal Provinces in the development and revision of air quality management plans.

3.4.3 Integration of gender perspectives and indigenous, traditional, and local knowledge into adaptation

South Africa recognises that adaptation is not only a technical response to climate hazards, but also a social and developmental process shaped by unequal exposure, differentiated

[17] https://www.gov.za/news/speeches/minister-barbara-creecy-forestry-fisheries-and-environment-dept-budget-vote-202324

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vulnerability and uneven access to resources. Climate impacts are experienced through existing inequalities related to gender, poverty, unemployment, rurality, disability, land access, care responsibilities, health risks and participation in decision-making. BTR1 established this baseline by recognising that climate change has differentiated impacts across genders and that indigenous, traditional and local knowledge can strengthen locally relevant adaptation responses (Department of Forestry, Fisheries and the Environment [DFFE], 2024).

Since BTR1, South Africa has strengthened the enabling environment for integrating gender perspectives and indigenous, traditional and local knowledge into adaptation. Progress is evident in gender-climate mainstreaming frameworks, institutional engagement on gender-responsive climate action, Indigenous Knowledge Systems (IKS) documentation and protection, and participatory adaptation planning. However, implementation remains uneven, and the evidence still points to gaps in systematic reporting, financing, indicators and monitoring of gender-responsive and knowledge-inclusive adaptation outcomes.

3.4.3.1 Gender climate change mainstreaming

Since BTR1, South Africa has continued to strengthen the policy and institutional basis for gender-responsive climate action. The *Strategy toward Gender Mainstreaming in the Environment Sector 2016–2021*, extended to 2025, remains the main sectoral framework for integrating gender into environmental governance, including climate change, biodiversity and conservation, oceans and coasts, the green economy, and waste management (DFFE, 2025b). This provides continuity from BTR1 and confirms that gender mainstreaming remains embedded in the environment sector's policy architecture.

BTR1 recognised that climate change has differentiated impacts across genders, with women often experiencing heightened vulnerability because of structural inequalities such as poverty, unemployment, restricted access to land and productive resources, unpaid care responsibilities, and increased exposure to health and safety risks during climate-related events (DFFE, 2024). Building on this baseline, the BTR2 period reflects a shift from general recognition of gendered vulnerability toward a more structured gender-climate mainstreaming agenda. This is particularly important for adaptation, where vulnerability assessments, sector planning, finance, implementation and monitoring need to account for differentiated exposure, capacity and access to resources.

The Draft Gender Action Plan for gender mainstreaming in NDC enhancement provides the clearest framework for this progression. It identifies strategic actions on institutional arrangements, sectoral coordination, gender-responsive climate policies, participatory monitoring and evaluation, funding alignment, and awareness and capacity-building (DFFE, 2022). These elements are directly relevant to adaptation because they provide practical entry

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points for integrating gender into vulnerability assessment, adaptation planning, implementation systems and reporting processes.

Institutional engagement has also advanced since BTR1. The Commission for Gender Equality's comments on the Draft Gender Action Plan demonstrate continued scrutiny of gender-responsive climate action and reinforce the need for adaptation and mitigation measures to respond to gendered impacts across sectors (Commission for Gender Equality, 2024). This strengthens accountability and situates gender-climate mainstreaming within South Africa's broader gender equality governance framework.

The main remaining gap is implementation. While South Africa has strengthened the policy and institutional basis for gender-responsive adaptation, evidence of systematic gender-disaggregated adaptation data, gender-responsive budgeting, sector-level indicators and reported adaptation outcomes remains limited. BTR2 should therefore present progress as an improvement in enabling conditions and institutional readiness, while noting that the next phase requires consistent application across sectors, especially in vulnerability assessment, human health, agriculture, water, coastal livelihoods, biodiversity, adaptation finance and monitoring systems.

3.4.4 Gender capacity-building workshops and reporting support

Note: This section will be revised to include inputs from the gender-climate mainstreaming workshop in October 2026.

Since BTR1, South Africa has advanced gender-climate capacity-building and methodological readiness for adaptation reporting.

3.4.5 Indigenous knowledge

South Africa's integration of indigenous, traditional and local knowledge into adaptation builds on an established national policy foundation. The *Indigenous Knowledge Systems Policy*, adopted by Cabinet in November 2004, provides the framework for recognising, affirming, developing, promoting and protecting Indigenous Knowledge Systems. It identifies institutional mechanisms for documentation, recordal, intellectual property protection, advisory support and coordination across sectors such as biodiversity, health, education, culture, trade and innovation (Department of Science and Technology, 2004).

BTR1 recognised the importance of indigenous, traditional and local knowledge for locally relevant adaptation, including climate observation, agriculture, biodiversity conservation, water management and disaster preparedness (DFFE, 2024). Since BTR1, progress has been made in strengthening the institutional systems that enable indigenous knowledge to be documented, protected and more effectively connected to public policy. The Department of

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Science, Technology and Innovation's 2024/25 Annual Report records continued work on Indigenous Knowledge Systems Documentation Centres, the Indigenous Knowledge Registration System, community engagement protocols, secure data capture, monitoring and evaluation, and support for the protection of traditional knowledge and genetic resources (Department of Science, Technology and Innovation [DSTI], 2025).

This progress is adaptation-relevant because knowledge documentation, registration and protection create the conditions under which indigenous and local knowledge can be used ethically in climate planning, without reducing knowledge holders to passive sources of information. The protection of traditional knowledge is particularly important for adaptation areas linked to biodiversity stewardship, medicinal plants, food systems, water management, ecosystem-based adaptation and sustainable livelihoods. DSTI's work with Indigenous Knowledge Systems Documentation Centres and related capacity-building therefore represents progress in the enabling infrastructure for knowledge-inclusive adaptation, even though further work is required to demonstrate systematic integration of IKS into sectoral adaptation implementation and monitoring (DSTI, 2025).

Recent South African scholarship supports the practical adaptation value of this work. Madzivhandila (2024) emphasises that IKS and culture are important for climate adaptation, particularly in rural communities where externally designed interventions may have limited effect when disconnected from local experience. Muchaku et al. (2023), drawing on Maluti-a-Phofung Local Municipality, argue that indigenous knowledge should be translated into actionable adaptation strategies through approaches that combine local perceptions with scientific knowledge. The wider African evidence base similarly shows that indigenous and local knowledge has long informed responses to climatic variability and can strengthen adaptation, especially where access to modern climate and weather information is limited (Leal Filho et al., 2022). Ijatuyi et al. (2025) further emphasise that integration of indigenous and scientific knowledge requires equitable collaboration, protection of intellectual property, culturally appropriate frameworks and recognition of indigenous communities as knowledge partners.

Overall, the progression from BTR1 to BTR2 is best characterised as movement from recognition of IKS as an important adaptation resource towards strengthening the systems required for ethical documentation, protection and policy uptake. The remaining gap is that IKS is not yet consistently reported as an input into adaptation plans, climate services, sectoral implementation, finance or monitoring systems. BTR2 should therefore present the progress as enabling and institutional, while identifying the next step as stronger evidence of how

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indigenous, traditional and local knowledge informs concrete adaptation actions and outcomes.

3.4.6 Post-BTR1 progress on IKS documentation, protection and registration

Since BTR1, South Africa has strengthened the institutional architecture for recognising, documenting and protecting indigenous knowledge systems. The Department of Science, Technology and Innovation's 2024/25 Annual Report records South Africa's contribution to the adoption of the World Intellectual Property Organization Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge. This development is significant for adaptation governance because it strengthens the protection of traditional knowledge and genetic resources and helps guard against misappropriation where indigenous and local knowledge informs climate-relevant practices, biodiversity stewardship, health systems and sustainable livelihoods (Department of Science, Technology and Innovation [DSTI], 2025).

Progress is also evident in the continued development of national systems for indigenous knowledge documentation and registration. In April 2024, DSTI, in collaboration with the University of KwaZulu-Natal, convened a forum for project managers of Indigenous Knowledge Systems Documentation Centres from eight provinces. The forum considered how these centres could serve as anchors of the Indigenous Knowledge Registration System and support the recognition of indigenous knowledge as a resource for socio-economic development (DSTI, 2025). This represents an important step in strengthening the governance infrastructure through which indigenous knowledge can be recorded, protected and made available for appropriate policy use.

DSTI further reports capacity-building activities for Indigenous Knowledge Systems Documentation Centre teams, including training on documentation processes, relevant legislation, community engagement protocols, secure data capture, monitoring and evaluation, and the technologies that support documentation work. In partnership with the University of Venda, DSTI also advanced recognition-of-prior-learning processes for traditional health practitioners through a pilot initiative to develop norms and standards in the province (DSTI, 2025). These interventions contribute to the broader enabling environment for adaptation by strengthening institutional capacity, ethical knowledge governance and pathways for recognising community-based expertise.

DSTI's smart villages work further demonstrates the relevance of indigenous knowledge to sustainable and climate-resilient development. In February 2025, DSTI hosted a Smart Villages Conference that examined the role of indigenous knowledge in shaping rural development, decolonisation and equitable rural-urban transformation (DSTI, 2025). This is

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relevant to adaptation because rural resilience depends not only on infrastructure, digital technologies and service delivery systems, but also on the living knowledge systems, cultural practices, ecological relationships and local institutions through which communities manage environmental change.

To support local adaptive capacity, the DFFE in partnership with local stakeholders has initiated collaborative, participatory baseline assessment rapid studies in four provinces. The purpose of these studies has been to establish the existence of indigenous knowledge holders, as well as evidence of existing structures and Indigenous Knowledge studies on climate change.

The main conclusions from these studies are:

- Indigenous Knowledge Systems (IKS) are highly relevant to climate adaptation across the provinces covered, including the Free State, Mpumalanga, North West and Western Cape. Communities use long-standing ecological, cultural and spiritual knowledge to understand environmental change and respond to climate risks.
- Communities are already observing climate change impacts through shifts in rainfall, drought frequency, temperature extremes, seasonal patterns, biodiversity loss, altered animal behaviour, reduced medicinal plant availability, soil degradation and changing water availability.
- IKS-based adaptation practices remain practical and locally grounded, including indigenous seed preservation, crop timing based on natural indicators, soil and water conservation, sustainable harvesting, protection of sacred sites, traditional food storage, rainwater harvesting, and indigenous weather forecasting.
- Cultural practices and rituals play an important role in environmental stewardship, including rainmaking ceremonies, taboos regulating resource use, protection of sacred places, oral traditions, songs, dances and intergenerational teaching.
- Traditional governance structures are central to local climate response, but there are persistent gaps between traditional systems and formal government planning, policy, monitoring and communication mechanisms.
- IKS is under-recognised in formal climate change policy and planning, despite its value for locally appropriate, culturally relevant and sustainable adaptation.
- The erosion of traditional practices is a major concern, especially due to modernization, reduced youth participation, cultural stigma, biodiversity loss and limited documentation of indigenous knowledge.

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The key recommendations are to:

- Integrate Indigenous Knowledge Systems (IKS) into formal climate change policy, planning and implementation, so that adaptation responses are locally relevant and culturally grounded.
- Create supportive legal and institutional frameworks that formally recognise IKS and enable its use in climate adaptation.
- Strengthen participatory climate monitoring by involving indigenous communities, traditional leaders, elders and knowledge holders in observing, recording and responding to climate impacts.
- Combine traditional and scientific knowledge through interdisciplinary research, joint learning and collaboration between communities, scientists and policymakers.
- Document, preserve and protect IKS, including traditional ecological knowledge, cultural practices, medicinal plant knowledge and indigenous weather forecasting.
- Safeguard indigenous intellectual property rights, especially where community knowledge is used in research, policy or programmes.
- Support community-led adaptation projects, including agroecology, water conservation, reforestation, biodiversity protection, renewable energy and sustainable resource management.
- Strengthen traditional governance systems so they can continue regulating land use, natural resource protection, sacred sites and community-based climate responses.
- Improve communication and coordination platforms, such as local climate forums, to connect traditional authorities, communities and government institutions.
- Promote intergenerational knowledge transfer, particularly to address the declining participation of younger people in indigenous practices.

3.4.7 Relevance to adaptation priorities, nature-based solutions and development planning

The integration of gender perspectives and indigenous, traditional and local knowledge strengthens adaptation planning by improving the quality of vulnerability assessment, implementation design and monitoring. It helps identify differentiated exposure, sensitivity and adaptive capacity across social groups, while also grounding adaptation responses in local realities, cultural practices and community priorities. This is particularly important for BTR2 because progress should not be assessed only by the existence of adaptation policies, but

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also by whether adaptation actions are responsive to the people, places and knowledge systems most affected by climate risk.

These knowledge systems are especially relevant to nature-based solutions and ecosystem-based adaptation. Indigenous and local knowledge can inform biodiversity conservation, water stewardship, soil management, agroecology, sustainable harvesting, medicinal plant use, sacred landscape protection and coastal resource management. Where such knowledge is integrated ethically and with appropriate safeguards for knowledge holders, it can strengthen locally legitimate and ecologically grounded adaptation responses.

Participatory planning is also an important area of progress since BTR1. The Climate Change Adaptation Response Plan for South Africa's Coastal Sector was developed through provincial stakeholder workshops held between September–November 2023 and August–November 2024, with contributions from hundreds of coastal stakeholders (DFFE, 2025c). This provides evidence of post-BTR1 stakeholder-informed adaptation planning in a climate-sensitive sector. For BTR2, this should be reported as progress in participatory and place-based planning, while recognising that future reporting should provide clearer evidence on how stakeholder inputs shaped final priorities, implementation arrangements and monitoring.

3.4.8 Gaps, constraints and reporting improvements

Table 3.3 gives a summary of progress and remaining gaps since BTR1. Overall, South Africa has made credible progress since BTR1 in strengthening the enabling environment for integrating gender perspectives and indigenous, traditional and local knowledge into adaptation. The Climate Change Act, the Second NDC, gender mainstreaming instruments, Commission for Gender Equality engagement, DSTI's IKS documentation and registration work, traditional knowledge protection processes, participatory coastal adaptation planning and the Belém Adaptation Indicators all provide evidence of progression.

However, implementation remains uneven. Gender-responsive adaptation still requires stronger gender-disaggregated data, gender-sensitive indicators, gender-responsive budgeting, and reporting on the participation and benefits of women, non-binary people, LGBTQIA+ people and other marginalised groups. Similarly, IKS documentation and protection have advanced, but the explicit integration of indigenous, traditional and local knowledge into adaptation planning, climate services, sectoral plans, finance and monitoring systems remains an area for further work.

Table 3.4 shows the Belém indicators relevant to gender perspectives and indigenous, traditional and local knowledge. Table 3.5 shows the preliminary alignment of selected Belém

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Adaptation Indicators with South Africa's Second NDC adaptation goals, SDG indicators, proposed proxy indicators and available baseline data for BTR2 reporting.

3.4.9 Way forward

The next phase of South Africa's adaptation response will focus on translating policy recognition into measurable implementation. South Africa will continue strengthening adaptation monitoring through the National Climate Change Information System and related reporting processes, including the progressive integration of indicators on gender, differentiated vulnerability, community participation, indigenous and local knowledge, and adaptation benefits. Future sectoral adaptation planning will identify opportunities to integrate gender analysis and indigenous knowledge systems into implementation, while climate-finance efforts will seek to increase support for women-led, Indigenous Peoples–led and community-led adaptation initiatives. Capacity-building will increasingly focus on applied reporting support, sector-specific tools and practical guidance for government officials and implementing partners.

South Africa will also strengthen ethical and inclusive knowledge governance by promoting the appropriate protection of indigenous, traditional and local knowledge from extraction and misappropriation and by recognising knowledge holders as partners in adaptation planning and implementation. This will contribute to adaptation interventions that are technically effective, socially legitimate and just.

Since BTR2, South Africa has strengthened the policy, institutional and methodological foundations for integrating gender perspectives and indigenous, traditional and local knowledge into adaptation. Future efforts will focus on operationalising these foundations through measurable implementation, targeted finance, effective monitoring and strengthened accountability.

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Table 3.3: Summary of progress and remaining gaps since BTR1

Area	BTR1 baseline	Progress since BTR1	Remaining gaps and constraints
Gender-responsive adaptation	BTR1 recognised that climate change has differentiated impacts across genders, with women often facing heightened vulnerability because of structural inequalities, including poverty, unemployment, limited access to land and productive resources, unpaid care responsibilities, and heightened exposure to health and safety risks during climate-related events (DFFE, 2024).	South Africa has maintained and extended the policy basis for gender mainstreaming through the *Strategy toward Gender Mainstreaming in the Environment Sector 2016–2021*, extended to 2025, and the Draft Gender Action Plan for gender mainstreaming in NDC enhancement (DFFE, 2022, 2025b).	Implementation remains uneven. Gender is recognised in policy, but systematic gender-disaggregated adaptation data, gender-responsive budgeting and reporting on gendered adaptation outcomes remain limited.
Gender Action Plan and institutional engagement	BTR1 identified the need to strengthen gender mainstreaming across climate adaptation policy, planning and implementation (DFFE, 2024).	The Draft Gender Action Plan provides a framework for institutional arrangements, sectoral coordination, gender-responsive policies, participatory monitoring and evaluation, funding alignment, and awareness and capacity-building (DFFE, 2022). The Commission for Gender Equality provided comments on the Draft Gender Action Plan, strengthening institutional accountability for gender-responsive climate action (Commission for Gender Equality, 2024).	The Draft Gender Action Plan requires consistent operationalisation across adaptation sectors, including indicators, reporting templates, implementation responsibilities and finance mechanisms.
Gender capacity-building and methodological readiness	BTR1 noted the need for more inclusive and gender-responsive approaches to adaptation planning and reporting (DFFE, 2024).	BTR2 preparatory work has strengthened attention to gender analysis tools, intersectional vulnerability assessment and gender-responsive climate vulnerability and capacity assessment.	Capacity-building still needs to be applied consistently across sectors and translated into gender-disaggregated data, reporting outputs, indicators and implementation evidence.
Indigenous, traditional and local knowledge	BTR1 recognised the importance of indigenous, traditional and local knowledge for locally relevant adaptation, including climate observation, agriculture, biodiversity, water management and disaster preparedness (DFFE, 2024).	South Africa has a long-standing IKS policy framework that recognises, affirms, develops, promotes and protects Indigenous Knowledge Systems (Department of Science and Technology, 2004). Since BTR1, DSTI has advanced documentation, registration, capacity-building and protection of indigenous knowledge systems (DSTI, 2025).	IKS is increasingly documented and protected, but explicit integration into adaptation planning, climate services, sectoral plans, finance and M&E remains uneven.
IKS documentation,	BTR1 identified the value of IKS while noting gaps in mechanisms for recognition, protection,	DSTI's 2024/25 Annual Report records post-BTR1 progress, including work on the WIPO Treaty on	These activities are adaptation-relevant but are not always explicitly reported as climate

Area	BTR1 baseline	Progress since BTR1	Remaining gaps and constraints
registration and protection	training and integration into formal policy systems (DFFE, 2024).	Intellectual Property, Genetic Resources and Associated Traditional Knowledge, the IK Registration System, Indigenous Knowledge Systems Documentation Centres, and training on documentation and community engagement protocols (DSTI, 2025).	adaptation actions. The link between IKS documentation and adaptation implementation requires further strengthening.
Nature-based solutions and ecosystem-based adaptation	BTR1 recognised the relevance of local and indigenous knowledge to biodiversity conservation, ecosystem management and adaptation (DFFE, 2024).	Evidence from South African and African literature supports the value of IKS in ecosystem stewardship, biodiversity conservation, agroecology, water management and locally grounded adaptation	Project-level reporting does not yet consistently document whether nature-based adaptation actions use indigenous, traditional or local ecological knowledge.
Participatory and place-based adaptation planning	BTR1 recognised the importance of stakeholder involvement and locally relevant adaptation (DFFE, 2024).	The *Climate Change Adaptation Response Plan for South Africa's Coastal Sector* was developed through provincial stakeholder workshops between September–November 2023 and August–November 2024, with contributions from hundreds of coastal stakeholders (DFFE, 2025c).	Participation is documented, but reporting should distinguish consultation from co-production and show how stakeholder inputs influenced final priorities and implementation.
Human health and gendered vulnerability	BTR1 recognised that climate impacts affect health and wellbeing, with differentiated risks for vulnerable groups (DFFE, 2024).	Gender-responsive adaptation framing increasingly recognises health risks linked to heat, water insecurity, disease exposure, disaster impacts and psychosocial stress.	Consolidated evidence remains limited on gender-sensitive climate-health adaptation indicators and training of health practitioners on climate adaptation and gendered vulnerability.
Monitoring, evaluation and learning	BTR1 identified the need to strengthen adaptation tracking and reporting systems (DFFE, 2024).	The Belém Adaptation Indicators provide relevant guidance for strengthening adaptation tracking, including indicators on gender-responsive planning, planning informed by traditional knowledge and local knowledge systems, and M&E systems (UNFCCC, 2025).	South Africa's adaptation M&E systems need to capture gender, differentiated vulnerability, IKS/local knowledge, participation and adaptation benefits more systematically.
Adaptation finance and implementation	BTR1 recognised that adaptation implementation requires resources, capacity and coordination (DFFE, 2024).	Policy frameworks and institutional processes have advanced, including the Climate Change Act, the Second NDC and sectoral adaptation planning (DFFE, 2025a; Republic of South Africa, 2024).	Evidence remains limited on dedicated finance for women-led, indigenous-led and community-led adaptation initiatives.

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Table 3.4 Belém indicators relevant to gender perspectives and indigenous, traditional and local knowledge

Belém indicator	Proposed BTR2 indicator for South Africa	2nd NDC goal	Data source	Supporting information
1(a): Indicators may be disaggregated by social categories, including vulnerability, gender, age, disability, race, socioeconomic status, status as Indigenous Peoples, status as migrants, children and young people.	Proportion of reported adaptation actions that include gender-disaggregated and/or socially disaggregated beneficiary information.	Tracking differentiated vulnerability, adaptive capacity and equitable adaptation outcomes.	NCCIS; DFFE adaptation reporting templates; sector adaptation reports; provincial and municipal adaptation reports; project M&E reports.	Use this only as disaggregation guidance. It supports reporting on whether adaptation actions identify and track benefits for women, youth, persons with disabilities, Indigenous/traditional knowledge holders, local communities and other vulnerable groups.
4(b): Extent of implementation of institutional frameworks for knowledge transfer, research and development, and extension services supporting climate change adaptation in the areas of food and agriculture relative to needs.	Extent of implementation of gender-responsive and IKS-informed agricultural extension, climate services or farmer-support programmes.	Climate-resilient food and agricultural production; rural livelihoods; equitable access to adequate food and nutrition.	DALRRD; ARC; provincial agriculture departments; DFFE; extension service records; project reports.	Use only where the section discusses food and agriculture. This can link gender and IKS to women smallholder farmers, local seasonal knowledge, drought preparedness, crop choices, soil management and water management.
5(h): Proportion of health practitioners who have received capacity-building support pertaining to climate change adaptation and health.	Number or proportion of health practitioners, community health workers or relevant officials trained on gender-sensitive climate-health risks and adaptation.	Climate-resilient health services; reduced climate-related morbidity and mortality, particularly in vulnerable communities.	Department of Health; provincial health departments; DFFE; training records; Lancet Countdown South Africa data sheet.	Use only where the section discusses human health. This can support reporting on whether climate-health adaptation considers women, pregnant people, children, older persons, persons with disabilities, informal settlement residents and rural communities.
6(a): Proportion of climate-resilient ecosystems that are providing services to populations that depend on them.	Number or proportion of climate-resilient ecosystems or ecosystem-based adaptation interventions that report benefits to dependent communities, including women, local communities	Ecosystem resilience; nature-based adaptation; protection of livelihoods and ecosystem services for vulnerable communities.	DFFE; SANBI; provincial conservation agencies; community-based natural resource management reports; project M&E reports.	Use where ecosystem services and dependent communities are discussed. This can connect nature-based adaptation to social benefits and local livelihoods.

Belém indicator	Proposed BTR2 indicator for South Africa	2nd NDC goal	Data source	Supporting information
	and traditional/indigenous knowledge holders.			
6(b): Proportion of ecosystem areas with adaptation actions implemented towards enhanced resilience and services.	Number or proportion of ecosystem-based adaptation or nature-based solution projects that document use of indigenous, traditional or local ecological knowledge.	Ecosystem-based adaptation; biodiversity resilience; nature-based solutions; rural and coastal livelihood resilience.	DFFE; SANBI; provincial conservation agencies; DSTI IKS Documentation Centres, project M&E reports.	Use where project evidence shows indigenous or local ecological knowledge has informed ecosystem-based adaptation. Do not present IKS use as confirmed unless the project documentation states it.
6(f): Level of adaptive capacity, resilience and vulnerability to climate impacts resulting from the implementation of ecosystem-based adaptation actions and nature-based solutions according to information reported by Parties, as appropriate.	Level of adaptive capacity, resilience and vulnerability outcomes reported from ecosystem-based adaptation or nature-based solution projects, including where indigenous or local ecological knowledge is documented.	Ecosystem-based adaptation, biodiversity resilience and nature-based solutions.	DFFE; SANBI; provincial conservation agencies; project M&E reports; DSTI IKS Documentation Centres where relevant.	Use only for ecosystem-based adaptation and nature-based solutions. The IKS link should be made only where project evidence documents use of indigenous or local knowledge.
9(a): Percentage of at-risk cultural and natural heritage sites and elements with adaptation measures implemented to enhance resilience to climate-related hazards under different warming scenarios, guided by traditional, local or Indigenous Peoples' knowledge and practices, disaggregated, as appropriate, by tangible and intangible cultural elements.	Number or percentage of at-risk cultural and natural heritage sites or elements with adaptation measures guided by traditional, local or Indigenous Peoples' knowledge.	Protecting cultural and natural heritage from climate-related risks through locally informed adaptation.	Department of Sport, Arts and Culture; DFFE; SANBI; DSTI IKS Documentation Centres; provincial heritage and conservation agencies.	Use only if heritage-site or cultural-heritage adaptation data are available. This is a direct IKS-relevant Belém indicator.
9(d): Level of establishment of institutional arrangements for the provision of regular training on climate change adaptation that incorporates guidance from	Level of establishment of institutional arrangements for adaptation training that incorporates traditional, local	Capacity-building for knowledge-inclusive adaptation.	DSTI Annual Report; DSTI IKS Documentation Centres; DFFE training records; CSIR/DFFE capacity-building records; provincial training reports.	This can be linked to DSTI's IKS documentation, registration and training work, but should be framed as adaptation-relevant capacity-

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Belém indicator	Proposed BTR2 indicator for South Africa	2nd NDC goal	Data source	Supporting information
traditional, local and Indigenous Peoples' knowledge where applicable.	and Indigenous Peoples' knowledge.			building unless the training is explicitly climate adaptation training.
9(e): Percentage of climate adaptation measures focused on cultural heritage that maintain sustained engagement with Indigenous Peoples and/or local communities.	Percentage or number of cultural-heritage adaptation measures that maintain sustained engagement with Indigenous Peoples and/or local communities.	Participatory and locally grounded adaptation for cultural heritage and community resilience.	Department of Sport, Arts and Culture; DFFE; provincial heritage agencies; municipal plans; project M&E reports.	Use only for cultural heritage adaptation. This is not a general IKS indicator for all adaptation actions.
11(b): Status of having gender-responsive adaptation plans, policy instruments, and planning processes and/or strategies in place.	Status of gender-responsive adaptation plans, policy instruments and planning processes in South Africa.	Gender-responsive adaptation planning and mainstreaming adaptation in relevant strategies and plans.	DFFE Gender Action Plan; DFFE Gender Mainstreaming Strategy; sector adaptation plans; provincial climate change response plans; NCCIS.	This is the strongest direct Belém indicator for the gender component of this section.
11(c): Existence of national adaptation plans, policy instruments, planning processes and strategies that have been informed by traditional knowledge, knowledge of Indigenous Peoples and local knowledge systems.	Existence and status of South African adaptation policies, plans or planning processes informed by indigenous, traditional and local knowledge.	Locally grounded and knowledge-inclusive adaptation planning.	DFFE adaptation planning documents; DSTI IKS documentation and registration systems; provincial and municipal adaptation plans; sector adaptation plans; NCCIS.	This is the strongest direct Belém indicator for the indigenous, traditional and local knowledge component. Use only where adaptation planning documents explicitly show use of IKS, traditional knowledge or local knowledge.
12(f): Capacity-building for climate adaptation reported in line with chapters IV, V and VI, as relevant and as appropriate, of the annex to decision 18/CMA.1, including capacity-building support for climate adaptation provided by developed countries and needed and received by developing countries for implementation of adaptation plans, policy	Capacity-building support received or needed for gender-responsive and IKS-informed adaptation planning, implementation and reporting.	Strengthening implementation capacity for adaptation plans, policies and strategies.	BTR support chapter; DFFE; CSIR; South-South-North; DSTI; training reports; donor/project reports.	Use for reporting capacity needs and support received. This can capture gender mainstreaming training and IKS-related capacity-building where directly linked to adaptation reporting or implementation.

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Belém indicator	Proposed BTR2 indicator for South Africa	2nd NDC goal	Data source	Supporting information
instruments and planning processes and/or strategies.				
13(a): Extent of design of a system for monitoring, evaluation and learning for national adaptation efforts relative to needs.	Extent to which South Africa's adaptation M&E system is designed to capture gender, differentiated vulnerability, participation and indigenous/local knowledge.	Strengthening national adaptation monitoring, evaluation and learning.	NCCIS; DFFE adaptation M&E system; BTR reporting systems; sector and provincial reporting processes.	Use in the gaps and way forward section. This supports improving the design of adaptation M&E systems.
13(b): Level of operationalization of a system for monitoring, evaluation and learning for national adaptation efforts.	Level of operationalisation of adaptation M&E systems that can report on gender-responsive and knowledge-inclusive adaptation.	Operationalising national adaptation monitoring, evaluation and learning.	NCCIS; DFFE adaptation M&E system; sector and provincial reports.	Use to assess whether gender and IKS-sensitive reporting is functioning in practice, not only designed on paper.
13(e): Level of institutional capacity to fully operate systems for monitoring, evaluation and learning for national adaptation efforts.	Level of institutional capacity to operate adaptation M&E systems that include gender-disaggregated data, IKS/local knowledge information and participation indicators.	Strengthening institutional capacity for adaptation tracking and reporting.	DFFE; NCCIS; CSIR; sector departments; provinces; training records.	Use for capacity gaps and reporting improvements. This links directly to the need for sector-specific guidance, training materials and reporting support.

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3.5 Progress on implementation of adaptation on selected projects in South Africa

A stock take of South Africa's current adaptation strategies, action plans and implemented actions was undertaken in the Technical Analysis to Support the Adaptation Component of South Africa's Second Nationally Determined Contribution (Taylor et al., 2025). The review identified 129 implementation-oriented adaptation projects in South Africa (excluding research projects (a list of these projects is provided in Taylor et al., 2025 in Appendix 1). The timelines of adaptation projects show that efforts have spanned more than two decades, with many projects launched between 2018 and 2021 in response to heightened Post-Paris Agreement action. Several large-scale projects are long-term, running up to 2051, particularly those focused on ecosystem restoration and systemic adaptation.

The strongest project concentration was in terrestrial ecosystems, followed by urban and rural settlements and water resources, while agriculture, coastal management, and health are less represented. The main project themes identified included ecosystem restoration, invasive alien plant control, wetland restoration, rainwater harvesting, climate-smart agriculture, disaster risk reduction, community capacity building, and policy or planning support.

In the projects reviewed the main intended beneficiaries were local communities, especially small-scale farmers, women, youth, and coastal communities. However, the review noted gaps in attention to indigenous peoples, older people, and persons with disabilities, suggesting that current projects are not yet fully intersectional. Government actors dominate implementation, especially the national Department of Forestry, Fisheries and the Environment and municipalities such as eThekwini and Cape Town. Geographically, adaptation activity is most visible in Mpumalanga, KwaZulu-Natal, the Western Cape, and the Northern Cape, with many projects concentrated in rural areas rather than peri-urban settlements.

The review highlights the need to strengthen monitoring, improve spatial targeting, mobilise more private and blended finance, and place more emphasis on peri-urban vulnerability and less-covered sectors.

3.6 Monitoring and evaluation of adaptation actions and processes

3.6.1 Approaches and systems for monitoring and evaluation adaptation actions

The National Climate Change Information System (NCCIS) has been established to support the tracking of South Africa's transition towards a low-carbon and climate-resilient society and

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economy. It provides decision-support tools and databases that support adaptation planning, implementation and reporting. The system includes the National Climate Change Response Database (NCCRD) and the Tracking and Evaluation (T&E) Portal, which are intended to monitor progress towards the objectives of the National Climate Change Adaptation Strategy (NCCAS) and South Africa's NDC goals, drawing on information from national, provincial and local systems. This provides an important foundation for strengthening the monitoring of climate risks, impacts, and adaptation interventions, while also supporting future efforts to assess Loss and Damage (L&D) and evaluate the effectiveness of adaptation responses.

South Africa has established foundational systems for climate data management and tracking through the NCCIS and NCCRD. However, these systems are currently undergoing significant redevelopment, led by DFFE with technical support from SAEON, to transition towards an integrated national monitoring, reporting and evaluation system aligned with the Climate Change Act and the Paris Agreement transparency requirements. While provincial systems are emerging, improved integration, standardisation and institutionalisation remain key priorities to enable effective tracking of adaptation implementation.

Key improvements include:

- Transition from information portal to an integrated MRV system
- Standardised indicators
- Data flows across sectors and spheres of government
- Stronger link between policy, implementation and reporting
- Integration of adaptation tracking and mitigation instruments (e.g. carbon budgets)

3.6.2 Indicators used to track adaptation progress

South Africa has made progress in developing and testing indicators to track climate change adaptation responses. Seyisi, Mantlana and Ndhleve (2023) provides a starting point by identifying 37 potential adaptation indicators and refining these to eight core indicators through SMART screening and stakeholder consultation. This work is complemented by national policy and technical processes, including the Desired Adaptation Outcomes, the National Climate Change Adaptation Strategy's M&E approach, and project-based initiatives such as ICAT South Africa. This project developed and tested indicators and M&E frameworks for disaster risk reduction, early warning systems and climate-related disaster impacts. More recent work linked to South Africa's second NDC highlights the need to move beyond tracking implementation towards assessing adaptation effectiveness, outcomes and learning across sectors and governance levels.

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Recently, South Africa has initiated a process to align the Belém Adaptation Indicators with its national adaptation priorities and reporting needs under the Enhanced Transparency Framework. The process is guided by the voluntary and country-driven nature of the indicators, as agreed under the CMA.7 decision. Belém Adaptation Indicators are to be tested in consultation with relevant practitioners and stakeholders and to use them, where appropriate, in BTRs, NDCs, adaptation communications, national adaptation plans and national communications.

The starting point for South Africa's selection process is the eight national adaptation goals contained in the Second NDC. These goals are used to identify the most relevant Belém indicators across sectors. Preliminary alignment work has focused on identifying indicators that are feasible, relevant, and supported by available or potentially obtainable data.

A series of consultations, technical meetings and workshops were held to further refine South Africa's approach to selecting appropriate indicators for BTR2. These sessions were aimed at testing practical approaches for reporting the Belém Adaptation Indicators in BTR2. Indicators are being screened according to their alignment with national priorities, coverage of the relevant Global Goal on Adaptation targets and subcomponents, data availability and quality, methodological clarity, temporal and spatial coverage, and relevance to gender equality and social inclusion.

The current status is therefore one of testing and refinement. However, some indicators are more difficult to interpret and report on than others. This is particularly the case for indicators that refer to a "level" or "extent" of progress, or to concepts such as "climate-resilient" services and infrastructure. These terms are not always linked to a single standardised quantitative method and may be understood differently across sectors, institutions, and countries.

South Africa is therefore taking a pragmatic and country-driven approach by identifying indicators that can be reported directly, while also developing nationally appropriate proxies or qualitative assessments for indicators that require further methodological clarification. Where proxy indicators are used, the BTR clearly notes the assumptions, data sources, limitations, and areas where further institutional coordination or data development is required. This approach allows South Africa to begin reporting on relevant Belém Adaptation Indicators in BTR2, while recognising that the national adaptation monitoring, evaluation, and learning system will continue to evolve over time.

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Table 3.5: Preliminary alignment of selected Belém Adaptation Indicators with South Africa's Second NDC adaptation goals, SDG indicators, proposed proxy indicators and available baseline data for BTR2 reporting.

Sector	Indicator	Proxy indicator	SDG	NDC2 goal	Relationship to new indicator	Baseline value	Units	Date of baseline	Current value
Water and sanitation	(a) Level of water stress, including as an outcome of adaptation actions where applicable, accounting for relevant climate hazard intensity and/or frequency;	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources in South Africa, change over time, compared to other countries (and areas) in the region	6.4.2	Goal 1	Direct	68%	%	2022	Not available
Water and sanitation	(b) Level of water use efficiency, including as an outcome of adaptation actions where applicable;	Change in water-use efficiency over time in South Africa, progress over time, compared to other countries (and areas).	6.4.1	Goal 1	Direct/proxy	16/m3	USD/m 3	2022	
Water and sanitation	(e) Proportion of the population using safe and affordable potable water services that are climate-resilient, including as an outcome of adaptation actions where applicable;	Proportion of population using safely managed drinking water services	6.1.1	Goal 1	Proxy	68%	%	2024	
Water and sanitation	(f) Proportion of the population using sanitation services that are safely managed and climate-resilient, including as an outcome of adaptation actions where applicable;	Proportion of population using safely managed sanitation services - overall	6.2.1a	Goal 1	Proxy	74%	%	2024	

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Sector	Indicator	Proxy indicator	SDG	NDC2 goal	Relationship to new indicator	Baseline value	Units	Date of baseline	Current value
Water and sanitation	(h) Proportion of bodies of water with good ambient water quality for drinking water supply, including as an outcome of adaptation actions where applicable;	Proportion of bodies of water with good ambient water quality	6.3.2	Goal 1	Direct	71%	%	2023	
Food and agriculture	(d) Level of food and agricultural yield in areas that are under management for food and agricultural production, including as an outcome of adaptation actions where applicable;	Cereal yield	2	Goal 4		4,96	t/ha	2022	
Food and agriculture	(e) Proportion of the population with equitable access to adequate food and nutrition, including as an outcome of adaptation actions where applicable.	Prevalence of undernourishment	2	Goal 4		8,1	%	2022	
Health impacts and health services	(a) Rate of mortality associated with climate impacts compared with counterfactual rates, including as an outcome of adaptation actions or coverage of early warning systems where applicable;	Age-standardized death rate due to cardiovascular disease, cancer, diabetes, or chronic respiratory disease in adults aged 30 to 70 years	3	Goal 2		22,7	%	2021	

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Sector	Indicator	Proxy indicator	SDG	NDC2 goal	Relationship to new indicator	Baseline value	Units	Date of baseline	Current value
Health impacts and health services	(b) Level of incidence of climate-sensitive infectious diseases, including as an outcome of adaptation actions where applicable;	Incidence of tuberculosis per 100,000 population		Goal 2		427	numbe r	2023	
Health impacts and health services	(e) Extent to which climate health services have remained at full capacity during and following climate-related events relative to pre-event service capacity;	Government spending on health and education (% of GDP)		Goal 2		11,56	%	2023	
Ecosystems and biodiversity	(c) Level of resilience of ecosystems, including as an outcome of adaptation actions where applicable;	Ocean Health Index: Clean Waters score		Goal 6		47,06	NA	2024	
Ecosystems and biodiversity	(d) Level of threat status of ecosystems, including as an outcome of adaptation actions where applicable;	Permanent deforestation (% of forest area, 3-year average)		Goal 6		0,11	%	2023	
Ecosystems and biodiversity	(d) Level of threat status of ecosystems, including as an outcome of adaptation actions where applicable;	Imported deforestation (m^2/capita)	15	Goal 6		2,79	(m^2/ca pita	2022	
Ecosystems and biodiversity	(e) Level of threat status of species, including as an outcome of adaptation actions where applicable;	Fish caught from overexploited or collapsed stocks (% of total catch)		Goal 6		20,78	%	2018	

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Sector	Indicator	Proxy indicator	SDG	NDC2 goal	Relationship to new indicator	Baseline value	Units	Date of baseline	Current value
Ecosystems and biodiversity	(e) Level of threat status of species, including as an outcome of adaptation actions where applicable;	Red List Index of species survival		Goal 6		0,77	NA	2023	
Infrastructure & human settlements	(a) Proportion of settlement upgrading programmes implemented that include climate change adaptation measures and maintain sustained engagement at the local level;	Rural population with access to all-season roads		Goal 3		99,4	%	2025	
Infrastructure & human settlements	(a) Proportion of settlement upgrading programmes implemented that include climate change adaptation measures and maintain sustained engagement at the local level;	Proportion of urban population living in slums	11	Goal 8		24,2	%	2022	
Infrastructure & human settlements	(a) Proportion of settlement upgrading programmes implemented that include climate change adaptation measures and maintain sustained engagement at the local level;	Population with convenient access to public transport in cities	11	Goal 3		19,41	%	2020	
Infrastructure & human settlements	(a) Proportion of settlement upgrading programmes implemented that include climate change adaptation measures and maintain	Access to improved water source, piped (% of urban population)		Goal 3		98,04	%	2022	

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Sector	Indicator	Proxy indicator	SDG	NDC2 goal	Relationship to new indicator	Baseline value	Units	Date of baseline	Current value
	sustained engagement at the local level;								
Infrastructure & human settlements	(b) Proportion of infrastructure and human settlements vulnerable to climate-related hazards and other extreme events relocated to a safer location.	Logistics Performance Index: Infrastructure Score		Goal 8		3,6	NA	2023	
Poverty eradication and livelihoods	(a) Level of population living in poverty, including as an outcome of adaptation actions where applicable;	SDG1: Poverty headcount at $2.15/day		Goal 8		34,27	%	2025	
Cultural heritage	(a) Percentage of at-risk cultural and natural heritage sites and elements with adaptation measures implemented to enhance resilience to climate-related hazards under different warming scenarios, as appropriate for regions and contexts, guided by traditional, local or Indigenous Peoples' knowledge and practices, disaggregated, as appropriate, by tangible and intangible cultural elements;	Mean area that is protected in marine sites important to biodiversity	14	Goal 6		52,73	%	2023	

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Sector	Indicator	Proxy indicator	SDG	NDC2 goal	Relationship to new indicator	Baseline value	Units	Date of baseline	Current value
Cultural heritage	(b) Proportion of cultural heritage protected from climate impacts through digitization measures for preservation and recovery and by storing movable heritage in climate-resilient facilities;	Mean area that is protected in terrestrial sites important to biodiversity		Goal 6		36,6	%	2023	
Cultural heritage	(c) Percentage of cultural heritage and sites with adaptation measures and emergency preparedness plans in place for climate change related hazards under different warming scenarios, as appropriate for regions and contexts;	Mean area that is protected in freshwater sites important to biodiversity		Goal 6		36,42	%	2023	
Cultural heritage	(e) Percentage of climate adaptation measures focused on cultural heritage that maintain sustained engagement with Indigenous Peoples and/or local communities.	Access to and affordability of justice (worst 0–1 best)		Goal 8		0,49	NA	2023	
impact, vulnerability and risk assessment	(f) Level of establishment of climate information services for risk reduction and systematic observation to support improved climate-related data, information and services;	Statistical Performance Index	17	Goal 5		82,37	NA	2023	

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Sector	Indicator	Proxy indicator	SDG	NDC2 goal	Relationship to new indicator	Baseline value	Units	Date of baseline	Current value
Adaptation planning and mainstreaming	(b) Status of having gender-responsive adaptation plans, policy instruments, and planning processes and/or strategies in place;	SDG5: Seats held by women in national parliament	5	Goal 7		44,6	%	2025	
Implementation	(c) Net savings as a percentage of gross domestic product from avoided losses, including as an outcome of adaptation actions where applicable;	Adjusted GDP growth index	8	Goal 5		46,79	NA	2023	
Implementation	(e) Technology development and transfer for climate adaptation reported in line with chapters IV, V and VI,	Government revenue excluding grants (% of GDP)	17	Goal 7		30,27	%	2022	
Monitoring, evaluation and learning	(e) Level of institutional capacity to fully operate systems for monitoring, evaluation and learning for national adaptation efforts.	Index of countries' support to UN-based multilateralism worst 0-100 best	17	Goal 7		72,99	NA	2025	

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3.6.3 Assessment of an indicator for when adaptation is not sufficient to avert impacts

South Africa already collects important disaster loss and damage information through the National Disaster Management Centre, provincial disaster management centres and municipal systems. These data can support indicators for identifying where adaptation has not been sufficient to avert impacts, including lives lost, people affected, households displaced, infrastructure repair costs, agricultural losses, disaster declarations, water restrictions, insured and uninsured losses, and repeated damages in the same locations. However, the information is often fragmented across departments and spheres of government and is therefore not always easily accessible or standardised for national adaptation reporting. Strengthening systems such as the NCCIS, NCCRD and the Tracking and Evaluation Portal, together with a national inventory of climate impacts, would improve South Africa's ability to assess residual risk, loss and damage, and the effectiveness of adaptation actions over time.

3.6.4 Implementation

3.6.4.1 How support programmes meet specific vulnerabilities and adaptation needs

Adaptation support is increasingly being targeted towards vulnerable sectors and communities, especially water security, informal settlements, disaster risk management, agriculture, health, biodiversity and ecosystems. The NDC2 adaptation goals provide a stronger basis for linking support to national vulnerabilities, including water and sanitation, disaster risk management, food security, climate services, ecosystem-based adaptation and climate-resilient human settlements.

3.6.4.2 How adaptation actions influence other development goals

Adaptation actions contribute directly to development goals by improving water security, reducing disaster losses, protecting livelihoods, improving public health, supporting food security, creating jobs through restoration and maintenance activities, protecting biodiversity, and strengthening infrastructure resilience. This is important for South Africa because adaptation is closely linked to poverty reduction, service delivery, spatial planning, municipal resilience and the just transition.

3.6.4.3 Good practices, experience and lessons learned from policy and regulatory changes, actions and coordination mechanisms.

Key lessons are that adaptation works best when embedded in development planning and service delivery mandates. Climate information must be translated into budget, infrastructure

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and planning decisions and effectiveness depends on linking climate information, finance, local capacity and institutional accountability.

3.7 Information related to averting, minimizing and addressing loss and damage associated with climate change impacts

South Africa has experienced a range of natural disasters over the period 1980–2024, with water-related hazards emerging as the most prominent. Data from the World Bank Climate Change Knowledge Portal, based on EM-DAT records, shows that floods and storms account for the largest share of recorded disaster events, while floods and droughts dominate in terms of reported economic damages (Figure 3.6 and Figure 3.7). The graphs highlight that South Africa's disaster risk profile is strongly shaped by water-related hazards, especially floods, storms and droughts. This reinforces the importance of adaptation measures focused on flood risk reduction, stormwater management, drought preparedness, water security, early warning systems and climate-resilient infrastructure.

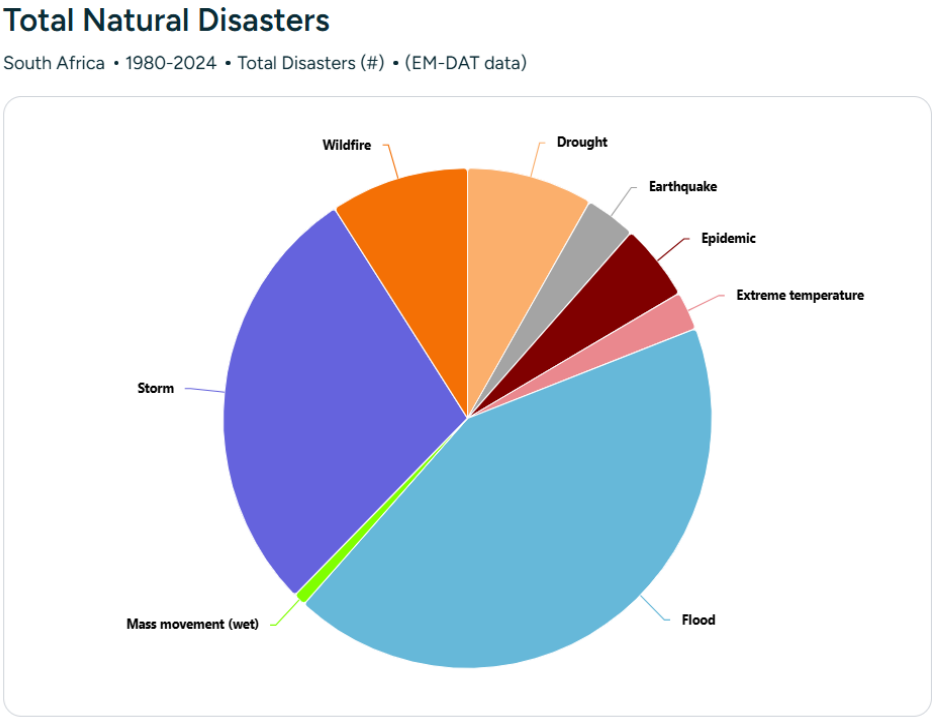


Figure 3.6: Total natural disasters by event type in South Africa, 1980–202 based on EM-DAT data presented through the World Bank Climate Change Knowledge Portal.

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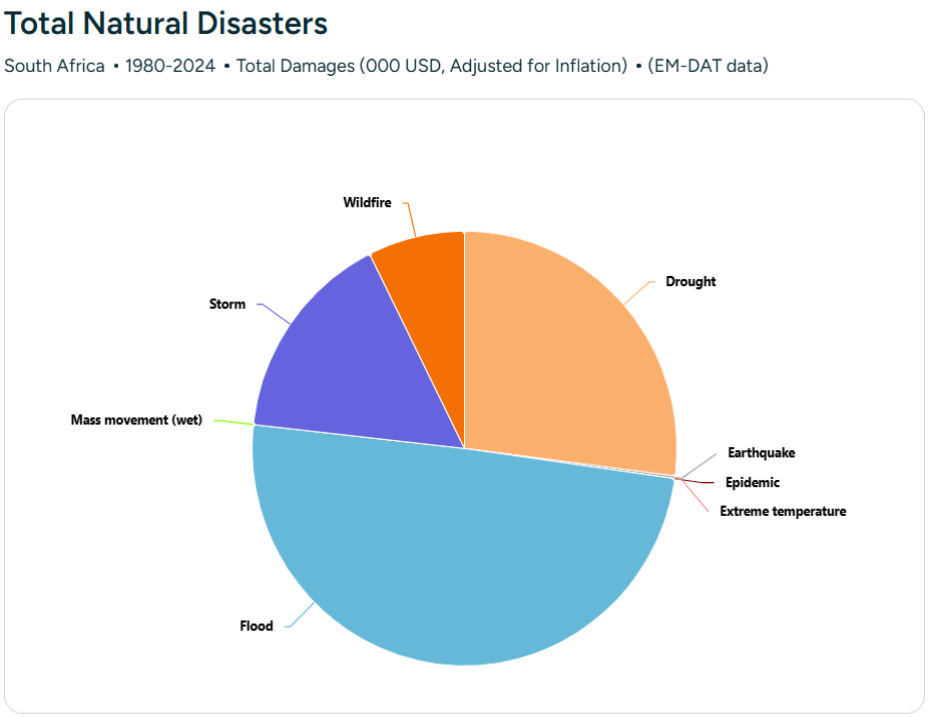


Figure 3.7: Total damages from natural disasters by event type in South Africa, 1980–2024 based on EM-DAT data presented through the World Bank Climate Change Knowledge Portal.

3.7.1 Observed and potential climate change impacts

Global temperatures are nearing the 1.5 °C threshold with the global annual average for 2025 estimated at 1.44 °C above the average during the period 1850 to 1900. It is estimated that the 1.5 °C global warming level will be reached before the end of the decade. South Africa is already increasingly experiencing significant loss and damage from climate-related extreme events, particularly flooding, drought and heatwaves with widespread economic and noneconomic losses and damages across key sectors, regions, and populations in South Africa. The impacts of climate extremes are intensifying in frequency and severity. A noteworthy recent extreme event includes the flooding in early January 2026 in Limpopo, Mpumalanga, and KwaZulu-Natal. Limpopo especially experienced severe flooding following extremely heavy and persistent rainfall, with the provincial government reporting up to 400 mm of rain in only a few days in parts of the province. The floods caused widespread damage to homes, roads, bridges, schools, health facilities, and other public infrastructure. Recovery needs were estimated at more than R4 bn. This included major repairs to the provincial road network and other critical infrastructure. The human impacts were severe, with the reported death toll of 27 flood-related deaths recorded by early February. The Limpopo floods formed

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part of a wider regional extreme rainfall and flooding event that also affected Mpumalanga and other northern parts of South Africa, as well as neighbouring countries including Mozambique and Zimbabwe, where large numbers of people were displaced, homes and crops were damaged, and further deaths were reported.

These events are consistent with observed trends of increasing rainfall intensity and variability under climate change. In a study by the World Weather Attribution (Pinto et al, 2026), it was found that the event occurred during a weak La Niña. However, the longer-term warming of the climate system has increased the capacity of the atmosphere to hold moisture and has contributed to more intense 10-day rainfall extremes in the region. Although the study indicates that there are limitations in the climate model's ability to represent the regional rainfall–ENSO relationship, it concludes with confidence that based on observations, physical understanding, and existing literature, that climate change increased both the likelihood and intensity of the heavy rainfall. The resulting flood impacts were further amplified by high exposure, vulnerable settlements and livelihoods, degraded ecosystems, ageing or insufficiently maintained infrastructure and gaps in preparedness and flood-risk governance.

The April 2022 Durban floods provide strong evidence of climate change intensifying flood risk in South Africa. A recent attribution study by Engelbrecht et al. (2025c) using high-resolution data found that rainfall over the larger Durban area was at least 40% higher in the present, anthropogenic affected climate than pre-industrial time. The study links this increase to warmer regional conditions, higher moisture availability over the KwaZulu-Natal coast, warming of the Agulhas Current and changes in circulation that helped strengthen rainfall-producing systems along the coast (Engelbrecht et al., 2025c).

Table 3.6 presents a summary of recent extreme weather events in South Africa, including associated fatalities and estimated economic losses. The information has been compiled from a range of sources, including media reports, government statements, and national disaster management assessments.

Table 3.6: List of recent extreme events in South Africa, indicating losses and damages associated with the event. The list of extreme events and associated losses and damages was compiled from various sources, including media reports, government statements, disaster management updates and other publicly available information.

Region	Lives lost	Economic losses	Other
May 2026: Flooding and storms in the Western Cape			
National disaster declared for provinces of Western Cape, North West, Free State, Eastern Cape,	10 lives lost and nearly 90,000 people displaced	Not yet fully assessed but damages could run into the billions of rand. The Department of Infrastructure estimates road and structure	Certain areas reported 72-hour rainfall totals that approached or exceeded 400 mm

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Region	Lives lost	Economic losses	Other
Northern Cape and Mpumalanga		repairs alone at about half a billion rand, while agricultural and structural losses across multiple municipalities are expected to surpass previous disaster figures	
January 2026: Flooding in Limpopo and Mpumalanga provinces			
Limpopo province	~17–18 fatalities	Part of total damages >R10bn significant damage to roads, bridges, housing	>1,900 houses damaged Communities isolated due to road damage Displacement of households Agricultural and livelihood impacts
Mpumalanga province	~20 fatalities	~R2bn infrastructure damage (provincial estimate)	~1,800 houses damaged (>1,200 households affected Damage to schools, roads, bridges – Displacement and service disruption
Kruger National Park (Limpopo and Mpumalanga)	No direct fatalities reported in park	Significant damage to tourism infrastructure long-term repair costs	>600 people evacuated Closure of park and tourism disruption Ecosystem and habitat disturbance
Summer 2025–2026: Wildfires and drought (Western Cape and Eastern Cape)			
Western Cape & Eastern Cape (incl. Garden Route District Municipality, Overberg, Cape Winelands, West Coast District Municipality)	No confirmed fatalities widely reported	~R64.8m agricultural losses (provincial estimate)	Severe wildfire season linked to prolonged dry conditions and drought ~81,869 ha burned (Overberg), ~51,906 ha (West Coast), ~34,129 ha (Cape Winelands), ~894 ha (Garden Route) Losses include ~R29.8m crop damage, ~R26.6m infrastructure damage, and ~R8.4m other impacts Damage to orchards, vineyards, irrigation systems, fencing and farm infrastructure Water shortages and critically low reservoir levels in parts of the Garden Route (e.g. Knysna) Significant impacts on agricultural production, livelihoods and food security Highlights increasing climate-driven wildfire risk and drought stress in the region
June 2025: Flooding in Eastern Cape			
Eastern Cape (OR Tambo District, incl. Mthatha)	~100–103 fatalities	Repairing the roads, bridges, schools, clinics, and water infrastructure destroyed will require at least R5.18bn.	Entire communities inundated; floodwaters up to several metres deep in places Large-scale displacement of households Damage to public infrastructure (roads, bridges, schools, clinics) Severe disruption to basic services (water, electricity, sanitation) Loss of livelihoods, especially informal economy, and subsistence activities.

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Region	Lives lost	Economic losses	Other
30 April–2 May 2025: Cold front-induced flooding and severe storms (KZN, Northwest, Northern Cape)			
KwaZulu-Natal, Northwest, Northern Cape	No confirmed fatalities reported; ~18 injuries	Localised damage to housing, infrastructure, and services (no consolidated national estimate available)	Severe cold front with heavy rainfall, thunderstorms, lightning, and strong winds River overflows and flash flooding reported ~4,429 households and 22,145 people affected ~1,000 households required urgent humanitarian assistance
20–28 February 2025: Flooding and mudslides from cold front (KwaZulu-Natal)			
Region	Lives lost	Economic losses	Other
KwaZulu-Natal (province-wide, incl. eThekwini Metropolitan Municipality, Msunduzi, uLundi, eMpangeni, Vryheid, Nkandla)	≥9 fatalities reported	~R3.1bn total damages (provincial estimate); >R1.4bn in eThekwini alone (incl. ~R1.36bn capital + ~R59m operational costs)	Severe cold front with heavy rainfall triggered flooding and mudslides across multiple districts 370 houses destroyed; >933 households affected Extensive damage to roads, bridges, schools and water infrastructure Widespread power outages across multiple municipalities (incl. Cato Ridge, eMpangeni, uLundi, Msunduzi, Vryheid, Nkandla) Significant impacts in urban, peri-urban and rural settlements, especially flood-prone areas State of disaster declared following event R1.444 billion released for immediate relief and reconstruction through national disaster response mechanisms
June 2024: Devastating EF3 tornado - winds 225 km/h - 265 km/h struck oThongathi KZN			
KwaZulu-Natal (incl. parts of eThekwini, uMgungundlovu, and northern KZN)	At least 12 fatalities' Over 100 people received medical treatment	Significant but not fully quantified; widespread damage to housing and infrastructure	• Tornado associated with a cut-off low pressure system caused severe localised destruction Homes destroyed or severely damaged, particularly in vulnerable settlements Damage to schools, clinics, roads and power infrastructure damaged more than 7 000 homes and affected 17 000 people.
7 - 9 November 2025: A heatwave over large parts of the country			
Large parts of the country, including the central interior, northern parts and the Western Cape	None reported	Not specified	High risks of heat-related illnesses, wildfires, and power-grid strain (EcoFlow, 2025).
25 - 30 January 2026: A heatwave over Northern Cape, Free State and Northwest			
Northern Cape, Free State and Northwest	None reported	Not specified	Upington temperatures reaching 40 °C and high fire danger was reported over parts of affected provinces, leading to

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Region	Lives lost	Economic losses	Other
			emergency service standby in cities like Kimberley (Mothibi, 2026).
8 - 13 March 2026: A heatwave over Northern and Western Cape			
Northern and Western Cape	None reported	Not specified	Record-breaking temperatures over several stations (GCIS, 2026b).
6 March 2026: Severe thunderstorms, associated with heavy downpours, damaging winds, excessive lightning, hail, localised flooding			
KwaZulu-Natal	6 fatalities	Not specified	Damage to schools, healthcare facilities and farms were reported (Mabaso, 2026).
20–22 September 2024: Heavy snow and icy conditions			
Free State and KwaZulu-Natal	1 fatality	Not reported	Thousands stranded for 3 days, major road closures (SAWS, 2024)
9 November 2024: Lightning strike in Northwest			
Eye of Malemani (between Lichtenburg and Zeerust), Northwest	None reported	> R1 million	53 Bonsmara cattle killed (including calves and stud animals; SAWS, 2024)
27 November 2024: Tornado in Gauteng			
Randfontein and Toekomsrus, Gauteng	None reported	Not reported	24 injured, ~620 homes destroyed, mall damaged, and cars destroyed (SAWS, 2024)

3.8 Activities related to averting, minimising and addressing loss and damage associated with the adverse effects of climate change

South Africa is progressively strengthening its efforts to avert, minimise and address loss and damage through a combination of disaster risk reduction, climate adaptation, and post-disaster recovery projects.

Averting loss and damage is primarily addressed through proactive risk reduction and climate adaptation measures. These include the integration of climate risks into national, provincial, and municipal planning instruments (e.g. Integrated Development Plans, Spatial Development Frameworks), the implementation of early warning systems through the South African Weather Service, and investments in climate-resilient infrastructure and water resource management. Ecosystem-based adaptation approaches, such as wetland restoration and catchment management, are also being promoted to enhance natural buffers against climate extremes.

Minimising loss and damage focus on reducing the impacts of climate-related hazards when they occur. This includes strengthening disaster preparedness and response systems coordinated by the National Disaster Management Centre and provincial disaster

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management centres. Activities include hazard mapping, evacuation planning, community awareness programmes, and targeted support to vulnerable groups.

Addressing loss and damage involves post-disaster response, recovery, and rehabilitation. Following major events, government mobilises financial resources for relief and reconstruction, including emergency funding allocations and support to affected households and municipalities. For example, recent flood events have triggered the declaration of states of disaster and the release of significant funding for infrastructure repair and humanitarian assistance. Social protection mechanisms, including temporary shelter, food aid and livelihood support, play a key role in assisting affected communities. However, challenges remain in systematically capturing and quantifying both economic and non-economic losses, particularly indirect impacts such as loss of income, cultural heritage, and ecosystem services.

3.9 Institutional arrangements to facilitate the implementation of activities reported under paragraph 115(b) above.

South Africa is actively developing a national loss and damage framework, supported by partnerships between government, academia and the private sector.

Key initiative: Standard Bank – UNISA Climate Loss and Damage Programme

3.9.1 Seed funding of R1m to support a Climate Change-Induced Loss and Damage (CILD) research programme

Developed in partnership with:

- UNISA (ISCC)
- Nedbank
- DFFE

Aims to:

- Generate policy-relevant evidence on loss and damage
- Develop indicators for economic and non-economic losses
- Support community-level solutions
- Strengthen data systems and early warning integration

Strategic significance:

- Supports the operationalisation of South Africa’s National Loss and Damage Programme

Positions loss and damage as:

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- A development and justice issue, not only environmental

Enhances:

- Capacity-building
- Evidence-based planning
- Collaboration across government, private sector, and communities

3.9.2 Access to international loss and damage funding

South Africa has explicitly stated in its updated NDC that it expects a “fair share” of international climate finance, including funding for loss and damage.

The country already accesses climate finance through:

- Green Climate Fund (GCF)
- Global Environment Facility (GEF)
- Climate Investment Funds

However, loss and damage finance represents a new and distinct funding stream, focused on impacts that cannot be adapted to. South Africa is eligible for the Loss and Damage Fund, but access will depend on demonstrating vulnerability and need as well as strengthening institutional and data systems. The Fund represents a critical opportunity to address increasing climate-related losses (e.g. recent flood events), but it is still in early stages, and significant gaps remain between available funding and actual loss and damage experienced.

South Africa is also engaging in international processes on L&D under the UNFCCC, including the operationalisation of the Loss and Damage Fund and alignment with the Warsaw International Mechanism for Loss and Damage. At the national level, efforts are underway to improve data systems, including strengthening platforms such as the National Climate Change Response Database (NCCRD) and National Climate Change Information System (NCCIS), to better track climate impacts, response actions, and associated losses.

3.10 Cooperation, good practices, experience, and lessons learned.

3.10.1 Efforts to share information, good practices, experience, and lessons learned

South Africa’s adaptation cooperation landscape has evolved from policy development and risk assessment towards implementation, monitoring, learning and improved targeting of adaptation investments. South Africa’s second NDC and adaptation communication further

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shifts the national adaptation agenda from broad planning towards implementation, prioritisation and tracking. The country is enhancing its approach to capturing good practices and lessons learned through ongoing efforts by the Department of Forestry, Fisheries and the Environment (DFFE) to systematically collect and analyse data on implemented adaptation projects. This process aims to identify effective interventions, key lessons, and opportunities for scaling up, with initial focus in selected provinces. The initiative supports improved knowledge sharing, evidence-based planning, and the replication of successful adaptation approaches across sectors and regions.

A key good practice is the use of open-access spatial decision-support systems to translate climate science into information that can inform planning and decision-making. These systems are linked to, or complement, the National Climate Change Information System and draw on tools, datasets and expertise from multiple institutions, including the CSIR Green Book, SAEON, SARVA and university-based research centres. Together, these platforms strengthen collaboration, improve public access to climate risk and vulnerability information, and support the integration of climate science into adaptation planning across different spheres of government. South Africa's experience also shows that cooperation is strongest where climate information is co-produced and translated into operational planning tools. This includes the involvement of universities, science centres, municipalities and sector departments in climate risk assessments and adaptation planning.

South Africa's experience indicates that adaptation is most effective when it is embedded in existing development planning and service delivery mandates, rather than treated as a stand-alone environmental programme. Climate risk information is increasingly available, but its effectiveness depends on whether it is translated into practical planning guidance, budget decisions, infrastructure standards and community-level preparedness. Good practices include the use of spatial risk tools, ecosystem-based adaptation, early warning systems, climate-smart agriculture, water conservation, wetland and catchment restoration, and municipal planning support. However, implementation remains uneven, with persistent gaps in finance, institutional capacity, municipal technical skills, data reporting, social inclusion and the ability to monitor whether adaptation interventions are reducing risk over time.

3.10.2 Lessons learned

A key lesson is that adaptation is most effective, sustainable and least likely to result in unintended negative consequences when it is grounded in robust climate information and evidence of observed impacts, risks and vulnerabilities. This evidence needs to be translated into focused, context-specific interventions that are co-designed with affected stakeholders, supported by municipal buy-in, aligned with existing municipal plans and systems, and

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matched to available finance, technical capacity and institutional mandates. Equally important is the need for clear institutional accountability, so that adaptation actions are not only implemented, but also tracked, monitored and evaluated for their effectiveness over time. A recent review by Taylor et al. (2025) on adaptation progress in South Africa similarly emphasises that the country's adaptation systems require stronger data flows, clearer institutional responsibilities, and improved monitoring of outcomes.

3.10.3 Strengthening scientific research and knowledge

South Africa continues to strengthen the scientific basis for adaptation through climate research, systematic observation, early warning systems, vulnerability assessment, adaptation planning tools and monitoring, evaluation, and learning systems. The country's climate science base includes the South African Weather Service, DFFE, SAEON, CSIR, SANBI, WRC, universities, and research centres such as UCT's Climate System Analysis Group. These institutions support climate observations, climate projections, downscaled modelling, vulnerability assessment, biodiversity and ecosystem research, water security research, disaster risk information, and decision-support tools.

Early warning and climate services are a major area of scientific and institutional strengthening. South Africa's second NDC identifies the enhancement of climate services, early warning and impact information as a national adaptation goal. Priority interventions include strengthening early warning systems, improving warning dissemination and response triggers, training community leaders to interpret climate information, developing a national inventory of impacts, and supporting a SADC integrated regional drought-monitoring system.

The South African Weather Service provides climate information and has established, with other stakeholders, a multi-hazard early warning system that draws on remote sensing and ground-based observations. The second NDC recognises that top-down early warning needs to be complemented by bottom-up impact data collected by local communities and local authorities, supported by provincial and national government. This is intended to strengthen adaptation action, loss and damage assessment, and tracking of implementation progress.

Monitoring, evaluation, and learning is an emerging priority. South Africa's second NDC states that M&E systems and indicators will be developed for each of the eight national adaptation goals, with the intention of enabling transparent domestic and international reporting, regular adaptation synthesis reports, and continuous improvement. The Tracking and Evaluation Portal, a sub-module of the NCCIS, is intended to monitor progress towards NDC goals through provincial and municipal inputs.

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3.10.4 Gaps and next steps

Despite significant progress, important knowledge and reporting gaps remain. Data on climate impacts, losses and damages are still fragmented across institutions and spheres of government while attribution of impacts to climate change remains technically complex. There is also a need to improve the consistency of municipal and provincial reporting, strengthen local capacity to collect and interpret data and develop indicators that can measure not only whether adaptation actions were implemented, but whether they reduced vulnerability, avoided losses and improved resilience. South Africa's priority is therefore to move from fragmented project-level reporting towards an integrated national adaptation monitoring, evaluation and learning system that links climate observations, vulnerability data, impact inventories, adaptation finance and implementation outcomes.

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4 Information on financial, technology development and transfer and capacity-building support needed and received under Articles 9-11 of the Paris Agreement

The chapter provides an update from BTR1 on financial, technology development and transfer, and capacity building support needed and received under Articles 9-11 of the Paris Agreement by South Africa for the period 1 Jan 2023 and 31 Dec 2024. The chapter will present an overview of international climate-related finance received and committed, as well as technology development and transfer, and capacity building support, needed and received within the BTR2 reporting period.

South Africa's national circumstances are described in the context of the climate finance landscape and institutional arrangements relevant to reporting on financial, technology and capacity building support needed and received. The international financial support received and committed, capacity building and technology support received from international donor funding sources, as well as financial, capacity building and technology support needed by South Africa to develop its response to climate change are outlined in this chapter.

4.1 National circumstances, institutional arrangements and country-driven strategies

4.1.1 National Circumstances

South Africa has established a comprehensive policy and legal framework for a low-carbon, climate-resilient and just transition. The country's climate response is anchored in the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and the Paris Agreement, and guided by Section 24 of the Constitution of the Republic of South Africa (RSA, 1996), the National Development Plan 2030 (NDP 2030) (NPC, 2011), the National Climate Change Response Strategy (NCCRS) (2004), and the National Climate Change Response Policy (NCCRP) (DEA, 2011) which builds on the NCCRS.

The NCCRP provides an integrated climate policy framework for both mitigation and adaptation, with climate finance, technology and capacity building identified as essential enablers. Clear mitigation and adaptation pathways are guided by the Low Emission Development Strategy (LEDS) 2050 which sets out long-term decarbonisation pathways for key economic sectors and associated actions required, and the National Climate Change Adaptation Strategy (NCCAS) which serves as South Africa's National Adaptation Plan. The

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NCCAS, developed in 2020, continues to provide a basis for climate change adaptation planning and implementation. The NCCAS served as South Africa's National Adaptation Plan, submitted in 2021, demonstrating the country's commitment to their obligations in terms of Article 7.9 of the Paris Agreement.

The Climate Change Act, signed into law in July 2024, establishes a coordinated governance framework and provides mechanisms for coordinated climate planning, implementation and financing across national, provincial and local government. The Climate Change Act was developed in recognition of the country's need to strengthen its climate change mandate. Effective climate action depends on adequate finance, technology, institutional capacity and coordinated implementation. In terms of climate finance, the Act provides the mechanisms to support and finance the climate change response, providing guidance and a governance framework to promote planning and implementation by national, provincial and local government.

4.1.1.1 South Africa's Second Nationally Determined Contribution

South Africa's Nationally Determined Contribution (NDC) under the Paris Agreement serves as the cornerstone of the country's climate change response under the Paris Agreement, balancing greenhouse gas mitigation, national adaptation goals, and international support requirements. South Africa's Intended Nationally Determined Contribution (INDC) was submitted in September 2015, prior to COP 21, which became the country's first NDC in November 2016. An updated and enhanced NDC was first NDC was submitted in September 2021. South Africa submitted its second Nationally Determined Contribution (NDC) to the UNFCCC in October 2025, committing to reduce annual greenhouse gas emissions to a range of 320 to 380 million tonnes of CO_2 equivalent (Mt CO_2e) by 2035 (RSA, 2025).

The second NDC demonstrates progression beyond the first and reflects the country's highest possible ambition considering equity and national circumstances. South Africa set a mitigation target in its second NDC for the year 2035, meeting the country's obligations under Article 4 of the Paris Agreement. The mitigation target for 2031-2035 South Africa's annual GHG emissions will be in a range from 320-380 Mt CO2-eq in 2035.

In its Second Adaptation Communication, the country reviewed the adaptation goals in their first NDC as updated in 2021, taking into account the thematic targets which were globally agreed in the Framework for Global Climate Resilience (FGCR) under the Global Goal on Adaptation (GGA) and referenced in the GST outcome (decisions 2/CMA.5 and 1/CMA.5, respectively). Eight national adaptation goals for the 2031–2035 period were identified, overseen via the Department of Forestry, Fisheries and the Environment (DFFE) under the

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legal framework of the Climate Change Act. South Africa will implement interventions to achieve these adaptation goals, consistent with the Climate Change Act, and National Climate Change Adaptation Strategy. A section on Loss and Damage was included in the 2nd Adaptation Communication and it was highlighted that support for improving data collection, processing and storage of gender-disaggregated disaster impacts, losses and damages is essential to underpin an evidence-based approach. It was further noted that while national government will do all it can, its resources and capacities are already being exceeded. This means there are increasing needs for international support to address loss and damage (RSA, 2025). South Africa has established a Green Fund, and in 2024 initiated the establishment of a Climate Change Response Fund to put in place the institutional arrangements for funding of adaptation, loss, damage, and mitigation.

4.1.1.2 Climate finance landscape analysis

The 2025 edition of South Africa's Finance Landscape Analysis (de Aragão Fernandes *et al*., 2025) provides an overview of South Africa's climate finance landscape, investment flows, policy context, and opportunities for low-carbon, climate-resilient development up to 2025 building on the baseline established in 2023. The report examines how climate finance was mobilised in 2022 and 2023, tracking flows for climate mitigation and adaptation solutions, as well as those with dual benefits across both mitigation and adaptation. The study tracks finance from both domestic and international sources, at both private and public levels, and indicates the instruments used to disperse those funds, ultimately identifying the sectors that benefited ((de Aragão Fernandes *et al*., 2025).

The 2025 edition introduces important methodological innovations, including closer alignment with the Green Finance Taxonomy, greater data granularity, and a first trial methodology for tracking just transition investments.

4.1.1.3 Green Finance Taxonomy

The first edition of the South African Green Finance Taxonomy (GFT 1st Edition), issued in 2022, outlined the results of milestones in developing the 1st Edition of the South African Green Finance Taxonomy for environmentally sustainable economic activities (NT, 2022a). The Green Finance Taxonomy is a classification system for defining which assets, and projects substantially contribute to climate change adaptation and mitigation.

Since BTR1, a report on 'Assessing International Interoperability and Usability of the South African Green Finance Taxonomy' was published (Gwebu et al. 2025). This report evaluates the international interoperability and usability of South Africa's Green Finance Taxonomy (SA

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GFT), comparing it with global standards, identifying gaps, and providing recommendations for improving international alignment and interoperability while also addressing usability challenges, stakeholder engagement, and effective implementation. These recommendations seek to ensure that the SA GFT remains a globally competitive framework for sustainable finance.

4.1.1.4 Climate Budget Tagging (CBT) system

Climate Budget Tagging (CBT) is a systematic tool used to identify, classify, track, and monitor climate-relevant decisions and expenditures within public budgets. CBT is one the main tools for implementing Climate-Responsive Budgeting (CRB) (Institute for Economic Justice, 2025). Launched in October 2022, the South African government, uses CBT as a key tool for tracking and reporting climate finance, together with the Climate Finance Landscape Analysis (CPI, 2023), the Green Finance Taxonomy, and the JET Projects' Register. CBT is expected to enhance accountability and help attract green financing for sustainable projects

Following the initial design and piloting of CBT system between 2020 and 2022, an inception report was developed, outlining key findings and recommendations to strengthen the tagging process. The subsequent phase focused on implementing these recommendations, including refining the tagging methodology, undertaking stakeholder consultations and establishing a formal governance structure involving DFFE, DPME and NT (National Treasury, 2026). During the first phase of tagging, three departments were selected to participate in the pilot programme, these were;

- Department of Water and Sanitation (DWS)
- Department of Transport (DoT)
- Department of Forest, Fisheries and Environment (DFFE).

In preparation for Phase II of CBT tagging during the 2026 budget cycle, the DFFE, as the lead sector department, provided guidance through a consolidated list of Sector Emission Targets (SETs) and associated Policy and Measures (PAMs) for each sector. A workshop was held in August 2025 with National Treasury Budget Analysts and pilot departments on the CBT framework, including the tagging guidelines, tagging template, targeted climate gaps, and SETs allocations. The SETs and PAMs list developed by sector leads supported the governance structure in the prioritization of sectors with material contributions to climate mitigation and adaptation objectives. As a result, six additional departments were identified and included in phase II pilot tagging as contributors to targeted climate gaps. These departments were:

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- Department of Electricity and Energy (DEE)
- Department of Mineral and Petroleum Resources (DMPR)
- Department of Trade, Industry and Competition (DTIC)
- Department of Agriculture (DoA)
- Department of Public Works and Infrastructure (DPWI)
- Department of Land Reform and Rural Development (DLRRD).

While results varied among departments in terms of the data quality of submissions, including defining activities, performance information, and overall completeness, it was noted that continued and enhanced capacity-building support was critical to ensure that pilot departments adequately integrate climate priorities into their plans and fully comply with the CBT requirements. This is discussed in more detail in Section 4.7.2. of this chapter.

4.1.1.5 JET Investment Register

The JET Grants register, launched in 2021, now integrated into the JET Investment Register, is a public tracking tool that records financial resources allocated to support the country's Just Energy Transition Investment Plan (JET IP). The register receives quarterly updates covering public sector expenditure, commercial investments, and blended finance, and is maintained by the JET Project Management Unit (PMU) alongside the JET Funding Platform which connects grant-ready projects with funders.

The JET Investment Register dashboard, available at: https://justenergytransition.co.za/jet-investment-register-dashboard, primarily reflects financing commitments reported by International Partners, with initial indicative pledges from the Private Sector and Local DFIs now included in the Status of International Pledges table. The dashboard does not yet comprehensively incorporate information from domestic public sector institutions or the broader private sector investor base. However, a collaborative process is underway with relevant stakeholders to access these additional datasets which will contribute to providing a more complete picture of the full financing landscape underpinning the Just Energy Transition Investment Plan in South Africa.

4.1.2 Institutional arrangements

South Africa's institutional arrangements for reporting on financial, technology development and transfer, and capacity-building support needed and received are coordinated through the Department of Forestry, Fisheries and the Environment (DFFE), which serves as the central national entity responsible for climate change reporting to the UNFCCC. Within the DFFE, the Chief Directorate: International Climate Change Relations and Reporting plays a lead role in coordinating the preparation and submission of Biennial Transparency Reports (BTRs),

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National Communications, and Nationally Determined Contributions (NDCs). These institutional arrangements are underpinned by the national Climate Change Act 22 of 2024 and guided by the Project Steering Committee (PSC), established by the Director-General of the DFFE, which provides oversight and technical guidance to contributing authors involved in the preparation of national reports. The institutional arrangements relevant to reporting on financial, technology and capacity support needed and received are illustrated in Figure 4.1 in terms of data providers and the flow of information from various directorates within the DFFE who are responsible for outputs to the UNFCCC, viz. National Communications, Biennial Transparency Reports and Nationally Determined Contributions.

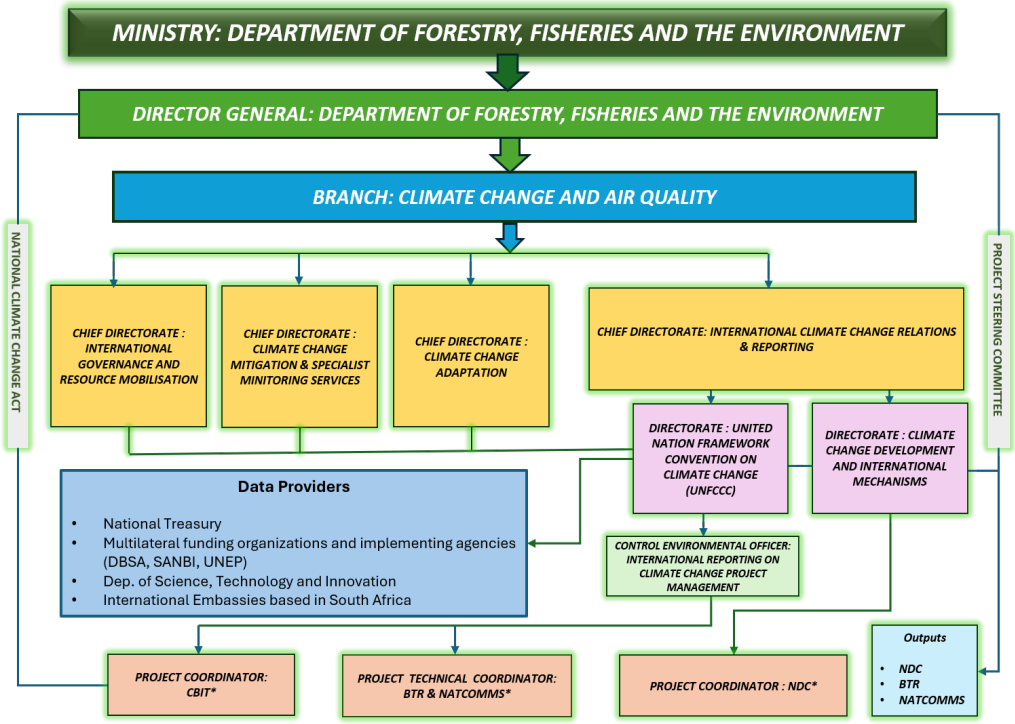


Figure 4.1. Institutional arrangements relevant to reporting on support needed and received

4.1.2.1 Tracking of Financial support received

For reporting, the tracking of climate finance received in South Africa is coordinated within the Department of Forestry, Fisheries and the Environment (DFFE), under the Branch: Climate Change and Air Quality (CCAQ). This function is undertaken through the Directorate: United Nations Framework Convention on Climate Change (UNFCCC), which is responsible for the compilation, processing, and reporting of climate finance information for inclusion in BTRs.

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This role was previously performed by the Directorate: Climate Change Developments and International Mechanisms (CCD&IM).

The National Treasury, which manages South Africa's national government finances, serves as the custodian of climate finance-related information and provides data on financial support received for inclusion in the BTRs. Institutional arrangements for data collection are supported through formalised data-sharing arrangements between DFFE and key data providers, complemented by ongoing technical coordination. A formal data-sharing arrangement between DFFE and the National Treasury has been established through an official request for the provision of data on financial support needed and received for the implementation of South Africa's Nationally Determined Contribution (NDC). This arrangement, formalised through official correspondence, supports the continuous compilation of BTRs under the Paris Agreement and seeks to institutionalise the regular and sustained provision of relevant financial data.

In addition, DFFE collects data on bilateral climate finance annually through a standardised template circulated to international embassies based in Pretoria. This process contributes to the systematic tracking of climate finance received from bilateral partners.

Data on multilateral financial support is sourced from multilateral climate funds and institutions, including publicly available information from entities such as the Green Climate Fund (GCF) and the Global Environment Facility (GEF), as well as implementing agencies such as the Development Bank of Southern Africa (DBSA), the South African National Biodiversity Institute (SANBI), and the United Nations Environment Programme (UNEP). These sources collectively contribute to a more comprehensive picture of multilateral climate finance flows to South Africa.

Further support in tracking climate finance is provided by the Chief Directorate: International Governance and Resource Mobilisation within the CCAQ Branch, which contributes relevant data and insights on financial flows and resource mobilisation efforts, thereby complementing the work of the Directorate: UNFCCC in consolidating financial support information.

Overall, the tracking of climate finance received in South Africa is not yet fully centralised, with data collected from multiple sources and institutions on an ad hoc basis. This reflects the complexity of climate finance flows and presents ongoing challenges for achieving a comprehensive and consolidated national tracking system.

4.1.2.2 Tracking and coordination of financial support needed

The DFFE, through the Chief Directorate: International Climate Change Relations and Reporting, mobilises resources from enabling activities projects funded by the Global Environment Facility (GEF) to support South Africa's climate change reporting obligations. The

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Chief Directorate oversees the tracking and coordination of financial support needed to address climate change, ensuring that resource flows are systematically documented and accounted for. Working closely with other Chief Directorates, Project Steering Committees, and other relevant entities, the Directorate: UNFCCC ensures that financial resource needs are accurately captured and reported in the BTR. This collaborative approach strengthens South Africa's capacity to fulfil its international reporting commitments while enhancing the country's ability to respond to climate change impacts through well-coordinated and adequately resourced mitigation and adaptation action.

4.1.2.3 Technology Transfer and Development Support Needed and Received

The Department of Science, Technology, and Innovation (DSTI) is mandated to lead the technological needs assessment for South Africa. DSTI collaborates closely with the DFFE and other relevant organizations in this regard in conducting the technology needs assessment (TNA) study (CSIR, 2019), which was an updated assessment of South Africa's climate technology needs across key sectors to both adapt to and mitigate climate change effects to achieve sustainable developmental goals. The scope of the TNA included the prioritisation of sectors and technologies that support adaptation and mitigation measures based on a review of policy, a barrier analysis to assess barriers to implementation of prioritised technologies as well as barriers to technological innovation, and a synthesis of the country's actions or planned activities towards supporting the deployment of selected prioritised technologies. The DFFE, through the Chief Directorate International Climate Change Relations and Reporting mobilised resources from enabling activities projects funded by the Global Environment Facility (GEF) and collaborated with the DSTI in hiring the service provider to assist with conducting the TNA study. The results of the TNA study are then used by the Chief Directorate for inclusion in the BUR/BTR. South Africa acknowledges that technology development and transfer remains a critical enabler for achieving its mitigation and adaptation objectives as outlined in the NDC and continues to strengthen institutional collaboration between DFFE and DSTI to ensure that technology support needs and received are comprehensively and accurately reported.

4.1.2.4 Capacity Building Support Received

The Directorate: UNFCCC is responsible for coordinating and tracking capacity building support received. The Directorate does this in consultation with the Chief Directorates: Climate Change Mitigation & Specialist Monitoring Services and Climate Change Adaptation, in terms of capacity building support received, and tracks all of it for reporting in the BTR. Through the Project Steering Committee (PSC) within DFFE, the Chief Directorate: International Climate Change Relations and Reporting via UNFCCC Directorate, also tracks on the capacity building

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support received on the Measurement Reporting and Verification of climate change reporting in the BTR.

4.1.2.5 Capacity Building Support Needed

The Chief Directorate: International Climate Change Relations and Reporting coordinates closely with the Chief Directorates: Climate Change Mitigation & Specialist Monitoring Services and Climate Change Adaptation in relation to capacity-building needs for reporting under the UNFCCC framework.

Within the Chief Directorate: Climate Change Mitigation & Specialist Monitoring Services, the Directorate: Climate Change Monitoring and Evaluation - Mitigation Response Analysis: GHG Inventory and Systems is responsible for the development and implementation of the Greenhouse Gas (GHG) Inventory Improvement Plan. The Improvement Plan identifies priority areas for strengthening national inventory systems and also serves as an important source of information on capacity-building needs, particularly in relation to data gaps, methodological improvements, and system enhancements required for more robust GHG reporting.

Coordination on capacity-building needs is further informed by the Technical Expert Review (TER) process under the UNFCCC, which provides recommendations and identifies areas for improvement in the national GHG inventory and reporting systems. These inputs are used alongside the GHG Inventory Improvement Plan to guide capacity-building priorities.

The Chief Directorate: International Climate Change Relations and Reporting also coordinates with the Climate Change Adaptation Chief Directorate on capacity-building needs related to adaptation reporting. In this regard, coordination with the Directorate: Climate Change Monitoring and Evaluation – Impact and Adaptation supports the development and refinement of adaptation indicators and monitoring frameworks, which also inform capacity-building requirements.

The Directorate: UNFCCC, within the Chief Directorate: International Climate Change Relations and Reporting, is responsible for consolidating and tracking capacity-building support needs and support received across both mitigation and adaptation reporting streams. This Directorate collaborates closely with other relevant Directorates to ensure comprehensive and coherent reporting on capacity-building under the BTR.

The Project Steering Committee (PSC), established by the Director-General of the DFFE, provides oversight and technical guidance to contributing authors involved in the preparation of national reports. The PSC reviews and provides inputs on the draft reports to ensure technical accuracy, consistency, and that the reporting appropriately reflects national circumstances and institutional arrangements.

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4.2 Underlying assumptions, definitions and methodologies

The BTR2 covers the period from 1 Jan 2023 – 31 Dec 2024. The format of tables presented in the report follows the guidance for Common Tabular Formats (CTF) for the electronic reporting in Decision 5/CMA.3.

The currency conversion rate to convert domestic currency into United Stated Dollars (USD) was US$ to ZAR is 17,61; Euros (EUR) (to add), and Swiss Franc (CHF) (to add).

4.2.1 Data sources for international funding received

Data is reported as either ‘received’ or ‘committed’ for international climate change-related funding. Data on multilateral and bilateral funding received or committed was provided by National Treasury in the form of grants received from Donors as reflected in the NT Reconstruction and Development Programme (RDP). Data on projects related to climate change were filtered from a larger database and project-related information, where available, was provided by National Treasury.

Other sources of data included the DFFE, including Annual Reports, and websites for donors and implementing agencies, for example, Green Climate Fund (GCF), Global Environment Facility (GEF), Energy Environment Partnership (EEP), United Nations Environment Programme (UNEP), United Nations Industrial Development Organization (UNIDO), the World Bank, and the JET Grant Register 34. Funding received/disbursed for 2023 and 2024 was reported in the common tabular formats (CTFs) and the status of that funding was ‘received’. Where data for funding received during the reporting period was not available (for e.g. as part of the NT RDP Fund or data available on donor websites), the funding amounts were reported as ‘committed’. The amounts for international climate change funding data ‘received’ was cross-checked against project titles and funding received as per the National Treasury RDP Grants and Donations and Transfers to avoid double-counting.

4.2.2 Allocation of funding Green Climate Fund projects approved for South Africa

As per the GCF website, or multi-country projects, financial information per country is equally divided unless the allocation % is specified. As such, the total funding committed for South Africa for projects funded by GCF was calculated by dividing the total funding by the number of countries supported.

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4.3 Financial support needed

Meeting the mitigation and adaptation objectives outlined in South Africa's Second NDC relies heavily on scaled-up support. The total investment required to implement South Africa's mitigation and adaptation actions over 2026–2035 is summarized in Table 4.1**Error! Reference source not found.** below (RSA, 2025). These totals represent the full estimated investment required, not only the portion for which South Africa seeks international support and are not incremental to business-as-usual costs.

Table 4.1: The total investment required to implement South Africa's mitigation and adaptation actions over 2026–2035 (Source: RSA, 2025)

Component	Total investment (2026–2035)	Annual average
Adaptation*	ZAR 250 billion	ZAR 25 billion/year
Mitigation **	ZAR 3.47 trillion	ZAR 347 billion/year

*The adaptation total reflects the investment required for 36 priority adaptation projects over the next 10 years and does not capture the full extent of South Africa's adaptation needs, previously estimated at around USD 4 billion per year. Estimates for the seven goals, and investment needs for the eighth goal, will be assessed in more detail in the forthcoming NDC investment plan. It is expected that as the NDC investment and finance plan is developed, the total amount of adaptation finance may increase. The cost estimates are in nominal values, and not increased with inflation (RSA, 2025).

**Mitigation totals include baseline or no-regret investments needed across multiple pathways, such as infrastructure upgrades, coal plant decommissioning, workforce support, and EV deployment. Totals indicate the overall investment envelope and do not reflect precise allocations by sector, timing, or financing instrument.

South Africa has established a Green Fund, and in 2024 initiated the establishment of a Climate Change Response Fund to put in place the institutional arrangements for funding of adaptation, loss and damage and mitigation. In this context, South Africa expects a fair share of international climate finance, to be provided by the Fund for Responding to Loss and Damage (FRLD) (RSA, 2025).

International support needs outlined for adaptation in SA's second NDC include:

- Sanitation infrastructure upgrading in rapidly growing informal settlements (with a focus on secondary cities),
- Conservation agriculture and sustainable rangeland management programmes for emerging and commercial farmers,
- Market access support for aquaculture small and medium-sized enterprises,
- Catchment restoration in strategic water source areas,
- The scaling-up of water conservation and demand management strategies,
- The design and construction of water reuse and managed aquifer schemes for

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water-stressed municipalities,

- The upgrading of energy transmission infrastructure to withstand increasing heat, winds and storms, improving health surveillance systems, and
- Enhancing transboundary water management functions.

4.4 Financial support received

The international climate finance data provided in this section will reflect bilateral and multilateral finance support received or committed for the reporting period of the BTR2.

Data on multilateral and bilateral funding received or committed will be collated once provided by National Treasury in the form of grants received from Donors as reflected in the NT Reconstruction and Development Programme (RDP). Data on projects related to climate change were filtered from a larger database and project-related information, where available, was provided by National Treasury.

Other sources of data will include the DFFE, including Annual Reports, and websites for donors and implementing agencies, for example, Green Climate Fund (GCF), Global Environment Facility (GEF), Energy Environment Partnership (EEP), United Nations Environment Programme (UNEP), United Nations Industrial Development Organization (UNIDO), the World Bank, and the JET Grant Register.

Table 4.2 provides a the multilateral and bilateral financial support received or committed between 1 Jan 2023 to 31 Dec 2024.

***NOTE:** In this First Order Draft, this table is currently incomplete and revised versions of this document will include additional data from National Treasury on the JET-IP Investments Dataset and ODA Loans Dataset once received and analysed.

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Table 4.2: Multilateral and bilateral financial support received or committed between 1 Jan 2023 to 31 Dec 2024

***NOTE:** Table incomplete in FOD, refer to note above

Donor	Title of activity, programme, project	Channel	Amount received (climate-specific)		Financial instrument	Status	Type of support	Sector
			Domestic currency (ZAR)	USD				
Belgium	Fostering low carbon and positive energy industrial spaces to accelerate the just energy transition in South Africa	Bilateral	33 788 716	1 908 967	Grant	Committed	Mitigation	Energy
European Union	Support Programme for the National System of Innovation	Bilateral	68 812 096	3 887 689	Grant	Received	Cross-cutting	Cross-cutting
European Union	Long-Term Joint EU-AU Research and Innovation Partnership on Renewable Energy	Bilateral	3 976 320	224 651	Grant	Received	Mitigation	Energy
European Union	M-ERA.NET Cofund	Bilateral	439 980.69	24 858	Grant	Received	Mitigation	Energy
European Union	Achieving a Net-Zero Energy of Wastewater Treatment Plants in South Africa	Bilateral	19 661 116	1 110 797	Grant	Received	Mitigation	Waste
European Union	Programme to Support the Transformation of the Wines and Spirits Sector in South Africa	Bilateral	286 086 217	16 163 063	Grant	Received	Cross-cutting	Agriculture
European Union	All-Atlantic Ocean Research & Innovation Alliance	Bilateral	2 182 159	123 286	Grant	Received	Cross-cutting	Marine and Coastal

Donor	Title of activity, programme, project	Channel	Amount received (climate-specific)		Financial instrument	Status	Type of support	Sector
			Domestic currency (ZAR)	USD				
France	CSP Phase 2 - Water resilience in Metropolitan Municipalities	Bilateral	2 307 779	130 383	Grant	Received	Cross-cutting	Water
Germany	Marine Spatial Management and Governance Programme	Bilateral	467 261	26 399	Grant	Received	Adaptation	Marine and Coastal
Global Environment Facility (GEF)	Development of Value Chains for Products	Multilateral	21 328 943	1 205 025	Grant	Committed	Adaptation	Biodiversity
Global Environment Facility (GEF)	Accelerating the shift towards electric mobility in South Africa	Multilateral	83 424 065	4 713 224	Grant	Committed	Mitigation	Transport
Global Environment Facility (GEF)	Acceleration of financial technology-enabled climate resilience solutions	Multilateral	3 055 877	172 648	Grant	Committed	Adaptation	Cross-cutting
Global Environment Facility (GEF)	Umbrella Programme for Preparation of Biennial Transparency Reports (BTRs) and National Communications (NCs) to the UNFCCC	Multilateral	10 620 000	600 000	Grant	Committed	Cross-cutting	Cross-cutting
Green Climate Fund (GCF)	Enhancing the institutional capacity of South Africa to coordinate green hydrogen activities of the Hydrogen Society Roadmap	Multilateral	9 561 398	540 192	Grant	Committed	Mitigation	Energy
Global Environment Facility (GEF)	Circular solutions to plastic pollution in South Africa	Multilateral	124 442 116	7 030 628	Grant	Committed	Mitigation	Waste

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Donor	Title of activity, programme, project	Channel	Amount received (climate-specific)		Financial instrument	Status	Type of support	Sector
			Domestic currency (ZAR)	USD				
Global Environment Facility (GEF)	Child project of the Global clean hydrogen program of South Africa	Multilateral	16 155 356	912 732	Grant	Committed	Mitigation	Energy
Montreal Protocol	SAF_KIP Energy Efficiency strategy	Multilateral	619 500	35 000	Grant	Committed	Mitigation	Energy
Portugal	All-Atlantic Ocean Research & Innovation Alliance	Bilateral	507 709	28 684	Grant	Received	Cross-cutting	Marine and Coastal
Switzerland (SECO)	Vuthela iLembe Local Economic Development (LED) Support Programme	Bilateral	17 162 376	969 626	Grant	Received	Cross-cutting	Cross-cutting
Switzerland	Global Eco-Industrial Park Programme II-South Africa country level intervention	Bilateral	37 389 440	1 808 000	Grant	Committed	Cross-cutting	Cross-cutting
Switzerland	Global Quality and Standards Programme South Africa, phase II: unlocking the export potential of essential and vegetable oils	Bilateral	29 911 986	1 446 421	Grant	Committed	Cross-cutting	Cross-cutting
United Nations Environment Programme (UNEP)	Catalyzing Financing and Capacity for the Biodiversity Economy around Protected Areas	Multilateral	22 759 293	1 285 836	Grant	Received	Adaptation	Biodiversity

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4.5 Technology development and transfer support needed

South Africa's Second NDC outlines the country's developmental pathways towards a low-emissions and climate resilient economy, while supporting the National Development Goals beyond 2030. The NDC notes a phased long-term decarbonisation path, with the 2020s focused on transforming the electricity sector, the 2030s focus on a deeper transition in the electricity and transport sectors through low emission vehicles and the 2040s and beyond targeting the decarbonisation of hard-to-mitigate sectors. The NDC further highlights the importance of addressing mitigation, adaptation, loss and damage, and support needs in an integrated manner.

Based on the Just Energy Transition Implementation Plan quarterly progress reports, progress has been made through national programmes and international partnerships. There is still a requirement for enhanced technology development and transfer support to allow for the large-scale deployment of low-carbon and climate-resilient solutions. The NDC identifies the need for strengthened climate services, improved early warning systems and climate impact information, as well as technologies and infrastructure to support water conservation and demand management, water reuse and managed aquifer schemes, climate-resilient sanitation infrastructure, sustainable agriculture and rangeland management, resilient energy transmission infrastructure, improved health surveillance systems, and enhanced disaster risk management systems.

The NDC further recognises that increasing climate impacts and the growing risks of loss and damage are placing pressure on existing national resources and capacities. There is an increasing need for international cooperation, technology transfer, capacity-building, and financial support to strengthen evidence-based decision-making, improve disaster impact data systems, and support the implementation of adaptation and resilience measures across vulnerable sectors and communities. Table 4.3 below provides a list of technology needs identified within various sector plans.

Table 4.3: Technology needs identified within sector plans

Sector	Document	Year of Publication	Technology needs mentioned
Coastal	Climate Change Adaptation Response Plan for South Africa's Coastal Sector	2025	Technologies for climate data collection, weather forecasting, environmental monitoring, and climate risk analysis to support informed decision-making. Community-based early warning systems and digital communication platforms to improve preparedness and response to coastal climate hazards.

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Sector	Document	Year of Publication	Technology needs mentioned
			Spatial mapping and modelling technologies used for vulnerability assessments, adaptation planning, and coastal risk management. Climate-resilient technologies for water supply, water harvesting, water reuse, and sustainable sanitation systems. Technologies supporting wetland, dune, estuarine, and coastal vegetation restoration to strengthen natural coastal protection and resilience. Climate-smart agriculture, sustainable fisheries and aquaculture, renewable energy systems, resilient infrastructure, and disaster response technologies to enhance adaptive capacity and sustainable development
Biodiversity and Ecosystems	Climate Change Vulnerability Assessment and Adaptation Strategy for South Africa's Biodiversity and Ecosystems Sector	2023	Improved ecological monitoring, data collection, accessibility, and information-sharing systems to support climate-resilient biodiversity management. Advanced spatial analysis, remote sensing, machine learning, and climate modelling tools to assess biome shifts, vegetation change, and ecosystem vulnerability. Early detection, monitoring, and fire management systems to reduce climate-related wildfire risks and ecosystem damage. Hydrological and smart water management technologies for water monitoring, water resource management, and improving ecosystem resilience to droughts and changing hydrological conditions. Climate-smart agricultural technologies, adaptive land management approaches, and strengthened research and adaptive management systems to support long-term ecosystem resilience.
Water and Sanitation	Climate Change Response Strategy for Water and Sanitation	2025	Alternative energy generation technologies, such as energy from methane at wastewater treatment plants and prevent release into the atmosphere. New and innovative sanitation technologies that use less water and reduce environmental impacts. Improve operations and maintenance of existing water and sanitation assets Stronger monitoring, modelling, and decision-support systems for climate and water variables. Better flood-resilient and climate-resilient infrastructure design, including dam features and planning tools.
Energy	South African Energy Masterplan (SAREM)	2025	Renewable energy and storage technologies which can be accessible to households in South Africa. Expansion of battery-storage technologies, especially lithium-ion batteries and vanadium redox flow batteries, and local manufacturing of cells and stacks. Develop end-of-life and circular-economy capacity for renewable-energy hardware, including reuse, remanufacturing, and recycling of batteries, panels, blades, and stack materials. Improve monitoring, data, and digital coordination systems so the market can see demand, track projects, and match skills to industry needs
Transport	Green Transport Strategy for South Africa: 2018-2025	2018	Alternative energy vehicles (The adoption of electric and plug-in hybrid vehicles.) Alternative fuels such as Compressed Natural Gas infrastructure and vehicles. The use of biogas or biomethane as a transport fuel. The modernisation of public transport and rail.

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Sector	Document	Year of Publication	Technology needs mentioned
			Smart and digital transport technologies, performance-based navigation and improved air traffic management systems.
Health	Draft National Climate Change and Health Adaptation Strategy and Implementation Plan.	2026	Climate-resilient medical equipment The installation of flood protection systems at healthcare facilities Solar power is considered as a backup energy system. Climate-informed health surveillance and early warning systems. Passive cooling systems to address heat impacts and reduce energy demand.
Human Settlement	Human Settlements Environmental Implementation Plan (2020-2025)	2023	Energy-efficient housing, using thermally efficient materials and energy-efficient building materials. Renewable energy technologies, such as solar cookers and biogas stoves, which reduce indoor air pollution caused by using traditional fuels. Water-efficient housing and water management technologies Climate resilient infrastructures

4.5.1 Just Energy Transition

South Africa's commitment to a low-carbon economy is outlined in the Just Energy Transition Investment Plan (JET IP) 2023-2027 (The Presidency of South Africa, 2025). Aligned with national energy and climate policies, the plan aims to diversify energy sources while also addressing challenges such as inequality, poverty and unemployment. The JET IP outlines the investment which is required to meet the country's decarbonisation targets under the Paris Agreement, to reduce emissions to between 320 and 450 Mt CO_2 by 2030.

There are six portfolios for the JET, which are Decarbonising South Africa's Electricity Sector, Mpumalanga Just Transition (JT), New Energy Vehicle (NEV) sector, Green Hydrogen (GH2), Skills Development and municipal capacity. Implementation of the Just Energy Transition is supported by a growing pipeline of projects across key sectors, including electricity, transport, green hydrogen, and regional development The Presidency of South Africa, 2025).

The Acceleration Coal Transition Investment Plan (ACT IP) is a key component for the electricity transition. It focuses on the phased decommissioning and repurposing of coal power stations such as Camden, Grootvlei and Hendrina. The decommissioning of these stations has been deferred to 2030 due to energy security and socio-economic considerations. The ACT IP emphasises reduced coal generation, prioritisation of lower emission plants and limited operation of high emission units to maintain system stability.

The ACT IP also prioritises a just transition in coal-dependent regions through early community development, skills development, and support for alternative livelihoods. Lessons from the

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Komati power station highlight the importance of community engagement and repurposing infrastructure for renewable energy.

In Mpumalanga, over 60 projects are being implemented to support economic diversification, including climate-smart agriculture initiatives such as the Grootvlei horticulture centre and skills development programmes for local communities. In the transport sector, projects such as the deployment of electric buses in Cape Town and the rollout of electric logistics, and e-hailing vehicles demonstrate early progress in the transition to new energy vehicles. Municipal-level initiatives are also supporting grid refurbishment, embedded generation, and energy access, while emerging green hydrogen projects, including Power-to-X initiatives, are advancing feasibility and development stages.

These projects highlight critical technology needs across the JET, particularly in grid infrastructure, renewable energy integration, electric mobility systems, hydrogen production technologies, and climate-resilient agriculture. In addition, there is a growing need for digital systems, skills development technologies, and local manufacturing capabilities to support the scaling and localisation of these interventions.

4.5.2 New Energy Vehicles

The Electric Vehicles White Paper (2023) mentions that its main goal is to set a course to transition the auto industry from primarily producing Internal Combustion Engine (ICE) vehicles to a dual platform that includes EVs in the production and consumption mix, alongside ICE vehicles in South Africa by 2035. This goal aligns with the targets of the South Africa Automotive Master Plan 2035, which aims to increase local content and strengthen the competitiveness of the domestic automotive industry. Achieving these targets requires a transition from ICE vehicles to a mix of battery electric, fuel-cell, and low-emission vehicle technologies in response to the changing global markets and tighter emission regulations in key export destinations. In supporting the transition, key technology development and support is required. These needs include the localisation and scaling of electric vehicles manufacturing technologies, specifically in battery production, power electronics and manufacturing components, along with developing a regional “critical minerals to batteries” value chain to increase value addition. There is a need to expand charging infrastructure technology and improve grid capacity to support increasing numbers of electric vehicles.

Support is required for research, development, and innovation, particularly in emerging technologies such as fuel-cell vehicles and sustainable fuels, as well as for skills development and reskilling programmes to ensure the workforce can adapt to new manufacturing processes and technologies (Department of Science and Innovation, 2021). The transition also depends

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on strengthening the broader EV ecosystem, including policy coordination, investment support, and the development of competitive supply chains. Addressing these technology needs through targeted investment and international technology transfer will be critical to ensuring that South Africa remains integrated into global automotive value chains while advancing its low-carbon development objectives (to add reference).

4.5.3 Hydrogen-related technologies

Hydrogen-related technology is a strategic priority for the country's low-carbon transition, especially for decarbonising hard-to-abate sectors such as mining and heavy industries (GIZ, 2025). The country has comparative advantages, including abundant renewable energy resources and platinum group metal reserves used in hydrogen technology (Takolia, 2023). Support is required to advance technology across the value chain. This includes the development and localisation of electrolyser technologies for green hydrogen production as well as fuel cell technologies for use in transportation and industries. There is also a need to strengthen research, development, and innovation systems to move hydrogen technologies from the pilot phase to commercial deployment (DSI, 2021).

Despite ongoing programmes such as Hydrogen South Africa, which support research & capacity development, there are gaps in scaling up production, reducing costs, and developing enabling regulatory frameworks (DSI, 2021). Addressing such challenges may require more international collaboration and technology transfer to support the development of an inclusive hydrogen economy.

South Africa also has an opportunity to become a regional supplier of low- and zero-emission maritime fuels, supported by its coastal infrastructure, renewable energy potential, and existing Fischer-Tropsch capabilities (GIZ, 2025). This can be linked to the development of the green hydrogen economy, as hydrogen and its derivatives (e-ammonia and e-methanol) are key inputs for sustainable maritime fuels. Targeted support will be required to up-scale hydrogen-based fuel production systems, which include fuel synthesis technologies, integrated Power-to-X solutions and electrolysers. South Africa can align with global decarbonisation targets in the maritime sector by strengthening these technologies, along with the development of port infrastructure.

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4.6 Technology development and transfer support received

4.6.1 Technology development and transfer support received – technical assistance

Table 4.4 shows an overview of projects based on information from the Technology Innovation Agency Annual Report (2024/25) and the Just Energy Transition Implementation Plan Quarterly Progress Report (31 December 2025).

Table 4.4: Overview of projects

Project / Programme	Project/Programme Focus	Location	Category / Sector
Global Cleantech Innovation Programme (GCIP-SA)	Supports cleantech innovators to develop solutions for energy efficiency, waste reduction, water security, and sustainable technologies	National (South Africa)	Green economy / Energy / Water
Cleantech Advance Accelerator (Agro processing)	Accelerates the adoption of clean energy and water-efficient technologies in agro processing	South Africa	Clean Technology
Scale Out of Impact (SOFI 2) Programme	Co-develops innovative solutions in food, energy, and water systems in underserved communities	Limpopo, Mpumalanga, Northern Cape, Eastern Cape	Energy / Food / Water systems
ReCha (Recycling Mobile Application)	Promote recycling through incentives and waste reduction	South Africa	Circular economy / Waste
Microalgae Biofuel Technology (DUT Project)	Developing biofuels from algae using wastewater and improving water treatment	Kingsburgh, KwaZulu-Natal	Bioenergy / Environmental Technology
Fine Bubble Technologies Project (ABIPP)	Uses nano-bubble systems to improve water and nutrient efficiency in agriculture	Western Cape	Agri-tech
GrooveTech (Recycled Plastic Roads)	Converts plastic waste into materials for road construction	City of Tshwane	Circular economy / Waste
Pyrol Tech (Pyrolysis Technology Project)	Converting biomass waste into biochar and bio-oils	South Africa	Circular economy
Transmission Infrastructure Expansion (ITP, CGV)	Expands grid capacity to integrate renewable energy	National	Electricity / Grid
Coal Plant Repurposing (Camden, Hendrina, Grootvlei)	Transitioning of coal plants into renewable and mixed-use sites	Mpumalanga	Electricity / Just Transition
Mpumalanga Just Transition Projects	Supports economic diversification and community development	Mpumalanga	Cross-sectoral
Grootvlei Horticulture Centre	Promotes climate-smart agriculture and alternative livelihoods	Mpumalanga	Agriculture
Electric Bus Rollout & EV Pilot Projects	Deploys electric buses and EV fleets	Western Cape (Cape Town)	NEV
Eskom–BYD Charging Infrastructure Partnership	Expands EV charging infrastructure	National	NEV

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Project / Programme	Project/Programme Focus	Location	Category / Sector
Electric Logistics & E-hailing Projects	Electrifies logistics and ride-hailing services	Urban centres (e.g. Gauteng, Western Cape)	NEV
EV Manufacturing Investment Projects	Supports local EV and component manufacturing	Gauteng, Eastern Cape	NEV
Municipal Energy Projects (MURP, grid upgrades)	Improves municipal energy systems and infrastructure	Multiple municipalities	Municipal Energy
Green Hydrogen & Power-to-X (PtX) Projects	Developing hydrogen and synthetic fuel technologies	Northern Cape, Eastern Cape, Western Cape	Hydrogen
SA-H2 Fund	Financing hydrogen infrastructure and projects	National	Hydrogen
JET Skills Desk & Skills Programmes	Supports workforce reskilling and capacity building	National	Skills Development

4.6.2 Green Technologies Stocktake

The Green Technologies Stocktake study was commissioned by the Technology Innovation Agency. A service provider (Promethium Carbon) was appointed in 2024 to undertake the study, which focuses on identifying existing technologies, evaluating the level of readiness and determining potential for deployment. (TIA, 2024) The study was concluded and presented to the TIA Board Technical Committee in 2025, where it was accepted, and has subsequently been tabled for consideration by the Presidential Climate Commission Climate Finance and Innovation Working Group for approval to be published on the PCC publications hub.

4.7 Capacity-building support needed

A list of completed, planned and proposed improvements for South Africa's GHG inventory - 2024 inventory is shown in Table 4.5.

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Table 4.5: List of completed, planned and proposed improvements for South Africa's GHG inventory - 2024 inventory.

Title	Objectives / description	Expected time frame (Inventory to use)	Status of activity	Current status	Sector	Priority	Reason	Completeness timeframe/task status
GHG Improvement Plan1	Improve uncertainty data for all sectors by incorporating more country specific uncertainty values	Incorporated as data becomes available	In progress	Ongoing – more detailed uncertainty analysis included for LULUCF; further disaggregation required	Cross-cutting	High	Improve transparency, accuracy and consistency in uncertainty analysis	Continuous improvement; phased incorporation as data becomes available (2025–2027)
GHG Improvement Plan2	Improve QA/QC process by addressing all issues in external review	Future inventories	In progress	Ongoing-review findings are being systematically assessed and incorporated into the improvement plan	Cross-cutting	High	Strengthen transparency, consistency, accuracy and completeness of the national GHG inventory and ensure alignment with UNFCCC review recommendations	Continuous; priority issues to be addressed before next BTR submission
GHG Improvement Plan5	Incorporate all background data for the Tier 2 calculations of enteric fermentation	2024 inventory (compilation in 2026)	In progress	Improve transparency and methodological robustness	Agriculture	High	Improve transparency and methodological robustness	Partially completed. All background equations are included, but some factors still rely on average data rather than annual data due to the absence of a sustainable data source; although the investigation was

Title	Objectives / description	Expected time frame (Inventory to use)	Status of activity	Current status	Sector	Priority	Reason	Completeness timeframe/task status
								conducted, no sustainable data source has been identified so far
GHG Improvement Plan7	Improve the uncertainty analysis for the Land sector to incorporate more detail.	2024 inventory (compilation in 2026)	In progress	Improve robustness of Land sector estimates	Agriculture	High		A more detailed uncertainty analysis was included in this inventory but further disaggregation is required to improve the analysis.
GHG Improvement Plan8	Improvement of land change data through detailed assessment of maps and tracking of land parcels	The land use improvement plan will be completed over the next 3 years so data will be incorporated as it becomes available (2024 and 2026 inventory)	In progress	Ongoing - 2022 SANLC map incorporated; key categories identified; seasonality removal prioritised	Agriculture		Improve accuracy of land representation and reduce misclassification	Progressive improvement through next inventory cycles
GHG Improvement Plan10	Move to a higher tier level for DOM in forest lands	2024 inventory (compilation in 2026)	In progress	Improve accuracy of forest carbon pool estimates	LULUCF	Medium		This was considered in the 2022 inventory and more detailed disturbance matrix data was included to determine the amount of biomass entering the DOM pool, however there were still one or two pieces of data missing which requires further investigation. This will be completed and included in the next inventory.

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Title	Objectives / description	Expected time frame (Inventory to use)	Status of activity	Current status	Sector	Priority	Reason	Completeness timeframe/task status
GHG Improvement Plan13	Incorporate NOx, CO, NMVOC, and SOx emissions	BTR 3 2028	In progress	Improve completeness of inventory and align with reporting requirement		Medium		Partly resolved/
GHG Improvement Plan21	Update of the VKT study, including segregation of on-road/off-road	Future inventories	In progress	Improve accuracy of transport sector emissions	Cross-cutting	High		Project to be initiated before next BTR
GHG Improvement Plan22	Comparison of the next VKT approach with fuel statistics	Future inventories	In progress	Improve accuracy of transport sector emissions	Cross-cutting	High		Project to be initiated before next BTR
GHG Improvement Plan31	Incorporate organic soils study to include emissions from organic soils	Future inventories	In progress	Improve completeness (CO_2 emissions from drained organic soils)	LULUCF	Medium		Organic soil area was determined from ISRIC data. The area of drained organic soils for *Grasslands remaining grasslands* and *Croplands remaining Croplands* were obtained from FAOSTAT. These datasets were used, together with IPCC default factors to estimate CO_2 emissions from drained organic soils. Further organic soil studies are required to improve emission estimates.

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Title	Objectives / description	Expected time frame (Inventory to use)	Status of activity	Current status	Sector	Priority	Reason	Completeness timeframe/task status
	Improve the biomass burning emissions		In progress	Analysis undertaken for 2024; assessment pending for replication in other years	LULUCF	Medium	Improve representation of fire-related emissions	In progress
	Use IPCC Software		Planned	Planned - migration to IPCC Software to be initiated	Improve completeness	Medium	Improve transparency, consistency and QA/QC of calculations	Outstanding - 2027-2028 inventory cycle
	Planned - research to be initiated		Planned	Planned - research to be initiated	Improve completeness	TBD	Improve completeness and accuracy of non-energy use emissions	Outstanding - 2027-2028 inventory cycle
	Further disaggregation of 1A2		In progress	Ongoing - currently disaggregated to 1A2a, 1A2b, 1A2-ab; further breakdown required	Improve completeness	High	Improve sectoral resolution.	Outstanding - progressive improvement through next inventory cycles
	Inclusion of methodology documentation/summary/approval process for tier 3 methods		Planned	Planned - to be collated and included	Improve completeness	Medium	Improve transparency	Outstanding - 2027-2028 inventory cycle

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Title	Objectives / description	Expected time frame (Inventory to use)	Status of activity	Current status	Sector	Priority	Reason	Completeness timeframe/task status
	CO_2, CH_4 and N_2O from spontaneous combustion of coal seams		Planned	Planned - research to be initiated	Improve completeness	Medium	Improve completeness	Outstanding - TBD, based on funding availability.
	CH_4 emissions from abandoned mines		Planned	Planned - research to be initiated	Improve completeness	Medium	Improve completeness	Outstanding - TBD, based on funding availability.
	CO_2 transport and storage		Proposed	Proposed	Improve completeness	Medium	Anticipate CCS developments	Outstanding – TBD
	CO_2, CH_4 and N_2O emissions from combined heat and power (CHP) combustion systems		Proposed	Proposed	Improve completeness	Medium	Improve completeness of combustion systems	Outstanding – TBD
	Assess significance of emissions from electronics industry		Proposed	Proposed	IPPU	Medium	Improve completeness of IPPU sector	Outstanding - TBD, Proposed; not implemented due to funding constraints
	Update the fluorinated gasses with higher accuracy figures from SARS		Proposed	Ongoing	IPPU	High	Improve accuracy of F-gas estimates	Outstanding - 2027-2028 inventory cycle
	Update SOC reference data		Proposed	Proposed	Agriculture	Medium	Improve soil carbon stock accuracy	Outstanding - TBD, Proposed; not implemented due to funding constraints
	Improve manure management data, including biogas digesters as a management system		Proposed	Proposed	Agriculture	High	Improve accuracy of CH_4 and N_2O estimates	Outstanding - Proposed; not implemented due to funding constraints
	Initiate data collection on controlled fires		Proposed	Proposed	LULUCF	High	Improve disaggregation	Outstanding - TBD

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Title	Objectives / description	Expected time frame (Inventory to use)	Status of activity	Current status	Sector	Priority	Reason	Completeness timeframe/task status
							biomass burning estimates	
	Perform a more detailed assessment of HWP to include a wider range of products		Proposed	Proposed	LULUCF	Medium	Improve carbon stock change estimates	Outstanding - TBD
	Collect data on other disturbances besides fire in forest lands		Proposed	Proposed	LULUCF	High	Accuracy -Improve forest carbon accounting	Outstanding - TBD
	Include information on population distribution in rural and urban areas as a function of income		Proposed	Proposed	Waste	Medium	Improve waste generation estimates	Outstanding - TBD
	Include HWP in solid waste		Proposed	Proposed	Waste	Medium	Improve completeness	Outstanding - TBD
	Obtain data on waste streams and the bucket system		Proposed	Proposed	Waste	Medium	Improve wastewater and solid waste estimates	Outstanding - TBD
	CH_4, N_2O emissions from biological treatment of waste		Proposed	Proposed	Waste	Medium	Improve completeness	Outstanding - TBD
	CO_2, CH_4 and N_2O from waste incineration		Proposed	Proposed	Waste	Medium	Improve completeness	Outstanding - TBD
	Data collection on quantities of waste disposed of into managed and unmanaged landfills		Proposed	Proposed	Waste	Medium	Improve completeness	Outstanding - TBD

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4.7.1 Capacity needs identified in the Technical Expert Review (TER) of the BTR1

The technical expert review (TER) of the BTR1 (UNFCCC, 2025), which took place 12 to 16 May 2025 in Pretoria, South Africa, indicates that a “comprehensive sectoral coverage for detailed projections will likely require targeted institutional strengthening in certain sectors; however, the nature and scale of these capacity needs can only be fully assessed once the sectoral emission targets are in place and sector-specific mitigation obligations are clearer. The TER team, together with the Party, identified capacity-building needs related to strengthening institutional and technical capacity for developing GHG projections by sector with a focus on the LULUCF sector and enhancing data availability”.

The TERT assessed the information reported in the BTR1 of South Africa and identified areas of improvement relating to consistency with the MPGs. For the inventory, there are number of recommendations made that need to be addressed in subsequent submissions. The inventory team has therefore highlighted the areas of support to ensure that the inventory is produced timeously and meets reporting requirements (see Table 4.6).

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Table 4.6: Recommendations made during the TER that need to be addressed in subsequent submissions

Project Title	Objectives	Rationale	Estimated budget	Relevant Submission
Development of a Road Transport Model for Estimating Vehicle Kilometres Travelled and Emissions	Develop a comprehensive model to estimate greenhouse gas emissions from the road transport sector, focusing on vehicle kilometres travelled (VKT) and transitioning to higher-tier methodologies.	Design and implement a transport model that estimates VKT across different vehicle categories. Integrate fuel consumption data, traffic activity, and vehicle fleet characteristics. Support the transition from Tier 1 to Tier 2/3 methods for improved accuracy in emissions reporting. Engage with stakeholders to validate assumptions and data sources. Provide training and documentation to facilitate knowledge transfer to DFFE staff	R1 500 000	3rd BTR
Appointment of a service provider to enhance and maintain the national greenhouse gas emissions reporting system.	The overall objective of the project is to enhance the reporting system to collect additional information to enable meeting of reporting requirements, as well as maintenance of existing infrastructure. The system service provider will be responsible for maintenance of the national greenhouse gas emissions system and enhance the system to collect additional greenhouse gas and activities where required.	To ensure continuous improvement of the inventory, the main system that drives data collection must be maintained. One of the areas highlighted by the TERT was the lack of collection of consistent data for the HFCs. The project will also address the findings from the TERT to improve the reporting of additional gases and activities.	R2 000 000	2nd BTR
Appointment of a service provider to enhance the functionality, usability, and integration of the National GHG Inventory System (NGHGIS) to support improved data management and reporting.	Enhance the functionality, usability, and integration of the National GHG Inventory System to support improved data management and reporting.	Upgrade system architecture to improve performance and scalability. Integrate new modules to support additional sectors and gases. Improve user interface and reporting capabilities. Ensure alignment with international reporting requirements and interoperability with other national systems.	R750 0000	2nd BTR.

Project Title	Objectives	Rationale	Estimated budget	Relevant Submission
		Provide technical support and training to DFFE staff. This project is critical to maintaining compliance with international reporting standards and ensuring readiness for future BTR submissions.		
Appointment of a Service Provider to Draft the National Emissions Inventory Report and Conduct Quality Checks	Support the drafting of the National GHG Inventory Report (NIR) and conduct quality assurance and control (QA/QC) checks to ensure completeness, consistency, and transparency.	Compile and draft the NIR for the 1990–2026 reporting period. Conduct QA/QC checks in line with IPCC guidelines and TERT recommendations. Review sectoral data and documentation to ensure accuracy and traceability. Coordinate with sector experts and DFFE staff to validate findings. Prepare the report for submission under the Biennial Transparency Report process.	R500 000	2nd and 3rd BTR

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Table 4.7 presents capacity-building needs identified by the Party and by the TERT in consultation with the Party during the technical expert review of its BTR1.

Table 4.7: Capacity-building needs identified during the technical expert review of BTR1

ID#	Reporting requirement	Area in which capacity-building is needed
National inventory report – General	identified by the TERT on the basis of the findings from the technical expert review.	
2.G_CBN.1	Specified in paragraph 57–58 of the MPGs	Estimating GHG emissions for the time series 1990–2000 (high priority)
2.G_CBN.2	Specified in paragraph 32 of the MPGs	Developing a data-collection and GHG emission estimation system for categories for which estimates are not yet reported and are currently considered insignificant or reported as "NE" (high priority)
2.G_CBN.3a	Specified in paragraph 12(a) of decision 18/CMP.1	Adapting the national inventory system to the tools for reporting under the enhanced transparency framework under the Paris Agreement by developing tools for automatically inputting GHG inventory data into the JavaScript Object Notation format files of the CRTs and by providing training on reporting information in tabular format
National inventory report – IPPU		
4.I_CBN.1	Specified in paragraph 48 of the MPGs	Developing a data-collection and emission estimation system for F-gases (high priority)
National inventory report – LULUCF	Informed by Table 4.16 of BTR1. Capacity support needed for preparing reports pursuant to Article 13 of the Paris Agreement – Capacity needs related to improvements to the GHG Improvement Plan	
6.L_CBN.1a	Specified in paragraphs 20, 47 and 50 of the MPGs	Developing a national forest inventory, beginning by initiating discussions with the Forestry branch of the Department of Forestry, Fisheries and the Environment
6.L_CBN.2a	Specified in paragraphs 20, 47, 50 and 56 of the MPGs	Enhancing the data-collection and emission estimation system for harvested wood products
6.L_CBN.3a	Specified in paragraphs 20, 47, 50 and 55 of the MPGs	Establishing a system for monitoring-controlled fires in the LULUCF sector, collecting data and reporting information thereon
6.L_CBN.4	Specified in paragraphs 20, 47, 50 and 55 of the MPGs	Improving the methodology for identifying land use and land-use changes, including by tracking changes in land use over time
National inventory report – waste		

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ID#	Reporting requirement	Area in which capacity-building is needed
7.W_CBN.1a	Specified in paragraph 47 of the MPGs	Establishing the data-collection and information management system for obtaining and managing data on waste streams and a bucket system
13_CBN.1	Specified in paragraphs 83, 85, 90 and 93–101 of the MPGs	NDC tracking/PaMs/GHG projections: strengthening institutional and technical capacity in modelling and assessing the effects of PaMs by increasing capacity in modelling projections of GHG emissions and removals and in reporting long-term emission reductions, socioeconomic impacts and a cost–benefit analysis related to PaMs; for example, by securing qualified, trained staff in a dedicated administrative unit (high priority)
13_CBN.2	Specified in paragraphs 83, 85, 90 and 93–101 of the MPGs NDC tracking/parameters for GHG projections:	Strengthening institutional and technical capacity in modelling and assessing the effects of PaMs by improving data availability and the quality of the macroeconomic framework, parameters and assumptions used in developing projections, including projections of energy demand by sector (e.g. transport, household) (high priority)
13_CBN.3	Specified in paragraphs 83, 85, 90 and 93–101 of the MPGs	Strengthening institutional and technical capacity in modelling and assessing the effects of PaMs by developing GHG projections by sector, with a focus on the LULUCF sector (high priority)

The following prioritized needs for capacity-building to facilitate the Party's reporting in its BTR1 relating to the flexibilities applied by it as per the MPGs, are listed in the TER (UNFCCC, 2025):

a) Developing a data-collection and emission estimation system for F-gases and for GHG emissions for other categories that are not yet reported and are considered insignificant;

b) Strengthening institutional and technical capacity in modelling and assessing the effects of PaMs by:

    i) Increasing capacity in modelling projections of GHG emissions and removals and in reporting long-term emission reductions, socioeconomic impacts and a cost–benefit analysis related to PaMs;

    ii) Improving data availability and the quality of the macroeconomic framework, parameters and assumptions used in developing projections, including projections of energy demand by sector;

    iii) Developing GHG projections by sector, with a focus on the LULUCF sector.

To facilitate continuous improvement in reporting, the following additional capacity-building needs were identified during the review (UNFCCC, 2025):

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a) Improving the methodology for identifying land use and land-use changes, including by tracking changes in land use over time;

b) Developing a national forest inventory to improve land representation in the GHG inventory;

c) Enhancing the data-collection and emission estimation system for harvested wood products;

d) Establishing a system for monitoring controlled fires, collecting data in the LULUCF sector and reporting information thereon;

e) Establishing a data-collection and information management system for obtaining and managing data on waste streams and a bucket system;

f) Adapting the national inventory system to the tools for reporting under the enhanced transparency framework under the Paris Agreement by developing tools for automatically inputting GHG inventory data into the JavaScript Object Notation format files of the CRTs and by training the CRT and CTF compilers on reporting information in tabular format.

4.7.2 Capacity needs for Climate Budget Tagging

The Climate Budget Tagging Progress report (National Treasury, 2026) highlighted that continued and enhanced capacity-building support is critical to ensure that pilot departments used to test the roll-out of the CBT system adequately integrate climate priorities into their plans and fully comply with the CBT requirements. The first phase of the pilot roll-out (3 pilot departments participated) revealed gaps in understanding of the reform and varying levels of readiness for a broader rollout. In particular, the need for capacity building was identified as a key constraint to effective implementation. In Phase II, six additional departments were identified and included in Phase II pilot tagging as contributors to targeted climate gaps.

The data collected during Phase II demonstrated an improvement compared to previous tagging phase, particularly in terms of the identification of targeted climate gaps, activities and allocations for mitigation and adaptation. This progress can be attributed to the focused efforts undertaken to improve departmental understanding of the CBT system. However, gaps remain in the quality data of submissions, including insufficiently defined activities, limited performance information and overall completeness. Continued and enhanced capacity-building support is therefore critical to ensure that pilot departments adequately integrate climate priorities into their plans and fully comply with the CBT requirements. Recommendations following Phase II

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include that capacitation of departments on CBT system, priorities, and tagging template continues and as well as provision of support to departments for the development of interventions and indicators to measure progress toward climate responsive budgeting in government.

4.7.3 Capacity needs for Just Energy Transition (JET) Skills Portfolio

The JET Implementation Plan was approved in November 2023 by Cabinet providing a roadmap for building institutional capacity and skills programmes. In April 2024, the NBi launched the Just Energy Transition Skills for Employment Programme (JET SEP).

The JET Skills Desk and the National JET Skills Advisory Forum, two pillars of South Africa's Just Energy Transition Skills Portfolio, were officially launched in August 2025[18], along with the Multi-Donor Initiative (MDI). The JET Skills Desk is in the Department of Higher Education and Training and serves as the operational engine for the JET Skills Portfolio to ensure planning is evidence-based, industry-informed, and aligned with labour market demand. Its priorities include:

- Reskilling and upskilling adult workers, especially in declining and vulnerable value chains
- Developing robust skill anticipation systems grounded in labour market intelligence
- Strengthening the foundational education system through curriculum reform, educator development, and institutional readiness

The National JET Skills Advisory Forum will be housed under the Human Resource Development Council (HRDC) which brings together stakeholders from across government, labour, business, and civil society and is a relevant platform for the Advisory Forum considering its multidisciplinary nature and stakeholder reach.

Under the JET Skills Desk and National JET Skills Advisory Forum, a JET Skills Integrated Plan will be developed to guide and coordinate interventions across the system to ensure alignment with national priorities, eliminate duplication, and maximise its impact. These structures will also support the development of Skills Development Zones, which are targeted hubs in high-impact areas like Mpumalanga, the Eastern Cape, and the Northern Cape. These zones will link training to employment opportunities in emerging sectors across core JET portfolios.

[18] https://www.gov.za/news/speeches/deputy-president-paul-mashatile-launch-just-energy-transition-skills-desk-advisory

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There is currently no dedicated financial allocation for JET skilling intervention, and as such, mobilisation of blended finance is important. Tangible measurable investments are needed in:

- In the infrastructure of TVET colleges and universities,
- In entrepreneurship and small business development in affected communities, and,
- In building robust systems for career guidance and train-the-trainer programmes.

The Multi-Donor Initiative supports the operationalisation of the JET Skills Desk, and is a collaboration between the South African Government, the European Union (EU), the Federal Republic of Germany, and the Swiss Confederation, implemented by GIZ. It is co-financed by the EU, the German Federal Ministry for Economic Cooperation and Development, and SECO, through Germany's flagship Career Path Development for Employment (CPD4E) programme.

4.7.4 Capacity needs for Adaptation

Table 4.8 outlines capacity support needs identified in Chapter 3 on Climate Impacts and Adaptation, along with the cross-reference to the relevant sections in the chapter.

Table 4.8. Capacity support needs for adaptation

Sector / Area	Key capacity-building needs	Section
Water security and water resources	Strengthen capacity for water balance modelling, demand management, catchment planning, drought preparedness, water allocation, water quality monitoring and integration of climate projections into water resource planning.	3.1.1.4 3.2.6.1 3.2.6.2
Biodiversity, ecosystems and ecological infrastructure	Build capacity for ecosystem-based adaptation, wetland and river restoration, invasive alien species management, biodiversity monitoring, land degradation assessment and restoration of strategic water source areas.	3.2.6.2 3.4.5 3.4.9
Agriculture, food security and rural livelihoods	Strengthen extension services, climate-smart agriculture skills, drought early warning, grazing and rangeland management, crop failure risk management, livelihood diversification and support for small-scale farmers.	3.2.6.2 3.4.5 3.7.1 3.10.1
Health	Build provincial and municipal capacity to assess and manage climate-related health risks, including heat stress, disease risks, disaster-related health impacts and climate-sensitive health surveillance. Training is needed for health practitioners on climate adaptation and differentiated vulnerability.	3.2.6.4 3.4.1 3.4.9
Human settlements and urban systems	Strengthen municipal capacity for climate-resilient spatial planning, informal settlement upgrading, heat-risk management, flood-risk reduction, resilient service delivery and integration of adaptation into municipal planning systems.	3.1.1.4 3.3.2 3.5 3.7.1
Infrastructure, transport and service delivery	Build technical capacity for climate-resilient infrastructure design, maintenance, asset management and investment planning, especially for interdependent water, energy, transport and stormwater systems.	3.1.1.4 3.6.4.3 3.7.1
Disaster risk management and loss and damage	Strengthen staffing, equipment, data systems, early warning dissemination, preparedness planning, disaster risk financing, impact documentation and post-disaster recovery planning at municipal and provincial levels.	3.2.6.6 3.7.1 3.9.2 3.10.4

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Sector / Area	Key capacity-building needs	Section
Local government and municipal implementation	Address uneven municipal capacity by improving staffing, technical skills, finance access, procurement capability, project preparation, enforcement of the Climate Change Act and integration of adaptation into Integrated Development Plans and service delivery mandates.	3.1.1.3 3.3.2 3.4.5; 3.4.6; 3.4.9 3.6.4.3 3.10.4
Climate information, data and monitoring systems	Build capacity to collect, manage and interpret climate impact data, vulnerability data, loss and damage data, biodiversity indicators and adaptation implementation evidence across spheres of government.	3.2.6.2; 3.2.6.6 3.4.9 3.6.4.3 3.10.1; 3.10.3 3.10.4
Adaptation monitoring, evaluation and learning	Strengthen institutional capacity to track not only whether adaptation actions are implemented, but whether they reduce vulnerability, avoid losses and improve resilience. This includes indicators, reporting templates, sector guidance and learning systems.	3.4.9 3.5 3.10.2; 3.10.4
Finance and budgeting	Build capacity for climate budget tagging, adaptation project preparation, accessing international climate finance, mobilising private and blended finance, gender-responsive budgeting and tracking finance for vulnerable communities.	3.1.1.3 3.3.2 3.4.3.1 3.4.5; 3.4.9 3.6.4.3 3.10.1; 3.10.2; 3.10.4
Gender and social inclusion	Strengthen capacity to generate and use gender-disaggregated and vulnerability-disaggregated data, apply gender-responsive planning and budgeting, and support women-led, community-led and indigenous-led adaptation initiatives.	3.1.1.3 3.4.3;3.4.3.1 3.4.9 3.10.1
Indigenous Knowledge Systems and local knowledge	Build capacity to document, protect and integrate indigenous, traditional and local knowledge into adaptation planning, climate services, biodiversity stewardship, water management, food systems and monitoring.	3.4.3 3.4.5 3.4.9 3.10.4
Governance, coordination and accountability	Strengthen institutional arrangements, clarify roles and responsibilities, improve cross-sector coordination and create accountability mechanisms for adaptation implementation, monitoring and reporting.	3.3.1; 3.3.2 3.4.6; 3.4.9 3.6.2 3.6.4.3 3.7.1 3.10.2
Climate services and early warning systems	Build capacity to translate climate information into practical planning, budget and infrastructure decisions, and strengthen bottom-up impact data collection by communities and local authorities.	3.4.5 3.10.1; 3.10.3
Reporting and transparency	Strengthen capacity to meet BTR, NDC and Enhanced Transparency Framework reporting requirements, including reporting on adaptation support needed and received, capacity-building, gender, IKS, participation and adaptation outcomes.	3.4.3.1 3.4.5; 3.4.9 3.10.1; 3.10.4

4.8 Capacity-building support received

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4.8.1 Capacity support received for preparing reports pursuant to Article 13 of the Paris Agreement

Support received for the implementation of Article 13 of the Paris Agreement and transparency-related activities, including transparency-related capacity-building, is provided in Table 4.9.

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Table 4.9: Support received for the implementation of Article 13 of the Paris Agreement and transparency-related activities

Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
Peer learning exchange for countries to share knowledge and experience on monitoring and evaluation of climate action under the CBIT Project of South Africa.	The peer learning aimed at sharing knowledge and experience on climate change adaptation and mitigation planning and implementation, climate change monitoring, reporting, and verification and to encourage gender mainstreaming in climate change development, implementation, and reporting.	11-15 Mar 2024	CBIT Global Support Programme (CBIT-GSP) and UNEP.	Cross-cutting	Cross-cutting	Completed	It focused on best practices, tools, and approaches for effective climate tracking. Expected results include strengthened Monitoring and Evaluation capacity, improved transparency and reporting systems, and enhanced regional collaboration for ETF	3
Global BTR Dialogue:Brussels, Belgium	The aim of this event was to provide developed and developing country Parties with a space to discuss the progress in developing their first BTR and exchange on common technical challenges. It has served to create momentum and support Parties in the last mile of their BTR preparation.	29 April - 03 May 2024	Partnership on Transparency in the Paris Agreement (PATPA)	Cross-cutting	Cross-cutting	Completed	The dialogue brought together countries and partners to share experiences, challenges, and best practices in preparing Biennial Transparency Reports (BTRs) under the Paris Agreement. It aimed to enhance technical capacity, promote peer learning, and strengthen transparency systems. Expected results include improved BTR quality and consistency, stronger international collaboration, and increased readiness for ETF reporting.	2

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Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
CGE Hands-on Training Workshops for Africa region "Preparation of the Biennial Transparency Reports", Victoria Falls, Zimbabwe	The workshop focused on the Enhanced Transparency Framework (ETF) under the Paris Agreement and provided practical guidance on using the electronic ETF reporting tools, fostering peer learning and improving technical capacity for BTR submissions	8 - 10 May 2024	Consultative Group of Experts (CGE) as the organizer, with the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP)	Cross-cutting	Cross-cutting	Completed	The workshop provided practical, hands-on training to African countries on the preparation of Biennial Transparency Reports (BTRs) under the Paris Agreement. It focused on data compilation, reporting tools, and methodological guidance. Expected results include strengthened technical capacity, improved accuracy and completeness of BTRs, and enhanced readiness for ETF reporting across the region.	3
Training Workshop on preparation and reporting of results of national GHG inventories under the ETF of the Paris Agreement, 25 - 27 June, 2024, Venue: Kigali Convention Center, Rwanda	The workshop supported Anglophone African countries in strengthening capacity to prepare and report national GHG inventories under the Enhanced Transparency Framework through technical guidance, practical exercises, and peer learning. It focused on improving NIRs, data management, and application of reporting requirements for BTRs.	25 - 27 June 2024	CBIT Global Support Programme (CBIT-GSP)	Mitigation	Cross-cutting	Completed	The training workshop was used to strengthen the technical capacity of Anglophone African countries in preparing and reporting national GHG inventories under the Enhanced Transparency Framework, with a focus on improving the quality of National Inventory Reports (NIRs) and Biennial Transparency Reports (BTRs). Its impact included enhanced understanding of the updated reporting requirements under the Paris Agreement, improved application of methodologies and tools for inventory preparation, and	2

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							strengthened institutional arrangements and data management practices. The estimated results include more consistent and transparent reporting of national GHG inventories, improved quality assurance and quality control processes, and increased readiness of countries to meet ETF reporting requirements through strengthened technical and institutional capacity.	
PCC Workshop on IPCC Inventory Software, Baku, Azerbaijan 4-6 September 2024		4-6 September 2024	CBIT	Mitigation	IPCC	Completed		1
Workshop on empowering Africa toward fast-tracking Biennial Transparency Reports (BTR) preparation: Togo, Lome	The Workshop provided technical support to countries to help them complete their first Biennial Transparency Reports (BTRs) by the December 2024 deadline. The workshop offered one-on-one coaching on the Enhanced Transparency Framework (ETF) modalities, a peer-to-peer exchange of experiences and lessons learned, and	9-12 September 2024	The United States Environmental Protection Agency (US EPA); the COP 29 Incoming Presidency represented_Republic of Azerbaijan,UN climate change secretariat e; and	Cross-cutting	Cross-cutting	Completed	The workshop aimed to strengthen the capacity of African countries to efficiently prepare Biennial Transparency Reports (BTRs) under the Paris Agreement. It focused on practical guidance, data management, and reporting processes. Expected results include accelerated BTR preparation, improved national transparency systems, and	2

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	focused discussions on key BTR chapters like Greenhouse Gas (GHG) inventories, Nationally Determined Contribution (NDC) tracking, and climate finance. The goal was to build confidence and develop clear steps for timely BTR submission under the Paris Agreement.		the West African Development Bank (BOAD), and the Azerbaijan International Development Agency (AIDA).				enhanced regional collaboration for effective ETF implementation.	
PCC Workshop on IPCC Inventory Software, Baku, Azerbaijan 4-6 September 2024	The workshop focused on strengthening technical capacity for estimating and reporting national greenhouse gas inventories using the IPCC Inventory Software and its interoperability function with the UNFCCC reporting tool. It combined technical demonstrations and hands-on exercises to support improved accuracy, consistency, and efficiency in inventory preparation across sectors. The programme also enhanced understanding of integrated reporting workflows under the Enhanced Transparency Framework.	4-6 September 2024	CBIT Global Support Programme (CBIT-GSP)	Mitigation	IPCC	Completed	The workshop was helped to build technical capacity on the use of the IPCC Inventory Software and its interoperability with the UNFCCC reporting tool for preparing national GHG inventories. Its impact included improved understanding of software-based inventory compilation, enhanced consistency and accuracy in reporting, and strengthened ability to align national systems with ETF reporting requirements. Estimated results include more efficient inventory preparation processes, improved quality and comparability of reported emissions data, and increased readiness of countries to use	1

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							integrated digital tools for future BTR submissions.	
Virtual training for South Africa on the GHG inventory tool	The training aimed to build South Africa's capacity to use the GHG inventory tool for compiling and reporting national greenhouse gas emissions under the Paris Agreement's Enhanced Transparency Framework.	16 Oct 2024	UNFCCC	Mitigation	Cross-cutting	Completed	The training aimed to build South Africa's capacity to use the GHG inventory tool for compiling and reporting national greenhouse gas emissions under the Paris Agreement's Enhanced Transparency Framework.	2
Virtual training for South Africa on tracking progress and Support tools	The training provided remote guidance to strengthen South Africa's capacity to track climate action progress and use support tools under the Enhanced Transparency Framework.	18 Oct 2024	UNFCCC	Mitigation	Cross-cutting	Completed	The workshop was used to build technical capacity on the use of the IPCC Inventory Software and its interoperability with the UNFCCC reporting tool for preparing national GHG inventories. Its impact included improved understanding of software-based inventory compilation, enhanced consistency and accuracy in reporting, and strengthened ability to align national systems with ETF reporting requirements. Estimated results include more efficient inventory preparation processes, improved quality and comparability of reported emissions data, and increased readiness of countries to use	12

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Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
							integrated digital tools for future BTR submissions.	
Peer Learning Workshop on Transparency (MRV) Systems in Baku, Azerbaijan,	The Peer Learning Workshop on Transparency (MRV) Systems in Baku was a collaborative event to share best practices and experiences in establishing measurement, reporting, and verification (MRV) systems. The workshop aimed to enhance countries' capacity for climate reporting, facilitate peer-to-peer exchange among countries with varying levels of transparency system development, and strengthen collaboration to support the Paris Agreement.	9-11 April 2025	RECC Azerbaijan, CBIT-GSP, and Aether UK, in collaboration with Azerbaijan's Ministry of Ecology and Natural Resources	Cross-cutting	Cross-cutting	Completed	The workshop facilitated peer-to-peer learning on Measurement, Reporting, and Verification (MRV) systems under the Paris Agreement's Enhanced Transparency Framework. It aimed to share best practices, challenges, and solutions among countries. Expected results include strengthened MRV capacity, improved national transparency systems, and enhanced regional collaboration for accurate and reliable climate	1
The Africa Capacity Building Workshop on the Enhanced Transparency Framework: Fostering the Linkage Between Nationally Determined Contributions (NDCs) and	The Anglophone Africa Network training, aimed to strengthen participants' capacity to link their Nationally Determined Contributions (NDCs) with their Biennial Transparency Reports (BTRs) to meet Paris Agreement reporting requirements. The program focused on training national	6-9 May 2025	The Capacity Building Initiative for Transparency - Global Support Programme (CBIT-GSP), the African Union, the UN Environment Programme (UNEP), the UNEP Climate Change	Cross-cutting	Cross-cutting	Completed	The workshop focused on strengthening the link between Nationally Determined Contributions (NDCs) and Biennial Transparency Reports (BTRs) to enhance coherent climate reporting under the Paris Agreement. It built technical and institutional capacity for effective data collection, tracking, and reporting. Expected results	2

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Biennial Transparency Reports (BTRs), in Mahe, Seychelles,	teams on the practical application of the Enhanced Transparency Framework (ETF), including NDC tracking, projections, and reporting tools, to improve transparency and support countries in developing more effective and ambitious climate action plans		Centre of Excellence (UNEP-CCC), and the Global Green Growth Institute (GGGI)				include improved integration of NDC and BTR processes, stronger transparency systems, and enhanced readiness for ETF implementation across African countries.	
The Anglophone African Regional Group Workshop on Biennial Transparency Reports (BTRs),held in Lagos, Nigeria.	The Anglophone African Regional Group workshop aimed to foster peer learning and technical exchange among African nations on their Biennial Transparency Reports (BTRs) under the Paris Agreement's Enhanced Transparency Framework (ETF). The workshop provided a platform to discuss challenges and lessons learned during the BTR development process, the preparation for the Technical Expert Review (TER), and how to build confidence for timely BTR submissions	22–25 July 2025	Organized by the Anglophone African Regional Group and hosted by Nigeria, with the Partnership on Transparency in the Paris Agreement (PATPA) and the UNFCCC Consultative Group of Experts (CGE)	Cross-cutting	Cross-cutting	Completed	The workshop aimed to build capacity of Anglophone African countries to prepare and submit Biennial Transparency Reports under the Paris Agreement. It focused on sharing experiences, identifying challenges, and strengthening national transparency systems. Expected results include improved BTR preparation, enhanced regional collaboration, and greater readiness for ETF reporting.	2
The Partnership on Transparency in the Paris	The Retreat (APR) in Bangkok, aimed at discussing the experiences with the first	28 August	Germany's International Climate Initiative	Cross-cutting	Cross-cutting	Completed	The retreat brought together countries and partners to share experiences and strengthen	2

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Agreement (PATPA) hosted the 12th Annual Partnership Retreat (APR), in Bangkok, Thailand.	Biennial Transparency Reports (BTRs) under the Paris Agreement's Enhanced Transparency Framework (ETF), technical challenges with the Modalities, Procedures and Guidelines (MPGs), and early ideas for the MPGs review. This project serves as a platform for developed and developing countries to share best practices and learn from one another in an open and collaborative atmosphere to build trust and drive ambition for climate action	to 2 Sept 2025	(IKI) for funding and the Food and Agriculture Organization (FAO) and South Korea's Greenhouse Gas Inventory and Research Center (GIR).				cooperation on implementing the Enhanced Transparency Framework under the Paris Agreement. It fostered peer learning, capacity-building, and knowledge exchange. Expected results include improved transparency systems, stronger networks, and enhanced readiness for climate reporting.	
High-Level Dialogue: Transparency for Transformation: Strengthening Accountability, Driving Ambition in Songdo, Incheon, Republic of Korea	The dialogue brought together government representatives, international organizations, and transparency experts to discuss progress under the Enhanced Transparency Framework (ETF) of the Paris Agreement. The session aimed to share lessons learned from Biennial Transparency Reports (BTRs) and National Communications (NCs), highlight innovative	3-5 Sep 2025	United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP), the Food and Agriculture Organization (FAO), the United Nations Framework Convention on	Cross-cutting	Cross-cutting	Completed	The event promotes accountability and ambition in implementing the Enhanced Transparency Framework under the Paris Agreement. It strengthens political commitment, enhances collaboration, and drives transparent climate action. Expected results include greater momentum for ETF implementation and stronger partnerships to support national reporting and ambition.	1

Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
	approaches to data management, and explore how enhanced transparency supports stronger climate ambition and accountability.		Climate Change (UNFCCC), and the Initiative for Climate Action Transparency (ICAT).					
Webinar on COPERT model to support National Greenhouse Gas Inventories from developing countries under the Enhanced Transparency Framework of the Paris Agreement	A three-day webinar to train developing countries on using the COPERT model for estimating and reporting GHG emissions from road transport under the Paris Agreement's Enhanced Transparency Framework. The sessions cover model functions, data input, Tier 2 and 3 methods, and using COPERT for energy balance, emission projections, and NDC tracking.	14 – 16 Oct 2025	UNFCCC	Mitigation	Cross-cutting	Completed	To improve the accuracy and transparency of national inventories and supports NDC tracking. Participants were expected to gain practical skills in using COPERT for energy balance, emission projections, and BTR reporting.	9
Webinar: Installation of the IPCC Inventory Software for National Greenhouse Gas Inventories	A webinar organized by the UNFCCC Secretariat in collaboration with the IPCC TFI TSU to guide participants through the installation and initial setup of the IPCC Inventory Software. Covers software overview, step-by-step installation (Windows focus), first run, database management, and Q&A.	Oct 2025	UNFCCC	Mitigation	Cross-cutting	Completed	To demonstrate to participants on how to successfully install and run the IPCC Inventory Software, manage the initial database, and start using the software for national GHG inventory reporting. Strengthens technical capacity for accurate and efficient reporting	4

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Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
Webinar on Uncertainty Analysis in National Greenhouse Gas Inventories to support the implementation of the Enhanced Transparency Framework under the Paris Agreement by developing countries	To build capacity of developing countries on uncertainty analysis in national GHG inventories under the Paris Agreement's Enhanced Transparency Framework. It covers uncertainty in input data, error propagation (Approach 1), and Monte Carlo simulation (Approach 2), with practical exercises and guidance to improve transparency and accuracy in GHG reporting.	28 – 30 Oct 2025	UNFCCC	Mitigation	Cross-cutting	Completed	To enhance the credibility and reliability of GHG data under the Enhanced Transparency Framework, enabling countries to produce more accurate and confident emission estimates.	2
Webinar on the IPCC Inventory Software for National Greenhouse Gas Inventories	A series of webinars organized by the UNFCCC Secretariat in collaboration with the IPCC TFI TSU, providing guidance and demonstrations on the use of the IPCC Inventory Software for national greenhouse gas inventories. Includes explanations of key functionalities and Q&A sessions.	5–6 Nov 2025	UNFCCC	Mitigation	Cross-cutting	Completed	To provide practical skills to use the IPCC Inventory Software effectively, improving accuracy and efficiency in compiling national GHG inventories. Enhanced capacity for reporting and compliance with IPCC/UNFCCC guidelines.	2

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Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
Webinar: Monitoring and Evaluation for Adaptation Reporting	A webinar organized to strengthen capacity for adaptation reporting in Biennial Transparency Reports (BTRs). Focuses on building functional monitoring and evaluation (M&E) systems, tracking adaptation indicators, and providing guidance on reporting under paragraphs 112–114 of the MPGs. Includes examples of domestic systems and approaches for effective adaptation reporting.	Nov 25	UNFCCC	Adaptation	Cross-cutting	Completed	To provide practical knowledge and tools to develop functional M&E systems for adaptation, improve tracking of adaptation indicators, and enhance the quality and consistency of BTR adaptation reporting. Expected to strengthen national adaptation planning and reporting capacities.	2
Annual Meeting of the Anglophone Africa Transparency Network: Achievements, Highlights, and Lessons in 2025	An online meeting aimed at evaluating the progress of the Anglophone Africa Transparency Network in implementing the 2025 workplan and discussing activities for 2026, specifically related to Biennial Transparency Reports (BTRs). The meeting highlighted key achievements and lessons learned from CBIT-GSP support, facilitated country reflections, and focused on aligning future support with national priorities for	Dec 25	UNFCCC	Cross-cutting	Cross-cutting	Completed	The meeting facilitated the sharing of insights and experiences among Anglophone African countries, enhancing their capacity to prepare and submit Biennial Transparency Reports (BTRs). Participants reported improved alignment of their reporting processes with the Paris Agreement, leading to increased transparency and accountability in climate actions. The estimated results included heightened engagement in peer learning, a clearer understanding of support needs for BTR2 submissions, and	2

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Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
	effective climate reporting under the Paris Agreement.						a collaborative framework for ongoing capacity building in climate reporting practices.	
webinar on the progress of the implementation of the Enhanced Transparency Framework (ETF)	A technical webinar providing updates on the implementation of the Enhanced Transparency Framework (ETF), including outcomes and achievements of the Technical Expert Reviews (TERs) and the Facilitative Multilateral Consideration of Progress (FMCP) conducted in 2025. The session also outlined planned transparency-related activities for 2026 and aimed to strengthen understanding of ongoing ETF processes among Parties	Jan 26	UNFCCC	Cross-cutting	Cross-cutting	Completed	Improved understanding of progress made under the ETF, particularly regarding TERs and FMCP processes. The webinar supported national capacity to engage in transparency review processes, enhanced awareness of upcoming reporting requirements, and contributed to better preparation for future BTR cycles and ETF implementation.	2
Webinar Series: Post-COP30 Transparency Outlook Conversation – Transparency roadmaps as a bridge between negotiations and national practice	A webinar series aimed at translating outcomes of COP30 negotiations into practical implementation considerations for countries under Article 13 of the Paris Agreement. The session explored transparency roadmaps as tools to strengthen national transparency systems,	Feb 26	CBIT Global Support Programme (CBIT-GSP	Cross-cutting	Cross-cutting	Completed	Enhanced understanding of COP30 outcomes related to Article 13 and the forward work programme. The webinar strengthened knowledge on developing national transparency roadmaps, improving institutional arrangements, and aligning reporting processes with support mechanisms for future BTR cycles.	2

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Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
	improve coordination among institutions, and support sustainable reporting under the Enhanced Transparency Framework (ETF).							
Refresher Webinar on MPGs on Enhanced Transparency Reporting for Anglophone Africa	A refresher webinar focused on the Modalities, Procedures and Guidelines (MPGs) for Enhanced Transparency Reporting under Article 13 of the Paris Agreement. The session aimed to strengthen understanding of reporting requirements, with a specific focus on the Greenhouse Gas (GHG) Inventory and Nationally Determined Contribution (NDC) Tracking chapters of the Biennial Transparency Report (BTR). It also facilitated exchange of experiences and lessons learned among Anglophone African countries in applying MPGs.	Mar 26	UNFCCC	Cross-cutting	Cross-cutting	Completed	Enhanced technical understanding of MPGs requirements for ETF reporting, particularly for GHG inventories and NDC tracking. The webinar supported national capacity to prepare and finalise BTR1 and advance preparations for BTR2, while also improving consistency and quality in transparency reporting through shared regional experiences and practical insights.	3
Regional Workshop on Improving Reporting in the BTR: Learning Exchange among	An in-person regional workshop aimed at strengthening transparency reporting under Article 13 of the Paris Agreement through peer-to-peer learning and	17-20 March 2026	Partnership on Transparency in the Paris Agreement (PATPA)	Cross-cutting	Cross-cutting	Completed	Strengthened national capacity to improve the quality and completeness of BTR reporting, particularly in NDC tracking, GHG inventory linkages, projections, and adaptation reporting. The	3

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Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
Anglophone African Countries in Windhoek, Namibia	experience sharing among Anglophone African countries. The workshop focused on lessons learned from the preparation of the first Biennial Transparency Report (BTR1), identification of remaining gaps including those highlighted during Technical Expert Reviews (TERs), and practical approaches to improving reporting for BTR2. Key thematic areas included NDC tracking, reporting on Article 6, projections, climate change impacts and adaptation, and understanding the MPGs, TER and FMCP processes.						workshop enhanced understanding of MPGs application, as well as TER and FMCP processes, and supported the identification of practical solutions to address reporting gaps. Peer learning and hands-on exercises contributed to improved institutional knowledge, better coordination, and more effective preparation for BTR2.	
Global Transparency Community Meetings: Enabling data-driven progress on NDC 3.0 implementation	Over three days of expert-led sessions, participants share experiences and explore how transparency tools and frameworks can accelerate effective NDC implementation.	14-16 April 2026	The meetings are co-organized by the Initiative for Climate Action Transparency (ICAT), the Capacity-Building Initiative for Transparency–Global Support Programme (CBIT-GSP), the	Cross-cutting	Cross-cutting	Completed	The sessions were used to strengthen national transparency frameworks, assess the impact of climate policies and measures, and support the development of financing strategies for NDC 3.0. They further contributed to improving systems for tracking and reporting NDC progress, while enhancing synergies between transparency and NDC processes. The sessions drew on	1

Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
			United Nations Environment Programme (UNEP), and the the United Nations Development Programme (UNDP) with the technical support from other partners, including the UN Climate Change Secretariat (UNFCCC), the Food and Agriculture Organization of the United Nations (FAO), and the Partnership on Transparency in the Paris Agreement (PATPA).				country experiences and expert guidance from global transparency support providers to ensure practical applicability. The impact of the sessions was reflected in an improved understanding of the role of transparency in supporting NDC implementation, as well as enhanced institutional and technical capacity to effectively utilize transparency systems. In addition, participants were better equipped to assess policy impacts and track progress towards NDC targets.	
BTR Regional Dialogue Series: Methodologies and Tools on Assessing	The BTR Regional Dialogue Series webinar on methodologies and tools for assessing Loss and Damage	Apr 26	Capacity-Building Initiative for Transparency–Global Support	Cross-cutting	Adaptation	Completed	The webinar was used to facilitate peer learning and regional exchange on methodologies and tools for	2

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Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
Loss & Damage and Reporting in the First BTRs-Lessons from Countries	supported peer learning and knowledge exchange across Eurasia, MENA, and Anglophone Africa to strengthen countries' understanding and application of L&D assessment approaches for improved reporting in the adaptation component of BTRs under the Enhanced Transparency Framework.		Programme (CBIT-GSP), the United Nations Environment Programme (UNEP), the Food and Agriculture Organization of the United Nations (FAO),				assessing Loss and Damage in the context of BTR reporting. Its impact included improved understanding of practical approaches and strengthened capacity to integrate L&D assessment into the adaptation component of Biennial Transparency Reports under the Enhanced Transparency Framework. Estimated results include enhanced quality and consistency of L&D reporting, increased use of relevant methodologies and tools, and improved readiness of countries to report more structured and comparable L&D information in future BTRs.	
Technical workshop on practical approaches to report Belem Adaptation Indicators in Biennial Transparency Report 2 for developing countries	The programme combined plenary sessions, technical guidance, and hands-on reporting and data clinics to support developing countries in identifying priority indicators, applying updated guidelines, and addressing data and methodological challenges under the Enhanced Transparency Framework. It further	20–22 April 2026	African Synthesis Centre for Climate Change, Environment and Development (ASCEND) at the University of Cape Town; the Africa Adaptation Initiative; and The Alliance of Biodiversity	Cross-cutting	Cross-cutting	Completed	The workshop was used to build technical capacity for reporting Belém Adaptation Indicators in BTR2 through practical application of guidelines, data clinics, and peer learning. Its impact included improved understanding of reporting requirements under the Enhanced Transparency Framework, strengthened ability to prioritise indicators, and	4

Title of activity, programme, project or other	Programme/project description	Time frame	Implementing entity	Type of support	Sector	Status of activity	Use, impact and estimated results	Additional info (No. of participants from DFFE)
	facilitated peer learning and discussions on means of implementation and ongoing support needs to strengthen countries' readiness for BTR2 reporting.		International & CIAT.				enhanced capacity to address data and methodological challenges. Estimated results include clearer identification of priority indicators, improved readiness for BTR2 submission, and strengthened approaches to data management and reporting on adaptation and means of implementation.	

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4.8.2 Gender-responsiveness training received

A Gender Mainstreaming in Climate Change Training Workshop was held in Pretoria on the 10th of October 2024 to provide training on gender-differentiation and equality in climate adaptation, mitigation, GHG, project reporting. The workshop provided workshop participants with a more detailed understanding of the following:

- Key concepts related to gender and climate change, including how the impacts of climate change affect communities, groups, and individuals differently.
- Integrating gender into climate change policies, highlighting the importance of gender-sensitive climate policies. Existing climate policies and their gender dimensions were reviewed.
- Tools for gender analysis in climate change were discussed in terms of available tools and application thereof to assess the gender impacts of climate change initiatives.
- Gender-responsive reporting in climate change included an overview of fundamentals of gender-responsive reporting, common challenges and recommendations on overcoming them.
- Analysing and presenting gender data in reports included an outline of how to collect and analyse gender-disaggregated data for climate change reporting, techniques for presenting gender data effectively in reports, and practical examples related to incorporating gender data into climate change reports.

4.9 Support received for the implementation of Article 13 of the Paris Agreement

The section provides an overview of work and processes undertaken in supporting South Africa's BTR2.

The preparation of South Africa's Second Biennial Transparency Report (BTR2) has progressed through a combination of national resources and remaining resources from the BTR1 project, complemented by technical and institutional support from national partners. This arrangement enabled the initiation of technical work while the funding and implementation arrangements for the BTR2 programme were being finalised.

A portion of the remaining BTR1 resources was allocated to support BTR2-related activities. A significant component of the work has been the engagement of the Council for Scientific and Industrial Research (CSIR) as the service provider to deliver technical support for the

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preparation of the BTR. The CSIR work includes the development, drafting and integration of BTR2 chapters in collaboration with DFFE personnel under the guidance of the project manager. The full amount allocated to CSIR for the BTR2 technical work is USD 231 417.02.

SouthSouthNorth (SSN) has continued to provide support to the development of BTR2 through the remaining BTR1 funds and serves as the third Executing Partner supporting DFFE, through UNEP as an implementing agency of the GEF, in the implementation of the project. This support includes technical, programme and operational assistance associated with the preparation of the report.

In parallel, the BTR2 preparation is being undertaken alongside the development of the broader BTR2/BTR3 and NC5 programme, for which the African Climate Foundation (ACF) will serve as the third Executing Partner of the DFFE, through UNEP as an implementing agency of the GEF. Once the remaining BTR1 resources supporting the current BTR2 activities have been utilised, South Africa will continue the implementation and completion of the BTR2 activities under the BTR2/BTR3&NC5 project with ACF.

The overall process has enabled South Africa to maintain progress in BTR2 preparation despite changes in the institutional and funding arrangements. The use of available national resources and remaining BTR1 resources has supported the initial technical outputs and maintained continuity during the transition. The BTR2/BTR3&NC5 project funds from GEF will subsequently support the outstanding technical and implementation activities required to complete and submit South Africa's BTR2 by December 2026. South Africa will then continue to use this bundled approach funding for the development of BTR3 and the Fifth National Communication. The total amount for the BTR2/BT3/NC5 GEF funded project of South Africa is USD 1 233 000.

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Annex 1: Methodologies and assumptions used to estimate the GHG emission reductions or removals due to each action, policy and measure

South Africa reports the methodologies and assumptions used to estimate GHG emission reductions and removals attributable to each policy and measure (PaM), where such information is available. However, reporting is constrained by several challenges, including the absence of formal data-sharing arrangements between the DFFE and key data providers, the cost of accessing certain datasets due to membership requirements, high staff turnover and resulting capacity constraints, delays in report approvals that affect the availability of data for some PaMs, and the need for additional capacity-building support to meet Enhanced Transparency Framework (ETF) reporting requirements.

Difficulties in collecting and consolidating activity data for individual PaMs have resulted in incomplete datasets that do not cover the entire 2023 to 2026 reporting period (for achieved and expected emission reductions). Where data gaps exist, reasonable assumptions have been applied, where appropriate, to estimate emission reductions through to 2026. These assumptions are documented under the relevant PaMs, as applicable.

For all PaMs included in the emission reduction assessment, Global Warming Potential (GWP) values from the IPCC Fifth Assessment Report (AR5) were used. The emission reduction accounting approaches described in this section are incorporated within the Mitigation Quantification Tool, which is used to estimate the mitigation impacts of PaMs. Developed by the DFFE in 2020, the tool was an outcome of an assessment of the greenhouse gas effects associated with selected PaMs.

Emission reduction estimates are based solely on ex-post evaluations of the shortlisted PaMs. No primary data collection was undertaken, and the underlying datasets were not independently verified or assured. Quantification methodologies varied across PaMs but generally involved applying appropriate emission factors to relevant activity data. The resulting emission reductions were calculated and reported annually in the tool as million tonnes of carbon dioxide equivalent (Mt CO_2e).

National Development Plan, 2030

Estimates of expected and achieved GHG emission reductions are not reported for the NDP 2030. The NDP 2030 is not a mitigation intervention in itself but underpins the government

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paradigm for medium term planning in all sectors of the economy to take appropriate actions to reduce GHG emissions. The strategic objectives of the NDP 2030 has contributed to legal and policy development post 2012. Including the emission reductions from NDP 2030 will lead to double accounting of GHG emission reductions; as the GHG effect of the NDP 2030 cannot be separately distinguished and quantified from the other mitigation PAMs described in this chapter. The GHG emission reductions achieved and expected of NDP 2030 are not reported.

Climate Change Act 22 of 2024 that includes sectoral emission targets, carbon budgets and the associated mitigation plans

Estimates of expected and achieved GHG emission reductions are not reported for the Climate Change Act No 22 of 2024 and its instruments including SETs, carbon budgets and mitigation plans. These PaMs are not mitigation interventions in themselves but incentivise government departments and private companies to take appropriate actions for example energy saving measures. As such mitigation measures and resulting emission reductions implemented to comply with Climate Change Act No 22 of 2024 regulations would be accounted for elsewhere There is double accounting of mitigation effects involved should the emission reductions of cross-cutting measures like SETs and carbon budgets as provisioned by the Climate Change Act be included in the accounting of emission reductions alongside sectoral PAMs.

National GHG Emission Reporting Regulations

Estimates of expected and achieved GHG emission reductions are not reported for the NGERs. The NGERS are applicable for carbon tax, sectoral emission target, carbon budget, and mitigation plan reporting. Including the emission reductions from the NGERS will lead to double counting of GHG emission reductions as the GHG effect of the NGERS cannot be separately distinguished and quantified from the other mitigation PAMs described in this chapter. The GHG emission reductions of NGERS are not accounted for and not reported.

Carbon Tax Act

The tax is integrated with other tools like sectoral emission targets and carbon budgets mentioned in the sub-section about the Climate Change Act 22 of 2024. Including the emission reductions from the carbon tax will lead to double accounting of GHG emission reductions; as the GHG effect of the tax cannot be separately distinguished and quantified from the other mitigation PAMs described in this chapter. The GHG emission reductions of the carbon tax are not reported.

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Hydrogen Commercialisation Strategy

The strategy was implemented in 2023. None of the projects mentioned in the Hydrogen Commercialisation Strategy have achieved commercial operational as these projects remain at investment decision, planning, pre-feasibility or feasibility status. The monitoring of the hydrogen projects forms a part of the broader just energy transition monitoring and evaluation (M&E) system. The most recent M&E report covering the first quarter of 2026 indicates that the Green Hydrogen Portfolio is advancing two export projects and one domestic project through pre-feasibility and feasibility studies, creating a pipeline of investment-ready opportunities. The Portfolio is strengthening governance, stakeholder coordination, funding engagement, and transparent investment tracking to move projects from planning to implementation and attract both concessional and commercial finance. The achieved and expected GHG emission reductions are not reported.

Just Energy Transition Implementation Plan

Reporting years for GHG emission reductions of PAMs are from 2010 to 2022 in this BTR. As the JET-IP was implemented in 2023; there are no emissions in the years before this. The JET-IP progress report for 2026 Quarter 1 mentioned that GHG emission reduction data is only available for the eco-industrial parks programme. GHG emission reductions data for the eco-industrials parks programme were collated from the United Nations Development Organization Global Eco-Industrial Parks Programme (GEIPP) South Africa monitoring dashboard[1] for years 2023, 2024, 2025. It is assumed that the emission reductions in 2026 are the same as in 2025 as the projects are still ongoing. The JET-IP progress report for 2026 Quarter 1 also mentions that no new submissions of information about emission reductions were made by implementing partners.

The high-level monitoring, reporting and learning (MRL) system for JET-IP is operational which includes reporting of GHG emission reductions. However, there is a challenge for how project level data is collected specifically about GHG emission reductions and integrated into the JET-IP MRL system.

12L Tax Incentive Program

In BTR1, the emission reductions were reported for the period 2010 to 2022: No direct calculations were made on the initial data provided by SANEDI. The $kgCO_2e$ savings for each project were supplied directly by SANEDI, reflecting the various energy carriers involved. The emission data sets from SANEDI are based on information submitted by claimants and verified by an accredited entity. The process starts with the creation and submission of a baseline

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benchmarking model and report to SANEDI for approval, which describes the business-as-usual scenario where the energy-saving measure would not have been implemented.

Emission reduction data were collated from SANEDI annual reports for 2023/2024 and 2024/2025 for the achieved GHG emission reductions in reporting years 2023 and 2024, respectively. For expected GHG emission reductions in 2025 and 2026: Firstly, the year-to-year percentage change in emission reductions were calculated based on the time series of data for 2010 to 2024. Secondly the average year-to-year percentage change in emission reductions was then computed, providing an indication of the long term mean change in emission reductions. Lastly the average year-to-year percentage change in emission reductions was used to extrapolate the emission reductions in 2025 and 2026. This extrapolation methodology had been recommended by the technical expert review team of South Africa's BTR1 considering South Africa's capacities to report expected emission reductions.

Municipal Energy Efficiency and Demand Side Management programme

For the estimation of achieved emission reductions in 2023 and 2024: Energy savings data were collated from the estimates of national expenditure report of the national budget which is published annually by National Treasury. The emission reductions were computed using the grid emission factor published by DFFE and the energy savings data. The grid emission factors were only available for 2021, 2022 and 2023. For the calculation of emission reductions in 2023, the DFFE grid emission factor for 2023 was applied. For the calculation of emission reductions in 2024, the average DFFE grid emission factor for 2021 to 2023 was applied.

For the calculation of expected emission reductions in 2025 and 2026: Expected energy savings data were collated from Medium Term Expenditure Framework Targets in the estimates of national expenditure report of the national budget which is published annually by National Treasury. The emission reductions were computed using the grid emission factor published by DFFE and the energy savings data. The grid emission factors were only available for 2021, 2022 and 2023. For the calculation of emission reductions in 2025 to 2026, the average DFFE grid emission factor for 2021 to 2023 was applied. The grid emission factors in the calculations of emission reductions will be updated in future BTRs as the data is made available publicly online by the DFFE.

The National Cleaner Production Centre South Africa program

Achieved emission reductions in 2023 and 2024: The cumulative energy savings for 2015 to 2025 were collated from the NCPC Annual Report for 2024/25. The average annual energy saving was computed from the cumulative energy savings. The emission reductions in 2023

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were calculated using the DFFE grid emission factor for 2023 and the annual average energy savings. The emission reductions in 2024 were calculated using the average DFFE grid emission factor for 2021 to 2023 and the annual average energy savings.

Expected emission reductions in 2025 and 2026: The cumulative energy savings for 2015 to 2025 were collated from the NCPC Annual Report for 2024/25. The average annual energy saving was computed from the cumulative energy savings. The emission reductions in 2025 were calculated using the average DFFE grid emission factor for 2021 to 2023 and the annual average energy savings. The emission reductions in 2026 were calculated using the average DFFE grid emission factor for 2021 to 2023 and the annual average energy savings.

The grid emission factors in the calculations of emission reductions will be updated for future BTRs as the data is made available publicly online by the DFFE.

The energy savings activity data collated from the 2024/25 NCPC annual report will be updated for future BTRs as updated data is reported in future NCPC annual reports.

Renewable Energy in South Africa's Integrated Resource Plan

The emission reductions reported represent the total annual electricity generated from IPP and non-IPP renewable energy projects. The activity data used in the quantification of emission reductions is the annual electricity generated from renewable energy sources collated from NERSA monitoring performance reports of renewable energy power plants. The emission reductions in 2023 were calculated using the DFFE grid emission factor for 2023 and the electricity generated from renewables in 2023. The emission reductions in 2024 were calculated using the average DFFE grid emission factor for 2021 to 2023 and the electricity generated from renewables in 2024.

For the calculation of expected emission reductions in 2025 and 2026: The emission reductions in 2025 were calculated using the average DFFE grid emission factor for 2021 to 2023 and the electricity generated from renewables in 2025. Since there has been an upward trend in the electricity generated from renewables from 2020 to 2025 – it is assumed that the electricity generated from renewables in 2026 is the same as in 2025. As such it is assumed that the emission reductions in 2026 are the same as in 2025.

Double accounting of emission reductions are avoided as the electricity generated from IPP and non-IPP renewable projects are reported separately in NERSA reports.

Renewable Energy Independent Power Producer Procurement programme

For BTR1, the emission reductions were estimated from secondary activity data sets, which detail the electricity generated by renewable energy projects each year and are sourced from

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Eskom Integrated Annual Reports, and multiplied by the grid emission factor specific to each to determine the emissions avoided through renewable energy generation. A conversion factor of 0.277778 was used to convert GJ to MWh, ensuring the coal emission factor is in the correct unit. A coal generation baseline was assumed. It is also assumed that these projects are still operational and continue to achieve the same emission savings as last recorded in 2020.

The emission reductions reported represent the total annual electricity generated from IPP renewable energy projects. The activity data used in the quantification of emission reductions is the annual electricity generated from renewable energy sources collated from NERSA monitoring performance reports of renewable energy power plants. The emission reductions in 2023 were calculated using the DFFE grid emission factor for 2023 and the electricity generated from IPP renewables in 2023. The emission reductions in 2024 were calculated using the average DFFE grid emission factor for 2021 to 2023 and the electricity generated from IPP renewables in 2024.

For the calculation of expected emission reductions in 2025 and 2026: The emission reductions in 2025 were calculated using the average DFFE grid emission factor for 2021 to 2023 and the electricity generated from IPP renewables in 2025. The electricity generated from IPP renewables in 2026 was extrapolated using the average year-to-year percentage change in electricity generated from IPP projects. The emission reductions in 2026 are calculated using the average DFFE grid emission factor for 2021 to 2023 and the extrapolated value for electricity generated from IPP renewables in 2026.

Double accounting of emission reductions are avoided as the electricity generated from IPP and non-IPP renewable projects are reported separately in NERSA reports.

Bus Rapid Transport System

Applied the ASIF approach (Eichhorst et al. 2018). Activity data included the number of BRT passenger trips; the average trip length and the fuel split between petrol and diesel of road transport modes. It is also assumed that these projects are still operational and continue to achieve the same emission savings as last calculated in 2020. This assumption applies to the achieved emission reductions in 2023 and 2024 and the expected emission reductions in 2025 and 2026.

Transnet Road-to-Rail Programme

The amount of emission reductions for achieved emission reductions in 2023 and 2024 were sourced from Transnet's Annual Integrated Reports. The expected emission reductions in 2025 and 2026 were extrapolated using the long-term average year-to-year percentage change in emission reductions.

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Electric Vehicles

The primary activity data used for the estimation of the emission reductions is the electric vehicle population in 2010 as reported in Merven et al. 2018 and then updated with the annual electric vehicles population reported in IEA EV reports. Other activity data includes the average annual distance travelled by cars; fuel split between petrol and diesel of road transport modes and vehicle fuel economy for different road transport types. Heavy duty electric vehicles have been excluded in the accounting of emission reductions for electric vehicles in 2023 to 2026 since the current numbers of vehicles are few and the related emission reductions therefore negligible. The expected emission reductions in 2025 and 2026 were extrapolated using the long-term average-year-to-year percentage change in emission reductions.

Glass Recycling

A Tier 1 approach was used to calculate GHG emissions from glass production for the period 2000–2017. For this time series, the average annual glass cullet ratio was applied in the Tier 1 calculations. GHG emissions were also estimated for a scenario in which the average annual glass cullet ratio was assumed to be zero (i.e., no cullet was used in glass production). The difference between the emissions estimated under this scenario and the reported GHG emissions for 2000–2017 represents the emission reductions attributable to the use of recycled glass in glass production. The annual percentage difference between the scenario emissions and the reported emissions was then calculated, and the mean annual percentage difference over the 2000–2017 period was subsequently determined.

For the period 2018–2024, the 2024 NID states that all glass producers estimated their emissions using facility-specific Tier 3 methodologies and reported the resulting emissions directly to the DFFE. However, due to confidentiality constraints, the underlying activity data and emission factors were generally not provided. Consequently, it was not possible to estimate an average annual glass cullet ratio or assess its effect on reported emissions for this period. Although the 2024 NID notes a planned improvement project to investigate the separate reporting of facility-level cullet ratios, the absence of detailed activity data and emission factors currently prevents quantification of the GHG emission reduction attributable to cullet use in glass production.

The mean annual percentage difference derived from the 2000–2017 time series was applied to the reported annual GHG emissions for the period 2018–2024 to estimate a scenario in which no glass cullet was used in glass production. The resulting values represent the estimated GHG emissions that would have occurred in the absence of recycled glass use.

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The emission reduction achieved in 2023 and 2024 is computed based on the difference between the scenario GHG emission value and the reported GHG emission value.

The expected emission reductions for 2025 and 2026 were estimated by extrapolating the 2018–2024 GHG emissions time series. This period was selected because it reflects the change in the methodological approach used to calculate emissions from glass production. The mean annual percentage change in emissions over the 2018–2024 period was applied to the previous year's reported emissions to project GHG emissions for 2025 and 2026. To estimate a scenario in which no glass cullet is used, the mean annual percentage difference derived from the 2000–2017 analysis was applied to the projected reported emissions for 2025 and 2026. The emission reductions for 2025 and 2026 were then calculated as the difference between the scenario emissions (without cullet use) and the projected reported emissions.

Conservation Agriculture

The AFOLU strategy (DEFF, 2020) reports that in 2018, conservation areas constituted 14% of the annual crop area, which was 11,126,022 hectares (DEA, 2019). These conservation areas have been expanding at an annual growth rate of 7.5%. The mitigation potential factor is estimated at 0.2 tC/ha/yr, although DEFF 2020 initially applied a higher value of 0.3 tC/ha/yr. However, due to the partial adoption of conservation activities (Findlater et al., 2019), the lower value of 0.2 tC/ha/yr was used. It is assumed that soil carbon will accumulate over the IPCC default period of 20 years, with the annual growth rate in conservation areas remaining constant at 7.5% per year.

Grassland Restoration

Emission reductions were estimated based on GHG emission values from the 2024 NID, for GHG emission reductions from cropland converted to grassland, settlements converted to grassland and other land converted to grassland.

Afforestation

Emission reductions were estimated based on GHG emission values from the 2024 NID, for GHG emission reductions from conversions of cropland/ grassland/ wetland/ settlements/ other land to indigenous forest/plantation/woodland.

Thicket Restoration

Emission reductions were estimated based on GHG emission values from the 2024 NID, for GHG emission reductions from conversions of indigenous forest/plantation/woodland /cropland/grassland/wetland/settlements/other land to thicket.

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Shrubland Restoration and Afforestation

Emission reductions were estimated based on GHG emission values from the 2024 NID, for the GHG emission reductions from land use conversions that include forestland converted to indigenous forest and woodlands.

Municipal Landfill Gas Destruction

Excluded to avoid double accounting as there are projects registered under carbon credit mechanisms.

National Waste Management Strategy

Emission reductions were obtained from secondary data sets sourced from DFFE for the years 2010-2020. For reporting reductions in years 2023 and 2024 and projected reductions in 2025 and 2026, it was assumed that the waste diversion projects were ongoing remained operational and avoided emissions at the same rate observed in the last recorded year (2020). Some waste management activities are registered under carbon credit mechanisms; however, their reported total annual emission reductions are minimal, thus considered negligible, and have therefore been excluded from the accounting.

There are challenges related to the quantification of emission reductions from waste management activities for recycling and composting activity data. The reported tonnages of waste treated or recycled as is available from the South African Waste Information Centre (SAWIC) are inconsistent since there is incomplete reporting from waste management sites across the country. South Africa will consider how this PaM will be reported in BTR3. Emission savings from plastics and metals recycling would need to be accounted for in the IPPU sector – as is done for glass recycling in this BTR. As monitoring reports for carbon credit projects, especially composting and biogas initiatives, become available, it will be possible to determine whether these projects continue to operate within a carbon credit mechanism or independently. This will enable accurate accounting of their activities and emissions outcomes.

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